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வருடாந்த செயற்திறன் அறிக்கை
ANNUAL PERFORMANCE REPORT

2017



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DEPARTMENT OF EXPORT AGRICULTURE

Web: www.exportagrdept.gov.lk

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சமூக நல சேவை மற்றும் ஆரம்பக் கைத்தொழில் அமைச்சு
MINISTRY OF SOCIAL WELFARE & PRIMARY INDUSTRIES

2017

லாஃகிக கார்டகாடல லாஃகால
வருடாந்த ஸெயற்திறன் அறிககை

ANNUAL PERFORMANCE REPORT

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ஊலாஃ ஊபலகாடல லா ஃரூபீக கரீலாஃன ஊலாஃலாஃல

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DEPARTMENT OF EXPORT AGRICULTURE

MINISTRY OF SOCIAL WELFARE & PRIMARY INDUSTRIES

ACKNOWLEDGEMENT

It is a great pleasure to extend my sincere gratitude to all Heads of the Divisions of the Department of Export Agriculture for the contribution they rendered to complete this annual performance report.

I wish to acknowledge the contribution made of the Additional Director General (Research, Development and Administration), Directors (Research), Directors (Development), Director (Regulation), Accountant, Internal Auditor and Assistant Director (Research) in-charge of the sub research stations and the Economic research unit for providing necessary information. The contribution made by the staff of the communication unit for the preparation of the cover page and printing of the report is appreciated.

Finally my thanks go to Mrs. G.E.M.A.K. Dissanayake (Assistant Director-Planning) for her commitment to gather the required data and compile them in this report.

Dr. A.P.Heenkenda
Director General
Department of Export Agriculture
2018. May

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ABBREVIATIONS

AD	-	Assistant Director
AM	-	Arbuscular Mycorrhiza
ASMEC	-	Annual Symposium of Minor Export Crops
BACC	-	Biodiversity conservation and Adaptation to Climate Change
BMICH	-	Bandaranayake Memorial International Conference
BRRD	-	Brown Rot Root Disease
CARP	-	Council for Agricultural Research Policy
COC	-	Copper Oxide Chloride
DEA	-	Department of Export Agriculture
GDP	-	Gross Domestic Product
EAC	-	Export Agricultural Crops
FTA	-	Free Trade Agreement
GAP	-	Good Agricultural Practices
GMP	-	Good Manufacturing Practices
HG	-	Home Garden
IBRS	-	Intercropping and Betel Research station
IPC	-	International Pepper Community
MT	-	Metric Tons
MOP	-	Muriate of Potash
NAA	-	Naphthalene Acetic Acid
NARP	-	National Agriculture Research Policy
NIPM	-	National Institute & Plantation management
NLFD	-	Nutmeg Leaf Fall Disease
PGIA	-	Postgraduate institute of Agriculture
PHASU	-	Post Harvest Advisory Service Unit
PHTD	-	Post Harvest Division
PIP	-	Productivity Improvement Program
SPnDP	-	Small Plantation and Development Program
SLIDA	-	Sri Lanka Institute of Development Administration
PGIA	-	Postgraduate Institute of Agriculture
SLIFTA	-	Sri Lanka India Free Trade Agreement

FOREWORD BY THE PRESENT DIRECTOR GENERAL



The mission of the Department of Export Agriculture (DEA) is to increase the foreign exchange earnings from Export Agricultural Crops (EAC) sector through increasing the production, productivity, quality improvement of products and enhancing the value addition capacity of primary products. This sector comprises of Spices, Beverages, Industrial crops, Essential oil producing crops and Stimulant crops. The DEA, under the supervision of the Ministry of Primary Industries, has planned and implemented its Research and Development programs in 2017 to achieve the mandated objectives.

Export Agriculture sector performed well in 2017 with 60,103 m.t. of export volume and Rs. 71,970mn. Export earnings. Exports of almost all major crops, such as Cinnamon, Pepper, Clove, Nutmeg, betel etc. has increased significantly. Especially, exports of Cinnamon in 2017 had increased by 13% and earnings had increased by 33% over 2016. It was noted that about 40% of total export earnings from EAC had come from exporting Cinnamon.

As a policy, the DEA paid more attention to increase the production, productivity and to improve the quality of products in order to meet the international standards and trade regulations, which enable to compete with other producing countries.

The DEA gave more emphasis to ensure the implementation of food safety standards in the domestic production system, while promoting Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP). In addition, a home garden promotion program called “Dhanasaviya” was implemented in 2016 had a significant improvement achieving target of 145,000 home gardens.

This report summarizes the overall performance and related information pertaining to the four sub-divisions of the Department namely Research, Development, Administration and Finance. It includes all the activities of the department, strategies used to meet the desired goals and the progress achieved during the year 2017.

Dr. A.P. Heenkenda
Director General
Department of Export Agriculture
May 2018

General Information– 2017

Contribution of the EAC sector in 2017

Contribution to the GDP	0.7									
Contribution to export earnings of agriculture	17.1%									
Export volume (Mt)	<p>Export Volume of Export Agriculture Crops - 2016 & 2017 (MT.)</p> <table border="1" style="display: none;"> <caption>Export Volume of Export Agriculture Crops - 2016 & 2017 (MT.)</caption> <thead> <tr> <th>Crop</th> <th>2016 (MT)</th> <th>2017 (MT)</th> </tr> </thead> <tbody> <tr> <td>Cinnamon</td> <td>16,000</td> <td>18,000</td> </tr> <tr> <td>Pepper</td> <td>9,000</td> <td>14,000</td> </tr> </tbody> </table>	Crop	2016 (MT)	2017 (MT)	Cinnamon	16,000	18,000	Pepper	9,000	14,000
Crop	2016 (MT)	2017 (MT)								
Cinnamon	16,000	18,000								
Pepper	9,000	14,000								
Export Value (Rs.mn.)	<p>Export Value of Export Agriculture Crops - 2016 & 2017 (Rs.Mn.)</p> <table border="1" style="display: none;"> <caption>Export Value of Export Agriculture Crops - 2016 & 2017 (Rs.Mn.)</caption> <thead> <tr> <th>Crop</th> <th>2016 (Rs.Mn.)</th> <th>2017 (Rs.Mn.)</th> </tr> </thead> <tbody> <tr> <td>Cinnamon</td> <td>28,000</td> <td>35,000</td> </tr> <tr> <td>Pepper</td> <td>14,000</td> <td>16,000</td> </tr> </tbody> </table>	Crop	2016 (Rs.Mn.)	2017 (Rs.Mn.)	Cinnamon	28,000	35,000	Pepper	14,000	16,000
Crop	2016 (Rs.Mn.)	2017 (Rs.Mn.)								
Cinnamon	28,000	35,000								
Pepper	14,000	16,000								
Estimated EAC extent (ha) (with ginger and turmeric)	119,814									

General Administration of the Department

➤ Distribution of District Offices

Eighteen offices distributed in the following districts of the country as follows;

- Central Province - Kandy, Matale and Nuwara-eliya
- Sabaragamuwa Province - Kegalle and Ratnapura
- Uva Province - Badulla and Monaragala
- Southern Province - Galle, Matara and Hambantota
- Western Province - Colombo, Kalutara and Gampaha
- North- Western Province - Kurunegala and Puttalama
- North –Central Province - Anuradhapura and Polonnaruwa
- Eastern Province - Ampara

➤ Locations of research stations and Sub-Units

Eight Research Stations and Sub-Units located as follows;

1. Central Research Station in Matale
2. Cinnamon Research Station at Pallolpitiya of Matara district
3. Intercropping and Betel Research Station at Dampelassa close to Narammala
4. Economics and Market Research Unit at Head Office in Peradeniya
5. Mid Country Research Station at Delpitiya close to Gampola
6. Tissue Culture Unit and Plant Nursery at Walpita of Gampaha district
7. Research Sub-Unit at Kundasale of Kandy district
8. Research Sub-Unit at Nilambe Galaha of Kandy district

➤ Location of department nurseries

Productions of plants are carried out in 10 nurseries in different locations as follows;

Kurunegala District	-	Serapies Plant Nursery at Polgahawela, Holongolla Plant Nursery at Dodangaslanda, Wennoruwa Plant Nursery at Narammala
Nuwaraeliya District	-	Blackwater, Plant Nursery at Ginigahaththena Mulhalkele Plant Nursery at Walapane
Matale District	-	Central Plant Nursery at Elwela
Matara District	-	Central Plant Nursery at Mapalana in Kamburupitiya
Kegalle District	-	Central Plant Nursery at Gasnawa, Nelundeniya
Gampaha District	-	Central Plant Nursery at Walpita
Hambantota District	-	Central Nursery and Spice Park at Middeniya

1. FUNCTION OF THE DEPARTMENT OF EXPORT AGRICULTURE

1.1 Role and Objectives

The major responsibility of the Department of Export Agriculture (DEA) is to develop the Export Agricultural Crop (EAC) sector in order to earn more foreign exchange by increasing the export volume and improving the quality of the products. As officially defined, the perennial crops, of which over 32% of the annual production is exported (excluding tea, rubber, coconut and cashew) and any other crop that is named by the Minister in-charge to be brought under the purview of the department are classified as EACs. As to this classification, DEA's main emphasis is to improve traditional crops such as Cinnamon, Pepper, Clove, Nutmeg, Cardamom, Coffee, Cocoa, Betel, Arecanut, Vanilla, Citronella, Lemongrass, Garcinia (*goraka*), *Kithul*, Ginger and Turmeric. The DEA is basically a technical department and its functions are focused on research and development activities of the EAC sector.

1.2 Major Functions

The Promotion of Export Agriculture Crops Act No. 46 dated 22nd September 1992 of Parliament of the Democratic Socialist Republic of Sri Lanka, embodies and gives statutory status to the functions and services mentioned below.

- Organizing and promotion of cultivation and processing of EACs
- Undertaking multidisciplinary research on crop improvement, crop husbandry, crop protection, post-harvest handling and socio economics
- Production and supply of quality planting material
- Implementation of EAC assistant schemes on crop production, productivity improvement and quality improvement
- Providing crop protection advisory services
- Promotion of Integrated Pest Management
- Promotion of Integrated Plant Nutrient Management
- Promotion of Organic Farming
- Dissemination of information on marketing, quality standards and prices etc.
- Control of importation of EAC products and planting materials etc.
- Training of persons involved in EAC production, processing and trading
- Providing advisory services for the promotion of EACs in estate sector
- Strengthening of the linkage among public and private organizations involved in EACs

- Executive authority vested under the Export Agriculture Act No. 46 of 1992
- Contributing towards EACs related policy matters in other governmental organizations
- Maintenance of technological demonstrations

ஊ நிர்வாகம் Administration



2. ADMINISTRATIVE DIVISION

2.1 Introduction

The Administrative Division which operates under the direction of the Additional Director General (Administration), oversees the operation of the administrative affairs of the department in co-ordination with all the other divisions and external institutes. Accordingly, major duties such as new recruitments, promotions, transfers, human resource development, control of discipline, departmental examinations, procurement and the maintenance of capital assets of the department are carried out by this division. In addition, the responsibility of implementing, as appropriate, welfare services for the welfare and motivation of the staff also rests with the administrative division.

2.2 The Staff

The approved cadre and the actual cadre in service are given in table 2.2.1

Table: 2.2.1: Cadre Particulars of the Department of Export Agriculture as at 31st December 2017

Post	Approved Cadre		Actual Cadre	Vacancies/ Excess
	Permanent	Contract Basis		
Director General	01	-	01	-
Additional Director General (Research)	01	-	-	01
Additional Director General (Development)	01	-	-	01
Additional Director General (Administration)	01	-	01	-
Chief Accountant	01	-	01	-
Director (Research/ Development/ Regulation)	07	-	-	07
Deputy Director/Assistant Director (Administration)	01	-	01	-
Deputy Director/Assistant Director	67	-	59	08
Accountant	01	-	01	-
Deputy Director /Assistant Director (Planning)	01	-	01	-
Internal Auditor	01	-	01	-

Statistician	01	-	01	-
Total of Senior Level	84	-	67	17
Administrative Officer	03	-	01	02
Extension Officer (District/Subject related)	19	-	01	18
Chief Technical Officer	03	-	02	01
Farm Manager (Special Grade)	01	-	-	01
Translator	02	-	01	01
Total of Tertiary Level	28	-	05	23
Technical Officer	01	-	-	01
Research and Development Assistant	84	-	79	05
Development Officer	411	-	313	98
Budget Assistant	01	-	01	-
Extension Officer	171	-	145	26
Technological Officer	22	-	19	03
Librarian	03	-	01	02
Farm Manager	20	-	07	13
Public Management Assistant	83	-	78	05
Information and Technological Assistant	01	-	01	-
Warden	01	-	01	-
Farm Services Assistant	02	-	02	-
Total of Secondary Level	800	-	647	153
Driver	61	-	55	06
Mason	01	-	01	-
Tractor Driver	02	-	01	01
Spray Machine Operator	02	-	02	-
Budder	01	-	01	-
Water Pump Operator	01	-	01	-
Nursery Keeper	02	-	02	-
Officer Employee	35	-	30	05
Driver Assistant	08	-	06	02

Watcher	47	-	36	11
Labourer	190	97	137	53
Cook	01	-	01	-
Circuit Bungalow Keeper	02	-	02	-
Total of Primary Level	353	97	275	78
Grand Total	1265	97	994	271
Watcher	-	-	17	-
Labourer	-	-	106	-
Grand Total	1265	-	1117	271

2.3 Changes in the staff in 2017

New Appointments

Assistant Director (Sri Lanka Scientific Service)	- 21
Development Officer (Allied Service)	- 23
Extension Officer (Sri Lanka Technological Service)	- 09
Technological Officer (Sri Lanka Technological Service)	- 02
Farm Manager	- 07

Transferred In

Public Management Assistants - Supra Grade	- 01
Translator Service	- 02
Development Officer (Allied Service)	- 20
Public Management Assistant	- 13
Officer Employee Service	- 06
Diver Service	- 03

Transferred Out

Public Management Assistant - Supra Grade	- 01
Translator Service	- 01
Development Officer (Allied Service)	- 03
Public Management Assistants	- 11

Office Employee Service	- 02
Driver Service	- 01
Resignations	
Translator Service	- 01
Development Officer (Allied Service)	- 01
Extension Officer (Sri Lanka Technological - Service)	- 01
Technological Officer (Sri Lanka Technological Service)	- 02
Technical Officer	- 01
Released from Service	
Development Officer (Allied Service)	- 02
Termination of Service	
Labourer	- 05
Watcher	- 01
Deaths	
Extension officer	- 01
Retirements	
Sri Lanka Scientific Service	- 02
Extension Officer	- 10
Research and Development Assistant	- 01
Office Employee Service	- 01
Labourer	- 08
Watcher	- 02
Vacation of Post	
Labourer	- 01

2.4: Particulars on the Departmental Examinations / Efficiency bar Examinations held in 2017

1. Holding the First and Second Departmental Examinations of the Extension Officers/ Farm Managers of the Sri Lanka Technological Service.
2. Holding the Second Departmental Examination of the Technological Officers of the Sri Lanka Technological Service.
3. Holding the 1st, 2nd and 3rd Efficiency Bar Examinations of the Drivers and Office Employee Service.

2.5: Particulars on officers who participated in overseas training programs and meetings.

1. Participation of 12 officers of the Sri Lanka Scientific Service at the International Spice Conference Committee Meetings and training workshops held in Japan, Netherland, Vietnam, Singapore, China, Indonesia, Thailand and India
2. Participation of 02 officers of the Sri Lanka Accountants Service at the Agriculture Value Chain Development Program held in Thailand and International Training on Management held in Netherlands
3. Participation of the Chief Technological Officer of Technological Service at the Workshop on Analysis of Remains after the Use of Pesticides held in Malaysia
4. Participation of 02 officers of the Technological Service and three officers of the Development Officer Service at the training workshops held in China and India

2.6 Targets Achieved in 2017

- Acquisition of Lands

The acquisition of the lands where the Extension Officer Quarters of Hunuketa Ela, Matale and the Extension Officer Quarters of Palapathwala Matale are located, has been duly completed.

- Actions were taken to fill 21 vacancies in the post of Assistant Director of the Sri Lanka Scientific Service in the Department of Export Agriculture.
- Actions were taken to fill 05 vacancies in the Office Employee Service of the Combined Service.

Table: 2.6.1: Particulars on Local Training Programmes -2017

Training Institute	Training Programme	Category of Posts Attending Training Programme	No	
Sri Lanka Press Institute	Certificate Course in Television Videography and Lighting	Development Officer	01	
Prag Educational Institute	Use of EXCEL in duties	Public Management Assistant	03	
		Development Officer	01	
		Research and Development Officer	01	
		Budget Assistant	01	
	Procurement Principles and Procurement Plans	Assistant Director (Planning)	01	
Prag Educational Institute	Preparation of Bidding Documents	Public Management Assistant	01	
	Administration of Contracts	Assistant Director (Planning)	01	
	Safe Driving and Highway Code	Driver	02	
Adams Skills Development Institute	MICROSOFT EXCEL	Public Management Assistant	01	
Official Languages Commission	Awareness Programme on Official Language Policy	Administrative Officer	01	
		Public Management Assistant	01	
National Productivity Secretariat	Awareness Programme on GP cell	Public Management Assistant	01	
	International Products	Deputy Director (Research)	01	
Sri Lanka Council for Agricultural Research Policy.	Annual Training Programme.	Development Officer	02	
National Institute of Labour Studies	Disciplinary Procedures	Public Management Assistant	01	
Training Institute in Matale	Training Workshop on Procurement	Development Officer Public Management Assistant	01	
Sri Lanka Institute of Development Administration	Training Programme in Quality Circles for Staff Grade Officers	Assistant Director(Research)	01	
	Preparation of Reports using Digital Technology	Statistician	01	
	Training on Disciplinary Procedures	Assistant Director (Research)	01	
Skills Development Fund	Maintenance of a Personal File	Public Management Assistant	02	
		Development Officer		
	Control on Office Equipment	Public Management Assistant Development Officer	01	
Skills Development Fund	Two Day Training for Officers in Charge of Vehicles	Public Management Assistant	01	
	District Secretariat Kandy	Awareness Programme on 5 S Certification	Development Officer	01
		12 Day Tamil Course for Public Officers	Development Officer	03

Kurunegala			
Ministry of Disaster Management	Minimizing Disasters in Agricultural Activities	Additional Director General (Development) Assistant Director	01 01
Sri Lanka Institute of Printing	Certificate course in Graphic Designing	Information and Communication Technical Assistant Development Officer	01 01
District Secretariat Matara	12 day Non-residential Training Course in Tamil Language	Nursery Keeper	01
National Procurement Commission	Public Procurement Guidelines	Development Officer	01

இலா நிதி Finance



3. FINANCE

The Annual Estimates for the year 2017 allocated a financial provision for a sum of Rs1,278.4 million under the Head 289 in one program with, two Recurrent Expenditure projects and two capital Expenditure projects

Table: 3.1: Financial Provision and Expenditure, 2017

Item	Net Provision(Rs.)	Expenditure (Rs.)	Expenditure (%)
Head - 289			
Program - 02			
Project- 01 - Export Crops Development program			
Capital Expenditure			
Rehabilitation and improvement of Capital Assets	22,500,000	15,158,456	67.37
Buildings and Structures	20,000,000	12,686,216	63.43
Plant, machinery and equipment	500,000	491,348	98.27
Vehicles	2,000,000	1,980,892	99.04
Acquisition of Capital Assets	17,500,000	7,362,743	42.07
Furniture and office equipment	2,500,000	2,492,722	99.71
Plant machinery and equipment	2,000,000	1,980,391	99.02
Building & Structure	10,000,000	-	0.00
Lands and Land Improvements	3,000,000	2,889,630	96.32
Assisting the Farmers for Export crop development			
Development Assistance	600,000,000	345,615,770	57.60
Capacity Building			
Staff Training	1,800,000	1,777,874	98.77
Infrastructure Development	2,000,000	1,303,238	65.16
Total Capital Expenditure	643,800,000	371,218,081	57.66
Recurrent Expenditure			
Personal Emoluments	370,482,000	370,481,388	100.00
Other Charges	69,744,000	69,720,618	99.97
General Administration	440,226,000	440,202,006	99.99
TOTAL EXPENDITURE(project-01)	1,084,026,000	811,420,087	74.85

Table: 3.2: Financial Provision and Expenditure-2017

Item	Net Provision (Rs)	Expenditure (Rs)	Expenditure (%)
Project-02-export crops research and integrated pest/disease management (IPM) program			
Capital Expenditure			
Rehabilitation and improvement of Capital Assets	5,400,000	5,162,127	95.59
Buildings and Structures	2,500,000	2,388,213	95.53
Plant, Mechinery and equipment	600,000	492,114	82.02
Vehicles	2,300,000	2,281,800	99.21
Acquisition of fixed Assets	16,000,000	15,266,208	95.41
Furniture and office equipment	2,000,000	1,982,459	99.12
Plant mechinery and equipment	3,000,000	2,993,903	99.80
Buildings and Structures	7,000,000	7,000,000	100.00
Lands and Land Improvements	4,000,000	3,289,846	82.25
Capacity Building			
Staff Training	500,000	488,711	97.74
Infrastructure Development	1,000,000	980,388	98.04
Implementation of National Agricultural Research Plan			
Investment (NARP)	4,000,000	3,999,208	99.98
Investment (Prevention & Control of .N.L.F.D	1,500,000	1,484,086	98.94
Research and Development (Innovative Research)	2,000,000	1,926,126	96.31
Total Capital Expenditure	30,400,000	29,306,854	96.40
Recurrent Expenditure			
Personal Emoluments	144,470,000	144,465,388	100.00
Other Charges	19,502,000	19,461,646	99.79
General Administration	163,972,000	163,927,034	99.97
TOTAL EXPENDITURE (project 2)	194,372,000	193,233,888	99.41
TOTAL EXPENDITURE	1,278,398,000	1,004,653,975	78.59

Total allocation of consolidate funds to the development for the year 2017 has increased by Rs. M: 131.24 over 2016 which was a 13.4% increase. Out of total allocation of Rs.1,107mn. The expenditure for the year was Rs.1, 004.6 m. And this was a 78.59% of the provision allocation for the year the financial performances of the project 1 and 2 were 89.78% and 91.92% of the allocated funds. Percentages of the amount spent under capital expenditure of the projects 1 and 2 for 2017 were 57.66% and 96.4% respectively and the same for the recurrent expenditure were 99.99% and 99.97 %. Despite the man power shortages at field level technical cadres. The spending of 78.59% of the total annual allocation for the year 2017 was an impressive achievement of the DEA.

Table: 3.3: Revenue of 2017

Revenue Source	Estimate (Rs.m.)	Actual (Rs.m.)
Rent on Govt. Buildings & Houses	1.45	1.98
Loan Interests –other	3.20	3.47
Departmental sales	9.00	14.48
Sundry Income	25.00	53.02
W & O P	15.00	17.27
Other Receipts	5.00	6.38
Total	58.65	96.60
Advance Account Limits		
	Limit Rs.	Actual Rs.
Maximum Limit of Expenditure	45,000,000	44,956,161
Minimum Limit of Receipts	28,000,000	28,618,902
Maximum Limit of Debit Balance	105,000,000	97,838,272

3.4 Internal Audit Division

Objectives

Investigating and reporting as per the Financial Regulations 133 and 134 whether the duties and the responsibilities assigned by the Export Agriculture Crops Promotion Act No: 46 dated 22nd September 1992 of the Parliament Of the Democratic Socialist Republic of Sri Lanka and the other acts, circulars and provisions to our department comprising a head office, district offices, research centres, farms and nurseries and involves in developmental activities and research, are carried out in accordance with

those acts, Financial Regulations, Establishment Code, Procurement Guidelines, circulars and other rules and regulations and provisions.

3.4.1 Objectives of Internal Auditing

- Prevention and exposure of frauds and errors in the financial activities by assisting the internal administration in the financial activities of the department and carry out a continued investigation on the formality and adequacy through internal inspection and by reporting to the Director General for future actions.
- Assisting the Chief Accounting Officer and in progress reviews to determine the progress achieved in the implementation of development and research project schemes, planning and programmes assigned and by the department implemented.
- Functioning as a co-ordinator between the persons involved in these activities and the Head of the Department / Progress Review Committee, as the necessity arises.

3.4.2. Responsibilities of Internal Auditing

- Providing assistance in the control of public finance on legal requirements in order to carry out efficiently, productively and transparently the tasks to be performed when reaching the vision, objectives and the mission of the department.

Internal auditing and probes are carried out through the following segments.

- Financial Auditing
- System Analysis
- Performance Analysis
- Special investigations.

3.4.3. Compilation of Internal Audit reports.

- Audit Reports
- Special Investigative Audit reports
- Determinations Reports of the Managements Audit Committee

3.4.4. Functions of Internal Audit Division

- Investigating whether the functionality of the administrative activities is successful for the management of the Institute.
- Inspecting whether the functional regulations, orders of the Establishment code, orders of the procurement guidelines and the instruction of the circulars have been duly followed in the accounting administration of the institute.
- Probing the reliability of accounts and other reports.
- Assisting in the establishment of practices which enhance the efficiency within the institute.
- Minimizing the inefficiency and frauds and enhancing the quality of the services.
- Holding Auditing and Management committee meeting.
- Inspecting whether the responsibilities vested with the staff of the institute are fulfilled without failure.
- Inspecting to which extent the public properties and assets have been used free from damage.
- Inspecting whether the government transactions are carried out in a manner that minimizes waste and cost, maximizes quality and profitability and protects the properties and assets.
- Holding of special probes as the need arises , auditing of the risky areas of the institute and observing whether the activities of the institute are carried out in accordance with the Action Plan.

3.4.5. Areas Focused in Internal Auditing

- Authorization under Financial Regulation 135
- Annual Performance Plan
- Imprest Accounts, Unsettled Imprest Accounts, expenditure control and asset management.
- Personal files and files related to leave.

Functions fulfilled

28 Audit units including the units listed out below were monitored by the internal audit division in the year 2017.

- Head Office

Accounts Division

Administrative Division

- District Office
 - Training Center
 - Research Centers and Sub Research Stations.
 - Central Nurseries
- Special Investigation

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4. DEVELOPMENT DIVISION

4.1 Introduction

The Development division of DEA plays a vital role in supporting all promotional activities of value chain development of EACs. The division continued its endeavour in the implementation of the Development Plan - 2017 throughout the year which included area expansion, supply of quality planting materials, productivity enhancement, post-harvest and quality product development, technology transfer, human resource development and creating employment opportunities.

The division is headed by an Additional Director General of the SL Scientific Services Super Grade assisted by 3 Directors of the SL Scientific Services Class I. It has 17 District offices spread across the country namely Galle, Matara, Hambantota, Colombo, Gampaha, Kalutara, Kandy, Matale, Nuwara Eliya, Kegalle, Rathnapura, Monaragala, Badulla, Kurunegala, Ampara, Anuradhapura and Polonnaruwa for ground level implementation of Development plan. Assistant Directors of SL Scientific Services Class II/III are entrusted with District level duties of the development division. Field level implementation of the development plan is executed by the Extension officers of SL Technical Services assisted by the Development Officers. Additionally the Development division has an In-service training center for HRD, Media unit for promotional activities and to disseminate the knowledge to a wide audience and a Business Counselling Unit to support the quality and marketing aspects of EACs.

4.2: Development Program

The Development Program 2017 of Department of Export Agriculture has design with our mission and vision in mind and considering this target of reaching the one billion dollars of foreign income by exporting export agricultural crops in year 2020. All the programs were implemented on 100% GOSL funding and the program has four subprograms as given below.

Table: 4.2.1: Development Programs– 2017

Program	Financial Target, Rs Mn.
1. Export Agricultural Crops development program	198.5
2. Productivity improvement program	311.50
3. Trade promotion program	30.0
4. Sector modernization program	60.0
Total	600.0

4.2.1: Export Agricultural Crops Development Program

The production of export agricultural crops has to be enhanced both quantitatively and qualitatively with a view to secure an increased value for the Sri Lankan Export Agricultural Crops at the ever growing local and foreign market. Accordingly, extension of Export Agricultural Crops new cultivation in 1300 hectares was initiated in the year 2017. Formal training and skill development programme were introduced for the production of qualitative planting materials which is the prime requirement of this programme.

4.2.1.1: Plant Production Program

The development division is launching a plant certification program led by an expert team constituted for this purpose, for supplying quality planting materials to all growers.

Table: 4.2.1.1.1: Total Plant Requirement of 2017

Pepper	Cinnamon	Nutmeg	Clove	Arecanut	Coffee	Citronella	Vanilla	Garzenia	Cocoa	Total
6,726,500	13,098,000	27,100	17,525	2,863,000	141,500	3,167,500	15,750	4,500	110,000	26,171,375

Table: 4.2.1.1.2: Departmental Prices of the EAC Planting Materials

Crop	Seed Material /Cuttings (Rs.)	Plants/ Suckers (Rs.)
Cinnamon	80.00 per kg of seeds	Plant 13.00
Pepper	0.20 per 3 node cutting	Plant 23.00
Clove	-	Large Plant 70.00
Nutmeg	10.00 per seed	Seedling 100.00 Budded 180.00
Cardamom	-	Sucker 10.00
Cardamom	-	Tissue cultured sucker 50.00
Vanilla	5.00 per 1m cutting	5.00
Arecanut	2.00 per nut	Plant 13.00
Cocoa	20.00 per pod	Plant 14.00
Coffee	80.00 per kg of ripened fresh berries and 150.00 per kg of parchment, dry coffee beans	Plant 14.00
Citronella	-	2.00 per sucker
Lemongrass		2.00 per sucker
Garcinea	-	Seedling 70.00 Budded 120.00
Kitul		Large 45.00 Small 12.00
Ginger	100.00 per kg	
Turmeric	40.00 per kg	

A healthy and quality plant is the key to successful cultivation. In order to produce such planting materials the department has registered private nurseries in the districts and 10 central nurseries belonging to the DEA.

Central Nurseries of the DEA

Table: 4.2.1.1.3: Plant Issues under the Central Nurseries in 2017

Nursery	Plant Issues in 2017				Total (Program wise)
	New Planting	Arecanut Promotion	Dhanasaviya	other	
Gasnawa	49,381	-	33,018	647	83,046
Holongolla	58,585	-	211,432	1,886	271,903
Cerapees	23,281	-	48,100	-	71,381
Wennoruwa	66,910	-	7,845	2,673	77,428
Mulhalkele	4,080	-	24,810	6,279	35,169
Blackwater	19,705	-	21,949	1,381	43,035
Matale	17,945	2,000	29,248	22,465	71,658
Walpita	66,706	170	39,140	25,109	131,125
Middeniya	-	-	2,700	-	2,700
Mapalana	41,060	-	96,364	5,620	143,044
Total	347,653	2,170	514,606	66,060	930,489

**Table: 4.2.1.1.4: Programme & Crop wise total Plant Issues of Central Nurseries
in 2017**

Crops	Plant Issues in 2017			
	New Planting	Arecanut Promotion	Dhanasaviya	other
Pepper	101,872	-	361,186	22,941
Cinnamon	214,050	-	66,672	18,163
Coffee	18,430	-	12,330	5,634
Arecanut	4,720	2,170	65,540	12,812
Clove	1,100	-	863	415
Nutmeg	1,471	-	6,008	4,487
Garcinia	-	-	1,937	110
Cocoa	-	-	10	894
Cardamom	5,500	-	10	34
Nutmeg (Budded)	-	-	-	5
Garcinia (Budded)	-	-	-	60
Mudun rikili	-	-	-	318
Bush Pepper	-	-	50	2
Miti Kithul	510	-	-	160
Cinnamon Big	-	-	-	25
Total	347,653	2,170	514,606	66,060
	930,489			

During 2017 year to strengthen the central nurseries several infrastructure developments during 2017 such as introduction of micro irrigation systems to mitigate the drought problem and provision of shade net houses to increase the plant production were carried out.

**Table: 4.2.1.1.5: Infrastructure Development Activities of Central Nurseries
in 2017**

Nursery	Development activities completed
Walpita, Matale, Cerepeas, Wennoruwa, Hologolla & Mapalana	Establishment of water supply systems
Cerepeas, Wennoruwa, Gasnawa & Black Water	Construction of labourers rest rooms
Matale, Black Water, Mulhalkele & Gasnawa	Construction of potting media storage units

Private Nurseries registered under DEA

During 2017, 921 private nurseries were registered by the district extension staff to meet the plant production target. Measures have been taken to strengthen the infrastructure facilities of the registered nurseries such as to establishment of shade net houses and micro irrigation systems.

To establish a micro-irrigation system, nurserymen were provided with financial assistance up to 50,000.00 which is the 50% of the cost of establishment. For a new shade net house a financial assistance of Rs, 150,000.00 was granted in two instalments and 50% of that sum has to be paid back when the plants are issued. (this program was funded by the Ministry of primary Industries)

Table: 4.2.1.1.6: Infrastructure Developments of registered nurseries of DEA in 2017

Infrastructure Development	No. of Nurseries
Shade net houses	89
Micro-irrigation system	62

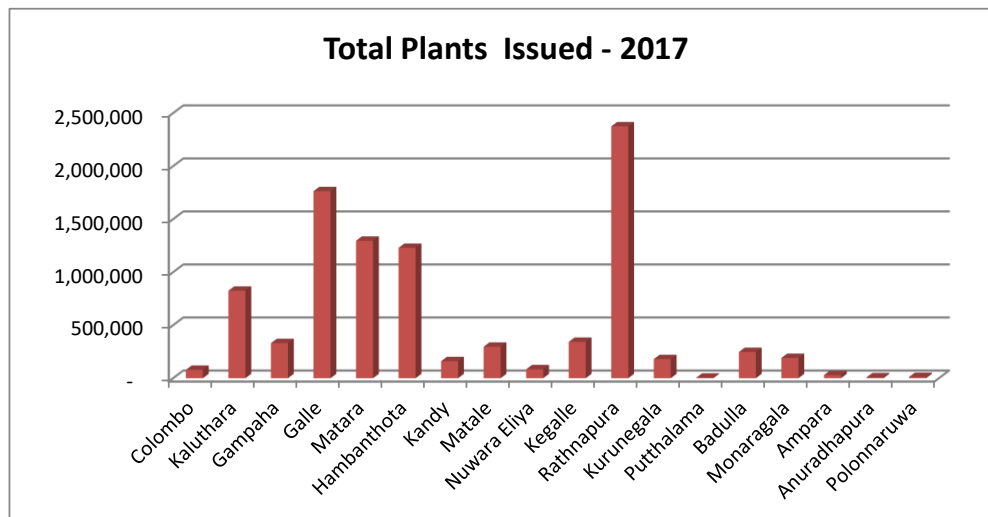
Plants issued by the registered nurseries of the districts in 2017 are given below.

Table: 4.2.1.1.7: Total Number of Plant Issues of Registered Nurseries in 2017

District	No of nurseries	Plant issues 2017										Total
		Pepper	Cinnamon	Arica nut	Nutmeg	Clove	Vani lla	Carda mom	Coffee	Cocoa	Garci nia	
Colombo	27	97,291	80,200	6,310	-	-	-	-	-	-	-	183,801
Gampaha	27	143,835	-	40,230	800	800	800	800	800	-	-	188,065
Kaluthara	35	284,170	979,411	58,235	132	-	-	-	-	-	-	1,321,948
Galle	70	344,290	4,916,810	23,220	-	-	-	-	-	-	-	5,284,320
Matara	107	250,741	2,316,464	2,350	-	-	-	-	-	-	-	2,569,555
Hambanthota	35	240,981	1,243,700	122,050	-	-	-	-	-	-	-	1,606,731
Kandy	88	279,549	55,500	32,496	11,498	1,468	-	-	12,910	-	509	393,930
Matale	50	257,310	177,300	67,740	776	538	-	-	6,600	-	234	510,498
Nuwara Eliya	47	97,000	-	10,380	-	846	-	-	49,390	-	-	157,616
Kurunegala	42	504,734	117,415	82,427	2,702	359	-	-	2,151	-	131	709,919
Kegalle	53	430,477	270,000	20,547	3,828	1,310	-	-	-	-	-	726,162
Rathnapura	87	548,920	4,550,640	274,570	-	-	-	-	-	-	-	5,374,130
Badulla	59	405,479	47,520	50,150	-	-	-	-	-	-	-	503,149
Monaragala	66	456,601	84,100	102,765	-	-	-	-	-	88,400	-	731,866
Ampara	50	149,050	76,200	80,541	-	-	-	-	-	-	-	305,791
Anuradhapura	48	13,109	109,290	39,755	-	-	-	-	-	-	-	162,154
Polonnaruwa	30	82,260	20,500	31,340	-	-	-	-	-	-	-	134,100
Total	921	4,585,797	15,045,050	1,045,106	19,736	5,321	800	800	71,851	88,400	874	20,863,735

Table: 4.2.1.1.8: District wise Total Plant Issues in 2017

Total Plant Issues - 2017													
District	Pepper	Cinnamon	Aricanut	Nutmeg	Clove	Vanilla	Cardamom	Coffee	Cocoa	Garcinia	Other	Citronella	Total
Colombo	97,291	80,200	6,310			-							183,801
Gampaha	205,659	51,754	52,225	811	800	800	6,337	802		2			319,190
Kaluthara	284,170	979,411	58,235	132	-	-	-	-		-			1,321,948
Galle	344,290	4,916,810	23,220	-	-	-	-	-		-			5,284,320
Matara	288,756	2,418,984	2,350	949	-	-	-	-		1,560			2,712,599
Hambanthota	243,681	1,243,700	122,050	-	-	-	-	-		-		860,750	2,470,181
Kandy	279,549	55,500	32,496	11,498	1,468	-	-	12,910		509		11,000	404,930
Matale	275,401	196,565	92,877	8,748	695	-	7	6,670	904	236	53		582,156
Nuwara Eliya	130,888	-	18,113	356	2,162	-	-	83,970		331			235,820
Kurunegala	809,444	203,115	108,494	4,093	484	-	-	3,857		183	961		1,130,631
Kegalle	457,248	309,646	34,857	5,115	2,090	-	-	36		100	116		809,208
Rathnapura	548,920	4,550,640	274,570	-	-	-	-	-		-		1,494,200	6,868,330
Badulla	405,479	47,520	50,150	-	-	-	-	-		-		55,000	558,149
Monaragala	456,601	84,100	102,765	-	-	-	-	-	88,400	-			731,866
Ampara	149,050	76,200	80,541	-	-	-	-	-		-			305,791
Anuradhapura	13,109	109,290	39,755	-	-	-	-	-		-			162,154
Polonnaruwa	82,260	20,500	31,340	-	-	-	-	-		-			134,100
Total	5,071,796	15,343,935	1,130,348	31,702	7,699	800	6,344	108,245	89,304	2,921	1,130	2,420,950	24,215,174

Chart: 4.2.1.1.2: District wise Total Plant Issues - 2017

In par with 45th International Pepper Community Meeting 2017 held in Sri Lanka a competition to select the best nurseryman was held for recognizing outstanding performances of the plant production sector and Mr. Layanel Jayarathne of Madagama, Bibile was awarded as the best nurseryman of the year 2017.

New Planting Program

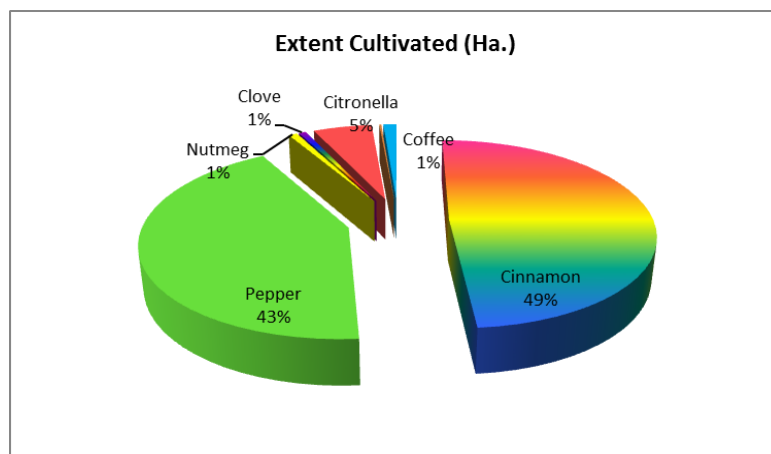
This is one of main programs of the DEA and was launched to expand the EAC cultivation area. To tackle the problem of declining soil fertility and water depletion Good Agricultural Practices has to be practiced by the farmer during the land preparation. For the cultivation of pepper, cinnamon, citronella, coffee, nutmeg, clove and cardamom growers were issued quality planting materials and they have to pay 50% of the cost of planting materials. Cocoa cultivation program initiated in Monaragala District was an exception to promote cocoa under rubber cultivations where planting materials were distributed free of charge.

1,600 ha were set as the target of new cultivation for 2017 with financial allocation of Rs. Mn.118.00, this target was successfully achieved and the district wise progress is given in Table 4.2.1.1.9.

Table: 4.2.1.1.9: Progress of New Planting Program 2017

District	Extent Cultivated (Ha)							
	Cinnamon	Pepper	Nutmeg	Clove	Citronella	Cardamom	Coffee	Total
Colombo	6.6	11.5	-	-	-	-	-	18.1
Gampaha	25.1	61.9	-	-	-	-	-	87.0
Kaluthara	89.2	13.2	0.10	-	-	-	-	102.5
Galle	193.9	10.9	-	-	-	-	-	204.8
Matara	141.7	12.3	-	-	-	-	-	154.0
Hambanthota	57.3	17.1	-	-	29	-	-	103.4
Kandy	6.1	52.9	5.2	2.4	0.4	-	1.0	68.0
Matale	20.3	62.0	2.7	1.4	-	-	2.6	89.0
Nuwara Eliya	-	21.5	0.8	1.7	-	2.85	13.9	40.8
Kurunegala	11.4	45.4	2.2	-	-	-	-	59.0
Putthalama	0.5	0.7	-	-	-	-	-	1.2
Kegalle	29.6	44.3	0.60	4.4	-	-	-	78.9
Rathnapura	104.8	77.5	-	-	47.2	-	-	229.5
Badulla	5.3	85.2	-	-	2	-	-	92.5
Monaragala	7.4	73	-	-	-	-	-	80.4
Ampara	-	17.4	-	-	-	-	-	17.4
Anuradhapura	0.6	1.9	-	-	-	-	-	2.5
Polonnaruwa	-	7.0	-	-	-	-	-	7.0
Total	700	616	11.6	9.9	78.7	2.9	17.5	1,436.5

Chart: 4.2.1.1.3: Extent Cultivated of Main Crops (Ha.)



Areca nut Promotion Program for Soil Conservation

Areca nut is one of the traditional exports since early days of the history. It is mainly grown in rural areas as a home garden crop and one of the best soil and water conservation tree which can grow easily along water canals and along the edges of paddy fields. Due to rapid urbanization and cultural and industrial needs areca nut plant population is dwindling. This program was launched to boost the planting of areca nut. Plants were provided free of charge.

Table: 4.2.1.1.10: Progress of Areca nut Promotion Program

District	Plants Issued
Kaluthara	38,800
Galle	2,300
Matara	1,700
Kandy	4,740
Matale	7,400
Nuwara Eliya	3,075
Kurunegala	3,350
Rathnapura	54,075
Badulla	9,635
Monaragala	11,075
Ampara	10,200
Polonnaruwa	22,000
Total	168,350

Cocoa Development Program

This program was initiated in Monaragala District where cocoa is planted under rubber. The program focussed on maximizing the land utilization and uplifting the socio economic level of this economically backward district.

Under this program 88,400 cocoa plants were issued and an extent of 88.4 Ha of cocoa under rubber was cultivated.

4.2.1.2: Capacity Building Program.

Knowledge and Skill Development of Farmers.

To obtain the targeted production, productivity, quality and finally the income, farmers should be armed with scientific knowledge in Good Agricultural Practices and Good Manufacture Practices. Extension staff of the DEA is entrusted with this responsibility at field level. They transfer technical knowhow of all aspects of EACs and disseminate research findings through farmer training classes and field days to the growers as well as other EAC sector stakeholders. The confirmed data from the districts, reflected huge number of participation of the beneficiaries.

Table: 4.2.1.2.1: Progress of the Farmer Training and Field Days held in 2017

District	GAP				GMP			
	Training Programs		Field Days		Training Programs		Field Days	
	Classes conducted	No. of farmers	Classes conducted	No. of farmers	Classes conducted	No. of farmers	Classes conducted	No. of farmers
Colombo	14	315	3	49	2	29	1	15
Gampaha	98	2,895	12	270	41	1200	17	421
Kaluthara	87	2,269	9	347	43	1074	6	349
Galle	101	3,413	25	919	15	407	7	132
Matara	48	1,412	5	188	18	781	-	-
Hambanthota	63	2,360	11	298	8	357	2	50
Kandy	163	5,428	20	701	87	2,573	8	306
Matale	139	3,172	5	144	14	378	7	157
Nuwara Eliya	34	1,201	9	297	21	582	10	384
Kurunegala	116	4,374	9	334	29	995	10	360
Putthalama	8	256	1	25	3	301	1	20
Kegalle	176	4,589	16	807	26	575	5	131
Rathnapura	83	4,543	21	814	28	878	13	417
Badulla	93	2,611	12	299	58	1,709	5	167
Monaragala	64	1,580	6	162	14	430	4	137
Ampara	30	960	2	190	1	23	-	-
Anuradhapura	38	1,660	5	142	6	148	1	20
Polonnaruwa	14	1,148	6	282	-	-	-	-
Total	1,369	44,186	177	6,268	414	12,440	97	3,066

In-Service Training Centre in Matale

In the In-Service Centre of the DEA in Matale is conducting training programs to improve the skills and professional competence of the departmental staff as well as officers of the other public and private organizations. Additionally, many stake holders of EAC value chain were also trained during the year of 2017.

Table: 4.2.1.2.2: Training Programs Conducted at the In Service Training Centre in Matale in 2017

Name of the Training Program	No. of Training Program	No. of Beneficiaries
Officers Training	14	548
Outdoor staff training	9	462
Entrepreneurship	6	212
Crop cultivation/ organic	13	470
Other organization / Institute	19	651
Conference / Work shops	7	567
Total	68	2,910

4.2.2: Productivity Improvement Programme

Under this program 2 sub programs were launched, namely, Productivity enhancement of pepper and cinnamon cultivations and “Danasaviya” Home Garden development Program.

4.2.2.1: Productivity Improvement of Pepper and Cinnamon Cultivations

Given the importance of reaching the one billion dollars of foreign exchange by exporting EACs in the year of 2020, Enhancement of crop productivity was given a priority role. In 2017 productivity improvement programme was initiated with the objective of supporting the EAC growers to increase the productivity of their pepper and cinnamon plantations by training and social mobilizing. Also steps were taken to change the mind set of farmers to become entrepreneurs. All the programs were carried out in cluster mode. Below mentioned Programmes were launched to achieve this objective.

4.2.2.2: Training the EAC Growers on Productivity Improvement.

Growers were given scientific knowledge of GAP and GMP productivity improvement of pepper and cinnamon through farmer training classes. For this purpose extension staff was supplied with advanced training aids. To tackle the problem of soil acidity which is common in EAC growing areas, extension officers were given pH meters to test the soil samples and advice farmers on soil nutrition management.

4.2.2.3: Farmer Clinics

These mass awareness programmes were earmarked to provide extension and other agro-services at one stop shop model. Farmer clinics were conducted in high potential areas with active participation of farmers with public and private sector institutions related to agriculture. Research specialists were available to solve field problems such as pest and diseases, plant nutrition etc. Farmers were given facilities to test soil samples and quality of their EAC products. Private sector was represented by fertilizer, agrochemical, pest management, micro irrigation areas.

Table: 4.2.2.1: Progress of Farmer Clinics

District	No. of Conducted Farmer Clinics	No. of Participated Farmers	No. of Registered Farmers	No. of Identified Problems	No. of Solved Problems	No. of Soil Tests	No. of Quality Tests	No. of Sold Technical Bulletins	Income by Selling Technical Bulletins	No. of Participated Government	No. of Participated Non-
Colombo	1	335	21	36	36	6	2	90	4,565.00	5	5
Gampaha	2	821	77	63	63	42	0	263	15,600.00	6	7
Kalutara	2	766	94	64	58	0	2	275	12,350.00	6	10
Galle	2	530	62	358	358	30	0	236	10,350.00	6	1
Matara	2	741	139	438	392	44	0	406	17,790.00	5	3
Hambantota	2	1109	402	90	83	20	0	270	12,265.00	6	6
Kandy	3	829	402	306	267	102	19	364	17,315.00	13	2
Matale	2	278	40	31	31	6	17	91	4,220.00	2	0
N.Eliya	2	504	368	45	38	4	0	60	2,895.00	12	4
Kurunegala	2	713	548	274	0	102	0	175	7,740.00	10	2
Kegalle	2	996	996	0	0	10	0	346	15,965.00	27	10
Ratnapura	2	980	360	319	187	17	3	383	17,855.00	6	6
Badulla	2	802	163	18	18	35	10	228	9,760.00	5	2
Moneragala	2	559	200	20	20	37	0	102	4,255.00	9	6
Ampara	1	182	103	20	20	0	0	17	770	4	0
Total	29	10,145	3,975	2,082	1,571	455	53	3,306	153,695.00	122	64

4.2.2.4: School Children Awareness Program

School children were educated about the importance of productivity improvement of EAC cultivations and used them as a bridge to disseminate their knowledge to reach parents- growers.

4.2.2.5: Productivity Improvement Awareness Programme for Large Scale Growers

Many large scale plantations of EACs mainly, cinnamon and pepper are underutilized and not reaching the standard productivity due to negligence of the owners. A workshop was conducted to educate them on importance of the productivity enhancement of their EAC plantations. This workshop was attended by 150 participants,

4.2.2.6: Establishment Micro Irrigation System Demonstration to Mitigate Climatic Hazards Faced by EAC Cultivations.

Many of the EAC cultivations are suffering from the drought under present climatic change scenario. To protect these cultivations artificial irrigation has to be promoted. Therefore, it is planned to establish demonstrations of micro irrigation systems.

Table: 4.2.2.2: Progress of Productivity Improvement Program

District	Farmer to entrepreneur program		Farmer clinics	School programs		Micro irrigation program
	No. of programs	No. of beneficiaries		No. of schools	Students participated	
Colombo	02	86	01	02	313	-
Gampaha	42	858	02	05	718	01
Kalutara	-	-	02	07	826	-
Galle	24	824	02	22	1,704	-
Matara	32	1,288	02	10	1,348	-
Hambantota	08	458	02	05	501	-
Kandy	14	497	03	24	2,078	-
Matale	27	1,012	02	07	624	-
N.Eliya	05	173	02	05	338	-
Kurunegala	26	777	02	10	1,089	02
Kegalle	15	343	02	11	1,053	01
Ratnapura	26	1,409	02	10	1,135	-
Badulla	45	1,838	02	10	1,156	-
Moneragala	06	149	02	04	250	-
Ampara	01	182	01	03	345	-
Total	273	9,894	29	135	13,478	04

4.2.2.7: “Danasaviya” Program

Economic Home Garden Programme

This program was initiated to uplift the economic capability of rural women by supporting them to establish export agricultural crop dominated home gardens aiming at the holistic development of small scale EAC sector by ensuring forward and backward linkages through a cluster approach with the active participation of women. Expected income from the home garden at maturity is Rs. 100,000.00. The earmarked target is 1 million home gardens by 2020. It is expected that the production of these EAC dominated home gardens will contribute to expect one billion USD earnings from EACs by 2020.

Table: 4.2.2.3: Composition of Export Agriculture Crops In Home Gardens

Crop Mixture	Crop	Number of Plants
Pepper/Arecanut	Pepper	30-80
	Arecanut	0-50
Cinnamon/Arecanut	Cinnamon	500-700
	Arecanut	0-50
Nutmeg	Nutmeg	03-15
Clove	Clove	03-15
Arecanut	Arecanut	100
Coffee	Coffee	50-100
Citronella	Citronella	2000
Pepper/Vanilla	Pepper	30
	Vanilla	20
Garcinia	Garcinia	3-5
Turmeric	Turmeric	Maximum 150 Kg

Crop composition of home gardens was selected based on the preference of the beneficiary as well as climatic suitability for the region. All women beneficiaries were trained on GAP of home gardening and productivity improvement of their existing home gardens.

This “Danasaviya” program was introduced to this country by the DEA in 2016 targeting 50,000 home gardens. In 2017 this target was increased up to 140,000 home gardens. The extension officers and development officers of DEA have successfully achieved this target district wise.

Table: 4.2.2.4: Established Home Gardens - 2017

District	Target H.G.	Achieved		No. of H.G. Established (According to the type of Home Garden)									
		Achieved (Samurdi)	Achieved (Other)	Pp/ Areca.	Cinn/ Areca.	Nutmeg	Clove	Areca.	Coffee /Pp	Citron ella	Pp/Vn	Garcenia	Turmeric
Badulla	6,000	2,516	3,987	6,343	-	-	-	160	-	-	-	-	-
Colombo	2,050	-	2,328	2,146	28	102	-	52	-	-	-	-	-
Kaluthara	7,500	-	8,510	7,543	287	635	-	45	-	-	-	-	-
Galle	11,900	745	14,536	10,131	5,115	-	-	35	-	-	-	-	-
Gampaha	10,000	674	7,683	8,262	16	-	-	79	-	-	-	-	-
Hambanthota	8,000	2,784	4,958	6,048	1,369	-	-	237	-	88	-	-	-
Kandy	13,250	1,908	8,537	6,907	1	2,825	177	310	171	-	6	48	-
Kegalle	11,100	1,943	9,816	10,072	126	1,152	260	70	-	-	79	-	-
Kurunegala	13,050	3,510	8,085	11,241	2	232	-	120	-	-	-	-	-
Matale	7,100	227	6,036	5,233	60	775	56	61	-	-	-	78	-
Matara	8,000	815	8,947	7,336	1,509	193	-	-	-	-	-	724	-
Monaragala	10,200	3,874	4,664	8,290	46	-	-	202	-	-	-	-	-
Nuwara Eliya	5,300	1,713	3,057	3,431	-	16	449	31	778	-	-	65	-
Rathnapura	15,650	7,364	12,409	12,402	6,215	-	-	1,059	-	97	-	-	-
Putthalama	2,500	605	647	1,251	1	-	-	-	-	-	-	-	-
Ampara	4,400	484	3,942	3,558	136	-	-	408	-	-	-	-	324
Polonnaruwa	2,100	938	1,458	2,317	51	-	-	28	-	-	-	-	-
Anuradhapura	1,900	-	1,204	708	188	-	-	308	-	-	-	-	-
Total	140,000	30,100	110,804	113,219	15,150	5,930	942	3,205	949	185	85	915	324
Grand Total			140,904										140,904

Chart: 4.2.2.1: No. of Home Garden Established - 2017

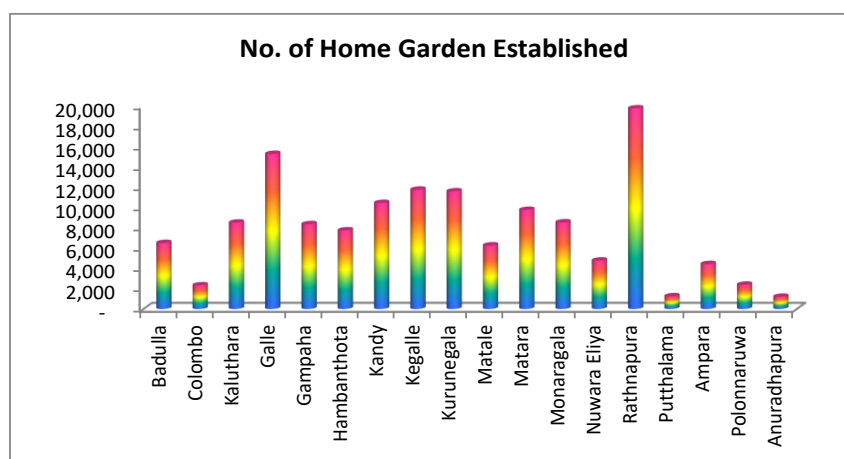


Table: 4.2.2.5: Plant Issues of “Danasaviya” Home Garden Development Program

District	Plat Issues								
	Pepper	Cinnamon	Nutmeg	Clove	Arecanut	Coffee	Ctronel la	Vanilla	Garcenia
Colombo	79,081	17,600	380	-	3,560	-	-	-	-
Gampaha	260,252	9,600	-	-	80,875	-	-	-	-
Kaluthara	256,030	161,400	1,982	-	24,935	-	-	-	-
Galle	317,330	2,936,725	-	-	12,670	-	-	-	-
Matara	277,787	923,500	933	-	1,540	-	-	-	2,289
Hambanthota	190,210	762,450	-	-	116,177	-	176,000	-	-
Kandy	224,979	600.00	10,869	868	26,086	9,885	-	127	509
Matale	164,155	8,022	3,744	206	78,900	20.00	-	-	234
Nuwara Eliya	101,510	-	149	1,687	14,360	46,380	-	-	325
Kurunegala	375,169	1,000	1,025	-	70,565	567	-	-	-
Putthalama	42,150	500.00	-	-	6,290	100	-	-	-
Kegalle	365,408	81,600	4,605	985	25,947	-	-	1,540	-
Rathnapura	413,420	3,605,740	-	-	219,565	-	194,000	-	-
Badulla	235,264	-	-	-	40,855	-	-	-	-
Monaragala	330,055	24,700	-	-	91,690	-	-	-	-
Ampara	118,444	75,200	-	-	69,040	-	-	-	-
Polonnaruwa	74,948	25,500	-	-	6,340	-	-	-	-
Anuradhapura	20,296	108,750	-	-	32080	-	-	-	-
Total	3,846,488	8,742,887	23,687	3,746	921,475	56,952	370,000	1,667	3,357
	13,970,259								

4.2.3: Industry Promotion Program

The main focus of this program is to increase the quality consciousness among the EAC stake holders and establishment of spice parks. For these purposes, awareness programs and infrastructure development of DEA spice parks at Matale and Delpitiya were planned. Additionally, a scheme of registration of EAC farmers was also started. Due to technical problems infrastructure developments could not be achieved. Progress of the trade promotion program is given in Table. 4.2.3.1.

Table: 4.2.3.1: Progress of the Trade Promotion Program

Project	Activity	Progress
3.1) Development of spice park	Development of spice park -Renovation of existing auditorium and office building at Delpitiya	Completed
3.2) Farmer Registration	Farmer Registration	6,814 Farmers registered
3.3) Trade facilitation	Trade facilitation	8 programs completed
3.4) Trade Promotion	Trade Promotion	2 programs Completed (Cinnamon Festival & Spice offering ceremony to Dalada Maligawa Kandy)
3.5) Quality improvement of EAC	Quality improvement of EAC	75 Moisture meters were distributed for quality testing

4.2.4: Sector Modernization Program**4.2.4.1: Establishment of Organic Agriculture Villages**

Spices produced in Sri Lanka are exported to various international markets especially consumers in developed countries are now more concerned on buying organic products. To be in line with rapidly changing world scenario, our spice producers will have to change their agronomic practices. To meet this challenge DEA has launched the Organic Agriculture Village Program.

Table: 4.2.4.1.: Progress of the establishment of Organic Agriculture Villages

Project	Activity	Progress
4.1) Establishment of organic agriculture villages	4.1.1) Supply of planting materials	plant Issued for 24.3 ha
	4.1.2) Provide investment assistance for conversion of conventional land into organic lands	142.6 ha
	4.1.3) Certification of organic villages	30 organization registered under the DEA
	4.1.4) Certification of organic villages under fair-trade logo	5 organization prepared for fair-trade certification
	4.1.5) Training programs for stakeholders (Badulla, Galle, Rathnapura and Kegalle)	3 completed (Badulla, Rathnapura & Kegalle)
	4.1.6) Preparing handbooks and manuals for basic guild line of organic agriculture	Printed 5000 hand books
	4.1.7) Selecting and registering of farmers for ecological green villages	2,000 farmers registered

4.2.4.2: Popularizing GAP and GMP among Stake Holders

With the aim of uplifting the standards of existing post-harvest processing centres the owners of those centres were encouraged to develop their processing techniques to suit the required level. Under the above programme 14 processing centres were developed to suit Good Manufacturing Practices standards.

Table: 4.2.4.2.1: Progress of the Establishment of GAP and GMP Centres

Project	Activity	Progress
4.2) Popularizing good agricultural practices(GAP) and good manufactural practices(GMP) among the stakeholders of EAC	4.2.1) Conducting awareness and training programs to develop knowledge and skills of stakeholders	5 programs completed
	4.2.2) Establishing GMP certified processing centers (certification cost)	14 centers prepared for certification

4.2.4.3: Dissemination of Appropriate Technology

Table: 4.2.4.3.1: Progress of the Dissemination of Appropriate Technology

Cinnamon Processing Centers/Units					
District	Medium		Small		
	No. Recommended	No. approved for	No. Recommended	No. approved for	No. paid
Gampaha			3	3	2
Kaluthara	4	4			
Galle			10	10	9
Matara	1	1	13	9	6
Matale			2		
Kurunegala	1	1			
Rathnapura			1	1	1
Monaragala			1		
Total	6	6	30	23	18

4.2.4.4: Communication Development

The communication and media Division is functioning to enhance the EAC promotional activities carried out by DEA. The main responsibility of this Division are dissemination of new technologies, research innovations, delivering knowledge to stake holders through mass media namely, radio, television and print media.

Table: 4.2.4.4.1: Progress of the Communication Division

Activity	Progress
Print media	220,000 leaflets were printed in Sinhala, English and Tamil languages and distributed to public
	Large format boards were designed and printed specially for exhibitions and other functions.
	EAC prices in Dinamina – No of advertisements publish - 52
Electronic Media-TV	‘Sengawunu Kahawanu’ on Rupavahini TV Channel- on 2 nd and 4 th Friday at 6.00 P.M No of programmes telecast -24
	Ranmasu Uyana’ on I.T.N.TV Channel- No of programmes telecast - 6
	Two Documentary film were Produced- for the International Pepper Community Conference
	TV Commercials were done on light berry harvesting and productivity improvement of cinnamon and pepper. No of TV commercials done - 11
Electronic Media-Radio	Rasa Janani’ on Kandurata Sevaya. FM 107.3) on every Saturday at 4.00 P.M. and on Ruhunu Sevaya, (F.M.107.3) Welanda Sewaya (F.M.94.3), Rajarata Sewaya (F.M.107.3), Wayamba Sewaya (F.M.90.1) on every Saturday at 4.30 P.M. as a simultaneous broadcast. No of programmes broadcast -43
	Rasa Manjari’ Radio Programme on I.T.N.F.M- every Sunday at 8.00P.M. on F.M.93.5.and 93.7
	Spice Star’ Entertainment Programme No of programmes broadcast - 44
	Krushi F.M. Radio Programme- a web cast No of programmes broadcast - 20
Exhibitions	Participated in 11 exhibitions (Exhibition stalls were designed and installed)

4.2.4.5: Other Programmes

Mushroom Cultivation Programme

This program was initiated to uplift the economy of the rural sector by facilitating them to acquire technology of mushroom cultivation and provide investment assistance to establish mushroom sheds. This program was initiated and funded by the Ministry of Primary Industries and field implementation was done by the extension staff of the DEA. During 2017, 212 of Mushroom cultivation units were established.

Pineapple Cultivation Programme

This program was initiated and funded by the Ministry of Primary industries to enhance the export volume and earning from the pineapple and create an income for the growers. Field implementation was performed by the extension staff of the DEA. Progress of the Pineapple cultivation program is given in Table 4.2.4.5.1.

Table: 4.2.4.5.1: Progress of the Pineapple Cultivation Programme

District	No. of Nursery	Extent (Ac.)	Cultivated Farmers	Extent (Ac.)
Kurunagala	25	21.5	47	36.25
Gampaha	09	8.5	80	68.5

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5. RESEARCH DIVISION

5.1 Technical Functions and Organization of Research Division

The Research Division operates under the supervision of the Additional Director General (Research) and consists of three main units; Commodity Research Unit, Economic Research Unit and Plant Protection Unit. Central Research Station and six sub-stations have constantly been developing appropriate technologies to solve farmers' problems and new technology to enhance the production, productivity and quality of Export Agriculture Crops. The locations of the Research stations and their functions are given below.

- Central Research Station, Matale - Multidisciplinary Research on EACs except Cinnamon, Citronella and Betel.
- National Cinnamon Research and Training Center, Pallolpitiya, Matara - Multidisciplinary Research on Cinnamon and Citronella.
- Intercropping & Betel Research Station, Narammala - Intercropping of EACs with Coconut and Betel.
- Tissue Culture Laboratory and Plant Production Nursery, Walpita - Tissue Culture Research and Plant Propagation.
- Sub-Research Station, Kundasale - Multidisciplinary Research mainly on Cocoa, Kithul, Ginger and Turmeric.
- Sub-Research Station, Nillambe - Cropping Systems.
- Sub-Research Station, Delpitiya - Organic Farming and Spice Park.
- Economic Research Unit, Head Office, Peradeniya - Conducting of Economics and Marketing Research.

Central Research Station and Plant Protection Unit function under the Director (Research) of Matale. Cinnamon Research Station and Betel Research Station are also operated under two Directors (Research), while other sub-research stations function under the supervision of the respective Research Officers in-charge. The progress of the research projects conducted in 2017 at the main research station and other sub-stations are described below, on crop and discipline basis.

5.2 Research Achievements on EAC's during the year of 2017

5.2.1 Cinnamon

Agronomy & Crop Improvement

Evaluation and comparison of superior quality characteristics of *Pieris* cinnamon with selected cinnamon accessions (Sri Gemunu and Sri Wijaya).

“*Pieris* cinnamon” termed by cinnamon growers in Galle district known for having superior characteristics such as erect firm stem, lengthy inter-nodes, pinkish golden-brown bark colour, year-round peelability, etc. Thus, the study was conducted to identify and evaluate superior quality characteristics of the accession comparing with selected accessions of Sri Gemunu and Sri Wijaya and to identify the possibility of using “*Pieris* cinnamon” in future varietal improvement programs. According to the observations made so far, it was evident that the collected accession (A1) showed high yield, greater growth performances, low severity of disease and pest damages and distinctively erect stem with lengthy internodes compared to other accessions. The average dry bark yield per stem was 183 g.

Elite Varieties with Superior Quality Characteristics

To produce elite varieties with superior quality characteristics, 46 hybrid plants were produced through hybridization among selected cinnamon accessions and established in the field. After screening and evaluation of the plants, three plants with elite characteristics (higher bark yield and low severity of pest and disease) were selected for further evaluation under recommended agronomic practices.

Sandy Texture in Cinnamon Bark

To identify the fundamental basis of formation of sandy texture in cinnamon bark tissues total elements of affected bark samples were determined in comparison to variety Sri Gemunu considering it as the normal plant at different maturity level of the stem. According to the results obtained it was evident that sandy textured bark tissues contain more Ca than variety Sri Gemunu and increased significantly with the maturity of the stem. In immature sandy textured stems (diameter <2 cm) Al, K, Na, Fe, Cu contents were higher and Mg content was lower than Sri Gemunu. With maturity K and Na contents not varied in variety Sri Gemunu, however, significantly decreased in affected plants and remained approximately constant at lower levels. Also, Al, Fe, Cu, levels decreased with maturity in affected plants and no significant variation was found in

variety Sri Gemunu with maturity, Mg level decreased significantly in variety Sri Gemunu however, remained approximately constant at a higher level in affected plants.

Effect of Different Concentration of Plant Hormone

Experiment was conducted to investigate the effect of different concentration of plant hormone (IBA and NAA) on rooting and growth of stem cuttings of cinnamon. IBA (Indole -3-butyric acid) and NAA (Naphthalene acetic acid) were used as rooting hormone and 6 levels of concentration (IBA and NAA 0, 200, 400, 600, 800, 1000ppm) were tested. Considering the results of this experiment, 0 - 1000ppm range of concentration of IBA and NAA has no significant effect on rooting or growth of stem cuttings of cinnamon. Also, interaction effect of IBA and NAA (0 – 1000ppm) do not have any significant effect on stem cuttings propagation of cinnamon.

Soil and Plant Nutrition

Application of dolomite at the rate of 750kg ha⁻¹ enhance Soil pH of cinnamon growing soil compared to previous dolomite recommendation of 500kg ha⁻¹.

When the cinnamon cultivated with half of the recommended amount of chemical fertilizer (DEA recommendation), spacing at 3x3ft and two rows of gliricidia planted in between the three rows of cinnamon plants (gliricidia loppings were added to the field) gave 1277.9 kg ha⁻¹ of dry bark yield after six years of planting. That yield was higher than the yield given by cinnamon cultivated with recommended dose of chemical fertilizer (1203.2 kg ha⁻¹).

The cinnamon fertilizer mixture with 675kg/ha of Ammonium sulphate that gives 143kg of Nitrogen (N), 163.5kg of sulfur (S) and 139kg/ha of Urea that gives 64 kg of N, recorded highest plant height than cinnamon cultivated with recommended dose of N from Urea or Ammonium sulphate alone after two years of planting.

Growth performances of cinnamon seedlings under different pH level ranged from 1.066-8.05 was observed at the nursery. The highest plant height was observed when initial soil pH was 5.04, where the minimum pH difference was recorded with experimental period.

Plant Protection

To obtain optimum export quality for cinnamon quills, they were stored 0, 3, 7 & 14 days under different temperatures and RH combinations (15 °C/ 45% RH, 15 °C/ 60% RH, 30 °C/ 30% RH and 30 °C/ 60% RH). Storage of cinnamon quills under 15°C and 30% RH within 3 days, gave the optimum conditions for packaging before exporting the cinnamon quills. Fungal and Bacterial colony growth was decreased within 14 days under 15°C temperature and 60% relative humidity.

Some physical characteristics such as peeling time, bark thickness and oil contents were tested in different severity levels of rough bark disease infected cinnamon bark. Peeling time increases with the severity of the disease. Normal and healthy bark is thicker than infected bark, but the bark thickness increases gradually with the severity of the disease but not more than healthy bark. Percentage of bark oil increases gradually up to 60 % of rough bark disease and there is a slight decrease of oil content after 60%. It might be an internal reaction against infection of rough bark disease at initial stage of the disease. But the highest oil content was present in normal healthy cinnamon bark.

Different concentrations of sea water with some organic materials (cow dung and vermicompost) were tested for managing nursery pests and diseases in cinnamon and plant growth as well. 1% sea water with cow dung and vermicompost had significantly higher growth (plant height) and lower pest and disease incidences (leaf blight, leaf galls and thrips damage). Cow dung and vermicompost without sea water also showed significant, higher growth performance and lower pest and disease incidences than control (only water with normal nursery mixture), without burning effect.

Post-Harvest Technology

Quality Parameters in Cinnamon Quills in Value Chain after Primary Processing

Quality parameters were checked in cinnamon quills at three levels (farmer, collector, and exporter) in value chain after primary processing in Matara district. Moisture content and sulphur content significantly differed among three levels at the 0.05 significance level. Volatile oil content, total ash content and acid insoluble ash content did not significantly differ among three levels at the 0.05 significance level. Level of farmer and collector has exceeded the limit of moisture content in SLS standard (81:2010). All three levels have exceeded the limit of acid insoluble ash content in SLS standard (81:2010).

Cinnamon quills have contaminated with insects at all three levels and microbial contaminations were present in farmer and collector level. Although minimum count of insects and microbes have occurred at exporter level. Sulphur residues were only found in cinnamon at exporter level. Therefore, Exporters may practice chemical method to reduce insect and microbial count.

Oil Content in Cinnamon Wood and Scrapings

Quality and quantity of oil in cinnamon wood and cinnamon scrapings were investigated. About 0.08 % of oil content was in scrapings and no any significant amount of oil present in cinnamon wood. According to the GCMS analysis Eugenol was present as the highest constituent (18.00 %) in oil of scrapings.

Grading of Cinnamon Based on the Thickness of Bark Layers

Amount of outer bark layer and inner bark layer present in different quill grading of cinnamon was investigated. Cinnamon quills selected during different grading were not contaminated with any physical or biological substance. Considering result of different cinnamon quills, presence of 50% of inner filling and outer bark gives C5 extra -special grade of quills. Content of inner fillings were higher in lower grades than higher grades.

5.2.2 Black Pepper

Agronomy & Crop Improvement

Studies on Variation of Vegetative Growth, Flowering, Fruit Setting and yield of Black Pepper under different Agro-Ecological Zones.

Highest number of flower initiations (06) were observed in Walpita and followed by Haldummla (04) and Narammala (03). However, pepper in Matale and Kolonna gave only two flower initiations during this year. But flower initiation at Kolonne can be considered as one initiation, due to the time difference between two initiations was only 2 weeks. As usual, it happened in Yala season which is the main season in this area. Highest variation in flowering was observed in Walpita and flowering occurred during both yala and Maha seasons.

Improvement of Resource Use Efficiency of Black Pepper to increase the Yield through Support Tree Manipulation

Vine canopy development was not completed in pepper on all four different supports after field establishments yet. Vine height was almost similar in pepper vines on all different supports except on Sooriya which showed the highest among the other treatments. Even though, the highest vines were shown with sooriya supports, lowest yield was recorded in sooriya due to lower number of lateral branches. Pepper vines on Gliricidia have given the highest fresh berry weight while vines on Kapok and Dadap showed second and third in yield performances. Percentages of spike filling in canopies were almost similar with all four supports. As shown in past years, significantly, the highest biomass production was given by Gliricidia even this year and lowest was recorded by Sooriya supports.

Effect of Micro-Irrigation on Plant Establishment, Growth and Yield of Black Pepper

Average yield has been increased by more than 60% during 2017 compared to the yield in 2016. Fresh berry yield in 2016 showed clear variations among the treatments and had increased with increasing rate of irrigation levels. However, no such variation or trend can be observed in fresh berry yield during 2017. It might be due to the rain received during the fruit filling stage of the crop. Because of that, effect of irrigation level was not reflected from the crop yield. Even though, the final yields in different irrigation treatments did not show much difference, different yield parameters at sixth month stage of spikes showed a notable relationship with the rate of irrigation level. Mean values of all yield parameters have increased with the increasing the rate of irrigation level applied.

Effect of Planting Material Originated from Different Cutting Types on Canopy Development and Yield of Black Pepper (*Piper nigrum* L.)

Growth and yield performances among the plants originated from different cutting types showed significant difference at all three locations. Vine height of plants from terminal branches and ground runners was more than three times higher than the plants from plagiotropics. Vine height of plants from terminal branches and ground runner did not show much difference at Matale and Nillambe, but plants at Nrammala were slightly different. However, number of lateral branches per vine was comparatively high in plants

from terminal branches at all three locations while it was expressively less in plants from plagiotropics. Yield data also showed same trend among the treatments except the plants at Matale location.

Effect of Soil Moisture on Flowering and Fruiting Habits of Black Pepper

(Piper nigrum L.)

Healthy planting material taken from fruiting branches were raised in pots with recommended potting mixture for the pepper and maintained under poly house for this experiment. Eight treatment combinations with two rates of irrigation and four different dry spells were applied and data were recorded for time (days) taken for flower initiation and number of flower initiation per plant. Two control treatments were also maintained only for two different irrigation treatments. Highest number of spike initiations were given by 6 liter of water/ 10 days dry spell, however the number of spike initiations were also comparatively high in control i.e. 6 liter of water only and treatment 2 i.e. 6 liter of water/ 20 day dry spell as compared to other treatment combinations. The lowest was recorded with low irrigation level and longest length of dry spell. This is a good indication for further studies on effect of dry spell and irrigation rate for flower initiation, but it should also be studied under field conditions for practical application in the field.

Effect of Maturity Stage of Stem Cuttings on High Quality Planting Material Production through Terminal Branches in Black Pepper (*Piper nigrum L.*)

To investigate the effect of the maturity of terminal branch cuttings of black pepper on subsequent growth of young pepper plants, five maturity stages (T1- softwood stem cutting, T2- greenwood stem cutting, T3- semi mature stem cutting, T4- fully mature stem cutting and T5- basal part stem cutting) were planted in poly bags. Different growth parameters were observed and T3 recorded the highest values for shoot length, shoot dry weight, root length, root dry weight, number of leaves and total leaf area. Therefore, maturity stage of cuttings is an important factor and can be concluded that semi mature stage of terminal cutting is the most suitable stem cutting for producing quality planting material in black pepper.

Variation of Micrometeorological Parameters and Different Yield Attributes of Black Pepper (*Piper nigrum* L.) with Growth of Live Support Tree (*Gliricidia sepium* Jacq. Walp) Canopy.

Effect on microclimate factors by growing gliricidia canopy and relationship with the growth and yield parameters of black pepper were studied under 0%, 40-50% and 70-80% shade levels of support tree canopy and significant variations were observed on different micro-meteorological factors between different shade levels. But these differences gradually decrease with the growth of gliricidia canopy. The difference of canopy temperature between 0% and 70-80% shade level gradually decreases from approximately 5 °C to 1 °C while the soil moisture increased in the opposite direction from 12% to 20% VWC. CO₂ concentration was higher in 70-80% shade level in the morning (07.00AM) and evening (06.00PM) times than 0% shade, while it was continuously lower in 70-80% shade from 09.00AM to 05.00PM than 0% shade. It clearly indicated more potential for higher CO₂ concentration supply for pepper vine with pruned Gliricidia. The correlation between shade level with both growth and yield performances showed negative relationship with R² values of 0.730 for growth and 0.601 for yield. Both new initiations of new shoots and spikes were the highest in 0% shade level and the lowest in 70%-80% shade level due to the variation of these microclimatic factors. Therefore, results clearly indicated that shade modified microclimate within pepper canopy and support tree canopy maintenance practices are highly important towards higher yield.

Variation of Flower Initiation and some Yield Attributes of Black Pepper (*Piper nigrum* L.) under Different Irrigation Levels.

A pot experiment was conducted with three irrigation levels (8, 4, 2 l/plant) under protected environmental conditions and variation of yield parameters were tested. Yield attributes, namely number of spikes per plant (81), spike length (11.76 cm), filling percentage (88.9%), number of berries per spike (87.4), fresh weight of berries of 10 spikes (128.1 g) and dry weight of berries of 10 spikes (37.9 g) were significantly highest with the highest irrigation level (8 l/plant) and they progressively decreased with the decreasing level of irrigation.

Evaluation of Bush pepper

Low spacing levels (3'x3') can be used to establish bush pepper plants in a home garden to fulfil the home consumption of pepper

Plant Protection

Preparation of a Bio Control Agent (*Trichoderma* spp,) for the Nursery and Field Level Applications in Black Pepper (*Piper nigrum* L.)

Trichoderma strain isolated previously from black pepper rhizosphere was sent to Industrial Technology Institute, for molecular characterization. Fungal strain characterization by DNA sequencing of ITS regions have been practiced. DNA extract had been sequenced by Microgen Inc. Korea and sequence had been analyzed using National Centre for Biotechnology Information (NCBI) Genebank data base. Based on the results, ITS sequences of the sample were similar to *Trichoderma asperellum* or *Trichoderma viride* sequence information deposited in NCBI data bank (ITI test report, Reference No. CTS 1709084).

Trichoderma talc-based formulation was prepared and tested under laboratory conditions. According to the results of shelf life study, *Trichoderma* spores remain viable even after three months of preparation.

Post-Harvest Technology

A greenhouse dryer has been designed and fabricated and evaluated for drying pepper. The dryer is 20 feet in length and 10 feet in width. Thirty-six (36) trays in the size of 3"x2" can be placed on iron structure. Capacity of the dryer is 130-140 kg/hr.

Genetics and Plant Breeding

Multi Location Pepper Evaluation

Multi-locational Pepper evaluation research trial at the Middeniya DEA farm yielded very high yields compared to the other field trials established. The wet spikes yields from 11 pepper accessions (GK -49, KWW-10, DM-7, WS, KWW-12, GM-28, KS, Ud-21, Panniyur-1, TG-7) are 6125, 4070, 3000, 6280, 8567, 4840, 6900, 6878, 6300, 4500 g/Vine/Yr respectively.

Soil Science and Plant Nutrition

Investigation on Effect of Source of Nitrogen on Growth and Yield of Black Pepper

Results showed that application of half of the recommended fertilizer mixture [(NH₄)₂SO₄ as N source] along with 10 Kg of Gliricidia green manure for a plant/year has given significant improvement in black pepper yield.

Effect of Cover Crops on Soil Properties, Growth and Yield of Pepper

The result showed that growing *Arachis pintoii* and *Desmodium ovalifolium* as cover crops in pepper growing fields can enhance shoot and leaf growth of young vines of black pepper. Also, these two cover crops helped to increase the soil moisture retention in pepper growing soils.

Study on Nutrient Removal in Black Pepper (*Piper nigrum* L.) at Different Stages of Harvesting

Tissue plant nutrients content in pepper berries at four selected maturity stages (3,5,7 and 8 months after flower initiation) were investigated in two cultivars namely, local selection MB 12 and Panniyur-1. Percentage of moisture and plant nutrients such as nitrogen (N), phosphorous (P), potassium (K), magnesium (Mg), zinc (Zn), copper (Cu), iron (Fe) and boron (B) were evaluated in both spikes and berries. Initial nutrient content in index and mature leaves and soil nutrients of rhizospheres of experimental vines were also evaluated to check the nutrient status of field. Both MB-12 and Panniyur-1 showed a similar pattern of moisture reduction over the maturity. The study, showed a significant ($P<0.05$) difference in nutrient removal of immature harvesting (3 and 5 months after flower initiation) and compared to mature harvesting (7 and 8 months after flower initiation). Both macro and micro nutrient removal at mature harvesting was higher than immature harvesting. Results indicate the requirement of more nutrients such as K, N and P during berry maturation and the importance of applying nutrients during reproductive stage of pepper.

Physiology and Plant Production

Plants produced from single nodal and large orthotropic top cuttings from field grown plants were established at 8' x 8' spacing while plants produced from plagiotropic branches from field grown plants were established at 4' x 4' spacing. The plant height was higher in plants originated from single nodal cutting plants (309cm) than orthotropic

plants (298.9cm). Significant differences were not observed on number of spikes/vine and yield / vine. Number of spikes/vine was higher in plants from single nodal cuttings (260) than orthotropic plants (223) and plagiotropic plants. Total yield /vine was higher in orthotropic plants (5.3kg) than single nodal plants (3.6kg).

Tissue cultured pepper vine and single nodal pepper vine establishment was completed at 8'x 8' spacing to compare the growth and yield differences. Recommended management practices for pepper were adapted. Growth measurements (height, girth, number of lateral branches) and yield data (number of spikes/plant, fresh weight/vine) were taken and recorded. There was no significant difference on growth parameters between two types of plants, single nodal cutting plants (vine length - 251.8cm, vine spread 117.3cm and diameter 22.2cm) and tissue culture plants (vine length – 252.4cm, vine spread 110.8cm and diameter 19.4cm). Significant differences were not observed on number of spikes/vine (single nodal plants 292 and tissue culture plants 259) and yield / vine among treatments (single nodal plants 2 kg and tissue culture plants 1.5kg).

Technology Innovation for Large Scale *in- vitro* multiplication of Black pepper

Half strength medium containing 0.5mg/L IBA and 0.15% charcoal has shown best rooting for in-vitro produced plants and maximum survival rate of in vitro produced plants was observed in coco peat compared to potting mixture (topsoil: sand: coir dust: cattle manure1:1:1:1)

Plant Production Programme

In year 2017, around 5,000 pepper plants including single nodal, lateral and top cutting were produced and 2,200 plants were issued to other divisions and Assistant Director Office Matala.170 pepper vines were issued to AD office Matala and Kundasale sub research station. Local and Panniyur vines were issued to AD office Matala to produce 1,550 pepper plants. Other pepper plants were used replanting programme in Bamboo Rapid Multiplication System for future plant production process and, research work.

5.2.3 Cocoa

Agronomy & Crop Improvement

Rehabilitation of Senile Cocoa with Improved Amelanado type Cocoa

(Theobroma cacao L.)

The rehabilitation of a 35 years old cocoa cultivation using improved high yielding materials (Cultivars SCA6 x ICS6, W5/5 and SCA6 x Na 34) showed a marginally irregular yield pattern over the experimental period. The replanting of bud grafted plants originated from chupon scion and fan scion of cultivar SCA6 x ICS6 and W5/5 produced high yield compared to the other cultivars.

5.2.4 Coffee

Genetic and Plant Breeding

International Quality report obtained on Lak Parakum Coffee indicated that, overall quality score is 85.5 considering the all ten quality attributes. This indicates that Lak Parakum coffee variety is among the 10 best coffee varieties in the world.

Plant Protection

Control of Coffee Berry Borer (CBB), (*Hypothenemus hampei*)

The results indicated that there were significant differences between the coffee cultivar with regards to Coffee berry borer damage. Arabica species were more susceptible than the Robusta species and BS₅ (Robusta variety) was the least damaged by CBB significantly.

Fruit fly Damage

Fruit fly damage was reported in Matale district as a new pest damage for coffee berries and it was identified as *Bactrocera (Bactrocera) kandiensis* (Drew and Hancock).

Physiology and Plant Production

***In-vitro* propagation of Coffee**

Different sterilization procedures were used to sterilize leaf explants, apical and axillary buds

Surface sterilization of coffee apical and auxiliary bud explants and leaf from green house were accomplished by careful selection of undamaged and healthy buds and

washing them in distilled water containing few drops of tween 20 for 10 min. Mercuric chloride (HgCl₂) (0.1%) for 10 min with 0.2% Charcoal has shown the best performances in survival and culture establishment. This was followed by the treatment of 20% NaOCl 10 for 10 min with 0.2% Charcoal.

5.2.5 Ginger

Agronomy & Crop Improvement

Ginger plants were irrigated with three different irrigation levels in three-day intervals. The treatments were T1: 15 L, T2: 30L. T3: 45 L per bed. The highest yield was recorded from T3 treatment.

Genetics and Plant Breeding

Evaluation of the Yield of Ginger Accessions

Thirty-four ginger accessions, which were collected from different areas in Sri Lanka, were field established under coconut in low country intermediate zone (IL_{1a}) and two years yield data were evaluated. According to the evaluation of Chinese type ginger, accessions no.G1 which was collected from Mirigama area gave the highest yield (1071.4 g/clump). Among the Rangoon type ginger accession G28 which was collected from Melsiripura area had the highest yield (765.4 g/clump). Out of the local type ginger, accession G26 which was collected from Udadumbara area gave the highest yield (570.6 g/clump) under coconut in low country intermediate zone.

Plant Protection

Effect of Rhizome Scales Insects (*Aspidiella hartii*) on Germination and Subsequent Yield of Ginger

Study revealed that Thiamethoxam 25% W/WG treated seed rhizomes of Local variety showed significantly higher growth and yield at field condition. After 3 months of storage time, all three varieties (Local, Chinese and Rangoon) were infested by the scale insects and treatment before the storage of seed materials facilitated to reduce the infestation.

Physiology and Plant Production

Technology Innovation for large Scale *in-vitro* Multiplication Ginger

DNA extraction and PCR protocols developed in this study were able to successfully amplify DNA bands of ISSR and SSR markers from all three cultivars.

5.2.6 Turmeric

Plant Breeding

Evaluation of the Yield of Turmeric Accessions

Twenty turmeric accessions, which were collected from different areas in Sri Lanka, were field established under coconut in low country intermediate zone (IL_{1a}) and two years yield data were evaluated. According to the evaluation, accession T4 which was collected from Rathnapura area has given the highest yield (1011.2 g/clump).

Technology Innovation for Large Scale *In- Vitro* Multiplication of Turmeric

Copious root formation was observed in 1/2 strength MS supplemented with the range of IBA at 1.5-2.0mg/l and charcoal. Coco peat showed maximum percentage of survival for tissue cultured turmeric. This was followed by the coir dust. However maximum shoot growth during the period of acclimatization has been shown in 1:1:1:1 ratio of coir dust: sand: top soil: cattle manure. The application of suitable liquid fertilizer mixture into the plants in coco peat was needed.

5.2.7 Betel

Agronomy & Crop Improvement

Above 60 % shade level is not suitable for betel which is produced for the export market, because of reducing number of side branches, leaf thickness and weight. There is no any effect of different types of betel cuttings on the growth of plantlets with compared to the terminal cuttings at nursery level.

5.2.8 Nutmeg

Agronomy & Crop Improvement

Effectiveness of the Approach Grafting Over the Other Vegetative Propagation Methods of Nutmeg (*Myristica fragrans* Houtt.)

Effectiveness of approach grafting over the current vegetative propagation methods of nutmeg were tested and results revealed that successful percentages for cleft grafting, soil layering, air layering, stem cuttings, approach grafting with plagiotropic shoots and approach grafting with orthotropic shoots were 24.81%, 0%, 17.13%, 0%, 75.00% and 87.37% respectively. Therefore, use of approach grafting with plagiotropic shoots and orthotropic shoots will be an efficient tool for the production of nutmeg grafted plants.

Plant Protection

Management of Nutmeg Leaf Fall Disease (NLFD)

With the objective of identification of potential alternative host plants of causal organism of NLFD, an experiment was carried out in year 2017. This study was conducted for the assessment of cross infection potential between *C. gloeosporioides* isolated from nutmeg and selected tropical fruits (avocado, mango and papaw). The results revealed that there is a possible disease-causing ability from *C. gloeosporioides* strains of avocado to nutmeg as well as nutmeg to mango and papaw fruits in both ways. Avocado was identified as one of the potential alternative host for the causal organism of NLFD. Therefore, the field sanitation of avocado plants must be recommended as an additional measure, where nutmeg and avocado are grown together to avoid spreading of NLFD as a long-term disease management strategy. However, the research is continued for further verification and to identify other possible alternative hosts of NLFD.

Physiology and Plant Production

Ten selections (A3, B, C1, C2, D1, D2, D4, D5, D6 and E1) were used for the evaluation. Grafted plants were established in the field at 12' x10' spacing in 2004. Well grown four grafted plants of each selection were established in a plot and replicated three times. Yield data (number of nuts/plant) were recorded. Based on past 11 years data, plant height was higher in selection B in both places, Gasnawa and Matale followed by selection E1. Canopy spread was higher in C1 and followed by E1 at both places. Considering yield data number of fruits were higher in selection B at Gasnawa (115) and selection C1 (65) and D1 (84) at Matale. Field evaluation of seedlings and air layered planting material originated from different sized lateral and upright branches of high yielding nutmeg cultivars was carried out and layering evaluation and performance testing have been completed. Marcotted branches were transferred into pots. Branches at 2 or 3, feet in length are more suitable for layering and nutmeg plant production.

5.2.9 Goraka

Post-Harvest Technology

Preliminary Phytochemical Screening of the Fruit Rind of Five Selections of *Garcinia queasita* in Sri Lanka – A Comparative Study

Fresh matured fruits from five selections of *G. quaesita* were collected from trees of experimental field at nursery of Department of Export Agriculture, Gasnawa and Kegalle Sri Lanka. The selections are Aranayaka 1 (A1), Aranayaka 2 (A2), Gasnawa (B), Ovilikanda 1 (C1) and Ovilikanda 2 (C2). Sample size was 1 kg for each selection. Harvested fruit rinds were washed and artificially dried in Fission drying cabinet at 55 °C for 60 hours separately. In this study, petroleum ether and ethanol were used as solvents to extract preparation. Qualitative chemical tests were conducted to establish the profile of chemical composition of *Garcinia quaesita*. Both solvents gave the best results in qualitative phytochemicals analysis. Petroleum ether was the most suitable solvent to extract alkaloids from *Garcinia quaesita* selections. Furthermore, ethanol was the most suitable solvent to extract flavonoids.

A Comparative Analysis of Phytochemical, Proximate and Mineral Composition of four Different Selections of dried Goraka (*Garcinia Queasita*) Fruit Rind in Sri Lanka

The objective of this study was to investigate the comparative phytochemical, mineral and proximate composition among four *Garcinia quaesita* selections namely, Ovilikanda I, Ovilikanda II, Gasnawa and Aranayaka I that cultivate under similar agro-climatic conditions in the nursery farm, Department of Export Agriculture Gasnawa, Kegalle, Sri Lanka. Standard Analytical procedures were followed to analyze phytochemical, mineral and proximate composition. The phytochemical analysis showed comparatively higher percentage of Hydroxycitric acid content in Aranayaka I selection than the other selections. Flavonoid contents were observed significantly ($p < 0.05$) higher amounts in Ovilikanda I than the other selections. The results of proximate analysis revealed that Ovilikanda I was the highest in acid insoluble ash and dry matter while Gasnawa selection gave a greater amount of crude fat and crude protein contents. It was found that significantly ($p < 0.05$) higher amount of crude protein and Nitrogen contents in Aranayaka I selection while Ovilikanda II selection gave the highest total ash content. In mineral analysis, significantly the highest amount of Magnesium was observed in Ovilikanda I, whereas Ovilikanda II contained the highest amount of Phosphorous. Gasnawa selection contained significantly ($p < 0.05$) the highest amount of Potassium and Aranayaka I contained the highest amount of Sodium compared to the other four selections.

Physiology & Plant Production

Planting material collection was done from five districts, i.e; Ratnapura, Kurunagala, Kaluthara, and Hambantota. Grafting was commenced and plants are in good condition. 215 plants survived. The success percentage of grafting process was 65 – 70 %. Grafted plants were re-potted using 10' x 12' bags filled with recommended potting mixture. Foliar application was done once a month. The experiment is in progress.

5.2.10 Other

Wallapatta and Garcinia Tissue Culture

The mother plants of black pepper were procured from BMRS and the explants used for the present investigation were nodes and apical meristem of healthy black pepper (Hybrid) plant grown in net house. The explants used for wallapatta were shoot tips and explants for Garcinia will be shoot tips, nodes and leaves. Under experiment 1 four sterilization treatments were applied. As experiment 2, basal media identification was done by using two media, i.e; full MS and woody plant media (WPM).

Sterilization treatments were applied for black pepper, garcinia and wallapatta shoot tips and nodal explants. Four treatments were applied and success percentage of black pepper was about 40%. Therefore, black pepper varieties (Hybrid) Kohukumburerala, Dingirala and Butawerala were introduced into MS and WPM media. Success percentage of Garcinia and Wallapatta were about 20. Both crops were also introduced to establishment media, i.e; MS and WPM. Experiment is continuing.

Develop, Test and Implement Monitoring Procedures and Practices at site, Regional and National Levels for: Belowground Soil Biodiversity (BACC project)

The main hypothesis of the present study is that plant population profile and soil physical characters have an influence on belowground diversity and abundance of organisms. It is expected that belowground community would be responsive to above ground plant diversity and soil physical characters. Based on the results so far gathered, it can be concluded that above ground plant diversity and soil physical characters could be used as indicators for soil belowground diversity assessment.

In – Vitro Propagation of Pineapple

Sterilization and multiplication activities were started. Further adjustments of chemical composition to be needed to optimize maximum multiplication and rooting.

5.3 Ongoing Research during the year 2017

5.3.1 Cinnamon.

- Evaluation and comparison of superior quality characteristics of 'Pieris cinnamon' with selected cinnamon accessions (Sri Gemunu and Sri Wijaya).
- Screening and evaluation of selected hybrid cinnamon plants for quality, growth, and yield performances.
- Identification of chemical and element composition of sandy textured cinnamon bark tissues.
- Effect of different concentration of plant hormones (IBA and NAA) on rooting and growth of stem cuttings of cinnamon.
- Effect of fertilizer application time on growth, yield and peeling ability of cinnamon.
- Effect of cinnamon leaf compost and inorganic fertilizer and their combinations.
- Effect of dolomite application on growth and yield of cinnamon grown in acid soil.
- Effect of growing gliricidia and legume cover crops on growth, yield and soil fertility status in cinnamon.
- Characterization and evaluation of soil fertility status of selected soils of major cinnamon growing areas and crop productivity relations.
- Effect of the application of sulphur containing fertilizers on growth and yield of Cinnamon.
- Determination of optimum pH level for growth of cinnamon.
- Identification of visible indicators of cinnamon (*Cinnamomum zeylanicum* Blume) to monitor major and minor soil nutrients.
- Effect of biofilm- bio fertilizer on growth and yield of cinnamon.
- Effect of type of planting materials and different rates of fertilizers on growth and yield of cinnamon.
- Effect of different levels of N, P and K fertilizers on growth, yield and quality of the cinnamon.
- Study on the effect of seawater for management of pest and disease in cinnamon nurseries.

- Studying etiology, symptomatology and histopathology of Rough Bark Disease of cinnamon.
- Study the ecology (seasonal abundance, locality of spread and peak swarming period etc.) of cinnamon wood borer.
- Identification and studying the biology, ecology and management of cinnamon thrips.
- Establishment and evaluation of electric fence and audio devices to manage vertebrate pests in cinnamon.
- Study on the white root disease infection, its pathogenicity and ecological factors that enhance the disease in cinnamon.
- Study about canker formation in cinnamon.
- Screening of cinnamon germplasm for pest and disease resistance.
- Evaluation of yield and quality characteristics of true cinnamon (*Cinnamomum zeylanicum* Blume) in different Agro-ecological regions in the Southern Province.
- Effect of sulfur- fumigation and packaging materials on shelf life of cinnamon quills.
- Anti-Fungal and Anti-Bacterial activity of true cinnamon (*Cinnamomum zeylanicum* Blume) for skin and oral diseases in human.
- Comparative evaluation of Anti-diabetic activity of two introduced varieties (Sri Gemunu and Sri Wijaya) of true cinnamon (*Cinnamomum zeylanicum* Blume).
- Investigation of the quality and quantity of oil in cinnamon scrapings and cinnamon wood.
- Investigation on the amount of outer bark layer and inner bark layer in different quill grading of cinnamon.
- Study on the effect of soaking time of cinnamon stem in water for peeling ability, appearance of bark and oil content of cinnamon.
- Introducing a soup cube by using cinnamon bark oleoresin.

5.3.2 Black Pepper

- Evaluation of new hybrid black pepper varieties against insect pest damages.

- Occurrence of insect pest and disease incidences in three commonly cultivated black pepper (*Piper nigrum* L.) cultivars grown under different shade levels and climatic conditions
- Hybridization of selected black Pepper (*Piper nigrum* L.) cultivars for low country intermediate zone.
- Comparison of black pepper (*Piper nigrum* L.) yield per unit area of plants originated from orthotropic and plageotropic branches.
- Studies on the use of soil moisture conservation methods and agronomic management practices for the improvement of black pepper (*Piper nigrum* L.) productivity as climate change adaptation practices.
- Effect of irrigation and fertilizer application on inducing of flower initiation and yield of bush pepper throughout the year.
- Study on the potential use of coconut tree as a live supporting material for pepper (*Piper nigrum* L.).
- Effect of different pruning levels on canopy development and yield of black pepper (*Piper nigrum* L.).
- Effect of cover crops on soil properties, growth and yield of black pepper.
- Identification of suitable bio-indicators to monitor soil qualities responsible for black pepper yellowing.
- Effect of arbuscular mycorrhizal infections on occurrence of yellowing in black pepper (*Piper nigrum* L.) plants under different soil moisture levels (NARP).
- Development of land suitability classification for black pepper (*Piper nigrum* L) in Sri Lanka.
- Effect of cover crops on soil properties, growth and yield of black pepper.
- Identification of suitable bio-indicators to monitor soil qualities responsible for Black pepper yellowing.
- Application of Bio Control agent *Trichoderma* sp. for controlling black pepper (*Piper nigrum* L.) quick wilt disease causing *Phytophthora capsica*.
- Evaluation of different irrigation and soil moisture conservation method for black pepper (*Piper nigrum* L.) cultivation under different agro-ecological zones.

5.3.2 Cocoa

5.3.3 Evaluation of selected cocoa (*Theobroma cacao*) lines for intercropping with coconut in low country intermediate zone.

- Studies on productivity improvement of cocoa under coconut in Kurunegala district in Sri Lanka.
- Productivity improvement of cocoa through integrated soil and plant nutrients management under rubber and coconut.
- Development of soil conditioner using bio-fortified cocoa pod husk for reclamation of cocoa fields.
- Productivity improvement of cocoa through integrated soil and plant nutrients management under rubber and coconut.

5.3.4 Coffee

- Use of *Beauveria brassiana* for the control of coffee berry borer.
- Investigation of biological control agents of coffee berry borer.
- Design a trap for coffee berry borer.
- Evaluation of the performance of selected coffee cultivars (*Coffea* sp.) under coconut in low country intermediate zone.
- Strategies for organic cultivation of arabica coffee.

5.3.5 Cardamom

- Screening of wild types of cardamom against thrips (*Sciothrips cardamomi*)

5.3.6 Clove

- Management of leaf fall disease (leaf blight & leaf spots) of clove (*Eugenia caryophyllus*) in mid country.

5.3.7 Nutmeg

- Management of nutmeg leaf fall disease.

5.3.8 Goraka

- Evaluation of collected Goraka cultivars for the resistance against the Oyster scale insect.

5.3.9 Betel

- Collection, establishment, evaluation and conservation of betel (*Piper betle* L.) germplasm in Sri Lanka.
- Breeding of ‘Maneru’ and ‘Mala Bulath’ with ‘Ratadalu’ and comparison.
- of the yield parameters of their subsequent generations with ‘Ratadalu’.
- Study the optimum shade level for producing export quality betel leaves (*Piper betle* L.).
- Studies on the effect of partially burnt paddy husk as an alternative nutrient source for growth and yield of betel (*Piper betle* L.).
- Phosphorous solubility improvement using mycorrhizae and commercial sulphur powder for betel (*Piper betle* L.) under coconut.
- Development of value added products using waste betel (*Piper betle* L.) leaves.
- Characterization of soil fertility status in betel cultivations.
- Fertilizer studies in betel (*Piper betle* L.).
- Investigation on the use of indigenous techniques for controlling bacterial leaf blight (BLB) in betel.
- Evaluation of department fertilizer mixture for single supporting system in betel.
- Evaluation of different plant raising methods for the production of betel (*Piper betel* L.) planting materials under shade nursery.

5.3.10 Ginger

- Effect of rhizome scales insects (*Aspidiella hartii*) on germination and subsequent yield of ginger.
- Evaluation of ginger (*Zingiber officinale*) germplasm under coconut.
- Sustainable methods of growing ginger in containers for household consumption and commercial purpose.
- Management of major diseases of ginger (*Zingiber officinale* Rosc.).
- Effect of different level of shade on growth, yield and quality of ginger (*Zingiber officinale*).

5.3.11 Turmeric

- Collection, establishment and evaluation of turmeric (*Curcuma domestica* L) germplasm under coconut.
- Effect of different level of irrigation on growth and yield of turmeric (*Curcuma longa* L.)

5.3.12 Other

- The awareness and use of pesticide usage of farmers on Export agriculture crops in economic and technical perspectives.
- Developing, testing and Implementing monitoring procedures and practices at site, regional and national levels for: below-ground soil biodiversity.

5.4 Progress of Other Activities of the Research Division

5.4.1 Development activities at National Cinnamon Research Station at Pllolpitiya

- Completed the second steps of the agronomy buildings.
- Purchased new laboratory equipment for the division of Agronomy & Crop improvement, Division of Soil & Plant Nutrition, Division of Plant Protection and Division of Post-Harvest Technology.
- Reconstruction of National Cinnamon Research Station internal road.
- Produced 3500 VP Plants from variety Sri Gemunu cinnamon and 500 VP Plants from variety Sri Wijaya and 3900 cinnamon seedlings poly bags.
- Eight medicinal crop species were collected and established their germplasm collection, among them, 1,000 Soursop (Katu- anoda) plants were propagated and about 750 plants were distributed.

5.4.2 Development Activities at IBRS, Naramamala

- Pineapple project was commenced and 3500 suckers were field established.
- Altogether five hundred lemon grass and citronella suckers were field established.
- Twenty betel beds were field established for the purpose of demonstration activities.
- Two thousand cinnamon seedlings were potted.

- Two hundred potted betel plants were kept in net houses for the purpose of taking betel cuttings.
- Frame of the net house was repaired.
- Gear box of MF-135 four-wheel tractor was repaired.
- Equipment for road lighting system of IBRS were purchased.
- Office furniture were purchased.
- A laptop computer was purchased.

5.4.3 Development Activities at Central Research Station, Matale

- Purchasing of Farm machineries eg. 2 grass cutters, bush cutter for two-wheel tractor, 3 pruning knives, electric water pumps etc.
- Repairing of plant houses and construction of 2 new plant houses.
- Implementation of drip irrigation system for arecanut field.
- Purchasing of fire extinguishers.
- Purchasing of laboratory chemicals and equipment – Biological microscope, printing machines etc.
- Installing Air conditioners for laboratories.

5.4.4 National Exhibitions and Workshops

National level exhibitions were organized in co-operation with the Ministry of primary industries. Women's day exhibition at BMICH- Colombo, INCO exhibition - BMICH, 40th anniversary of the open economy exhibition in Maharagama, Pro food pro pack Exhibition- BMICH- Colombo, Spice promotion for tourist exhibition at KCC, Kandy, Farmer Clinic exhibition at district level, Spice promotion exhibition Jaffna, Siyane Exhibition Gampaha etc. were successfully conducted.

5.4.5 Other Activities at Central Research Station, Matale

1. Organized & participated at the ASMEC research symposium of minor export crops.
2. Participated as a resource person at the vanilla processing training for Kandy district farmers programme organized by the In-Service training centre.

3. Conducting training programmes: For extension officers and other officers of the Export Agriculture Department, university students (University of Wayamba, University of Uwa Wellassa, University of Peradeniya, University of Rajarata, University of Ruhuna), Farmer groups coordinated by vidatha training centres, other farmer training programmes, other students (school, farm schools, etc).
4. Participated at the exporter market place workshop on the 19th December jointly organized by the Exports Development Board, the Dilmah conservation and the World Bank.
5. Visited two Industries namely HDDDES Pvt. Ltd. and EOAS organics pvt. Ltd.

5.4.6 Advisory Services

Laboratory analysis done in National Cinnamon Research & Training Centre.

Table: 5.4.6.1: Laboratory Analysis by Division of Post-Harvest Technology

No.	Name of the Analysis	No. of samples	
		External (with payments)	Research related to the Department
1	Determination of oil content	06	667
2	Determination of moisture content (Dean & stark method)	06	547
3	GCMS analysis	18	162
4	Determination of water activity	36	204
5	Determination of Sulphur content	-	170
6	Determination of moisture content (Moisture analyzer)	-	172
	Total	66	1922

Table: 5.4.6.2: Laboratory Analysis by Division of Soil and Plant Nutrition

No.	Name of the Analysis	No. of samples	
		External (with payments)	Research related to the Department
1	Soil pH and EC	106	464
2	N, P, K analysis	84	205
3	ICPOES –Micro nutrient/ Heavy metal analysis	18	165
	Total	208	834

5.4.7. Training Programmes carried out by the Research Staff**Awareness and Training Programmes offered by the Research Staff of the National Cinnamon Research & Training Centre**

In year 2017, Eight hundred and fifty-nine stakeholders (859) and or one thousand and six hundred seven-man days were successfully trained. Twelve sessions of five days cinnamon peelers training programmes, three sessions of two days programmes, eight sessions of one day programme, five programmes of NVQ- RPL programme and one cinnamon accessor training programme were worked out. Furthermore, 130 persons visited the station and obtained necessary information regarding cinnamon industry.

Table: 5.4.7.1: Awareness and Training Programmes offered by the Research Staff of the Central Research Station, Matale

Training Programme		
Place	Organized	Topic
Kolonna	AD-Office	Strategies to save EACs from droughts
ISTC - Matale	DEA	Planting material production through terminal branches
Batangala, Kegalle	DEA	Potential for EAC cultivation
Mahawilachchiya	DOA District Office, A/pura	Pepper cultivation
Anuradhapura	DOA District Office, A/pura	Nursery Management - Pepper
MOPI, Battaramulla	MOPI DEA	Nursery Management-pepper
Center for banking Studie, Rajagiriya	MOPI DEA	Pepper Productivity Improvement
Rattota, Theldeniya, Matale, Kandy	DEA, CRS	Post Harvest Technologies
Madampe	DEA CRS	VIDATHA, Post-Harvest

Table: 5.4.7.2: Research Projects and Other Training Programmes conducted by the Research Staff of the Central Research Station: Matale

Beneficiaries	Number
University students	572
Diploma level students	218
Technical college students	57
School students	1,203
Farmers	470
Short term trainings (1 – 6 months)	12
Mini lab training programmes	07
Other	50

Knowledge and Technology Dissemination of Betel through IBRS in Year 2017

- The number of training programmes conducted - 16
- The number of participants in training programme (farmers, growers) - 809
- The number of personnel who acquired advice over the telephone - 297
- The number of personnel who visited to IBRS seeking advice - 192

Table: 5.4.7.3: TV & Radio Programmes – Mathale Research Institute

Among the radio programmes broadcast this year, were three “Subharathie” programmes which were broadcast on the Local Service on 10.01.2017, 14.02.2017 and 27.06.2017 and they were produced on climatic changes and export crops cocoa and pepper.

In addition, through three “Rasajanie” programmes which were broadcast on Kandurata Service on 17.03.2017, 09.05.2017 and 11.07.2017 awareness was raised respectively on disadvantages of light berries of pepper, shade control in pepper cultivation and fluctuation in pepper prices.

Further, two programmes in connection with Export Crops Research Conference were broadcast on “Rangiri FM” and “Lak FM” services on 13.03.2017 and 14.03.2017.

Similarly, the following Television programmes were telecast on the National Television Channel during the year 2017.

Table: 5.4.7.3: Television Programs

Date Broadcast	Topic	Program
13.01.2017	Facing the Droughts	Segawunu Kahawunu
16.03.2017	Pepper planting material	News Telecast at 8.00pm
14.04.2017	Harvesting light berries of pepper	Segawunu Kahawunu
30.04.2017	National spice garden	Adaraneeya Sri Lanka

- Recorded 4 Radio programmes and one Ranmasu Uyana TV program -Post Harvest Division

5.4.8 Local & Foreign Trainings Programs attended by the Officers at the Research Centers in Matale and Narammala.

1. T. Liyanage , Assistant Director (Research) 23rd International Pepper Conference on Quality held in Jakarta, Indonesia from 26th – 27th March 2017
2. Dr. D. N. Samaraweera, Director (Research) A workshop on Global Positioning System held at the Postgraduate Institute of Science, Peradeniya on 29-07-2017 and 30-07-2017
3. K. G. P. Shantha, Research and Development Assistant, a workshop on GPS technology at the Postgraduate Institute Biology, University of Peradeniya on 29-07-2017 and 30-07-2017
4. Dr. D. N. Samaraweera, Director (Research), S.I.C.Silva, Assistant Director (Research), K.D.N.Priyadarshani, Assistant Director (Research), W.M. Chandrarathne, Research and Development Assistant, K.G.P. Shantha, Research and Development Assistant participated at the workshop on Scientific Document System at the Post Graduate Institute of Peradeniya.

5. D.M.P.V. Dissanayaka, Assistant Director (Research), attended a training programme on post-harvest technology held in Thailand, from 22-05-2017 to 02-06-2017

5.4.9 Local/Foreign Training Programmes and Workshops attended IBRS

- D.M.P.V. Dissanayaka, Assistant Director (Research), A Training programme on post-harvest technology of fruit and vegetable crops for developing countries in Thailand, during 22-05-2017 to 02-06-2017
- Dr. D. N. Samaraweera Director (Research) A workshop on GPS technology. 29-07-2017 to 30-07-2017 Postgraduate Institute of Science, University of Peradeniya, Peradeniya
- Mr. K. G. P. Shantha, Research and Development Assistant A workshop on GPS technology. 29-07-2017 to 30-07-2017 Postgraduate institute of science, University of Peradeniya, Peradeniya
- Dr. D. N. Samaraweera, Director (research) A workshop on scientific writing. 14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.
- S. I. C. Silva, Assistant Director (research) A workshop on scientific writing. 14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.
- K. D. N. Priyadarshani, Assistant Director (research) A workshop on scientific writing. 14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.
- D. M. P. V. Dissanayaka, Assistant Director (research) A workshop on scientific writing. 14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.

- W. M. Chandrarathne, Research and Development Assistant A workshop on scientific writing.14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.
- K. G. P. Shantha Research and Development Assistant A workshop on scientific writing.14-11-2017 Postgraduate institute of agriculture, University of Peradeniya, Peradeniya.

5.4.10. Pest and Disease Control

Plant Protection Service

- Nine farmer training classes, 05 field days and 36 field visits were conducted on the request of stakeholders and appropriate solutions for their Plant protection problems. These farmer training classes, field days and field visits were organized in collaboration with the officers of development division of DEA in respective areas. (Table 01)
- Participated at the 18 crop clinics organized by the extension staff of 10 districts (Kandy, Matale, N' Eliya, Kurunegala, Kegalle, Rathnapura, Badulla, Monaragala, Gampaha and Colombo). In crop clinics, appropriate solutions were given to the stakeholders for their pest and disease problems of EACs, delivered the lectures on major pest and disease management strategies of EACs and analysed on spot soil pH, EC of more than 500 soil samples collected from farmer fields and recommended site-specific fertilizer recommendations and dolomite application.
- Six leaflets (pepper little leaf, quick wilt, slow wilt, vine borer clove leaf fall, Nutmeg /clove shoot borer) were prepared and printed to raise awareness among stakeholders.
- Providing technical advisory service and monitoring of activities of nutmeg leaf fall disease management project (NLFD) conducted in Kandy, Kurunegala, Matale and Kegalle districts.

- Appropriate solutions were given for more than 1000 plant protection problems raised via our direct telephone lines and 1920 “ Govi sahana sarana sevaya”

Table: 5.4.10.1: Number of Farmer Field visits, Training class and Field days conducted in year 2017 under the Plant Protection Service.

Crop	Disease/ Pest	Number of Trainings	No. Participants for training	Number of Field Days	Number of Field Visits
Nutmeg	Leaf fall disease				06
	Root rot				05
	Stem Canker				01
	Stem Borer				03
Pepper	Little leaf disease				04
	Slow wilt				05
	Quick wilt	04	350	02	05
	Leaf blight				01
	Vine borer				02
Clove	Shoot borer				-
	Leaf fall Disease	02	200	02	01
Gliricidia	Shot hole borer				01
Goraka	Scale insect	02	225	01	01
Cardamom	Leaf blight	-	-	-	01
All EACs	Nursery pest & Disease Management	01	100		-
Total		09	875	05	36

5.4.11 Planting Material Issued by the Research Division

Table: 5.4.11.1: Planting Material Issued by the Research Division

Item	Quantity
Pepper rooted cuttings	20,762

5.4.12 Collaborative Research and Development Project

1. Mainstreaming biodiversity conservation and use in Sri Lankan agro-ecosystems for livelihoods and adaptation to climate change (BACC) project.

University Students Research

1. Effect of different irrigation levels and length of dry spells on flower initiation and subsequent spike development of black pepper (*Piper nigrum* L.). A.M.N.P. Abeysinghe - Department Of Plantation Management, Faculty Of Agriculture And Plantation Management, Wayamba University of Sri Lanka.
2. Variation of micrometeorological parameters and different yield attributes of black pepper (*pipper nigrum* l.) with growth of live support tree (*gliricidia sepium* jacq. walp) canopy. K.V.A.T.J. Kodithuwakku - Department Of Plantation Management, Faculty Of Agriculture And Plantation Management, Wayamba University of Sri Lanka,
3. Effect of maturity stage of stem cuttings on high quality planting material production through terminal branches in black pepper (*Piper nigrum* L.). W.P.U. Gunasekara- Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka,
4. Effectiveness of the approach grafting over the other vegetative propagation methods of nutmeg (*myristica fragrans* houtt.). a.a.c. h. dharmasena - department of export agriculture, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka
5. Variation of flower initiation and some yield attributes of black pepper (*Piper nigrum* L.) under different irrigation levels. R.W.I.B. Priyadarshana - Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka
6. Comparative analysis of the chemical composition of clove: R.M.B.P.K. Ranathunga Dept. of Food Science, Faculty of Applied Science, University of Sabaragamuwa
7. Study on nutrient removal in black pepper (*piper nigrum* l.) at different stages of harvesting E.M.K. Dissanayaka, Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka

5.4.13 Special Awards

The research team of Senevirathne, J.M., Rajapakse, I.G.M., Thilakarathne, C.L., received the national awards for excellence in agricultural research in consideration of the research on

“Development of high yielding black pepper hybrids with authentic high quality of local black pepper”.

5.5 Economics & Market Research on EAC

5.5.1 Studies and Surveys

5.5.1.1 Market Behaviour of Pepper Farmers

Marketing of EAC is solely handled by the private sector and the market behaviour is entirely depends on the interests of buyers and sellers. Among EAC, pepper shows the most divergent marketing pattern as it has different uses at different maturity stages. Recommendation for harvesting and processing is at 7-8 months maturity after fruit setting followed by adequate sun drying. However in- practice a special market exists for immature berries, which is used for oil and oleoresin extraction, locally and internationally. Therefore farmers are used to harvest immature berries or lease out their cultivations to organized harvesting groups. Even after maturity there are number of harvesting practices as farmers face a number of difficulties in harvesting and processing.

DEA has designed its post harvest assistance program assuming that farmers are harvesting pepper at correct maturity and process by themselves. Based on that assumption, farmers are assisted to purchase equipments needed for harvesting and processing. However it was felt that understanding of different harvesting and processing behaviours of pepper sector was worth to find as it could give a direction about whom to be assisted. To find out that situation a survey was done in 2017 with a randomly selected 120 farmers in Kandy, Matale and Kurunagala districts, who own mature pepper cultivations, using a pre tested questionnaire.

Results revealed that over 50% of surveyed farmers in the Central Province in both 2016 and 2017 had harvested pepper after maturity and sold as raw berries. It was a deviation of the accepted and recommended practice of harvesting and processing. Overall results showed that majority of farmers preferred selling as raw berries rather than going for

processing. Multiple responses were given by farmers and practical problems were the major issue. Main difficulties faced by farmers were lack of adequate drying facilities, handling difficulties, no time to spend and labor problems. It was followed by financial reasons such lack of significant benefits in selling as dried forms and ability to get returns as soon as possible. Only a few farmers had used to harvest at immature stage and selling as raw berries. Results further showed that leasing out immature raw crop, which has been claimed to be a big business in some pepper growing areas, was not a prominent behaviour of pepper farmers in the surveyed area. Further studies are needed but these findings indicate that local collectors of spices are the most important group to be assisted.

Further results showed that surveyed farmers had preferred to sell their pepper to a closest place rather than exploring higher prices in distant regions. When further inquired, 110 of them (91%) had prior knowledge about the collecting places they sold their pepper. Nobody had thought of supplying to upper segments of market channel or exporting by themselves. There was no significant trend towards value addition of pepper in the surveyed area but some tendency was there for production of white pepper (about 0.03% of the surveyed sample). Results implied that majority of farmers had received Rs. 300-400/kg. for raw berries and Rs. 1000-1420/kg. for dried produce in both years. Those were highly satisfactory prices when compared with the average market price prevailed for dry pepper in that year. Main sources of market information were local traders and neighbours but there were some farmers who get market information from different sources with their experience. Results revealed that major information, farmers wanted, were on prices and market places. Information on value chain segments, post- harvest handling etc. had almost been neglected.

5.5.2 Extent of EAC

Extent of EAC was previously computed based on the 2002 Agriculture census data and the newly planted acreage, which was qualified to be paid 2nd instalment of the New Planting Assistance Scheme of the DEA (successfully established extent after 18 months). However, home gardening program was the prioritized development program in past two years and systematic new planting activities were done at minor scale. Therefore it was difficult to count the correct field established extent of EAC as there were many home garden programs of EAC in past few years. Therefore it was decided

to adopt the extent figures collected and published by Department of Census and Statistics in 2017 as presented in the Annex 1.

5.5.3 Estimated Production of EAC in 2017

The annual production of main EAC is usually estimated considering exports, local consumption in different sectors in the economy (house hold consumption based on per capita annual consumption reported by the Dept. of Census & Statistics, industry consumption, and Food service industry consumption) and imports. Substantial amounts are allocated for withholding stocks and unreported exports. Based on those assumptions, the estimated production of EAC for 2014-2017 is given below (table 5.1).

Table: 5.5.3.1 Estimated Production of EAC (mt.) – 2014/2017

Crop	2014	2015	2016*	2017**
Cocoa***	500	457	649	471
Coffee	2,674	2,639	2,824	2,714
Cinnamon	17,600	17,707	18,945	22,341
Pepper	18,660	27,232	18,476	29,546
Cardamom	87	91	120	113
Clove	3,225	5,253	1,823	6,428
Nutmeg(& mace)	2,960	2,750	2,723	2,845
Areca nut	22,385	22,869	23,082	18,739
Betel	24,123	22,524	22,298	21,193
Citronella oil***	35	31	54	42
Ginger****	15,481	17,273	23,184	16,326
Turmeric****	11,351	14,387	25,204	10,267

Source: Dept. of Census & Statistics & DEA data base * Revised estimated data ** Provisional estimated data *** annual. prod. Forecast **** DC&S data

5.5.4 Exports and Export Earnings of EAC in 2017

Total export volume of EAC had reached to 60,103mt. in 2017 with Rs. 71,970mn. export earnings by recovering the setback faced in 2016 (Annex. II). Almost all crops

which showed declined exports and earnings in 2016 had gained a considerable improvement in 2017. .

Black pepper received high public attention in 2017 creating a significant political tension in the country. Impact of the collapse of the world pepper market in late 2016, due to oversupply, had affected on Sri Lankan pepper prices too and it was on the declining trend throughout 2017. However the decline of Sri Lankan pepper prices was slow until May 2016 and almost parallel to Indian pepper prices while prices of other pepper origins had showed a steady decline. But after May 2017 Sri Lankan pepper prices had started to decline sharply and by August 2017 it was almost halved from early 2016 price level. Many people, involved in the sector, had blamed that illegal import of cheap Vietnamese pepper is the main reason for this decline and there are credible evidences that such things had happened. As reported evidences Vietnamese pepper had imported to Sri Lanka and re-exported to India with the certificate of Sri Lankan country of origin, by exploiting the tax concessions that had offered under SAFTA and SAPPTA. After identifying the authenticity of the product Indian buyers had refused Sri Lankan pepper or opted to pay a minimum price. Declined prices had direct impact on the whole value chain in Sri Lanka, resulting a significant economic loss to all stakeholders in the value chain. It was reported that almost all value chain players have been holding pepper stocks anticipating a recovery of the market but current prediction of the world pepper situation does not allow a conclusion of speedy recovery of pepper market even in 2018. Despite this gloomy situation, Sri Lanka had exported 13,309mt. pepper and earned Rs.12,767mn. in 2017. It was around 69% increase of export volume and 21.2% increase of export earnings over 2016. Export volume and earnings of pepper oil were 49mt. and Rs.484mn. in 2017 and both had increased by 14.6% and 12.8% respectively over the previous year. Export volume of oleoresins, which include over 90% of pepper oleoresins, had decreased to 382mt. from 560mt. in the previous year. Export earnings too from exporting oleoresins had declined significantly from Rs.3,257mn. in 2016 to Rs.2,743mn. in 2017.

Cinnamon exports had gained a momentum, starting from 2016, by breaking the stagnation of export volume over decades. Export volume of cinnamon in 2017 had reached to 16,617mt., an increase of 13% over previous year, and it was the recorded highest export in the recent history. Export earnings too had increased by 33% over the previous year from Rs.23,171 mn. in 2016 to 30,873 in 2017. It was seen that around

42% of the total export earnings of EAC in 2017 had come from exporting cinnamon (Annex. 2)

Except arecanut and ginger, export volumes and values of all other EAC in 2017 had increased over 2016 and cocoa, cloves, and betel had shown a significant increase (Annex. 2). Betel export had increased to over 5000mt. after about a decade due to tax concessions granted by Pakistan to Sri Lankan betel. Cocoa export had also increased but large bulk of export was mainly re-export of processed cocoa from imported cocoa. Unlike pepper and areca nut, re-export of cocoa is in the right direction as market had broadened from India to other countries such as UAE and Hong Kong.

Except cardamom oil, nutmeg oil and mace oil export of all other essential oils had increased but notable increases were shown by cinnamon leaf oil, cinnamon bark oil and citronella oil. Oils from cinnamon had been on increasing trend but export of citronella had increased from 8.27mt. in 2016 to 38mt. in 2017 and recovered from declining export trend in recent years. Though volumes and values are small, a considerable positive growth had been shown in export of vanilla, vanilla oil and lemon grass oil. It is important to note this achievement as there are no established large scale commercial cultivations in those crop sectors (Annex. II). As a whole export of Essential oils of EAC had increased by 10% over 2016 and export earnings too had increased by 3.6% in 2017 over the previous year.

5.5.5 Importing Countries of EAC from Sri Lanka

As usual, Mexico had purchased around 40% of total cinnamon export and many Latin American countries had purchased large bulks. Purchase of cinnamon by USA had declined from 2,170mt. in 2016 to 1995mt. in 2017. India was the main buyer of Sri Lankan pepper, cloves and mace with 82% of pepper export, 71% of clove export and 86% of mace export respectively. Similarly around 98% of areca nut export in 2017 had also reached to India. India had imported 1331mt. of cocoa from Sri Lanka and it was around 51% of total cocoa export in 2017. Meanwhile India was a significant buyer of nutmeg and cardamom with export volumes of 230.6mt nutmeg and 233mt. of cardamom. Pakistan, the main importer of Sri Lankan betel, had increased export share from 1933mt. in 2016 to 5030mt. in 2017. USA was the main buyer of cinnamon leaf and bark oils, nutmeg oil and pepper oil and also a significant buyer of all other essential

oils. France, Germany and Canada had appeared as main buyers of clove oil, cardamom oil, lemongrass oil, ginger oil and nutmeg oil in 2017.

5.5.6 Behaviour of Prices

Average annual farm gate prices of cocoa, coffee, cinnamon quills, cardamom, and ginger had increased in 2017 while the same in pepper, clove, nutmeg, mace, betel and citronella had decreased (Annex. III). Among EAC most outstanding price increases in 2017 were shown by cinnamon quills and cardamom. Average annual farm gate price of cinnamon had increased from Rs. 1,544 per kg. In 2016 to Rs. 1,846 per kg in 2017 while the same for cardamom had increased from Rs. 1,638 per kg. In 2016 to Rs.2502 per kg. In 2017. Decline of pepper price was the most noticeable feature in 2017. Pepper prices had started to decline since the end of 2016 but sharp and steady decline was noted after May. Although the average pepper price stood as Rs. 831 per kg. (due to high prices in first quarter) it had remained around Rs. 550-650 per kg. levels in most of the months in 2017.

Prices of betel also had shown sharp fluctuations during 2017 creating a tension among growers. Main reason was the oversupply and dominance of a few large scale exporters in the market. Once in 2017 price of betel declined to Rs. 500 per 1000 leaves but not lasted long and recovered to an acceptable price level. However annual average price of betel had declined from Rs. 4151 per 1000 leaves in 2016 to Rs. 1855 per 1000 leaves in 2017.

According to the “Public Ledger”, international prices of many EAC commodities had declined in the year 2017 and recover of cardamom prices from previous depression was the only noticeable change (Annex III).

5.5.7 Trends in EAC Imports in 2017

Total import of EAC in 2017 had increased by 16% from 11,772mt. in 2016 to 13,670mt. in 2017 while the import expenditure too had increased from Rs. 6378mn. in 2016 to 6769mn. in 2017 (Annex. IV). Cocoa, turmeric, cardamom, ginger and pepper were major EAC items imported to Sri Lanka in 2017. Especially recorded import of pepper, mainly for the value addition purpose, had increased by 133% from 599mt. in 2016 to 1398mt. in 2017 but many in the EAC sector claims that there were illegal imports of pepper to the country too.

Import of ginger had increased by 329% from 403mt. in 2016 to 1731mt. in 2017 while import of cocoa and cardamom, mainly used for re-exports, had declined in 2017. One important fact here is the import of clove to Sri Lanka in 2017 and it is the first time in recent past while importation of clove is banned by the quarantine law. All other EAC except nutmeg oil and betel, had imported to Sri Lanka in 2017 at least in minor quantities (annex IV)

5.6 Research Publications

Abeyasinghe A.M.N.P., Subasinghe H.M.P.A and Gunathilake H.A.W.S. (2017), Effect of different irrigation levels and length of dry spells on flower initiation and subsequent spike development of black pepper (*piper nigrum* l.), proceedings of 16th Agricultural research symposium – 2017, Wayamba University of Sri Lanka.

Dharmasena A.A.C.H., Subasinghe H.M.P.A and Yapa Y.M.D.B (2017), Effectiveness of the approach grafting over the other vegetative propagation methods of nutmeg (*myristica fragrans* houtt.), International research symposium (2017), Sabaragamuwa University, Sri Lanka.

Erandika, K.W.D., Tharanga K.H.G.M., Samaraweera D.N., Amarasekara M.G.T.S.(2017),

Identification of nutrient deficiencies through visual deficiency symptoms of cinnamon – abstract in proceedings of the 9th annual research symposium – 2017, Faculty of Agriculture, Rajarata University of Sri Lanka.

Gunasekara W.P.U, Subasinghe H.M.P.A and Gunathilake H.A.W.S. (2017), Effect of maturity stage of stem cuttings on high quality planting material production through terminal branches in black pepper (*piper nigrum* l.), proceedings of 16th Agricultural research symposium – 2017, Wayamba University of Sri Lanka

Gunawardhana,W.P.D.S, Swarnathilaka, D.B.R, and Perera, P.I.P.(2017). Optimization of explant sterilization protocol for clonal propagation of *piper nigrum*, proceedings of 16th Agricultural research symposium (2017) 296-300.

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Jayasinghe, G. G., Kumara, K. L. W., Wijayawardhana, M. W. G. C., Wijesinghe, K. G. G. Samaraweera D. N and Priyangika, K.M.M. (2017), Rough bark disease of cinnamon (*Cinnamomum verum*): disease symptoms development and the causal agent with special reference to its morphology, histopathology and nutritional states of affected plants. Proceedings of the symposium on minor export crops (Ed: B. Marambe), 16-17 march 2017. Peradeniya, Sri Lanka, Vol 4, 63-72pp.

Kodithuwakku K.V.A.T.J., Subasinghe H.M.P.A and Gunathilake H.A.W.S. (2017), Variation of micrometeorological parameters and different yield attributes of black pepper (*pipper nigrum* l.) with growth of live support tree (*gliricidia sepium* jacq. walp) canopy, proceedings of 16th Agricultural research symposium – 2017, Wayamba University of Sri Lanka.

Kumara, P.G.A.L. and Sumanasena, H.A. (2017), Effect of length and type of branches on air layering of nutmeg (*myristica fragrance* houtt.), annual symposium of minor export crops (B. Marambe, editor). volume 4, pp 20, 16 -17 march. Peradeniya, Sri Lanka.

Kumudini A.J.P., Wijeweera A.A., Jayasinghe H.A.S.L., Jeewanthe P.W., Wijesinghe K.G.G., (2017), evaluation of yield variations of true cinnamon (*cinnamomum zeylanicum* blume) in different agro-ecological regions in Matara district, International research symposium (2017), Uwa Wellassa University, Sri Lanka.

Liyanage T., Jayasundara K.K.I, Wijesinghe W.A.J.P, Aththanayake A.M.C.I.M, Edirisinghe E.D.K, Bandara W.M. S.R.A., Comparative analysis of phytochemical, proximate and mineral composition of four different selections of dried goraka (*garcinia quaesita*) fruit rind in Sri Lanka, proceedings of annual symposium on minor export crops Department Export Agriculture Edit. B. Marambe, vol.4 100-106pp .

Liyanage T., Edirisinghe E. D. K, Indrasena I. K. and Karunarathne A.I. (2017), Development of technology to produce ginger jam, Proceedings of annual symposium on minor export crops Department Export Agriculture Edit. B. Marambe, vol.4 117-120 pp .

Liyanage T., Jayasundara K.K.I., Wijesinghe W.A.J.P, Aththanayake A.M.C.I.M, Edirisinghe E.D.K., Bandara W.M. S.R (2017), Preliminary phytochemical screening of the fruit rind of five selections of *Garcinia quaesita* in Sri Lanka - a comparative study, Proceedings of annual symposium on minor export crops, Department Export Agriculture Edit. B. Marambe, vol.4 91-100 pp .

Piumi K.V.H., Induruwa I.V.A.D.C.S., Alakolanga A.G.A.W. and Jayasinghe H.A.S.L. (2017), Development of a simple protocol to extract pure curcumin from turmeric (*Curcumalonga* L.) rhizome. International research symposium. Uwa Wellassa University,Badulla, SriLanka. 19-20 January pp.25

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Annexure I: Estimated Extent (ha) of EAC by Districts - 2017 *

District	Cinnamon	Pepper	Clove	Cardamom	Coffee	Cocoa	Nutmeg	Arecanut	Betel	Citronella	Total (EAC)	Ginger	Turmeric	Grand Total (including Ginger & Turmeric)
Kurunegala	173	2,822	161	6	597	61	50	1,122	812	0	5,803	298	54	6,155
Putthalam	1	38	0	0	35	1	0	53	91	0	220	46	2	267
Matale	361	7,693	777	242	620	624	74	1,314	44	0	11,739	39	40	11,818
Kandy	132	7,396	3,511	338	1,732	384	829	2,526	72	0	16,930	436	263	17,629
Nuwaraeliya	35	981	397	378	924	10	4	593	16	0	3,437	146	128	3,711
Badulla	203	3,783	53	8	399	59	0	1,642	58	0	6,205	74	41	6,320
Moneragala	94	3,640	0	0	215	721	1	1,182	50	0	5,903	11	12	5,926
Hambantota	3,346	1,882	67	0	61	0	0	394	29	849	6,601	12	10	6,623
Matara	8,665	1,807	226	24	136	0	5	2,171	152	0	13,129	103	65	13,297
Galle	11,412	1,144	17	1	50	1	2	702	166	0	13,479	62	35	13,576
Kalutara	3,464	909	18	10	130	9	4	788	172	0	5,474	122	35	5,630
Colombo	248	233	2	4	123	0	2	190	37	0	841	77	12	931
Gampaha	299	1,174	35	2	214	2	6	1,012	501	0	3,274	151	40	3,464
Kegalle	273	2,396	1,736	155	1,023	96	45	1,558	186	0	7,468	173	114	7,755
Ratnapura	4,274	6,673	177	89	309	19	9	2,274	150	564	14,538	66	35	14,640
Anuradhapura	0	0	0	0	0	0	0	386	71	0	457	3	1	461
Polonnaruwa	0	170	0	0	2	0	0	119	65	0	356	16	9	381
Ampara	0	184	0	0	4	0	0	178	41	0	408	45	34	487
Other Districts	5	64	0	0	6	0	0	516	147	0	738	3	2	743
Total	32,985	42,989	7,177	1,257	6,580	1,987	1,031	18,720	2,860	1,413	116,999	1,883	932	119,814

Source: Department of the Census & Statistics.
Cinnamon, Nutmeg & Citronella - DEA Data

* Provisional

Annexure II: Export Volume and Value of Export Agriculture Crops – 2016 & 2017

Commodity	Unit	2016	2017 *	Growth % 2016-2017
Cinnamon	Vol (MT)	14,692.69	16,617.04	13.1
	Val (Rs.Mn)	23,176.95	30,872.79	33.2
Cinnamon leaf Oil	Vol (MT)	226.40	309.01	36.5
	Val (Rs.Mn)	905.89	976.45	7.8
Cinnamon Bark Oil	Vol (MT)	27.32	40.50	48.2
	Val (Rs.Mn)	890.13	1,492.63	67.7
Cloves	Vol (MT)	1,378.90	5,809.89	321.3
	Val (Rs.Mn)	1,869.52	6,761.46	261.7
Clove Stems	Vol (MT)	463.78	1,995.70	330.3
	Val (Rs.Mn)	90.37	400.43	343.1
Clove Oil	Vol (MT)	6.24	9.41	50.8
	Val (Rs.Mn)	52.75	84.83	60.8
Cocoa & Cocoa Products	Vol (MT)	1,345.00	2,583.36	92.1
	Val (Rs.Mn)	630.04	2,339.48	271.3
Coffee	Vol (MT)	13.70	13.79	0.7
	Val (Rs.Mn)	20.51	29.26	42.7
Pepper	Vol (MT)	7,875.54	13,309.08	69.0
	Val (Rs.Mn)	10,530.53	12,767.97	21.2
Pepper Oil	Vol (MT)	42.74	48.96	14.6
	Val (Rs.Mn)	429.54	484.42	12.8
Oleoresine	Vol (MT)	559.60	382.24	-31.7
	Val (Rs.Mn)	3,257.22	2,742.72	-15.8
Cardamom	Vol (MT)	779.39	839.17	7.7
	Val (Rs.Mn)	843.25	870.52	3.2
Cardamom Oil	Vol (MT)	0.71	0.42	-40.8
	Val (Rs.Mn)	25.96	22.11	-14.8
Citronella	Vol (MT)	8.27	38.02	359.7
	Val (Rs.Mn)	114.29	263.15	130.2
Nutmeg	Vol (MT)	1,509.19	1,691.71	12.1
	Val (Rs.Mn)	1,603.10	1,562.11	-2.6
Mace	Vol (MT)	195.33	351.15	79.8
	Val (Rs.Mn)	358.15	636.48	77.7
Nutmeg Oil	Vol (MT)	122.36	65.45	-46.5
	Val (Rs.Mn)	595.39	424.43	-28.7
Mace Oil	Vol (MT)	0.12	0.04	-66.7
	Val (Rs.Mn)	0.92	0.58	-37.0
Arecuanut	Vol (MT)	13,468.58	10,645.28	-21.0
	Val (Rs.Mn)	4,948.98	5,744.48	16.1
Betel	Vol (MT)	1,955.67	5,144.92	163.1
	Val (Rs.Mn)	1,126.13	3,164.08	181.0
Vanilla	Vol (MT)	2.06	5.99	190.8
	Val (Rs.Mn)	22.29	27.06	21.4
Vanilla Oil	Vol (MT)	0.05	0.23	360.0
	Val (Rs.Mn)	0.07	0.40	471.4
Lemongrass Oil	Vol (MT)	0.26	0.98	276.9
	Val (Rs.Mn)	1.11	5.00	350.5
Total EAC	Vol (MT)	44,673.90	59,902.34	34.1
	Val (Rs.Mn)	51,493.09	71,672.84	39.2
Ginger	Vol (MT)	115.03	81.59	-29.1
	Val (Rs.Mn)	128.95	93.83	-27.2
Ginger Oil	Vol (MT)	2.73	4.18	53.1
	Val (Rs.Mn)	45.14	100.37	122.4
Turmeric	Vol (MT)	70.00	114.88	64.1
	Val (Rs.Mn)	72.23	103.12	42.8
Total (Ginger and Turmeric)	Vol (MT)	187.76	200.65	6.9
	Val (Rs.Mn)	246.32	297.32	20.7
Total (with Ginger and Turmeric)	Vol (MT)	44,861.66	60,102.99	33.97
	Val (Rs.Mn)	51,739.41	71,970.16	39.10

Source: - Sri Lanka Customs * Provisional

Annexure III: Average Prices of Export Agricultural Crops (Rs/Kg) in 2014/2017

Crop	Price	Annual Average Price				Growth % 2016/17
		2014	2015	2016	2017	
Cocoa	FG	234.84	244.38	297.47	309.81	4.15
	AU	339.21	369.81	403.58	418.52	3.70
	WM	402.23	473.39	491.66	365.35	-25.69
Coffee	FG	218.86	251.19	362.65	463.93	27.93
	AU	263.13	301.72	414.32	343.80	-17.02
	WM*	301.6	381.96	415.88	425.19	2.24
Pepper	FG	1,037.64	1,090.34	1,246.23	831.90	-33.25
	AU	1,095.81	1,144.36	1,308.72	904.32	-30.90
	WM	1,247.25	1,449.41	1,609.09	1,347.46	-16.26
Clove	FG	1,400.89	1,046.11	1,053.14	975.38	-7.38
	AU	1457.68	1257.9	1246.63	1,145.02	-8.15
	WM	1,904.25	1,822.37	1,220.53	1,366.09	11.93
Cinnamon	FG	1,172.79	1,246.06	1,544.58	1,846.13	19.52
	AU	1,284.66	1,365.86	1,805.51	1,834.66	1.61
	WM	-	-	-	-	-
Nutmeg	FG	642.17	511.28	522.88	460.00	-12.03
	AU	692.31	556.65	562.5	547.40	-2.69
	WM	2,257.58	1,776.92	1,567.80	1,555.31	-0.80
Mace	FG	1,741.52	1,423.59	1,478.08	1,324.68	-10.38
	AU	2,024.80	1,619.73	1,743.07	2,045.83	17.37
	WM	2,169.48	1,996.08	1,986.27	2,044.76	2.94
Cardamom	FG	1,642.08	1,610.78	1,638.50	2,502.47	52.73
	AU	1,804.56	1,755.61	1,967.55	1,758.89	-10.61
	WM	1,187.48	1,576.12	1,331.15	2,394.56	79.89
Betel (Rs./1000 leaves)	FG	2,166.15	3,583.89	4,151.63	1,855.26	-55.31
	AU	-	-	-	-	-
	WM	-	-	-	-	-
Areca nut	FG	304.60	341.74	294.90	294.75	-0.05
	AU	305.11	364.74	394.55	304.17	-22.91
	WM	-	-	-	-	-
Citronella	FG	2,754.50	6,381.12	9,668.99	3,745.18	-61.27
	AU	3,000.00	-	10,500.00	8,750.00	-16.67
	WM	2,713.23	2,459.08	2,457.29	2,974.94	21.07
Ginger (Raw)	FG	289.59	137.72	127.12	425.67	234.86
	AU	-	-	90	75.00	-16.67
	WM	395.67	415.74	421.53	337.06	-20.04
Turmeric (Raw)	FG	37.37	34.72	43.18	65.38	51.40
	AU	-	-	32.5	27.08	-16.67
	WM	111.02	-	-	-	-

Source: ERU data base FG: Farm-gate Price; AU: Auction Price; WM: World Market Price
*Robusta coffee

Annexure 1V: Import Volume and Value of Export Agriculture Crops – 2016 & 2017

Commodity	Units	2016	2017 *	Growth% 2016/17
Cinnamon	Vol (mt.)	37.31	61.64	65.2
	Val (Rs.mn)	57.35	87.70	52.9
Cinnamon Leaf Oil	Vol (mt.)	3.10	0.10	-96.8
	Val (Rs.mn)	0.48	0.04	-91.7
Cinnamon Bark Oil	Vol (mt.)	0.02	0.16	700.0
	Val (Rs.mn)	0.03	3.81	12,600.0
Clove	Vol (mt.)	-	9.51	-
	Val (Rs.mn)	-	11.32	-
Clove Stems	Vol (mt.)	-	14.01	-
	Val (Rs.mn)	-	1.87	-
Clove Oil	Vol (mt.)	2.13	3.14	47.9
	Val (Rs.mn)	6.86	11.71	70.7
Cocoa & Cocoa Products	Vol(mt.)	5,380.75	4,828.04	-10.3
	Val (Rs.mn)	3,845.13	3,557.86	-7.5
Coffee	Vol(mt.)	94.74	75.04	-20.8
	Val (Rs.mn)	103.57	88.54	-14.5
Pepper	Vol(mt.)	598.96	1,398.08	133.4
	Val (Rs.mn)	679.74	1,231.29	81.1
Pepper Oil	Vol(mt.)	1.77	0.99	-44.1
	Val (Rs.mn)	1.83	0.07	-96.2
Oleoresine	Vol (MT)	1.94	1.69	-12.9
	Val (Rs.Mn)	10.98	8.08	-26.4
Cardamom	Vol(mt.)	570.13	321.88	-43.5
	Val (Rs.mn)	408.21	334.42	-18.1
Cardamom Oil	Vol(mt.)	0.51	2.20	331.4
	Val (Rs.mn)	11.48	12.51	9.0
Citronella	Vol(mt.)	1.83	2.45	33.9
	Val (Rs.mn)	5.14	5.87	14.2
Nutmeg	Vol(mt.)	5.00	10.23	104.6
	Val (Rs.mn)	8.94	8.40	-6.0
Nutmeg Oil	Vol(mt.)	1.2	-	-
	Val (Rs.mn)	6.75	-	-
Arecanut	Vol(mt.)	-	242.34	-
	Val (Rs.mn)	-	73.16	-
Betel	Vol(mt.)	0.5	-	-
	Val (Rs.mn)	0.26	-	-
Vanilla	Vol(mt.)	1.90	5.27	177.4
	Val (Rs.mn)	25.15	5.40	-78.5
Vanilla Oil	Vol(mt.)	5.68	0.65	-88.6
	Val (Rs.mn)	5.40	0.95	-82.4
Lemon Grass Oil	Vol(mt.)	0.41	0.96	134.1
	Val (Rs.mn)	1.29	2.55	97.7
Total EAC	Vol(mt.)	6,707.88	6,978.39	4.0
	Val (Rs.mn)	5,178.33	5,445.56	5.2
Ginger	Vol(mt.)	403.21	1,731.33	329.4
	Val (Rs.mn)	155.68	259.72	66.9
Ginger Oil	Vol(mt.)	0.35	1.67	377.1
	Val (Rs.mn)	5.10	17.19	237.1
Turmeric	Vol(mt.)	4,660.49	4,958.32	6.4
	Val (Rs.mn)	1,039.16	1,046.87	0.7
Total (Ginger & Turmeric)	Vol(mt.)	5,064.05	6,691.52	32.1
	Val (Rs.mn)	1,199.94	1,323.88	10.3
Total (with Ginger & Turmeric)	Vol(mt.)	11,771.93	13,669.91	16.1
	Val (Rs.mn)	6,378.27	6,769.44	6.1

Source: Sri Lanka Customs

* Provisional

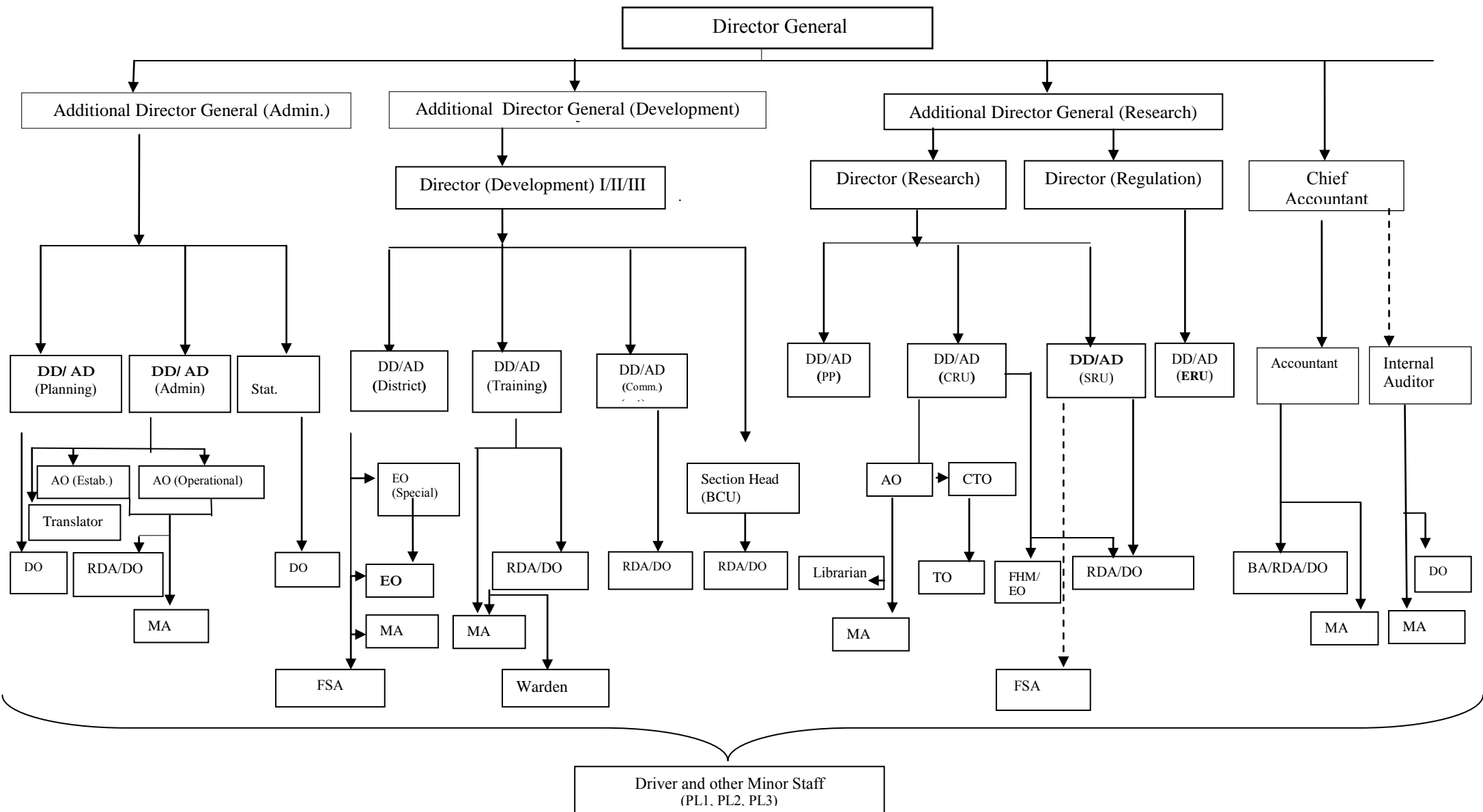
Annexure V: Deployment of Extension Officers

District	EO's Range	District	EO's Range	District	EO's Range
Matara	Deniyaya	Galle	Aluthwela	Hambantota	Okewela
	Akuressa		Hiniduma		Beliattha
	Pasgoda		Habaraduwa		Middeniya
	Hakmana		Ambalangoda		Katuwana
	Weligama		Balapitiya		Walasmulla
	Devinuwara		Akmeemana		Sooriyawawa
	Deiyandara		Ethkandura		Weeraketiya
	Kamburupitiya		Elpitiya		Warapitiya
	Matara		Karandeniya		Tangalle
	Pitabaddara		Baddegama		
	Niyagama				
	Hikkaduwa				
	Yakkalamulla				
	Nagoda				
Nuwaraeliya	Ginigathhena	Matale	Palapathwela	Colombo	Avissawella
	Helboda		Ukuwela		Homagama
	Hanguranketha		Thenna		Padukke
	Walapane		Rattota		
	Rikillagaskada		Weragama		
	Maldeniya		Yatawatta		
			Hunukataela		
			Pallepola		
	Wahakotte				
	Alugolla				

Kaluthara	Madurawela	Rathnapura	Weligepola	Kandy	Galagedara
	Bandaragama		Kolonne		Udunuwara
	Kaluthara		Ayagama		Kurunduwatte
	Mathugama		Godakawela		Harispatthuwa
	Iththepana		Palmadulle		Poojapitiya
	Baduraliya		Balangoda		Udadumbara
	Beruwala		Rathnapura		Rambukpitiya
	Horana		Embilipitiya		Yatinuwara
	Bulathsinghala		Niwithigala		Wattegama
	Pelawatta		Kealla		Kundasale
	Agalawatta		Elapatha		Hatharaliyadda
			Pothupitiya		Alawathugoda
	Pallebadda	Medapitiya			
		Gangawatakorale			
		Udapalatha			
		Theldeniya			
		Thalathuoya			
		Minipe			
		Galaha			

Kegalle	Mawanella Ussapitiya Pinnawala Kegalle Warakapola Daraniyagala Dedigama Aranayake Ruwanwella Yatiantota Bulathkohupitiya Galigamuwa Rambukkana	Kurunagala	Polgahawela Dodamgaslande Mawathagama Rambadagalle Polpithigama Karandagolla Melsiripura Dambadeniya Katugampola Udubaddawa Wariyapola Kuliyapitiya Panduwasnuwara Madampe Naththandiya Chilaw	Gampaha	Dompe Udugampola Gampaha Mahara Badalgama Pallewela Biyagama Meerigama Divulapiyiya Minuwangoda Aththanagalle
Badulla	Badulla Haldummulla Nikapotha Uvapanagama Passara Ridimaliyadde Haliela Meegahakiula Kandeketiya Bandarawela	Monaragala	Bibile Manaragala Badalkumbura Madulle Hingurukaduwa Madagama Padiyathalawa Wellawaya Meegahayaya Kandaketiya Bandarawela		

Annexure VI: Organizational Structure of the Department of Export Agriculture - 2017



DD-Deputy Director AD-Assistant Director PP-Plant Protection CRU- Central Research Unit SRU-Sub Research Unit ERU-Economic Research Unit Stat-Statistician AO -Administrative Officer EO-Extension Officer RDA-Research & Development Assistant DO-Development Officer CTO-Chief Technical Officer TO-Technical Officer FHM-Farm House Manager BA-Budget Assistant MA- Management Assistant FSA-Farm Service Assistant CDEO- Computer Data Entry Operator

DEPARTMENT OF EXPORT AGRICULTURE

ஏற்றுமதி விவசாயத் திணைக்களம்

Department of Export Agriculture





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ஏற்றுமதி விவசாயத் திணைக்களம்
Department of Export Agriculture

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வளமான எதிர்காலத்திற்கு
For a Prosperous Future