सत्यमेव जयते

वार्षिक रिपोर्ट
ANNUAL REPORT 2020-21

सुपारी और मसाला विकास निदेशालय
कृषि और किसान कल्याण मंत्रालय
कृषि एवं किसान कल्याण विभाग
भारत सरकार, कालीकट- 673005, केरल

Directorate of Arecanut and Spices Development
Ministry of Agriculture & Farmers Welfare
Department of Agriculture & Farmers Welfare
Government of India, Calicut - 673005, Kerala, India

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DIRECTORATE OF ARECANUT AND SPICES DEVELOPMENT

Ministry of Agriculture and Farmers Welfare

(Department of Agriculture and Farmers Welfare)
Government of India
Calicut, Kerala 673 005

DASD Annual Report 2020-21

Directorate of Arecanut and Spices Development
Ministry of Agriculture and Farmers Welfare
(Department of Agriculture and Farmers Welfare)
Government of India
Calicut – 673 005, Kerala.

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PREFACE

The Directorate of Arecanut and Spices Development, a subordinate office under Department of Agriculture and Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India has the distinction of successfully implementing Central Sector Schemes on Spices, Arecanut and Medicinal & Aromatic Plants over the plan periods with the cooperation of State Departments, State Agricultural Universities, ICAR Institutes etc. During 2005-06, the Government of India launched National Horticulture Mission (NHM) to give further impetus to encourage growth in production of horticultural crops including spices. Since the inception of NHM, the Directorate is coordinating and monitoring the overall activities on the development of spices in the country. The Directorate also supplements the developmental efforts of the State Govts by making available nucleus planting materials of various high yielding varieties of spices and aromatic crops across the country.

The integrated approach adopted for implementing NHM/MIDH programmes helped the objectives of enhanced production and productivity of spices in the country and reflected in the official statistics of area and production of spices in the country. The production of spices which was 3.8 million tonnes from an estimated area of 2.3 million ha during the year 2005-06 has increased to around 11.12 million tonnes from 4.46 million ha in2020-21. Foreign exchange earnings through Spices export havecrossed 4 billion US $ in 2020-21 for the first time in the history. This gives me immense satisfaction in bringing out the Annual Report of the Directorate for the year 2020-21.

The Report carries all the activities undertaken by the Directorate in improving the spices production scenario at national level. Augmenting production of good quality planting materials across the country had been one of the major programmes of the Directorate. Dissemination of technologies through frontline demonstration plots, farmers training programmes, seminars and workshops and accreditation of nurseries have been given the highest priority.

I take this opportunity to thank Dr. S.K. Malhotra, Horticulture Commissioner for giving adequate support. I also thank my colleagues for their cooperation in achieving the goals set by the Directorate.

(Homey Cheriyan)
Director

CONTENTS

1. INTRODUCTION

The Directorate of Arecanut and Spices Development was established on 1st April, 1966 at Calicut in Kerala, as a subordinate office under Ministry of Agriculture, Government of India, to look after the development of spices and arecanut at National level. This responsibility was earlier shouldered by Central Spices and Cashewnut Committee and Indian Central Arecanut Committee, which were abolished in 1965 consequent to the recommendations of Agricultural Research Review Team.

1. Mandate

The Directorate of Arecanut and Spices Development, Calicut is a national level institution responsible for development of spices, aromatic plants, betel vine and arecanut grown in the country.

The mandate of the Directorate is as follows.

- Assessment of the developmental needs of the crops entrusted to it.
- Formulation of Central Sector/Centrally Sponsored Schemes and implementation of the same either directly or through the State Governments, Agricultural Universities etc.
- Monitoring the implementation of Central Sector/Centrally Sponsored Schemes and coordinating the development activities.
- Rendering technical assistance to State Governments and other agencies on commodity development programmes.
- Collection and compilation of statistics of area, production, export, import, prices etc. and dissemination of the same to the Central and State Governments and other agencies.
- Keeping liaison with the research institutes and extension agencies and acting as a two-way channel in the transfer of technology.
- Undertaking the publicity and propaganda works relating to the commodities.
- Assisting the Central and State Governments on all matters relating to the development of the commodities.
- Accreditation of spices nurseries.

Fig. 1. Office of the Directorate of Arecanut and Spices Development

2. Organizational Structure

The Directorate is headed by a Director supported with two Deputy Directors, one Assistant Director, one Research Officer and other supporting staff viz. Superintendent, Senior Technical Assistants, Statistical Investigator, Technical / Marketing/ Statistical Assistants along with other administrative staff.

In accordance with the mandate, the Directorate has four Sections *viz.* Development, Marketing, Economic Research & Statistics, Publicity and Administration.

Fig. 2. Organizational structure

3. Staff

a. Staff strength as on 31-03-2021

Sl. No.	Name of the post	Group A/B/C/D	Sanctioned Strength	In Position
1.	Director	A	01	01
2.	Deputy Director	A	02	02
3.	Assistant Director	A	01	-
4.	Research Officer	A	01	-
5.	Superintendent	B	01	01
6.	Statistical Investigator	B	01	01
7.	Senior Technical Assistant	B	02	02
8.	Junior Translator	B	01	01
9.	Technical Assistant	C	03	02
10.	Marketing Assistant	C	03	02
11.	Statistical Assistant	C	01	01
12.	Artist Photographer	C	01	01
13.	Computor	C	01	-
14.	Stenographer Grade II	C	03	03
15.	Upper Division Clerk	C	04	03
16.	Lower Division Clerk	C	06	04
17.	Staff Car Driver (OG)	C	01	01
18.	Multi Tasking Staff	C	06	06
	TOTAL		**39**	**31**

b. STAFF IN POSITION AS ON 31-03-2021

Sl.No.	Name	Designation
1	Dr. Homey Cheriyan	Director
2	Dr. Femina	Deptuy Director
3	Shri. Babulal Meena	Deptuy Director
4	Shri C. Shunmuga Sundaram	Superintendent
5	Smt. C.V. Divya	Senior Technical Assistant
6	Dr. J.S. Remya	Senior Technical Assistant
7	Shri. K. Manojkumar	Statistical Investigator
8	Dr. P.N. Jyothi	Junior Translator
9	Shri C.F. Gedam	Artist Photographer
10	Smt. M.K. Suma	Technical Assistant
11	Smt. K. Thejas Das	Technical Assistant
12	Smt. K. Ushakumari	Marketing Assistant
13	Smt. K.S. Kanchana	Marketing Assistant
14	Smt. Sruthi Sreekumar	Statistical Assistant
15	Shri. P.R. Anil Kumar	Stenographer Grade II
16	Shri. O.P. Haridasan	Stenographer Grade II
17	Shri. M.P. Unnikrishnan	Stenographer Grade II
18	Shri. P. Vinod Kumar	Upper Division Clerk
19	Shri. T.K. Damodaran Nair	Upper Division Clerk
20	Shri. P. Baiju	Upper Division Clerk
21	Shri. K.V. Rajesh	Lower Division Clerk
22	Shri. Palash Kanti Mollick	Lower Division Clerk
23	Shri. T. Srikumar	Lower Division Clerk
24	Shri. Satish Kumar	Lower Division Clerk
25	Shri. M. Ranjith	Staff Car Driver
26	Shri. E. Ajithkumar	Multi Tasking Staff
27	Shri. K.S. Santhos	Multi Tasking Staff
28	Shri. K.V. Chandran	Multi Tasking Staff
29	Shri. T.Pramoth Kumar	Multi Tasking Staff
30	Shri. P.P. Sureshkumar	Multi Tasking Staff
31	Shri. L. Sujeesh	Multi Tasking Staff

4. Plan and non-plan budget

(a) Non-plan budget for 2020-21

Particulars of sub-head and name of the scheme etc. 1/2401	Sanctioned budget (Rs in lakhs)	Expenditure (Rs in lakhs)
550501- Salaries	284.90	278.44
550502- Wages	1.12	1.11
550506 - Medical treatment	1.5	1.23
550511- Domestic Travel Expenses	2.12	1.69
550013- Office Expenses	14.46	11.89
550016- Publications	5.13	3.77
550026- Advertising & Publicity	0.00	0.00
550027- Minor Works	13.16	11.46
96-Swchhata Action	0.60	0.50
Total	**322.99**	**310.13**

(b) Plan budget under Mission for Integrated Development of Horticulture (MIDH) 2018-19

Particulars of Sub-Head and name of the Scheme etc.	Sanctioned budget (Rs. in lakhs)	Expenditure (Rs. in lakhs)
MIDH	1200	1181

5. Right to Indormation (RTI) in DASD

During the year 2020-21, the Directorate received requests under various provisions of RTI Act seeking various kinds of information. During the year, Shri Babulal Meena, Assistant Director was designated as Central Public Information Officer (CPIO) and Director was the Appellate Authority. The details of RTI requests received and disposed off is as under:-

Total number of RTI requests received	Total no. of request disposed off	Total no. of request in which information was denied	Total no. of appeals received
6	6	NIL	NIL

6. Vigilance Awareness Week

In accordance with the instruction received from the Ministry, Vigilance awareness week 2020 was observed in the Directorate during the period from 27th October to 2nd November, 2020. Posters and Banners were prepared and displayed in prominent places of the Directorate. On 27th October, 2020 all the Officers and staff assembled in the Office. Dr. Femina, Deputy Director, DASD addressed the staff explaining the importance of eradicating corruption and to raise public awareness regarding the threat caused by corruption. Afterwards, the Deputy Director administered the integrity pledge to all the staff at 11.00 am on 27th October, 2020.

On 2nd November, 2020, a workshop on Vigilance Awareness was organized in this Directorate. Dr Homey Cheriyan, Director gave lecture on vigilance awareness and officers and staff attended the workshop.

Fig. 3. Officers and Staff taking vigilance pledge

7. Sadbhavana Diwas

"Sadbhavana Diwas" was observed on 20th August, 2020 on the birth anniversary of former Prime Minister Rajiv Gandhi. All staff were gathered and took Sadbhavana Diwas pledge on that day.

8. Rashtriya Ekta Diwas (National Unity Day)

Rashtriya Ekta Diwas (National Unity Day) was observed on 31st October, 2020 on the birth anniversary of Sardar Vallabhabhai Patel and all staff were gathered and took Rashtriya Ekta Diwas Pledge on 31st October, 2020.

2. DEVELOPMENT PROGRAMMES

The Directorate has the national mandate for the development of Arecanut, Spices (other than Cardamom), Betel vine and Aromatic plants. Arecanut, Spices, Betelvine and Aromatic Plants occupy an important position among the horticulture crops because of their huge domestic consumption, sizeable export earnings and substantial employment generation particularly in the rural sector.

1. Mission for Integrated Development of Horticulture (MIDH)

During 2005-06, Government of India launched National Horticulture Mission (NHM) in the country to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies with an aim to double the production in Horticulture crops, primarily through the improvement in productivity of the crops. The National Horticulture Mission envisaged to cover all aspects of production including scientific cultivation, adoption of improved production technology, integrated pest and disease management, integrated nutrient management, organic cultivation, post-harvest management including value addition, storage etc. The mission programmes are fully funded by the Government and different components proposed for implementation financially supported on the scales laid down. The schemes were implemented in all the states and Union Territories in the country except North Eastern and Himalayan States, for which a separate scheme has been sponsored by the Government of India. During 2014-15, the Ministry of Agriculture and Farmers Welfare, Government of India has subsumed all the development schemes of horticulture in the country under an umbrella scheme namely Mission for Integrated Development of Horticulture (MIDH) for the holistic growth of the entire horticulture sector including spices in the country. The Mission programmes has completed a period of almost 15 years and the programme has made significant progress in achieving its objectives.

1.1 Role of the Directorate of Arecanut and Spices Development (DASD) in the implementation of MIDH programmes

- ❖ Responsible for coordinating and monitoring the activities on development of Arecanut, spices and aromatic plants.
- ❖ Responsible for organizing national level training programmes, seminars and workshops on spices, medicinal & aromatic plants on regular intervals.
- ❖ Directorate supplements the developmental efforts of the State Government by making available the nucleus planting materials of various high yielding varieties of spices and aromatic plants across the country, through Central Institutes and State Agriculture Universities.
- ❖ Directorate is responsible for undertaking accreditation of spice nurseries across the country.
- ❖ Directorate disseminates periodically the seasonal crop prospects, area coverage, price trend etc. for the use in the planning process.

1.2 Strategies identified for development of Spices and Aromatic Plants under MIDH

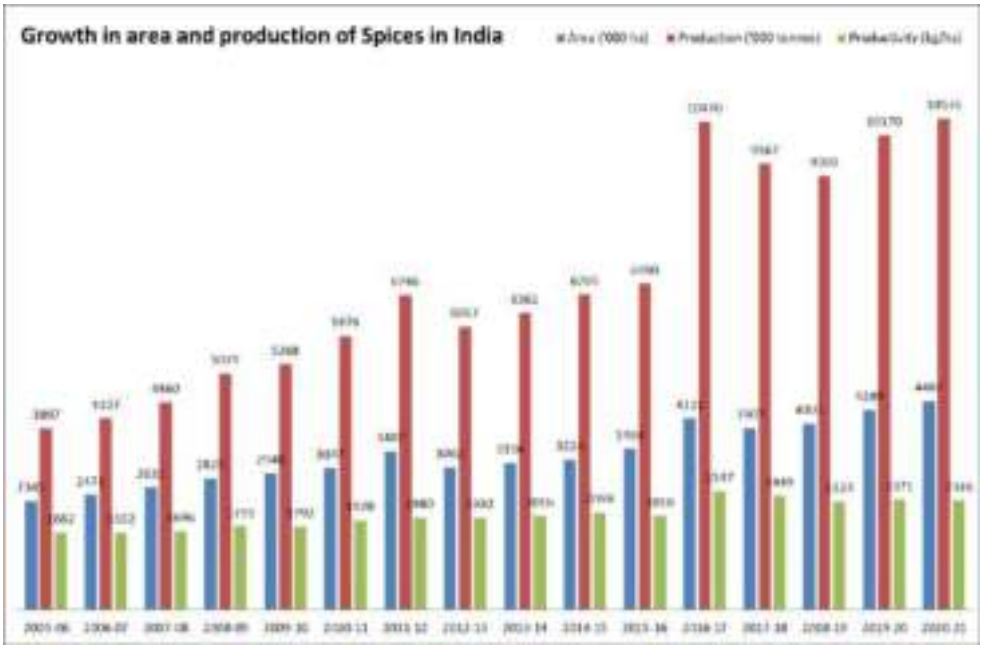
The growing demand for various spices and aromatic plants in food, pharmaceutical and cosmetic industries, both within the country and globally, necessitates streamlining production of these commodities so as to make available enough material for the domestic market as well as for exports. As a result of the national policies on liberalization and globalization and integrated approach in the crop development adopted in the

previous plan periods, our export of spices and aromatic plant products, have increased substantially in recent years. Further, the above plant products are generally exported mainly in the whole form collected from various production centres without looking into the varieties. Variety has specific characteristic suited for production of value-added products. Such varieties having specific characteristics, which inter-alia relate to its intrinsic quality, will have to be rapidly multiplied and their cultivation organized for regular production. In order to take full advantage of the above situation and to keep up the momentum of exports, a Mission approach seems inevitable.

Growth in spices sector during NHM / MIDH period

The National Horticulture Mission is specially focused on increasing production and productivity through adoption of improved technologies, ensuring quality through genetic upgradation of all horticulture crops. Special emphasis is also given on adoption of area-based cluster approach for developing regionally important crops based on their local adaptation. Availability of quality planting materials being the primary requirement, received focused attention through an integrated approach in nucleus planting material production by providing the required infrastructure to various organizations predominantly the ones responsible for the release of these varieties and having sufficient technical support for production and maintenance of purity.

Various development programmes implemented in the spices sector under MIDH (Mission for Integrated Development of Horticulture) have helped tremendously in achieving spectacular growth in production of spices. During the period of NHM/MIDH, from 2005-06 to 2020-21, the area of spices has increased from 23.45 lakh ha to 44.87 lakh ha and production from 38.97 lakh tonnes to 105.33 lakh tonnes with a CAGR of 4.4% and 6.9% respectively. Productivity has also increased to the tune of 2.3%. . Indian Spices Export has shown a spectacular growth during the pandemic period, 2020-21 and export earnings reached an all-time high of 3.6 billion US $.



1.3 Thrust areas identified for development of Arecanut, Spices and Aromatic Plants under MIDH

- ❖ Achieving higher level of productivity and reducing the cost of production so as to keep the prices at affordable level in the local market and competitive in the international market.
- ❖ Assuring availability of quality, disease free planting material of HYV of spice crops through planting material production programme implemented in SAUs and ICAR Institutes.
- ❖ Through nursery accreditation programme, ensuring regulation of quality and genuinity of planting material produced through private and public sector nurseries.
- ❖ Developing the cultivation of export-oriented varieties such as bold and pungent pepper varieties, ginger with low fibre content, turmeric with high curcumin, chillies with bright red colour and low pungency, varieties of spices with high oleoresin and volatile oil content.
- ❖ Encouraging women in cultivation as well as community processing.
- ❖ Reducing the foreign exchange outflow on account of import of certain spices and aromatic plants by increasing production of these crops.

1.4 Strategies adopted for development of spices

In order to achieve the production targets, to meet the domestic and export demands, accomplishing the quality parameters and product diversification, the following strategies are being adopted:

- ❖ Promotion of High Yielding Varieties with good quality attributes and better export demand.
- ❖ Production of nucleus planting material at 100% assistance through State Agri. Universities and Central Institutes. Promoting the production of quality planting materials in large scale, adopting the advanced techniques including tissue culture, microrhizome production in ginger and turmeric, protray raising of seedlings etc. through State Agriculture/Horticulture Departments, Research Institutes, voluntary and private organizations and individuals.
- ❖ Promoting nursery accreditation programme for regulating the public/private nurseries across the country.
- ❖ Motivating farmers to follow improved cultivation methods including plant protection measures through transfer of technology programmes.
- ❖ Collecting statistics on area & production, market arrivals, prices etc. within and outside the country, their compilation and dissemination, conduct studies on cost of production, price spread, domestic demand etc.

1.5 Crop wise strategies adopted by the Directorate for development of Mandate crops

1. Black pepper - To improve the productivity of black pepper , the directorate has been prioritizing cluster based demonstration programmes on organic/ sustainable production practices and multiplication and distribution of improved varieties which assures improved productivity and biotic/ abiotic stress resistance.

2. Ginger – To address the disease spread through seed material, promotion of disease free planting material production through microrhizomes and protray technique is implemented in main production centres. High oil / oleoresin containing varieties having suited for industrial purpose are also promoted under planting material production programme.
3. Turmeric – Promotion of high curcumin varieties through planting material production programme is implemented in main producer states and cluster based demonstrations for promoting organic/ sustainable production practices and export oriented high curcumin turmeric cultivation is implemented in selected potential production clusters.
4. Chilli – Quality seed material production programme and demonstrations on promotion of sustainable cultivation practices are implemented in main producer states. Leaf curl resistant/ tolerant high yielding Hybrid varieties developed in public sector are also promoted through demonstration programme. In drought prone areas, drip irrigation is also demonstrated for improved productivity.
5. Seed Spices – Identifying export oriented pesticide free production of seed spices. Promotion of Good Agricultural Practices, Drip irrigation practices and multiplication and demonstration of potential HYV.
6. Tree spices – promotion of quality planting material production through planting material production programme, establishment of nurseries /mother blocks linking with accreditation programme in clove, nutmeg, tamrind, garcinia etc. Promotion of high density cultivation and post harvest handling practices to commercialise cinnamon cultivation and other tree spices.
7. Arecanut – Promotion of multi species cropping system, INM/ IPM practices and use of bioagents and newer molecules in pest and disease management.
8. Betelvine – Establishing hi-tech baroj structures in major production centres to ensure availability of quality planting material.
9. Aromatic crops – Establishment of Cluster based demonstrations and distillation units to create awareness among rural farmers on the potential of commercial cultivation and value addition of aromatic plants .

2. Development Programmes taken up by DASD under MIDH during 2020-21

The development programmes implemented by the Directorate consisted primarily of the production of nucleus planting material of different spices through SAUs and ICAR Institutes and technology dissemination programmes including establishment of frontline demonstration plots, conduct of National Seminar/Workshops/Farmer's Training programmes. During 2020-21, the Directorate implemented the NHM programmes with an outlay of Rs.12.00 crores for the development of Spices and Aromatic Plants.

Table 1. Major programmes implemented and achievements made during 2020-21 are as follows.

				Target		Achievement	
S.No.	Programmes	Unit	Cost per unit (Rs in Lakhs)	Physical	Financial (Rs. in lakhs)	Physical (Rs. in lakhs)	Financial
I	**Production and Distribution of Quality Planting Materials**						
I	**Production and Distribution of nucleous Planting Materials of spices**						
1	Black Pepper / Betelvine	Nos in lakhs	8.00	23.6750	189.400	23.4000	188.15737
2	Ginger rhizomes	Qty in tones	0.30	148.1000	44.4300	148.1000	44.4300
3	Ginger Protray seedlings	Nos in lakhs		2.4700	2.9640	2.4700	2.9640
4	Turmeric rhizomes	Qty in tones	0.30	572.0000	171.6000	572.0000	171.6000
5	Turmeric protray seedlings	Nos in lakhs		3.7200	4.4640	3.7200	4.4640
6	Chilli seeds	Qty in (qtls)	0.75	30.7400	23.0550	30.7400	23.0550
7	Seed spices	Qty in tones	0.40	131.5000	52.6000	131.5000	52.6000
8	Garlic	Qty in tones	0.50	85.3000	42.6500	85.3000	42.6500
9	Bush Pepper	Nos in lakhs	40.00	0.1000	4.0000	0.1000	4.0000
10	Tree spices grafts /seedlings						
i.	Nutmeg grafts Orthotropic)	Nos in lakhs	140.00	0.0745	10.4300	0.0745	10.4300
ii.	Nutmeg grafts (Plagiotropic)	Nos in lakhs	80.00	0.5850	46.8000	0.5850	46.8000
iii	Tamarind / Kokum grafts	Nos in lakhs	20.00	1.4500	29.0000	1.4500	29.0000
iv	Clove /Allspice seedlings	Nos in lakhs	20.00	0.2700	5.4000	0.2700	5.4000
v	Cinnamon /Cassia /Curry leaf seedlings	Nos in lakhs	5.00	4.1150	20.5750	4.1150	20.5750
11	Aromatic Plants	Ha.	0.75	54.0000	40.5000	54.0000	40.5000
12	Nursery Centre for spices and Aromatic Plants	Nos	15.00	4.0000	60.0000	4.0000	60.0000
13	Upgradation of spice nurseries	up to 10 lakhs/4ha	up to 10 lakhs/4ha	10.000	25.000	10.000	25.000
14	Seed processing and storage infrastructure	10 lakh/unit	10.00	5.000	50.000	5.000	50.000

15	Production of nucleus planting material of Betelvine in Bundelkhand region of Uttar Pradesh				11.250		11.2500
	Sub Total				**834.118**		**832.87537**
II	**Accreditation of spice nurseries**	LS		25	2.000	9.00	
III	**Technology Dissemination through Frontline Demonstration**						
i.	Organic Farming Spices	Nos in ha	0.60/1.00	53.000	43.000	53.000	43.000
ii.	Maintenance of demonstration plots of pepper established during 2018-19	Nos in ha	0.20	13.000	3.250	13.000	3.250
iii.	Demonstration plots of seed spices	Nos in ha	0.40	85.000	34.000	85.000	34.000
iv.	Demonstration plots of aromatic plants	Nos in ha	0.80	53.000	42.400	53.000	42.400
v	On farm management by micro irrigation	Nos in ha	LS	61.000	27.750	61.000	27.750
vi.	Multi species cropping in Arecanut Gardens in karnataka (Nutmeg)	Nos in ha	LS	2.000	5.990	2.000	5.990
vii.	Multi species cropping in Arecanut Gardens in Karnataka (Cocoa)	Nos in ha	LS	2.000	3.590	2.000	3.590
viii	Multi species cropping in Arecanut Gardens in Assam	Nos in acre	LS	2.000	1.350	2.000	1.350
ix	Demonstration of Fruit rot disease management in areanut using mandipropamid fungicide	Nos in ha	LS	3.000	3.990	3.000	3.990
x	Demonstration of E P N in Arecanut	Nos in acre	LS	4.000	6.440	4.000	6.440
xi	Demonstration of Arecanut Dwarf Hybrids	Nos in 0.5 acre	LS	2.000	2.950	2.000	2.950

xii	Participatory Demonstration Plots of Cinnamon intercropping in coconut	Nos in acre		5.000	3.765	5.000	3.765
xiii	Technology dissemination through FLD for HDP of grafted Bush pepper under shade net structure	300 sq meters		5.000	1.200	5.000	1.200
xiv	Technology dissemination through FLD for HDP of grafted Bush pepper under shade net structure				4.000		4.000
	Sub total				**183.6750**		**183.6750**
IV	**Project based programmes**						
a.	Hi tech prod system for quality disease free seed rhizomes of Turmeric and Ginger		LS	6.00	6.000	6.000	6.000
b.	Scaling up of microrhizome technology based ginger seed production	LS	LS	5.00	32.000	5.000	32.000
c.	Establishment of essential Oil Distillation Unit	Nos	LS		15.00	4.000	15.000
	Sub Total				**53.000**		**53.000**
V	**Transfer of Technology programmes**						
a.	District Level Seminar Workshops	Nos	2.00	5.00	10.000	5.00	10.000
b.	Farmers Training programme	Nos	0.75	57.00	42.750	57.00	42.750
	Sub Total				**52.750**		**52.750**
VI	**Skill Development Schemes**	Nos in lakhs	LS	3	**12.315**	3.000	**12.315**
VII	**T S G (**Monitoring, Evaluation, Mass Media, Publicity etc**)**					LS	5.000
VIII	**Mission Management**	LS	57.14200		49.42229		
	GRAND TOTAL				**1200.000**		**1184.03766**

2.1 Production and Distribution of Quality Planting Materials

The NHM/MIDH programmes on spices implemented in different States such as area expansion, replanting/rejuvenation etc. requires a sizeable quantity of quality planting materials of the respective spices crop. Non-availability of quality planting materials of high yielding varieties is identified as a major constraint in achieving the desired productivity of these crops as conceived in the Mission. Quite a good number of varieties of various spices and aromatic crops have been evolved in various research centres. However, for want of basic infrastructure and adequate funds, the required quantum of nucleus planting material is not being generated so that it can be made available for large scale multiplication and distribution to the farmers. In order to improve the situation, as done in the past, the Directorate had taken up the production of nucleus planting material during 2020-21 also with a financial outlay of Rs.832.87 lakhs. This programme was implemented in association with the SAUs and ICAR Institutes in different states of the country. The materials so produced were made available for further multiplication and distribution to the farmers.

2.1.1 Black pepper and Betelvine

Non-availability of good quality planting material of improved varieties is one of the major constraints in black pepper and betelvine cultivation. To overcome this situation, Directorate has taken up production of quality planting materials of black pepper by both conventional and advanced propagation technologies in the State Agricultural University (SAU) farms and Indian Council of Agricultural Research (ICAR) farms located in the major production centers of pepper. A total of 23.40 lakhs of planting materials were produced and distributed with a financial utilization of Rs.188.157 lakhs. Rate of assistance given for production of quality nucleus planting materials of pepper was Rs. 8.00/cutting. Kerala, Karnataka and Tamil Nadu are the major states producing black pepper in the country. Different Universities/Institutes in Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal and Maharashtra implemented this programme for production and distribution of planting materials in the states. The details of Universities/Institutes which undertook this component during the year is placed in the table below.

Table 2. Planting material production of black pepper 2020-21 (University-wise).

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Assam Agricultural University, Assam	0.300	2.400
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	0.800	6.400
3	Central Island Agricultural Research Institute, Port Blair	0.250	2.000
4	College of Horticulture and Forestry, CAU, Pasighat,Arunachal Pradesh	0.050	0.400
5	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	3.000	24.000
6	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	0.400	3.200

7	ICAR-Central Coastal Agricultural Research Institute, Goa	0.250	2.000
8	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	1.500	12.000
9	Kerala Agricultural University, Thrissur, Kerala	7.500	60.000
10	Navsari Agricultural University, Gujarat	0.025	0.200
11	Odisha University of Agriculture & Technology, Odisha	0.200	1.600
12	Tamil Nadu Agricultural University, Tamil Nadu	3.500	28.000
13	University of Agricultural and Horticulture Sciences, Shimoga, Karnataka	3.000	24.000
14	University of Agricultural Sciences, Bangalore, Karnataka	0.500	4.000
15	University of Agricultural Sciences, Dharwad, Karnataka	0.250	2.000
16	University of Horticultural Sciences, Bagalkot, Karnataka	0.900	7.200
17	Uttar Banga Agricultural University, Pundibari, West Bengal	0.750	6.000
18	Directorate of Arecanut and Spices Development, Kozhikode, Kerala	0.225	2.75737
	Total	**23.675**	**188.15737**

Implementing centres at Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Uttar Banga Agricultural University, Pundibari , West Bengal, Odisha University of Agriculture & Technology, Bhubaneswar, University of Agricultural Sciences, Dharwad and University of Agricultural Sciences, Bangalore also produced rooted cuttings of betelvine from the allotted targets.

2.1.2 Ginger

The Directorate produced and distributed 148.10tonnes of nucleus seed rhizomes of high yielding varieties of ginger through various SAUs and ICAR Institutes located all over the country. Assistance was provided at the rate of Rs. 0.30 lakh/tonne of ginger rhizomes. An amount of Rs.44.43 lakhs was incurred for the programme. The Institute-wise production details of ginger seed rhizomes are detailed below.

Table 3. Planting material production of ginger 2020-21 (University-wise)

S.No.	Institute	Quantity Produced and distributed (in tonnes)	Financial utilisation (Rs.in lakhs)
1	Assam Agricultural Universtiy, Assam	10.000	3.000
2	Banda Agricultural Universtiy, Uttar Pradesh	14.000	4.200
3	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	3.000	0.900
4	Birsa Agricultural Universtiy, Jharkhand	5.000	1.500
5	Cetnral Island Agricultural Research Institute, Port Blair	5.000	1.500
6	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharasthra	2.000	0.600

7	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharasthra	10.000	3.000
8	Dr. Y S Parmar Universtiy of Horticulture and Foretsry, Solan, Himachal Pradesh	2.000	0.600
9	ICAR-Cetnral Coastal Agricultural Research Institute, Goa	5.000	1.500
10	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	20.000	6.000
11	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	5.000	1.500
12	Kerala Agricultural Universtiy, Thrissur, Kerala	8.100	2.430
13	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharasthra	8.000	2.400
14	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharasthra	10.000	3.000
15	Odisha Universtiy of Agriculture & Technology, Odisha	6.000	1.800
16	Dr. Rajendra Prasad Cetnral Agricultural Universtiy, Bihar	2.000	0.600
17	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	5.000	1.500
18	Sri Konda Laxman Telangana State Horticultural Universtiy, Telangana	5.000	1.500
19	Tamil Nadu Agricultural Universtiy, Tamil Nadu	1.000	0.300
20	Universtiy of Agricultural and Horticulture Sciences, Shimoga, Karnataka	5.000	1.500
21	Universtiy of Agricultural Sciences, Bangalore, Karnataka	2.000	0.600
22	Universtiy of Agricultural Sciences, Dharwad, Karnataka	8.000	2.400
23	Universtiy of Horticultural Sciences, Bagalkot, Karnataka	2.000	0.600
24	Uttar Banga Agricultural Universtiy, Pundibari, West Bengal	5.000	1.500
	Total	**148.100**	**44.430**

2.1.3 Ginger protray seedlings

State Agri. Universities/ICAR Institutes working on ginger and turmeric have standardized protocol for raising low-cost ginger seedlings using single bud rhizomes in protrays, which can be transplanted to main field within 30-40 days. DASD has been promoting this technique and started providing assistance to implementing agencies since 2019-20, to produce protray seedlings @ 1.20 Rs./seedling. During this year, 2.47 Lakhs ginger protray seedlings were produced and distributed under this programme, utilizing a financial assistance of Rs.2.964 lakhs.

Table 4. Ginger protray seedlings produced in 2020-21 (University-wise)

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	College of Horticulture and Foretsry, CAU, Pasighat,Arunachal Pradesh	1.000	1.200
2	ICAR-Cetnral Coastal Argicultural Research Institute, Goa	0.100	0.120
3	Kerala Agricultural Universtiy, Thrissur, Kerala	0.270	0.324
4	Universtiy of Horticultural Sciences, Bagalkot, Karnataka	1.100	1.320
	Total	**2.470**	**2.964**

2.1.4 Turmeric

Turmeric seed production programme was mainly implemented through the SAUs located in the major turmeric producing states. Financial assistance was given @ Rs.25,000/- tonnes for turmeric seed rhizomes production. By the implementation of the programme, 572 tonnes of turmeric seed rhizomes were produced and distributed and Rs.171.60 lakhs has been utilized for the same. The Institute-wise production details of turmeric seed rhizomes are given below.

Table 5. Planting material production of turmeric 2020-21 (University-wise).

S.No.	Institute	Quantity Produced and distributed (in tonnes)	Financial utilisation (Rs.in lakhs)
1	Anand Agricultural Universtiy, Gujarat	8.000	2.400
2	Assam Agricultural Universtiy, Assam	10.000	3.000
3	Banda Agricultural Universtiy, Uttar Pradesh	10.000	3.000
4	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	30.000	9.000
5	Birsa Agricultural Universtiy, Jharkhand	12.000	3.600
6	Choudhary Charan Singh Haryana Agricultural Universtiy, Hissar, Haryana	3.000	0.900
7	Cetnral Island Agricultural Research Institute, Port Blair	2.000	0.600
8	College of Horticulture and Foretsry, CAU, Pasighat,Arunachal Pradesh	6.000	1.800
9	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	20.000	6.000
10	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharasthra	84.000	25.200
11	Dr. Y S Parmar Universtiy of Horticulture and Foretsry, Solan, Himachal Pradesh	2.000	0.600
12	Dr. Y S R Horticultural Universtiy, Andhra Pradesh	40.000	12.000
13	ICAR-Cetnral Coastal Agricultural Research Institute, Goa	5.000	1.500
14	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	25.000	7.500
15	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	10.000	3.000
16	Kerala Agricultural Universtiy, Thrissur, Kerala	15.000	4.500
17	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	25.000	7.500
18	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharasthra	10.000	3.000
19	Narendra Dev Universtiy of Agricultural and Technology, Faizabad, Uttar Pradesh	6.000	1.800
20	Navsari AgriculturalUniverstiy, Gujarat	17.000	5.100
21	Odisha Universtiy of Agriculture & Technology, Odisha	21.000	6.300

22	Punjab Agricultural Universtiy, Ludhiana, Punjab	35.000	10.500
23	Dr. Rajendra Prasad, Cetnral Agricultural Universtiy, Bihar	24.000	7.200
24	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	15.000	4.500
25	Sri Konda Laxman Telangana State Horticultural Universtiy, Telangana	15.000	4.500
26	Tamil Nadu Agricultural Universtiy, Tamil Nadu	52.000	15.600
27	Universtiy of Agricultural. and Horticulture Sciences, Shimoga, Karnataka	10.000	3.000
28	Universtiy of Agricultural Sciences, Bangalore, Karnataka	10.000	3.000
29	Universtiy of Agricultural Sciences, Dharwad, Karnataka	10.000	3.000
30	Universtiy of Horticultural Sciences, Bagalkot, Karnataka	5.000	1.500
31	Uttar Banga Agricultural Universtiy, Pundibari, West Bengal	35.000	10.500
	Total	**572.000**	**171.600**

2.1.5 Turmeric protray seedlings

State Agricultural Universities/ICAR Institutes working on turmeric have standardized protocol for raising low cost seedlings using single bud rhizomes in protrays, which can be transplanted to main field within 30-40 days.DASD has been promoting this technique and started providing assistance to implementing agencies since 2019-20, to produce protray seedlings @ 1.20 Rs./seedlings. Under this programme, 3.72 lakhs turmeric protray seedlings were produced and distributed, utilizing a financial assistance of 4.464 lakhs during this year. Following implementing agencies implemented this programme in 2020-21.

Table 6. Turmeric protray seedlings produced in 2020-21 (University-wise)

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	College of Horticulture and Foretsry, CAU, Pasighat, Arunachal Pradesh	1.000	1.200
2	ICAR-Cetnral Coastal Argicultural Research Institute, Goa	0.100	0.120
3	Kerala Agri Universtiy, Thrissur, Kerala	0.020	0.024
4	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharasthra	1.000	1.200
5	Universtiy of Horticultural Sciences, Bagalkot, Karnataka	1.600	1.920
	Total	**3.720**	**4.464**

2.1.6 Chilli

Chilli is the largest produced spice in the country and it is estimated that about 30 tonnes of chilli seeds are required annually to meet the demand. The Directorate had taken up a programme on production of nucleus seeds of chillies through the SAUs located in the major chilli producing centres. During the year 2020-21, a quantity of 30.74 quintals of nucleus seeds of chillies were produced and distributed to State Department farms for further multiplication and distribution among farmers. Assistance to the tune of Rs. 75,000/quintal was provided to the implementing agencies for this programme. A total of Rs.23.055 lakhs was incurred for this purpose during the year.

Table 7. The planting material production of chilli seeds during 2020-21

S.No.	Institute	Quantity Produced and distributed (in quintals)	Financial utilisation (Rs.in lakhs)
1	Anand Agricultural Universtiy, Gujarat	1.000	0.750
2	Birsa Agricultural Universtiy, Jharkhand	0.500	0.375
3	C S Azad Universtiy of Agriculture and Technology, Kanpur, Uttar Pradesh	0.040	0.0300
4	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	1.000	0.750
5	Dr. Y S R Horticultural Universtiy, Andhra Pradesh	6.000	4.500
6	Kerala Agri Universtiy, Thrissur, Kerala	2.200	1.650
7	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	4.000	3.000
8	Sri Konda Laxman Telangana State Horticultural Universtiy, Telangana	1.000	0.750
9	Sher-e-Kashmir Universtiy of Agri. Sciences and Technology, J & K	1.000	0.750
10	Tamil Nadu Agricultural Universtiy, Tamil Nadu	2.000	1.500
11	Universtiy of Agricultural Sciences, Bangalore, Karnataka	3.000	2.250
12	Universtiy of Agricultural Sciences, Dharwad, Karnataka	9.000	6.750
	Total	**30.740**	**23.055**

2.1.7 Seed spices

Seed spices occupy about 50% of area under spices and contributes 20% of total spices production in the country. This group of spices has a prominent place in our national economy because of its large domestic consumption and growing demand for export. Low productivity is one of the serious problems in the production of seed spices. Production of nucleus seeds of high yielding released varieties of seed spices was

carried out in major seed spice producing states through the SAUs and ICAR Institutes. It is estimated that around 25,000 tonnes seeds of seed spices are required annually. The Directorate in association with the SAUs situated in the major seed spices production centres, produced 131.50 tonnes of seeds and distributed to State Department farms and private nurseries for further multiplication and distribution among farmers. Assistance provided for this purpose was Rs. 40,000/tonne and Rs.52.60 lakhs were incurred for this programme.

Table 8. University-wise details of seed spices seed production programme 2020-21

S.No.	Institute	Quantity Produced and distributed (in tonnes)	Financial utilisation (Rs.in lakhs)
1	Agriculture University, Jodhpur, Rajasthan	10.000	4.000
2	Agriculture University, Kota, Rajasthan	10.000	4.000
3	Anand Agricultural University, Gujarat	3.000	1.200
4	Banda Agricultural University, Uttar Pradesh	2.000	0.800
5	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1.000	0.400
6	Choudhary Charan Singh Haryana Agricultural University, Hissar, Haryana	7.000	2.800
7	C S Azad Universtiy of Agriculture and Technology, Kanpur, Uttar Pradesh	1.000	0.400
8	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	3.000	1.200
9	Dr. Y S Parmar University of Horticulture and Foretsry, Solan, Himachal Pradesh	0.500	0.200
10	Dr. Y S R Horticultural University, Andhra Pradesh	4.000	1.600
11	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	10.000	4.000
12	Junagadh Agri Universtiy, Gujarat	2.000	0.800
13	Maharana Pratap Universtiy of Agri. and Technology, Udaipur, Rajasthan	4.000	1.600
14	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharasthra	2.000	0.800
15	Narendra Dev Universtiy of Agricultural and Technology, Faizabad, Uttar Pradesh	3.000	1.200
16	ICAR-National Research Cetnre for Seed Spices, Ajmer, Rajasthan	25.000	10.000
17	Punjab Agricultural Universtiy, Ludhiana, Punjab	1.000	0.400

18	Dr. Rajendra Prasad, Central Agricultural University, Bihar	1.500	0.600
19	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	4.000	1.600
20	Sardar KrushinagarDantiwada Agri University, Jagudan, Gujarat	5.000	2.000
21	Sri Konda Laxman Telangana State Horticultural University, Telangana	12.500	5.000
22	Sardar Vallabh Bhai Patel Univ. of Agri Sciences and Technology, Meerut, UP	2.000	0.800
23	Sher-e-Kashmir University of Agri. Sciences and Technology, J & K	2.000	0.800
24	Sri Karan Narendra Agriculture University, Jobner, Rajasthan	7.000	2.800
25	Tamil Nadu Agricultural University, Tamil Nadu	3.000	1.200
26	Universtiy of Agricultural Sciences, Bangalore, Karnataka	2.000	0.800
27	University of Agricultural Sciences, Dharwad, Karnataka	4.000	1.600
	Total	**131.500**	**52.600**

2.1.8 Garlic

Garlic is an important spice crop grown in an area of 2.97 lakh ha with an estimated production of around 16.01 lakh tonnes. The low productivity when compared to other producing countries is primarily because of the varieties being cultivated in major parts of the country. New varieties released from various research stations have not reached the farmers in the required extent. Directorate of Arecanut and Spices Development had been funding Universities to produce nucleus planting materials during 2020-21 so as to make available enough materials for further multiplication and distribution among the farmers. A target of 85.30 tonnes garlic bulbs were produced and distributed to farmers under this component during 2020-21. The Directorate has produced 85.3 tonnes of garlic for which the financial assiastance was Rs.42.60 lakhs.

Table 9. Nucleus seed production programme of Garlic 2020-21.

S.No.	Institute	Quantity Produced and distributed (in tonnes)	Financial utilisation (Rs.in lakhs)
1	Agriculture University, Kota, Rajasthan	10.000	5.000
2	Banda Agricultural University, Uttar Pradesh	5.000	2.500
3	Choudhary Charan Singh Haryana Agricultural University, Hissar, Haryana	8.000	4.000
4	C S Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh	0.300	0.150
5	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	5.000	2.500

6	Dr. Y S Parmar University of Horticulture and Foretsry, Solan, Himachal Pradesh	2.000	1.000
7	Junagadh Agricultural University, Gujarat	3.000	1.500
8	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	10.000	5.000
9	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharasthra	12.000	6.000
10	Narendra Dev University of Agricultural and Technology, Faizabad, Uttar Pradesh	2.000	1.000
11	Punjab Agricultural University, Ludhiana, Punjab	13.000	6.500
12	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	5.000	2.500
13	Sri Konda Laxman Telangana State Horticultural University, Telangana	3.000	1.500
14	Sardar Vallabh Bhai Patel Univ. of Agri Sciences and Technology, Meerut, UP	1.000	0.500
15	Sher-e-Kashmir University of Agri. Sciences and Technology, J & K	1.000	0.500
16	Tamil Nadu Agricultural University, Tamil Nadu	3.000	1.500
17	Universtiy of Agricultural Sciences, Dharwad, Karnataka	2.000	1.000
	Total	**85.300**	**42.650**

2.1.9 Bush Pepper

Since scope for area expansion islimited, especially in urban horticulture, cultivation of bush pepper in the terrace garden, coconut garden, orchards is one of the alternatives to increase the black pepper production to meet the growing demand. From 2020-21, considering the increasing demand for bush pepper as a part of emerging urban horticulture, the Directorate initiated to provide assistance for bush pepper production @ Rs. 40/- per plant. During this year, 4 implementing agencies produced 10000 number of bush pepper plants/ grafts with a total financial assistance of Rs. 4.00 lakhs.

Table 10. Bush pepper planting material production programme

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	0.040	1.600
2	ICAR-Cetnral Coastal Argicultural Research Institute, Goa	0.040	1.600
3	Kerala Agricultural University, Thrissur, Kerala	0.010	0.400
4	Tamil Nadu Agricultural Univesity, Tamil Nadu	0.010	0.400
	Total	**0.100**	**4.000**

2.1.10 Tree spices

Tree spices being of perennial nature, quality planting material has a major role to play in the success of its cultivation. Lack of good quality planting materials in tree spices like clove, cinnamon/tejpat, tamarind, nutmeg, allspice, cassia, curry leaf etc. is a major hindrance to its development. The Directorate extended assistance for the production of tree spices grafts/seedlings sourced from selected high yielding trees to SAUs and ICAR Institutes located in southern states and Konkan region where it is popularly grown. Grafts of nutmeg & tamarind and seedlings of clove, cinnamon, curry leaf, allspice, cassia were included in the programme. Approximately Rs.6.4945 lakh grafts/ seedlings of various tree spices were produced and distributed with a financial utilization of Rs.112.205 lakhs.

Table 11. Details of tree spices planting material production programme

S.No.	Institute	Unit	Unit cost	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
i.	Nutmeg grafts Orthtoropic)	Nos in lakhs	140.00	0.0745	10.4300
ii.	Nutmeg grafts (Plagitoropic)	Nos in lakhs	80.00	0.5850	46.8000
iii.	Tamarind / Kokum grafts	Nos in lakhs	20.00	1.4500	29.0000
iv.	Clove /Allspice seedlings	Nos in lakhs	20.00	0.2700	5.4000
v.	Cinnamon /Cassia /Curry leaf seedlings	Nos in lakhs	5.00	4.1150	20.5750
	Total			**6.4945**	**112.205**

Table 12. Institute-wise details of planting material production of tree spices

(a) Nutmeg (Orthotropic)

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	ICAR-Cetnral Coastal Agricultural Research Institute, Goa	0.005	0.700
2	Kerala Agricultural Universtiy, Thrissur, Kerala	0.0695	9.730
	Total	**0.07450**	**10.430**

Nutmeg (Plagiotropic)

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	0.500	40.000
2	ICAR-Central Coastal Agricultural Research Institute, Goa	0.010	0.800
3	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	0.025	2.000
4	Tamil Nadu Agricultural University, Tamil Nadu	0.010	0.800
5	University of Agricultural Sciences, Bangalore, Karnataka	0.030	2.400
6	University of Agricultural Sciences, Dharwad, Karnataka	0.010	0.800
	Total	**0.585**	**46.800**

(b) Tamarind/Kokum grafts

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Banda Agricultural University, Uttar Pradesh	0.020	0.400
2	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	0.500	10.000
3	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	0.150	3.000
4	Dr. Y S R Horticultural University, Andhra Pradesh	0.050	1.000
5	Kerala Agricultural University, Thrissur, Kerala	0.1300	2.600
6	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	0.150	3.000
7	Sri Konda Laxman Telangana State Horticultural University, Telangana	0.200	4.000
8	Tamil Nadu Agricultural University, Tamil Nadu	0.060	1.200
9	University of Agricultural Sciences, Bangalore, Karnataka	0.060	1.200
10	University of Agricultural Sciences, Dharwad, Karnataka	0.080	1.600
11	University of Horticultural Sciences, Bagalkot, Karnataka	0.050	1.000
	Total	**1.450**	**29.000**

(c) Clove/Allspice Seedlings

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Cetnral Island Agricultural Research Institute, Port Blair	0.050	1.000
2	Kerala Agricultural University, Thrissur, Kerala	0.090	1.800
3	Tamil Nadu Agricultural University, Tamil Nadu	0.020	0.400
4	University of Agricultural Sciences, Bangalore	0.070	1.400
5	University of Horticultural Sciences, Bagalkot	0.040	0.800
	Total	**0.270**	**5.400**

(d) Cinnamon/Cassia/Curry leaf

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Banda Agricultural University, Uttar Pradesh	0.020	0.100
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	0.500	2.500
3	Cetnral Island Agricultural Research Institute, Port Blair	0.050	0.250
4	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	0.500	2.500
5	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharasthra	0.200	1.000
6	ICAR-Central Coastal Agricultural Research Institute, Goa	0.060	0.300
7	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	0.050	0.250
8	Kerala Agricultural University, Thrissur, Kerala	0.545	2.725
9	Vasatnrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	0.500	2.500
10	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	0.100	0.500
11	Sri Konda Laxman Telangana State Horticultural University, Telangana	0.200	1.000
12	Tamil Nadu Agricultural University, Tamil Nadu	0.150	0.750
13	University of Agricultural Sciences, Bangalore, Karnataka	1.000	5.000
14	University of Agricultural Sciences, Dharwad, Karnataka	0.200	1.000
15	University of Horticultural Sciences, Bagalkot, Karnataka	0.040	0.200
	Total	**4.115**	**20.575**

2.1.11 Aromatic Plants

In order to multiply quality planting materials of selected aromatic plants which are in good demand for the domestic industries and also for the export markets, the Directorate extended financial assistance to 17 Universities/ICAR Institutes spread across the country. A total of 54 hectares were covered under the programme with a financial outlay of Rs.40.50 lakhs during 2020-21, with an assistance @ Rs.75,000/ha.

Table 13. Institute-wise details of planting material production programme in Aromatic Plants

S.No.	Institute	Quantity Produced and distributed (in lakhs)	Financial utilisation (Rs.in lakhs)
1	Banda Agricultural University, Uttar Pradesh	2.000	1.500
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1.000	0.750
3	Choudhary Charan Singh Haryana Agricultural University, Hissar, Haryana	2.000	1.500
4	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	6.000	4.500
5	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	8.000	6.000
6	Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat	2.000	1.500
7	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	6.000	4.500
8	Kerala Agricultural University, Thrissur, Kerala	4.000	3.000
9	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	4.000	3.000
10	Narendra Dev University of Agricultural and Technology, Faizabad, Uttar Pradesh	1.000	0.750
11	Odisha University of Agriculture & Technology, Odisha	1.000	0.750
12	Punjab Agricultural University, Ludhiana, Punjab	1.000	0.750
13	Sri Konda Laxman Telangana State Horticultural University, Telangana	3.000	2.250
14	Tamil Nadu Agricultural University, Tamil Nadu	5.000	3.750
15	University of Agricultural Sciences, Bangalore, Karnataka	6.000	4.500
16	University of Agricultural Sciences, Dharwad, Karnataka	1.000	0.750
17	University of Horticultural Sciences, Bagalkot, Karnataka	1.000	0.750
	Total	**54.000**	**40.500**

Quality Planting Material Production Programme 2020-21

Fig.1. Black Pepper Nursery at DASD , Kozhikode

Fig.2. Black pepper rooted cuttings raised at BCKV, West Bengal

Fig.3. Planting material production of Black Pepper at CCARI-Goa

Fig. 4. Rapid multiplication of Black Pepper at COH Mulde, BSKKVP

Fig.5. Black Pepper Cuttings produced at ICAR-CIARI, Port Blair

Fig.6. Black Pepper rooted cuttings raised at HRS Chintappalli

Fig.7. Pepper planting material production HRS Pechiparai,TN

Fig.8. OUAT,Orissa Black Pepper planting material production unit

Fig. 9 Panniyur 1 pepper cuttings raised at UASD, Karnataka

Fig.10. Black Pepper rooted cuttings produced at IISR, Calicut

Fig.11 Quality Planting material production of pepper at AAU, Assam

Fig.12. Raising of pepper cuttings at UBKV, West Bengal

Fig.13.QPM in Black Pepper
at UAHS Shivamogga

Fig.14. QPM of Black Pepper
at UAS, Bangalore

Fig.15. Betelvine rooted cuttings raised
at UASD, Karnataka

Fig.16. Betelvine planting material production
at OUAT, Orissa

Fig.17. Bush Pepper produced at Model nursery,
KAU, Mannuthy

Fig.18. Treatment of Betelvine cuttings
with bio agents, Dr.PDKV Akola

Fig.19. Planting material of Betelvine raised at UAS Bangalore

Fig.20. Betelvine quality planting materials at UBKV, West Bengal

Fig.21. Ginger seed production plot at BCKV, West Bengal

Fig.22. Field view of Ginger seed production at UAHS, Shivamogga

Fig.23. Ginger Participatory seed production plot IISR, Kerala

Fig.24. Quality Ginger rhizome produced at ARS, Palghar, BSKKVP

Fig.25. Ginger seed production field
at UASD, Karnataka

Fig.26. Field view of ginger seed production
at MPKV, Rahuri

Fig.27. Harvesting of Ginger seed rhizomes raised
at Dr.YSPHU, Solan

Fig.28. Mahima variety of Ginger multiplied
at Amaravati, Dr.PDKV Akola

Fig. 29. Nadia variety of Ginger multiplied
at BCKV, WB

Fig.30. OUAT Orissa -Field view of
Ginger seed production plot

Fig.31. Land preparation for turmeric planting at UASB, Karnataka

Fig.32. Protray method for Ginger multiplication at CAU Pasighat

Fig.33. Protray Multiplication of Maran variety of Ginger, SKLTSHU, Telangana

Fig.34. QPM in Turmeric at Anand Agri University, Gujarat

Fig.35. QPM in Turmeric at ARS Bhavanisagar, TNAU

Fig.36. Field view of Turmeric rhizome production at Assam AU

Fig.37. Turmeric seed production plot at IISR, Calicut

Fig.38. Field visit to NDUAT Turmeric seed production plot

Fig.39. Turmeric seed produced & distributed at Rajendra Agril University, Bihar

Fig.40. QPM of Turmeric produced at Dr.YSPHU, Solan

Fig. 41. Turmeric rhizome multiplication at MPKV, Rahuri

Fig. 42. Quality Turmeric seed production at Dr. YSRHU, Andhra Pradesh

Fig. 43. Quality seed rhizome of turmeric multiplied at OUAT, Orissa

Fig. 44. Turmeric seed production plot CCARI Goa

Fig. 45. Turmeric multiplication at UASD, Karnataka

Fig. 46. Field view of Turmeric seed production plot CAU, Pasighat

Fig. 47. Turmeric seed production at HRS Chintappalli

Fig. 48. Turmeric seed production plot at Birsa Agri. University, Jharkhand

Fig.49. Turmeric seed production at PAU, Ludhiana

Fig.50. Quality seedlings production of Turmeric at CIARI, Port Blair

Fig. 51. Protray seedlings of Turmeric, CCARI, Goa

Fig. 52. Turmeric protray seedlings produced at CAU, Pasighat

Fig. 53 .Turmeric seedlings raised by protray method, COH Mulde, BSKKVP

Fig.54. QPM of Chilli produced at ARS Kovilpatti, Tamil Nadu

Fig.55. Chilli QPM production
at Anand Agricultural University, Gujarat

Fig. 56. Chilli seed production plot at MPKV, Rahuri

Fig.57. Field view of Chilli seed production
at RVSKVV, Gwalior

Fig.58. Chilli planting material production
at NDUAT, UP

Fig. 59. Field view of qulaity seed production of Chilli
at UASD, Karnataka

Fig. 60 .Chilli seed drying yard
at UAS, Dharwad, Karnataka

Fig. 61. Field view production of QPM of Chilli plants, UHS, Bagalkot

Fig. 62. Chilli quality planting material production at HRS, Lam

Fig.63. Drying yard of Chilli seeds at UAS Bangalore, Karnataka

Fig.64. Cumin GC 4 field view at Rajmata Agri.University, MP

Fig.65. Coriander seed production field at SKUAST, Jammu & Kashmir

Fig.66. Coriander seed production programme at Junagadh Agri University

Fig. 67. Coriander Seed Production plot at AU, Kota

Fig.68. Quality seed production of Coriander variety Pant Haritima SVPUAT, Meerut

Fig.69. RRS, Aruppukotai, Tamil Nadu produced QPM of Coriander

Fig.70. Field view of Coriander QPM production at HRS, Lam

Fig.71. Celery quality seed production of Punjab Celery 1 by PAU, Ludiyana

Fig.72. Rajendra Agri University, Bihar – Field view of Coriander seed production

Fig. 73. Suguna variety of Coriander seed production, SKLTSHU, Telangana

Fig. 74. Coriander seeds produced at Dr.YSPHU, Solan

Fig.75. QPM of Coriander produced at Rajmata RVSKV, Gwalior

Fig.76. Quality seed production of Coriander-Field view UASD, Karnataka

Fig. 77. AU Jodhpur, Seed production plot

Fig. 78·Fenugreek seed production at MPUAT, Udaipur

Fig. 79. Field view of Quality seed production of Fenugreek variety ML 150 PAU, Ludhiana

Fig. 80. Fenugreek Seeds produced at Dr. YSPHU, Solan

Fig. 81.Seed production of Fenugreek CCSHAU, Hisar

Fig. 82.Quality seed multiplication of Fenugreek at Rajmata VSKV, Gwalior

Fig. 83. Quality planting material production of Fennel at Rajmata VSKKV , Gwalior

Fig. 84. Fennel (AF 1 variety) seed production at PAU, Ludhiana

Fig. 85. Field view of QPM production of Garlic at MPKV, Rahuri

Fig. 86. Garlic multiplication at Junagadh Agri University, Gujarat

Fig. 87. Garlic planting material production at UASD, Karnataka

Fig. 88. QPM production in Garlic at SKUAST, J&K

Fig. 89. Garlic variety G-282 multiplied at KVK, Farm, Dhar RVSKKVV

Fig. 90. Garlic multiplication field at HRS Ooty, TN

Fig. 91. QPM of Garlic at Dr. YSPHU, Solan

Fig. 92. Nutmeg grafts produced at HRS, Pechiparai

Fig. 93. Nutmeg grafts raised at UAS, Bangalore

Fig. 94. Orthotropic Nutmeg budlings at Model nursery, KAU

Fig. 95. Nutmeg grafts produced at BSKKVP

Fig. 96. Nutmeg grafts preparation at IISR, Kerala

Fig. 97. Seedlings production of Clove at CIARI, Port Blair

Fig.98. Cinnamon seedlings produced at KAU

Fig. 99. Nutmeg grafts raised at IISR, Calicut

Fig. 100. Production of QPM of PKM 1 Curry Leaf, SKLTSHU, Telangana

Fig. 101. Curry leaf seedlings produced, HRS Pechiparai, TN

Fig. 102. Curry leaf mother block at BCKV, WB

Fig. 103. Curry leaf seedlings produced at UAS, Dharwad

Fig. 104. Tamarind grafts at HRS Anantaramapuramu, YSRHU

Fig. 105. Quality Tamarind Grafts produced at UAS, Dharwad

Fig. 106. Garcinia grafts Produced at KAU, Vellanikkara

Fig. 107. Kokum seedlings at CES Wakavali, BSKKVP

Fig. 108. Quality Planting Material production of Kokum at UAHS, Shivamogga

Fig.109. Vetiver QPM field at DMAPR, Anand

Fig. 110 .Quality planting material production of Vetiver, Dr.PDKV, Akola

Fig. 111. Krishna variety of Lemon grass multiplied at PAU, Ludhiana

Fig. 112. Multiplication of Khus at MPKV, Rahuri

Fig. 113. Lemon grass QPM at MPKV, Rahuri

Fig. 114. Lemongrass multiplied at BUAT, Banda

Fig. 115. Palmarosa QPM at CCS, HAU, Hisar

Fig. 116. Quality planting material production of Thulsi at CCS, HAU, Hisar

2.2 Establishment of seed processing and storage infrastructure

This programme is being implemented since 2005-06 under NHM and has contributed significantly in the development of seed processing infrastructure and storage facilities in various SAUs and Central Institutes.

Development of infrastructure facilities for processing and storage of seeds is important for any seed production programme. The Directorate has given financial assistance to various Universities/Institutes for developing facilities for handling, processing and package of Seeds. Assistance was also given for creating infrastructure like drying platforms, cleaning and grading machineries, storage bins, packaging units and other related equipments. 100% assistance was provided for this programme. A total of 5 Universities were covered under the programme with a total financial utilization of Rs.50.00 lakhs. Each University were provided with an assistance of Rs.10 lakhs for establishing a seed processing and storage infrastructure. Following are the Universities/Institutes involved in this programme.

1. Agriculture University, Jodhpur, Rajasthan
2. Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra
3. ICAR-National Research Centre for Seed Spices, Ajmer, Rajasthan
4. Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh
5. University of Horticultural Sciences, Bagalkot, Karnataka

2.3 Nursery centre for spices and aromatic plants

In order to ensure the quality of planting material of HYV of spices and aromatic crops, the Directorate is providing financial assistance for establishing nursery infrastructure at selected SAUs / ICAR Institutes, based on the proposal received from them. This includes establishing necessary facilities for better root growth in vegetative cuttings/seedlings, bud/graft union, hardening etc. in the nursery which can assure higher success rate in multiplication of planting material. The assistance is provided for establishing mist chambers, polyhouse structures, shadenet structures, mother gardens, facilities for preparation of potting mixture and filling of polybags, purchase tools and implements for the nursery etc. During 2020-21, DASD established 4 small nursery centres for which Rs. 15.00 Lakhs/ centre were provided as assistance. Total Rs.60.00 lakhs were incurred for this purpose.

Following SAUs implemented this programmed during 2020-21;

1. Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra
2. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra
3. Narendra Dev University of Agricultural and Technology, Faizabad, Uttar Pradesh
4. Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh

2.4 Upgradation/Modernisation of Nurseries

Non-availability of quality planting material had been a major bottleneck in improving the production and productivity of spices crop. Nursery infrastructure is an important factor in ensuring the quality of planting material produced.

There are many nurseries in the country which lack modern facilities for producting quality planting material, mainly due to less financial resources. DASD is upgrading / modernizing such existing nurseries with all the modern facilities to meet accreditation norms for producing quality planting material. Both public and private nurseries are strengthened under this programme. The most important component is mother block establishment to ensure the genuinety of the varieties multiplied. The other components include soil solarization unit, work shed for mixing potting mixture, the mist chambers for root and shoot development, poly houses for giving right environment for growth, hardening sheds, irrigation facility etc.

Based on the applications received from nurseries across the country, following nurseries which are already accredited under DASD nursery accreditation programme were selected for providing assistance for upgradation during 2020-21.DASD officials visited the selected nurseries and evaluated the requirements submitted in the proposals. A total financial assistance of Rs.25 Lakhs were provided to these nurseries as assistance for upgradation.

Table 14. Institute-wise details of upgradation programme taken up in 2020-21

Sl. No.	Implementing centre	Nursery Upgradation works implemented	Budget utilized (in Rs.)
1	CRS Pampadumpara, KAU	Establishment of pepper mother block, construction of mist chamber, supply of solarization sheets, power sprayers and trolley for nursery, renovation of existing polyhouse.	2,06,840
2	PPNMU Vellanikara, KAU	Establishment of pepper mother block with drip irrigation, construction of workshed and mist chamber	2,30,300
3	AMPRS Odakkali, KAU	Establishment of Cinnamon mother block with drip irrigation	1,10,000

4	ARS Mannuthy, KAU	Construction of mist chamber, supply of solarization sheets, power sprayers and trolley for nursery, renovation of existing polyhouse	3,51,030
5	ICAR-CCARI, Goa	Establishment of Nutmeg and Pepper mother block with drip irrigation, renovation of existing polyhouse	3,18,490
6	HRS Chintapalli, Dr. YSRHU, AP	Establishment of Cinnamon mother block with drip irrigation, construction of mist chamber, supply of power sprayers for nursery	2,82,600
7	HRS, Anantapuramu, Dr. YSRHU, AP	Establishment of tamarind mother block with drip irrigation	1,10,000
8	CIARI Port Blair	Establishment of Cinnamon mother block with drip irrigation	1,10,000
9	RFRS Vengurla, Dr. BSKKVP Dapoli	Establishment of pepper mother block with drip irrigation, construction of workshed and mist chamber, supply of solarization sheets, power sprayers and trolley for nursery	4,85,540
10	CES, Asond, Dr. BSKKVP Dapoli	Establishment of pepper mother block with drip irrigation, supply of solarization sheets, power sprayers and trolley for nursery	2,95,200
		Total	**Rs. 25,00,000**

Establishment and Upgradation of Spice nurseries, storage structures 2020-21

Fig. 117. Aromatic plants nursery at COH, UHS, Bidar

Fig. 118. Aromatic Nursery Structure established at RVSKKV, Gwalior

Poly house constructed in an area of 1189 sq.m

Black pepper Plants Planted in Vertical Column Method

Fig. 119. HRS, Chintappalli – Black Pepper Nursery

Fig.120. Nursery established at KVK Sirsi UASD, Karnataka

Fig. 121. Nursery centre established at MPKV, Rahuri

Fig. 122. Poly House Constructed at HR&ES Sirsi, UHS Bagalkot

Fig. 123. Director, DASD visiting the upgraded nursery at KAU

Fig. 124. Turmeric storage structure established at AU, Assam

Fig. 125. Storage structure for Turmeric at Rajendra Agri University, Bihar

Fig. 126. Spices storage Structure, UHS, Bagalkot

Fig. 127. Turmeric Storage structure at CAU, Pasighat

3. Accreditation of spices nurseries

Quality of planting material plays an important role in the successful cultivation and development of spices. The planting material requirement by the spices growers is mainly met by nurseries established under State Department of Horticulture/Agriculture, the SAUs and ICAR Institutes at present. However, these nurseries in public domain provide only 30-40% of the demand for planting material. The major part of the demand is met by the unregulated private nurseries, which lacks modern infrastructure such as green house, mist chamber, efficient nursery tools and gadgets, implements and machinery. Establishment of a network of Spice Nursery to ensure the availability of good quality, disease free, certified planting material of desired high yielding variety will have a tremendous impact on production, productivity and quality of the spices produced. Towards this direction, DASD has been authorized by the Ministry of Agriculture and Farmers Welfare, Govt. of India for accrediting spices nurseries.

Accreditation of Nurseries is an important step to ensure availability of quality planting material to the farmers. As per the MIDH norms, planting materials need to be procured only from accredited nurseries for all

government programmes. Under the accreditation programme, DASD grants graded recognition to nurseries based on their infrastructure, production system & quality parameters of planting material and management practices adopted. The assessment is carried out through a special committee formed for this purpose. The programme was initiated in the year 2015-16 and around 45 nurseries have been accredited by DASD till March, 2021.

Table 15. - List of spice nurseries accredited by DASD during 2020-21

Sl. No.	Nursery Details	State	Crop certified	Variety/ Cultivar	Star rating	Production capacity (Nos) / annum
1	M/s Maruthi Nursery, Hassan	Karnataka	Black pepper	Panniyur 1	**One star**	2,00,000
2	M/s Yemmigoondi Estate, TATA Coffee LTD, Kodagu	Karnataka	Black pepper	Panniyur 1 and Thevam	**Two star**	40,000
3	M/s Cannncadoo Estate, TATA Cofee LTD, Kodagu	Karnataka	Black pepper	Panniyur 1 and Thevam	**Two star**	40,000
4	M/s Karadibetta Estate, TATA Coffee LTD, Hassan	Karnataka	Black Pepper	Panniyur 1 and Thevam	**Two star**	40,000
5	M/s Annapoorna Nursery, Udupi	Karnataka	Black Pepper	Panniyur 1, Thevam, Thekkan and Karimunda	**One star**	50,000
6	M/s Green Tree Nursery, Uttara Kannada	Karnataka	Black Pepper	Panniyur 1	**One star**	50,000
7	M/s Kalpataru Farm and Nursery, Shimoga	Karnataka	Black Pepper	Panniyur 1 & 4	**One star**	80,000
8	M/s Srinidhi Nursery	Karnataka	Black Pepper Clove	Panniyur 1 local varieties	**One Star**	75,000 20,000
9	M/s Shree Krishna Farm & Nursery, Shimoga	Karnataka	Black pepper	Panniyur-1	**One star**	60,000

(*The procedure for recognition and assessment criteria and details of accreditation are available in the website* www.dasd.gov.in)

DASD Nursery Accreditation Activities 2020-21

Fig.128. Black pepper Mother Block
at Cannancadoo nursery, TATA Coffee LTD, Karnataka

Fig. 129. Accreditation visit to Kalpatharu Nursery
Karnataka

Fig. 130. Annapurna Nursery
at Karnataka visited by Accreditation team

Fig. 131. Maruthi Nursery, Accredited for
Black Pepper at Karnataka

Fig. 132. Accreditation visit
at Shri Krishna Nursery, Karnataka

Fig. 133. Accreditation visit to Green tree nursery,
Karnataka

Fig. 134. Mother Plants Multiplication
at Yemmigoondi nursery of TATA Coffee LTD

Fig. 135. Pepper cuttings raised
at Srinidhi Nursery, Karnataka

Fig. 136. Poly bag filling at Karadibetta nursery of
TATA Coffee LTD, Karnataka

4. Technology Dissemination through Frontline Demonstration

4.1 Demonstration of organic farming in Spices

Organic farming in the spices sector is becoming increasingly important. Its environmental and economic benefits have captured attention in most of the importing countries. The gradual upward trend in the market of organic products makes organic cultivation of spices imperative. The organic practices aim at developing sustainable practices for long term stable yield and premium quality products. The tremendous potential for organic spices in the market has led to promotion of the production technologies among farming community under the mission programmes.

The frontline demonstration plots will serve to demonstrate and convince farmers of the applicability of various technologies developed for organic cultivation in different crops. It will encourage farmers to take up

the organic farming thereby increasing the country's share in the organic products. By identifiying suitable production hubs in the country that can be developed in to production/marketing/ processing clusters will help to develop these areas into export hub for spices.

The Directorate identified four potential clusters in the country to implement the farmer participatory demonstrations on cluster based organic production. The activities taken up in these clusters during 2020-21 are detailed below;

1. **Bilaspur district of Chhattisgarh** – Demonstration on enhancement of tribal livelihood through improved cultivation of organic Turmeric and value addition was established in a selected cluster of 25 ha area of Bilaspur district, Chattisgarh, in association with Indira Gandhi Krishi Vishwavidyalaya, Raipur.

   The major activities undertaken as a part of the demonstration programme are detailed below:

   Selection of farmer beneficiaries: 223 farmers from 23 villages of block Kota in Bilaspur district were selected for an area of 25 ha for improved cultivation of organic Turmeric (*Curcuma Longa L.*) by demonstration mode using different varieties of turmeric having high curcumin percentage. 50 percent of beneficiaries were from tribal population including women farmers.

   Distribution of seed material: Initial awareness programmes were organized between months of April - July involving small group of farmers and 102 quintals seed material of turmeric varieties i.e.Roma, Suranjana, BSR-2, Pratibha, Narendra, Duggirala Red and Rashmi were procured and distributed to the farmers after training.

   Cultivation practices & Crop management : Farmers adopted both cultural and mechanical operations and used tractors and power tillers for weeding and earthling of turmeric crop. The crop management and pest/ disease management measures followed were fully organic, under the guidance of university. Mother culture of consortia of NPK biofertilizers (Azospirillium, Azotobacter, Phosphate solublizing bacteria, Potash mobilizing bacteria) were provided to the farmers. Trainings were given to farmers on mass multiplication and application of biofertilizers, Preparation of Jeevamrit solution "Amrit Paani" and preparation of Bio Consortia.

   The crop was less affected by pest/ disease problem. Minor infestation by leaf folder was successfully controlled by the application of *Bacillus thuriengiensis* (BT) @ 10 ml / litre water and Taphrina leaf spot was controlled by the use of *Trichoderma viride* @10 ml /litre.

   Workshops and Field Day: Krishak Diwas as well as Workshop were conducted in connecton with the demonstration programme. One day state level training programme and an interactive session with experts and farmers were also organized.

   Harvesting and Yield: The average productivity reported from the organic turmeric demonstration plots were 13.91 tonnes/ ha and total yield was 352.4 tonnes from 25 ha area.

Performance of turmeric varieties demonstrated under organic cultivation

Turmeric varieties	Productivity (t /ha)
Roma	15.0
BSR-02	13.8
Narendra Haldi	14.6
Rajendra Soniya	14.1
Rajendra Sonali	13.8
NDH-98	13.0
Suranjana	13.1
IISR Pratibha	13.6
Duggirala Red	14.2

Formation of farmer cooperative and organic group certification for organized marketing: Farmer's cooperative of organic turmeric producers has been formed and registered as *Shramveer Jaivik Kisaan Samooh* to enable the farmers to sell their produce in the form of planting material as well as processed product and strengthen their livelihood source of income. A Group of 30 farmers cultivating organic turmeric in 6.50 ha area of the cluster have been registered in Chhattisgarh Certification (CGCERT) in the name of Shramveer Jaivik Kisaan Samooh and produced 780 q certified organic turmeric produce.

Outcome of the demonstration programme: The FLD programme implemented at tribal belt of Bilaspur, Chattisgarh has helped in creating an organic turmeric cultivation hub in the area and uplift the financial status of the tribal people involved. Farmers have started processing of organic turmeric in dried form and powder form for selling in the market.

Turmeric organic demonstration programmes at Chhattisgarh

Fig. 137. Turmeric FLD Field preparation IGKV, Chattisgarh

Fig. 138. Seed treatment and sowing

Fig. 139. Field visit after germination

Fig. 140. Earthing up and weeding

Fig. 141. Preparation of jeevamrit

Fig. 142. FT organised at Bilaspur

Fig. 143. Workshop on organic cutlivation and processing

Fig. 144. Boiling of organic turmeric

Fig. 145. Drying of turmeric

CERTIFICATE OF REGISTRATION - NPOP

With reference to your application, we have registered you as ICS and your Registration No. is ORG-2012-003206

Please note your registration number and use the same in all the future correspondence. Your basic information is given below :

Name :	Shramveer Jaivik Kishan Samuh
Address :	Village - Jhingatpur Block - Kota, Bilaspur, Jhingatpur, Kota, Bilaspur, Chhattisgarh-495113
Operation Type :	ICS
Manage By :	Self
Status :	Registered
Date of Registration :	03/12/2020
Contact No. :	9977250888
E-Mail ID :	ashishmishra21@rediffmail.com
PAN :	AIMPM0871F

From the date of Registration, this project is under supervision of Chattisgarh Certification Society, till formally withdrawn by you. In case of any query, please do not hesitate to contact undersigned.

Authorized Signatory
Chattisgarh Certification Society
Campus SFRTI Near Vidhan Sabha Zero point, Baloda Bazar Road, Raipur, Raipur, Chhattisgarh

Issued On : 03/12/2020

Fig. 146. First year NPOP certification for FPO

2. Wayand District of Kerala - Demonstration of bio-intensive management of black pepper adopting organic cultivation practices for creating targeted production hubs in Wayanad is being implemented in a selected cluster of 25 ha area in association with ICAR - Indian Institute of Spices Research, Kozhikode. The programme has been rolled out in Mattilayam watershed region of Thondernadu panchayath in Wayanad district, which is the only identified "Aspirational district" in the Kerala state by the NitiAyog. The implementation of the programe within a contiguous demarcated watershed region enables better targeting and implementation of the intervention activities. The demonstration is laid out in contiguous area with more than 25,000 black pepper vines and following cluster approach through farmer's collectives.

The technical programme for the project involves,

a. Establishment of black pepper community nursery in the panchayat, using improved varieties of black pepper.

b. Nutrient management based on site specific approach based on soil and plant testing for sustainable soil and plant health management.

c. Demonstration of use of organic inputs like bio control agents, PGPR formulations, bio pesticides for growth promotion and pest/ disease management.

d. Conducting farmers field days to create awareness among the farming community for large scale adoption.

e. Impart knowledge on scientific and biorational management to the pepper growers by regular field visits of experts through pepper mobile clinic facility.

Activities taken up as a part of the programme during 2020-21:

- The project location was demarcated after visiting Mattilayam watershed region.
- Focus Group discussions were conducted with lead farmers and key informants in the project location
- Project officials visited 10 black pepper plots to identify constraints and intervention potential
- Baseline data collection completed from 364 households
- Following inputs were distributed to beneficiaries as a part of demonstration –
  - Varieties (IISR Thevam, Malabar excel, SreekaraPanchami, Subhakara, IISR Shakthi),
  - Neem cake - 5000 kg (0.25-0.50 kg per vine based on the age)
  - Bio-capsules – Trichoderma- 500 capsules , PGPR- 500 capsules Black pepper micronutrient mixture – 200 kg
- Polyhouse construction was completed and established mother nursery of high yielding black pepper varieties
- Field visits were done to address abiotic constraints reported by beneficiary farmers

3. Golaghat District of Assam

The demonstration on organic cultivation of black pepper is initiated at selected farmers field of Padumpathar and Uriamghat villages of Golaghat district, in association with Assam Agricultural University.

Activitites conducted in 2020-21:

- ❖ The officials visited the area and conducted a baseline survey to assess the issues addressed by the farmers in the area and designed the inerventions accordingly.
- ❖ Two awareness trainings were conducted for the selected beneficiary farmers and field visits were conducted in 2020-21.
- ❖ Inputs like pepper cuttings and bio agents were distributed to the famers and planting of more than 17 ha (out of 25 ha) is completed.
- ❖ Location for establishing shadenet house has been identified in farmers field and the construction work will be completed in 2021-22.

4. Waigaon area of Wardha District, Maharashtra

The area under turmeric in Maharashtra is increasing every year in which zones like Vidharbha are emerging new as promising players in turmeric industry. Dr. PDKV University has released a new selection variety of turmeric from local cultivar in Waigaon area which is having high curcumin (6.2%) meeting industry demand. The variety also has a GI registration due to its unique quality. The Directorate initiated the demonstration programme in the wardha district to promote the cultivation of high curcumin variety and develop the area into an export-oriented production hub for turmeric in association with Dr. PDKV Akola. The demonstration will follow organic cultivation practices and will be linked with organic certification programme. This project will also help to generate sufficient quantity of planting material to meet the demand for the waigaon variety.

During 2020-21, initial baseline survey were conducted and beneficiary farmers for 25 ha area demonstration have been identified. Two awareness trainings were conducted on organic production practices and export-oriented production of turmeric to the beneficiary farmers. The input distribution and planting will be conducted in 2021-22.

Photographs of other organic FLD programmes taken up in 2020-21

Fig. 147. IISR, Calicut FLD input distribution

Fig. 148. IISR organic FLD - field level nursery established for planting material production

Fig. 149. Selection of organic FLD demo plots at Assam

Fig. 150. Planting material distribution for establishment of organic cluster FLD on pepper at Assam

Fig. 151. Seed material distributed to selected farmer beneficiaries for cluster based turmeric FLD at Waigaon

Fig. 152 .Field planting in demo plots at Waigaon

Fig. 153. Field demonstration on preparation of organic inputs at Waigaon

Fig. 154. FLD on Black Pepper rooted top shoots on concrete poles established at KAU

Fig. 155. Organic FLD on Black pepper under OUAT

4.2 Demonstration plots for seed spices

Seed spices comprise the single largest group of spices with over 17 items coming under it. The important amongst this group are coriander, cumin, fennel, fenugreek, celery, ajowan seed, dill seed, aniseed etc. India is the largest producer of seed spices with a production of 20.20 lakh tonnes of seed spices annually from an estimated area of about 20.97 lakh ha. This group has a prominent place in our agricultural economy because of its large domestic consumption and growing demand for export. Being annual crops, these are grown extensively in rotation with food crops and also as inter/mixed crops under rainfed/irrigated conditions. Seed spices are mainly cultivated in the states of Rajasthan and Gujarat with a sizeable area in the states of Madhya Pradesh, Haryana, Punjab, Uttar Pradesh, Andhra Pradesh and Bihar. However, the productivity of these crops is much less compared to the potential yield of varieties released by various research stations. This is primarily because of the non-adoption of technologies evolved in these crops. The Directorate established 85 demonstration plots in the major production centres of the seed spices for dissemination of technological information among the farming community. The financial assistance for one unit of the demonstration plot was Rs. 0.40 lakh/hectare. An amount of Rs.34.00 lakhs was utilized for this programme. A cluster-based demonstration on export-oriented pesticide free cumin production was implemented by DASD through NRCSS, Ajmer under the component, as detailed below.

Frontline demonstration on Pesticide free cumin production

The insect pests and diseases complex on the seed spice crops causes maximum damage at field level, which account for up to 100 per cent losses at field level in case of severe attack. Among sucking pests, aphids and thrips and in case of diseases wilt /root rot complex, blight and powdery mildew cause maximum losses at field level. Seed spices are high value low volume crops and are exported to the extent of 15% of total production of the country. Pesticide residue is one of serious non-tariff barrier in export of this commodity to other countries. There is an increasing demand for alternative to broad spectrum chemical pesticides. The development of resistance by some insect pests and diseases, increased awareness of adverse effect on non-target organism and environmental contamination has encouraged interest and investment in biological and

other selective pest control agents. To create awareness on the ecofriendly management of cumin and to develop a pesticide free export production hub for the crop, the Directorate established a large-scale demonstration of Good Agricultural Practices (GAP) in cumin in association with ICAR-NRCSS, Ajmer, Rajasthan at village Inana, Mundwa, district –Nagaur, Rajasthan.

Under the programme, 25 farmers were selected for pesticides free cumin production in one hectare area each in the village.

Nutrient management: As per the recommendation, nitrogen phosphorus and potash were given inorganically through Urea, DAP and MOP @ of 30:20:20 kg/ha. Organic amendments were given as compost 30 days prior to seed sowing and Phosphorus Solubilising Bacteria (PSB) and Azotobactor multiplied in compost for 15 days was given at the time of sowing.

Irrigation and weeding: 4 to 5 rounds of sprinkler irrigations were given and 2 to 3 manual weeding was carried out during the whole crop duration.

Pest and disease management: The scientists from NRCSS monitored the crop from seed sowing to crop maturity and suitable non chemical products were recommended for effective pest/ disease control. The major pests and diseases were wilt *(Fusarium oxysporum f.sp. cumini),* Blight *(Alterneria burnsii),* Powdery mildew *(Erysiphe polygoni),* nematode *(Pratylenchus thornei),* thrips (Thrips tabaci), Aphids (*Aphis gossypii* and *Myzus persicae*). The bioagents/ botanicals applied as seed treatment, soil application with FYM and as foliar spray to control pests and diseases included *Trichoderma viridi, Trichoderma harzanium, Paecilomyces lilacinus, Pseudomonas fluorescens, Bacillus subtilis, Verticillium lecanii* and Azadirachtin 10000 ppm.

For wilt/root rot and nematode management at time of germination to early cumin crop growth, *Trichoderma viride* (1x108 CFU's/gm was given @10g/kg of seed mixing at the time of sowing and soil application of Trichoderman *viride, Pseudomonas fluorescens* and *Paecilomyces lilacinus* were given after treating with FYM. During vegetative stage to crop maturity - wilt *(Fusarium oxysporum)*, Blight (Alternaria *sp.*) and Nematode (*Pratylenchus thornei)* and Aphids (*Myzus persicae* and *Aphis gossypii*) were managed by the application of *Bacillus subtilis*(1x108 bacterial cells / ml), *Trichoderma viride*(1x108 CFU's/gm), *Paeceliomyces lilanicius* (1x108 CFU's/ml), Azadirachtin 10000 ppm and Botanical Insecticides. About 4 to 5 application of these bio agents were given to the crop for complete protection.

Harvesting & yield: The mature cumin crop was harvested as per the GAP protocol for clean and safe seed without any admixture of soil/plant/animal part or excreta. The harvested seeds were sun dried to keep the moisture below 10 % level. The cumin crop yield ranged from 3.5 q/ha to 8.0 q/ha with average of 5.10 q/ha during this, while yield of farmers practices (uses of chemical herbicides/fungicides/insecticides) ranged from 5.0 to 8.0 q/ha with average yield of 6.17q/ha.

Interface meeting of stakeholders: On completion of the demonstration programme, an interface meeting with stakeholders of the project was organised at Mundwa, district, Nagaur, Rajasthan to facilitate marketing of the produce. The beneficiary farmers, exporters and representatives from DASD, ICAR-NRCSS and Spices Board participated in the meeting. The exporters/ traders interacted with the farmers and were convinced about the quality of cumin produced in the demonstration programme. They appreciated the efforts for pesticide free cumin production and committed to purchase the cumin at better price than existing market rate.

Demonstration on production technology of seed spices implemented in 2020-21

Fig. 156. Distribution of inputs for FLD on seed Spices, UBKV, WB

Fig. 157. Field day on seed spices cultivation at MPUAT Udaipur

Fig. 158. Demonstration plot for Coriander at Junagadh Agri Unversity, Gujarat

Fig. 159. FLD on Cumin Junagadh Agri University, Gujarat

Fig. 160. Field day organized at AU Jodhpur FLD field

Fig. 161 .SKN Jobner demonstration field for fenugreek

Fig. 162. FLD plot for Coriander at Dr.YSPHU, Solan

Fig. 163. Input distribution for FLDs at NRCSS, Ajmer

Fig. 164. Organic Ajowain production demonstrated at RVSKVV, Gwalior

Fig. 165. Organic Coriander FLD established by TNAU, Coimbatore

Table 15. Institute-wise details on FLDs established for seed spices

S. No.	Institute	No. of Plots (in ha)	Financial utilisation (Rs.in lakhs)
1	Agriculture University, Jodhpur, Rajasthan	7.000	2.800
2	Agriculture University, Kota, Rajasthan	5.000	2.000
3	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1.000	0.400
4	C S Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh	1.000	0.400
5	Dr. Y S Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh	1.000	0.400
6	Junagadh Agri University, Gujarat	2.000	0.800

7	Maharana Pratap University of Agri. and Technology, Udaipur, Rajasthan	4.000	1.600
8	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	5.000	2.000
9	Narendra Dev University of Agricultural and Technology, Faizabad, Uttar Pradesh	2.000	0.800
10	ICAR-National Research Centre for Seed Spices, Ajmer, Rajasthan	30.000	12.000
11	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	6.000	2.400
12	Sri Konda Laxman Telangana State Horticultural University, Telangana	6.000	2.400
13	Sri Karan Narendra Agriculture University, Jobner, Rajasthan	10.000	4.000
14	Tamil Nadu Agricultural Univesity, Tamil Nadu	3.000	1.200
15	University of Agricultural Sciences, Dharwad, Karnataka	2.000	0.800
	Total	**85.00**	**34.0000**

4.3 Demonstration plots for Aromatic Plants

India is endowed with a rich wealth of medicinal and aromatic plants and presently it has a well developed strong market at global level. In recent years, there has been a tremendous demand in plant based drugs, pharmaceuticals, essential oils, perfumery products, cosmetics and aroma compounds. The aromatic plants are extensively used as raw materials for the extraction of oils, used in food, flavors, fragrances, and natural color industries. Nowadays, the aromatic industry has emerged as a promising sector and a source of economic growth with increased utilization in food supplements, cosmetics, botanical pesticides, medicines etc. Due to its wider applicability and high demand, it is very important to introduce these crops into the cropping system of the county and also educate the farming community about the latest technologies in cultivation and processing. With this view, this Directorate established 53 demonstration plots in the various locations spread over the country in the crops of priority in the respective areas. Assistance of Rs.0.80 lakhs was given for establishing a demonstration plot of one hectare. An amount of Rs.42.40 lakhs was utilized for this purpose.

Table 16. Institute-wise details of demonstration plots for aromatic crops

S. No.	Institute	No. of Plots (in ha)	Financial utilisation (Rs.in lakhs)
1	Banda Agricultural University, Uttar Pradesh	2.000	1.600
2	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	4.000	3.200
3	Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat	5.000	4.000
4	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	25.000	20.000
5	Kerala Agri University, Thrissur, Kerala	1.000	0.800

6	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	2.000	1.600
7	Narendra Dev University of Agricultural and Technology, Faizabad, Uttar Pradesh	2.000	1.600
8	Odisha University of Agriculture & Technology, Odisha	5.000	4.000
9	Sri Konda Laxman Telangana State Horticultural University, Telangana	3.000	2.400
10	Tamil Nadu Agricultural Univesity, Tamil Nadu	4.000	3.200
	Total	**53.0000**	**42.4000**

Out of 53 ha area of demonstration programme, 25 ha area was laid out in a cluster of 25 ha in Korea District of Chhattisgarhin association with Center of Excellence, Indira Gandhi Krishi Vishwavidyalaya, Raipur,Chhattisgarh.The Korea district is predominantly inhabited by tribal farmers who have a severe scarcity of resources. The demonstration was planned with an aim to develop the area into an aromatic production hub in the country. Line departments of the district administration had also contributed for success ful implementation of the programme.

Following activities were conducted as a part of the demo programme:

- Established the resources at the ground level *i.e.,* fencing, tube well, drip irrigation works were done in a total of 25 hectares land in five different dominated tribal villages with the financial support of MGNREGA and District Administration.
- Critical inputs such as slips of lemon grass/ citronella, fertilizers, bio pesticides, vermi compost, etc. were distributed to selected beneficiary faremrs of the cluster. Field day and awareness training on cultivation of aromatic crop were also imparted to the farmers.
- Slips of lemon grass were planted in the village Dudhania and Lai during sep/oct 2020 in association with MGNREGA under fallow land development programme. Lemon grass & citronella has been planted in the month of February, 2021 at village Tarabahara, Vishrampur and Shivgad respectively,
- First cutting of Lemon Grass was done in the month of Feb and March, 2021 and has yielded 56,000 to 62,000 kg of fresh herbs from 5 hectare. The tribal farmers of village Dudhania & Lai have received a total income of 1.12 to 1.24 lakh by selling fresh herbs at Rs. 2 per kg to their own Farmers Producer Organization (FPO). Similarly, the FPO has obtained a total net income of about Rs. 2.00 lakhs from the Oil distillated by plant set up at Krishi Vigyan Kendra, extracting about 250 kg of oil.
- FPO's has manufactured handmade soaps, aromatic incense sticks, 15 ml bottles of essential oils, lemon grass herbal leaves and stems etc. from essential oil and is being sold to various government institutions such as TRIFED, Khadi India. Hastshilp Vikas Nigam, Khadi Gramodyog etc. through online as well as their sale counter.

Outcome of the demonstration programme: This demonstration programme has led to the cultivation of aromatic crops in Korea district which has led to the creation of various enterprises such as mini packing of essential oils, handmade soap, incense sticks, room freshner, lemon grass herbal leaves and stems etc. for better livelihood. This is also helped to get an approval of setting up a 500 kg capacity steam distillation unit at village Tarabahar from the district administration. Korea district of Chhattisgarh has been identified as an aromatic hub and can be further promoted to expand the area in aromatic plants.

Activities taken up as a part of aromatic FLD programme during 2020-21

Fig. 166. Cluster demonstration on aromatic grasses established by IGKV in Korea

Fig. 167.Products developed as a part of demonstration programme by IGKV

Fig. 168. Organic cultivation of Rosemary demonstrated at Periyakulam, TNAU

Fig. 169. FLD on Aromatic Plants established at BUAT

Fig. 170. Front Line Demonstration on Vetiver, DMAPR, Anand

4.4. Demonstration of on-farm water management

Productivity and quality of any crop is affected by availability of optimum level of irrigation during critical stages of growth. The water holding capacity of soil has gone down due to decreased organic matter content as a result of intensive cultivation. Developing water resources, adoption of water conservation methods, use of appropriate irrigation method etc. can ensure water availability throughout the crop period and thus help in uniform growth and development of plants.

Growth and yield parameters of spices like Black pepper, Chilli, etc. showed significant increase in response to irrigation. Experiments show that pre-monsoon irrigation helps in early spiking and better crop yield in black pepper. Yield of Ginger and Turmeric has shown significant increase with micro irrigation. As major seed spices are grown in arid and semi arid zones, adoption of suitable irrigation methods will be beneficial in increasing the productivity of the crop. The major objective of this programme is to enhance water use efficiency by promoting efficient on-farm water management technologies and equipments in spice crops. 61 No. of demonstration plots of spice crops on drip irrigation system were established in different spices in SAUs/ ICAR institutes and selected farmers fields.

On farm water management demonstrations taken up in 2020-21

Fig. 171. Drip irrigation in Turmeric demonstrated at IGKV, Raipur

Fig. 172 Drip facility set up for chilli demonstration at RVSKVV, Gwalior

Fig. 173. FLD on Drip irrigation in turmeric established at Dr.YSRHU, AP

Fig. 174. Drip irrigation in Ginger demonstrated at IGKV, Raipur

Table 17. Crop wise Details of Demonstration plots

Demonstration Plot – Crop	No of Demonstration plots proposed	Rate of Assistance (Rs in lakhs)	Financial Requirement (Rs in lakhs)
Black Pepper	6	0.50	3.00
Ginger	12	0.45	5.40
Turmeric	15	0.45	6.75
Chilli	16	0.45	7.20
Seed spices	12	0.45	5.40
Total	**61**		**27.75**

Table 18. Demonstration of drip irrigation in Black pepper

S. No.	Institute	No. of Plots	Financial (Rs.in lakhs)
1	Assam Agri University, Assam	1.00	0.50
2	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	2.00	1.00
3	University of Agri. and Horticulture Sciences, Shimoga, Karnataka	2.00	1.00
4	University of Horticultural Sciences, Bagalkot, Karnataka	1.00	0.50
	Total	**6.00**	**3.00**

Table 19. Demonstration of drip irrigation in Ginger

S. No.	Institute	No. of plots	Financial (Rs. In lakhs)
1	College of Horticulture and Forestry, CAU, Pasighat, Arunachal Pradesh	1.00	0.45
2	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	2.00	0.90
3	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	1.00	0.45
4	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	1.00	0.45
5	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	1.00	0.45
6	Sri Konda Laxman Telangana State Horticultural University, Telangana	2.00	0.90
7	University of Agri. and Horticulture Sciences, Shimoga, Karnataka	2.00	0.90
8	University of Agricultural Sciences, Bangalore, Karnataka	2.00	0.90
	Total	**12.00**	**5.40**

Table 20. Demonstration of drip irrigation in Turmeric

S. No.	Institute	No. of plots	Financial (Rs. In lakhs)
1	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	2.00	0.90
2	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	2.00	0.90
3	Dr. Y S R Horticultural University, Andhra Pradesh	1.00	0.45
4	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	2.00	0.90
5	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	1.00	0.45
6	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	1.00	0.45
7	Sri Konda Laxman Telangana State Horticultural University, Telangana	3.00	1.35
	University of Agri. and Horticulture Sciences, Shimoga, Karnataka	2.00	0.90
8	University of Agricultural Sciences, Bangalore, Karnataka	1.00	0.45
	Total	**15.00**	**6.75**

Table 21. Demonstration of Drip irrigation in Chilli

S. No.	Institute	No. of plots	Financial (Rs. In lakhs)
1	College of Horticulture and Forestry, CAU, Pasighat, Arunachal Pradesh	1.00	0.45
2	Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth, Dapoli, Maharashtra	2.00	0.90
3	Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	2.00	0.90
4	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	4.00	1.80
5	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	1.00	0.45
6	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	2.00	0.90
7	Sri Konda Laxman Telangana State Horticultural University, Telangana	1.00	0.45
8	University of Agricultural Sciences, Bangalore, Karnataka	2.00	0.90
9	University of Horticultural Sciences, Bagalkot, Karnataka	1.00	0.45
	Total	**16.00**	**7.20**

Table 22. Demonstration of drip irrigation in Seed Spices

S. No.	Institute	No. of plots	Financial (Rs. In lakhs)
1	Agriculture University, Kota, Rajasthan	2	0.9
2	Rajmata VijayarajeScindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh	4	1.8
3	Sri Konda Laxman Telangana State Horticultural University, Telangana	4	1.8
4	University of Agricultural Sciences, Bangalore, Karnataka	2	0.9
	Total	**12.00**	**5.40**

4.5 Multi species cropping in Arecanut Gardens

Arecanut (*Areca catechu* L.) is one of the important commercial crops grown in the parts of Kerala, Karnataka, Assam and West Bengal. The long pre-bearing period, low returns during the initial bearing period, violent fluctuation in market prices, unexpected loss due to pests and diseases, especially yellow leaf disease are some of the problems associated with the cultivation of Arecanut. Introduction of multi species cropping in Arecanut gardens aimed at increasing the net returns from unit area helps the farmers to withstand the fluctuating prices of Arecanut. Multiple cropping has tremendous potential to generate employment for improving quality of rural life. Multiple cropping, not only provides additional income from inter/mixed crop and employment, it can also act as a social security against instabilityof prices of main crop. Therefore, establishing demonstration plots in few farmers' gardens will encourage many others to follow arecanut based cropping system for the improvement of their livelihood.This Directorate had established a total of 22 demonstration plots of one hectare each in Arecanut growing areas of Kerala, Karnataka and Assam during 2007-08, 2012-13, 2016-17, 2017-18, 2018-19 and 2019-20 which were highly successful in disseminating the information to the farmers.

The following demo plots established during previous years were maintained during 2020-21 under this programme :

- Two demo plots established in 2018-19 at Boko, Kamrup (Rural) district of Assamin association with CPCRI-RRS, Kahikuchi with Cocoa, Black Pepper and Banana as intercrops.
- Two demo plots on Arecanut based cropping system with Nutmeg + Black Pepper + Banana intercrops established at farmers field in Dakshin Kannada district of Karnataka during 2019-20.
- Four Demonstration plots on Arecanut based cropping system with Arecanut + Cocoa + Black Pepper + Banana which were established at farmers field in Dakshin Kannada district of Karnataka during 2019-20.

The field survey conducted by the CPCRI, Kasargod in two districts of Karnataka (Dakshina Kannada and Udupi) showed that about 73% of farmers have adopted multi cropping systems in arecanut. This is a clear indication that farmers are accepting this technology for better income.

4.6. Demonstration of arecanut fruit rot disease management using Mandipropamid 23.3% SC fungicide.

Fruit rot ('Koleroga' or Mahali) is counted as one of the most dreaded disease of arecanutwhich has resulted in 40-65 % yield loss in different districts of Kerala and Karnataka during 2018-19. Based on trials conducted by ICAR-CPCRI, it was concluded that the use of Mandipropamid 23.3 %SC @ 0.5% spray is the most effective method to control the disease in comparison with conventional methods. The Directorate had established demonstrations on integrated disease management practices for management of arecanut fruit rot using oomycetes specific fungicide Mandipropamid 23.3 % SC in the selected farmers field of Kasaragod (Kerala) and Dakshina Kannada (Karnataka) districts in association with CPCRI Kasargod during 2020-21.

FLDs were established in 3 units (of one acre each) in the disease prone area of selected districts during 2020-21. Arecanut gardens were selected based on regular occurrence of fruit rot disease in order to conduct field level demonstration. The arecanut gardens selected were in Belvai village of Moodbidri taluk, Kotekar village in Mangalore taluk of Dakshina Kannada and Kodimoole in Enmakaje of Kasaragod district. Pretreatment incidence of the fruti rot disease were recorded in selected demonstration plots and phytosanitory measures such as disposal of old infected dried bunches, dead palms and cleaning of drainage channels were done in all the three demonstration plots. Soil samples from demonstration plots were collected and analysed for nutrient status. Inputs such as fertilizers and fungicide (Mandipropamid 23.3 %SC) were procured and layout was prepared to conduct demonstration trial. Treatments are scheduled to be imposed from last week of May, 2021 before completion of monsoon.

4.7. Demonstration of use of *Entomo Pathogenic Nematode* (EPN) in root grub management of Arecanut

White grub is a key pest of Arecanut and its intercrops in sandy loam soils of Karnataka and Kerala. It damages the seedlings and adult palms by feeding on roots, boring the bole and collar region. Presently the grubs are managed with application of high dose of pesticide frequently which is deleterious to ecosystem. EPNs are identified to be effective and environment friendly alternative to manage white grubs by CPCRI, Kasaragod. To popularize ecofriendly integrated pest management (IPM) of white grub using EPNs, DASD had established 4 acres of demonstration plots in farmer's fields in arecanut growing areas of Karnataka during 2015-16, which was widely accepted and many farmers of the area adopted this technology for managing rootgrubs in the plantation. The imposed IPM includes two time application of native EPN isolate of CPCRI *Steinernemacarpocapsae* to root zone @ 1.5 billion infective juveniles (IJs) per hectare in combination with imidacloprid 17.8 SL @ 0.25 ml/litre of water, neem cake 2 kg/palm and providing proper drainage system in gardens resulted in 91% root grub populations in three years of treatments, significantly higher than that untreated gardens (without IPM practices). The EPN demonstration has exhibited significant increase in arecanut yield than untreated gardens in root grub alone infested gardens and yellow leaf disease (YLD) + root grub infested gardens in Dakshina Kannada and Chikmagalur districts of Karnataka.

In 2018-19 similar demo plots were established in the Arecanut farmers field in Udupi and Dakshin Kannada districts of Karnataka. A survey on incidence of root grub and other pests in arecanut based cropping system was conducted in these areas and technical guidance were provided to the beneficiaries. Orientation trainings were given to the farmers of selected gardens on EPN technology for the integrated management of root grub. Farmers were supplied with critical inputs viz., neem cake and EPN bio-control agents for management of root grub in the demonstration plots. Drainage facility and intercultural operations were undertaken in the selected demonstration plots. During the 2nd year 2019-20, mass multiplication of EPN host insect and infective juveniles were done and treatments were imposed for the management of root grub in the

selected demo plots. Application of the Kalpa EPN (CPCRI – SC1), *Steinernemacarpocapsae* liquid formulation @ 1.5 billion IJs/palm twice in a year (June – July & September – October) followed by application of Neem cake @ 2 kg/palm during December – January resulted significant decrease in root grubs population to 83 - 88% with increase in dry nuts yield of 1.7 – 2.2 kg/palm and the incidence of root grub infested palms was observed below 2% in treated gardens compared to farmer practice were recorded 57% of palms showed yellowing and tapering of stem with grub population between 5 – 12 grubs/palm.

Mass production of the Kalpa EPN (CPCRI – SC1) liquid formulation of entomopathogenic nematodes*Steinernemacarpocapsae* were done on Greater wax moth, *Galleria mellonella*. Fully grown moth larvae were reared on artificial diet in the laboratory. During the year 2020-21, about 14,127 units (each unit 150 ml) of KalpaEPN liquid formulation were produced and supplied to the farmers of root grub infested arecanut gardens in Udupi, Shivamogga, Sirsi, Dakshina Kannada, Chikkamagalore and Davangere district of Karnataka and Kasaragod district of Kerala. Apart from this around 3,200 units of Kalpa EPN were utilized in experimental and demonstration gardens taken up under the demonstration programmes.

4.8 Demonstration of Arecanut Dwarf Hybrids

Arecanut tall varieties even though possess high yield potential, are frequently prone to wind damage and sun-scorching and also become difficult to manage. The tall nature of the palm hinders various operations like spraying and harvesting which are quite labour intensive and cumbersome. Dwarf hybrids with high yield potential will directly benefit the growers by way of enhanced returns and reduced cost of various cultural operations like harvesting, spraying and also without causing much damages to palms due to sun-scorching and heavy wind and gives mechanical support to stem. The Directorate established demonstrations on arecanut dwarf hybrids (HYV released from CPCRI, VYTLAH1 & VYTLAH 2) in farmer's fields (2 units of 0.5 acre each) during 2019-20 at Puttur and Sullia taluks of Karnataka in association with CPCRI, Kasargod to promote its advantages among progressive farmers. The spacing followed for planting was 9 ft. x 9 ft. between palms. Technical guidance on cultivation of arecanut was provided to the selected beneficiary farmers and seasonal operations were carried out. The inputs for maintainance of the demo plots were distributed to beneficiary farmers and gap filling was done in 2020-21.

4.9 Participatory Demonstration Plots of Cinnamon intercropping in Coconut

Growing spices under coconut in a farming system leads to economic buffering of the farmer against the risk of mono cropping. Many spices, when grown under coconut complement each other and form compatible combinations and such combinations, if appropriately exploited, can substantially increase the income from a unit area of land through synergism than the coconut or spices grown as a mono-crop. The filtered light received underneath the palm favors the growth of crops like black pepper, vanilla, clove, nutmeg, cinnamon and allspice.

Among the above spice crops, potential of commercial cultivation of Cinnamon is least explored by the farmers in Kerala. In modern times, cinnamon is used to flavour a variety of foods, from confections to curries; in Europe and USA it is especially popular in bakery goods. Cinnamon is a stimulant, astringent and carminative, used as an antidote for diarrhoea and stomach upsets. Rampant substitution of cassia for cinnamon has left little demand for the original spice. Consumption of cassia in high amounts is injurious to health since it contains a toxic component by name coumarin. Coumarin is banned as a food additive in many countries since mid-20th century because it is moderately toxic to liver and kidney.

The average production of cinnamon in India is 80 to 100 tonnes per annum. This is miniscule compared to the annual demand of 12,000 tonnes. To meet this growing demand as well as for re-exporting cinnamon after value addition, India imports about 10,000 tonnes of cassia and 200 tonnes of cinnamon a year. In 2016-17, about 1100 tonnes of cinnamon was imported to India according to Spices Board. If the possibility of commercial cultivation of Cinnamon is demonstrated, farmers will be encouraged to take up the crop in future. Cinnamon tree could be grown successfully as intercrop in the ideal conditions prevailing in the coconut plantations. This method is practiced successfully in Sri Lanka, major cinnamon producing country. To demonstrate this technology, DASD has initiated demonstration of high density intercropping of cinnamon in coconut plantations in association with CPCRI,Kasargod during 2018-19. The demo plots were established in selected coconut plantations of Pollachi (Tamilnadu), Bhatkal (Karnataka) Kasargod (Kerala) through participatory approach. The activities taken up in these plots are detailed below:

In Kerala**,** the demonstrations were established at CPCRI, Kasargod campus. The cinnamon was planted on 29th March 2019 as an intercrop in a 53 years old coconut garden variety West coast tall (WCT) planted with a spacing of 8.0 m X 8.0 m. The spacing followed were 0.6 m x 1.2 m, 0.9 m x 1.2 m, 1.2 m x 1.2 m, 1.5 m x 1.2 m and 1.8 m x 1.2 m. Manuring, irrigation and weeding were done as per the schedule.

In Tamil Nadu, the identified farmer is Mr. Senthilkumr, Pollachi. The coconut variety WCT was spaced at 7.5 m x 7.5 m in his one-acre plot. Theplanting was done on 4th January, 2020.

In Karnataka, the demo was laid out in Mr. Umesh Hegdde's coconut garden at Bhatkal. Here, cinnamon is planted as intercrop in 35 years old coconut garden. There are 4 different spacing treatments viz., T1: 0.6 x 0.6, T2: 1 x1 m T3: 0.6 x1.2 m and 0.6 x0.6 m. Planting was done in pentagon method with 5 plants per pit. Planting was done on 7th June, 2020. Recommended package of practices were adopted as per schedule.

The growth parameters *viz.,* height, girth and number of branches of cinnamon plants are recorded from each demonstration plot. After completing growth of 1- 1.5 years, the cinnamon plants will be pruned for ideal branching, keeping optimum height suitable for easy harvest.

Demonstrations implemented in association with CPCRI, Kasargod during 2020-21

Fig. 175. Demonstration plot of intercropping Cinnamon in Coconut garden, Pollachi

Fig. 176. FLD plot Cinnamon intercropping in Coconut garden visited by Director, DASD

Fig. 177. Demonstration plot of Cinnamon intercropping in Coconut Garden at Bhatkal

Fig. 178. Demo plots on Arecanut Dwarf hybrids established at Karnataka

Fig. 179. Better nut yield in EPN treated field for arecanut root grub management

Fig. 180. FLD plots established on use of EPN in root grub management, Karnataka

Fig. 181. Mass production training for EPN demonstration on root grub management

Fig. 182. Initial Field preparation in selected plots for demonstration of fruit rot management

Fig. 183. Diagnostic Field visits conducted as a part of for demonstration of fruit rot management in Arecanut

Fig. 184. Training organized as a part of demo on multispecies cropping in Arecanut at Kamrup, Assam

Fig. 185. QPM distribution for Multi species cropping in Arecanut gardens at Karnataka

4.10 Technology dissemination through FLD for HDP of grafted bush pepper under shade net structure

High density planting of bush pepper assures higher productivity levels per unit area with the adoption of high-tech irrigation technology under shade net structures. This technology is suitable for small scale holdings to earn higher economic returns per unit area. Preliminary results of HDP of grafted bush pepper units in Farmers' fields established by ICAR-CCARI, Goa indicated higher yield potential of black pepper per unit area. One-year old bush pepper grafts have recorded 200 -250 g dry pepper corns per plant. During the national seminar on spices at CCARI, Goa it was recommended to include bush pepper technology to increase income from unit area and it was suggested that this technology may be given wide publicity so that farmers with lesser land resources can adopt this as a profitable enterprise. To promote this technology, the Directorate had established demonstration plots in Goa and Tamilnadu as described below :

1. FLD for HDP of grafted Bush pepper under shade net structure under CCARI-Old Goa

Black pepper is an important high value spice crop suitable for cultivation in Goa and its adjoining regions. To address the issue of foot rot disease Colubrinum grafted bush pepper were found effective in the area. The demonstrationprogramme was implemented in five selected locations in association with ICAR-CCARI, Old Goa. The main activities conducted under the programme were;

i. Five FLDs, two each in North Goa and South Goa Districts in the farmers' fields and one OFD unit in the Institute's Farm at Old Goa, were established to create awareness and thus, disseminate the technology for enhancing the productivity levels.

ii. Each FLD unit were to accommodate 400-500 bush pepper grafts at 50 cm x 40 cm spacing in paired row with 60 cm path space after each paired row.

iii. Bush pepper grafts of high yielding varieties grafted on Colubrinum root stocks planted and maintained for next two years.

iv. 50 % green shade net was used for shade net structures

v. Shade net structures were supported by mist emitters on the roof line and drip irrigation in the bottom line for dry season.

Locationwise status of the demonstrations established are detailed in the **Table.23** below :

Sl. No.	Location of FLDs	District	Area (in square meter)	Status of the demo programme
1	ICAR-CCARI Unit, Old Goa	North Goa	200 (500 grafts)	Shadenet house with mist emitters were erected and planting was done on 18.09.2018. Drip irrigation facilities for fertigation were established. The plants started flowering after 1st year. Dry pepper yield of 18.8 kg was obtained after second year (10.6 kg: Panniyur-1 & 8.2 Kg: Panniyur-5) @104.4 g/ graft from 180 bush grafts. Simultaneously flowering is continued.
2	Shri. Santosh Nani Naik Mangueshi, Mardol, Ponda, North Goa	North Goa	160 (400 grafts)	Shadenet house with mist emitters were erected and planting was done on 28th May,2019. Drip irrigation facilities for fertigation were established. The plants started flowering after 1st year.
3	Shri. Anand Tukaram Mandrekar Podwal, Khorjuem, Bardez, North Goa	North Goa	160 (400 grafts)	Shadenet house with mist emitters were erected and planting was done on 10thJune,2019. Drip irrigation facilities for fertigation were established. 2.5 Kg dry pepper obtained during first harvest in Feb,2020. Dry pepper yield of 18.5 kg fresh pepper corns (6.05 kg dry pepper) obtained during Aug –March, 2021. Simultaneously flowering is continued.
4	Shri Lactancio Faleiro, Raia, Salcette, Goa	South Goa	160 (400 grafts)	Shadenet house with mist emitters were erected and planting was done on 20thJuly,2019. Drip irrigation facili ties for fertigation were established.Flowering has started after 1st year. Yield during Aug – March, 2021 on first harvest: 8.5 kg fresh pepper corns (2.85 kg dry pepper)
5	Shri. Ajit Pai, Kharga, Paiguenim, Cancona, South Goa	South Goa	160 (400 grafts)	Shadenet house with mist emitters were erected and planting was done on 10th May, 2019. Drip irrigation facili ties for fertigation were established.12.8 Kg dry pepper yield is already obtained. Further flowering is continued.

2. FLD for HDP of grafted Bush Pepper under shade net structure at HRS, Pechiparai

The potential for cultivation of bush pepper under shadenet structures in Pechiparai was demonstrated in association with HRS, Pechiparai under Tamil Nadu Agriculture University with the following objectives;

- Establishment of HDP in bush pepper under shade net to demonstrate high yield and quality.
- To serve as a model demonstration plot for marginal farmers

During 2020-21, the shadenet structures were erected with mist and drip facilities and bush pepper planting materials were planted on raised beds at a spacing of 1 x 1 m with two plants per pit under the HDP method. The raised beds were incorporated with the growing media having forest soil, FYM and sand in equal proportion. To prevent root rot, Trichoderma @ 10 g/ bush and VAM were added in the growing media. Gap filling was done on 15 days after planting. The planted bush pepper rooted cuttings are being maintained by adopting regular cultural operations *viz.,* irrigation, weeding, spraying of plant protection chemicals, plant growth promoters etc. Field days will be conducted on completion of establishment.

Fig. 186. HDP of grafted Bush pepper under shadenet structures demonstrated at CCARI, Goa

Fig. 187. DASD officials monitoring HDP Bush pepper programme at CCARI, Goa

Fig. 188. Farmers field demonstration of HDP programme implemented by CCARI, Goa

Fig. 189. FLD on Bush Pepper cultivation under shadenet, established at Pechiparai, TNAU

5. Innovative Programmes

The Directorate introduced some innovative programmes on Hi-tech production system for quality disease free seed rhizomes of Ginger and Turmeric and participatory mode rehabilitation of black pepper. A brief of these programmes are given below.

5.1 Hi-tech production system for quality disease free seed rhizomes of Ginger and Turmeric.

Generally, turmeric and ginger are propagated by rhizomes with a low proliferation rate, and the reproducing part (the rhizome) is also the economically used part of turmeric and ginger, which restricts the availability of seed materials required for cultivation. The major production constraint in turmeric and ginger is the presence of certain soil born diseases which negatively affect the quality and quantity of rhizomes. Among the diseases, rhizome rot and bacterial wilt are the most serious ones which causes heavy losses in yield. Since the crop improvement programmes in turmeric is constrained due to low seed set, modern technologies like clonal selection, mutation breeding, induction of polyploidy and biotechnological tools are used for the improvement of these crops. In turmeric and ginger, propagation by *in vitro* induced microrhizomes, produced independent of seasonal variations, is an ideal method both for the production of pathogen free planting material and for the conservation and exchange of germplasm.

The National Consultative Meeting on Planting Material Production of Ginger and Turmeric organized by DASD under the Chairmanship of Horticulture Commissioner had recommended for establishment of a production system for ginger and turmeric that could ensure freedom from disease and maintain the purity in the planting material produced for distribution to farmers. The Meeting recommended to resort to microrhizome production followed by multiplication of rhizome in soil less medium in protected structure before it is multiplied in field for distribution among farmers. Based on the recommendations of the meeting, The Kerala Agricultural University and Indian Institute of Spices Research have submitted a proposal for high-tech production system for quality seed production in ginger with the following objectives.

- ❖ To produce high-quality disease-free Ginger and Turmeric micro rhizome through tissue culture
- ❖ Seed multiplication through high tech production system with single bud derived plants from microrhizomes

The advantages of *in vitro* microrhizomes production of turmeric and ginger can be summarized as

- ❖ Microrhizomes production can be done *in vitro* in during any season
- ❖ Using microrhizomes has commercial potential for micropropagation
- ❖ Microrhizomes can be used as pathogen free seed rhizomes specially in regions with high disease incidence
- ❖ Microrhizomes can be stored easily, transported and can be used in germplasm conservation.

In order to produce disease free seed rhizomes of ginger and turmeric, micro rhizome production of ginger and turmeric varieties were resorted and inoculated different varieties of ginger and turmeric into MS medium

supplemented with growth hormones. The rhizomes of ginger and turmeric were germinated in sterile sand. The sprouting buds from rhizomes served as initial explants. Multiple shoots were induced through adventitious bud regeneration. The *in vitro* developed shoots of ginger and turmeric were subcultured at regular intervals.

Methodology adopted:

- For the collection of explants, sufficient quantities of disease-free seed rhizomes of pure varieties of ginger and turmeric was collected.
- Plant the rhizome bits in green house under protected conditions with 4- 5 inches of sand on top and periodically (once in 20 days) spray/ drench copper oxychloride at 0.3% to minimize the contamination.
- Select the newly sprouting buds and use it as a source of explants for the culture.
- Sprouted rhizome buds, washed well under tap water, treated with copper oxychloride and Tween 20 for 30 minutes and washed again.
- The external skin and remnant scale leaves were removed from the rhizome with a knife.
- Sprouted rhizome buds along with bits of rhizome were cut, removed and treated with 0.1% Mercuric chloride for 3 minutes and washed with sterile distilled water.
- These explants were transferred to the aseptic environment of laminar air flow chamber, again treated with 0.1% $HgCl_2$ for another 3 minutes and washed thoroughly with sterile distilled water.
- These rhizome bits with viable buds were inoculated into culture initiation medium.

In vitro multiplication

- After 30 days, established cultures were used for further multiplication.
- Cultures were inoculated in multiplication media with composition of MS + BA (3 mg/ L) + NAA (3 mg/ L) + 30 g sucrose.
- Cultures were incubated at a temperature of 25°C.
- After 30-40 days, these cultures were subcultured.
- Further it was subcultured 3-4 times at an interval of 30-40 days.

Microrhizome induction

- Explants were taken from 3 months old *in vitro* multiplying contamination free cultures.
- Roots and top part of the stem were trimmed off and explants of about 2 cm were used.
- These explants were inoculated in micro rhizome induction medium.
- MS medium supplemented with BA (3 mg/L) + NAA (1 mg/ L) and 9% sucrose were used.
- A photoperiod of 16 hrs. light and 8 hrs. darkness were provided.
- Microrhizome development was noticed after 80-90 days of culture initiation and reached maturity in 120 days.

Field transfer of micro rhizomes through pro trays

- Harvest the matured micro rhizomes
- Roots and top part of the shoots were trimmed off
- The rhizomes were transferred to pro trays filled with potting mixture (coir pith + cow dung + vermi compost at 1:1:1 ratio)
- These were allowed to grow for 30-35 days under green house conditions and then shifted to bags which produced healthy plants

Varieties multiplied

- Microrhizomes of Athira, Karthika and Aswathy Ginger varieties were produced in KAU
- IISR has produced microrhizomes of IISR Mahima, IISR Varada (Ginger varieties), IISR Pratibha, Sona, Varna and Kanthi (Turmeric varieties)

5.2. Scaling up of micro rhizome technology-based ginger seed production

Lack of availability of high-quality disease-free seed rhizomes remains a major problem in ginger and turmeric cultivation. Seed production programmes taken up by research institutes and Govt. farms could meet only a small percentage of requirements for the seed material. Even after several years of release, spread of HYV is low due to the lack of supply of seed material in required quantities. Being a crop highly prone to seed and soil borne diseases, the availability of quality disease free seed rhizomes of HYV could contribute significantly to the success of these crops.

The Directorate has standardized, the protocols for production of tissue culture plants of turmeric/ginger transplants using bud sprouts of rhizomes at KAU, TNAU and IISR centres under MIDH programme and following findings were made;

- High tech polyhouse cultivation can be adopted for seed production in ginger
- *In vitro* induced microrhizomes could be included in the seed chain of ginger
- There is no additional yield advantage in ginger with higher amount of seed material
- There is no additional yield advantage in ginger with higher fertigation schedule in polyhouse cultivation
- Potting mixture with sand soil and cowdung (1:1:1) in grow bag is better than soilless medium with coirpith alone
- Performance of three KAU varieties Athira,Karthika and Aswathy in poly house was on par .
- Microrhizomes could be produced *in vitro* with simple tissue culture facility
- Year-round production of microrhizome and year-round availability of planting material is thus possible
- Off season production of ginger also can be planned using microrhizomes
- Long distance transport of micro rhizome is possible in thermocol boxes and hardening can be undertaken at the receiving end.

- Localised production of planting materials using microrhizomes and single bud transplants will help to reduce seed rate in ginger and reduce transportation cost also.
- As there was no incidence of diseases and infestation of pests in poly house, production of quality rhizomes (clean ginger) without any pesticide residues is also possible.

Based on these findings, a discussion was done with Vice Chancellor and concerned officials of Kerala Agri. University during 2019-20, to scale up production of microrhizomes derived ginger seed to replace ginger seed production by conventional method in the university and a two-year programme was chalked out to scale up ginger seed production through microrhizome technology. The proposed activities under the programme are as follows;

Time frame	Activities
First year	• Production of microrhizomes of three KAU released ginger varieties *viz.*Athira, Karthika and Aswathy and distribution to different network centres • Scaling up production of microrhizomes for distribution to progressive farmers/entrepreuners • Establishment/ modification of existing poly house at different centres for growing of microrhizomes • Growing of microrhizomes in poly houses at different centres
Second year	• Production of protray budlings from microrhizomes at different network centres • Refinement of production technology at Centre of Excellence in High tech Horticulture • Experiments on off season production of microrhizomes at Centre of Excellence in High tech Horticulture

Activities done in 2020-21: The CPBMB provided the microrhizome derived protray seedlings to the 10 different network centres in 2020-21. These centres raised the protray seedlings under protected structures. The production technology standardized by KAU for production of seed rhizomes under polyhouse conditions were followed at these centres. Trials on refinement of the production technology and off-season production of microrhizomes was also undertaken as a part of the programme. Financial assistance to renovate, upgrade and establish poly house structures in these centres was also provided.

The second year of the project envisages production of 30 lakhs single bud transplants within the project period which will be distributed to licensed farmers / university centres for further multiplication and distribution covering an area of 50 ha which would yield a minimum of 1,000 tonnes of disease-free ginger seed material.

Glimpses of innovative programmes implemented in 2020-21

Fig. 190. Microrhizome production from different ginger varieties at ICAR-IISR Kozhikode

Fig. 191. *In vitro* raised plantlets of Athira ginger at KAU

Fig. 192. Ginger seedlings planted on field under scaling up programme at KAU,Mannuthy

Fig. 193. Microrhizomes planted in poly bags under scaling up programme at KAU

5.3 Establishment of Distillation Unit

Aromatic crops are some of the most profitable but underutilized crops, which have immense potential to alleviate socio-economic conditions of small and marginal farmers. Essential oils of these crops have very high demand in national and international market. India stands third in world's total essential oil production with a share of 16-17 percent and stands second in terms of value with the share of 21-22 percent. The country's Rs.15,000-crore fragrances and flavors market (aromatic sector) are witnessing buoyant times with consumption /demand going up in the FMCG sector, rapid penetration in the rural market, and growing acceptance of Indian items in the global market. Aromatic essential oils are mainly used by pharmaceutical, fragrance, perfumery and aromatherapy industries. The market for industrial fragrances, which go into end products, from toothpaste, talcum powder, soaps and agarbattis, and flavours that go into food items, have been driven by several factors – the growth of the FMCG sector in the country, affordability for products in the rural parts of the country and growing acceptance of Indian materials in the global market place. However, the growth opportunities in this sector have not been fully utilized.

To promote aromatic crops, the Directorate has been implementing planting material production programme, frontline demonstration of production technologies, trainings for growers and skill development trainings on essential oil extractor for rural youth. As the area under the aromatic crops is increasing, there is a lack of expertise and facilities for processing of the herbage produced to yield quality essential oils. The quality of the aromatic oil produced depends on the technology used for distillation. Steam distillation process involves the use of a distillation unit wherein plant material is distilled with the steam generated outside the unit in a standalone boiler. Essential oil passes with the steam into a condenser and subsequently oil separator where it is separated.

The Directorate has initiated demonstration of the essential oil extraction process through steam distillation unit under MIDH assistance in potential areas. This demonstration will encourage small and marginal farmers for extraction of essential oil, processing and marketing and thus help them become self-reliant to earn appropriate profits from cultivation of aromatic crops. Under this programme, the Directorate allotted funds to 4 agencies for establishing demo distillation units during the year 2020-21. The list is as under:

a. ICAR – Directorate of Medicinal and Aromatic Plants, Anand, Gujarat
b. Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh
c. Punjab Agricultural University, Ludhiana, Punjab
d. Sher-e-Kashmir University for Agricultural Sciences and Technology, J & K.

Work for establishment of the distillation units have been initiated by all the above agencies and is progressing at different stages of implementation.

6. Skill Development Training

Pradhan Mantri Kaushal Vikas Yojana (PMKVY) is the flagship outcome based skill training scheme of the Ministry of Skill Development & Entrepreneurship (MSDE). The scheme offers meaningful, industry relevant, skill based training to enable youth to get wages or self-employment leading to increase earnings and/or improved working conditions such as getting formal certifications for informal skills.

During 2020-21, the Directorate initiated conduct of skill development trainings under MIDH programmes in selected job roles through KVKs, SAUs/ICAR Institutes affiliated to Agriculture Skill Council of India (ASCI). Institutes with sufficient infrastructure and facilities were newly affiliated as per the ASCI norms, and a trainers training (ToT) for the nominated trainers were conducted at different locations. The qualified trainers were given ASCI Trainer Certificate.

The affiliated centres have conducted 200 hrs. skill training successfully on different job roles like Gardener, Vermicompost producer, Medicinal plants grower, spice cultivator etc. during 2020-21. The beneficiaries identified for these trainings were rural unemployed youth. The trainees were certified on different job roles under this programme. They were encouraged to take up their own enterprise related to the skillset achieved and thus attained improved income and livelihood.

Skill development training conducted at various centres during 2020-21

Fig. 194. Medicinal plants grower skill trainees of Faculty of Forestry, Benhama (SKUAST-K) visiting JKEDI Pampore

Fig. 195.Certificate distribution to skill trainees , Forestry College, SKUAST

Fig. 196. Vermicompost Preparation by skill trainees at HMAARI, Leh

Fig. 197. Vermicompost producer skill trainees at HMAARI, Leh

Fig. 198. Field training during Gardener Skill training at DMAPR, Anand

Fig. 199. Trainees at skill training programme for Gardener at DMAPR, Anand

Fig. 200. Skill trainees on vermicompost producer at IGKV preparing the compost

Fig. 201. Skill training programme on vermicompost producer at IGKV

Fig. 202. Skill training on Vermicompost producer conducted at BUAT

Fig. 203. Skill trainees for Gardener training programme at BCKV, WB

Fig. 204. Participants at Spice crop cultivator skill training , HARS, Pottangi

Fig. 205. Vermicompost production skill training at UBKV, WB

7. Transfer of Technology Programmes

The Directorate organizes transfer of technology programmes like Seminar and Workshops at national level, state level and district level to disseminate the latest improved technologies evolved in the various research stations of SAUs and ICAR Institutes among the extension workers of the State Departments and progressive farming community. The Directorate also conducts farmers training programme in the major production centres of spices, arecanut and aromatic plants to update the farmers on latest improved technologies available in the cultivation of these crops.

Details of the various seminars/workshops and training programmes organized at various centres are detailed as below :

7.1 National Seminar

Symposium on Spices as Flavours, Fragrances & Functional Foods (SYMSAC X)

International symposium on Spices as Flavours, Fragrances & Functional Foods was held during 09-12 February, 2021 on online mode. The event was organized by Indian Society for Spices with the financial assistance from MIDH. The latest developments in the field, either basic or applied, were presented and discussed at the symposium. The Inaugural Session of International Symposium on Spices as Flavours, Fragrances & Functional Foods (SYMSAC X) was held on 09-02-2021 as two separate events. The forenoon session was solely on a virtual mode while the afternoon session was a hybrid event. Dr. Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education & Director General of Indian Council of Agricultural Research (ICAR) inaugurated the four-day international symposium SYMSAC X on 9 February 2021. Dr. Vikramaditya Pandey, Assistant Director General (HS-I), ICAR, New Delhi presided over the programme hosted by the Indian Society for Spices. Dr. Rattan Lal, Director, Professor of Ohio State University and winner of World Food Prize delivered the keynote address on Carbon sequestration for nutritional security.

Sugandha Bharathi award for outstanding contributions in spices research was presented to Dr.P.N.Ravindran by Dr. J.Rema, Director of ICAR-IISR. Sugandhasree Innovative farmer award to Mr. T. Joseph was also given away at the function. Dr. A. K. Singh, Deputy Director General (HS), ICAR; Mr. D. Sathiyan,IFS, Secretary & Chairman of Spices Board; Ms. Hoang Thi Lien, Executive Director of International Pepper Community, Indonesia; Dr. Gopal Lal, Director, ICAR - National Research Centre on Seed Spices; Dr. Homey Cheriyan, Director, Directorate of Arecanut and Spices Development; Dr. J. Rema, Director of ICAR-IISR; Dr. A. B. Remashree, Director (Research), Spices Board; Mr. Ramkumar Menon, Chairman, World Spice Organization and Dr. Santhosh J. Eapen, General Chairman, SYMSAC-X also spoke on the occasion.

There were five technical sessions, each with invited lead talks and contributory (oral and poster) papers. The following were the sessions:

Session I: Spices - Global production and trade scenario. In this session there were 7 lead talks and 2 oral presentations related to global production and trade scenario of spices by resource persons from different spice producing countries.

Lead talks:

1. Ms. Hoang Thi Lien, Executive Director, International Pepper Community, Jakartha, Indonesia presented 'Global production and trade scenario-Black pepper'
2. Shri D. Sathiyan, IFS, Secretary, Spices Board, Kochi, Kerala, India delivered a talk on Global scenario of Indian spices
3. Mr. Gusland McCook, Acting Director General, Jamaica Agricultural Commodities Regulatory Authority, Jamaica delivered a talk on present status and future for Jamaican ginger.
4. Mr. B. Sarada De Silva, Chairman, M/s. B. Darsin De Silva & Sons Pvt. Ltd., Sri Lanka gave a talk on Global production and trade scenario-Tree spices
5. Dr. Prabodh Kumar Trivedi, Director, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow, Uttar Pradesh, India delivered a talk on Global production and trade scenario -Herbal spices
6. Dr. Gopal Lal, Director, ICAR-National Research Centre for Seed Spices, Ajmer, Rajasthan, India gave a talk on Global production and trade scenario-Seed spices.
7. Dr. K. Kandiannan, Vivekananda Technical Centre of RKM, Government of Fiji delivered a talk on Spices scenario in the Pacific region.

Session II: Spices –Chemistry and functional foods

There were 6 lead talks and 3 oral presentations covering a whole range of topics related to the chemistry of spices as functional foods.

Lead talks:

1. Prof. G. Padmanabhan, Department of Biochemistry, Indian Institute of Science, Bengaluru, India delivered a talk titled 'Curcumin - a wonder drug in waiting.
2. G Bhanuprakash Reddy, ICMR-National Institute of Nutrition, Hyderabad, India delivered a lecture on 'Spices and their novel bioactive compounds for complications of diabetes and obesity'.
3. Dr. Balu P Maliakel, M/s. Akay Natural Ingredients Private Limited, Kochi, Kerala, India gave a detailed presentation titled 'Unlocking nutritional secrets of spices'.
4. Prof. Gopinadhan Paliyath, University of Guelph, Canada presented his lead talk titled 'Molecular mechanisms of action of nutraceuticals in horticultural crops'.
5. Dr. Ramasamy Ravi, Tennessee State University, Nashville, USA gave a talk on 'Quality control of spices by electronic nose'.
6. Dr. Jissy Jacob, Program Manager & Associate Principal Scientist, Mondelēz International, New Jersey, USA spoke about 'Spices and their antioxidant properties'.

Session III: Spices – Processing and value addition

There were four lead talks by eminent speakers from the country and three oral papers for disseminating the research work carried out by individual researchers.

Lead talks:

1. Dr. C. Anandharamakrishnan, Indian Institute of Food Processing Technology, Thanjavur, Tamil Nadu, India presented the lead lecture titled 'Nano encapsulation techniques for food bioactive compunds'.
2. Dr. R T Patil, Former Director, ICAR-CIPHET, Ludhiana, India delivered a talk on 'Advances ingrinding technology of spices'.
3. Mr. Geemon Korah, CEO, M/s. Kancor Ingredients Ltd, Ernakulam, Kerala, India presented a highly relevant lecture on 'Spice processing and value addition: An industry perspective'.
4. Dr. Sushama Sreekandath, M/s. A.V.T. McCormick Ingredients Pvt. Ltd., Kochi, Kerala, India delivered her lecture on 'More per crop: Value addition in spices'.

Session IV: Spices - Environment and food safety

There were five lead and six oral presentations in this session.

Lead talks:

1. Dr. Rajeev K. Varshney, International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, Telangana, India presented the lead lecture titled 'Genomics of non model crops'.
2. Dr. Ganesh Bagler, Indraprastha Institute of Information Technology, New Delhi, India delivered a talk on 'Computational gastronomy: Levering artificial intelligence for data-driven food innovations'.
3. Mr. Debasis Dan, Microsoft India (R&D) Private Limited, Microsoft Campus, Hyderabad, India dealt in detail the topic 'AI applications for agriculture'.
4. Dr. Akshaya K. Biswal, Plant Transformation and Tissue Culture, International Maize and Wheat Improvement Center (CIMMYT), Texcoco, México talked about 'Crisper/Cas9 gene editing and other novel strategies for crop improvement'.
5. Prof. Neena Mitter, Centre for Horticultural Science, Queensland Alliance for Agriculture & Food Innovation, University of Queensland, Brisbane, Australia delivered the lead talk titled 'Next generation RNA based pesticides for sustainable crop protection'.

Session V: Spices - Cutting edge technologies for plant health

Seven lead lectures and six oral presentations were delivered online by various speakers in this session.

Lead talks:

1. Mr. Sanjay Dave, Food Safety and Standards Authority of India (FSSAI), Ministry of Health and Family Welfare, Government of India delivered the lead talk on 'Codex alimentarius and standards for spices'.
2. Prof. N K Dubey, Department of Botany, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi, Uttar Pradesh, India talked about 'Essential oils of spices as food preservative'.
3. Mr. Manish Pande, Project Analysis Documentation Division, Quality Council of India, New Delhi, India presented on the topic 'Global approach for improving quality and safety in spice sector'.
4. Dr. K K Sharma, Network Coordinator, Project Coordinating Cell, AINP on Pesticide Residues, ICAR-Indian Agricultural Research Institute, New Delhi, India gave a presentation on 'Pesticide residues: Problems and solution'.

5. Mr. Vic Anthony Joseph Fabre Tagupa, IFOAM Asia, Chungbuk Organic Agriculture Research Institute, Goesan County, Chungbuk Province, Philippines spoke about 'How IFOAM Asia is leading the organic movement in Asia'.
6. Dr. Jenna Elizabeth Forsyth, Post Doctoral Research Fellow, Stanford University, Stanford, California explained about 'Lead tainted turmeric colour – Problems and solutions'.
7. Ms. Charlotte Haeusler Vargas, Private Business Action for Biodiversity project, Deutsche GIZ, GmbH, Germany narrated on the 'Importance of biodiversity and ecosystem services in the spice supply chain'.

Plenary Session

The four-day International Symposium on Spices, organized by Indian Society for Spices (ISS), concluded at ICAR Indian Institute of Spices Research on 12 February 2021. Dr. T. Janakiram, Vice-Chancellor; Dr. Y.S.R. Horticultural University was the chief guest for the valedictory session. Dr A. K. Singh, Deputy Director General (HS), ICAR presided over the session. Dr. A. B. Remashree, Director (Research), Spices Board; Dr. Homey Cheriyan, Director, Directorate of Arecanut and Spices Development, Kozhikode; Dr. Gopal Lal, Director, ICAR-National Research Centre on Seed Spices, Ajmer; Dr. J. Rema, Director, ICAR-IISR, Dr. Santhosh J. Eapen, President, ISS and Dr. C. N. Biju, Secretary, ISS also spoke. The session adopted a declaration to sum up the deliberations and discussions during the four days' long symposium. Taking inputs from the presentations by the experts and the discussions on various topics, Dr. D Prasath, General Convener of SYMSAC-X presented the report and recommendations which were approved by the house.

Symposium recommendations

1. The development and introduction of good agricultural practices (GAP) and their popularization among farmers to enhance the availability of high-quality spices for domestic and industrial consumption need to be given top priority. Introduce good manufacturing practices (GMP) along with GAP for assuring clean and hygienic spices which ultimately can improve spice export.
2. The Ministry of Agriculture and Ministry of Commerce should converge for the betterment of spices sector. The Symposium stressed the importance of collaboration between institutes and countries for developing technology sharing and policy congruence to solve trade related issues in spices. The Symposium also suggested to undertake studies on carbon footprint and proper trade information management pertaining to spices sector.
3. The Symposium recommended evidence and analytical data-based nutraceuticals development in spices and a comprehensive study into the role of spices in personalized nutrition. It also stressed the need for a database on quality parameters, contaminants and adulterants in raw materials to maintain efficacy and safety of nutraceutical preparations.

4. In spice processing and value addition, large scale adoption of mechanization for harvest and post-harvest operations and promotion of small and medium enterprises for quality spices products were recommended. There is an urgent need to evolve regulatory standards for processed spice products and to frame policy guidelines in processing industries for export and import of spices. Besides, more ring tests on quality of spices are essential to ensure accuracy and reliability of test results.
5. The Symposium unanimously appealed to include spices research organizations in FSSAI (Food Safety and Standards Authority of India) and QCI (Quality Council of India) committees related to spices.
6. The importance of different types of genomic breeding approaches for managing biotic and abiotic stresses in spices was highlighted. The significance of reference genomes of important spices crops and collaboration with private players in AI for crop and pest management were also stressed upon.

Fig. 206. Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR inaugurating SYMSAC

Fig. 207. SYMSAC organizing team during the inaugural session

Fig. 208. Presenting Sugandha Bharathi award to Dr. P. N. Ravindran for outstanding contributions in spices research

Fig. 209. Dr. Homey Cheriyan , Director , DASD addressing the participants during the concluding session

7.2. State Level Seminar

1. State Level Seminar on "Spices and Aromatic Crops – Prospects and Potential in Chhattisgarh" conducted by Indira Gandhi Krishi Vishwavidyalaya, Raipur.

Two days State Level Seminar on "Spices and Aromatic Crops – Prospects and Potential in Chhattisgarh was held at Barrister Thakur Chhedilal College of Agriculture & Research Station, Indira Gandhi Krishi Vishwavidyalaya, Bilaspur (C.G.) Campus, during March, 19-20, 2021. The event was organized by Indira Gandhi Krishi Vishwavidyalaya, Raipur in association with Directorate of Arecanut & Spices Development, Calicut, Kerala, National Bank for Agriculture and Rural Development (NABARD) and Chhattisgarh Council of Science & Technology, Raipur (C.G.).

Smt. Rashmi Singh, Hon'ble Parliamentary Secretary, Department of Women and Child Welfare & Hon'ble MLA Takhatpur, Hon'ble Vice Chancellor of Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) Dr. S.K. Patil, Smt.ShailyJamuar, Deputy General Manager, NABARD, Raipur (C.G.), Shri Anand Mishra, Hon'ble Board Member, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) were present during the inaugural programme. The inaugural function was followed by lead lectures, technical sessions and inauguration of exhibition.

Altogether, 400 participants comprising of dignitaries, scientists, officers, buyers, suppliers, spice growers, faculties & research scholars from all over the Chhattisgarh State took part in the event. There were 18 lead talks, 90 oral presentations and 50 poster presentations. A total of 20 exhibitors put up their stalls for exhibition. About 30 – 40 spice growers, 20 Govt. officials from all the districts of Chhattisgarh participated in the event. Besides these, there were about 100 participants of faculties and research scholars from Indira Gandhi Krishi Vishwavidyalaya.

The lead papers presented in the technical sessions held in two days is listed below;

Inaugural Session

S.No.	Lead Lectures	Resource person
1	Cultivation of aromatic and spices crops in Chhattisgarh –Their commercialization and industrialization.	Dr. S.K. Patil, Vice-Chancellor, I.G.K.V., Raipur (C.G.)
2	Prospects and Potential of Aromatic and Spices Crops.	Dr. Homey Cheriyan, Director, Directorate of Arecanut and Spices Development, Calicut, Kerala
3	NABARD's vision on Development of Spices and Aromatic Crops in Chhattisgarh.	Smt. Shaily Jamuar, DGM, NABARD, Chhattisgarh Regional Office, Raipur (C.G.)

Technical Session 1: Production Technologies, Nutrient Management, Weed Management and Economics

S.No.	Lead Lectures	Resource person
1	Prospects of turmeric and ginger cultivation under agroforestry practices in Korba District of Chhattisgarh, India.	Dr. S.L. Swamy, Dean, College of Agriculture & Research Station, Katghora- Korba (C.G.)
2	Prospects and potential of aromatic spices crops.	Ms. Shraddha Singh, CEO, Go-Organic, Bilaspur (C.G.)
3	Cultivation, characterization & medicinal properties of Trigonella foenum-graceum (Methi)	Sh. Avinash Narwaria, Associate Vice-President, Emami Group, Kolkata (W.B.)
4	Prospects and potential of aromatic and spices crops	Sh. Sandeep Sharma, CEO, Farmer Pride, Bilaspur (C.G.)

Technical Session 2: Crop improvement and new cultivars

S.No.	Lead Lectures	Resource person
1	Chhattisgarh coriander variety Chhattisgarh Shri Chandrhasinidhaniya – 2 to meet coriander demand of the ten states of India.	Dr. Shrikant Laxmikantrao Sawargaonkar, Scientist, CARS, Raigarh (C.G.)
2	A survey on medicinal and economical importance of Kalungi (Nigella sativa) in NICRA Village Kharghana in Bilaspur District.	Smt. Shilpa Kaushik, SMS, KVK, Bilaspur (C.G.)
3	Chhattisgarh spices varieties to meet market demand of the India.	Dr. Shrikant Laxmikantrao Sawargaonkar, Scientist, CARS, Raigarh (C.G.)

Technical session 3: Management of abiotic and biotic stresses i.e. Insect, pests and diseases

S.No.	Lead Lectures	Resource person
1	Role of microbial biopesticides for the control of plant diseases and insect-pest of aromatic and spices crops.	Dr. R.K.S. Tiwari, Dean, BTCCARS, Bilaspur (C.G.)

Technical session 4: Organic farming and use of Biofertilizers, Biopesticides and Bioagents

S.No.	Lead Lectures	Resource person
1	Kandhamal the paradise of organic spices.	Sh. Sanjit Kumar Patnaik, Secretary, Kandhamal Apex Spices Association for marketing, Odisha

Technical session 5: Qualitative assessment, Processing, Value Addition and Marketing

S.No.	Lead Lectures	Resource person
1	Trade, marketing and quality aspects of medicinal and aromatic plants.	Dr. Ramesh Chandra Uniyal, Head, Bioresources Development, Emami Ltd., Kolkota (W.B.)
2	Processing, Value Addition and Marketing.	Dr. S. Patel, Professor, Swami Vivekanand College of Agricultural Engineering Technology and Research Station, IGKV, Raipur (C.G.)

Following comments/suggestions were made by the farmer participants after technical sessions;

- Farmers are unaware of the potential of local domestic market and hence they are limiting their production levels to smaller scales
- Formation of farmers associations/ clusters with efficient leadership are necessary for better marketing and connecting with buyers.
- The farmers were apprehensive about payment by buyers the right amount at the right time.
- Tribal people should utilize their large cultivable land for agriculture and minimize the unemployment problem in the state.
- Cost of transportation is too high which is a major concern.
- Govt. assistance may be required for organic certification to large scale farmers so that they can get better price.
- KVKs must initiate awareness on scientific growing, processing, value addition and marketing of produce.
- Farmers have to keep an eye on the market prices and store their produce till the prices are better.

Exhibition held in connection with the state level seminar: The exhibition stalls were inaugurated by Smt. Rashmi Singh, Hon'ble Parliamentary Secretary, Department of Women and Child Welfare & Hon'ble MLA Takhatpur on 19.03.2021. Various spice produce and its value added products were exhibited by different Company / Organization during State Level Seminar. Altogether, 20 stalls were put up by exhibitors.

2. State level seminar on Spices organised by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli organized a State Level Seminar under the MIDH scheme on 26th and 27th March 2021 at the College of Horticulture, Dapoli. All University authorities including the Hon'ble Vice Chancellor, Director of Research, Director of Extension Education, Associate Dean & Head of Departments, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli and Dr. Kute, SDAO, BDO, all extension functionaries of Government Development Department were present for the programme.

During the technical sessions lectures were delivered by resource persons on different aspects of spice production. The details are as under;

S.No.	Name of the Resource Person	Subject
1	Dr. B R Salvi	Production of Quality Planting Material of Spices in Konkan Region of Maharashtra
2	Dr. P M Haldankar	Production technology of Nutmeg
3	Dr. R G Khandekar	Production technology of Black Pepper
4	Dr. C D Pawar	Post harvest management of spices
5	Dr. K V Malshe	Production technology of Kokum and Processing
6	Dr. P C Mali	Production technology of Turmeric and ginger
7	Dr. Y R Parulekar	Intercropping of spices in coconut gardens
8	Dr. N V Dalvi	Production technology of Cardamom and clove
9	Shri M M Kulkarni	Production technology of Cinnamon
10	Shri S B Thorat	Production technology of Bush pepper
11	Dr. M. S. Joshi	Diseases and pest management in spices and control measures
12	Dr. R T Bhingarde	Conducted field visits

In the inaugural session, Dr. B.R.Salvi, Head, Associate Dean & Principal Investigator, MIDH on Spices welcomed all dignitaries, chief guest and presidency of the seminar and in introduction he briefed about the importance of the seminar and technical support of DASD, Calicut. In the introductory remarks, Dr.P.A. Sawant, Head, Department of Extension Education,Dr.B.S.Konkan Krishi Vidyapeeth,Dapoli highlighted the success stories of Spices (Turmeric) growers and appealed to come forward for spice cultivation. Dr.P.M. Haldankar, Director of Research, Dr.B.S. Konkan Krishi Vidyapeeth, Dapoli emphasized on the importance of the spices crops under climate aberrations. Shri. Kute, SubDivisional Agriculture officer, Dapoli pointed out about the scope for area expansion under spices & medicinal plants. Curcumin and other essential oil extraction. He also suggested to set up such units in the tahsils. In the presidential address Hon'ble Dr.S.D. Sawant, Vice Chancellor, Dr.B.S. Konkan Krishi Vidyapeeth, Dapoli advised to conduct the demonstrations on cultivation, processing of black pepper, turmeric in all the districts of region. Further he appealed to rural youth to initiate spices cultivation.

The programme was conducted in offline mode. Farmers from 11 districts namely, Ratnagiri, Sindhudurg, Raigad, Satara, Sangli, Solapur, Kohlapur, Pune, Mumbar, Thane and Palghar took part in the programme. There were 231 participants including women farmers. The participants were provided with a

training kit consisting of Booklet, Pen and Conference Pad. They were also provided with boarding and lodging facilities at the University. An exhibition of live samples viz. Nutmeg, Black pepper, Bush pepper, Cinnamon, Aromatic Plants, Turmeric (30 Varieties) was arranged for 2 days. Planting material of Cinnamon, Nutmeg &Kokam along with dried samples of Cinnamon were distributed to the farmers. Field visits and practical demonstrations of rapid multiplication of Black Pepper and grafting in champaca were conducted. During this training many farmers expressed their concern for availability of planting material, trainings at local level, export quality spices production in cluster approach, extraction of curcumin, high curcumin content varieties, nucleus planting material availability to the farmers, etc.

Recommendations of the seminar

The technical session were held on Cultivation of the spices, medicinal and aromatic plants, Processing & value addition of spices & Organic production of spices. After discussions the following recommendations are given;

1. The area under the spices crops (tree spices) should be increased as the schemes of multicropping system in coconut, arecanut garden be implemented by State and Central Government.
2. For the processing and value addition, the small scale units need to establish & the product should be marketed under the specific branding.
3. It is necessary to establish units of curcumin extraction from turmeric as well as essential oil extraction plants should be established in Konkan region and for these purposes the technical as well as financial assistance is essential.
4. The training programmes for interested growers be organized in a cluster comprising 5-6 villages in each tehsils.
5. The identical demonstration plots of turmeric and black pepper should be developed in various centres under university and on farmers fields.

7.3 District Level Seminar

1. District level seminar on "Doubling farmers' income through medicinal and aromatic plants cultivation" organised by Orissa University for Agriculture and Technology, Bhubaneshwar, Odisha

A District level seminar on **"Doubling farmers' income through medicinal and aromatic plants cultivation"** was held from 23-24 March, 2021 at Biju Patnaik Hall, OUAT, Bhubaneswar. A total of 54 medicinal and aromatic plants growing farmers, 38 students and 32 faculties, scientists including invited resource persons, guests, NGO personnels and other dignitaries took part in the deliberations of the seminar.

The inaugural session was presided by Dr. P.K. Agarwal, the Hon'ble Vice- Chancellor, OUAT. The other dignitaries on the dias were Mr. P.K. Jha, IFS, Chief Executive, State Medicinal Plants Board, Odisha, Bhubaneswar, Dr.(Mrs.) Sashikala Beura, Prof. & Head, Dept. of Floriculture and Landscaping, OUAT,

Bhubaneswar and Dr.S.C. Swain, Principal Investigator, CSS on MIDH, OUAT, Bhubaneswar. At first the meeting started with the lightening of the holy lamp. The dignitaries on the dias and off the dias were welcomed by Dr. Sashikala Beura, Prof. & Head, Dept. of Floriculture and Landscaping in her introductory address.

Dr.K.C. Barik, Dean of Research, highlighted the importance of MAP and its status in the state of Odisha. The chief speaker of the occasion Mr.P.K.Jha, IFS, Chief Executive, State Medicinal Plants Board, Odisha, Bhubaneswar, in his address gave importance of doubling farming income through MAP and its future scope in the state of Odisha. He has also informed the house about the identified species of MAP for cultivation in the state. In his presidential address, Hon'ble Vice- Chancellor narrated the richness of the state with respect to MAP and its importance. He urged upon the scientists concerned to develop or standardize the agronomy of the plants to be cultivated in the state. He also urged to work in collaboration with the state govt. for improving the marketing facility and value addition in the processing of MAP. He also emphasized to work in a mission mode by taking all stake holders for improvement in the MAP cultivation so as to double the farmer's income in a time bound manner. To mark the occasion, Booklets on “Production technologies of Lemongrass” and “Scientific cultivation of Satavari” were released by the dignitaries.

Dr.S.C.Swain, Associate Professor (Horticulture) and PI of the project proposed vote of thanks.

Technical session- I

During this session, presentations given by different resource persons on diversity and conservation of medicinal plants, its present and future prospects in Odisha, commercial cultivation of medicinal and aromatic plants, their characterization and standardization and different technologies developed by CIMAP.

S.No.	Name of the Resource Person	Subject
1	Dr. N.Dhal, Chief Scientist and Head, Dept. of Environment and sustainability, C SIR-IMMT, Bhubaneshwar	Diversity of medicinal plants and strategies for conservation of RET spices in Odisha
2	Dr. Subhash Chandra Swain, Associate Professor (Hort), OUAT	Present status and future prospects of aromatic and medicinal plant cultivation in Odisha
3	Dr. A K. Dash, Professor and Head Dept. of vegetable sciences (Retd), OUAT	Good Agricultural Practices of different medicinal plants by using liquid manure, green manure, vermi-compost, poultry manure and FYM
4	Dr.Sashikala Beura, Professor and Head, Dept. of Floriculture and Landscaping, OUAT	Production technologies of different aromatic plants for commercial cultivation in Odisha.
5	Dr. H.M. Maharatha, IFS (Retd.)	Standardization procedures of medicinal plants and its value addition.
6	Mr.Vinaya Kumar Yadav, CSIR-CIMAP	Technologies and varieties developed by the CIMAP in aromatic and medicinal plants.

Technical session- II

In technical session II, presentations on processing, value addition, utilization and marketing were made by different resource persons.

S.No.	Name of the Resource Person	Subject
1	Dr. (Mrs.) Kalpana Rayguru, Professor and Head, Dept. of Agricultural Processing and food engineering.	Processing and value addition of medicinal and aromatic plants.
2	Dr. M. M. Padhi, Former Deputy Director General, CCRAS, Ministry of AYUSH, Govt. of India.	Importance of India and Indian Scriptures as source of information for medicinal plants and their utilization in different kinds of diseases and sufferings.
3	Mr. S.K. Das, Phytobiox Pvt. Ltd., Bhubaneshwar.	Processing of aromatic plants for essential oil.

A statement was made by the dias that in case of entrepreneurship development in medicinal and aromatic plants there should be division of labour i.e. a group of farmers should get involved in producing planting materials, another group in growing the plants, third group should have expertise in processing whereas the fourth group of farmers should be involved in marketing the processed products so that the farmers can have self help through mutual help.

A field visit programme was arranged for the farmers and some participants in the next day to aromatic and medicinal plants growing areas of Khurda district of Odisha for better interaction and exposure visit to the farmers. The farmers were taken to the farm and processing plant of a progressive farmer Mr. Durga Das who is involved in cultivation and processing of aromatic plants in the Bhola village of Khurdha district. During exposure visit Mr. Vinay Kumar Yadav, CSIR-CIMAP, Lucknow explained practically to the farmers about the cultivation practices of vetiver, mentha and lemongrass. He also discussed about the processing and marketing of essential oil from these plants. Later, the farmers were shown the extraction of oil from lemongrass in the processing plant.

Recommendations

The following unanimous recommendations were suggested for wider and profitable cultivation of aromatic and medicinal plants in the state of Odisha.

1. More research should be focused on standardization of Good Agricultural Practices for commercial cultivation of MAP in the state of Odisha.
2. Large scale field level demonstration should be made for popularizing the suitable MAP to be cultivated by the farmers.

3. More emphasis on training and awareness is required for expansion of the crop.
4. Emphasis should be given on production of quality planting materials (QPM) of suitable/recommended varieties of MAP in the state.
5. Govt. should take initiative for development of data base of MAP in Odisha.
6. The Directorate of Horticulture should take initiative for cultivation of MAP in Odisha on cluster basis.

2. District level seminar on spices organized by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra

The University conducted a two-day district level seminar at the College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli on 16th & 17th March,2021. All University authorities including the Hon'ble Vice Chancellor, Director of Research, Director of Extension Education, Associate Dean & Head of Departments, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli and Dr. Kute, SDAO, BDO, all extension functionaries of Government Development Department were present for the programme.

During the technical sessions lectures were delivered by resource persons on different aspects of spice production. The details are as under:

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3	Dr. R. G. Khandekar	Production technology of Black Pepper
4	Dr. C.D. pawar	Post harvest management of spices
5	Dr. K.V. Malshe	Production technology of Kokum and Processing
6	Dr. P.C. Mali	Production technology of Turmeric and ginger
7	Dr. Y.R. Parulekar	Intercropping of spices in coconut gardens
8	Dr. N.V. Dalvi	Production technology of Cardamom and clove
9	Shri M.M. Kulkarni	Production technology of Cinnamon
10	Shri S.B. Thorat	Production technology of Bush pepper
11	Dr.Rathod	Diseases and pest management in spices and control measures
12	Dr. R.T. Bhingarde	Conducted field visits

The programme was conducted in offline mode. Farmers from 9 talukas namely, Dapoli, Khed, Mandangad, Chiplun, Sangameshwar, Rajapur, Lanja, Guhagar and Ratnagiri took part in the programme. There were 200 participants with a majority being women farmers. The participants were provided with a training kit consisting of Booklet, Pen and Conference Pad. They were also provided with boarding and lodging facilities at the University. An exhibition of live samples viz. Nutmeg, Black pepper, Bush pepper, Cinnamon, Aromatic Plants, Turmeric (30 Varieties) was arranged for 2 days. Planting material ofCinnamon, Nutmeg &Kokam along with dried samples of Cinnamon were distributed to the farmers. Field visits and demonstrations as detailed below were also conducted

- Practical demonstration of Rapid multiplication of Black pepper
- Practical demonstration of plantation of Cardamom
- Practical demonstration of plantation of Bush pepper
- Practical demonstration of plantation of Nutmeg
- Practical demonstration of Air layering in Cinnamon

During the training programme, many farmers expressed their concern about the availability of planting material, trainings at local level, export quality spices production in clusters, extraction of curcumin, high curcumin content varieties, nucleus planting material availability to the farmers, etc. The farmers requested for conduct of many more such trainings for better dissemination of University technologies and adoption. The availability and distribution of nucleus planting material to the farming community was very much appreciated by all.

7.4 Farmers Training Programme

Table.24

S. No.	Institute	Training topic	Date & Venue	Training details
1	Indian Institute of Spices Research, Calicut, Kerala	Advances in production and processing of spices	5th March, 2021 at IISR, Calicut.	One day farmers training programme titled 'Advances in production and processing of spices' was conducted at IISR,Calicut. The topics discussed in the training were Good Agronomic practices for Spices (Black pepper, Ginger and turmeric), Plant Health management in Black pepper, Ginger and Turmeric, Primary Processing, Postharvest operations and Value addition in Black pepper, Ginger and Turmeric. More than 50 farmers from Harita farmers club, Calicut participated in the training.
				A farmer's training programme was organized by ICAR-Indian Institute of Spices Research (ICAR-IISR), Kozhikode under MIDH at ICAR-Krishi Vigyan Kendra (KAU), Kumarakom, Kottayam on 10th March, 2021.

		Biotic and abiotic stress management in spices crops	10th March, 2021 at ICAR-Krishi Vigyan Kendra, Kumarakom, Kottayam	The training programme on "Biotic and abiotic stress management in spice crops" witnessed a congregation of 40 farmers involved in spice farming especially, black pepper, ginger and nutmeg representing Kottayam and neighbouring districts. The training programme included three technical sessions, *viz*., "Pest and disease management in spices", "Soil and water conservation techniques" and "Technology dissemination in spices through KVK".
2	Junagadh Agricultural University, Junagadh, Gujarat	Agricultural Expertise, Export and Value addition of Seed Spices Crops	28th January, 2021 at SSK, JAU, Junagadh	JAU organised a training programme on the topics (a)Economics and marketing of seed spices crops (b) Harvesting, grading, processing and value addition of seed spices crops (c) National and international rules regulation and procedure for export of seed spices crops (d) Pest management in seed spices crops (e) Improved varieties of seed spices crops (f) Development & scope of seed spices crops in Gujarat (g) Important keys for increase production of spices crops and (h) Certified seed production of seed spices crops. One Training Manual in vernacular language on "Agricultural Expertise, Export and Value addition of Seed Spices Crops" (Beej Masala Pako Ni Krushi Tajagyta, Nikasane Mulyavardhan) was released and distributed among the participants on this occasion.Total 107 progressive farmers were participated in the programme.
3	Agriculture University, Jodhpur, Rajasthan	Improved production technology in seed spices crops	25th February, 2021 at Chawandiya, Merta City, Nagaur District	A farmers training programme on "Improved production technology in seed spice crops" was organised at AU, Jodhpur. The topics covered during the training are soil and water management in spices crop, Integrated disease management of seed spices, Improved agricultural practices in seed spices, Residue management & quality produce in seed spices, Production in seed spice crops and Govt. of Rajasthan scheme for major seed spices. A total of 97 progressive farmers participated in the programme.
		Nutrient and plant protection management in seed spices crops	27th February, 2021 at ARSS, SamdariBarmer	A farmers training programme on "Nutrient and plant protection management in seed spice crops" was conducted at ARSS, Barmer. Nutrient management in seed spice crops, Disease management of seed spice

				crops, weed management in seed spice crops, Varieties of spices and its character & seed production, Insect- pests management of seed spice crops and improved agricultural practices in seed spices were discussed during the programme. A total of 85 progressive farmers participated in the programme.
4	Maharana Pratap University of Agriculture & Technology, Udaipur, Rajasthan	Technologies for enhancing productivity of spices	25th February, 2021 at KVK, Chittorgarh	One day farmers training programme entitled "Technologies for enhancing productivity of spice crops" was conducted at Krishi Vigyan Kendra, Chittorgarh on 25th Februrary, 2021. Resource persons of different constituent unit of University /Government delivered the lectures on various aspects of spices production, improvement and protection. Topics covered during the session are The role of spices for upgradation of economic status of farmers, Integrated nutrient management aspects in spices, Different schemes of Agriculture Department for the benefits of farmers, and Importance of spices in our daily life. Total 40 progressive farmers participated in the programme.
		Improved Technology of Seed Spices	27th February, 2021 at Krishi Vigyan Kendra, Bhilwara	Resource persons of different constituent unit of university delivered the lectures on various aspects of spices production, improvement and protection during the training programme. The topics disccussed during the sessions are -The importance and scope of spices in Rajasthan and its role in upgradation of economic status of growers/farmers, integrated insect pest and disease management in spices, Improved varieties of seed spices, Integrated nutrient management in seed spices, Important cultivation tips for different seed spices and Post harvest management of seed spices. Total 40 progressive farmers were attended the programme.
5	Navsari University, Navsari, Gujarat	Off -Campus seed production trainig programme on turmeric and black pepper	15th January, 2021 at HMRS, Waghai	Trainings were organised on the topics (a) Quality seed production techniques (b) Higher yield potential varieties (c) Crop management (d) Pest and Diseases management (e) post-harvest handling and (f) Storage and marketing etc. Around 101 farmers took part in the training programme.

		Off -Campus seed production training programme on turmeric and black pepper	19th January, 2021 at HMRS, Waghai	Trainings were organised on the topics (a) Quality seed production techniques (b) Higher yield potential varieties (c) Crop management (d) Pest and diseases management (e) post-harvest handling and (f) Storage and marketing etc. Around 101 farmers took part in the training programme.
6	Central Agricultural University, Pasighat, Arunachal Pradesh.	Spices production in Arunachal Pradesh	26th & 27th February, 2021 at College of Horticulture & Forestry (CHF), CAU, Pasighat.	One day training programme on "Spices production in Arunachal Pradesh" was conducted. Inaugurating the programme Prof. B.N. Hazarika, Dean, CHF highlighted the importance of spices cultivation in Arunachal Pradesh and also encouraged the farmers for growing of cash crops like ginger and turmeric. Different faculties from the University delivered presentation on Overview of ginger and turmeric cultivation in Arunachal Pradesh, Awareness on the medicinal values of various spices, Nutrient management of important spices, Improved production technology of Black pepper, and processing of spices. During the programme, emphasis was given on curing and processing of ginger and turmeric for boosting farmer's income. 76 participants attended the programme.
7	ICAR - Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat	Cultivation of Medicinal and Aromatic plants	6th March, 2021 at Gutal, Vaghodiya	One day farmer's training conducted on "Cultivation of Medicinal and Aromatic plants" on March 06, 2021 at Gutal, Vaghodiya. Shri Hementbhai Patel was presented with a memento as an innovative farmer for large scale tulsi cultivation and its primary processing. Different topics discussed on the programme are Sustainable cultivation of MAPs, GAP of medicinal plants, Disease management in MAPs and Role of MAPs in animal husbandry. The front-line demonstration of tulsi was visited by experts and farmers.100 farmers participated from nearby villages of Vadodera district.
		Cultivation of Aromatic Grasses	9th March, 2021 at Kantu, Goghumba	One day farmer's training programme on "Cultivation of Aromatic Grasses" was organised at Kantu, Goghumba. The aim of this training was to provide knowledge to farmers on medicinal and aromatic plants. Scientists from DMAPR delivered classes on Introduction of the scheme, Sustainable cultivation of

				MAPs, GAP of medicinal plants, disease management in MAPs, and Role of MAPs in human health. The horticulture nursery was visited by experts and farmers. Skill trainees were given participation certificates during the event. 81 farmers were participated from nearby villages of Panchmahal.
8	Anand Agriculture University, Anand, Gujarat	Scientific Cultivation of Seed Spices	11th February, 2021 KVK, AAU, Arnej, Dist. Ahmedabad	One day farmers training programme was conducted by Krishi Vigyan Kendra, AAU, Arnej on the topic of 'Scientific Cultivation of Seed Spices'. Lectures were delivered on Importance of Spices Crops and their Varieties, Scientific Crop Cultivation of Spices Crops, Value Addition in Spices, Irrigation Management in Spices Crops, Importance of Spices and Medicinal Crops in Animal Science, Plant Protection Measures in Spices Crops and Nutrient Management in Spices Crops. Total 112 farmers were participated along with 23-woman participants.
		Scientific Cultivation of Seed Spices, Medicinal and Aromatic Crops	19th March, 2021 at Regional Cotton Research Station, AAU, Viramgam	One day farmers' training programme on the topic of "Scientific Cultivation of Seed Spices, Medicinal and Aromatic Crops" was conducted at Regional Cotton Research Station, AAU, Viramgam. Lectures were delivered on different topics like spices cultivation practices and fertilizer management, Different varieties of seed spice crops and Integrated nutrient management in seed spice crops". All the recent technologies were demonstrated to the farmers during field visit. Total 100 progressive farmers from different villages of Viramgam, Dhandhuka and Mandal talukas participated.
9	Bidhan Chandra Krishi Viswa Vidyalaya, West Bengal.	Training on Spices & Aromatic Plants	24th February, 2021 at Murshidabad KVK, WBU Animal & Fishery Science	Lectures were delivered on Scope of Spices in Murshidabad, West Bengal, a Potential area for seed spices, chilli and turmeric, Black Pepper multiplication,Turmeric,Aromatic Crops and ginger growing, Cultivation of seed spices and curry leaf, Black Peppr,Ginger and Turmeric under fruit based cropping system, Disease-Pest Management in Spices and aromatic crops, Spices in Integrated farming system, Soil and fertilizer management in Spice cultivation and Field level problems and

				prospects of spices. Around 115 farmers took part in the training programme including female participants.
		Training on Spices & Aromatic Plants	26th February, 2021 at Gobindapur Samabay Krishi Unnyan Samity, Govt. of West Bengal	Lectures were delivered on Increasing farmers income by spices cultivation, Significance of MIDH spices and aromatic crops,Spice marketing, Improved Production technology, Onion, Garlic, Ginger and Turmeric under fruit based cropping system, History of spices ,Spices Medicinal and Aromatic Crops, Black Pepper multiplication and Capsicum and ginger & Seed Spices curry leaf, Disease Management/Pest Management in Spices and aromatic crops and Indigenous spices and medicinal crops Spices for rural livelyhood. Around 110 farmers took part in the training programme including female participants.
		Spices & Aromatic Plants	28th February, 2021 at Fatepur High School & Fatepur Panchayat	Lectures were delivered on Scope of Spices in India, Spice marketing, Spices and role of Women, Spices Medicinal and Aromatic Crops, Improved Production technology , Improved onion Garlic Production technology, Modern techniques for Ginger multiplication, Black Pepper multiplication and Capsicum and ginger turmeric growing, Production management of Curry leaf, Pest/Disease Management in Spices and aromatic crops, Spices for increasing farmers income, Spices in Integrated farming system at farmers level in Nadia and Spice at field level problems. Around 117 farmers took part in the training programme including female participants.
10	ICAR-Central Coastal Agricultural Research Institute, Goa	"Improved production technology for turmeric, ginger and black pepper"	30-31 March, 2021	One training programme on "Improved production technology for turmeric, ginger and black pepper" was conducted during 30-31, March, 2021. During the training, the participants were appraised of the improved varieties of important spice crops like black pepper, nutmeg, turmeric and ginger, improved production practices including the organic practices, spice crop nursery aspects for production of quality planting material, harvesting and post harvest handling and processing and value addition. Around 45 farmers took part in the training programme.

11	Central Plantation Crops Research Institute, Kasaragod, Kerala	Cinnamon inter-cropping in coconut garden	22nd February, 2021 at Valavadi, Udumelpet, Tirupur District, Tamil Nadu.	FT programme "Intercropping of cinnamon in coconut" was conducted at Valavadi, Udumalaipet, Tirupur district on 22.02.2021. Classes were undertaken on the aspects of coconut based cropping system, intercropping of cinnamon and beneficial effects of cinnamon were explained. The classes were followed by group discussion and clarified the queries raised by the farmers on all aspects of cultivation aspects of cinnamon intercropping and the farmers were convinced about the benefits of intercropping in coconut in general and cinnamon intercropping in particular. There were 126 farmers attended the programme. There were about four farmers shown keen interest to take up intercropping of cinnamon in their coconut garden.
		Varietal wealth in arecanut and arecanut based multi species cropping system	23rd February, 2021 Shivagouri, Kalamandhira, Padpinangady, Sullia Tk.	Conducted training programme on "Varietal wealth in arecanut and arecanut based multi species cropping system". Lectures, demonstrations and discussions on various topics related to arecanut varieties, arecanut based cropping system and integrated pests and diseases management were arranged which helped the farmers to know the scope, importance and advantages of the arecanut varieties, arecanut based cropping system and integrated pests and diseases management to increase the profit. Quiz competition was also organized for the participants and prizes were given to winners. 136 participants attended the programme.
		Good cultivation practices in arecanut and arecanut based multi species cropping system	26th February, 2021 at Kolli Dhurgadevi Kalamantapa, Mitthabhagilu, Belthangady Tk.	Organised a training Programme on "Good cultivation practices in arecanut and arecanut based multi species cropping system". Lectures, demonstrations and discussions on various topics related to arecanut based cropping system and integrated pests and diseases management were arranged which helped the farmers to know the scope, importance and advantages of the arecanut based cropping system and integrated pests and diseases management to increase the profit. Exhibits related to varieties/ hybrids, quality planting materials production, agronomic practices, arecanut based cropping

				system, integrated pests and diseases management etc. were displayed for giving first-hand information to the participants. Quiz competition was also organized for the participants and prizes were given to winners. 135 participants were attended the programme.
		Good cultivation practices in arecanut and arecanut based multi species cropping system	9th March, 2021 at Panja, Sullia Tk.	Training Programme on "Good cultivation practices in arecanut and arecanut based multi species cropping system' was organized at Panja, Sullia Tk., Dakshina Kannada Dt., Karnataka. 139 participants attended the programme and got benefitted. Lectures, demonstrations and discussions on various topics related to arecanut based cropping system and integrated pests and diseases management were arranged which helped the farmers to know the scope, importance and advantages of the arecanut based cropping system and integrated pests and diseases management to increase the profit. Exhibits related to varieties/ hybrids, quality planting materials production, agronomic practices, arecanut based cropping system, integrated pests and diseases management etc. were displayed for giving first-hand information to the participants. Quiz competition was also organized for the participants and prizes were given to winners.
		Good cultivation practices in arecanut and arecanut based multi species cropping system	24th March, 2021 at Ubaradka Mithoor, Sullia Tk.	Training Programme on "Good cultivation practices in arecanut and arecanut based multi species cropping system" was organized and 56 farmers attended the programme and got benefitted. Lectures, demonstrations and discussions on various topics related to arecanut based cropping system and integrated pests and diseases management were arranged which helped the farmers to know the scope, importance and advantages of the arecanut based cropping system and integrated pests and diseases management to increase the profit. Exhibits related to varieties/ hybrids, quality planting materials production, agronomic practices, arecanut based cropping system, integrated pests and diseases management etc. were displayed for giving first-hand

				information to the participants. Quiz competition was also organized for the participants and prizes were given to winners.
12	Sardar Krushi Nagar Dantiwada Agriculture University, Gujarat	Training on Seed spices Training on Seed spices	19th March, 2021 at Devpura,Tal. Vav,Dist. BK. 22nd March, 2021 at NavaTal. Deesa Dist. BK.	Conducted two days farmers trainings under MIDH on seed spices through KVK, Tharad at Devpura village of Vav taluka and through KVK, Deesa at Nava village of Deesa taluka of Gujarat on 19th and 22nd March, 2021 respectively. The main objective of organizing the farmers trainings was to transfer the available latest technologies of seed spices to the growers in order to improve production and quality of seed spices. The main topics of the trainings were (1) Mission for Integrated Development of Horticulture (MIDH) – Development and strategies of Horticulture in Gujarat State (2) Production scenario of seed spices, export potential and tips for profitable production (3) Production technology of seed spices with special reference to no or low cost technology (4) Crop production and protection technologies of seed spices under organic farming condition (5) Integrated Pest and disease Management in seed spices (6) Processing, post harvest and Value addition in seed spices (7) Improved varieties and seed production technologies in seed spices with special reference to seed village concept (8) Export barriers and quality standards in seed spices and (9) Farmers and scientists interaction. During two different trainings total 200 farmers /participants from different talukas of Banaskantha district of Gujarat. The printed material in form of leaflets were distributed to all the participants during trainings.
13	SKN Agriculture University, Jobner, Rajasthan	Production technology of seed spices	20th January, 2021 at KVK, Ajmer, Rajasthan.	Scope of seed spices in Rajasthan & their medicinal values, Advance in production technology of seed spices crops, Technology dissemination in seed spices crops, Organic farming practices in seed spices, Integrated Nutrients management in seed spices crops and Integrated pest management in seed spices crops and Farm Visit were discussed in the programme. Around 120 farmers took part in the training programme including female participants.

		Improved Production technology of spices	14th March, 2021 at KVK, Fatehpur, Shekhawati.	Improved production technology of spice crops, Major diseases and pests of spice crops their identification life cycle and nature of damage, Soil health and nutrient management in spice crops, Vermicompost production for organic farming, Azolla production technology, Post harvest technology & value addition of spices were discussed. Around 120 farmers took part in the training programme including female participants.
14	Uttar Banga Agricultural University, West Bengal.	Training programme on spices	22 – 23 January, 2021 at Samuktala, Alipurduar	Improved production technology of betel vine production, Production technology of spice crops, Processing and Value addition of Spices. Disease Management in Spices and Processing of spices were discussed during the training programme. Around 88 farmers, including female participants, took part in the training programme.
		Training programme on spices	01 – 02 February, 2021 at Kagey Village, Kalimpong	Eco-friendly management of major Insect pest of Large Cardamom , Eco-friendly management of major diseases of large Cardamom, Problems and Prospects of Ginger cultivation in Hills and Management of Rhizome rot complex disease in ginger, Problems and Prospects of Large Cardamom cultivation in Hills and also toughed the Cultivation and Processing technique of ginger to the farmers, Major insects-pests of ginger and their management, Cultivation and Processing technique of Large Cardamom were dealt in the programme. Around 82 farmers including female participants took part in the training programme.
		Training programme on spices	08-09 February, 2021 at Manikchak, Malda	Importance and scope of spices cultivation in Malda district of West Bengal, Production and processing of betelvine, Improved package and practice of major spices and their marketing, Improved package and practice of seed spices and their marketing and Nursery techniques in spice crops were dealt in the programme. Around 76 farmers took part in the training programme including female participants.
15				One farmers' training programme conducted in association with Krishi Vigyan Kendra, Banda at Village Jamalpur of Banda district on 23rd March,

	Banda University of Agriculture and technology Banda, Uttar Pradesh.	Training on Spices crops	23rd March, 2021 at Krishi Vigyan Kendra, Banda	2021. The training of the farmers was conducted by Resource persons from KVKs and faculty members of BUAT, Banda. Lecturers related to Disease Management in Spices condiments, Extension of spice crop among the farmers, Insect-pest and Disease Management in Seed Spices', Marketing Strategies for Spices Crop and Value addition of Spices crop were discussed in the programme. Around 85 farmers took part in the training programme.
		Training on Spices crops	26th March,2021 at Krishi Vigyan Kendra, Mahoba	One day Farmers training conducted at Krishi Vigyan Kendra, Mahoba to motivate the farmers about the production of Betelvine at their farms. The farmers were encouraged to grow different type of spices crops as well as Betelvines per the location for fetching the remunerative prices. During inaugural function Head, Krishi Vigyan Kendra, Mahoba, scientists of Banda University of Agriculture & Technology were present. Lectures related to Practices of Organic Farming and Procedure of Certification, Good Agricultural Practices for Cultivation of Betelvine, Prospects of Entrepreneurship Development through Spice Crops, Value Addition in Spices, Opportunities and Avenues and Extension of spice crop among the farmers were discussed. Around 85 farmers took part in the training programme including female participants.
16	Kerala Agricultural University, Thrissur, Kerala	Recent advances in cultivation of major spice crops (online)	14th December, 2020 at FSRSS adananda-puram	One day farmers training programme on Recent advances in cultivation of major spice crops (online) was held on 14th December, 2020 at FSRS, Sadanandapuram. Three resource persons delivered the lectures on various aspects of recent crop production techniques of black pepper, ginger and turmeric and also Pest and disease management of major spice crops.Total 75 progressive farmersparticipted in the programme. *Psuedomonas, Trichoderma*, Neem oil, garlic soap were distributed to 75 farmers.
				One day farmers training programme on "Varieties and nursery practices in black pepper Good

		Varieties and nursery practices in black pepper Good Agricultural Practices in black pepper	31st March, 2021 at Conference Hall, CRS, Pampadumpara	Agricultural Practices in black pepper" was held on 31st March, 2021 at Conference Hall, CRS, Pampadumpara. Training were organized on the topics (a) Varieties and nursery practices in black pepper (b) Good Agricultural Practices in black pepper. Total 50 progressive farmers participted in the programme. One kg packet each of three biocontrol agents *viz.Trichoderma, Metarhizium & Pseudomonas*, rooted cuttings of pepper in polybag and also a brochure on pest and disease management in black pepper were distributed to the farmers.
		SOP in Spice production	11th February, 2021 at Training Hall, Model Nursery on Spices.	Trainig were organized on the topics (a) Advanced production technologies in Nutmeg (b) Integrated pest management in Spices (c) Advanced production technologies in Ginger (d) Integrated Disease Management in Spices (e) Intensive cultivation techniques in Black pepper and Advanced production technologies in turmeric. Total 60 progressive farmers participted in the programme.
17	Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh	Tarining programme on Spices crops	17th March, 2021 at KVK, Babugarh, Hapur of Uttar Pradesh.	One District Level Farmers training programme was conducted on 17th March, 2021 at KVK, Babugarh. Total 75 farmer participants were attended this training programme. During the technical session, various technical lecturers delivered by the resource persons/Scientists of Department of Horticulture and KVKs on various topics of spices crops as per mandates. The resource persons were delivered the lectures on topic Masala Phaslon Ka Vartman Staar and Sambhavnayein, Production Technology for Turmeric and Ginger, Production Technology of Seed Spices and plant protection measures, Production technology of Chilli and Fennel, Soil and nutrient management for Spices crops, Technology of seed production of various spices and improved varieties of Garlic and Fenugreek production .
18	Agricultural University, Kota, Rajasthan	Production Technology of Seed Spices	10th February, 2021 at KVK, Jhalawar.	One training programme entitled "Production Technology of Seed Spices" was organized by KVK, Jhalawar on 10th February 2021. Eight resource persons delivered the lectures on various aspects of spices production, improvement and protection,

				Integrated disease management of seed spices, Processing and post harvest management of seed spices, Integrated weed management of seed spices etc. The Chief Guest of the programme, Prof. (Dr.) J.M.Dhakar, Additional Director (Seed & Farm), AU, Kota discussed advance research thrust area and themes in major spice crops. Thereafter, release of Folder on Coriander Crop was performed by invited guests. Around 100 farmers took part in the training programme including female participants.
19	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra	Training on spices and aromatic plants	8th February, 2021 at Dabhol Panchakroshi.	The University conducted four farmers training programmes during the year at different villages. The topics for the trainings were Production of quality planting material of spices in Konkan region, production technology of pepper, Cinnamon, Nutmeg, clove and turmeric, intercropping of spices in coconut gardens and post harvest management of spices. Dr. B R Salvi, Dr. R G Khandekar, Dr. Y R Parulekar, Dr. K V Malshe and Dr, N V Dalvi were the resource persons. All University authorities including the Hon'ble Vice Chancellor and Director of Research, were present for these TOT programme. Exhibition of live samples *viz.* Nutmeg, Black pepper, Bush pepper, Cinnamon, Aromatic Plants, Turmeric was arranged. The participants were given Booklet, Pen, Conference Pad, Planting material of Cinnamon, Nutmeg & Kokum along with dried samples of Cinnamon as training kit. The training programmeMatvan village was conducted on Women's Day with the participants being only women. Over 75 farmers took part in each of the training programme.
		Training on spices and aromatic plants	11th February, 2021 at Kelshi, Anjarle, Panchakroshi.	
		Training on spices and aromatic plants	8th March, 2021 at Matvan village.	
		Training on spices and aromatic plants	12th March, 2021 at ARS, Awashi, Khed.	
20	Choudhary Charan Singh Haryana Agricultural University, Hissar, Haryana	Training programme on spices Training programme on spices	24th February, 2021 at Main Campus CCS, HAU, Hissar 3rd March, 2021 at Main Campus CCS, HAU, Hissar	Two farmer's trainings were organized at the main campus of CCS Haryana Agricultural University, Hisar on February 26, 2021 and March 03, 2021. In order to create awareness among the farmers regarding cultivation of spices crop for diversification in agriculture, lectures on relevant topics were delivered by different scientists of HAU regarding package of practices and usefulness of these crops. Over 75 farmers including women farmers took part in each of the training programme

21	Punjab Agricultural University, Ludhiana, Punjab	Production and processing of Aromatic and spice crops	11th Dec, 2020 at KVK, Pathankot	Two farmers training programmes were organized by the School of Organic Farming, Punjab Agricultural University, Ludhiana (Punjab) at Pathankot and Fatehgarh Sahib. Training schedule was planned as per the needs of the farmers and accordingly lectures related to importance, scope, uses, cultivation practices, processing and marketing of aromatic and spice crops were delivered. The concerned resource persons/speakers having expertise and experience on the subject were invited from PAU, Ludhiana. An exhibition, comprising live samples of various aromatic and spice crops, essential oil and processed products was also arranged at both the locations to make the training programme. Field visits were also conducted. There were around 200 participants for the training programmes.
		Production and processing of Aromatic and spice crops	15th Dec, 2020 at KVK, Fatehgarh Sahib	
22	Orissa University for Agriculture and Technology, Bhubanes-hwar at Odisha	Organic Ginger Cultivation	10th February, 2021 at RRTS, Semiliguda	The one-day farmers training programme on Organic Ginger Cultivation was held at RRTTS, Semiliguda on 10th Feb, 2021. 75 Farmers from the area attended the programme. Resource persons from OUAT, KVK, Koraput and the state department delivered lectures on different government facilites operating in the district for ginger farmers, marketing facilities, production practices, post harvest management, processing, storage and pest management for Ginger
23		Cultivation and processing of Spices and Aromatic Crops	2nd March, 2021 at BTC, CARS, Bilaspur.	One day training programme was organized on 2nd March, 2021 at BTC College of Agriculture and Research Station, Bilaspur on cultivation and processing of aromatic and spices crops. The main emphasis of training was on the aspect of Post Harvesting technique and processing of turmeric. Lectures were delivered on process of certification for organic farming of Turmeric and seed spices, processing and value addition of spice produce, and use of bio pesticides for the management of diseases of Turmeric. Field visits were also conducted. Around 250 farmers took part in the programme.
				One day farmers Training Program was organized at KVK Korea (Tribal area) on “Production technology of Aromatic Crops, essential oil extraction & value

	Indira Gandhi Krishi Vishwavidyalaya Raipur, Chhattisgarh	Production technology of Aromatic crops, essential oil extraction and value addition	28 – 29 Jan, 2020 at KVK, Korea.	addition" on 28th and 29th Jan, 2021. The main Emphasis of the training was on the aspect of processing and making of value-added products for the use of aromatic oils. Lectures were delivered on production technology of Khus, Citronella and Patchouli, nutrient management and processing of aromatic crops. Dr. S STuteja, Dr. P K Joshi and Dr. K C Rajhansa were among the resource persons. 86 farmers from the area took part in the programme. At the end of training, Certificates, slips of aromatic crops and value-added products like aromatic soaps and agarbatti were distributed to participants.
24	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh	Training programme on spices	25th February, 2021 at KVK, Neemuch	A one-day training programme was organized and around 330 farmers from various spice growing villages like Hanumantiyapanwar, Lalpura, Amlikheda, Jawasa, Kelukheda, Bawal, Melankheda, Bhatkehdi, Bhamesar and Basniya etc. participated in the programme. The workshop covered around 6 lectures and 1 field visit. The participants were guided and trained about multiple aspects of production technology, integrated pest management, various plant protection measures, post harvest technology by various scientists.
		Training programme on spices	5th December, 2020 at KVK, Dhar	A one-day training programme was organized and total 167 farmers and 9 dignitaries were participated in the programme. Principal Scientist and Head, KVK, Dhar welcomed the participants and informed about the importance of spice crops and soil health for doubling the farm income. Dr. S. S. Chauhan, Soil Scientist expressed his views on the importance of organic farming and soil health with respect to different spices crops by making presentation. The farmers were given detailed information about the organic certification process, filling of forms in spice crops by Shri Manoj Kumar, Deputy Director/Organic Inspector, Madhya Pradesh State Organic Certification Agency (MPSOCA), Bhopal.
		Training programme on spices	11th February, 2021 at KVK, Alirajpur	A one-day farmers training programme was conducted at KVK Alirajpur. During the programme, scientists from College of Agriculture, Indore and

				Scientist of KVK, Alirajpur delivered the lecture on production technology, pest management and organic farming. Film on spice crop production also shown to farmers during programme. Deputy Director, Agriculture, Assistant, Director Horticulture, Deputy Director, Veterinary and PD, ATMA also participated and expressed their views and encouraged the famers for spices crop production. Total 152 farmers were participated the training programme and visited the drip irrigation and sprinkler system method of irrigation at KVK after the programme.
25	Dr. Rajendra Prasad Central Agricultural University, Bihar	Training programme on spice Production Training programme on spice Production	18-20 Jan, 2021 at Dholi 22 to 24 March, 2021 at Dholi	Dr. S. P. Singh, PI of the scheme was the training coordinator and conducted two training programmes consisting of 3 days each during the year on spice production. The topics covered during the trainings were production technology of seed spices, spice cultivation prospects in Bihar, pest and disease management in spices, and organic practices to be adopted in spice crops. Around 100 farmers from different villages of the district took part in the programme.
26	University of Agricultural Sciences, Dharwad, Karnataka	Training programme on Ginger and Turmeric Production	28th January, 2021 at ARS, Malagi	A farmers training programme on "Ginger and Turmeric production training programme" was organized at ARS, Malagi. The programme was inaugurated by the Director of Research, UAS, Dharwad. Scientists from different faculties gave a lecture on ginger and turmeric production practices. Pest and disease control in ginger and turmeric, marketing opportunities for organically grown spices, and the importance of quality planting material and post harvest technologies of ginger and turmeric production in Uttar Kannada District. 130 farmers attended this training programme. A booklet entitled "Ginger Production Technologies" was released.
		Training programme on spices	21st February, 2021 at KVK, Ambedkar Bhavan, Sirsi	A Farmers training programme on Spices was conducted by K V K, Sirsi with the theme of "Spices Mela – A nutrition Security". The speakers delivered lectures on importance of spices in Uttara Kannada and Nutrition Security, various aspects of spices

				cultivation, production problems, marketing, financial support & schemes and value addition. About 207 participants attended the training. The highlight of the programme was a cooking competition on the use of spices to prepare nutritious dish.
27	University of Agricultural Sciences, Bangalore, Karnataka	Training programme on spices and Aromatic Crops	18th February, 2021 at KVK Chintamani, Chikkaballapur	A farmers training programme on "Spices and Aromatics Crops" was conducted at KVK, Chintamani, Chikkaballapur. The programme was inaugurated by Dean, College of Sericulture, Chintamani, Chikkaballapur District. He highlighted about the scope and importance of Spices, especially their role during COVID-19 pandemic period and the importance of Aromatic crops cultivation. The topics covered during the training programme were Cultivation, harvesting, processing of Spice crops, Cultivation of Aromatic crops and post-harvest processing and value addition and marketing of Spices and Aromatic crops. Field visits were conducted to enable farmers to learn the practicality of spices and aromatic crops production, processing and essential oil extraction methods. Around 75 farmers from various parts of Chikkaballapur District attended the training programme.
		Training programme on spices and Aromatic Crops	8th March, 2021 at KVK Ramanagara	A farmers training programme on "Spices and Aromatics Crops" conducted at KVK Ramanagara District, Karnataka. The programme was intended to assert the importance of spices cultivation and their demand especially during COVID situation, also scope for women empowerment in the areas of value addition of spices and aromatic crops. The topics covered during the training programme were Cultivation, harvesting, processing of Spice crops, Cultivation of Aromatic crops and post-harvest processing and value addition and marketing of Spices and Aromatic crops. Field visits were conducted to enable farmers to learn the practicality of spices and aromatic crops production, Around 75 farmers from various parts of Ramanagara District attended the training programme.

Farmers training programmes conducted at different implementing agencies

Fig. 210.State Level Seminar organised at BSKKVP

Fig. 211. State Level Seminar - CAU, Arunachal Pradesh

Fig. 212. State level Seminar organized at Dr.PDKV, Akola

Fig. 213. District Level Seminar conducted at Dr. YSPHU, Solan

Fig. 214. District Level Seminar conducted at DMAPR, Anand

Fig. 215. District Level Seminar conducted at BSKKVP, Maharashtra

Fig. 216. DLS, OUAT Doubling farmers income through medicinal and aromatic plants cultivation

Fig. 217. District Level Seminar on turmeric conducted at HRS Anantarajupet, YSRHU

Fig. 218. Planting Materials Distributed during District Level Seminar at PRS, KAU, Kannur

Fig. 219. Farmers Training held at RS – Vittal, CPCRI

Fig. 220. Field visit during FT at Assam Agri. University.

Fig. 221. FT conducted at KVK Arnej, Anand Agri. University

Fig. 222. BUAT - FT- Harnessing the Potential of Spices Production in Bundelkhand Region, UP

Fig. 223. Farmers Training at CSAUST, UP

Fig. 224. FT at KVK Kotputli, Jaipur organized by SKNAU, Jobner

Fig. 225. Farmers training conducted at CCSHAU, Hisar

Fig. 226. Field Visit by framers during FT KAU, Mannuthy

Fig. 227. Farmers Training held at BCKV, West Bengal

Fig. 228. FT at Junagadh Agri. University, Gujarat

Fig. 229. Farmers Training at KVK, Tharad RVSKV, Gwalior

Fig. 230. FT at CRS Pambadumpara, KAU

Fig. 231. Farmers Training on spices organised at Planetarium, Calicut

Fig. 232. Farmers Training held at AU, Jodhpur

Fig. 233. FT - BSKKVP-Planting material distribution, Dapoli

Fig. 234. FT conducted at SVPUAT, Meerut

Fig. 235. Farmers registration during FT at UHS, Bagalkot

Fig. 236. Farmers interaction during FT at KVK, Banda

Fig. 237. FT organised by RVSKVV, Gwalior

Fig. 238. FT organized at Dr.YSPHU, Solan

Fig. 239. OUAT,Orissa organised FT on Organic ginger cultivation

Fig. 240. Farmers Training at Kalimpong, UBKV, WB

Fig. 241. Farmers Training programme conducted by Dr.PDKV, Akola

Fig. 242. FT organized by Rajendra Agri. University, Bihar

Fig. 243. FT organised at UAS, Bagalkot

Fig. 244. Farmers Training at HCRI, Periyakulam, TNAU

Fig. 245. Farmers Training programme conducted at IISR, Calicut

Fig. 246. FT organized at KVK, Sirsi, UAS, Dharwad

Fig. 247. MPUAT, Udaipur conducted FT at KVK, Chittorgarh

Fig. 248. Farmers Training session at NDUAT, UP

Fig. 249. Off-Campus seed production training programme on turmeric & black pepper at HMRS, Waghai - NAU

Fig. 250. Participants at FT on Spices Production in Arunachal Pradesh, CAU, Pasighat

Fig. 251. PAU, Ludhiana conducted Farmers training on Spices

Fig. 252. Planting material Distribution to farmers during FT at CIARI, Port Blair

Fig. 253. FT organised at SKUAST- Jammu & Kashmir

8. Monitoring

The Directorate is responsible for coordinating and monitoring the activities on the development of arecanut, spices and aromatic plants under Mission for Integrated Development of Horticulture (MIDH) in the country. MIDH programmes were monitored through periodical review meeting, field visits, discussions with the officers concerned.

8.1 Review Meeting of MIDH programmes being implemented by DASD

The fourteenth Annual Review meeting of the MIDH programmes implemented through the Directorate of Arecanut and Spices Development, was held on 28-29 July, 2020 through video conferencing. There were around 53 participants representing 45 agencies implementing DASD programmes.

The inaugural session began at 10.00 AM. Dr. Femina, Deputy Director delivered the introductory remarks. Dr. Homey Cheriyan, Director, DASD delivered the formal welcome address. Dr. B.N.S. Murthy, Horticulture Commissioner, Govt. of India was the Chief Guest and inaugurated the review meeting. In his inaugural address, he highlighted that the demand for spices is expected to increase in the post COVID period. The production/productivity improvement made in NHM period to meet export and domestic demand is remarkable. He also appreciated the efforts done by DASD in Rajasthan to develop export clusters for pesticide free cumin production. He assured support from Ministry in the efforts to address post COVID difficulties in spices sector. Dr. S K Rao, Hon'ble Vice Chancellor, RVSKVV also addressed the audience.

The technical sessions began at 10.30 AM. The Review Team consisted of Dr. B N S Murthy, Horticulture Commissioner, Dr. Homey Cheriyan, Director, DASD and Dr. Femina, Deputy Director, DASD. Center/Institute wise presentation were done by Principal Investigators/ representative of the implementing agencies and the review team critically evaluated the progress of implementation in each centre. Suggestions were made for effective implementation of the development programmes.

Following points were mentioned by the Director, DASD in his closing remarks;

1. Unspent balance of Seminar/Workshop/Farmer's training programme - The balance funds may be utilized for some purpose connected with the event. The balance of unspent funds of seminars/FT must be refunded, if not utilized fully. Any funds being refunded to the Govt. of India under MIDH has to be in the name of Director, DASD, Calicut. Detailed report on the programme alongwith soft copy of photographs (in JPEG format) must be sent to the Directorate.

2. The implementing agencies may ensure that funds of the immediate previous year are only lying unspent with them. Funds of the previous years may be utilized completely, as revalidation of funds left unspent for more than 2 years is not permitted. Revalidated funds of the previous years are to be utilized only for the already approved components and these funds are to be utilised first, before the current year's funds are used. Year wise details of unspent balance may not be mentioned. Total opening balance, release, expenditure and unspent balance only are to be given in the APR.
3. MIDH/NHM logo to be placed at all places where funds under NHM are utilized, such as infrastructure, fields, nursery, seminar, farmer's training etc.
4. All nurseries established under NHM funds from the Directorate should be accredited by DASD. Private /public spice nurseries in contact with the University may be encouraged to take up nursery accreditation.
5. Submission of Audited Utilisation Certificates are mandatory. Therefore, all agencies may ensure submission of the same within 2 years after implementation.
6. The varieties used in multiplication should be declared at the time of proposal itself. Details of planting material distributed is to be intimated to DASD. The reports on planting material production should show the variety of the crop produced. Those varieties which are released in last 10 years are to be given priority for multiplication under the programme.
7. Details of the planting material produced at each centre to be uploaded on the DASD website.
8. Articles, success stories in c/w the conduct of the FLDs, innovative projects, infrastructure development, skill trainings, Seminars etc.to be submitted to the Directorate for publication in journal.
9. Impact of skill developmentprogramme, to be intimated to DASD in form of success stories.
10. Refund of funds to DASD - Funds liable to be refunded to DASD may be done only after approval/directions of DASD.

The two-day review meeting was concluded with the formal vote of thanks delivered by Dr. Femina, Deputy Director, DASD.

Fig. 254. Dr. Homey Cheriyan, Director, DASD addressing the Delegates during inaugural session of review meeting

Fig. 255. View of the participants

Fig. 256. Dr. Gopal Lal, Director, ICAR-NRCSS delivering felicitation address

Fig. 257. DASD review team

3. STATISTICS

The exhaustive, reliable and timely statistics have been identified as the foremost requirement for evolving the development strategies in agriculture sector. Since the correct information on area and production of export-oriented commodities like spices is necessary for planning development programmes as well as strategy for export, a more reliable and scientific data base of spices is very essential. With this objective, the Ministry of Agriculture & Farmers Welfare has rightly put collection, compilation and dissemination of statistics of spices and arecanut as one of the mandates of the Directorate of Arecanut and Spices Development (DASD) since its inception. In 2008, the DASD has been authorized as the nodal agency for the collection and compilation of area and production of spices and arecanut.

The main activities related to compilation of statistics are:

- Collection and compilation of area and production of various spices and arecanut from different States.
- Generate All India estimates for area and production of various spices and arecanut.
- Collection and compilation of data related to export, import, cost of production, price trend of the commodities concerned.
- Dissemination of the generated data to the development agencies, traders, exporters, scientists, researchers etc.
- Review of production and price situation of the crops entrusted to the Directorate.

1. Area and Production Statistics

The Directorate collects the area and production estimates from the reporting agencies (State Agricultural Statistics Authority-SASA) like State Department of Economics and Statistics / Horticulture / Agriculture and office of the commissioner of land records. The collected data are being compiled for estimating the all-India figures for spices as a whole and for individual spices. Similarly, the Directorate compiles State-wise area and production statistics of arecanut. These estimates are being provided to Horticulture Statistics Division of the Ministry of Agriculture & Farmers Welfare, Government of India periodically for releasing the estimates on area and production of horticultural crops including spices at National level.

1.1 Spices

As per the second advance estimates for 2020-21, production of spices in the country is 105.32 lakh tonnes from an area of 44.87 lakh ha, which registered an increase of 3.56 % in production and 4.62% in area when compared to 2019-20. Among the various spices black pepper, ginger, red chilies, garlic, coriander, cardamom, cinnamon, clove and fenugreek registered increase in production and other spices registered a decrease in production. All India estimates of area, production and productivity of spices for the years 2019-20 and 2020-21 are given below.

Table 1. Crop-wise estimates on area, production and productivity of spices

(Area: '000 ha, Production: '000 tonnes, Yield: kg/ha)

Spices	2019-20			2020-21 (Adv/Est.)#		
	Area	Production	Productivity	Area	Production	Productivity
Black Pepper	259.148	104.071	402	259.021	119.475	461
Ginger (Fresh)	178.135	1868.435	10489	175.664	1882.157	10715
Red Chillies	623.446	1841.799	2954	732.212	1988.304	2715
Turmeric (Dry)	296.181	1178.751	3980	294.690	1102.318	3741
Garlic	352.644	2926.090	8298	384.924	3118.143	8101
Cardamom	85.433	20.907	245	83.750	31.370	375
Coriander	528.970	700.813	1325	628.618	822.184	1308
Cumin	1276.283	912.041	715	1241.297	856.505	690
Fennel	82.731	139.762	1689	79.842	128.497	1609
Fenugreek	126.294	182.170	1442	133.229	203.360	1526
Ajwan	41.134	28.973	704	36.073	23.351	647
Dill/Poppy/Celery	32.798	34.566	1054	30.877	30.083	974
Cinnamon/Tejpat	3.021	7.561	2503	3.276	7.652	2336
Nutmeg	24.252	15.688	647	23.478	15.076	642
Clove	2.043	1.144	560	2.179	1.183	543
Tamarind	44.098	163.315	3703	44.321	159.243	3593
Vanilla	0.091	0.060	659	0.147	0.067	456
Mint (Mentha)*	328.654	44.023	134	330.234	43.939	133
Saffron	3.523	0.004	1	3.490	0.004	1
Total	4288.878	10170.172	2371	4487.322	10532.913	2347

*Mint production in terms of mentha oil

#Subject to revision

Coutnry-wise area and production of spices are being collected from international organizations like Food and Agriculture Organization (FAO), Rome and International Pepper Communtiy (IPC), Jakarta.

Pepper production in the world was estimated 6.20 lakh tonnes from an estimated area of 6.08 lakh ha in 2020 against a production of 6.81 lakh tonnes from 6.03 lakh ha during 2019. The world production of pepper has decreased in 2019-20 when compared to 2018-19. Vietnam is the largest pepper producing coutnry with a production 2.5 lakh tonnes from 1.13 lakh ha.

Table 2. Coutnry wise area, production and yield per hectare of pepper during 2019 and 2020

(Area: ha, Production: tonnes, Yield: kg/ha)

Coutnry	2019			2020		
	Area	Production	Productivtiy	Area	Production	Productivtiy
Brazil	31000	80000	2581	27850	78000	2801
India	244560	137360	562	259148	104071	402
Indonesia	118200	78000	660	116375	78000	
Malaysia	17477	24000	1373	17437	24000	1376
Sri Lanka	41000	19360	472	40241	21800	542
Vietnam	115000	280000	2435	113142	250000	2210
China	21000	32000	1524	20000	33000	1650
Madagascar	4000	4000	1000	4000	4000	1000
Thailand	614	5000	8143	500	5000	10000
Cambodia	7471	16586	2220	7471	18000	2409
Ecuador & Others	2800	5000	1786	2800	5000	1786
Total	603122	681306	1130	608964	620871	1020

Source: India- DASD, Other coutnries- IPC

1.2 Arecanut

Arecanut production in the coutnry was 13.52 lakh tonnes from an estimated area of 7.31 lakh ha in 2019-20. As per the estimates for 2020-21, area under Arecanut have increased to 7.39 lakh ha but production has decreased to 12.33 lakh tonnes. Karnataka, Kerala, Assam, Meghalaya, Mizoram, West Bengal etc. are the major arecanut growing states in the coutnry. All India estimates of area, production and productivtiy of arecanut in India during 2019-20 and 2020-21 are given in Table 3.

Table 3. State-wise area, production and productivtiy of Arecanut

(Area: '000 ha, Production: '000 tonnes, Yield: kg/ha)

State	2019-20			2020-21		
	Area	Prodn	Yield	Area	Prodn	Yield
Karnataka	1.096	10.418	9505	2.033	4.066	2000
Kerala	67.021	50.040	747	67.021	50.040	747
Assam	1.971	3.704	1879	2.000	4.100	2050
Meghalaya	500.522	1081.840	2161	500.000	950.000	1900
West Bengal	96.921	92.755	957	96.784	92.599	957
Tamil Nadu	2.666	5.000	1875	2.147	3.841	1789

Tripura	17.951	24.467	1363	17.963	24.550	1367
Mizoram	13.000	10.840	834	21.420	33.540	1566
Andaman & Nicobar	0.216	1.197	5540	0.298	1.742	5854
Maharasthra	6.843	13.543	1979	7.568	15.309	2023
Goa	7.167	24.511	3420	6.146	19.465	3167
Andhra Pradesh	11.890	23.857	2006	11.913	23.338	1959
Nagaland	4.336	10.589	2442	4.434	11.022	2486
Pondicherry	0.052	0.078	1500	0.052	0.082	1565
All India	731.652	1352.839	1849	739.778	1233.693	1668

Coutnry-wise area and production of arecanut were collected from Food and Agriculture Organization, Rome. The latest available data are of 2019. World production of arecanut in 2019 was estimated as 19.37 lakh tonnes from an area of 14.22 lakh ha against 15.01 lakh tonnes from 10.40 lakh ha reported in 2018. India accounts for 49% of area and 58% of production of Arecanut in the world.

Table 4. Coutnry-wise area and production of Arecanut

Coutnry	2018			2019		
	Area (Ha)	Production (tonnes)	Yield (kg/ha)	Area (Ha)	Production (tonnes)	Yield (kg/ha)
India	505236	881645	1745	704024	1115740	1585
Indonesia	154565	128745	833	188490	149450	793
China, Taiwan Province of	41500	102918	2480	40920	103767	2536
Myanmar	55615	132086	2375	56545	135664	2399
Bangladesh	228371	137043	600	386957	316715	818
Sri Lanka	17877	54691	3059	18275	53645	2935
Thailand	23856	40390	1693	23485	40037	1705
Nepal	3946	13905	3524	1737	5542	3191
Bhutan	9066	9399	1037	1747	16107	9220
Malaysia	95	323	3400	60	206	3433
Kenya		113			113	
Maldives	3	3	1000	37	27	730
Total	1040130	1501261	1443	1422277	1937013	1362

Source: India- DASD, Other coutnries- FAO

2. Export and Import Data

2.1 Spices

The data on export of spices (item-wise and country-wise) were collected from the Spices Board India, which is the nodal agency for the export promotion of spices in the country. Import data were also collected from Spices Board.

Despite the COVID-19 pandemic, Indian Spices Export has sustained its upward trend in 2019-20 as well in 2020-21 and has reached an all-time high of 3.6 billion US $ for the first time in the history of Spices export. The export of Spices during 2020-21 was 15.65 lakh tonnes valued at Rs.27193.20 Crores (US $ 3.624 billion) against 12.08 lakh tonnes valued at Rs. 22062.79 Crores (US $ 3.110 billion) during 2019-20. The export has shown an increase of 23% in rupee value and 30% in quantity compared to last year. Chilli continued to propel the growth story as India's largest exported spice, accounting for Rs 6.01 lakh tonnes valued at Rs 8429.75 crores. Export of ginger, chilli, turmeric, coriander, cumin, curry powder/paste, fenugreek, oil and oleoresins, fennel, nutmeg & mace registered significant increase during this year. Export of garlic, mint products and pepper decreased during the year 2020-21.

Table 5. Estimated export of Spices during 2019-20 and 2020-21.

Spices	2019-20		2020-21	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Pepper	17,000	57,371	16,300	54,446
Cardamom (Small)	1,850	42,537	6,500	1,10,675
Cardamom (Large)	1,310	7,090	1,325	9,126
Chilli	4,96,000	6,71,040	6,01,500	8,42,975
Ginger	60,410	52,905	1,25,700	75,665
Turmeric	1,37,650	1,28,691	1,83,000	1,67,660
Coriander	47,135	39,831	57,000	48,983
Cumin	2,14,190	3,32,806	2,99,000	4,25,310
Celery	6,230	6,904	7,650	9,984
Fennel	24,220	23,162	31,800	27,630
Fenugreek	26,570	15,690	38,300	24,642
Other seeds (1)	37,580	22,081	48,800	30,008
Garlic	22,280	17,183	17,950	15,630
Nutmeg & Mace	2,900	13,280	3,875	19,000
Other spices (2)	37,235	66,546	44,000	70,943
Curry powder/Paste	38,370	81,279	38,450	89,145
Mint Products (3)	24,470	3,83,202	27,400	3,66,825
Spice Oils and Oleoresins	13,000	2,44,683	16,450	3,30,675
Total	12,08,400	22,06,279.91	15,65,000	27,19,320.25
Million US $		3,110.63		3,624.76

(1) Include Ajwan seed, Dill seed, Poppy seed, Aniseed, Mustard etc.

(2) Include Asafoetida, Cinnamon, Cassia, Cambodge, Saffron, Spices (NES) etc.

(3) Include menthol, menthol crystals & mint oils.

During the year 2020-21, import of spices in the country registered an increase of 16% in terms of quantity and 22% in terms of value. In 2020-21, India imported 223627 tonnes of various spices and spice products valued at 949 million US $ against the import of 2,20,571 tonnes valued at 936 million US $ in 2019-20. In 2020-21, Cassia is the major item in the import contributing 17% of the total spices imported followed by other spices (15%), pepper (13.1%), clove(12.15) , turmeric (11.5) etc. are the major spices imported into the country during the period. Item-wise import of spices during the year 2019-20 and 2020-21 are given below.

Table 6. Import of Spices in India during 2019-20 and 2020-21

Spices	2019-20		2020-21	
	Quantity	Value	Quantity	Value
Pepper (1)	26230	58153	29416	78135
Cardamom (Small)	470	5688	311	5663
Cardamom (Large)	6300	32046	7799	39811
Chilli/Paprika	1280	2121	1808	4264
Ginger Fresh/Dry	18874	11026	15385	13927
Turmeric	28850	24579	25709	22917
Coriander	12000	8027	8777	5881
Cumin black/white	2615	4419	7139	11121
Mustard Seed	10	10	414	304
Poppy seed	19940	44177	879	1311
Garlic	2750	953	7586	3600
Clove	27190	112866	27176	98582
Nutmeg	1645	5545	912	2906
Mace	1910	21137	1669	19600
Cassia	30000	57288	37897	79498
Star anise	6600	24758	4218	19075
Other spices (2)	27545	169815	34060	153928
Oils & Oleoresins (3)	6362	82633	9867	140572
Total	220571	665241	223627	702786
Value in Million US $		936.29		948.54

(1)Include white pepper, light pepper & black pepper

(2)Include Aniseed, Asafoetida, Cinnamon, Pepper long, Cambodge, Herbal spices and Spices NES

(3)Include Spice Oils & Oleoresins and Mint products

2.2 Arecanut

Arecanut is a commodtiy, which has a very limited export potential. The bulk of the arecanut production is consumed within the country. However, a small quantity of arecanut is exported mainly meant for the Indian settlers abroad. Arecanut is mainly exported in the form of whole, split, ground and other arecanuts. Majortiy of the export is in the form of whole arecanut. During 2020-21, export of arecanut has increased substantially and India exported 3193 tonnes of arecanut valued at Rs.85.86 crores against an export of 2,640 tonnes valued at Rs. 69.87 crores in 2019-20. Sri Lanka, Maldives, UAE, USA etc. are the major export destinations of Indian arecanut.

Table 7. Country-wise export of Arecanut from India

Country	2019-20		2020-21	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Maldives	756.11	2269.04	650.67	2549.08
USA	114.29	507.84	150.61	825.66
Sri Lanka	1010.00	2265.78	183.07	688.28
UAE	189.93	600.42	203.40	662.90
U K	71.82	245.78	92.66	442.93
Singapore	9.48	17.46	180.04	356.02
South Africa	52.22	246.27	38.74	173.33
Autsralia	32.14	99.00	27.27	143.58
Canada	29.75	81.43	29.13	136.21
Bhutan	8.13	36.22	35.29	107.15
Saudi Arabia	16.51	33.35	25.04	82.83
Nepal	125.86	226.20	18.63	46.57
New Zealand	4.91	23.50	7.19	41.84
Mozambique	4.93	13.64	9.85	41.56
Kenya	4.75	12.31	10.82	38.55
Mauritius	16.88	55.14	8.12	30.81
Germany	4.55	19.65	3.61	22.52

Uganda	6.60	16.52	3.07	12.13
Fiji	14.63	14.18	2.43	7.75
Netherland	3.14	11.84	0.77	4.30
Congo D. Rep.	13.96	53.80	1.10	3.97
Trinidad	7.06	19.38	0.43	2.12
Bangladesh	80.00	10.59	0.50	0.36
Total (Including others)	2639.92	6987.39	3193.76	8586.17

Source: Dept. of Commerce, Govt of India

Table 8. Product-wise export of arecanut from India

Country	2019-20		2020-21	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Arecanut, whole	982.54	3008.86	854.68	3442.82
Arecanut, split	227.82	601.87	1151.39	1833.07
Arecanut, ground	0.21	0.91	1.36	4.34
Other arecanuts	1429.35	3375.75	1186.33	3305.95
Total	2639.92	6987.39	3193.76	8586.17

In 2020-21, India imported 23,988 tonnes of arecanut valued at Rs. 508.58 crores against an import of 16,761 tonnes valued at Rs. 342.56 crores in 2019-20. Usually arecanut is imported in the form of whole, split, ground and other arecanuts. Sri Lanka and Indonesia are the two major sources of arecanut import in the coutnry. Coutnry-wise import of Arecanut in the coutnry during the last two years are given below.

Table 9. Coutnry-wise import of Arecanut in India

Country	2019-20		2020-21	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Sri Lanka	9,555	25,572	10,093	27,911
Indonesia	7,107	8,535	9,861	12,383
Myanmar			3,818	9994
UAE			217	570
Vietnam	98	145		
Canada	1	5		
Total including others	16761	34256	23988	50858

Table 10. Product-wise import of Arecanut in India

Product	2019-20		2020-21	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Arecanut, whole	991	2435	2731	6421
Arecanut, split	3593	3962	7163	9702
Arecanut, ground	321	921	89	267
Other arecanuts	11856	26939	14005	34470
Total	16761	34256	23988	50858

3. Price statistics

Price behavior of agricultural commodities is an area of major concern for policy makers. Prices of most of the spices commodities like pepper, ginger, turmeric, garlic, cumin, chillies etc. are highly volatile. Price instabiltiy affects both producers and consumers and has macroeconomic implications as well. Bearing this in mind, the Directorate has rightly put one of its mandates as collection, compilation and dissemination of price data of spices and arecanut. Weekend wholesale price data of various spice commodities and arecanut are collected from domestic markets across the country. Agricultural Produce Marketing Committees, Regional offices of the Department of Economics and Statistics, State Dept. of Marketing, Spices Board etc. are the major sources of price data. Arrivals and sales were also obtained from marketing centres. Monthly average of the weekend-prices of major spices and arecanut recorded in the important markets in the country during the last two years are tabulated below.

Table 11. Monthly average prices of various major spices and arecanut

(Price Rs./quintal)

Month	Pepper Garbled (Cochin)		Ginger Dry (Cochin)		Chillies (Virudhunagar)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
April	35287	33023	24000	27000	7687	NT
May	36657	32764	24800	27000	8900	
June	36650	33400	25750	27000	8875	
July	35511	32468	26000	28000	9750	11500
August	35472	33533	26000	28750	10625	11000
September	34665	34462	26000	29000	12250	12812
October	33164	34164	26000	28800	10687	16250
November	33907	34800	26000	27250	13450	13833
December	35400	35376	26375	26750	13875	13450
January	34314	34611	27400	24800	16562	13187
February	33337	34667	27375	23250	11250	13000
March	32126	37504	27000	20625	12167	12562
Mean	34708	34231	26058	26519	11340	13066

Table 11 contd. (Price Rs. quintal)

Month	Turmeric (Chennai)		Garlic (Chennai)		Coriander (Chennai)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
April	11750	11750	4875	4500	8575	-
May	11750	-	5500	-	8840	-
June	11750	-	6112	-	9000	-
July	11750	11750	5875	6000	9000	10500
August	11750	11750	6700	11000	8850	10500
September	11750	11750	11437	11500	8750	11250
October	11750	11600	16500	11040	8687	11300
November	11700	11562	16500	9687	9000	9562
December	11750	11500	16500	8450	8750	9000
January	11750	11725	15900	8500	8850	8750
February	11750	12500	13875	8187	8750	8250
March	11750	12500	4500	6562	8625	8250
Mean	11745	11839	10893	8543	8823	9707

Table 11. Contd.... (Price Rs./quintal)

Month	Cumin (Chennai)		Fennel (Chennai)		Fenugreek (Chennai)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
April	16950	-	11400	-	6337	-
May	18090	-	11450	-	6670	-
June	18250	-	11487	-	6550	-
July	18087	14750	9950	9250	6550	6250
August	17720	14750	9550	9187	6430	7300
September	16837	14650	9287	9250	6250	7575
October	16500	14600	9050	9500	6350	7650
November	16680	15000	9120	9437	6540	7887
December	17150	15000	9075	9210	6462	7270
January	17540	14875	9000	9162	6090	7050
February	15275	14500	8750	9062	5700	6925
March	14900	14850	8750	10750	5500	7425
Mean	16998	14775	9739	9423	6286	7259

Table 11. Contd....

(Price Rs./quintal)

Month	Tamarin (Chennai)		Ajwan (Chennai)		Mace-Rs/kg (Cochin)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
April	12250	13000	13500	-	600	1110
May	12150	-	13500	-	777	
June	11750	-	13500	-	717	750
July	11750	12500	13250	12000	937	912
August	11850	12625	13250	13000	828	1020
September	12250	13000	13250	14250	700	1080
October	12187	14000	13250	13500	868	1000
November	12000	15250	13750	14375	909	1016
December	12000	13850	14000	13600	800	1323
January	12500	15500	14000	13000	1128	1177
February	12950	14750	12000	13000	1300	1183
March	13100	14250	12500	14500	1300	1476
Mean	12228	13873	13313	13469	905	1095

Table 11. Contd....

(Price Rs./quintal)

Month	Clove (Cochin)		Nutmeg without shell (Cochin)		Arecanut-Dry (Kozhikode)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
April	62000	56750	41000	39875	21500	NT
May	69538	56947	39673	-	21475	23250
June	68587	56208	33591	33060	21350	26000
July	66519	55083	39444	36680	20825	27250
August	61660	54525	39200	40041	21125	NT
September	61026	55571	37000	41667	21750	30000
October	59250	54000	35272	41386	22750	31000
November	57630	51956	37195	46360	20800	29333
December	55977	51913	36704	51000	21500	26500
January	55220	51442	41520	51673	24000	30000
February	55586	52636	41000	55104	25125	31500
March	26500	55660	41000	56120	25000	31750
Mean	58291	54391	38550	44815	22267	28658

4. PUBLICITY

An important aspect of the scientific process is the broadcasting of new results and innovations through publication of Journals so that the information is disseminated to the larger community.

Transfer of technology plays a vital role as a catalyst for further development which is one of the main mandate of the Directorate. With a view of achieving our target to make the agricultue production system in the country more robust through effective publicity, the Directorate brought out several publications on mandatory crops in English, Hindi and Malayalam and have also participated in various exhibitions during the year.

1. Publications

Indian Journal of Arecanut, Spices and Medicinal Plants

The Directorate publishes a quarterly journal the "Indian Journal of Arecanut, Spices and Medicinal Plants", which has wide circulation among farmers, extension workers, scientists, exporters, industrialists and other stakeholders etc. The journal contains popular articles by eminent scientists on scientific cultivation, processing and marketing aspects of Arecanut, spices and medicinal and aromatic plants, thereby providing information on latest technology in the field of Agriculture. Quarterly market reviews, price statistics, area and production statistics, forecast on farm operations etc. are also featured regularly in the journal. Annual subscription for this Journal is Rs.200/-.

Fig. 1. Cover pages of published journals

The Editorial Board Meeting for selection of articles for the printing of the Journal was held as per the details given below.

Vol. 22 No.2 issue	-	10.7.2021
Vol 22 No.3 & 4 issues	-	24.9.2021
Vol. 23 No.1 issue	-	25.2.2021

2. Participation in Exhibitions

Participation in exhibitions and fairs is an important programme of the Directorate for promotion of cultivation of various Spices and dissemination of advanced technologies in crop production all over the country. Usually the Directorate will put up stalls exhibiting banners and display boards depicting various activities of the Directorate and descriptions about various Spices. During such exhibitions live Spices, Dry Spices, Oleoresins, Leaflets, Journals and other publications are also displayed especially for the farming community. Due to the Covid-19 conditions during 2020-21, the Directorate did not participate in any National/State level exhibitions.

5. OFFICIAL LANGUAGE

राजभाषा कार्यान्वयन

भारत सरकार की राजभाषा नीति को प्रभावपूर्ण ढंग से कार्यान्वयन करने में सुपारी और मसाला विकास निदेशालय सदा सक्रिय है। निदेशालय के 80 प्रतिशत से अधिक कर्मचारी हिंदी में कार्यसाधक ज्ञान प्राप्त कर लिए है। इसके अनुसार निदेशालय राजभाषा नियम 10 के उप नियम (4) के अंतर्गत भारत सरकार के राजपत्र में अधिसूचित किया गया है।

राजभाषा कार्यान्वयन समिति

राजभाषा से संबंधित नियमों का अनुपालन सुनिश्चित करने एवं अनुभागों में कार्यान्वयन का अवलोकन करने के उद्देश्य से निदेशालय में राजभाषा कार्यान्वयन समिति गठित की गई है। हर अनुभाग के अध्यक्ष इसमें सदस्य है।

डॉ. होमी चेरियान	निदेशक	अध्यक्ष
डॉ. फेमिना	उप निदेशक	सदस्य
श्री. बाबुलाल मीणा	उप निदेशक	हिंदी संपर्क अधिकारी
श्री. सी. सनमुख सुंदरम	अधीक्षक	सदस्य
श्रीमती. सी. वी. दिव्या	वरिष्ठ तकनीकी सहायक	सदस्य
श्री. के. मनोजकुमार	सॉख्यकीय अन्वेषक	सदस्य
श्री. के.वी. राजेश	अवर श्रेणी लिपिक	सदस्य
डॉ. पी.एन. ज्योति	कनिष्ठ अनुवादक	सदस्य-सचिव

निदेशालय में राजभाषा के प्रगामी प्रयोग को बढ़ाने के लिए इस समिति की बैठकें हर तिमाही में आयोजित की जाती है। हिंदी के प्रयोग को बढ़ावा देने के लिए प्रत्येक अनुभाग के सदस्यों को वार्षिक कार्यक्रम में निर्धारित लक्ष्य पाने का सुझाव दिया जाता है। बैठक का कार्यवृत्त मंत्रालय के हिंदी अनुभाग, बागवानी प्रभाग, राजभाषा विभाग के क्षेत्रीय कार्यान्वयन कार्यालय और नगर राजभाषा कार्यान्वयन समिति को नियमित रूप से भेज दिया जाता है।

राजभाषा नियम 1976 के धारा 3(3) का अनुपालन

निदेशालय में राजभाषा नियम 1976 के धारा 3(3) का शत प्रतिशत अनुपालन किया जाता है। कार्यालय आदेश, परिपत्र, कार्यालय ज्ञापन आदि शत प्रतशत द्विभाषी रूप में जारी किए जाते है। कार्यालय में पूर्णतः हिंदी-अंग्रजी द्विभाषी मोहरों का प्रयोग

किया जाता है। अधिकारियों और अनुभागों के नाम पट्ट, सूचना बोर्ड, कार्यालय वाहन, बैनर आदि दविभाषी रूप में है। रजिस्टरों और सेवा पंजियों में प्रविष्ठियों हिंदी में की जाती है। निदेशालय का नाम बोर्ड मलयालम-हिंदी-अंग्रेजी त्रिभाषी रूप में है।

आज का शब्द

कर्मचारियों के बीच हिंदी में प्रयुक्त शब्द एवं वाक्यांशों के प्रयोग सिखाने के उद्देश्य से व्हाइट बोर्ड पर हर दिन अंग्रेजी के समानार्थक एक हिंदी शब्द / वाक्यांश लिखा जाता है। हिंदी पखवाड़ा के दौरान इन शब्दों एवं वाक्यांशों के आधार पर प्रतियोगिता चलाकर विजेताओं को पुरस्कार दिया जाता है।

हिंदी दिवस/पखवाड़ा

कार्यालय में हिंदी के प्रयोग के लिए अनुकूल वातावरण बनाने के उद्देश्य से निदेशालय में 14-28 सितंबर, 2020 के दैरान हिंदी दिवस/पखवाड़ा आयोजित किया गया। डॉ होमी चेरियान, निदेशक ने दीप जलाकर पखवाड़ा का उद्घाटन किया। उन्होने सभी स्टाफ सदस्यों को राजभाषा नियमों और समय-समय पर जारी निर्देशों का अनुपालन सुनिश्चित करने का अनुरोध किया। डॉ फेमिना, उप निदेशक ने स्वागत भाषण दिया और पत्राचार में हिंदी या द्विभाषी रूप में पत्र भेजने का अनुरोध किया। श्री. बाबुलाल मीणा, उप निदेशक ने हर अनुभाग में हिंदी के प्रयोग बढाने का अनुरोध किया। डॉ पी.एन. ज्योति, कनिष्ठ अनुवादक ने हिंदी से संबंधित संवैधानिक प्रावधानों और नियमों का विवरण दिया और कार्यालय में सरल हिंदी के प्रयोग करके पत्राचार एवं टिप्पण को बढाने का अनुरोध किया। कर्मचारियों के राजभाषा संबंधी ज्ञान बढाने एवं अपने दायित्व के बारे में जागरूक बनाने के उद्देश्य से राजभाषा अधिनियम, आठवीं अनुसूचि में सम्मिलित भाषाएँ, जॉच-बिंदुएँ, नेमी कार्यालय टिप्पणियॉ आदि का संकलन द्विभाषी रूप में तैयार करके वितरण किया गया।

हिंदी दिवस के अवसर पर कर्मचारियों को हिंदी के प्रयोग में उपयोगी विभिन्न प्रकाशनों का परिचय देने के लिए संदर्भ ग्रंथों, हिंदी में तैयार किए गए पोस्टरों और अन्य प्रदर्शन सामग्रियों, निदेशालय द्वारा प्रकाशित हिंदी पत्रकें, कार्यालय में उपलब्ध हिंदी पत्रिकाएँ, पुस्तकें, समाचार पत्र आदि शामिल करते हुए राजभाषा प्रदर्शनी तैयार किया गया। आठवीं अनुसूची में सम्मिलित 22 भाषाओं को भारत की पृष्ठभूमि में सजाकर रंगीन पोस्टर और मसाले फसलों एवं पौधों से संबंधित नई सूचना सामग्रियों भी प्रदर्शनी में शामिल की गई।

कर्मचारियों को हिंदी के प्रयोग केलिए प्रेरणा एवं प्रोत्साहन देने के उद्देश्य से पखवाड़े के दौरान हिंदी में विभिन्न प्रतियोगितायें आयोजित की गई। निबंध लेखन, टिप्पण, टंकण, तकनीकी शब्दावली हस्तलिपि, अंताक्षरी आदि प्रतियोगिताएँ चलाई गई। राजभाषा से संबंधित प्रश्नों को शामिल .करते हुए हिंदी में प्रश्नोत्तरी कार्यक्रम चलाया गया।

हिंदी पखवाड़ा का समापन समारोह डॉ. होमी चेरियान, निदेशक की अध्यक्षता में संपन्न हुआ। उन्होंने अपने भाषण में हर अनुभाग में अधिकाधिक पत्राचार हिंदी में करके निर्धारित लक्ष्य प्राप्त करने का अनुरोध किया। इस अवसर पर उन्होंने हिंदी प्रतियोगिताओं के विजेताओं को पुरस्कार वितरण किया।

हिंदी पखवाड़ा उदघाटन समारोह की झलकियां

हिंदी पखवाड़ा समापन समारोह की झलकियां







हिंदी कार्यशाला

कर्मचारियों को हिंदी के प्रयोग में प्रशिक्षण देने के उद्देश्य से 17.09.2020 को एक-विदसीय हिंदी कार्यशाला आयोगित किया गया। इसमें कर्माचारी भविष्य निधि कार्यालय के वरिष्ठ अनुवाद अधिकारी श्री. एम. अरविदाक्षन ने राज्यभाषा नीति, नियमों और अधिनियमों के विषय पर आनलाईन क्लास चलाया।

नगर राजभाषा कार्यान्वयन समिति की सदस्यता

कालिकट नगर राजभाषा कार्यान्वयन समिति के तत्वावधान में आयोजित प्रत्येक कार्यक्रम में निदेशालय सक्रिय रूप से भाग ले रहा है। इसकी हर अर्धवार्षिक बैठकों में निदेशक और हिंदी अनुवादक नियमित रूप से भाग ले रहे है। नराकास दवारा कंठस्थ के विषय पर आयोजित आँनलाइन वेबिनार में निदेशक उप निदेशक और हिंदी अनुवादक ने भाग लिया।

हिंदी प्रकाशन

निदेशालय दवारा प्रकाशित इंडियन जर्नल ऑफ अरीकनट, स्पाईसेस एण्ड मेडिसिनल प्लान्टस नामक त्रैमासिक पत्रिका में विभिन्न मसाला फसलों पर आधारित वैज्ञानिक लेख़, कृषि कियाएँ. मसालों के बाजार मूल्य की समीक्षा आदि नियमित रूप से हिंदी में प्रकाशित किए जाते है।

प्रोत्साहन योजना

कार्यालयीन काम मूल रूप से हिंदी में करने केलिए कर्मचारियों को प्रेरणा देने केलिए राजभाषा विभाग द्वारा लागू किये गये नकद पुरस्कार योजना और हिंदी में टंकण करने केलिए प्रोत्साहन भत्ता योजना का कार्यान्वयन निदेशालय में किया गया है। दोनों योजनाओं में कर्मचारियाँ सक्रिय रूप से भाग ले रहे हैं।

पुस्तकों की खरीद

कार्यालय में संदर्भ के लिए हिंदी में विभिन्न विषयों पर पुसतकें खरीदी जाती है। इसके अलावा निदेशालय में हिंदी दैनिक समाचार पत्र नवभारत टाइम्स तथा हिंदी पत्रिकाएँ जैसे कृषि समीक्षा, उन्नत कृषि, नारियल पत्रिका, कैरली, रोशनी, मसालों का महक, मसाला समाचार आदि भी उपलब्ध है।

☆☆☆

सत्यमेव जयते

सुपारी और मसाला विकास निदेशालय
कृषि और किसान कल्याण मंत्रालय
कृषि एवं किसान कल्याण विभाग
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