2018-19 वार्षिक रिपोर्ट ANNUAL REPORT

सत्यमेव जयते

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

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

वार्षिक रिपोर्ट
ANNUAL REPORT
2018-19

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DIRECTORATE OF ARECANUT AND SPICES DEVELOPMENT

Ministry of Agriculture and Farmers Welfare

(Department of Agriculture, Cooperation and Farmers Welfare)

Government of India

Calicut, Kerala 673 005

DASD Annual Report 2018-19

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

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PREFACE

The Directorate of Arecanut and Spices Development, a subordinate office under Department of Agriculture, Cooperation 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 9.2 million tonnes from 3.9 million ha in2018-19. Foreign exchange earnings through Spices export have also increased tremendously during this period from 592.9 million US $ in 2005-06 to 2710.44 million US $ in 2018-19. This gives me immense satisfaction in bringing out the Annual Report of the Directorate for the year 2018-19.

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. B.N.S. Murthy, 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

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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.

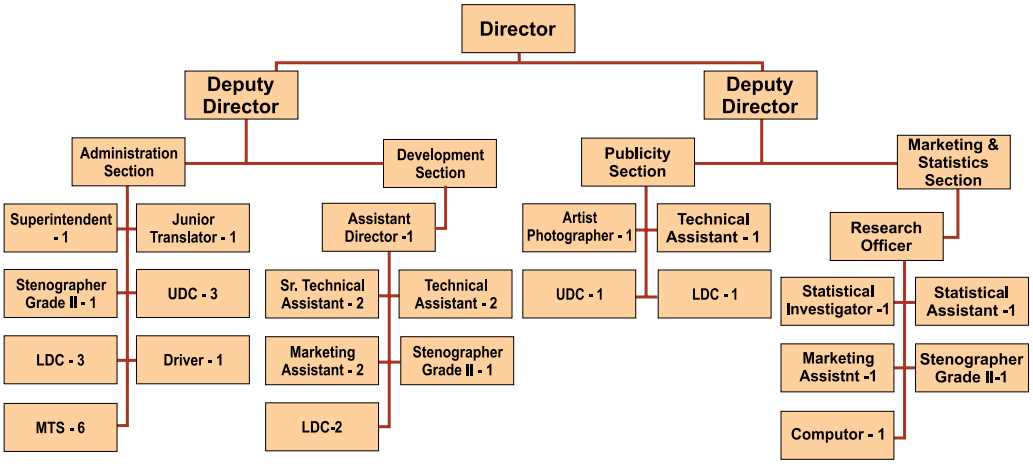


Fig. 2. Organizational Structure

3. Staff

a. Staff strength as on 31-03-2019

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	01
3.	Assistant Director	A	01	01
4.	Research Officer	A	01	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	03
17.	Staff Car Driver (OG)	C	01	01
18.	Multi Tasking Staff	C	06	06
	TOTAL		**39**	**31**

b. Staff in position as on 31-03-2019

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

4. Plan and non-plan budget

(a) Non-plan budget for 2018-19

Particulars of sub-head and name of the scheme etc. 1/2401	Sanctioned budget (Rs. in lakhs)	Expenditure (Rs. in lakhs)
040001- Salaries	252.00	233.58
040002- Wages	1.06	1.11
040006 - Medical treatment	2.16	0.71
040011- Domestic Travel Expenses	20.00	16.79
040013- Office Expenses	22.20	20.27
040016- Publications	5.22	3.87
040026- Advertising & Publicity	1.15	0.70
040027- Minor Works	14.20	14.20
Total	**317.99**	**291.25**

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	1300	1276

5. Right To Information (RTI) in DASD

During the year 2018-19, 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
11	11	NIL	NIL

6. Vigilance Awareness Week

In accordance with the instructions received from the Ministry, Vigilance Awareness Week 2018 was observed in the Directorate during the period from 29th October to 2nd November, 2018. Posters and Banners were prepared and displayed in prominent places of the Directorate. On 29th October, 2018 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 29th October, 2018.

On 1st November, 2018 at 15.00 hrs, a workshop on Vigilance Awareness was organized in this Directorate. Shri. Suresh Kumar, Deputy Superintendent of Police, Vigilance, Anti Corruption Bureau (Special Cell), Kozhikode gave lecture on vigilance awareness and officers and staff attended the workshop.

Fig. 3. Banner displaying Vigilance Awareness Week

Fig. 4. Integrity pledge by the staff

Fig. 5. Shri Suresh Kumar, Deputy Superintendent of Police, Vigilance, Anti-Corruption Bureau (Special Cell), Kozhikode taking class

Fig. 6. Vigilance Awareness Rally

7. Swachhta Hi Sewa Campaign

"Swachhta Hi Sewa Campaign" was held in the Directorate from 15th September to 2nd October, 2018 with various programmes. Banners on Swachhta Hi Sewa Campaign was prepared and exhibited in prominent places of the Directorate. Cleaning activity were undertaken in and around the office premises during the above period. In addition to the above the Directorate participated in a Rally with Regional Science Centre and Planetarium, Kozhikode and Nehru Yuva Kendra, Kozhikode on 26th September, 2018. All State/Central Government employees, students, NSS volunteers, public etc. actively participated in the rally. As part of Shramadan, the officers and staff cleaned the office premises and inside the office. Director, Deputy Director and Research Officer planted seedlings of spices and medicinal plants and the Director insisted to ensure their growth.

Fig. 7 & 8. View of rally held on 20th September, 2018 at Calicut

Fig. 9 & 10. Cleaning of office premises by officers & staff of DASD

Fig. 11. Director planting a tree in the office garden

Fig. 12. Deputy Director planting a tree in the office garden

8. Sadbhavana Diwas

"Sadbhavana Diwas" was observed on 20th August, 2018 on the birth anniversary of former Prime Minister Late Rajiv Gandhi. All staff were gathered and took Sadbhavana Diwas pledge on that day.

9. Rashtriya Ekta Diwas (National Unity Day)

Rashtriya Ekta Diwas (National Unity Day) was observed on 31st October, 2018 on the birth anniversary of Sardar Vallabhabhai Patel and all staff were gathered and took Rashtriya Ekta Diwas Pledge on 31st October, 2018.

10. International Yoga Day

4th International Yoga Day was celebrated on 21st June, 2018 in the Directorate. On the same day all officers and staff performed Yoga under the guidance of Yoga master from **"Friends of Yoga"** Calicut.

Fig. 13. Dr. Homey Cheriyan, Director addressing the gathering

Fig. 14. Officers and staff performing yoga

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 has 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 high 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 are 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. The objective of the Mission based approach was to give impetus to encourage growth in spices production so as to double the production by 2010. During 2014-15, the Ministry of Agriculture, 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.

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

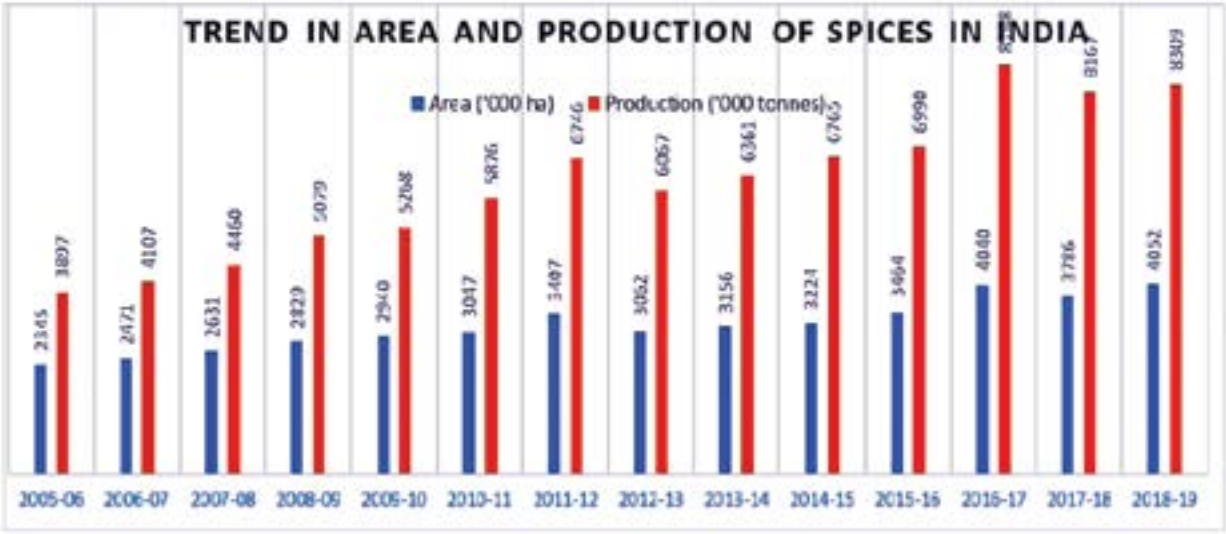
- Responsible for coordinating and monitoring the activities on development of Arecanut, spices and aromatic plants.
- Responsible for organizing National level training programmes, seminars and workshops on spices and medicinal & aromatic plants on regular intervals.
- Directorate supplements the developmental efforts of the State Govt. 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. 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.

The efforts made by the implementation of NHM programmes have reflected in the production statistics of spices. Area and production of spices in the country has increased to the tune of 4.5% and 6.4% per annum, respectively during the period from 2005-06 to 2018-19. Productivity of spices has also increased substantially during the period from 1634 kg/ha to 2051 kg/ha.



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.
- ✿ Quality regulation of the private and public sector nurseries is also thrust area of the Directorate, which is ensured through nursery accreditation programme.

- ✿ 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 taking place on account of import of certain spices and aromatic plants by increasing their production.

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 varieties available in the country which have high production potential and better export demand.
- ✿ Promoting the production of quality planting materials in large scale, adopting the latest technology including tissue culture techniques 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.

2. Development Programmes taken up by DASD under MIDH during 2018-19

The activities of the Directorate during the year 2018-19 were

- ✿ Coordinating and monitoring the activities on the development of arecanut, spices and aromatic plants in the country.
- ✿ Monitoring of NHM programmes in the mandate crops in various states in the country.
- ✿ Implementation of development programmes in the mandated crops through various state agricultural universities and central institutes to supplement the state's efforts in achieving the desired results in the production fronts as conceived in the National Horticulture Mission.

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 2018-19, the Directorate implemented the NHM programmes with an outlay of Rs.13.00 crores for the development of Spices and Aromatic Plants.

Table 1. Major programmes implemented and achievements made during 2018-19 are as follows:

S. No.	Programmes	Unit	Cost / unit (Rs in Lakhs)	Target		Achievement	
				Physical	Financial (Rs. in lakhs	Physical	Financial (Rs. in lakhs
I	**Production and distribution of quality planting materials**						
i.	**Production and distribution of nucleus planting materials of spices**						
1	Black Pepper / Betelvine	Nos in lakhs	8.00	25.425	203.40	24.00	202.324
2	Ginger rhizomes	Qty in tonnes	0.30	165.00	49.50	165.00	49.500
3	Turmeric rhizomes	Qty in tonnes	0.30	451.00	135.30	451.00	135.300
4	Chilli seeds	Qty in qtls	0.75	25.92	19.44	25.92	19.440
5	Seed spices	Qty in tonnes	0.40	149.00	59.60	149.00	59.600
6	Garlic	Qty in tonnes	0.50	70.30	35.15	70.30	35.150
7	Tree spices grafts /seedlings						
i.	Nutmeg grafts (Orthotropic)	Nos in lakhs	140.00	0.06	8.40	0.06	8.400
ii.	Nutmeg grafts (Plagiotropic)	Nos in lakhs	80.00	0.365	29.20	0.365	29.200
iii	Tamarind / Kokum grafts	Nos in lakhs	20.00	1.02	20.40	1.02	20.400
iv	Clove /Allspice seedlings	Nos in lakhs	20.00	0.335	6.70	0.335	6.700
v	Cinnamon/ Cassia/Curry leaf seedlings	Nos in lakhs	5.00	3.20	16.00	3.20	16.000
8	Aromatic Plants	Ha.	0.75	48.00	36.00	48.00	36.000
9	Nursery Centre for Aromatic Plants	Nos	15	4.00	60.00	4.00	60.000
10	Establishment of seed storage and infrastructure	Nos	10.00	6.00	60.00	6.00	60.000
11	Hi-Tech Production of Quality Planting Materials of Betelvine				10.00		10.000
	Sub Total				**749.090**		**748.014**
II	**Accreditation of spice nurseries**	LS		25		21.00	
III	**Nursery programmes**						
a.	Estt. of Nursery structures in Sikkim			5.00	25.00	5.00	12.500
b.	Upgradation/ Modernisation of nurseries				25.00	4.00	24.960
	Sub Total				**50.000**		**37.460**

IV	Technology Dissemination through Frontline Demonstration						
i.	Organic Farming Spices	Nos	0.6/1.0	91.00	85.800	91.000	85.800
ii.	Maintenance of demonstration plots of pepper established during 2016-17	Nos	0.250	13.00	3.250	13.000	3.250
iii.	Maintenance of demonstration plots of pepper established during 2017-18	Nos	0.20	10.00	2.000	10.000	2.000
iv.	Demonstration plots of seed spices	Nos	0.40	55.00	22.000	55.000	22.000
v	Demonstration plots of aromatic plants	Nos	0.80	23.00	18.400	23.000	18.400
vi.	On farm management by micro irrigation	Nos	LS	49.00	22.400	49.000	22.400
vii.	Multi species cropping in Arecanut Gardens in Karnataka	Nos	LS	4.00	6.650	4.000	6.650
viii	Multi species cropping in Arecanut Gardens in Assam	Nos	LS	2.00	1.000	2.00	1.000
ix	Demonstration of IDM technologies for management of bacterial wilt of ginger		LS	6.00	6.000	6.00	6.000
x	Demonstration of E P N in Arecanut	Nos	LS	1.00	6.440	1.000	6.440
xi	Technology dissemination through FLD for HDP of grafted Bush pepper under shade net structure			6.00	9.200	6.00	9.200
xii	Participatory Demonstration Plots of Cinnamon intercropping in Coconut			4.00	7.065	4.00	7.065
	Sub total				**190.205**		**190.205**

V	**Project based programmes**						
a.	Hi-tech production system for quality disease free seed rhizomes of Turmeric and Ginger		LS		9.000		9.000
b.	Pilot project on participatory mode rehabilitation of Black Pepper garden in Cherutazham Panchayat	LS	LS		5.480		5.480
c.	Participatory mode rehabilitation of black pepper gardens in Kuttiyatoor Panchayath	Nos	LS		7.490		7.490
d.	Varietal Authenticity and Purity Identification in Black pepper	Nos	LS		5.900		5.900
	Sub Total				**27.870**		**27.870**
VI	**Transfer of Technology programmes**						
a.	National Level Seminar	Nos	1.00	1.00	5.000	1.000	5.000
b.	State Level Seminar/Workshop	Nos	3.00	5.00	15.000	5.000	15.000
c.	District Level Seminar/ Workshops	Nos	2.00	17.00	34.000	17.000	34.000
d.	Farmers Training programme	Nos	0.75	129.00	96.750	129.000	96.749
	Sub Total				**150.750**		**150.749**
VII	**Skill Development Schemes**	Nos in lakhs	LS	15	**61.575**	15.000	**61.575**
VIII	**T S G** (Monitoring, Evaluation, Mass Media, Publicity etc.)			LS	8.000		4.262
IX	**Mission Management**			LS	62.51		55.6100
	GRAND TOTAL				**1300.00**		**1275.745**

2.1 Production of Quality Planting Materials of Spices

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 2018-19 also with a financial outlay of Rs. 619.09 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

Availability of good quality planting material is one of the major constraints in improving the production of black pepper in pepper growing areas. 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 24.00 lakhs of planting materials were produced and distributed with a financial utilization of Rs.202.324 lakhs. Rate of assistance given for production of quality nucleus planting materials of pepper was Rs. 8/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 tabulated below.

Table 2. Planting material production of black pepper 2018-19 (University-wise).

S. No.	Institute	Quantity produced and distributed (Nos. in lakhs)	Financial utilization (Rs. in lakhs)
1.	Assam Agricultural University	0.300	2.400
2.	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1.000	8.000
3.	Central Island Agricultural Research Institute, Portblair	0.400	3.200
4.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2.000	16.000
5.	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	0.500	4.000
6.	Dr. Y S R Horticultural University, Andhra Pradesh	1.000	8.000
7.	ICAR Research Complex, Goa	0.150	1.200
8.	ICAR - Indian Institute of Spices Research, Kozhikode	1.000	8.000
9.	Kerala Agricultural University	10.000	80.000
10.	Navsari Agricultural University	0.025	0.200

11.	Orissa University of Agriculture and Technology	0.500	4.000
12.	Tamil Nadu Agricultural University	3.000	24.000
13.	University of Agriculture and Horticulture Sciences, Shimoga	2.650	21.200
14.	University of Agricultural Sciences, Bengaluru	0.500	4.000
15.	University of Agricultural Sciences, Dharwad	0.300	2.400
16.	University of Horticultural Sciences, Bagalkot	1.000	8.000
17.	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	0.600	4.800
18.	DASD, Calicut	0.500	4.000
	Total	**24.00**	**202.324**

2.1.2. Ginger

The Directorate produced and distributed 165 tonnes 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.49.50 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 2018-19 (University-wise)

S. No.	Institute	Quantity produced and distributed (in tonnes)	Financial utilization (Rs. in lakhs)
1	Assam Agricultural University	15.000	4.500
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	5.000	1.500
3	Central Island Agricultural Research Institute, Portblair	5.000	1.500
4	College of Horticulture and Forestry, CAU, Pasighat	5.000	1.500
5	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	5.000	1.500
6	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	10.000	3.000
7	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	2.000	0.600
8	Dr. Y S R Horticultural University, Andhra Pradesh	2.000	0.600
9	Indira Gandhi Krishi Vishwavidyalaya, Raipur	15.000	4.500
10	ICAR - Indian Institute of Spices Research, Kozhikode	4.000	1.200
11	Kerala Agricultural University	12.000	3.600
12	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	2.000	0.600
13	Mahatma Phule Krishi Vidyapeeth, Rahuri	10.000	3.000
14	Orissa University of Agriculture and Technology	7.000	2.100
15	Sri Konda Laxman Telangana State Horticultural University	10.000	3.000
16	Tamil Nadu Agricultural University	2.000	0.600
17	University of Agriculture and Horticulture Sciences, Shimoga	34.000	10.200
18	University of Agricultural Sciences, Bengaluru	2.000	0.600
19	University of Agricultural Sciences, Dharwad	2.000	0.600
20	University of Horticultural Sciences, Bagalkot	6.000	1.800
21	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	10.000	3.000
	Total	**165.000**	**49.500**

2.1.3. 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 of turmeric seed rhizomes produced. By the implementation of the programme, 451 tonnes of turmeric seed rhizomes were produced and distributed and Rs.135.30 lakhs has been utilized for the same. The Institute-wise production details of turmeric seed rhizomes are given below.

Table 4. Planting material production of turmeric 2018-19 (University-wise)

S. No.	Institute	Quantity produced and distributed (in tonnes)	Financial utilization (Rs. in lakhs)
1.	Anand Agricultural University, Gujarat	5.000	1.500
2.	Assam Agricultural University, Assam	10.000	3.000
3.	Banda Agricultural University, UP	10.000	3.000
4.	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	35.000	10.500
5.	Birsa Agricultural University, Ranchi	10.000	3.000
6.	Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana	3.000	0.900
7.	Central Island Agricultural Research Institute, Portblair	2.000	0.600
8.	College of Horticulture and Forestry, CAU, Pasighat	10.000	3.000
9.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	9.000	2.700
10.	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	40.000	12.000
11.	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	2.000	0.600
12.	Dr. Y S R Horticultural University, Andhra Pradesh	28.000	8.400
13.	ICAR Research Complex, Goa	4.000	1.200
14.	Indira Gandhi Krishi Vishwavidyalaya, Raipur	20.000	6.000
15.	ICAR - Indian Institute of Spices Research, Kozhikode	6.000	1.800
16.	Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur	5.000	1.500
17.	Kerala Agricultural University	12.000	3.600
18.	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	7.000	2.100
19.	Mahatma Phule Krishi Vidyapeeth, Rahuri	5.000	1.500
20.	Narendra Dev University of Agriculture and Technology, Faizabad	3.000	0.900
21.	Navsari Agricultural University	20.000	6.000
22.	Orissa University of Agriculture and Technology	10.000	3.000
23.	Punjab Agricultural University	20.000	6.000
24.	Rajendra Agricultural University	50.000	15.000
25.	Sri Konda Laxman Telangana State Horticultural University	15.000	4.500
26	Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut	1.000	0.300
27	Tamil Nadu Agricultural University	35.000	10.500
28	University of Agriculture and Horticulture Sciences, Shimoga	30.000	9.000

29	University of Agricultural Sciences, Bengaluru	4.000	1.200
30	University of Agricultural Sciences, Dharwad	5.000	1.500
31	University of Horticultural Sciences, Bagalkot	15.000	4.500
32	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	20.000	6.000
	Total	**451.000**	**135.300**

2.1.4. 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 2018-19, a quantity of 25.92 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. 19.440 lakhs was incurred for this purpose during the year.

Table 5. The planting material production of chilli seeds during 2018-19

S. No.	Institute	Quantity produced and distributed (in quintals)	Financial utilization (Rs. In lakhs)
1	Anand Agricultural University , Gujarat	2.000	1.500
2	Birsa Agricultural University, Ranchi	0.500	0.375
3	C S Azad University of Agriculture & Technology, Kanpur	0.020	0.015
4	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	1.000	0.750
5	Dr. Y S R Horticultural University, Andhra Pradesh	2.000	1.500
6	Kerala Agricultural University	1.200	0.900
7	Sardarkrushinagar Dantiwada Agricultural University, Jagudan	1.000	0.750
8	Sri Konda Laxman Telangana State Horticultural University	4.000	3.000
9	Sher-e-Kashmir University of Agricultural Sciences and Technology, J&K	1.000	0.750
10	Tamil Nadu Agricultural University	1.000	0.750
11	University of Agricultural Sciences, Bengaluru	2.000	1.500
12	University of Agricultural Sciences, Dharwad	5.000	3.750
13	University of Horticultural Sciences, Bagalkot	5.200	3.900
	Total	**25.920**	**19.440**

2.1.5. 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 149.00 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. 59.60 lakhs was incurred for this programme.

Table 6. University-wise details of seed spices seed production programme 2018-19

S. No.	Institute	Quantity produced and distributed (in tonnes)	Financial utilization (Rs. In lakhs)
1	Agriculture University, Jodhpur	15.000	6.000
2	Agriculture University, Kota	15.000	6.000
3	Anand Agricultural University	4.500	1.800
4	Banda Agricultural University, UP	3.000	1.200
5	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	2.000	0.800
6	Birsa Agricultural University, Ranchi	1.000	0.400
7	Chaudhary Charan Singh Haryana Agricultural University, Hisar	6.000	2.400
8	C S Azad University of Agriculture & Technology , Kanpur	1.500	0.600
9	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	5.000	2.000
10	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	0.500	0.200
11	Dr. Y S R Horticultural University, Andhra Pradesh	4.000	1.600
12	Indira Gandhi Krishi Vishwavidyalaya, Raipur	10.000	4.000
13	Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur	1.000	0.400
14	Junagadh Agri University	1.000	0.400
15	Maharana Pratap University of Agriculture and Technology, Udaipur	5.000	2.000
16	ICAR - NRC on Seed Spices, Ajmer	30.000	12.000
17	Punjab Agricultural University	1.000	0.400
18	Rajendra Agricultural University	1.500	0.600
19	Sardarkrushinagar Dantiwada Agricultural University, Jagudan	10.000	4.000
20	Sri Konda Laxman Telangana State Horticultural University	10.000	4.000
21	Sher-e-Kashmir University of Agricultural Sciences and Technology, J&K	2.000	0.800
22	Sri Karan Narendra Agriculture University, Jobner	10.000	4.000
23	Tamil Nadu Agricultural University	4.000	1.600
24	University of Agricultural Sciences, Dharwad	2.000	0.800
25	University of Horticultural Sciences, Bagalkot	4.000	1.600
	Total	**149.000**	**59.600**

2.1.6. 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 2018-19 so as to make available enough materials for further multiplication and distribution among the farmers.

Table 7. Nucleus seed production programme of Garlic 2018-19.

S. No.	Institute	Quantity produced and distributed (in tonnes)	Financial utilization (Rs. in lakhs)
1	Agriculture University, Kota	10.000	5.000
2	Chaudhary Charan Singh Haryana Agricultural University, Hisar	15.000	7.500
3	C S Azad University of Agriculture & Technology, Kanpur	0.300	0.150
4	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	10.000	5.000
5	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	2.000	1.000
6	Junagadh Agri University	2.000	1.000
7	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	3.000	1.500
8	Mahatma Phule Krishi Vidyapeeth, Rahuri	5.000	2.500
9	Navsari Agricultural University	2.000	1.000
10	Sri Konda Laxman Telangana State Horticultural University	4.000	2.000
11	Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut	1.000	0.500
12	Sher-e-Kashmir University of Agricultural Sciences and Technology, J&K	1.000	0.500
13	Tamil Nadu Agricultural University	8.000	4.000
14	University of Agricultural Sciences, Dharwad	2.000	1.000
15	University of Horticultural Sciences, Bagalkot	5.000	2.500
	Total	**70.300**	**35.150**

2.1.7. 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 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. 4.98 lakh grafts/ seedlings of various tree spices were produced and distributed with a financial utilization of Rs.80.70 lakhs.

Table 8. Details of tree spices planting material production programme

Programmes	Rate of assistance/ unit (Rs. in Lakhs)	Physical (nos. in lakhs)	Financial (Rs. in lakhs)
a. Nutmeg grafts Orthotropic	140.0	0.06	8.40
Plagiotropic	80.00	0.365	29.20
b. Tamarind / Kokum grafts	20.00	1.02	20.40
c. Clove /Allspice seedlings	20.00	0.335	6.70
d. Cinnamon / Cassia / Curry leaf seedlings	5.00	3.20	16.00
Total		**4.980**	**80.70**

Table 9. Institute-wise details of planting material production of tree spices

a) Nutmeg

S. No.	Institute	Produced and distributed (in lakh nos.)	Financial utilization (Rs. in lakhs)
	Nutmeg (Plagiotropic)		
1.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	0.300	24.000
2.	ICAR - Indian Institute of Spices Research, Kozhikode	0.020	1.600
3.	Tamil Nadu Agricultural University	0.010	0.800
4.	University of Agricultural Sciences, Bengaluru	0.020	1.600
5.	University of Horticultural Sciences, Bagalkot	0.015	1.200
	Total	**0.365**	**29.200**
	Nutmeg (Orthotrophic)		
1.	Kerala Agricultural University	0.060	8.400
	Total	**0.060**	**8.400**

b) Tamarind/Kokum grafts

S. No.	Institute	Quantity produced and distributed (in lakh nos.)	Financial utilization (Rs. in lakhs)
1.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	0.400	8.000
2.	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	0.150	3.000
3.	Dr. Y S R Horticultural University, Andhra Pradesh	0.050	1.000
4.	Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur	0.010	0.200
5.	Kerala Agricultural University	0.100	2.000
6.	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	0.100	2.000
7.	Tamil Nadu Agricultural University	0.050	1.000
8.	University of Agriculture and Horticulture Sciences, Shimoga	0.020	0.400
9.	University of Agricultural Sciences, Bengaluru	0.050	1.000
10.	University of Agricultural Sciences, Dharwad	0.040	0.800
11.	University of Horticultural Sciences, Bagalkot	0.050	1.000
	Total	**1.020**	**20.400**

c) Clove/Allspice Seedlings

S. No.	Institute	Quantity produced and distributed (in lakh nos.)	Financial utilization (Rs. in lakhs)
1.	Central Island Agricultural Research Institute, Portblair	0.030	0.600
2.	Kerala Agricultural University	0.200	4.000
3.	University of Agricultural Sciences, Bengaluru	0.050	1.000
4.	University of Horticultural Sciences, Bagalkot	0.055	1.100
	Total	**0.335**	**6.700**

d) Cinnamon/Cassia/Curry leaf

S. No.	Institute	Quantity produced and distributed (in lakh nos.)	Financial utilization (Rs. in lakhs)
1	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	0.480	2.400
2	Central Island Agricultural Research Institute, Portblair	0.060	0.300
3	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	0.300	1.500
4	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	0.200	1.000
5	Kerala Agricultural University	0.600	3.000
6	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	0.050	0.250
7	Orissa University of Agriculture and Technology	0.040	0.200
8	Tamil Nadu Agricultural University	0.050	0.250
9	University of Agricultural Sciences, Bengaluru	1.000	5.000
10	University of Agricultural Sciences, Dharwad	0.200	1.000
11	University of Horticultural Sciences, Bagalkot	0.120	0.600
12	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	0.100	0.500
	Total	**3.200**	**16.000**

2.1.8. 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 16 Universities/ICAR Institutes spread across the country during the year 2018-19. Assistance was granted @ Rs.75,000/- per ha. A total of 48 hectares were covered under the programme with a financial outlay of Rs. 36.00 lakhs.

Table 10. Institute-wise details of planting material production programme in Aromatic plants

S. No.	Institute	Area in ha	Financial utilization (Rs. in lakhs)
1	Banda Agricultural University, UP	1.000	0.750
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1.000	0.750
3	Chaudhary Charan Singh Haryana Agricultural University, Hisar	3.000	2.250

4	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	4.000	3.000
5	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	5.000	3.750
6	Indira Gandhi Krishi Vishwavidyalaya, Raipur	5.000	3.750
7	Kerala Agricultural University	4.000	3.000
8	Mahatma Phule Krishi Vidyapeeth, Rahuri	5.000	3.750
9	Orissa University of Agriculture and Technology	2.000	1.500
10	Punjab Agricultural University	1.000	0.750
11	Sri Konda Laxman Telangana State Horticultural University	2.000	1.500
12	Tamil Nadu Agricultural University	5.000	3.750
13	University of Agriculture and Horticulture Sciences, Shimoga	2.000	1.500
14	University of Agricultural Sciences, Bengaluru	5.000	3.750
15	University of Agricultural Sciences, Dharwad	1.000	0.750
16	University of Horticultural Sciences, Bagalkot	2.000	1.500
	Total	**48.000**	**36.000**

Fig. 1. Betel vine baroj for QPM at UBKV, West Bengal

Fig. 2. Mother block of black pepper at BSKKVP, Dapoli

Fig. 3. Quality pepper planting material multiplied by IISR, Calicut

Fig. 4. Quality planting material of Black Pepper at KVK, Sirsi

Fig. 5. Quality planting material production of Black pepper at KAU, Thrissur

Fig. 6. Pepper rooted cuttings raised at RCRS, Bhatye

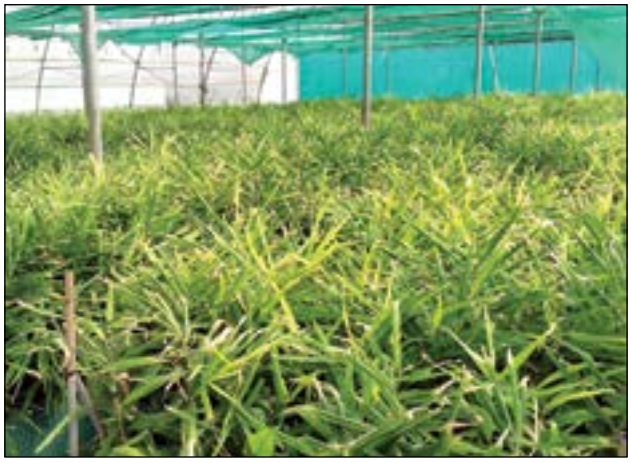


Fig. 7. Mahima variety of Ginger Seed production at UASD, Karnataka

Fig. 8. Quality Ginger seed multiplication at UAHS, Shimogga

Fig. 9. Quality Ginger seed production plot at BCKV, West Bengal

Fig. 10. Quality rhizomes of Ginger multiplied at YSPHU, Solan

Fig. 11. Quality seeds of Ginger produced at KAU, Kerala

Fig. 12. Distribution of quality Turmeric seeds produced at PDKV, Akola

Fig. 13. Pratibha Turmeric seed Production at UASD, Karnataka

Fig. 14. QPM of turmeric at CES Wakavali, BSKKVP

Fig. 15. Quality turmeric seed production at CAU, Pasighat

Fig. 16. Turmeric seed Multiplication at OUAT, Orissa

Fig. 17. Turmeric seed production plot at ZAHRS, Karnataka

Fig. 18. Turmeric seedlings are raised in SKLTSHU, Telangana

Fig. 19. Chilli seed produced at UASB, Karnataka

Fig. 20. Director, DASD visiting chilli seed production at UASB, Karnataka

Fig. 21.Chilli seed production plot affected by excess rainfall at UHSB, Karnataka

Fig. 22. Quality seed production plot of Chilli at SKUAST, J&K

Fig. 23. Quality seeds of Chilli produced at SKUAST, J&K

Fig. 24. Seed production plot for Chilli at UASD, Karnataka

Fig. 25. Quality bulbs of Garlic raised at YSPHU, Solan

Fig. 26. QPM plot for Garlic at YSPHU, Solan

Fig. 27. Celery transplanting at Punjab Agriculture University, Ludhiana

Fig. 28. Coriander Seed multiplication at RAU, Bihar

Fig. 29. Coriander seed multiplication plot at YSPHU, HP

Fig. 30. Cr-3 variety of coriander seed multiplied at SDAU, Gujarat

Fig. 31. Cumin seed production at Farmers field by NRCSS, Ajmer

Fig. 32. Fenugreek ML 150 variety field at PAU, Ludhiana

Fig. 33. Field view of Fennel seed production plot at SDAU, Gujarat

Fig. 34. QPM production of Fenugreek at HAU, Hisar

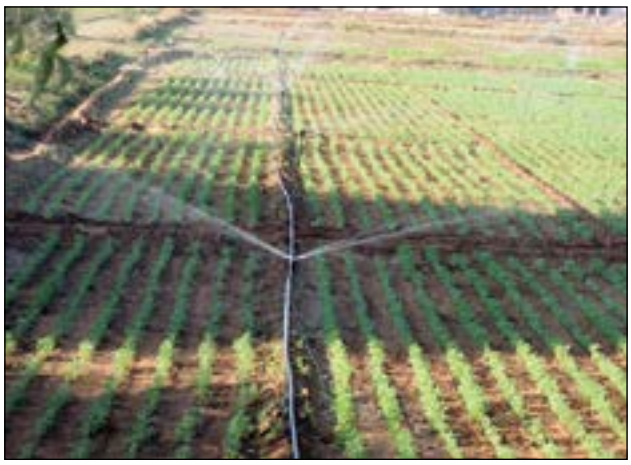


Fig. 35. Quality seed production of Fenugreek at SDAU, Gujarat

Fig. 36. Quality seed production plot of Fennel at NDUAT, Gujarat

Fig. 37. Ajwain seed production plot at YSRHU, Andra Pradesh

Fig. 38. Allspice seedlings are produced at HRS, Sirsi

Fig. 39. Cinnamon planting material produced at RCRS, Bhatye

Fig. 40. Mother block for Kokum seedling production at BSKKVP, Dapoli

Fig. 41. Nutmeg grafts produced at KAU, Thrissur

Fig. 42. Nutmeg grafts raised at CES, Wakavali

Fig. 43. QPM of Clove raised at KAU, Thrissur

Fig. 44. Quality planting materials of kokum produced at ARS, Shirgaon

Fig. 45. Suvasini-Curry leaf seedlings raised at UASD, Karnataka

Fig. 46. Citronella planting material production at MPKV, Rahuri

Fig. 47. Quality planting material production of Chambaka at BSKKVP, Dapoli

Fig. 48. Quality planting material production of Lemon grass at MPKV, Rahuri

Fig. 49. Vetiver multiplication plot at KAU,Thrissur

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 6 Universities were covered under the programme with a total financial utilization of Rs.60.00 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. Assam Agricultural University
2. College of Horticulture and Forestry, CAU, Pasighat
3. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

4. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
5. Maharana Pratap University of Agriculture and Technology, Udaipur
6. Sri Karan Narendra Agriculture University, Jobner

2.3 Nursery centre for aromatic plants

In order to supply quality planting materials of selected aromatic plants which are in good demand for the domestic industries and also for the export markets, the Directorate established 4 small nurseries in different SAUs. An amount of Rs. 15.00 lakhs were provided per University for establishing the nursery centre. Total Rs.60.00 lakhs were incurred for this purpose.

Following SAUs implemented this programme.

1. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli
2. Dr. Y S R Horticultural University, Andhra Pradesh
3. ICAR - Indian Institute of Spices Research, Kozhikode
4. Orissa University of Agriculture and Technology, Bhubaneswar

Fig. 50. Nursery centre established for aromatic plants at MPKV, Rahuri

Fig. 51. Nursery centre established at YSRHU, Chintapalli

Fig. 52. Nursery structure for aromatic crops at TNAU

Fig. 53. Nursery Structure established at CIARI, Port Blair

Fig. 54. Nursery structure established for aromatic crops at HAU, Hisar

Fig. 55. Seed storage structure established at RAU, Bihar

Fig. 56. Seed Spices Storage Structure established at RAU, Bihar

Fig. 57. Seed Storage infrastructure established at CAU, UP

Fig. 58. Seed Storage structure at PDKV, Akola

Fig. 59. Seed storage structure established at OUAT, Orissa

2.4. Hi-Tech Production of Quality Planting Materials of Betelvine

Betelvine (*Piper betel* L.) is a perennial, dioecious, evergreen climber that is primarily grown in tropics and subtropics for its leaves that are used as a chewing stimulant. It also contains medicinal properties including the presence of piperine. Betelvine is an important and highly remunerative cash crop of the state of Odisha and is grown in more than 4000 hectares. The betelvine growing areas are mainly in coastal districts from Balasore to Ganjam. But due to non-availability of quality planting materials of Betelvine in the state, the area expansion is being badly affected. The farmers, NGOs and other entrepreneurs are regularly requesting to supply the QPM of Betelvine of released and elite varieties for area expansion.

The crop requires optimum shade for proper growth and development. Most of the farmers are growing Betelvine in the BAROJ system, which is a closed structure made up of locally available materials. This kind of structure gets affected very frequently by the natural calamity such as high wind and flood. Hence, a protected structure (Shadenet house) with micro irrigation facility is a basic requirement for constant and safe production of QPM (rooted cuttings) of Betelvine in order to fulfil the requirement of the farmers of the Odisha state. To meet the requirements of farmers of the state, DASD in association with OUAT, Bhubaneswar centre have established a hi-tech planting material production (shadenet structure with micro irrigation facility) for betelvine in the state under MIDH. A mother block of betelvine planting material is being established inside the structure. The quality planting material production of betelvine will be started after establishment of the mother block.

2.5. 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 gadget, 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 will be carried out through a special committee formed for this purpose. The programme was initiated in the year 2015-16 and around 49 nurseries have been accredited by DASD till March, 2019.

Table 11 - List of 21 spice nurseries accredited under this programme during 2018-19.

S. No.	Nursery Details	State	Crop	Cultivar	Star rating
1	State Horticulture Farm Devala, Gudallur	Tamil Nadu	Black Pepper	Panniyur - 1	One Star
2	M/S Yemmigoondi Estate TATA COFFEE LTD, Pollibetta, Kodagu	Karnataka	Black Pepper	Panniyur - 1 Thevam	Two Star
3	M/s Cannoncadoo Estate TATA COFFEE LTD, Sidapur, North Kodagu	Karnataka	Black Pepper	Panniyur - 1 Thevam	Two Star
4	M/s Karadibetta Estate TATA COFFEE LTD, Rayarkopal Post, Hassan	Karnataka	Black Pepper	Panniyur - 1 Thevam	Two Star
5	M/S. S S M S Nursery, 27/6, Guddenahalli Village Koppa, Periyapatna, Mysore	Karnataka	Black Pepper	Panniyur - 1	One Star
6	M/S Namma Nursery Krishnapura, Mudigere Chikmangalore	Karnataka	Black Pepper	Panniyur - 1	One Star
7	M/s Shabarimalai Nursery Mogadu, Kanthi Post, Chikmangalore	Karnataka	Black Pepper	Panniyur - 1	One Star
8	M/s Kamandala Nursery Konduguli village, Kesave Post, Koppa Taluk, Chikmanglore	Karnataka	Black Pepper	Panniyur - 1	One Star
			Clove	local varieties	
9	M/s New Evergreen Nursery Farm, Sringeri Road, Balehonnur, Chikmanglore	Karnataka	Black Pepper	Panniyur - 1	Two Star
10	M/S Annapoorna Nursery, Pethri, Cherkudy Brahmavar, Udupi	Karnataka	Black Pepper	Panniyur - 1 Thekkan Karimunda	One Star
11	Home Grown Nursery & Farms, Vizhithode, Kanjirapally, Kottayam	Kerala	Nutmeg	Kallivayal, Kochukudy and Kadukanmackal	Three Star
12	Model Nursery on spices, Kerala Agricultural University, Thrissur	Kerala	Black Pepper	Panniyur varieties, Vijay, Panchami, Pournami, Sreekara, Subhakara, IISR Shakthi, IISR Malabar Excel, IISR Thevam	Four Star
			Nutmeg	Identified promising farmers selections	
			Curry Leaf	Suvasini	
			Ginger	Athira, Karthika, Aswathy, Varada, Rejatha, Mahima	
			Turmeric	Kanthi, Sobha, Sona, Varna	

13	Small Nursery on spices, Kerala Agricultural University, Thrissur	Kerala	Black Pepper	Panniyur - 1, 2 - 8 and Vijay	Four Star
14	M/s Yashaswi Pepper Nursery, Puttur	Karnataka	Black Pepper	Panniyur - 1 and Karimunda	One Star
15	M/s Amba Nursery, Siddapur	Karnataka	Black Pepper	Paniyur - 1, Thevam and Karimunda	One Star
16	M/s Sigandini Nursery, Siddapur	Karnataka	Black Pepper	Panniyur - 1, Thevam, Karimunda, Subhakara, Malabar Excel and Sreekara	One Star
17	M/s Sasya Spandana Nursery, Siddapur	Karnataka	Black Pepper	Panniyur - 1, Thevam, Karimunda, Subhakara, Malabar Excel, Sreekara and Panchami	One Star
18	M/s Mallikarjun Nursery, Siddapur	Karnataka	Black Pepper	Panniyur - 1 and Karimunda	One Star
19	Regional Fruit Research Station, Vengurla, Dr. BSKKVP, Dapoli	Maharashtra	Nutmeg,	Konkan Swad, Konkan Sugandha	Three Star
			Cinnamon	Konkan Tej	
			Kokum	Konkan Amruta, Konkan Hatis	
20	RARS, Kerala Agricultural University, Ambalavayal Pin - 673 593, Wayanad, Kerala	Kerala	Black Pepper	Panniyur - 1	Two Star
			Ginger	Rio-de-Janeiro, Maran, Aswathy	
			Turmeric	Sobha, Pratiba	
			Clove	Ambl - SA 1	
			Cinnamon	Ambl - C V 1	
21	Panniyur Research Station, Kerala Agricultural University, Panniyur, Kannur, Kerala	Kerala	Black Pepper	Panniyur 1-8, Karimunda	Three Star

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

Fig. 60. Accreditation team at RFRS, Vengurle

Fig. 61. Accredited Black pepper Nursery KAU, Thrissur

Fig. 62. DASD Accreditation team evaluating the mother block at PRS, Kannur

Fig. 63. Evaluation of the Cinnamon mother block at RFRS, Vengurle

Fig. 64. Evaluating the nutmeg grafts at Home grown Nursery, Kerala

Fig. 65. Kamandala Nursery, Karnataka

Fig. 66. Model nursery for nutmeg at KAU

Fig. 67. Mother block of Sigandhini nursery, Karnataka

Fig. 68. Namma Nursery, Karnataka

Fig. 69. Nursery Accreditation team at Devala State Horticulture Farm - Tamil Nadu

Fig. 70. Record Verification by DASD Accreditation team at New Evergreen Nursery Farm

Fig. 71. Sasya spandhana Nursery, Karnataka

Fig. 72. Skilled labour at VV Nursery, Karnataka

Fig. 73. TATA coffee black pepper nursery at Karadibata Estate

Fig. 74. Turmeric seeds ready for distribution at accredited Nursery, ARS, Ambalavayal

Fig. 75. Yashaswi Pepper Nursery, Puttur, Karnataka

Fig. 76. Yemmigoondi Estate, Karnataka

Fig. 77. Accreditation team at ZAHRS, Mudigere

3. Nursery Programmes

3.1 Establishment of Large Cardamom Nurseries in Sikkim

Large cardamom (*Ammomum subulatum* Roxb.) which belongs to the family *Zingiberaceae* is the main cash crop of the Sikkim state. Sale of planting material of large cardamom is an important income generating activity of the state. However, there is no systematic nursery activity undertaken in the state for the production of true to type, healthy quality planting material. The suckers are directly collected from the plantations without maintaining the motherblock and sold as such, hence the genuineness and health of the suckers are questionable. This leads to the spread of disease and loss to the farmers as the suckers are of varying bearing capacities. Hence, it is essential that the concept of "Nursery" be introduced in the state of Sikkim, in order to ensure that only quality planting material of genuine variety is traded within and outside the state.

DASD had conducted awareness training for Deptt. officials and nurserymen of Sikkim and neighbouring states, on importance of nursery concept for producing healthy and disease-free planting material. Based on the notification published by DASD, 5 State Department nurseries submitted proposal for establishing large cardamom nurseries at different districts of the state. A preliminary assessment of the sites was made by the Deputy Director, DASD along with Department officials and the proposal was accepted. Five state seed farms identified were Ravangla Farm (South Sikkim), Dzongu Farm-Mangan (North Sikkim), Lingtam farm (East Sikkim), Chamarey (Nazitam) farm (East Sikkim), Buriakhop farm (West Sikkim).

Nursery establishment acivitites for large cardamom at different state seed farm at Sikkim

Fig. 78

Fig. 79

Fig. 80

Fig. 81

Fig. 82

Fig. 83

Fig. 84

Fig. 85

3.2 Upgradation/Modernisation of nurseries

Non-availability of quality planting material had been a major bottleneck in improving the production and productivity of spices crop. Govt./Public Sector nurseries could hardly cater to 10-15% of the total requirement of planting material in the spices sector. The rest has to be met through private sector. Poor quality planting material supplied by private nurseries cause great loss to the farmers especially in perennial crops where they realize the truth only after couple of years. Genuinity of the variety and health of the planting material raised are two important factors that determine the quality of planting material. These two factors can be addressed only if there is required infrastructure in the nurseries.

There are a number of genuine nursery men who wish to produce quality planting material but do not have the financial resources to acquire the infrastructure required to do so. In this Scheme, the Directorate attempt to help the nurseries both in public and private sector to build up their infrastructure and develop their capability to produce good quality planting material. The important component required as infrastructure are 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. The most important of all this is the mother block which is the source of the propagule used for planting material.

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 2018-19.

1. RCRS Bhatye, Maharashtra
2. HRS Yercaud, Tamil Nadu
3. HRS Thadiyankudisai, Tamil Nadu
4. CIARI – Portblair

DASD officials visited the selected nurseries and evaluated the requirements submitted in the proposals. A total financial assistance of Rs. 25 Lakhs was provided to these nurseries as assistance for upgradation.

Fig. 86. DASD team at HRS, Thadiyankudisai

Fig. 87. DASD team at HRS, Yercaud

Fig. 88. DASD Evaluation team at RCRS Bhatye

Fig. 89. Nursery structure upgradation at CIARI, Port Blair

Fig. 90. Spices Nursery Upgradation awareness meeting conducted at UAHS Shimoga

4. Technology Dissemination through Frontline Demonstration

The Directorate established frontline demonstration plots for technology dissemination of organic cultivation of major spices like pepper, ginger, turmeric and chilli. The Directorate also gave assistance for maintenance of demonstration plots established during the preceding years.

The details of the above programmes are given below.

4.1 Demonstration of organic farming in Spices

Organic farming in the spices sector is becoming increasingly important. Its environmental, health and economic benefits have captured attention in most of the importing countries. Consumers' demand for organically produced food products and society's demand for more sustainable development provide new opportunities for farming and business around the world. In view of the growing demand for the organically produced food items worldwide, the country's natural advantages in this regard need to be fully exploited. The Directorate established frontline demonstration plots in SAUs / National Institutes and reputed NGOs for dissemination of latest technologies developed in organic cultivation of Black Pepper, Ginger, Turmeric and Chilli. All the demonstration plots were established with the participation of reputed farmers.

Table 12. Rate of assistance for organic demonstration plots

Demonstration plot-Crop	Cost (Rs/ha)		
	1st year	2nd year	3rd year
Black Pepper	60,000	20,000	25,000
Ginger	1,00,000	-	-
Turmeric	90,000	-	-
Chilli	1,00,000	-	-

Table 13. Frontline demonstration plots in organic farming of spices - Crop wise details

Demonstration Plot - Crop	No of Demonstration plots established	Rate of Assistance (Rs. in lakhs) /ha	Financial Utilization (Rs. in lakhs)
Black Pepper	13.00	0.60	7.800
Ginger	21.00	1.00	21.00
Turmeric	40.00	1.00	40.00
Chilli	17.00	1.00	17.00
Total	**91.00**		**85.80**

Table 14. Frontline demonstration of organic cultivation of pepper

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	3	1.800
2	ICAR - Indian Institute of Spices Research, Kozhikode	1	0.600
3	Kerala Agricultural University	4	2.400
4	Orissa University of Agriculture and Technology	2	1.200
5	Tamil Nadu Agricultural University	1	0.600
6	University of Horticultural Sciences, Bagalkot	2	1.200
	Total	**13**	**7.800**

Table 15. Frontline demonstration of organic cultivation of Ginger

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Assam Agricultural University	1	1.00
2	Central Island Agricultural Research Institute, Portblair	1	1.00
3	College of Horticulture and Forestry, CAU, Pasighat	1	1.00
4	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	1	1.00
5	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	1.00
6	Indira Gandhi Krishi Vishwavidyalaya, Raipur	2	2.00
7	ICAR - Indian Institute of Spices Research, Kozhikode	1	1.00
8	Kerala Agricultural University	3	3.00
9	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	2	2.00
10	Orissa University of Agriculture and Technology	3	3.00
11	Sri Konda Laxman Telangana State Horticultural University	1	1.00
12	Tamil Nadu Agricultural University	1	1.00
13	University of Horticultural Sciences, Bagalkot	1	1.00
14	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	2	2.00
	Total	**21**	**21.00**

Table 16. Frontline demonstration of organic cultivation of Turmeric

S. No.	Institute	Area (in ha)	Financial (Rs. in lakhs)
1	Assam Agricultural University	1	1.00
2	Banda Agricultural University, UP	1	1.00
3	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	2	2.00
4	College of Horticulture and Forestry, CAU, Pasighat	1	1.00
5	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	3	3.00
6	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	2	2.00
7	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	1.00
8	Dr. Y S R Horticultural University, Andhrapradesh	3	3.00
9	Indira Gandhi Krishi Vishwavidyalaya, Raipur	2	2.00
10	ICAR - Indian Institute of Spices Research, Kozhikode	1	1.00
11	Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur	1	1.00
12	Kerala Agricultural University	2	2.00
13	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	2	2.00
14	MYRADA , Krishi Vigyan Kendra, Erode	1	1.00
15	Navsari Agricultural University	1	1.00
16	Orissa University of Agriculture and Technology	2	2.00
17	Punjab Agricultural University	4	4.00
18	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	2	2.00
19	Sri Konda Laxman Telangana State Horticultural University	2	2.00
20	Tamil Nadu Agricultural University	2	2.00
21	University of Agricultural Sciences, Dharwad	1	1.00
22	University of Horticultural Sciences, Bagalkot	2	2.00
23	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	2	2.00
	Total	**21**	**21.00**

Table 17. Frontline demonstration of organic cultivation of Chillies

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Banda Agricultural University, UP	1	1.00
2	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	1	1.00
3	C S Azad University of Agriculture & Technology , Kanpur	1	1.00
4	College of Horticulture and Forestry, CAU, Pasighat	1	1.00
5	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2	2.00
6	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	1	1.00
7	Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur	1	1.00
8	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	1	1.00
9	Sri Konda Laxman Telangana State Horticultural University	1	1.00
10	Sher-e-Kashmir University of Agricultural Sciences and Technology, J&K	2	2.00
11	Tamil Nadu Agricultural University	2	2.00
12	University of Agricultural Sciences, Dharwad	1	1.00
13	University of Horticultural Sciences, Bagalkot	2	2.00
	Total	**17**	**17.00**

Benefit of the programme

Even though there is lot of demand for organic products in the markets, the farming community is yet to be fully convinced of the feasibility of organic farming in various crops. The frontline demonstration plots established to demonstrate and convince farmers of the applicability of various technologies developed for organic cultivation in different crops. The programme encouraged the farmers to take up the organic farming thereby increasing the countries share in the organic products.

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 11.75 lakh tonnes of seed spices annually from an estimated area of about 16.53 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 55 demonstration plots in the major production centres of the seed spices for dissemination of technological information among the farming community. The demonstration

Table 18. University-wise details of demonstration plots for seed spices

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Agriculture University, Jodhpur	4	1.60
2	Agriculture University, Kota	5	2.00
3	Anand Agricultural University	2	0.80
4	Banda Agricultural University, UP	1	0.40
5	Bidhan Chandra Krishi Viswavidyalaya, West Bengal	2	0.80
6	C S Azad University of Agriculture & Technology, Kanpur	1	0.40
7	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	3	1.20
8	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	0.40
9	Indira Gandhi Krishi Vishwavidyalaya, Raipur	2	0.80
10	Junagadh Agricultural University	2	0.80
11	Maharana Pratap University of Agriculture and Technology, Udaipur	3	1.20
12	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	2	0.80
13	ICAR - NRC on Seed Spices, Ajmer	7	2.80
14	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	2	0.80
15	Sri Konda Laxman Telangana State Horticultural University	3	1.20
16	Sher-e-Kashmir University of Agricultural Sciences and Technology, J&K	2	0.80
17	Sri Karan Narendra Agriculture University, Jobner	8	3.20
18	Tamil Nadu Agricultural University	2	0.80
19	University of Horticultural Sciences, Bagalkot	1	0.40
20	Uttar Banga Krishi Viswa Vidyalaya, Pundibari	2	0.80
	Total	**55**	**22.00**

plot established was one hectare size. The financial assistance for one unit of the demonstration plot was Rs.0.40 lakh/hectare. An amount of Rs. 22.00 lakhs was utilized for this programme.

4.3 Demonstration plots for Aromatic Plants

India with 16 different agroclimatic zones, is one of the top 12 mega bio-diversity centres of the world with two hot spots located in the Eastern Himalayas and Western Ghats containing 3500 and 1600 endemic species of higher plants, respectively. The Indian biodiversity is immensely rich in medicinal and aromatic plants occurring in diverse ecosystems.

Dissemination of information regarding cultivation of the above crops, among the farming community is very essential. This Directorate established 23 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.18.40 lakhs was utilized for this purpose.

Table 19. Institute-wise details of demonstration plots for aromatic crops

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Banda Agricultural University, UP	1	0.80
2	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	3	2.40
3	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	2	1.60
4	Directorate of Medicinal and Aromatic Plants Research, Anand	5	4.00
5	Indira Gandhi Krishi Vishwavidyalaya, Raipur	2	1.60
6	Kerala Agricultural University	1	0.80
7	MYRADA , Krishi Vigyan Kendra, Erode	2	1.60
8	Orissa University of Agriculture and Technology	1	0.80
9	Tamil Nadu Agricultural University	5	4.00
10	University of Horticultural Sciences, Bagalkot	1	0.80
	Total	**23**	**18.40**

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. Demonstration plots of spice crops (49 Nos.) on drip irrigation system were established in different spices in SAUs/ ICAR institutes and selected farmers fields.

Table 20. Demonstration of drip irrigation in black pepper

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Centre For Water Resources Development and Management, Calicut	1	0.50
2	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2	1.00
3	ICAR - Indian Institute of Spices Research, Kozhikode	1	0.50
4	Kerala Agricultural University	1	0.50
5	Tamil Nadu Agricultural University	1	0.50
6	University of Horticultural Sciences, Bagalkot	1	0.50
	Total	**7**	**3.50**

Table 21. Demonstration of drip irrigation in ginger

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Centre For Water Resources Development and Management, Calicut	1	0.45
2	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2	0.90
3	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	2	0.90
4	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	0.45
5	Indira Gandhi Krishi Vishwavidyalaya, Raipur	1	0.45
6	Orissa University of Agriculture and Technology	1	0.45
7	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	2	0.90
8	Sri Konda Laxman Telangana State Horticultural University	1	0.45
9	Tamil Nadu Agricultural University	1	0.45
10	University of Horticultural Sciences, Bagalkot	1	0.45
	Total	**13**	**5.85**

Table 22. Demonstration of drip irrigation in turmeric

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2	0.90
2	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	2	0.90
3	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	0.45
4	Dr. Y S R Horticultural University, Andhra Pradesh	1	0.45
5	Indira Gandhi Krishi Vishwavidyalaya, Raipur	1	0.45
6	MYRADA , Krishi Vigyan Kendra, Erode	1	0.45
7	Orissa University of Agriculture and Technology	1	0.45
8	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	2	0.90
9	Sri Konda Laxman Telangana State Horticultural University	1	0.45
10	Tamil Nadu Agricultural University	1	0.45
11	University of Horticultural Sciences, Bagalkot	1	0.45
	Total	**14**	**6.30**

Table 23. Demonstration of drip irrigation in chilli

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Anand Agricultural University	1	0.45
2	Banda Agricultural University, UP	1	0.45
3	Centre For Water Resources Development and Management, Calicut	1	0.45
4	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	2	0.90
5	Sri Konda Laxman Telangana State Horticultural University	1	0.45
6	University of Horticultural Sciences, Bagalkot	1	0.45
	Total	**7**	**3.15**

Table 24. Demonstration of drip irrigation in seed spices

S. No.	Institute	No. of plots	Financial (Rs. in lakhs)
1	Agriculture University, Kota	1	0.45
2	Banda Agricultural University, UP	1	0.45
3	Dr. Y. S. Parmar University of Horticulture & Forestry, Solan, HP	1	0.45
4	Orissa University of Agriculture and Technology	2	0.90
5	Sri Konda Laxman Telangana State Horticultural University	1	0.45
6	University of Horticultural Sciences, Bagalkot	2	0.90
	Total	**8**	**3.60**

4.5 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 environmental 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 *Steinernema carpocapsae* 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 year 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 also similar demo plots are being established in the Arecanut farmers field in 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 year. Mass multiplication of EPN and host insect will be done imposing treatments for the management of root grub in the selected demo plots. The project will be completed by 2020-21.

4.6 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 garden aimed at increasing the net returns from unit area is being identified as thrust area for sustenance of Arecanut farming. This Directorate had established frontline demonstration plots for dissemination of technology on multi species cropping in Arecanut Gardens during 2007-08, 2012-13 and 2016-17 in Puttur taluk, Belthangady taluk and Kasaragod taluk which was found to be very successful. The demo plots initiated in 2016-17 were established completely by this year. The plots established under this programme are a combination of crops like Arecanut + Black Pepper + Cocoa + Banana. These plots were established in Dakshin Kannada district of Karnataka. Significant improvement in income was observed between the pre demonstration and post demonstration period because of introduction of cropping system approach. New Demo plots on Arecanut based cropping system has been initiated at Assam also during 2018-19. The field survey conducted during the year 2018 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.

4.7 Demonstration of IDM technologies for management of bacterial wilt of ginger

Bacterial wilt is one of the most lethal diseases prevalent in the ginger growing areas in the country. *Ralstonia solanacearum*, the bacterial wilt pathogen can survive in the soil saprophytically for long time without true hosts. Dissemination of the pathogen through infected planting material is a serious issue in case of ginger, potato etc. In such cases detection and diagnosis of the pathogen is imperative to develop the adequate control strategies. Management of the pathogen with chemical / biological control measures has met with limitations. Among the several strategies evaluated, integrated management using soil solarization followed by rhizome priming and soil application of a disinfecting salt solution has found to be a very effective, feasible and promising technology by Indian Institute of Spices Research (IISR) for the management of bacterial wilt.

Using the above technologies, DASD in association with IISR has initiated demonstrating IDM strategies in bacterial wilt prone areas in 2017-18. Field diagnosis of bacterial wilt pathogen using real time LAMP for testing soil and seed rhizome is also conducted as a part of demonstration.

Activities done in 2018-19: Two farmers plot at Wayanad were selected for the demonstration of IDM technology developed against bacterial wilt. Two systems were included in the demonstration - one for organic system of cultivation using biocontrol agent *Bacillus licheniformis* and another for inorganic system using $CaCl_2$. In the integrated strategy, soil solarization was the main component. Before planting, soil was indexed for the presence of pathogen and subjected to solarization for 50

days. Planting was done with the onset of rains. The treatments were imposed at the time of planting and at 30, 45, 60 and 90 days. No bacterial wilt incidence occurred in both the plots whereas control and adjacent plots showed more than 30% disease incidence. The harvest data showed absolutely disease-free rhizomes suitable for seed purpose. Being convinced with both the technologies in Wayanad area, the technology is demonstrated in Karnataka and North-East region in four locations of one acre each during 2018-19. During 2018-19, FLD was under taken in nine AICRP centers including in NE states, one farmers plot at Karnataka and five farmers plot under KVK, Peruvannmuzhy under ICAR-IISR. Under KVK FLD's organic system of cultivation is being practiced where biocontrol agent *B. licheniformis* alone is incorporated in the trial where as in AICRP centres and Farmers field at Karnataka, both the strategies are being demonstrated. In each centre two sets of treatments, one with solarization and another without solarization were imposed. In each set there are three sub treatments which include T_1- Soil drenching with $CaCl_2$, T_2- Seed priming and soil drenching with *B. licheniformis* and T_3- recommended practice from each centre. The results showed that good germination and establishment of the plants in solarized plots amended with both $CaCl_2$ and *B. licheniformis*.

Technologies Demonstrated & Achievements

1. Technology for the management of bacterial wilt of ginger using an apoplastic bacterium isolated from ginger – The technology is being demonstrated in major ginger growing tracts of India through AICRPS and farmers' fields.
2. Technology for the management of bacterial wilt of ginger using $CaCl_2$ – The technology is being demonstrated in major ginger growing tracts of India through AICRPS and farmers' fields.
3. Launched a talc formulation of the bioagent named 'Bacillich' and it is being distributed to farmers in Kerala and Karnataka.

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

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. Moreover, HDP 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. To promote this potential technology among farmers in the area, five FLDs (two each in North Goa and South Goa Districts) on farmers' fields and one OFD unit in the Institute's Farm at Old Goa, were established by DASD in association with ICAR-Central Coastal Agricultural Research Institute, Old Goa during 2018-19. Shade net structures with 50% green shade net with 300 Sq.m area (20 m X 15 m) accommodating 1000 bush pepper grafts (at 50 cm x 40 cm spacing in paired row with 60 cm) was established for demonstration.

4.9 Participatory Demonstration Plots of Cinnamon intercropping in Coconut

Coconut (*Cocos nucifera* L.) is a perennial palm popularly referred as "Kalpavriksha" or "Tree of Heaven". The innumerable benefit it provides to millions of people has made it nature's gift to the mankind. Coconut is mostly a crop of small farmers in India, the average size of a holding being 0.22 ha. More than 90% of the five million coconut holdings in the country are less than one ha in size. Due to the problems like long pre-bearing period, occurrence of pests and diseases and fluctuating market prices apart from the small size of holdings, the crop has failed to generate sufficient income to sustain

even the small families. Diversifying the cropping system including more crops per unit area may be necessary to sustain the small and marginal coconut farm families.

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. Herbal spices like long pepper also requires filtered light similar to that of other annual spices like ginger and turmeric.

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 of Kasargod District, Kerala in association with CPCRI, Kasargod during 2018-19. Five demonstration plots of one acre each are being established in different locations in farmer participatory mode and this will be completed in 3 years.

Fig. 91. Demo on Multispecies cropping system in arecanut established by CPCRI at farmers field, Assam

Fig. 92. Demo on Multispecies cropping system in arecanut established by CPCRI at farmers field, Assam

Fig. 93. CPCRI Regional Centre - Kahikuchi officials visiting multispecies Demonstration plot

Fig. 94. Establishment of Demo plot on Cinnamon intercropping in Coconut plantations at CPCRI

Fig. 95. High density Planting of Cinnamon seedlings for demo on Cinnamon intercropping in Coconut plantations

Fig. 96. Hands on training on use of EPN for rootgrub management in Arecanut

Fig. 97. Demo plots established on ecofriendly management of arecanut rootgrub using EPN in farmers field at Karnataka by CPCRI

Fig. 98. Field operations in Demo plots on ecofriendly management of arecanut rootgrub using EPN

Fig. 99. Field operations in Demo plots on ecofriendly management of arecanut rootgrub using EPN

100. Demo plot on ecofriendly management of arecanut rootgrub using EPN, established at Sullia, Karnataka

Fig. 101. Demo on HDP of grafted Bush pepper under shade net structure, established at farmers field South Goa

Fig. 102. FLD on grafted bush pepper established at CCARI, Goa

Fig. 103. FLD on grafted bush pepper established at farmers field, North Goa

Fig. 104. FLD on grafted bush pepper established at farmers field, North Goa

Fig. 105. Demo on Turmeric boiler at Chintapalli, SKLTSHU

Fig. 106. FLD on organic Ginger production at YSPHU, Solan

Fig. 107. Demo on organic production technology in Ginger established at farmers field by AAU Jorhat

Fig. 108. Organic Turmeric production demonstrated at HRS, Anantharajupeta

Fig. 109. Demo plots on organic production of turmeric established in farmers filed by BSKKVP, Dapoli at Asond

Fig. 110. FLD on organic Turmeric production established by SKLTSHU, Telangana

Fig. 111. Organic chilli demo plots established by UAS, Dharwad

112. Production technology of coriander demonstrated at CSAU, Kanpur

Fig. 113. FLD on drip irrigation in turmeric demonstrated at HRS, Mahanandi

Fig. 114. Hi-tech structure for planting material production of betelvine established at OUAT

Fig. 115. FLD on organic pepper production demonstated by OUAT, Bhubaneswar

Fig. 116. Lemongrass production technology demonstrated at OUAT, Bhubaneswar

Fig. 117. Organic turtmeric production demonstrated at OUAT, Bhubaneswar

118. FLD plot for demonstration of Seed spices production established at KVK, Kanker

Fig. 119. Demo on organic turmeric production established at RVSKVV, Gwalior

Fig. 120. Organic ginger production demonstrated by UAHS, Shimoga

Fig. 121. Organic turmeric production demonstrated by MAU, Parbhani

Fig. 122. Chilli organic production technology demonstrated at SKUAST, Kashmir

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

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, KAU and IISR has 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 in to 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. For ginger and turmeric, the explants source and stage is the most important step for establishing contamination free cultures with good *in vitro* responses.

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^{0}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 + vermin compost at 1:1:1 ratio)
- These were allowed to grow for 30-35 days under green house conditions

5.2 Pilot Project on Participatory mode Rehabilitation of Black Pepper Gardens in Cheruthazham Panchayath

Cheruthazham Panchayath was adopted for three years farmer participatory mode rehabilitation of pepper gardens from 2014-15 to 2016-17 under DASD-MIDH programme. After completing the programme, handholding of pepper farmers of the Cheruthazham Panchayath was required to reap the

full potential of the programme and DASD proposal for extending the project for the next two years was approved in 2017-18.

To recover from the decline in black pepper production due to the soil deterioration, an integrated soil health management, crop health management and need based plant protection measures were followed in farmer participatory mode to improve the productivity of the black pepper plantations under this programme. Pepper samithies were formed in 17 wards of the panchayath and continuous trainings on soil health management, crop nutrition and crop protection were conducted for farmers. Mini nurseries and mother progeny gardens were established to ensure supply of quality planting material and healthy pepper cuttings were distributed in the project area. Demonstration plots were laid out and soil testing, diagnostic field visits and hands on training on biocontrol agent multiplication and application were also conducted as a part of the programme. As a result of this programme, the demo plots have survived drought condition much better than the other areas. Crop health has improved in general and almost 60% of the crop in the area has been rehabilitated. By the continuous awareness training and agro clinics, farmers are now convinced about the importance of soil health management. The best indication of the success of this programme is the increase in the litre weight noticed from 450 g to 550 g of pepper produced in this area.

5.3 Participatory mode rehabilitation of black pepper gardens in Kuttiyattoor Panchayath

The Directorate had initiated a black pepper rehabilitation programme in Kuttiyattoor Panchayath (identified under SAGY in Kannur constituency) for a period of 3 years from 2017-18 to 2019-20. It is one of the important potential pepper growing areas in the district with 1427 pepper farmers having more than 212 ha under pepper cultivation at present. The success of the pepper rehabilitation programme in Cheruthazham Panchayath has instigated for proposing a similar programme in Kuttiyattoor Panchayath. Similar to the situation in Cheruthazham Panchayath, here too poor soil health, improper management practices with changes in climatic factors leading to the incidence of biotic and abiotic stress and predominance of senile and uneconomic vines are the primary reason for decline in pepper productivity. The rehabilitation programme is implemented in association with KVK, Kannur of Kerala Agricultural University.

Initially, Participatory Rural Appraisal (PRA) was conducted involving all stakeholders and first-hand information on the basic issues in black pepper production in the area was documented. Pepper samithies were formed for planning, implementation and monitoring of the project in the Panchayath and trainings were given to the samithi for capacity building. Twenty-five numbers of farmers plots were identified for demonstration of soil reclamation activities and inputs were distributed to these farmers. Ten decentralised nurseries with a production capacity of 10,000 cuttings/year/nursery following RMP and serpentine method of multiplication and two mothervine progeny garden with RMP method were established in the Panchayath.

In 2018-19, Standard Operating Protocol (SOP) was developed to benefit the farmers of Kuttiyattoor to address all sorts of issues of Black pepper in the Panchayat. An increase in area under pepper from 212 ha. to 500 ha is proposed under the programme. The pepper farmers would almost double from the present 1,427 nos. to 2,500 farmers. The productivity level would rise from the present 525 gm per standard to 1,000 gm dry pepper per standard. The Panchayath will be self-sufficient with its own planting material and would not require introduction from outside. Farmers Field Schools (FFS) at

different stages of development of pepper would give the farmers a clear understanding of the critical stage of pepper for different operations.

Improvement in the litre weight of the pepper produce in the area from 500 to 600 gm, is expected in 3 years which is sought after by the exporters. The pepper production from this area would increase from the present level of 100 tonnes to 300 to 400 tonnes. The impact of the technological solutions offered in the production and productivity of black pepper in the area will be documented on completion of the project

5.4 Varietal Authenticity and Purity Identification in Black pepper

Black pepper (*Piper nigrum* L), is an important spice and medicinal plant known since time immemorial. The authenticity of cultivars is a topic of great economic importance especially when the crop is lucrative, cultivation is expanding, quality principles are genotype dependent, and there is growing interest among farmers for quality high yielding planting material. Clonal selection played the most significant role in developing several high yielding varieties in black pepper. The selection was mainly applied on land races collected from different growing areas of the country. Identification of cultivars has been traditionally carried out by morphological and agronomic traits.

In black pepper, variety and cultivar identification is one of the most important aspects in production systems. The large number of varieties or landraces has made it difficult to identify and characterize varieties solely on the basis of morphological characters because they are non stable and originate due to environmental and climatic conditions, and therefore phenotypic plasticity is an outcome of adaptation. Molecular marker techniques based on DNA profiling provide novel approaches for cultivar identification. They offer advantages for comparison over morphological and biochemical markers, with respect to resolving power, cost effectiveness, testing at any stages of development, rapidity, environment independent expression and produce an array of polymorphism.

The introduction of Polymerase Chain Reaction and the subsequent development of DNA finger printing methods have opened up new avenues in finger printing varieties/cultivars. Molecular markers are powerful tools in aiding genetic characterization, conservation and improvement in crops. RAPD (Random Amplified Polymorphic DNA) and ISSR (Inter Simple Sequence Polymorphism) are the most commonly used marker strategies and ISSR is found to be more robust and reliable even in case of closely related individuals. The development of SCAR markers by directly sequencing RAPD and ISSR products will generate markers useful for cultivar identification and mapping. The SSR and SNP marker identification will be helpful in authentication of black pepper varieties.

The present planting material production programmes under MIDH and other government funded programmes are multiplying released high yielding varieties and distributes to farmers. Many private nurseries are also engaged in planting material production. In the absence of reliable varietal authentification methods, often spurious seed materials are passed off as that of established variety so as to meet the seed demand. The area expansion and productivity increase in black pepper can be directly linked to spread of improved high yielding varieties. Therefore, genuineness of planting material plays a vital role in production and productivity improvement. The major obstruction in this value chain is, routing of planting materials from unregulated private nurseries which lack mother block and infrastructure to ensure genuineness of the variety. In the nursery accreditation programme,

due importance is given to genetic purity of varieties so that reliability of the variety is assured. The accreditation programme of Government of India could also be strengthened if marker assisted varietal authentication technology is effectively utilised.

DASD in association with Indian Institute of Spices Research, Kozhikode is implementing a two year programme from 2018-19 to develop a set of molecular markers for cultivar identification in black pepper. In two years, it is proposed to develop a proof varietal authentication method using morphological, chemical and molecular markers for black pepper.

In the first year, as per the approved programme, 20 Black pepper varieties/cultivars were collected and DNA isolation work was done using the standard procedure. Quantification of the isolated DNA was completed using agarose gel analysis and spectrophotometric analysis techniques. Sequencing of the 20 selected accessions is in progress and unique markers were identified in some varieties. More number of primers need to be screened to identify a core set of primers capable of distinguishing all accessions.

Fig. 123. Mother vine progeny garden established under Cheruthazham Project

Fig. 124. Cover crops grown at demo plots at Cheruthazham

Fig. 125. Director, DASD monitoring progress of the Cheruthazham Project

Fig. 126. Rejuvenated pepper fields at Cheruthazham

Fig. 127. Ginger seed production in growbags at KAU

Fig. 128. Multiplication of Ginger at IISR

Fig. 129. Multiplication of turmeric at IISR

Fig. 130. Training on microrhizome production technology held at KAU

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 2018-19, 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). More than 10 Institutes with sufficient infrastructure and facilities were newly affiliated as per the ASCI norms, and a trainers training (ToT) for the nominated trainers was conducted at Krishi Vistar Sadan, Directorate of Extension, Ministry of Agriculture & Farmers Welfare, New Delhi on 26-28 November 2018. 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, spice cultivator etc. during 2018-19. The beneficiaries identified for these trainings were rural unemployed youth. About 240 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.

Table 25. Details of trainings completed in 2018-19.

S. No.	ASCI affiliated training Centre	Job role	ASCI approved Trainer	Number of trainees participated
1	HMAARI SKUAST-K Leh	Greenhouse operator	Dr. Deldan Namgial	25
2	HMAARI SKUAST-K Leh	Vermicompost producer	Dr. Jigmet Yangchen	15
3	Faculty of Forestry -SKUAST-K , Benhama	Medicinal Plants Grower	Dr. Peerzada Ahmad	25
4	Banda Agricultural University, UP	Vermicompost Producer	Dr. Arbind Kumar Gupta	25
5	Banda Agricultural University, UP	Gardener	Mr. Krishna Singh Tomar	25
6	DMAPR, Boriavi, Anand , Gujarat	Gardener	Dr. P.I. Saran	25
7	HRES, Sirsi , Karnataka	Nursery worker	Dr. L. N. Hegde	25
8	UBKV, West Bengal	Vermicompost producer	Dr. Ranjith Chatterjee	25
9	HARS, Pottangi, Odisha	Turmeric grower	Dr. Parshuram Sial	25
10	HRS, Pechiparai, TNAU	Gardener	Dr. Jaya Jasmine	25
	Total			**240**

Fig. 131. Participants at skill development training on vermicompost producer conducted by BUAT, Banda

Fig. 132. Skill training on Vermicompost production at BUAT, Banda

Fig. 133. Gardener skill training participants at DMAPR, Anand

Fig. 134. Field visit of skill training participants at DMAPR

Fig. 135. Gardener skill trainees at KVK, Mudigere

Fig. 136. Field training for KVK, Mudigere Gardener trainees

Fig. 137. Medicinal plants grower trainees at MPKV, Rahuri

Fig. 138. Field visit of skill trainees at MPKV, Rahuri

Fig. 139. Release of skill training manual at NAU, Navsari

Fig. 140. Skill trainees interaction with progressive greenhouse growers at Navsari

Fig. 141. Skill trainees for turmeric grower at HARS, Pottangi

Fig. 142. Demo for green house operator trainees at HMAARI, Leh on micro irrigation

Fig. 143. Medicinal plants grower trainees at COF, Benhama, SKUAST

Fig. 144. HMAARI Leh trainees at demo on Vermicompost production

Fig. 145. Certificate distribution to Gardener trainees at HRS, Pechipari

Fig. 146. Skill trainees at Vermicompost producer training at UBKV, West Bengal

Fig. 147. Skill development training on gardener conducted by KVK, Kannur

Fig. 148. Nursery bag filling by gardner skill trainees at KVK, Kannur

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 follows.

7.1 State Level Seminar

(a) Clean and Safe Production of Seed Spices for Enhancing Farmers Income conducted at ICAR-NRCSS, Ajmer

State level Seminar on "Clean and Safe Production of Seed Spices for Enhancing Farmers Income" was organized jointly by ICAR-National Research Centre on Seed Spices, Ajmer and DASD, Calicut under

MIDH during 27-28 March, 2019 at ICAR-National Research Centre on Seed Spices, Ajmer. Theme areas of seminar were: Plant genetic resources and crop improvement, natural resource management and hi-tech horticulture, crop health management, organic production of seed spices, post-harvest management and value addition, innovations in technology dissemination. In the inaugural session, Dr. H.P. Singh, Ex- DDG (Horti. Sci.), ICAR, New Delhi was the Chief Guest. Dr. Gopal Lal, Director, ICAR-NRCSS, Ajmer presided over the function. In the seminar, there were four Technical Sessions (Technical Session-I on Plant Genetic Resources and Crop Improvement, Technical Session-II on Crop Production Management and Organic Production of Seed Spices, Technical Session-III on Crop Health Management and Technical Session-IV on Post Harvest Management and Transfer of Technology) conducted in two consecutive days.

Plenary Session cum valedictory function was organized at the end of the session on 28.03.2019. Dr. G. B. Raturi, Ex-Director, NRCSS, Ajmer was Chief Guest, Dr. Dinesh Arora, Professor, KVK, Ajmer was Guest of Honour. Session was chaired by Dr. Gopal Lal, Director, ICAR-NRCSS, Ajmer. In the programme, the rapporteurs of each technical session presented the recommendations made by the different committees. Dr. Raturi, addressed the gathering and congratulated the Organizing team for successful organization of two days seminar. He appreciated the recommendations made in different technical sessions and said that these recommendations will be helpful for enhancing farmers' income through adoption of clean and safe production technologies of seed spices. Scientists-farmers interaction session was also conducted, in that scientists answered the queries of farmers in relation to the seed spices cultivation. The seminar was ended with vote of thanks delivered by Dr. B.K. Mishra, Co-organizing Secretary of the Seminar.

(b) State level Seminar on Spices and Aromatic Crops conducted at BCKV, Kalyani

Two days State level seminar was conducted at FACC (Lake Hall), BCKV, Kalyani on 8-9th Februry, 2019. The programme was inaugurated by traditional "Karam" dance of tribal ladies and lightening of lamp by the guests. Prof. J.P. Gupta - Vice Chancellor (i/c), Prof. P. Hazra, Dean, Post Graduate Studies, Prof. S. Das - Dean Agriculture, Prof. S. Mukherjee, Director of Research, Prof. P. Chattopadhyay, Former Dean, Horticulture, Prof. R. Chatterjee, Former Dean, Horticulture, Dr. S. Mitra, Director of Farms, Prof. P. Bandyopadhyay, Director of Extension Education, BCKV, Dr. A. Nandi, State ATMA Coordinator participated in the inaugural function as guests. Dr. Homey Cheriyan, Director, DASD and Prof. T. Mandal, Hon'ble MP send their massages for the successful deliberation of the seminar. Different scientists shared their expertise views regarding production management of chilli, capsicum and seed spices, Organic spice cultivation technology, Advances in ginger and turmeric cultivation & value addition, Ginger and Turmeric under coconut based cropping system and Pest and Disease Management in Spices and Success stories with spices SHG: women empowerment. Seed materials of spices were distributed to the farmers and field visit to spices demo plots were conducted. Around 180 nos. of participants from different districts of West Bengal attended the seminar.

(c) State level Seminar on Spices and Farm Innovation conducted at ICAR-IISR Experimental Farm, Peruvannamuzhi, Kozhikode

Two days State Level Seminar and Agricultural Exhibition held on 26-27 October, 2018 at ICAR-IISR Experimental Farm, Peruvannamuzhi, Kozhikode. The Seminar was inaugurated by Sri. E. K. Vijayan, MLA, Nadapuram, Kozhikode on 26.10.2018. Sri. Babu Parasserry, President, District Panchayat, Kozhikode presided over the inaugural session in which Dr. K. Nirmal Babu, Director, ICAR-IISR, Kozhikode welcomed the gathering. The inaugural session was followed by technical sessions in which Dr. V. Krishna Kumar,

Principal Scientist and Head, ICAR, Central Plantation Crops Research Institute (CPCRI), Kayamkulam handled the session on "Plantation crops: Problems and Solutions" and Dr. P. S. John, Professor (Retd.), Kerala Agricultural University dealt with "Soil and Spice Crops". During the technical session on second day, Dr. Jacob John, Professor and Head, Integrated Farming Systems Research Station (IFSRS), Karamana and Dr. Lijo Thomas, Scientist, ICAR-IISR spoke on "Integrated Farming and Sustainability" and "Role of Spices in Doubling Farmer's Income", respectively. The programme witnessed congregation of farmers (588 nos.) representing different parts of Kerala and the exhibition stalls showcased products of various agencies and innovators.The major recommendations were:

Efforts shall be strengthened to promote spice production technologies among farming community in collaboration with agricultural and local self-government departments, identification of suitable spices and varieties shall be prioritized to establish economically viable, sustainable and remunerative spice-based cropping systems, In the regime of climate change and to prevent biodiversity erosion, ITKs and other promising technologies based on climate resilience shall be identified and popularized among the farmers, Site-specific recommendations of fertilizers based on soil nutrient analysis shall be implemented in order to reinstate the soil fertility status in regions severely affected with the monsoon vagaries, Efforts shall be channelized to provide quality disease-free planting materials of elite varieties of spices in collaboration with State Agricultural Departments and certified nurseries.

7.2 District Level Seminar

(a) Seminar on seed spices conducted by Sardar Krushi Nagar Dantiwada Agri. University, Jagudan, Gujarat

One day District level seminar was conducted on 5th January, 2019 at Radhanpur,Gujarat. The seminar was inaugurated by Dr. A.M. Patel, Director of Research, SDAU and Dr. K. A. Thakkar, Director of Extension Education, SDAU, Sardarkrushinagar. The main objective of organizing this Seminar was to transfer the available latest technologies of seed spices to the spices growers in order to improve production and quality of seed spices. The main themes of the seminar were Mission for Integrated Development of Horticulture (MIDH) – Development and strategies of Horticulture in Gujarat State, Production scenario of seed spices, export potential and tips for profitable production, Production technology of seed spices with special reference to no or low cost technology, Integrated Pest and Disease Management in seed spices, Value addition in seed spices, Field visit – Seed Production Plot – Varietal and technologies demonstration etc. In addition, exhibition was organized in which charts and samples of different value added products of fennel, coriander, fenugreek, ajwain and their importance were presented. 900 farmers including 148 woman farmers from Patan, Banaskantha and other districts of Gujarat were participated.

(b) Seminar on Spices and aromatic crops cultivation conducted by Anand Agri. University, Anand, Gujarat

Two days district level seminar was organized by Medicinal and Aromatic Plants Research Station (M&APRS), Anand Agricultural University, Anand on 29-30 January, 2019. During the inaugural session, Director of Research & Dean P. G. Studies, Dr. K. B. Kathiria addressed the farmers in relation to the importance of aromatic and spice crop cultivation and how doubling income can achieved through the cultivation of aromatic and medicinal crops. Different topics were presented by the scientists of various faculties during the two days district level seminar *i.e.*present scenario of aromatic and spices cultivation including medicinal plants in India and international market, importance of medicinal

and aromatic plants and its conservation modules, present needy requirement in the pharmaceutical industries and status of its cultivation practices, cultivation practices including irrigation schedules, weed control and marketing were discussed. Distributed seminar souvenir, kits and seeds of different released varieties of different spices and medicinal and aromatic crops. About 122 farmers participated from different districts of Gujarat as well as many famers were participated from different states especially from Rajasthan.

(c) Seminar on Improved Cultivation of Seed Spices under Climate Change Scenario conducted by NRCSS, Ajmer.

Two days District Seminar entitled "Improved Cultivation of of Seed Spices under Climate Change Scenario held on 26-27 December, 2018 at Department of Agriculture, Govt. of Rajasthan, Jaisalmer. Dr. Gopal Lal, Director, NRCSS, Ajmer presided over the programme. Dr. D. S. Godara, Deputy Director, Department of Agriculture, hosted this programme. Dr. Lal addressed the farmers regarding potential and sustainability of seed spices in Jaisalmer under the scenario of climate change. He informed the gathering that recently cumin growing areas in Jaisalmer has crossed 1 lakh hectare. Different scientists shared their expertise views regarding various challenges and alarming issues of seed spices viz. pests and diseases management, crop production and pesticides residues issues etc. Lectures delivered during District Seminar includes, Improved cultivation of seed spices under climate change scenario, export potential of seed spices with respect to WTO, varietal wealth of seed spices, possibilities of flower cultivation in arid and semi-arid condition, post-harvest management and value addition in seed spices, beneficial schemes of Agriculture Department for farmers welfare, pest and disease management in seed spices. About 128 progressive seed spices growers of Jaisalmer District participated in the programme.

(d) Seminar on Spices production technology in Western Rajasthan conducted by Agriculture University, Jodhpur

Two days District level seminar on Spices production technology in Western Rajasthan held on 21-22 February, 2019 at Agricultural Research Station, Mandor, AU, Jodhpur. Inaugural session of seminar was chaired by Dr. Balraj Singh, Hon'ble Vice Chancellor, AU, Jodhpur, presided by Dr. B. R. Choudhary, Director Research, AU, Jodhpur. Chief Guest Dr. Balraj Singh, Hon'ble Vice Chancellor, AU, Jodhpur in his address enlightened with the importance of farming under stress condition in Western Rajasthan and highlighted the importance of spices specially seed spices. He stressed upon advance cultivation practices and improved technology adoption in spice production for export value. Lectures delivered during the Seminar includes, Good Agriculture Practices in Spices, Irrigation management in spices, Disease and Pest management in spice crops, Methods for nominal pesticide residue in spices, Effective extension methodology in spices, Need and opportunity for organic farming in spices, Major toxic fungi, their harmful effect and management in spices. In this two days seminar, 100 delegates comprising scientists, subject matter specialists, technical staff of University, officials from Agriculture Department of State Governments and farmers participated. Total 12 lead lectures were presented by various resource persons from University and ex-faculties.

(e) Seminar on Recent advances in cultivation and processing of spices conducted by IISR, Kozhikode

One district level seminar "Recent advances in Cultivation and processing of spices" organized by ICAR-IISR on 01.03.2019 was attended by all the farmers adopting Coffee based Black pepper systems,

ginger and turmeric. The seminar was inaugurated by Hon'ble MLA by lighting the lamp, followed by other members. He discussed about single bud method of propagation of ginger demonstrated in the HARS, Pottangi. Planning Board Member appreciated the efforts of Scientists of IISR for visiting the coffee based black pepper gardens and suggesting the farmers to increase production and controlling diseases. Different scientists shared their expertise views regarding pepper, ginger and turmeric production and processing technology, strategies for spices improvement in Odisha. Mrs. Sunita Behera demonstrated the seedling production of ginger and turmeric cultivation in HARS, Pottangi. ATMA has also shown interest to popularize the single bud propagation of ginger. About 130 farmers of Koraput district of Odisha participated in the programme.

(f) Seminar on Strategies for enhancing productivity of seed spices in Maharana Pratap University of Agri. & Tech., Udaipur, Rajasthan

Two days District level seminar 'strategies for enhancing productivity of seed spices held on 28-29 January, 2019 at MPUAT, Udaipur. In the inaugural session, the Chief Guest, Prof. U.S Sharma, Hon'ble Vice Chancellor, MPUAT, Udaipur highlighted the importance of seed spices cultivation in this region and advised the government officials to motivate farmers to adopt new technologies for spice cultivation for getting better yield. Two folders in Hindi on "Methi-Unnat Utpadan Techniques" and "Bijiya Masala Phasalo me Samanwit Kharpatwar Prabhandhan" were prepared by the MIDH Team of MPUAT, Udaipur and were released by the Hon'ble Vice Chancellor, MPUAT, Udaipur during inaugural session. A visit of Organic Unit for the participants was organized by Dr. Roshan Chaudhary, Asstt. Prof., Agronomy. Dr. Abhay Dashora, Training Organizer highlighted various features of improved varieties of major seed spices and also pointed out importance of seed production aspect in seed spices. About 75 participants attended the programme.

(g) Seminar on Spices conducted by Uttar Banga Agricultural University, West Bengal

Two days District level seminar on spices held on 4-5 February, 2019 at UBKV, Pundibari, Cooch Behar. Inaugural session of seminar was chaired by the Hon'ble Vice Chancellor. Different scientists shared their expertise views regarding Problems and Prospects of Spice Cultivation in Cooch Behar district, Improved production Technology of black pepper, Economics of spice cultivation, Organic production technology in Spices, Growing spices in multi-storeyed cropping system, Disease management of chilli, onion and seed spices, Disease management of ginger, turmeric and black pepper and Processing of spices etc.

(h) Seminar on Medicinal and Aromatic plants conducted by DMAPR, Anand, Gujarat

Two days district level seminar cum stake holders meet on MAPs during February 6-7, 2019 has been conducted by the Directorate of Medicinal and Aromatic Plants Research (DMAPR), Anand, Gujarat. The aim of the seminar was to provide platform to stakeholders, transfer of technology and enhancing knowledge through trainers to farmers with recent development in Medicinal and Aromatic plants. The seminar chaired by Dr. S. Roy, Director, DMAPR, Boriavi and chief guest was Shri B.U.Parmar, Senior Executive Officer/Joint Director, State Horticulture Mission, Gujarat. It covered all aspects of MAPs *viz.*, cultivation, QPM production, GACP, organic cultivation, improved varieties, PHT, quality primary processing and supply chain / marketing through presentation of ten experts, two progressive farmers, two industries and one field visit. About 201 farmers got benefited from different villages of Gujarat.

(i) Workshop on 'Harnessing the potential of spices production in Bundelkhand region of Uttar Pradesh: Issues and Strategies' conducted by BUAT, Banda, Uttar Pradesh

Regional level workshop on 'Harnessing the potential of spices production in Bundelkhand region of U.P. - Issues and Strategies' was held at Banda University of Agriculture and Technology, Banda, U.P. during December 18-19, 2018. The inaugural programme of the workshop was chaired by Dr. U.S. Gautam, Hon'ble Vice Chancellor, BUAT, Banda. This session was well attended by Dr. V.K. Singh, JDA, Chitrakoot dham, Prof. N.K. Bajpai, Director Extension, BUAT, Banda, Prof. G.S. Panwar, Dean, CoA and Mr. Madhu Nair, Research Officer, DASD, MoA & FW, Calicut, Kerala as a special invitee. Resource persons from the University delivered lectures on "Issues and strategies for production and propagation technologies of spices" in Bundelkhand region, Strategies for plant protection measures of Spices in Bundelkhand region, Post-Harvest Management, Marketing and Industrial Application. There were more than 72 participants from 7 KVKs of Bundelkhand region along with 3 more KVKs of Uttar Pradesh having same agro-climatic condition registered in the workshop. A field visit was also conducted for the participants in BUAT campus.

(j) Spice Seminars conducted by Kerala Agricultural University, Thrissur

- Two days District level seminar conducted on 11th December, 2018 at Sreekrishnapuram, Palakkad and on 25th March, 2019 at RARS, Pattambi respectively. Topic covered are Production and processing of nutmeg, Nutrient management in pepper, Integrated disease management in spices and Integrated pest management, Prospects of pepper cultivation and rejuvenation of pepper in Kerala, Nutrient management in spices, Pest and disease management in spices. Method demonstration in serpentine layering in pepper was conducted. Above 106 and 107 farmers were participated in each of the programme.

- In order to support the rejuvenation of spices in Wayanad district, Regional Agricultural Research Station, Amabalavayal conducted two days seminar "SUGHANDHI-2019" for the benefit of farmers of Wayanad. The seminar was conducted from 6th March, 2019 to 7th March, 2019. A total of 200 farmers registered for the programme. The different sessions and respective resource persons who handled the sessions are : Management of Spice garden under post flood scenario in Wayanad district, Disease management for spice garden, Ecofriendly pest-management in spice garden, Pesticide Residue - A challenge to spice export, Post-harvest handling and value-addition in spice crops, Climate variatiability and survival in Spice crops, Soil health and spice plantation management and Safe handling of pesticides. Planting materials and various inputs were distributed to the participant farmers. A group of 100 enthusiastic farmers were selected from all around Wayanad district for training at Indian Institute of Spice Research, Calicut. Then the farmers were taken to plant protection lab where they were exposed to various diseases of spice crops in Kerala with respect to Wayanad and their control measures. A total of 200 farmers registered for the programme.

- A district level seminar was conducted in connection with the inauguration of the Farmer Producer Organisation (FPO) formed at Cheruthazham Panchayath. Farmer producer organization was inaugurated by Hon'ble Agricultural Minister Shri. V.S. Sunil Kumar on 24th November, 2018. A national level awareness campaign was conducted with the involvement of All India Spice Producers organization and agencies in Spice export to address the export potential of pepper through this FPO. The major activities undertaken by the FPO are production of quality planting material,

harvesting, grading, storage, processing, value addition, branding and marketing including export of black pepper, organic manure production, production of planting materials. The technical support for smooth functioning of FPO involves 11 members from skill development training conducted under MIDH at KVK, Kannur during 2018-19.

(k) Seminar on Production Technology of Spices conducted by Dr. BSKKVP, Dapoli

A two day seminar on production technology of Nutmeg, Black Pepper, Cinnamon, Ginger, Turmeric, Bush Pepper, Kokum and Aromatic crops was conducted on 27-28 Feb, 2019 at Dr. BSKKVP, Dapoli. Resource persons from the Univesity delivered lectures on the production technology of different spice crops. Processing technology on spices and intercropping with spices in coconut orchards were also described during the seminar. There was also a class on pest and disease management in spices. There were over 250 participants for the District level seminar.

(l) Seminar on Advance Production Technology of Ginger, Turmeric and Black pepper conducted by UHS, Bagalkot

A district level seminar was organized at College of Horticulture, Mysuru on 6-7 March, 2019 with the main objective to have interaction between the farmers and scientific community in adopting new technologies. Experienced growers and innovative farmers address the participants which build up confidence among the farmers about new technologies. This seminar made a way to have one to one interaction among the scientists and farmers to discuss key areas of the crops. Farmers from far districts of Bidar, Bellary and Bagalkot were also participated along with farmers from Mysuru, Hassan, Kodagu, Chamrajanagara and Mandya. Technical bulletin on "Production Technology of Ginger, Turmeric and Black Pepper" was released during inaugural session of the seminar and distributed to the farmers.

7.3 Farmers Training Programme

S. No.	Institute	Training topic	Date & Venue	Training details
1	Indian Institute of Spices Research, Kozhikode, Kerala	Good Agricultural Practices for clean and safe spices	22nd December, 2019 at IISR, Calicut.	Soil management practices for production of clean and safe spices, crop management practices for spice based farming systems were discussed in the training programme. More than 75 farmers participated in the training.
		Scientific and technological interventions of improving production and quality of major spices	21st March,2019 at IISR regional station, Appangala	Training programme emphasized on recent advances in production and processing of black pepper, cardamom and ginger. Impoved varieties-bridging yield and quality gaps in spices, advances in quality planting material production, physiological interventions in spices cultivation, biotic stress and its management in spices, post harvest processing and value addition in spices were discussed in the programme. About 120 farmers from different regions of Karnataka attended the programme.

2	Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut, UP	Spices crops	22-02-2019 at KVK, Nagina, Bijnore	Production Technology of Garlic, chilli and seed spices, Plant protection measures for spices crops were dealt with in the programme. Around 80 farmers were participated in the programme.
		Spices crops	26-02-2019 at KVK, Saharanpur	Production technology of Coriander and Garlic, Processing of Spices and value addition technology were discussed in the programme.
		Spices crops	28-02-2019 at Krishi Vigyan Kendra, Muradnagar, Ghaziabad	Production technology of Turmeric and Ginger, Technology of Organic spice production, Plant protection measures in spices crops were discussed.
3	Junagadh Agricultural University, Gujarat	Seed Spices Scientific Cultivation, Value Addition and Export	29th October, 2018 at K.V.K., J.A.U., Jamnagar.	Scientific cultivation and importance of value addition of spices crops and importance of seed spices crops were discussed in the programme. One Training Manual in vernacular language on "Seed Spices - Scientific Cultivation, Value Addition and Export" ("Beej Masala Pako Ni Vaignanik Kheti, Mulyavardhan Ane Nikas") was released and distributed among the participants on this occasion. Total 110 progressive farmers including men and women participted in the programme.
4	Agricultural University, Jodhpur, Rajasthan	Spices crops	28th January, 2019 at ARSS, Samdari	Management of soil nutrients, saline soil and water for spices crop, weed management in spices, seed production and improved varieties in seed spice crops and Management of diseases in seed spices were discussed.
		Spices crops	6th January, 2019 at KVK, Gudamalani	Improved agro-technology in spices crops, post-harvest management in seed spices crops, main diseases of seed spices and their management, management of saline soil for seed spices crop, improved varieties and seed production in seed spice crops and also Management of insect in spices crops are discussed in the programme.
		Spices crops	28th February, 2019 at Village Khakharki (Mertacity, Nagaur)	Post harvest management & market assistance in spices crops, facilities and schemes of State Agriculture Department, weed management in spices, Management of saline soil and water for spices crop, Main Insects and diseases of seed spices and their management and Improved agro technique for seed spice crops were disscussed.

		Spices crops	7th March, 2019 at Seed production farm, Bilara	Improved varieties and seed production in spices crops, Important diseases in seed spice crops and their management, method of soil health and management of essential nutrient in seed spice crops, Improved agro technique for spice crop and Important insect and pest in spice crops and their management were dealt in the programme.
5	Maharana Pratap University of Agri. & Tech.,Udaipur, Rajasthan	Improved Cultivation Techniques of Spice Crops	6th January, 2019 at KVK, Chitttorgarh	Various aspects of spices production, improvement and protection were discussed in the training. The important topics handled by the experts were INM in Spice Crops, seed production in important seed spices, organic cultivation of spices as well as various plant protection measures for seed spices, procedure and importance of soil testing and vermi-compost in spices cultivation. About of 86 progressive farmers attended the training.
		Improved Production Technology of Spice Crops	5th February, 2019 at KVK, Bhilwara	Highlighted the importance and scope of seed spices in southern Rajasthan, various features of improved varieties of major seed spices, post harvest technology and value addition in seed spice crops, information on disease and insect pest management in spice crops and organic production technology in seed spice etc. About 50 farmers participated in the training programme.
		Quality seed production of turmeric and its crop protection	4th January, 2019 at NAU, Navsari	Various aspects of seed production techniques, crop management, pest and diseases management, seed quality, post-harvest handling storage etc. of turmeric. Total beneficiaries are 105. Resource persons are Dr. C. G. Intwala, Associate Research Scientist, NAU, Navsari and Dr. V.L. Parmar & Prof. Gopal Vadodaria, Dept. of Genetics & Pl. Breeding, NAU, Navsari.
6	Navsari Agri. University, Navsari, Gujarat	Quality seed production on turmeric and black pepper and its crop protection	7th March, 2019 at BAIF Institute for Sustainable Livelihoods and Development, Kaprada Dist., Valsad	Quality seed production of turmeric, seed storage and plant protection etc. were discussed. A total of 122 farmer beneficiaries attended the training .
		Quality seed production on spices crop and crop protection	18th March, 2019 at Megaseed Project, NAU, Navsari	Importance of spices crop, seed production techniques, new variety etc. were discussed in the programme. About 85 progressive farmers attended the one day training programme

7	Central Agri. University., Pasighat	Boosting farmers income through ginger and turmeric farming	22nd & 23rd March, 2019 at College of Horticulture & Forestry, Pasighat	Encouraged the farmers for growing of cash crops like ginger and turmeric. Improved production technology of ginger, package of practices of turmeric cultivation were also discussed in the programme.
		Scientific production technology of ginger and turmeric	15th February, 2019, at Ziro, Lower Subansiri District, Arunachal Pradesh	Marketing problems facing by the ginger and turmeric growers and urged for its urgent solution, scientific production technology of ginger, package of practices of turmeric cultivation and curing and processing of turmeric were dealt in the programme.
8	Dte. of Medicinal and Aromatic Plants Research, Anand, Gujarat	Cultivation of Aromatic crops	September 19, 2018 at Porda	Four trainings were conducted in different locations with an aim to provide information to farmers with recent development in Aromatic plants cultivation and essential oil extraction. Farmers have visited FLDs conducted on tulsi, palmarosa and lemongrass at Kothi, Deviakampa and Gardalath. Exposure for essential oil extraction units and proper utilization of residue have been given to farmers. About 349 farmers got benefited from different villages of Gujarat.
		Cultivation of Aromatics as an intercrop	September 27, 2018 at Dediapada	
		Basil cultivation for improving livelihood	October 12, 2018 at Talod, Sabarkantha	
		Cultivation of aromatic crops for sustainability	December, 29, 2018 at Kothi, Dehgam	
9	Anand Agri. University, Anand, Gujarat	Aromatic and Spice Crops Production	3rd March, 2019 at Agriculture Research Station, AAU, Arnej	About 115 farmers were participated.
		Cultivation Practices of Spices and Condiments	3rd March, 2019 at KVK, AAU, Arnej	About 110 farmers were participated.
		Shakbhaji Masala Pakoni Khetima Vaignanik Abhigam	24th Jan., 2019 at MVRS, Anand	Importance of spices and vegetable cultivation at present scenario, doubling income by cultivation of spices and vegetable crops has been discussed in the programme. About 100 farmers were participated in the training.
10	Bidhan Chandra Krishi Viswa Vidyalaya, W.B.	Spices & Aromatic Plants	5th October, 2018 at Sarai ManasaFarmers' Club, Dt. -Hooghly	Economics & Scope of Spices in WB, Cultivation of Spices, Medicinal and Aromatic Crops, Improved Garlic Production technology, Disease & Pest Management in spices and Aromatic crops, Black Pepper multiplication were discussed in the programme.

		Spices & Aromatic Plants	12th October, 2018 at District Training Centre, Govt. of WB, Bankura	MIDH spices BCKV a boon for rural unemployment small scale industry, Economic Significance of spices and aromatic crops, Spices Medicinal and Aromatic Crops for rural lively hood, Marketting channel of spices, curry leaf, Seed Spices were dealt in the programme.
		Spices & Aromatic Plants	5th December, 2018 at Boys Union Club + Howra KVK, Dt- Howra	Increasing farmers income by spices cultivation, Significance of spices and aromatic crops, World soil day, Soil testing procedure, Indegeneous spices and medicinal crops were discussed in the programme.
		Spices & Aromatic Plants	19th and 20th December, 2018 at Murshidabad KVK	Production management of Chilli, Black Pepper multiplication and Capsicum and ginger growing, Pest Management in Spices and aromatic crops, Cultivation of seed spices, Improved Onion and Garlic Production technology, Modern techniques for Ginger multiplication are discussed in the programme.
11	C.S. Azad Univeristy of Agri. & Tech, Kanpur, U.P.	Seed spices	20th November, 2018 at Village-Korsam, Block-Malwan, Dist-Fathepur	Importance of different seed spices crops for the benefit of farmers and farm-women, important varieties and package of practices of different seed spices crops, Integrated disease management of seed spices crops, organic farming of seed spices and also discussed the safe usage of bio pesticides in different seed spices crops. More than 80 farmers were participated in the programme.
12	Central Plantation Crops Research Institute, Kasaragod, Kerala	'Multispecies cropping system and health management in Arecanut	11th November, 2018 at ICAR - CPCRI Regional station Kidu, Dakshina Kannada	A training programme conducted at CPCRI Regional station with special emphasis on the advanced concept in management practices of pest and diseases of arecanut and entomopathogenic nematodes. Multispecies cropping system and Nutrient management in arecanut, Improved varieties and hybrids in arecanut, Integrated disease management in arecanut, Integrated pest management in arecanut were discussed in the programme. More than 200 farmers, development officials, elected members, private input supplier agency, college students etc. had participated in the training.

		Advances in arecanut health management and multispecies cropping system	18th December, 2018 at Ishwaramangla village of Dakshina Kannada	Multispecies cropping system and Nutrient management in arecanut, Improved varieties and hybrids in arecanut, Integrated disease management in arecanut and Integrated pest management in arecanut were dealt with the programme. More than 100 farmers, development officials, elected members, private input supplier agency, college students etc. had participated in the training.
		Integrated pest and disease management and multispecies cropping system in arecanut	11th January, 2019 at Averse village of Udupi	Multispecies cropping system and Nutrient management in arecanut, Improved varieties and hybrids in arecanut, Integrated disease management in arecanut and Integrated pest management in arecanut were discussed. More than 80 farmers, development officials, elected members, private input supplier agency, college students etc. had participated in the training. During the interaction session, various issues related to pest and diseases management, mass multiplication of EPNs, biology of nematodes and its mode of action on root grubs in soil etc. were discussed and farmers shared their experiences. An exhibition was also organized in connection with the programme. Extension literature in regional language on soil health, pest and diseases management in arecanut and coconut were displayed and distributed for the benefit of the farmers during the programme
		Integrated Pests and Diseases Management in Arecanut	22nd January, 2019 at Kuppepadavu, Mangaluru Tk., Dakshina Kannada	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 cropping system in arecanut garden to increase the profit. Exhibits related to varieties/hybrids, quality planting materials production, agronomic practices, integrated pests and diseases management, harvesting etc. were displayed for giving first-hand information to the farmers. About 170 participants attended the programme.

		Multi Species Cropping System in Arecanut and Integrated Pests and Diseases Management in Arecanut	2nd March, 2019 at Mr. Pidamale Govinda Prasad's 24 garden, Kodungai, Bantwal Tk., Dakshina Kannada	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 cropping system in arecanut garden to increase the profit. Different topics i.e. Varieties / hybrids in arecanut based cropping system, Quality planting material production in arecanut based cropping system, Production technologies of arecanut based cropping system, Integrated Pests and disease Management in arecanut based cropping system, Cost of cultivation in arecanut based cropping system and Demonstration of Bordeaux mixture preparation were discussed with the programme.
13	National Research Centre on Seed Spices, Ajmer.	Good Agricultural Practices in Seed Spices	17th November, 2018 at ICAR-NRCSS, Ajmer (Rajasthan)	Programme inaugurated by the Director, ICAR-NRCSS, Ajmer. In the inaugural speech Director, NRCSS, Ajmer insisted upon farmers to adopt good agriculture practices for better yield and quality of seed spices. The participants were imparted knowledge on high yielding varieties in seed spices, improved production technology of seed spices, pest and disease management and retention of flavor and aroma of seed spices by cryogenic grinding. About 75 farmers from different villages of Ajmer District participated in the Training programme.
		Good Agricultural Practices in Seed Spices	24th December, 2018 at Agriculture Department (ATMA), Govt. of Rajasthan, Nagaur.	Expert team of Scientists of NRCSS, Ajmer interacted with farmers regarding alarming issues of seed spices viz. pests and diseases management, crop production, varietal wealth and pesticides residues issues in seed spices. 81 farmers from different villages of Nagaur District participated in the training programme.
		Women empowerment through seed spices	ICAR-NRCSS, Ajmer	Dr. Gopal Lal, Director, NRCSS, Ajmer interacted with farm women regarding their role in Agriculture. He urged women to adopt Good Agriculture Practices in seed spices to produce quality of seed spices. Further, he insisted to reduce the use of chemical pesticides in seed spices in order to control the pesticides residues issues in seed spices which is ultimately affect the export of seed spices. Other experts of NRCSS, Ajmer shared their expertise regarding varietal wealth, intercropping of vegetables and fruits, pest and diseases management, organic farming, post-harvest management and value addition in seed spices.

14	Sardar Krushi nagar Dantiwada Agri. University, Gujarat	Importance of processing in increasing profitability of seed spices crops	10-03-2019 at Detrojpura, Mehsana	Production, protection, processing, quality maintenance and varietal improvement and seed production technologies in seed spices were dealt with the programme.
		Importance of value addition in increasing profitability of spices crops with special reference to seed spices	12-03-2019 at, Navapura, Kadi	Production as well as protection technologies of organic farming, processing and varietal improvement and seed production technologies were discussed in the programme.
		Scientific Cultivation of Seed spices Crops	22-02-2019 at Pratapgadcampa, Vijayanagar	Scientific cultivation of seed spices crops, and integrated nutrient management and plant protection in fennel are discussed in the meeting.
		Scientific Cultivation of Seed spices Crops	1-03-2019 at Ravipura campa,Vadali	Scientific cultivation of seed spices crops, integrated pest and disease management in fennel and nutrient management in fennel were discussed.
		Scientific production technology of seed spices	4-01-2019 & 25-02-2019 at KVK, Kolava and Jamada Village,Tharad	Two days training programmes on Scientific production technology of seed spices conducted at Kolava and Jamada village, Tharad. About 121 and 110 farmers each participated in the programme.
		Scientific production technology of seed spices	23-12-2018 & 16-02-2019 at Santarvada, Dantiwada and Nav, Deesa	Two days training programmes conducted at Santarvada Village, Dantiwada and Nava village, Deesa. About 120 and 130 farmers each participated in the programme.
15	SKN Agri. University, Jobner, Rajasthan	Scientific cultivation of spices	31st January, 2019 at KVK, Navgaon, Alwar	Scientific cultivation of Methi, Scientific tips to boost Methi production, Weed Management and Medicinal use of Methi were discussed in the programme.
		Recent advances in Fenugreek cultivation	31st January, 2019 at KVK, Fatehpur, Shekhawati	Importance of seed spices, current status and future prospects, Production technology of fenugreek, Production technology of seed spices in Rajasthan specially in Shekhawati region, Identification of major disease and pest and their control in seed spices and Improved varieties of major seed spices were discussed in the programme.
		Production technology of seed spices	19th February, 2019 at Krishi Vigyan Kendra, Bharatpur	Integrated nutrient management in seed spices crop, Scientific cultivation of fennel, Integrated Disease and Pest Management, Importance of organic manures in quality seed spices production and Value addition of seed spices by Self Help Group Formation were dealt with the programme.

		Improved Technology of Coriander Cultivation	27th February, 2019 at Krishi Vigyan Kendra, Dholpur	Improved varieties and cultivation technology of coriander, Importance of vermicompost in Spice Crops, Insect and pest management of coriander crop, Nutrient management in coriander production, Irrigation Management in coriander cultivation and Post harvest technology of coriander are discussed in the training programme.
		Production technologies of seed spices crops	1st March, 2019 at Krishi Vigyan Kendra, Kotputli - Jaipur	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.
		Improved production technology of spice crops	12th March, 2019 at KVK, Ajmer	Improved production technology of spice crops, Major 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 & visit of KVK farm and Post harvest technology & value addition of spices were discussed.
16	Uttar Banga Agricultural University, W.B.	Training programme on spices	30th January and 4th February, 2019 at RRSS, Terai Zone, UBKV, Kharibari	Scientific Package of practices for Ginger production, Package of practices and economics of tree spices - Curry leaf and Darchini (Cinnamon) production, Scientific Package of practices for Turmeric production, Importance, economics and package of practices for major seed spices (coriander, black cumin, cumin, etc.), Importance, economics and package of practices for Tree Spices (Tej patta – *Cinnamomum tamala*), Scientific Package of practices problems in Arecanut production and processing, Management of disease-pest of ginger, turmeric, tree spices, pepper and seed spices and Scientific Package of practices for Black pepper production and economics are discussed in the programme.

		Training programme on spices	14-15 February, 2019 conducted by RRS, OAZ, UBKV, Majhian	Importance and scope of spice cultivation in Dakshin Dinajpur,Overall views of MIDH-Spice project and package and practice of seed spices in Dakshin Dinajpur district, Improve package and practice of Ginger and Turmeric, capsicum, black pepper and their marketing, Necessity of agro advisory service for the cultivation of horticulture crops specially Spice crops, Soil and their management for spice cultivation and Important pest of spices crops and their management practice.
		Training programme on spices	27-28 February, 2019, conducted by RRS, Hill Zone, Kalimpong, UBKV	Problems and Prospects of Large Cardamom cultivation in Hills, Eco-friendly management of major diseases of Large Cardamom, Problems and Prospects of Ginger cultivation in Hills, Cultivation and Processing technique of Large Cardamom were dealt in the programme.
		Training programme on spices	07-08 March, 2019, conducted by RRSS, OAZ, Manikchak, UBKV	Different cultural practices of rhizome spice crops and seed spices, Black pepper multiplication Technique and Pest management of spice crops were discussed in the programme.
		Training programme on spices	24-25 March, 2019, conducted by UBKV, Pundibari at Dahshin Kalrayer Kuthi, Pundibari, Cooch Behar	Growing spices in multi-storeyed cropping system, Improved production Technology of black pepper, Organic production technology in Spices, Disease management of chilli, onion and seed spices and Improved package of practices of spices were discussed.
17	Banda University of Agri. & Technology, Banda, U.P.	Spices crops	16th March, 2019 at Krishi Vigyan Kendra, Hamirpur	Cultivation of Turmeric and Ginger,Value Addition and Post Harvest Management of Spices Crops, Composting Methods: NADEP and Vermicompost, Practices of Organic Farming and Formation and Management of SHGs were dealt in the programme. Over 90 farmers participated in the programme.
		Spices crops	16th March, 2019 at Krishi Vigyan Kendra, Lalitpur	Cultivation of Turmeric and Ginger, Insect Pest and Disease Management in Prominent Spices in Bundelkhand, Value Addition and Post Harvest Management of Spices Crops, Composting Methods: NADEP and Vermicompost, Practices of Organic Farming and Formation and Management of SHGs were dealt in the prograamme. Over 104 farmers participated in the programme.

18	Kerala Agricultural University, Thrissur	Black pepper varieties, cultivation and IPDM	29th January, 2019 at Kudiyanmala Merchant Association Hall, Kudiyanmala	Black pepper varieties, nursery management and cultivation, Integrated pest and disease management were discussed. Around 100 farmers took part in the training.
		Black pepper cultivation	15th February, 2019 at Padiyur Senior Citizen's Centre, Padiyur	Major topics covered in the training were Black pepper varieties, nursery management and cultivation practices, Plant protection in black pepper. Around 120 farmers took part in the training.
		Climate resilient technologies for Spice Crops in the High ranges of Idukki	27th October, 2018 at Christuraj Parish Hall, Rajamudy, Idukki	Lectures on Management of spice crops in the post flood scenario, Climate resilient varieties of black pepper for the high ranges, Safer disease management technologies for Spice crops, Safer pest management technologies for Spice crops, Soil health management in spice crops and Prospects of value addition in spice crops were delivered during the training. Around 225 farmers took part in the training.
		Climate resilient technologies for sustainable production of spice crops in Kottayam district with focus on pepper & nutmeg.	1st November, 2018 Udayanapuram Panchayath Hall	Lectures on Climate resilient technologies for sustainable production of spice crops, Climate change adaptation strategies for spice production, Nutrient management in spices in the post flood scenario, Bio intensive pest and disease management were delivered by the experts. Around 85 farmers took part in the training.
		Production of quality planting materials in spices.	12th March, 2019 at College of Agriculture, Vellayani	Major topics for training were production of quality planting materials in black pepper, Production of quality planting materials in ginger, turmeric & tree spices, Establishment of a nursery for the production of quality planting materials in spices, Practical sessions on budding, grafting & layering. Around 100 farmers took part in the training.

		Brainstorming session on "Rejuvenating black pepper economy of Kerala.''	3rd August, 2018 at Karshaka Bhavanam, Kerala Agricultural University, Thrissur	A brain storming session on Rejuvenating black pepper economy of Kerala was held at Karshaka Bhavanam, KAU on 3rd August, 2018 involving all the stakeholders of black pepper viz. farmers, scientists, traders, industry, processors, Agriculture Department officials etc. 42 select black pepper farmers including the tribal farmers from Periyar Tiger Reserve, Thekkady participated in the one day meeting. Presentations on Developmental programmes on black pepper in Kerala, Present status and future priorities on black pepper varieties for Kerala, Certified organic black pepper production and export with special reference to Wayanad district, Certified organic black pepper production and export with special reference to Idukki district, Post harvest handling and product diversification in black pepper-issues and challenges, Production and export of pepper oils and oleoresins: Present status and future potentials, Black pepper economy of Kerala-present status and future directions were made by the experts in respective fields. Recommendations and policy suggestions for rejuvenating pepper economy of Kerala were evolved after discussions.
19	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	Production technology of spices	Asond, Dapoli on 1st March, 2019	Production technology of Black Pepper, Cinnamon, Nutmeg, Turmeric, Aromatic crops, intercropping of spices in coconut gardens etc. were dealt in the classes. Over 125 farmers took part in the training programme with a majority being female participants.
		Production technology of spices	Agarwayangani, Dapoli on 2nd March, 2019	Production technology of Black Pepper, Cinnamon, Nutmeg, Turmeric, Aromatic crops etc., intercropping of spices in coconut gardens, processing technology of spices were dealt in the classes. Over 170 farmers took part in the training programme with a majority being female participants.

		Production technology of spices	Kalvande, Chiplun on 5th March, 2019	Production technology of Black Pepper, Cinnamon, Nutmeg, Turmeric, Aromatic crops etc., Intercropping with spices in coconut orchard, Processing technology of spices were discussed in the training . Over 140 farmers took part in the training programme.
		Production technology of spices	Narvan, Guhagar on 7th March, 2019	Production technology of Black Pepper, Cinnamon, Nutmeg, Turmeric, Aromatic crops etc., Coconut- spices intercropping, processing technology of spices were dealt in the training. Over 148 farmers took part in the training programme with a majority being female participants.
		Production technology of spices	RCRS Bhatye, Ratnagiri on 13th Feb., 2019	Lectures on production of quality planting material of spices in the Konkan region, production of spices and doubling of farmers income, production technology of Black Pepper, Cinnamon, Nutmeg, Turmeric, Aromatic crops etc., Pest and disease management in spices were handled by experts. Over 200 farmers took part in the training programme with a majority being female participants.
		Production technology of spices	KVK Roha Raigad on 18th March, 2019	Lectures on production of quality planting material of spices in Konkan region, production and processing technology of Pepper, Cinnamon, Nutmeg and kokum, coconut-spices intercropping system were delivered to the farmers. Over 95 farmers took part in the training programme with a majority being female participants.
		Production technology of spices	RARS, Raigarh on 25th March, 2019	Lectures on INM & IPM in spices, Production technology of Ginger and Bush Pepper, Production technology of Goldgen champaka were included in the training. Over 80 farmers took part in the training programme.
20	Chaudhary Charan Singh Haryana Agricultural University, Hisar	Training programme on spices	HAU Main campus on 27th Feb., 2019	The Department of vegetable science cunducted the FT programme on production technology of spices crops at their centre. Training material and kit were distributed to the participants. Resource persons from the University handled the technical sessions. over 75 farmers including women took part in the programme.

			HAU Main campus on 6th March, 2019	FT programme on production technology of spices crops was conducted. Training material and kit were distributed to the participants. Resource persons from the University handled the technical sessions. over 75 farmers including women took part in the training.
			HAU Main campus on 22-23 Oct., 2018	A two day farmers training programe on cultivaiton of aromatic plants - opportunity, problems and solutions was conducted. Training material and kit were distributed to the participants. Resource persons from the University handled the technical sessions. over 75 farmers including women took part in the programme.
21	Punjab Agricultural University	Cultivation on Aromatic and spice crops	KVK, Bahowal, Hoshiarpur on 4th Feb., 2019	Importance, scope, uses, cultivation practices, processing and marketing of aromatic and spice crops were delivered. Twelve concerned resource persons/ speakers having expertise and experience on the subject were invited from PAU, Ludhiana and State Department of Agriculture, Punjab. 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 more informative by familiarizing the farmers with these crops. Besides technical know-how, the farmers were also benefitted through distribution of planting material comprising different herbal plants and turmeric seed of variety Punjab Haldi 1 (4 Kg/beneficiary). Over 75 Farmers took part in the programme.
		Cultivation on Aromatic and spice crops	KVK, Gurdaspur on 7th Feb., 2019	Importance, scope, uses, cultivation practices, processing and marketing of aromatic and spice crops were delivered. Twelve concerned resource persons/ speakers having expertise and experience on the subject were invited from PAU, Ludhiana and State Department of Agriculture, Punjab. 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 more informative by familiarizing the farmers with these crops. Besides technical know-how, the farmers were also benefitted through distribution of planting material comprising different herbal plants and turmeric seed of variety Punjab Haldi 1 (4 Kg/beneficiary). Over 75 Farmers took part in the programme.

22	Orissa University of Agriculture and Technology, Bhubaneswar	Organic Ginger and Turmeric Cultivation	Kalahandi on 28th Nov., 2018	Lectures were delivered on Scope and importance of organic turmeric and ginger cultivation, Govt. schemes, subsidy, credit facilities and marketing for turmeric and ginger cultivation, HYVs, seed treatments, planting techniques nutrient management and cultural practices for organic turmeric and ginger cultivation and Disease management in ginger and turmeric through organic way. Over 75 farmers including SC and ST farmers took part in the programme.
		Organic Ginger and Turmeric Cultivation	Kalahandi on 29th Nov., 2018	Lectures were delivered on Scope and importance of organic turmeric and ginger cultivation, Govt. schemes, subsidy, credit facilities and marketing for turmeric and ginger cultivation, HYVs, seed treatments, planting techniques nutrient management and cultural practices for organic turmeric and ginger cultivation and Disease management in ginger and turmeric through organic way. Over 75 farmers including SC and ST farmers took part in the programme.
		Organic Ginger and Turmeric Cultivation	HRS Pottangi on 29th Jan., 2019	Lectures were delivered on Different schemes of Horticulture under MIDH and organic farming schemes in Koraput district. Multiplication of bio -organisms of biofertilisers and biopesticides and Production of organic manures and use, application of biofertilisers in ginger and turmeric etc. were dealt in technical sessions. Around 80 farmers took part in the training.
23	University of Horticultural Sciences, Bagalkot	New production techniques in Turmeric and Ginger	College of Horticulture, Mysuru on 19th Sept., 2019	One day farmers training programme was conducted on "New Production Techniques in Turmeric and Ginger". 120 Farmers of from Mysuru, Mandya, Hassan, Chamarajanagara and Madikeri districts were participated and benefited by this training programme. New techniques of production, disease management and post harvest techniques was taught by expertise personnel to the farmers. Well experienced farmers also shared their views and problem faced by the farmers at ground level and suggested techniques they followed to overcome problems and encourage the new farmers in adopting the crop and also new technology. Exhibition was also organized to give

				farmers a practical understanding about the crop and new technologies. Technical leaf folder on "Single Node Seedling Production in Turmeric" was released and distributed to the participants. Displayed specimen of rhizomes of new varieties in turmeric and ginger. Demonstrated the production technology of single node seedlings in turmeric and ginger.
24	Indira Gandhi Krishi Vishwavidya-laya, Raipur	Cultivation, processing and marketing of Spices and Aromatic Crops	CoE, Maps & NTFP, KVK Durg on 4-5 Dec., 2018	The main emphasis of training was on the aspect of Post-harvest Techniques and processing of Turmeric and Ginger and preparation of value added products of aromatic oils. Literature regarding production technology and processing of Spices and Aromatic Crops were distributed to participants. At the end of training, certificates and Aromatic crop slips were distributed to participants. Over 75 farmers took part in the training programme.
		Cultivation, processing and marketing of Turmeric, Ginger, Spices & Aromatic crops	CoE, Maps & NTFP on 27-28 Dec., 2018	The main emphasis of this training was focused on Production and distillation of Aromatic oils and preparation of value added products. During this training, quiz based on aromatic crops and spices was conducted and winner farmers rewarded by Aromatic oil kit. Literature on production technology of Spices and Aromatic Crops were also distributed. At the end of training, certificates were distributed to participants. Principal Scientists and other Senior Scientists from the Univesity were the resource persons. Over 75 farmers took part in the training programme.
		Cultivation, processing and marketing of Turmeric, Ginger, Spices & Aromatic crops	KVK Korea (Tribal Area), CoE, Maps & NTFP on 10 - 11 Jan., 2019	In Korea district, turmeric is cultivated in homesteads by tribal farmers. Hence, the main emphasis of training was on Production, processing, diseases and pest management of turmeric, ginger & production technology of aromatic crops. During this training, literature of production technology and processing of Spices and Aromatic Crops were also distributed. Certificates and Aromatic plant Slips were distributed to participants on completion of the training.

		Cultivation, processing and marketing of Turmeric, Ginger, Spices & Aromatic crops	CoE, Maps & NTFP & Pt KLS CHRS, Rajnandgaon on 11-12 Feb., 2019	The main emphasis of training was on Production and post harvest technology of Turmeric. Literature of production technology and processing of Spices and Aromatic Crops were distributed. At the end of training certificates and Slips of Aromatic Crops were distributed to participants. Over 85 farmers took part in the programme
			CoE, MAPs & NTFP, IGKV Raipur on 26 -27 Feb., 2019	The main emphasis of training was on Production and distillation of Aromatic oils and preparation of value added products from aromatic oils. Literature of production technology and processing of Spices and Aromatic Crops were distributed to participants. At the end of training certificates were distributed to participants. Over 80 participants took part in the training programme.
25	Mahatma Phule Krishi Vidyapeeth, Rahuri	Cultivation and processing of turmeric	Agricultural Research Station, Kasabe Digraj, Tal.: Miraj, Dist.: Sangli on 7th Feb., 2019	Tranings were organised on the topics (a) Role of biostimulators in economical, residue free and sustainable turmeric production (b) Improved post harvest technology in turmeric (c) Management of insect pest and diseases of turmeric (d) Novel techniques in primary processing & opportunities in turmeric processing industry. Field visit was also organised. Over 90 farmers took part in the programme.
		Cultivation and processing of ginger	Agricultural Research Station, Kasabe Digraj, Tal.: Miraj, Dist.: Sangli on 8th Feb., 2019	Trainings were organised on the topics (a) Improved technology of Ginger cultivation and post harvest technology (b) Management of insect pest and diseases of ginger (c) Novel techniques & opportunities in ginger processing (d) Innovative approaches in ginger cultivation. Field visit was organised in the programme for the 90 farmers.
		Cultivation of medicinal and aromatic plants, garlic, chilli, turmeric and ginger	Medicinal and Aromatic Plants Project, MPKV, Rahuri on 14th Feb., 2019	Trainings were organised on 'perspectives and prospects of medicinal and aromatic plants, its cultivation and importance of it in the global market'. Lectures were delivered on the processing and improved production technology of these crops, Chilli, Garlic, Ginger and Turmeric. Over 120 farmers attended the training programme.

26	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	Training programme on spices	KVK Dhar on 16th Sept., 2018	The potential of Chili, Ginger, Turmeric, coriander Onion & Garlic crops in Dhar district were discussed and so emphasis should be given on scientific management, value addition, storage & marketing of spice crops.
		Training programme on spices	KVK Manawar on 5th Oct., 2018	Scope of spice production in Nimar Valley and role of spices cultivation in doubling farmers income was discussed. Income and employment generation may change farmers' livelihood. It was suggested that Chilli, Ginger, Turmeric, Coriander have much potential & emphasis should be given on scientific management, value addition, storage & marketing of these spice crops.

Fig. 149. Inauguration of state level seminar held at IISR -KVK Peruvannamuzhi, Kozhikode

Fig. 150. State level seminar on spices held at BCKV, West Bengal

Fig. 151. District level seminar on spices held at CSAU, Kanpur

Fig. 152. Field visit during district level seminar conducted by CSAU, Kanpur

Fig. 153. Distribution of pepper seedlings to participants of seminar on Climate resilient technologies for Spice crops in the high ranges

Fig. 154. District level seminar conducted at AU, Jodhpur

Fig. 155. District level seminar organised by NRCSS, Ajmer

Fig. 156. District level seminar held at KVK Kannur by KAU

Fig. 157. District level seminar conducted by DMAPR, Anand

Fig. 158. District level seminar for Palakad District organised at RARS, Pattambi by KAU

Fig. 159. District level seminar for Wayanad District organised at RARS, Ambalavayal by KAU

Fig. 160. District level seminar held at MPUAT, Udaipur

Fig. 161. District level seminar on spices organised at Periyakulam

Fig. 162. District level seminar organised by Dr. YSPHU, Solan at KVK, Berthin

Fig. 163. Release of publications during district level seminar held at HRS Chintapalli

Fig. 164. Participants at district level seminar organised by UAS Bangalore

Fig. 165. Regional workshop organised by BUAT for Bundelkhand region

Fig. 166. Farmers training on production and export on spices at Sirsi

Fig. 167. Training on organic ginger and turmeric cultivation organised by OUAT at Kalahandi

Fig. 168. FT on Pepper cultivation conducted at PRS Panniyur

Fig. 169. Spices planting material distributed during FT at CIARI, Portblair

Fig. 170. FT organised at Nagaland Agri University

Fig. 171. Training on QPM in Turmeric held at Navsari Agri University

Fig. 172. Planting material distribution during FT conducted at Raigad

Fig. 173. Training on spices conducted by BSKKVP at Asond

Fig. 174. Participants at training organised by Assam Agri University

Fig. 175. Training on spices conducted by PDKV, Akola

Fig. 176. Exhibition of spices organised in connection with FT conducted at IISR, Kozhikode

Fig. 177. Inauguration of FT organised at IISR-CRC Appangala

Fig. 178. Training programme organised at SDAU, Jagudan

Fig. 179. Farmers training organised at RAU, Bihar

Fig. 180. Training for SHGs organised by IGKV, Raipur

Fig. 181. Training on Spices and aromatic plants organised by MPKV Rahuri

Fig. 182. Distribution of NDH-1 Turmeric seed material during training at NDUAT

Fig. 183. Training on spices held at HAU, Hisar

Fig. 184. Training conducted by CSAUAT at Kanpur Nagar

Fig. 185. Planting material of aromatic plants distributed at FT organised by PAU, Ludhiana

Fig. 186. Participants of FT programme on aromatic and spice crops organised by PAU

Fig. 187. Farmers field visit during training held at SKUAST, Shalimar

Fig. 188. Farmers at training programme on temperate spices organised by SKUAST

Fig. 189. Participants at training programme organised by SKLTSHU

Fig. 190. Farmers visiting exhibition of turmeric varieties organised in connection with turmeric fest

Fig. 191. FT on aromatic plants organised by DMAPR, Anand

Fig. 192. Farmers participated in the TOT organised at Manawar by RVSKVV, Gwalior

Fig. 193. Release of publication during FT conducted at AU, Jodhpur

Fig. 194. FT conducted on spice cultivation by Dr.YSPHU, Solan at Amarpur Panchayat

Fig. 195. Training on Turmeric and Chilli organised at Krishnanagar, Kurnool by Dr. YSRHU, Andhra Pradesh

Fig. 196. FT organised by SVBPUAT at KVK, Saharanpur

Fig. 197. Farmers attending FT organised by SKNAU Jobner at KVK, Khumer, Bharatpur

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 Twelfth Annual Review meeting of the MIDH programmes implemented through the Directorate of Arecanut and Spices Development, was held on 26 – 27 June, 2018 at the IGKV, Raipur, Chhattisgarh. There were 70 participants representing 45 agencies implementing DASD programmes.

The inaugural session began at 11.00 AM after registration of the Delegates. Dr. Arun Tripathi, IGKV, Raipur welcomed the participants. Dr. Homey Cheriyan, Director, DASD conveyed the objectives of the Review Meeting in his Introductory address. He briefed the audience about the changes in perception to be brought in the implementation of MIDH programmes and briefly explained the importance of nucleus planting material production programmes and the new programmes proposed by the Directorate like outcome-based skill training programmes, nursery accreditation programme, micro rhizome technology for seed production in ginger etc. Dr. S.K. Patil, the Hon'ble VC of IGKV presided over the inaugural function. Dr. Gopal Lal, Director, NRCSS made a special address on seed spices. Dr. B.N.S. Murthy, Horticulture Commissioner, Govt. of India was the Chief Guest and inaugurated the review meeting. In the inaugural address, he highlighted the importance of spices in Indian economy. Dr. S. S. Tuteja, IGKV, Raipur proposed vote of thanks.

After a break for tea, the technical sessions began at 12.00 Noon. The Review Team consisted of Dr. B.N.S. Murthy, Horticulture Commissioner, Dr. Homey Cheriyan, Director, DASD, Dr. Femina, Deputy Director, DASD and Shri. Babulal Meena, Asst. Director, DASD. The institute-wise power point presentations on scheme activities undertaken was done by the representative delegates. The review team critically evaluated the performance of each implementing agency and offered comments.

Director, DASD in his closing address mentioned the following points:

(a) In order to ensure quality planting material, all the spice nurseries under Govt./ private agencies have to get accredited under the Accreditation programme of DASD. Therefore, the applications for recognizing nurseries may be sent to the Directorate immediately.

(b) It was noticed that the implementing agencies are not submitting the AUCs. AUCs are mandatory and should be submitted in time.

(d) The revalidated funds of the previous year are to be utilized first and on the approved components only. Only then the current years funds are to be utilized.

(e) For all project based programmes such as Seed infrastructure and Nursery Centre, a completion report is to be sent to DASD.

(f) It will be the responsibility of the PI to collect the reports from different implementing centres and submit the consolidated report to DASD. The PI should ensure prompt correspondence with the Directorate.

(g) The implementing agencies who agreed to take up skill development training programmes in 2017-18 should confirm their programmes and share details of trainers at the earliest.

(h) All the implementing agencies will be provided with user name and password for uploading stock of planting material in the DASD website 'www.spicenurseries.in'. Availability of planting material of spices under scheme/non scheme at each centre must be uploaded in the site without fail.

(i) All the successfully implemented programmes like FLDs, micro irrigation and innovative projects need to be documented and the reports should be sent to the Directorate for publishing in the journal of the Directorate.

(j) Success stories to be made and sent to DASD from time to time.

Dr. B.N.S. Murthy, Horticulture Commissioner in his concluding remarks, appreciated the good work done by most of the Universities and hoped others would also rise to the expected levels and stated that continuation of MIDH scheme in the Universities can be justified only if sufficient level of breeder seed production of released HYVs is made at SAUs. Therefore, Universities must focus more to produce nuclear seeds and planting material of released / notified varieties of spices for further multiplication and distribution. He requested all agencies to compile the success stories and send to DASD for uploading on the DASD Website as well as on the Kisan Channel. As regards, establishment of Frontline Demonstration plots, the HC insisted that a comparative assessment has to be made to show the results obtained through organic farming and otherwise. The technology imparted/used should be recorded and the results are to be supported with sufficient data. Then the same should be sent in the form of a report to DASD. The Horticulture Commissioner then thanked one and all for the support and success at the venue. He wished the participants all success.

Dr. Femina, Deputy Director, DASD delivered the formal Vote of Thanks. She thanked the Horticulture Commissioner, the VC, all other officials of IGKV, all participants of the Review Meeting and each and every one who contributed to make the function a success.

Fig. 198. Inauguration of review meeting by Dr. B.N.S. Murthy, Horticulture Commissioner

Fig. 199. Inaugural address

Fig. 200. Presentation of MIDH annual report by delegates

Fig. 201. View of the participant delegates from SAUs/ICAR institutes

202. Delegates

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 since its inception. In 2008, the Directorate of Arecanut and Spices Development 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 advance estimates for 2018-19, production of spices in the country is 91.99 lakh tonnes from an area of 38.92 lakh ha, which registered a decline of 4.25% in production and 0.53% in area when compared to 2017-18. Among the various spices, ginger, turmeric, fennel, cinnamon, mint 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 2017-18 and 2018-19 are given below.

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

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

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

Crops	2017-18			2018-19 (Adv. Est.)		
	Area	Production	Productivity	Area	Production	Productivity
Black Pepper	139.487	71.488	513	138.929	62.425	449
Ginger (Fresh)	168.989	1,794.56	10,619	173.58	1,845.66	10,633
Red Chillies	678.88	1718.20	2,531	721.15	1689.52	2,343
Turmeric (Dry)	231.637	863.460	3,728	245.255	929.967	3,792
Garlic	409.72	3,113.74	7,600	354.30	2,848.02	8,038
Cardamom	82.17	28.31	345	76.81	22.17	289
Coriander	544.24	721.39	1,326	468.07	567.21	1,212
Cumin	966.17	689.42	714	1,027.83	607.97	592
Fennel	65.81	103.83	1,578	90.39	157.35	1,741
Fenugreek	149.33	213.34	1,429	121.78	188.59	1,549
Ajwan	35.42	24.21	683	35.12	22.70	646
Dill/Poppy/Celery	35.91	34.04	948	29.94	30.20	1,009
Cinnamon/Tejpat	2.69	5.08	1,889	2.26	5.11	2,265
Nutmeg	23.47	15.11	644	18.60	12.34	663
Clove	2.21	4.29	1,938	2.23	1.86	836
Tamarind	45.34	175.47	3,870	47.71	174.43	3,656
Vanilla	0.88	0.31	350	0.89	0.32	359
Mint (Mentha)*	327.63	32.74	100	333.90	34.05	102
Saffron	3.69	0.01	1	3.45	0.004	1
Total	3913.66	9608.98	2455	3892.185	9199.903	2364

*Mint production in terms of mentha oil

Pepper production in the world was estimated as 5.25 lakh tonnes from an estimated area of 4.89 lakh ha in 2018 against a production of 5.15 lakh tonnes from 4.77 lakh ha during 2017. In 2015, India ranks 3rd in pepper production with 65,000 tonnes. As per 2018, estimates India ranks 2nd in terms of production with 0.715 lakh tonnes of pepper from 1.39 lakh ha. Vietnam is the largest pepper producing country with a production 2.05 lakh tonnes from 1.13 lakh ha.

Table 2. Country wise area, production and yield per hectare of pepper during 2017 and 2018

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

Country	2017			2018		
	Area	Production	Yield	Area	Production	Yield
Brazil	27730	65000	2344	28000	67000	2393
India	134281	62080	462	139487	71488	513
Indonesia	117500	75000	638	116375	70000	602
Malaysia	17000	23500	1382	17437	31045	1780
Sri Lanka	36221	29545	816	40241	20135	500
Vietnam	110000	200000	1818	113000	205000	1814
China	20000	26000	1300	20000	26000	1300

Madagascar	4000	5000	1250	4000	5000	1250
Thailand	500	4000	8000	500	4000	8000
Cambodia	6700	20000	2985	6700	20000	2985
Ecuador & Others	2800	5000	1786	2800	5000	1786
Total	476732	515125	1081	488540	524668	1074

Source: India- DASD, Other countries- IPC

1.2 Arecanut

Arecanut production in the country was 9.06 lakh tonnes from an estimated area of 5.20 lakh ha in 2017-18. As per the advance estimates for 2018-19, area of Arecanut have marginally decreased to 5.18 lakh ha and production has decreased to 8.53 lakh tonnes. Karnataka, Kerala, Assam, Meghalaya, West Bengal etc. are the major arecanut growing states in the country. All India estimates of area, production and productivity of arecanut in India during 2017-18 and 2018-19 are given in Table 3.

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

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

State	2017-18			2018-19		
	Area	Production	Yield	Area	Production	Yield
Karnataka	279.46	606.18	2169	279.00	600.00	2151
Kerala	94.58	108.52	1147	94.71	67.50	713
Assam	80.81	77.90	964	81.62	78.68	964
Meghalaya	18.21	23.99	1317	17.36	25.11	1446
West Bengal	11.58	22.95	1982	11.520	22.582	1960
Tamil Nadu	6.74	14.93	2215	6.838	11.428	1671
Tripura	5.99	20.41	3409	5.18	17.50	3377
Mizoram	12.14	8.38	690	12.14	9.10	750
Andaman & Nicobar Islands	4.70	10.50	2234	4.57	10.15	2220
Maharashtra	1.81	2.87	1590	1.827	3.384	1852
Goa	1.84	3.30	1797	1.836	3.296	1795
Andhra Pradesh	1.92	3.31	1729	0.976	0.787	806
Nagaland	0.39	2.30	5897	0.607	3.513	5785
Pondicherry	0.05	0.08	1500	0.051	0.090	1765
All India	**520.205**	**905.612**	**1741**	**518.236**	**853.114**	**1646**

Country-wise area and production of arecanut were collected from Food and Agriculture Organization, Rome. The latest available data are of 2017. World production of arecanut in 2017 was estimated as 13.97 lakh tonnes from an area of 9.83 lakh ha against 13.80 lakh tonnes from 9.72 lakh ha in 2016. India accounts for 49% of area and 56% of production of Arecanut in the world.

Table 4. Country-wise area and production of Arecanut

Country	2016			2017		
	Area (Ha)	Production (tonnes)	Yield (kg/ha)	Area (Ha)	Production (tonnes)	Yield (kg/ha)
India	472679	774019	1638	482236	782554	1623
Indonesia	138000	135000	978	141649	136837	966
China, Taiwan Province of	42576	99992	2349	44738	102165	2284
Myanmar	61832	142450	2304	63072	147524	2339
Bangladesh	203519	121448	597	197244	119039	604
Sri Lanka	18175	44689	2459	18722	46333	2475
Thailand	22430	38105	1699	22575	38429	1702
Nepal	3905	14225	3643	3918	14390	3673
Bhutan	8998	9467	1052	8467	8931	1055
Malaysia	83	303	3651	94	328	3489
Kenya	NA	114	NA	NA	114	NA
Maldives	21	22	1048	25	25	1000
Total	**972218**	**1379834**	**1419**	**982740**	**1396669**	**1421**

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.

As per the data collected from Spices Board, Cochin, export of spices from India during 2018-19 was 1,063,020 tonnes valued at Rs. 18,845.00 crore (US $ 2710.44 million). The export has increased 3.4% in volume and 5% in value as compared to last year. Chilli continued to propel the growth story as India's largest exported spice, accounting for Rs. 4,520.00 crores in value and 519,130 tonnes in quantity. Export of chilli, turmeric, coriander, cumin, curry powder/paste, registered a significant increase during this year. Export of pepper, ginger, garlic, fennel, fenugreek, celery, nutmeg & mace, spice oils and oleoresins other spices and mint products decreased during the year 2018-19.

Table 5. Estimated export of Spices during 2017-18 and 2018-19

Spices	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Pepper	16,840	82,078	13,730	57,166
Cardamom (Small)	5,680	60,909	3,320	39,052
Cardamom (Large)	760	5,646	1,040	7,505
Chilli	443,900	425,633	452,000	519,130
Ginger	22,605	21,607	17,550	18,583
Turmeric	107,300	103,567	129,100	125,666

Coriander	35,185	27,275	48,550	35,079
Cumin	143,670	241,799	170,750	273,590
Celery	6,480	5,950	6,020	6,569
Fennel	34,550	25,906	25,850	24,230
Fenugreek	29,280	12,689	26,720	12,809
Other seeds (1)	22,175	16,046	29,590	18,567
Garlic	46,980	30,936	25,840	14,146
Nutmeg & Mace	5,500	22,094	3,270	14,614
Other spices (2)	38,305	65,253	40,850	60,345
Curry powder/Paste	30,150	61,620	33,500	74,440
Mint Products (3)	21,500	322,835	20,750	353,875
Spice Oils and Oleoresins	17,200	266,172	14,590	229,135
Total	**1,028,060**	**1,798,016**	**1,063,020**	**1,884,501**
Million US $		**2,789.35**		**2,710.44**

(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 2018-19, import of spices in the country registered an increase of 0.53% in terms of quantity and in terms of value, it increased by 0.6%. In 2018-19, India imported 207300 tonnes of various spices and spice products valued at 724.18 million US $ against the import of 206,205 tonnes valued at 776.07 million US $ in 2017-18. In 2018-19, Turmeric is the major item in the import contributing 14.7% of the total spices imported followed by Ginger (14.5%), cassia (13.5%), other spices (12.5%), pepper (12%) etc. are the major spices imported into the country during the period. Item-wise import of spices during the year 2017-18 and 2018-19 are given below.

Table 6. Import of Spices in India during 2017-18 and 2018-19

Spices	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Pepper (1)	29650	109084	24950	77991
Cardamom (Small)	685	4379	479	4136
Cardamom (Large)	5670	33109	3343	17599
Chilli/Paprika	1450	2700	1230	1961
Ginger Fresh/Dry	34,300	10060	30085	16154
Turmeric	17,120	18434	30578	29947
Coriander	28040	13200	13230	5609
Cumin black/white	3420	6066	950	1831
Mustard Seed	300	216	30	48
Poppy seed	8540	14005	18450	31788
Garlic	450	988	445	719
Clove	19510	96759	16940	82139
Nutmeg	530	1817	1195	4551

Mace	1750	11888	1890	15817
Cassia	26430	33251	28180	42133
Star anise	7900	15107	5825	12019
Other spices (2)	16880	77611	26090	107447
Oils & Oleoresins (3)	3580	51545	3410	51314
Total	**206205**	**500217**	**207300**	**503206**
Value in Million US $		**776.07**		**724.18**

(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 commodity, 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. Majority of the export is in the form of whole arecanut. During 2018-19, export of arecanut has decreased substantially and India could export only 2162 tonnes of arecanut valued at Rs. 62.55 crores against an export of 4614 tonnes valued at Rs. 67.88 crores in 2017-18. Nepal, Maldives, UAE, USA etc. are the major export destinations of Indian arecanut.

Table 7. Country-wise export of Arecanut from India

Country	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in Lakhs)	Quantity (tonnes)	Value (Rs. in Lakhs)
Maldives	781	2191	911	2718
UAE	201	543	478	1208
U S A	233	554	193	596
Nepal	1758	1904	126	328
Sri Lanka	53	117	115	318
U K	80	219	103	347
South Africa	22	71	28	150
Kenya	8	12	28	29
Canada	41	94	27	84
Malaysia	87	536	23	135
Mauritius	12	29	18	53
Australia	10	48	15	71
Congo D. Rep.	2	9	15	27
Lebanon	9	4	13	9
Mozambique	1	4	12	11
Bangladesh	1220	165	1	3
Others	97	287	57	167
Total	4614	6788	2162	6255

Table 8. Product-wise export of arecanut from India

Product	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Arecanut, whole	1281.95	3239.76	1220.73	3704.79
Arecanut, split	1615.41	1695.68	462.80	1174.61
Arecanut, ground	160.72	332.09	0.80	2.02
Other arecanuts	1556.12	1520.71	477.80	1373.50
Total	4614.20	6786.24	2162.13	6254.92

In 2016-17 and 2017-18, the import of Arecanut in the country registered a significant decline compared to 2015-16. But in 2018-19, import increased by around 7,000 tonnes. In 2018-19, India imported 18,152 tonnes of arecanut valued at Rs. 427.64 crores against an import of 11,875 tonnes valued at Rs. 304.32 crores. Usually arecanut is imported in the form of whole, split and other arecanuts. Sri Lanka and Indonesia are the two major sources of arecanut import in the country. Country-wise import of Arecanut in the country during the last two years are given below.

Table 9. Country-wise import of Arecanut in India

Country	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in lakh)	Quantity (tonnes)	Value (Rs. in lakh)
Sri Lanka	11837	30404	10993	29059
Indonesia	36	23	7124	13637
Vietnam			32	57
Afghanistan			3	9
Pakistan	2	5		
Australia			0.4	2
Total	11875	30432	18152	42764

Table 10. Product-wise import of Arecanut in India

Product	2017-18		2018-19	
	Quantity (tonnes)	Value (Rs. in lakhs)	Quantity (tonnes)	Value (Rs. in lakhs)
Arecanut, whole	276	708	921	2012
Arecanut, split	89	159	3383	3746
Other arecanuts	11510	29564	13849	37005
Total	11875	30431	18152	42764

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 instability affects both producers and consumers and has macroeconomic implications as well. Bearing this in mind, the Directorate has rightly put one of its mandate 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 Department 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)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
April	60274	38754	13156	13500	4312	7750
May	53560	38450	12156	13833	4000	7875
June	51452	37754	11700	15500	3600	8800
July	50320	35246	11531	15500	4812	8375
August	49968	37952	12718	15500	5410	8150
September	46620	40073	13406	15500	6000	8000
October	44700	39345	13500	17250	6000	8000
November	42891	39436	13500		6500	8000
December	43492	38696	13500	20500	5800	8250
January	43880	37138	13500	20500	6812	7375
February	41761	36358	13500	28500	7167	7125
March	39556	34652	13500	26750	7875	7550
Mean	47373	37821	12972	18439	5691	7938

(Price Rs/quintal)

Month	Turmeric (Chennai)		Garlic (Chennai)		Coriander (Chennai)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
April	11750	12000	4300	2250	7875	6450
May	11625	12375	4487	2250	7813	6400
June	11350	12280	4900	1950	7500	6280
July	11600	12000	4875	3000	6875	6350
August	12000	12000	4850	3900	6950	6850
September	12000	12000	5250	4000	7000	6825
October	12000	12000	6125	4500	7825	6875
November	12000	11900	6250	3950	8000	7860
December	12000	11750	3750	2875	7400	7875
January	12000	11750	3500	3687	7000	7500
February	12000	11750	2937	4362	7000	7625
March	12000	11750	2460	3900	6700	8000
Mean	11860	11963	4474	3385	7332	7074

Table 11 contd...

(Price Rs quintal)

Month	Cumin (Chennai)		Fennel (Chennai)		Fenugreek (Chennai)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
April	20387	16675	10125	10067	4781	4583
May	20000	16550	8500	10050	4125	4850
June	19400	17230	8500	10280	3940	4890
July	19875	19375	9125	10950	4175	4887
August	20240	20240	9750	10910	4330	5070
September	19800	19737	9750	10837	4225	4912
October	19625	20500	9187	10850	4018	4875
November	19925	20870	9075	11340	3937	5280
December	20790	20700	9680	10925	3940	5400
January	21600	18700	9475	10400	4450	5400
February	19987	18137	10000	10250	4375	5375
March	18230	17880	9860	10350	4180	5280
Mean	19988	18883	9419	10601	4206	5067

Table 11 contd...

(Price Rs quintal)

Month	Tamarind (Chennai)		Ajwan (Chennai)		Mace - Rs/kg (Cochin)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
April	10750	15450	10437	10583	534	443
May	9687	14500	10250	10500	435	389
June	9500	14900	10250	10650	450	300
July	9500	14750	9875	11250	344	468
August	11100	14500	9600	10950	398	600
September	12500	15125	9750	10500	350	558
October	12812	16000	9187	10500	354	550
November	14687	15300	8750	10710	450	677
December	17900	14562	8900	14875	478	700
January	16700	14750	10625	14500	500	882
February	16725	13875	10975	14625	500	900
March	15840	29800	10750	14500	500	729
Mean	13142	16126	9946	12012	441	600

Table 11 Contd...

(Price Rs/quintal)

Month	Clove (Cochin)		Nutmeg without shell (Cochin)		Arecanut-Dry (Kozhikode)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
April	63182	68391	42045	34043	20600	20000
May	63458	69440	33146	31365	19375	19625
June	67928	72056	32000	30000	18125	20300
July	68980	74880	27923	34520	19125	19575
August	68596	73706	29000	40062	19300	20034
September	68476	72295	31500	41325	19125	23063
October	69159	72354	29261	41000	19250	22875
November	67900	72763	31000	43800	19875	23760
December	67260	73333	33374	42175	20300	23500
January	66442	72136	36846	45590	21500	24066
February	67152	69318	34804	42263	21000	22625
March	66791	63062	34660	41381	21000	21500
Mean	67110	71145	32963	38960	19913	21744

4. Training cum workshop for Chief Nodal Officers of Shosa

To strengthen the system of collection, compilation and dissemination of horticultural statistics, especially area, production and productivity of horticulture crops in the country, the Horticulture Statistics Division of the Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) has initiated to put in place, a State Horticulture Statistics Authority (SHOSA) in each State and directed the State to designate Director level officer as a Chief Nodal officer. This workshop was organised by the Horticulture Statistics Division of DAC&FW in association with Directorate of Arecanut and Spices Development (DASD) at ICAR-Central Coastal Agricultural Research Institute, Old Goa to familiarize the Chief Nodal officer with the statistical methods of collection and compilation of data and to give a hands on training on uploading the data in the official web portal of HAPIS.

The Training-cum-Workshop was inaugurated by Smt. Sudha P. Rao, Principal Adviser, DAC&FW and presided by Smt. Mamta Saxena, Adviser (Hort.) & Dr. Vidya Dhar, Additional Director General, DAC&FW. Dr. Homey Cheriyan, Director, DASD welcomed the delegates and highlighted the emergence of horticulture crops as a prominent sector which would play an important role in improving the income and life of the farmers of the country. Dr. E.B. Chakurkar, Director, ICAR-CCARI was also a special invitee for the function.

In the training, presentations were made on the important topics such as

- Role of Horticulture Statistics Division in improving Horticulture Statistics System by DAC&FW by Dr. R. P. Gupta, Consultant, Horticulture Statistics, DAC &FW.
- Anomalies in Spices Statistics and action taken on the recommendations of 3rd NCM on Spices Statistics at Trivandrum by Dr. Homey Cheriyan, Director, DASD.
- Methodology to be developed by IASRI for estimation of area and production of major spices by Dr Prachi Misra Sahoo, Principal Scientist, IASRI.
- Application of Remote Sensing and GIS in Horticulture Statistics (CHAMAN Project) by Dr M.M. Kimmothi, Consultant, MNCFC.
- Demonstration of Horticulture Area and Production Information System (HAPIS) by Dr. Mamta Saxena, Adviser, Horticulture Statistics Division, DAC & FW.

A hands on training were also given to all the delegates for data entry and report generation in HAPIS.

The major initiatives taken to improve Horticulture Statistics can be summarized as follows:

- **Horticulture Area Production Information System (HAPIS)** - A web enabled work flow based system, which enables crop wise data entry at block and District level and consolidation, validation at State/District level and effective monitoring at central level.
- **State Horticultural Statistics Authority (SHOSA).** The state nodal officer should develop a network system to contact once in a month or so to district level officer either through telephone or video conference or other mode of communication for collecting monthly the status of horticultural crops like pest & diseases, vegetative growth, flowering and fruiting along with trends in area and production of important crops.
- **Coordinated Programme on Horticulture Assessment & Management using geo informatics (CHAMAN) -** The project for assessment and development of Horticulture at a cost of Rs.13.38 crores, has two components, viz. Remote Sensing Technology and Sample Survey methodology.

Finally delegates from various states/UT's and National Level Agencies raised their issues in data generation and reporting. Dr. Mamta Saxena, Advisor (Hort), highlighted the untimely reporting of data from the state departments and also about the variation in the methodologies adopted by various state departments. She insisted all the states to call for a meeting for reconciliation and rectify anomalies before sending data to Ministry.

The following major decisions were taken in the meeting to improve the horticulture statistics in the country.

1) For collection of horticulture data, the current system may be continued, with efforts to improve it as far as possible.
2) There is a need to strengthen the ground level network system for horticulture statistics so as to enable collection of village level horticulture information, to be aggregated at block level.

3) States may ensure timely reporting of data as per schedule to the HSD, DAC & FW. Before submission, the State level data aggregated from the districts may be reconciled.

4) All States, who have not designated a nodal officer as State Horticulture Statistics Authority (SHOSA), (e.g. Kerala, Jammu & Kashmir, Manipur, Dadra & Nagar Haveli, Daman & Diu, Delhi and Lakshadweep) may do so at the earliest.

5) States submitted that the shortage of staff was a handicap in submission of accurate and timely data. It is, therefore, imperative that state governments may fill up the existing vacant posts and if required additional manpower may be provided. However, HAPIS facilitates faster compilation and transmission of data and reporting in HAPIS three times a year may not require extra manpower.

6) The states would be ranked in the order of performance based on the following parameters.

   a) Methodology being used.

   b) Technology (Remote Sensing Crop Assessment) used.

   c) Quality of Data

   d) Entry of data in HAPIS - at districts and state levels for various estimates.

   e) Timely submission of data in HAPIS

7) States may report Ginger in fresh form and Turmeric in processed form. DASD may apply the conversion factor (4.65) for ginger, if reported in dry form.

8) For Turmeric, conversion factor (0.20) may be applied for converting fresh to processed form.

9) Red and green chillies may be reported separately.

10) Include curry leaf and mint in the list of spices from 2017-18 onwards. For Curry leaf, estimate, Andhra Pradesh may share the methodology with DASD.

11) Area recorded under pepper may be reviewed and the methodology may be Improved for area estimation of pepper in the State immediately in Karnataka.

12) For mint, Department of Horticulture, UP may take necessary steps to provide reliable estimates on area and production. Remote sensing technology may also be utilized for estimation of area & production of mint.

13) Garlic production in the State of Madhya Pradesh has gone up from 4 lakh tonnes to 18 lakh tonnes and productivity is 11 tonnes per hectare. State may examine the data and give necessary clarification in this regard.

14) Remote sensing techniques may be developed for estimation of area/ production of Brinjal, Cauliflower and Pappaya.

15) Rajasthan may report data of Mehandi and Ishabgol separately.

16) Month/season-wise breakup should be added to NIC in HAPIS.

17) Jammu & Kashmir may report the data of aromatic and medicinal plants.

Fig. 1. Smt. Sudha P. Rao, Principal Adviser inaugurated the programme by lighting the lamp

Fig. 2. Smt. Mamatha Saxena, Adviser (Hort.) lighting the lamp

Fig. 3. Dr. Homey Cheriyan, Director, DASD, welcoming the delegates

Fig. 4. A view of the audience

Fig. 5. Group photo of the participants

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 as 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

1.1 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.150/-.

Fig. 1. Cover pages of published journals

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. The Directorate had 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. The Directorate participated in 10 National/State level exhibitions during the period under report as given below.

1. Karshikam 2018 an Agricultural Exhibition cum sale of various agricultural produce, organic and value added products, agricultural inputs, agro machinery, innovative agricultural production technologies etc. from 17-18 May, 2018 held at Government Model School Ground, Calicut, Kerala organized by K.A. Keraleeyan Smaraka Samiti with the cooperation of M.S. Swaminathan Research Foundation.
2. Exhibition arranged in connection with the State Level Farmers' Day Celebrations from 12-16 August, 2018 at Safari Grounds, Edappal, Malappuram District, Kerala organized by the Department of Agriculture, Government of Kerala.
3. The Directorate had participated in the Krishimela held at Shimoga from 12-15 October, 2018 organised by the University of Agricultural and Horticultural Sciences, Shimoga, Karnataka.
4. 2nd Malabar Innovation Festival during 14-15 November, 2018 held at Regional Science Centre & Planetarium, Kozhikode, Kerala.
5. Farmers' Mela – Spice Fest during 22-23 December, 2018 arrranged in connection with the inauguration of Advanced Laboratory for Post Harvest Technology held at IISR, Kozhikode, Kerala.
6. Krishi Unnati-mela (Vaiga-2018) held at Thrissur, Kerala during 27-30 December, 2018 organised jointly by the Ministry of Agriculture & Farmers Welfare, Government of India and Agriculture Department, Government of Kerala.
7. Exhibition "Malayora Mahotsavam" at Mukkam, Kozhikode District, Kerala from 11-20 January, 2019.
8. Calicut Flower Show held at Beach Ground, Calicut, Kerala from 25.1.2019 to 3.2.2019 organised by Calicut Agri Hort. Society.
9. District Kisan Mela organized by ATMA, Kozhikode from 22 to 23 February, 2019 at Agricultural Urban Wholesale Market, Vengeri, Kozhikode, Kerala.
10. Exhibition in connection with the Technology Week at KVK, IISR, Peruvannamuzhi, Kozhikode, Kerala from 12-15 March, 2019.

Fig. 2. Karshikam exhibition at Calicut

Fig. 3. The Farmers Day celebration at Edappal

Fig. 4. Krishi Mela at Shimoga

Fig. 5. Malabar Innovation Festival at Regional Science Centre & Planetarium, Kozhikode

Fig. 6. Farmers Mela at IISR, Kozhikode

Fig. 7. Krishi Unnati Mela at Thrissur

Fig. 8. Malayora Mahotsavam at Mukkam

Fig. 9. Calicut Flower Show

Fig. 10. Technology Week at KVK, IISR, Peruvannamuzhi

5. OFFICIAL LANGUAGE

राजभाषा कार्यान्वयन

सरकार की राजभाषा नीति का कार्यान्वयन प्रभावपूर्ण बनाने के उद्देश्य से सुपारी और मसाला विकास निदेशालय सक्रिय है। निदेशालय के 80 प्रतिशत से अधिक कर्मचारी हिंदी में कार्यसाधक ज्ञान प्राप्त कर लिए हैं। यह कार्यालय 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 कार्यान्वयन में तेज़ी लाने 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	सहायक निदेशक	हिंदी संपर्क अधिकारी
श्री. मधु एन.	अनुसंधान अधिकारी	सदस्य
श्री. सी. सनमुख सुंदरम	अधीक्षक	सदस्य
श्रीमति सी.वी. दिव्या	वरिष्ठ तकनीकी सहायक	सदस्य
श्री. के. मनोज कुमार	साँख्यकीय अन्वेषक	सदस्य
श्री. के.वी. राजेश	अवर श्रेणी लिपिक	सदस्य
डॉ. पी.एन. ज्योति	कनिष्ठ अनुवादक	सदस्यसचिव

राजभाषा के प्रयोग में हुई प्रगति की जायजा लेने 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 नियमों के अनुसार 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 द्विभाषी रूप में जारी किए जाते हैं। कार्यालय में पूर्णतः हिंदी अंग्रेज़ी द्विभाषी मोहरों का प्रयोग किया जाता है। अधिकारियों और अनुभागों के नाम पट्ट, सूचना बोर्ड, कार्यालय

वाहन, बैनर आदि द्विभाषी रूप में है। रजिस्टरों और सेवा पंजियों में प्रविष्टियाँ हिंदी में की जाती है। निदेशालय का नाम बोर्ड त्रिभाषी मलयालम हिंदी अंग्रेज़ी में है।

आज का शब्द

कर्मचारियों के बीच हिंदी में प्रयुक्त शब्द एवं वाक्यांशों का परिचय देने के उद्देश्य से व्हाइट बोर्ड पर हर दिन अंग्रेज़ी 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 हर वर्ष निदेशालय में हिंदी दिवस/पखवाड़ा आयोजित किया जाता है। इस वर्ष 13 सितंबर, 2018 को हिंदी पखवाड़ा का शुभारंभ किया। डॉ. होमी चेरियान, निदेशक ने दीप जलाकर पखवाड़ा का उद्घाटन किया। उन्होंने सभी स्टाफ सदस्यों को हिंदी के प्रयोग करके अपना संवैधानिक दायित्व मानने का आह्वान किया। पत्राचार में हिंदी या द्विभाषी रूप में पत्र भेजने का अनुरोध किया। डॉ. फेमिना, उप निदेशक ने स्वागत भाषण दिया। श्री. बाबुलाल मीणा, सहायक निदेशक ने हर अनुभाग में हिंदी के प्रयोग बढ़ाने का अनुरोध किया। डॉ. पी.एन. ज्योति, कनिष्ठ अनुवादक ने हिंदी से संबंधित संवैधानिक प्रावधानों और नियमों का विवरण दिया और पखवाड़ा केलिए प्रस्तावित कार्यक्रमों का ब्योरा प्रस्तुत किया।

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 औऱ मसाले फसलों एवं औषधीय पौधों से संबंधित नई सूचना सामग्रियाँ भी प्रदर्शनी में शामिल की गई।

कर्मचारियों को हिंदी के प्रयोग के लिए प्रेरणा एवं प्रोत्साहन देने के उद्देश्य से पखवाड़े के दौरान हिंदी में विभिन्न प्रतियोगिताएँ आयोजित की गई। टिप्पण आलेखन, टंकण, तकनीकी शब्दावली, हस्तलिपि, अंताक्षरी, हिंदी पढ़न आदि प्रतियोगिताएँ चलाई गई। हिंदी 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। कर्नल.एन.ए. प्रदीप, डीजीसी एवं मुख्य प्रशासनिक अधिकारी, एनसीसी मुख्यालय, कालिकट इस के मुख्य अतिथि थे। उन्होंने हिंदी के प्रयोग के लिए प्रेरणात्मक भाषण दिया और बोला कि हिंदी आम जनता

की भाषा के रूप में काफी प्रचलित है। इसकी सरलता एवं सुंदरता से यह ज्यादा जनप्रिय बन चुकी है। इसलिए हिंदी में काम करना आसान है। इस अवसर पर उन्होंने हिंदी प्रतियोगिताओं के विजेताओं को पुरस्कार वितरण किया।

Fig. 1. डॉ. होमी चेरियान, हिंदी पखवाडा का उद्घाटन करते हुए

Fig. 2. कर्नल एन.ए. प्रदीप मुख्य भाषण देते हुए

Fig. 3. तकनीकी पत्रक का निर्मोचन

Fig. 4. पुरस्कार वितरण

हिंदी कार्यशाला

कर्मचारियों को हिंदी के प्रयोग में प्रशिक्षण देने के उद्श्य से 13-09-2018 को एक दिवसीय हिंदी कार्यशाला आयोजित किया गया। इसमें कालिकट विश्व विद्यालय में सहायक प्रोफेसर के पद पर कार्यरत डॉ. पी.जे. हर्मन ने कंप्यूटर में हिंदी के प्रयोग करने के लिए उपयोगी तकनीकी विकास पर क्लास चलाया। उन्होंने हिंदी के प्रयोग में नवीनतम गतिविधियों पर चर्चा की। दूसरे सत्र में टिप्पणआलेखन का अभ्यास कराया।

Fig. 5. डॉ. पी.जे. हर्मन कार्यशाला में क्लास चलाते हुए

Fig. 6. कार्यशाला का प्रेक्षकगण

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 हैं। समिति द्वारा आयोजित पाँच दिवसीय अनुवाद प्रशिक्षण कार्यक्रम में हिंदी अनुवादक ने भाग लिया।

हिंदी प्रकाशन

निदेशालय द्वारा प्रकाशित इंडियन जर्नल ऑफ अरीकनट, स्पाइसेस एण्ड मेडिसिलनल प्लान्ट्स नामक त्रैमासिक पत्रिका में विभिन्न मसाला फसलों पर आधारित वैज्ञानिक लेख, कृषि क्रियाएँ, मसालों के बाज़ार मूल्य की समीक्षा आदि नियमित रूप से हिंदी में प्रकाशित किए जाते हैं। कृषकों को वितरण करने के लिए अदरक और हल्दी की खेती एवं प्रसंस्करण नामक हिंदी पत्रक का प्रकाशन किया गया।

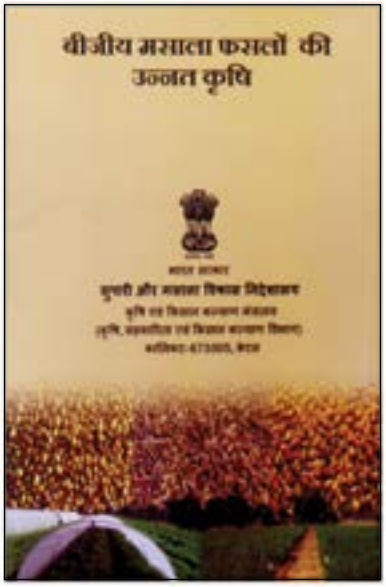


Fig. 7 & 8. हिंदी में प्रकाशित पत्रकें

प्रोत्साहन योजना

कार्यालयीन काम मूल रूप से हिंदी में करने के लिए कर्मचारियों को प्रेरणा देने के लिए राजभाषा विभाग द्वारा लागू किए गए नकद पुरस्कार योजना और हिंदी में टंकण करने के लिए 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 पुस्तकें 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 आदि भी उपलब्ध है।

* * *

सत्यमेव जयते

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

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Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Co-operation & Farmers Welfare
Government of India, Calicut - 673005, Kerala, India