STRATEGIC PLAN

2016 – 2020

COCONUT RESEARCH INSTITUTE

1.   **Introduction**

The Coconut Research Institute of Sri Lanka (CRI) carries forward the proud and age-long tradition of commodity research. It has become the backbone for intellectual resources for coconut production in Sri Lanka. The CRI makes innovations available for the improvement of coconut production and also processing coconut products with special emphasis on value addition. Monoculture coconut plantations constitute one specific farming system, but the production of coconuts by the smallholders involves mixed farming or home gardens, which sets the coconut palm on a wider socio-economic and cultural setting for both domestic and export production.

The first Corporate Plan of the institute covered the period 2008 – 2012. The land mark achievements of this 5-year period included the development of high yielding coconut hybrids, judicious use of fertilizers through the differential fertilizer applications, soil fertility management through agroforestry systems, incorporation of organic manures and in situ grown fertilizer trees, water harvesting and moisture conservation by the use of agronomic practices, management of pests, specially invasive pests by biological control agents and processing and value addition to coconut products.

The second Corporate Plan covers the period 2013 – 2017. It addresses two broad aspects mandated to the Coconut Research Institute; research and technology transfer. Although research is the primary function of the institute, the approach has now drastically changed to make it more effective to achieve public good research outputs. Hence, in order to strengthen the research agenda the research activities was broadly categorized into thirteen major trust. Under each trust area research programmes and projects have been identified. A new research programme has been included for oil palm cultivation since this crop has been mandated under the institute. In this (or plan more emphasis is given to addressing current issues of the coconut industry such as the effects of climate change on coconut production, socio-economic issues of the coconut industry, expansion of coconut cultivation to non- conventional areas, efficient nutrient management, health effects of coconut oils and the management of invasive pests and incurable diseases. A comprehensive research and development programme is in place to address these new and other persisting issues of the industry. The major achievements made during the 3-year period from 2013 to date include development of a process-based yield prediction model, identification of drought tolerant hybrids, development of coconut mite and Weligama Coconut Leaf Wilt Disease resistant coconut cultivars, policy proposal for taxing of imported edible oils, integrated nutrient management and introduction of new coconut products.

In recent times the importance of coconut as a primary food crop has been shifted to an industrial crop with the international recognition of health benefits and nutritive value of coconut. This shift has placed Sri Lankan coconut industry in a prominent position demanding more production and high value products of coconut and judicious policies to face global challenges. The new Strategic Plan for 2016 – 2020 incorporates additional research programmes to address these recent trends of the coconut industry. In addition to the plan of 2013-2017, in the new plan

emphasis is given to research on rehabilitation of coconut lands, improvement of soil quality, coconut cultivation in non-traditional areas and managing uncertainty of yield and markets.

The institute acknowledges the fact that certain research developments and specialized services to the stake holders cannot be undertaken by other organizations, public or private sector alone without the intervention of this institute. Hence, the Strategic Plan 2016 – 2020 incorporates research development programmes such as improved seed nut production, incubating small and medium level processors and national programmes for management of pests and diseases. Services include production and supply of biocontrol agents to manage pest outbreaks and issuing of quality certificates and analyses reports. Also, transferring of coconut technologiesto trainers is a salient component of the plan. Eleven main issues of the coconut industry have been recognized and 18 strategies have been identified under seven trusts in formulating the institute's strategic plan.

The research implementation is vested with the scientific staff of each research division of the institute and with the support of the service divisions. A considerable number of research projects are collaboratively implemented with outside research organizations. The Genetic Resource Centers and Research Centers of the institute play a major role in supporting the research and development programmes of the institute.

The Strategic Plan is a forward looking road map for the development of the industry. Our ultimate aim is to become the Centre of Excellence in coconut research among the coconut growing countries in the world.

2.   Executive Summary

The Coconut Research Institute having an existence of over 80 years is mandated to conduct coconut research, technology development and technology transfer to increase coconut production and profitability of coconut industry. Out of the total staff cadre over two thirds is directly involved in research while the others service the research divisions. The institute possesses reasonably equipped laboratories and 10 Genetic Resource Centres and Research stations to carry out field research in different agro climatic zones.

The institute has made many note-worthy achievements through excellence in research over the past years. It has close links with the stakeholders of the coconut sector and identifies researchable problems through constant stakeholder consultations. A number of research and development projects are undertaken in collaboration with outside organizations, both locally and overseas.

The Strategic Plan 2016 – 2020 aims to address current issues and trends of the coconut sector. Eleven main issues of the coconut industry have been recognized and 18 strategies have been identified under 07 trusts in formulating the institute's strategic plan.

3. Background and History

The Coconut Research Institute was founded in 1929 as the Coconut Research Scheme under the Coconut Research Ordinance No. 24 of 1928.

The scheme established its headquarters in Bandirippuwa Estate, Lunuwila and began its research activities with three Technical Divisions viz. Genetics, Chemistry and Soil Chemistry, for assisting coconut growers with technical information on coconut cultivation. With the enactment of the Coconut Research Act No.37 in 1950, the scheme was upgraded and renamed as the Coconut Research Institute ((CRI) of Ceylon. Under the Coconut Development Act No. 46 promulgated in 1971, the Coconut Research Board was set up in 1972 with the responsibility of managing the CRI.

The CRI is a semi-autonomous research institution under the Ministry of Plantation Industries. The Chairman and the Board of Management is vested with the responsibility of laying down policies, with the approval of the Ministry.

The Coconut Research Institute of Sri Lanka (CRISL) as is the first institute established in the world solely dedicated for the development of the coconut. Its mandate is now broadened to provide research support for the oil palm industry.

The CRI in its existence of over 80 years has significantly contributed to the development and sustenance of the coconut industry in the country. CRI is in the forefront in many areas of coconut research and have the distinction of acquiring the only and the largest isolated coconut seed garden in the world. This produces nearly one million seed coconuts per annum for the national coconut planting programs . It holds recognition as history's most spectacular success achieved in biological control of the devastating pest of coconut, the coconut leaf miner, *Promecotheca cumingi,* which spread over 8,000 hectares country wide in early 70's.

CRI conduct scientific research on developing high yielding cultivars with greater adaptability to withstand biotic and abiotic stresses, appropriate cultural practices, pests and disease control measures, soil fertility enhancement in coconut lands, climate change impacts, profitable utilization of coconut lands, coconut product and process diversification and value addition and socioeconomics for policy initiatives in the sector. The institute also engages in transfer of coconut technologies through training and extension in harmony with the Coconut Cultivation Board. The institute maintains experimental stations, genetic resources centers and nurseries and maintains pilot plants for coconut processing and fabricating processing equipment.

The Coconut Research Board (CRB) consists of 11 members including the Chairman appointed by the Hon. Minister for a three-year term and executes its functions under the Minister of Plantation Industries. The Director is overall in Charge of the Institute and is assisted by the Additional Director. The Deputy Director (Research) supervises the nine Research Divisions, Technology Transfer Division and the Library. The Deputy Director (Administration) oversees the Establishment Division, Engineering Division and the Estate Management Division. Senior

Accountant is responsible for all financial functions of the Institute. Internal Audit Unit is independent and it reports directly to the Chairman, Coconut Research Board. The Estate Management Division operates as a self-financed entity.

4. Vision

The vision of the Coconut Research Institute is to be the centre of excellence in coconut research, technology development and technology transfer in the region.

5. Mission

The mission of the Coconut Research Institute to generate knowledge and technology through excellence in research towards increasing productivity and profitability of coconut

6. SWOT Analysis

No.	Strengths	Weaknesses	Opportunities	Threats
1.	Unprecedented place occupied by coconut in the Sri Lankan culture and its contribution to the national economy.	Lack of a solid national macro-economic policy for the coconut industry.	Multitude of uses in coconut and its place in the national economy and pursues to introduce solid policy scheme.	Coconut is the livelihood of many and hence any problem emerging in the industry becomes a socio economics and political issue and this situation pressurizers CRI for quick solutions.
2.	Recognition as a major agricultural crop for development in the National priorities.	Limited opportunities for training scientists in developed countries at postgraduate and postdoctoral levels and current extension programme is not sufficient.	Prospects for securing funds for short-term research studies from local donors; CARP,NRC, and NSF from competitive grants and international donors; World Agro Forestry Centre, COGENT, FAO etc.	Inability to retain trained scientists from leaving the country for much greener pastures in developed countries and discernible difference in incomes of academics and researchers leading to brain drain.
3.	Consider as one of the major food crops in the country.		Form a task force to create an awareness amongst the people in the country	Improve yield production of coconut with various strategies.
4.	A fund of knowledge, innovations and technologies developed and accumulated over 87 years of CRI's existence.	Limited funding for infrastructure development and maintenance of buildings, roads and other permanent structures	Willingness of growers to participate in farmer's field experiments and other research and development efforts such as promotion of organic manure for soil	Running Estates of CRI as Self-financed Units affect in the best use of estate lands for experimental purposes.

No.	Strengths	Weaknesses	Opportunities	Threats
			fertility improvement, organic coconut farming intercropping and livestock management.	
5.	Well evolved research management and monitoring mechanism over a long period of time.	Unattractive salaries resulting in failure to recruit competent staff for higher administrative, financial and estate management positions.	Closer links with industry facilitating research-industry links	Risk of continuity of long term field experiments in private estates limits conducting of multi-location field experiments to a few agro-ecological zones.
6.	Well maintained office space, equipped laboratories, library, internet facilities and substations for facilitating laboratory and field research.	Delays in procurements and construction work due to rigid procurement procedures.		
7.	Highly qualified, trained and committed Scientific, Experimental, Technical and Field Staff with proven skills for conducting high quality research.	Inflated costs of laboratory equipment, glassware and chemicals not locally available.	Global trends in coconut production encourage development of the coconut industry.	Growers' issues more often fall outside the mandate of CRI though the criticism is directed towards the CRI.
8.	Possibility to increase the coconut growing areas in the country.	Growers are not encouraged to grow coconut due to limited facilities from the Government.	Possibility to expand the cultivation in non-traditional areas (North, East etc) in the country and various products of coconut becoming popular in the world.	Subsidies are limited.
9.	Development of machinery for coconut cultivation and processing.	Most of the practices involving coconut industry are basically done by labourers.	Machineries can be invented by various institutes and individuals.	Identify the required machineries and encourage people to make successfully.

7. Main issues

   i. Low yield of coconut lands
   ii. Poor land/ land use efficiency
   iii. Shortage of lands in traditional areas
   iv. Vulnerability of coconut to climate change
   v. Shortage of labour
   vi. Vulnerability of coconut to pests and diseases

vii. Uncertainty of coconut production and markets

viii. Low efficiency, profitability and less diversification of coconut-based products

ix. Low adoption of recommended technologies

x. Low competitiveness

xi. Insufficient national production of edible oils

8.   Trust Areas

i.   Breeding and micro-propagation of coconut

ii.   Plant and soil management

iii.   Coconut based farming systems

iv.   Pest and disease management

v.   Coconut products and machinery development

vi.   Socio economic analyses of coconut production and processing

vii.   Technologies for oil palm cultivation

9. Strategies

i.   Genetic improvement of coconut

ii.   Developing of *in vitro* propagation protocols

iii.   Enhancing soil quality

iv.   Rehabilitating coconut soils

v.   Managing soil water

vi.   Developing improved farming systems

vii.   Developing appropriate cultivation practices in mon-traditional areas

viii.   Mitigating and adapting to climate change effects

ix.   Developing sustainable pest and disease management systems

x.   Developing technologies for value addition and process improvements

xi.   Mechanizing farm and industrial operations

xii.   Managing uncertainty of yield and markets

xiii.   Analysing socio-economic status of recommended technologies

xiv.   Developing technologies to reduce cost of production

xv.   Developing/ improving propagation methods and nutrient and pest management in oil palm

xvi.   Transferring technologies to stakeholders

xvii.   Providing specialized services to the stake holders

xviii.   Developing human resource, infrastructure and library facilities to support research and development

10. Goals

i.   Increase production of coconut to meet culinary and industrial needs of the country

ii.   Improve land/ land use efficiency to maximize productivity and profitability of coconut lands

iii.   Reduce crop loss by protecting coconut palms from pests and diseases

iv.   Develop/ improve products and processes towards sustainable coconut industry and compete in global market

v.   Develop environmentally sound and economically viable coconut industry

vi.   Improve technologies for oil palm cultivation to increase national production of edible oils

vii.   Promote Technology Transfer for adoption of developed technologies to enhance coconut cultivation, processing and marketing

viii.   Providing services to stakeholders for contributing to the national development by providing specialized services to the stakeholders of the coconut sector

ix.   Managing Genetic Resource Centers and Research Stations to facilitate research and development

x.   Developing human resource and infrastructure to enhance performance of the institute.

11. Objectives

i.   To increase coconut production potential by breeding new varieties for high yield and tolerant to biotic and abiotic stresses

ii.   To develop tissue culture techniques to mass produce elite coconut genotypes and assist in the coconut breeding programme

iii.   To enhance soil quality to provide optimum nutrients to the palm for increased yield of coconut

iv.   To rehabilitate degraded coconut soils by agronomic practices for increased yields

v.   To promote soil moisture conservation for increased coconut yields

vi.   To develop appropriate cultivation practices for non-traditional areas to expand coconut cultivation to increase coconut production

vii.   To adapt and mitigate to climate change effects to reduce vulnerability of coconut to climate change

viii.   To develop improved farming systems to increase profitability of coconut lands

ix.   To develop sustainable pest management systems to reduce crop loss in coconut

x.   To develop reliable detection methods, prevent spread and manage Weligama Coconut Leaf Wilt Disease

xi.   To develop technologies for value addition of coconut products and process improvements to increase profit / income of coconut industry

xii.   To identify nutritional and medicinal properties of coconut oil

xiii.   Mechanizing farm and industrial operations to reduce labor usage

xiv.   To assist stakeholders and policy makers to minimize the risk caused by uncertainties in yield and markets

xv.   To increase competitiveness of coconut industry

xvi.   To increase adoption of recommended technologies through socio economic analysis

xvii.   Improve research methodologies to enhance experimentation

xviii.   To train growers and general public on production technologies

xix.   To assess land suitability and identify suitable areas to expand OP cultivation in Sri Lanka

xx.   To increase competitiveness of coconut industry

xxi.   To develop management methods for porcupine and wild boar damage in oil palm

xxii.   To transfer of coconut technology

xxiii.   To provide advisory services to growers and other stakeholders

xxiv.   To supply sufficient improved seeds to meet the national requirement of planting

xxv.   To assist in management of Weligama Coconut Leaf Wilt Disease

xxvi.   To assist small and medium scale entrepreneurs to commence coconut processing industries

xxvii.   To disseminate technology for king coconut export and issue certificates

xxviii. To demonstrate live intercropping models and farming systems

xxix.   To provide analysis reports to assure quality of products/processes

xxx.   To provide various services required by the stakeholders

xxxi.   To provide coconut information to the stake holders, policy makers and public

xxxii.   To improve and maintain genetic resource centres and research centers to facilitate research and development activities

xxxiii. To provide library services to the scientists and public

xxxiv.   To develop human resource

xxxv.   To improve infrastructure and laboratory facilities

Trust Area 1: Breeding and micro-propagation of coconut

Goal: Increase yield of coconut to meet culinary and industrial needs of the country

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets				
				Year				
				2016	2017	2018	2019	2020
1.	**To increase coconut production potential by breeding new varieties for high yield and tolerant to biotic and abiotic stresses**	1.Development of new cultivars for high yield, early bearing, shorter stature and tolerant to drought and their evaluation under different climatic and management conditions	a. 02 new high yielding coconut cultivars b 01short stature coconut cultivar for urban home gardens c. 01 drought tolerant coconut cultivar d. 01 drought tolerant coconut accession	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Release 01 high yielding cultivar c. Establish 04 drought tolerant evaluation trials d. Collect 02 sets of physiological and growth measurement data e. Identify 01 drought tolerant cultivar based on seedling characters	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Establish 02 drought tolerant evaluation trials c. Collect 02 sets of physiological and growth measurements data	a. Collect 12 sets of nut yield data and 4 sets of FC data b. Release 01 short stature cultivar c. Collect 02 sets of physiological and growth measurements data	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Release 01 high yielding cultivar c. Collect 02 sets of physiological and growth measurements data d. Develop 01 drought tolerant coconut accession and release to growers	a. Collect12 sets of nut yield data and 04 sets of FC data b. Collect 02 sets of physiological and growth measurements data
		2. Development of new cultivars resistant/tolerant to pests and diseases and beverage purposes	a. 01 coconut cultivar resistant/tolerant to coconut *Aceria* mite b. 01 coconut variety/ hybrid tolerant to Weligama Coconut Leaf Wilt Disease (WCLWD) c. 01 coconut cultivar tolerant/ resistant to Weligama Coconut Leaf Wilt Disease d. A selected coconut cultivar for beverage	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Screen mite damage quarterly. c. Screen WCLWD quarterly. d. Pollinate 30 GD palms with pollen from resistant tall e. Establish 03 WCLWD evaluation trials f. Population genetic analysis of king coconut in Sri Lanka with SSR/SNP markers	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Screen mite damage quarterly. c. Screen mite damage quarterly d. Identify 01 WCLWD tolerant /resistant coconut cultivar e. Pollinate 30 GD palms with pollen from resistant talls f. Establish 03 WCLWD evaluation trials g. Evaluate tender nut water for higher sugar contents and	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Screen mite damage quarterly c. Release 01 *Aceria* mite tolerant coconut cultivar d. Screen for mite damage quarterly e. Pollinate 30 GD palms with pollen from resistant talls f. Establish 03 WCLWD evaluation trials g. Control pollination of 50 selected palms	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Screen for mite damage quarterly c. Screen for mite damage quarterly. d. Release 01 WCLWD tolerant coconut cultivar e. Control pollination of 50 selected palms	a. Collect 12 sets of nut yield data and 04 sets of FC data b. Screen mite damage quarterly c. Screen mite damage quarterly d. Release a selected cultivar for beverage purpose

No.	Objective	Output	Indicators	Year 1	Year 2	Year 3	Year 4	Year 5
				select good parents				
		3. Enrich coconut genetic diversity in Sri Lanka for use in future breeding	a. *ex-situ* gene-banks to conserve coconut germplasm b. 10 exotic varieties multiplied by self-pollination c. 03 new exotic coconut varieties, including a cold tolerant variety imported from China d. 50 conserved germplasm characterized and a core collection	a. Manage gene-banks with standard management practices b. Multiply 10 exotic varieties by self-pollination c. Import 01 coconut variety d. Collect leaf, stem, inflorescence characters from 20 coconut accessions	a. Manage gene-banks with standard management practices b. Develop core-collection	a. Manage gene-banks with standard management practices b. Import 02 coconut varieties	Manage gene-banks with standard management practices	Manage gene-banks with standard management practices
		4. Develop efficient tools for marker assisted selection	a. all mapping population maintained b. A framework map for coconut c. A QTL map for coconut	a. Maintain all mapping population b. Molecular characterization of F_2 population by Dart markers and other markers c. Compile morphological data of the F2	a. Maintain all mapping population b. Construct frame work map c. Construct QTL map d. Pollinate for construction of F_2 population from F_1 population of RD x T (Walpita)	a. Maintain all mapping population b. Pollinate for construction of F_2 population from F_1 population of RD x T	a. Maintain all mapping population b. Establish F_2 mapping population c. Genotype the F_2 mapping population	a. Maintain all mapping population b. Collect data from mapping population
2.	To develop tissue culture techniques to mass produce elite coconut genotypes and assist in the coconut breeding programme	1. Develop protocols for safe exchange of germplasm	a. Efficient *in vitro* germplasm exchange protocol through higher survival of plants during acclimatization. b. A protocol for long term storage of somatic embryos.	a. Record growth measurement data of *in vitro* grown plants under elevated CO_2 and reduced sucrose levels. b. True to type conformity of plants or somatic embryos survived after cryopreservation	a. Acclimatize plants raised under elevated CO_2 with comparison to those raised under normal laboratory conditions. b. Publish protocol on development of cryopreservation of somatic embryos	a. Screen 03 potting mixtures during acclimatization and testing of physiology of plantlets b. Prepare manuscript on photoautotrophic growth of in vitro cultured coconut plants and cryopreservation of somatic embryos.		
		2. Develop vegetative propagation methods	a. Improved tissue culture protocol to	a. Produce 250 tissue cultured plants and	a. Detect expression pattern of two	a. Prepare manuscript on gene	a. Commence a study on	a. Record 02 sets of growth

		using unfertilized ovary, anther and microspore culture and their field evaluation	induce somatic embryogenesis and plant regeneration from ovary-derived callus b. Efficient protocol for androgenesis of coconut and field planted dihaploid coconut palms c. Genetic stability of tissue cultured palms established d. Efficient protocol for genetic transformation of somatic callus tissues of coconut	acclimatization of 50 plants. b. Screen12 mother palms from cultivars DT, TSR and WCLWD tolerant palms. b. Detect relative expression of two genes in a time course (10 samples at different phases) during coconut somatic embryogenesis. c. Develop improved and efficient protocol for androgenizes of coconut and production of dihaploid coconut palms to initiate pure lines	embryogenesis related genes in unfertilized ovaries of eight responsive and eight non responsive palms. b. Identify relationships of above genes during coconut embryogenesis c. Produce 50 anther derived dihaploid plants and acclimatize 20 dihaploid plants d. Field establish clonal plants and seedlings	expression during coconut somatic embryogenesis. b. Acclimatize 50 dihaploid plants and testing of ploidy levels. c. Record 02 sets of growth measurement data of field established plants. c. Prepare the gene construct	multiplication of *in vitro* regenerated shoots b. Field plant at least 30 dihaploid palms. c. Record 02 sets of growth measurement data of field established plants. d. Optimize conditions for transforming callus originated from suitable somatic tissue of coconut	measurement data of field established plants and evaluation of root system of tissue cultured plants. b. Produce transgenic coconut palms harboring foreign genes

Trust Area 2: Plant and soil management

Goal: Increase yield of coconut to meet culinary and industrial needs of the country

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets Year				
				2016	2017	2018	2019	2020
1.	To enhance soil quality to provide optimum nutrients to the palm for increased yield of coconut	1. Formulate new fertilizer mixtures	a. 05 recommendations of locally available fertilizer materials (application of ERP with goat manure in Dry zone,responce of NaCl in coconut palms, use of king coconut husk as a organic potassium source, application of high dolomite doses to coconut palms) b. 01 fertilizer mixture c. 06 research papers d. New experiment to improve fertilizer recommendation with Sulphur.	*Local materials* a. Complete 14 pick recordings b. Collect and analysis of 576 soil samples and 497 leaf samples. b. Make 01 recommendation on application of ERP with goat manure in Dry zone. c. Process king coconut husks into 100 kg of nutrient supplementary material. d. Analysis 20 representative samples of NSM for determination of nutrient levels. e. Treatment application for 03 experiments. e. Write 02 research papers (Short term effect of NaCl on soil nitrification rates, use of king coconut husk as a nutrient supplementary material) *Mixtures* a. Analyze 89 soil samples and 42 leaf samples. b. Publish 01 research	*Local materials* a. Collect and analyze 492 leaf samples and 496 soil samples. b. Collect data in 28 picks. c. Produce 200 kg of NSM from King coconut husks. d. Analyze of 30 NSM samples. *Mixtures* a. Analyze 102 drainage samples and 50 fertilizer samples.	*Local materials* a. Collect and analyze 512 leaf samples and 506 soil samples. b. Data collection in 24 picks. c. Make 01 recommendation on high dose of dolomite to wet and intermediate zones to prevent Mg deficiency d. Produce 02 publication(on processing of king coconut husk as a nutrient source, high dose of dolomite to prevent Mg deficiency and minimizing K and Mg interaction). *Mixtures* a. Analyze 102 drainage samples and 50 fertilizer samples. b. Produce one publication.	a. Collect and analyze 452 leaf samples and 466 soil samples. b. Collect data in 8 picks. c. Make 02 recommendation (effect of NaCl application on coconut palms,fertilizer application techniques to improve productivity) d. Publish 01 research paper (effect of NaCl application on coconut palms, fertilizer application techniques to improve nutrient absorption efficiency). c. New experiment to improve fertilizer recommendation with Sulphur.	a. Collect and analyze 332 leaf samples and 166 soil samples. b. Collect data in 8 picks. c. Make 01 recommendation. d. Publish 01 research paper c. Progress report on the experiment to improve fertilizer recommendation with Sulphur.

				paper.			
		2. Develop / improve fertilizer application methods and assess fertilizer use efficiency	a. 01 recommendation on fertilizer application method for major nutrients. b. 02 recommendations on application of micro nutrients and one recommendation on fertilizer application using backhoe machine c. Quantify nutrient losses from fertilizer application. c. Publish 03 research papers d. New experiment on fertilizer application using backhoe machine	a. Complete 06 pick recordings. 108 leaf samples analysis for four major nutrients (N, P, K & Mg). b. Collect and analysis 300 soil samples and 161 leaf samples for micro nutrients c. Analyzing 102 drainage samples. Analyzing 50 fertilizer samples d.New experiment on fertilizer application using backhoe machine	a. Complete 06 pick recordings. 108 leaf samples analysis for four major nutrients (N, P, K & Mg). b. Collect and analysis 300 soil samples and 161 leaf samples for micro nutrients c. Analyze 36 drainage water samples and 26 fertilizer samples	a. Complete 06 pick recordings. 108 leaf samples analysis for four major nutrients (N, P, K & Mg). b. Revise fertilizer recommendation with micronutrients.	a. Complete 06 pick recordings. 108 leaf samples analysis for four major nutrients (N, P, K & Mg).
		3. Develop/ improve soil fertility	a. Beneficial traits of Bio Char identified. b. Risks of using biochar in coconut understood. c. Potential use of Panicum maximum to remove contaminated PAHs from biochar or any other sources. c. Beneficial microorganisms of coconut soils will be identified. d. Wild sunflower as a green manure for coconut plantations e. Publish six research papers. f. Commence new experiment on	a. Analyse 60 leaf, 60 root and 20 soil samples for two PAHs. b. Collect 30 soil samples and isolate beneficial microorganisms. c. Apply treatments 06-monthly, collect nut yield data at monthly intervals and 02 soil analysis of sunflower treatment. d. Isolation and identification of mycorrhizae from coconut palms. e. Commence new experiment on nutrient leaching losses in biochar applied soil.	a. Analyse 60 leaf, 60 root and 20 soil samples for two PAHs. b. Identify beneficial mycorrhizae from coconut lands c. Apply treatments 06-monthly, collect nut yield data at monthly intervals and 02 soil analysis of sunflower treatment. d. Isolation and id entification of mycorrhizae from coconut palms.	a. Analyse 60 leaf, 60 root and 20 soil samples for two PAHs. b. Apply treatments 06-monthly, collect nut yield data at monthly intervals and 02 soil analysis of sunflower treatment. c. Give research highlights on beneficial microbes in coconut growing soils. d. Commence new experiments (Adding amendments to improve soil moisture content,	a. Develop a recommendation on the use of wild sunflower as a green manure for coconut plantations b. Four progress reports on adding amendments to improve soil moisture content and use of beneficial mycorrhizae to improve drought tolerance of coconut palms and Exchangeable base behavoiur in soils and biochar incorporated soils, fertilizer application	a.Four reports on use of beneficial mycorrhizae to improve drought tolerance of coconut palms and effect of biochar application with organic manure and Exchangeable base behavoiur in soils and biochar incorporated soils, fertilizer application techniques for different soil types b.One recommendation on adding amendments to improve soil moisture contents c.One research paper on adding

No.	Objective	Strategy					
			nutrient leaching losses in biochar applied soil, Adding amendments to improve soil moisture content, use of beneficial mycorrhizae to improve drought tolerence of coconut palms, Exchangeable base behavoiur in soils and biochar incorporated soils, fertilizer application techniques for different soil types, effect of biochar application with organic manure. g. One recommendation on adding amendments to improve soil moisture contents	f. Publish 02 papers on optimization of trace elements into Madampe soil series, optimization of trace elements into Boralu soil series, Nutrient leaching losses in biochar applied soil.	e. Publish 03 papers on micronutrient behaviour in bio char incorporated Madampe soil, Micronutrient behavoiur in biochar incorporated Boralu soil series, Mycorrhizal strains present in coconut lands)	use of beneficial mycorrhizae to improve drought tolerance of coconut palms, Exchangeable base behavoiur in soils and biochar incorporated soils, fertilizer application techniques for different soil types)	techniques for different soil types c. Commence new experiments on effect of biochar application with organic manure	amendments to improve soil moisture contents
		4. Map soil nutrient status of coconut soils	a. Analyze 640 soil and 240 leaf samples and giving research highlights on investigation on leaf and soil Sulphur content in coconut triangle	a. Analyze 320 soil and 120 leaf samples to investigation on leaf and soil Sulphur content in coconut triangle.	a. Analyze 320 soil and 120 leaf samples and giving research highlights on investigation on leaf and soil Sulphur content in coconut triangle			
2.	To rehabilitate degraded coconut soils by agronomic practices for increased yields	Improve agronomic practices	a. Recommendation to minimize soil erosion in coconut lands b. Develop an ecological base soil quality index	a. Collect 02 soil analysis data sets on soil erosion. b. Develop a research proposal to evaluate the soil ecological indices in coconut gliricidia agroforestry systems in three different agro	a. Collect 02 soil analysis data sets on soil erosion. b. Collect 60 soil analysis data sets on soil quality index	a. Collect 02 soil analysis data sets on soil erosion. a. Publish a research paper	a. Develop a recommendation to minimize the soil erosion in coconut lands	

No.	Objective						
3.	**To promote soil moisture conservation for increased coconut yields**	Develop/improve sustainable soil moisture conservation practices	a. Suitable coconut cultivars and integrated soil moisture management package for coconut mini-triangle b. A low cost biochar production system and use of carbonized plant materials for moisture retention in coconut soil c. Recommendation to conserve soil moisture in coconut lands by surface application of non-retted coir pith	a. Recommend coconut cultivars and integrated soil moisture management package for coconut mini-triangle b. Analyze different properties of 12 biochar types c. Record yield data monthly and analyze soil samples twice a year in biochar study. c. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets	a. Develop a low cost biochar production recommendation b. Record yield data monthly and analyze soil samples twice a year in biochar study. c. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets	a. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets b. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets	a. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets b. Apply coir pith treatments at six monthly, collect nut yield data monthly and collect 02 soil analysis data sets	a. Develop a low cost sustainable soil moisture conservation method using biochar b. Develop a recommendation to conserve soil moisture in coconut lands using non-retted coir pith
4.	**To develop appropriate cultivation practices for non-traditional areas to expand coconut cultivation to increase coconut production**	Assess land use suitability for coconut in non-conventional areas	a. Identify suitable lands for coconut in Moneragala, Ampara, Trincomalee, Batticaloa, Anuradhapura and Polonnaruwa districts b. Compile 06 soil and land suitability district maps.	Compile 02 soil and land suitability maps	Compile 04 soil and land suitability maps			
5.	**To adapt and mitigate to climate change effects to reduce vulnerability of coconut to climate change**	1. Identify vulnerable areas, effects of climate change on performance of coconut and screen coconut varieties / hybrids for heat and drought tolerance	a. Vulnerability indices for 06 major coconut growing districts b. Assess drought risk in hybrid seed nut production in seed gardens c. Identify degree of drought tolerance of coconut varieties /	a. Prepare indices for two districts b. Prepare database	a. Prepare indices for two districts b. Prepare database preparation, data analysis and report writing c. Collect monthly field data	a. Prepare indices for two districts b. Identify cardinal temperatures for 07 coconut hybrids		

			hybrids					
		2. Adapt to changing microclimatic conditions and reducing vulnerability of coconut plantations to projected climate change	a. Two coconut based cropping and agro-forestry systems to overcome climatic effect on nut production	a. Record micro-climate data at bimonthly interval b. Record growth data at 06 monthly intervals and analyze soil samples once a year.	a. Record the micro-climate data at bimonthly interval b. Record growth data at 06 monthly intervals and analyze soil samples once a year.	Develop a recommendation to overcome climate effect on nut production b. Record growth data at 06 monthly intervals and analyze soil samples once a year.	Record growth data at 06 monthly intervals and analyze soil samples once a year.	Record growth data at 06 monthly intervals and analyze soil samples once a year.
		3. Maximize the environmental benefits of coconut intercropping systems by realizing maximum benefits of coconut- Gliricidia bioenergy system	a. Carbon footprint of bio energy and coconuts b. Management package for Coconut-Gliricidia bio-energy system	a. Collect bi-monthly / quarterly data	a. Collect bi-monthly / quarterly data	a. Collect bi-monthly / quarterly data		
		4. Estimate Carbon sequestration potential of coconut mixed cropping systems	Potential use of coconut plantations for climate change mitigation and Carbon trading	Carbon balance in six mixed cropping systems	Data collection at six monthly intervals and preparation of Carbon balance sheets for six systems in wet, intermediate and dry zones	Data collection at six monthly intervals and preparation of Carbon balance sheets for six systems in wet, intermediate and dry zones	Data collection at six monthly intervals, preparation of Carbon balance sheets for six systems in wet, intermediate and dry zones, data analysis and report writing	data analysis and report writing

Trust Area 3: Coconut based farming systems

Goal: Improving land/ land use efficiency to maximize productivity and profitability of coconut lands

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets Year 2016	2017	2018	2019	2020
1.	To develop improved farming systems to increase profitability of coconut lands	1. Develop and improve intercropping models and farming systems	a. Dragon fruit as an intercrop under mature coconut plantations b. High value resin crops under coconut c. CO-3 fodder grass under coconut d. Fodder sorghum under coconut e. New herbicide to manage weeds in coconut lands	a. Record growth data of dragon fruit at six month interval and analyze soil samples once a year. b. Record growth data of resin plants at six month intervals c. Apply treatments, record yield data at monthly intervals & analyze soil samples twice a year for CO-3 fodder grass and fodder sorghum d. Tests 02 new herbicides and recommend.	a. Record growth data of dragon fruit at six month interval and analyze soil samples once a year. b. Record growth data of resin plants at six month intervals c. Apply treatments, record yield data at monthly intervals & analyze soil samples twice a year CO-3 fodder grass d. Recommend fodder sorghum e. Test 04 new herbicides and recommend	a. Record growth data of dragon fruit at six month interval and analyze soil samples once a year. b. Record growth data of resin plants at six month intervals c. Apply treatments, record yield data at monthly intervals & analyze soil samples twice a year CO-3 fodder grass	a. Record growth data of dragon fruit at six month interval and analyze soil samples once a year. b. Record growth data of resin plants at six month intervals c. Recommend CO-3 fodder grass under coconut	a. Record growth data of dragon fruit at six month interval and analyze soil samples once a year. b. Record growth data of resin plants at six month intervals
		2. Develop and improve livestock based integrated farming systems	a. Buffalo integrated method b. Sheep coconut model to popularize sheep farming under coconut	a. Apply treatments, record yield data at monthly interval & analyze soil samples twice a year. b. Establish treatments for sheep grazing & sample collection	a. Apply treatments, record yield data at monthly interval & analyze soil samples twice a year. b. Continue sheep grazing trial one and start trail two & sample collection	a. Apply treatments, record yield data at monthly interval & analyze soil samples twice a year. b. Continue sheep grazing trial one and start trail two & sample collection	a. Publish 04 papers on buffalo integrated system	a. Develop a recommendation of suitable integrated methods with buffaloes.
		3. Develop feeds for livestock	a. Formulate an economical nutritive feed for livestock under coconut using *Panicum maximum* b. Determine herbage parameters of fodder species commonly	a. Establish experiment and analyze the 200 feed samples of Panicum. b. Establish fodder species and sample collection	a. Develop a recommendation to manage problematic grass weeds and formulate new cattle feed using Panicum. b. Sample collection of fodder species	Publish research paper on fodder species		

		used for livestock feeding in Sri Lanka c. Establish a model fodder demonstration unit		and analyse			
		4. To evaluate requirements for organic coconut production	a. Requirements for organic coconut production determined. b. 03 control methods for termite, plesispa and black beetle in organic plantations c. 02 research publications	a. Analyze 20 leaf and 40 soil samples. b. Conduct 02 laboratory bioassays for botanicals on termite and plesispa beetle and collect 05 sets of data	a. Analyze 20 leaf and 46 soil samples. b. Conduct 03 field experiments on botanicals to control termite, Plesispa beetle and black beetle and collect 15 sets of data	a. Analyze 20 leaf and 46 soil samples. b. 03 recommendations on control of termite, plesispa and black beetle in organic coconut farming	Analyze 20 leaf and 46 soil samples and 01 research publication.	. Analyze 20 leaf and 46 soil samples and 01 research publication.

Trust Area 4: Pest and disease management

Goal: Reduce crop loss by protecting coconut palms from pests and diseases

Ind ex No.	Objectives	Programme/ Project	Outcome/output indicator	Targets				
				Year				
				2016	2017	2018	2019	2020
1.	To develop sustainable pest management systems to reduce crop loss in coconut	1. Develop management methods to reduce damage by black beetle	Method for integration of pheromone trapping and other methods to reduce damage of black beetle.	Collect 06 sets of data on damage assessment and trap catches	Collect 06 sets of data on damage assessment and trap catches	a. Collect 6 sets of data on damage assessment and trap catches. b. Recommend integration of pheromone trapping and other methods.		
		2. Develop biological control method and population forecasting model for Plesispa beetle and evaluate resistance of coconut palms to Plesispa beetle	a. Biological control method for Plesispa beetle using *Tetrastichus plesispae* b. Information on population fluctuation of plesispa beetle c. Varietal resistance to Plesispa beetle determined.	a. Collect 03 sets of data on post release parasitism levels. b. Recommend biological control of Plesispa beetle c. Collect 08 sets of data on population levels of plesispa	a. Collect 08 sets of data on population levels of plesispa b. 01 experiment on varietal resistance to Plesispa beetle	a. Collect 8 sets of data on population levels of plesispa b. 01 experiment on varietal resistance to Plesispa beetle	a. Develop forecasting model b. Identify varietal resistance to plesispa beetle	
		3. Develop integrated management methods for coconut mite and determine behavioural and reproductive responses of coconut mite to coconut varieties	a. Integration of predatory mite and palm oil - Sulphur mixture. b. Behavioural and reproductive responses of coconut mite to coconut varieties determined. c.Generation of information on searching behaviour, survival and fecundity of coconut mite d. Generation information on	a. Collect 06 sets of data on harvest b. Conduct 03 experiments on searching behaviour, survival and fecundity of coconut mite and collect 03 sets of data	a. Collect 06 sets of data on harvest b. Conduct 02 experiments on fecundity of coconut mite and SEM studies on nuts collect 03 sets of data	a. 01 publication and recommend integration	a. 01 publication on coconut mite behavior	

			anatomical differences of nut surfaces in different varieties				
		4. Develop semio-chemical based management methods for coconut pests	a. 03 pheromone dispensers and formulations for red weevil, black beetle and Plesispa beetle b. 03 essential oils as repellents for red weevil, black beetle and plesispa beetle identified.	a. Install 150 coconut caterpillar pheromone traps b. Test 03 pheromone dispenser materials for red weevil and black beetle c. Conduct 01 experiment to identify behaviourally active volatile compound for Plesispa beetle d. Conduct 01 Experiment to identify essential oil repellents for red weevil, black beetle and plesispa beetle	a. Install 150 coconut caterpillar pheromone traps b. Test 03 pheromone dispenser materials for red weevil and black beetle c. Conduct 01 experiment to identify behaviourally active volatile compound for Plesispa beetle d. Conduct 01 Experiment to identify essential oil repellents for red weevil, black beetle and plesispa beetle	a. Test 03 pheromone formulations for red weevil and black beetle b. Conduct 03 field experiments on pheromone dispenser and formulations for red weevil and black beetle c. Conduct 01 experiment to identify behaviourally active volatile compounds for Plesispa beetle d. Conduct 01 Experiment to identify essential oil repellents for red weevil, black beetle and plesispa beetle e. Recommend 03 pheromone dispensers and formulations for red weevil, black beetle and Plesispa beetle f. Identify 03 essential oils as repellents for red weevil, black beetle and plesispa beetle		
		5. Evaluate new/ low toxic pesticides and botanicals against pests of coconut	03 chemical control methods for red weevil, Plesispa beetle and termites	a. Test 03 chemicals for red weevil and plesispa beetles b. 01 chemical control method for Plesispa beetle	a. Test 03 chemicals for red weevil and termites b. Develop 02 recommendation to control red weevil			

#	Objective	Activity	Output				
			and termites				
		6. Develop methods to predict pest outbreaks and develop threshold levels of coconut pests	a. Forecasting methods for 04 pests b. ETL and EIL of plesispa beetle and leaf blight disease establsied	Conduct 04 surveys to monitor the caterpillar, nettle grub, mealy bug and scale infestations and their natural enemies and collect 08 sets of data	a. Conduct 04 surveys to monitor the caterpillar, nettle grub, mealy bug and scale infestations and their natural enemies and collect 08 sets of data b. Conduct 01 experiment on ETL and EIL of plesispa beetle and collect 12 sets of data	a. Conduct 04 surveys to monitor the caterpillar, nettle grub, mealy bug and scale infestations and their natural enemies and collect 08 sets of data b. Conduct 02 experiments on ETL and EIL of plesispa beetle and leaf blight and collect 2412 sets of data	a. Conduct 04 surveys to monitor the caterpillar, nettle grub, mealy bug and scale infestations and their natural enemies and collect 08 sets of data b. Conduct 02 experiments on ETL and EIL of plesispa beetle and leaf blight and collect 24 sets of data	a. Provide 04 recommendations on forecasting of pest outbreaks b. Make 02 recommendations on ETL and EIL of plesispa beetle and leaf blight disease
		7. Evaluate nonconventional methods for pest and disease management	Information on the use of electro-magnetic waves to control red weevil	-	-	Conduct 01 experiment on electro-magnetic waves to control red weevil	Conduct 01 experiment on electro-magnetic waves to control red weevil	Conduct 01 experiment on electro-magnetic waves to control red weevil
		8. Develop molecular approaches for pest and disease management	RNAi genes of coconut caterpillar, nettle grub and coconut leaf folder identified	-	-	-	Conduct 02 experiments on identification of RNAi genes of coconut caterpillar and Nettle grub	Conduct 03 experiments on identification of RNAi genes of coconut caterpillar, Nettle grub and coconut leaf folder
2.	To develop reliable detection methods, prevent spread and manage Weligama Coconut Leaf Wilt Disease	9. Develop management methods for Weligama coconut leaf wilt disease (WCLWD)	a. Reliability level of nested PCR determined. b. Transmissibility of WCLWD by 02 vectors confirmed. c. Seednut transmission of WCLWD determined. d. Alternate hosts of WCLWD phytoplasma identified. e. ELISA technique with local antiserum	a. Conduct 02 experiments to validate nested PCR technique and determine the storage period of diseased samples and DNA, collect 24 sets of data b. Conduct 01 experiment on *Protista moesta* as a vector, collect 12 sets of data and confirmation of 01 vector c. Conduct 01	a. Conduct 01 experiment on improvements to PCR detection of WCLWD and collect 12 sets of data b. Conduct 01 experiment on *Stephanitis typica* as a vector, collect 12 sets of data c. Conduct 01 experiment on ELISA technique and collect 12 sets	a. Conduct 01 experiment on improvements to PCR detection of WCLWD and collect 12 sets of data b. Conduct 01 experiment on *Stephanitis typica* as a vector, collect 12 sets of data and confirmation of 01 vector c. Conduct 01 experiment on	a. Conduct 01 experiment on improvements to PCR detection of WCLWD and collect 12 sets of data b. Conduct 01 experiment on improvements to ELISA technique and collect 12 sets of data	-

			validated. f. Palm to palm spreading pattern of WCLWD determined.	experiment on seednut transmission of WCLWD phytoplasma and collect 03 sets of data d. Conduct 01 experiment on alternate hosts of WCLWD phytoplasma and collect data on 10 palms species e. Conduct 01 experiment on ELISA technique and collect 12 sets of data f. 01 recommendation on palm to palm spreading pattern of WCLWD	of data d. 01 recommendation on alternate hosts of WCLWD e. 01 recommendation on seed nut transmission.	improvements to ELISA technique and collect 12 sets of data		

Trust Area 5: Coconut products and machinery development

Goal: Develop/ improve products and processes towards sustainable coconut industry and compete in global market

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets Year 2016	2017	2018	2019	2020
1.	**To develop technologies for value addition of coconut products and process improvements to increase profit / income of coconut industry**	1. Value addition to coconut oil 2. Value addition to kernel based product 3. Value addition to mature / tender coconut water based products 4. Value addition to coconut sap 5. By product utilization of coconut 6. Improvement of coir processing and products	a. Four recommendations on. storage time of copra, extra VCO production, correct maturity stage of nuts of coconut for oil production and best varieties for coconut oil production b. Publish four research papers c. Partnerships with industry for fractionation of coconut oil and development of capsules from lauric acids	a. Conduct 24 trials and analyse 144 samples for quality b. Recommend correct storage time of copra. c. 01publication on storage time of copra	a. Conduct 24 trials and analyse 144 samples for quality b. Recommend method for extra VCO production and correct maturity stage of coconut for oil production c. 02 publications	a. Conduct 24 trials and analyse 144 samples for quality b. Recommend best varieties for oil production c. 01 publication d. 02 new proposals on fractionation of coconut oil and development of capsules from lauric acids	a. Install and carry out preliminary trials on fractionation of coconut oil b. Sign MOU with a suitable partner for scaling up trail	a. Install capsule making machine and carry out preliminary trials b. Introduce lauric oil in a capsule
			a. Develop 04 new kernel based products / process; Ready to use dry kernel with multiple usage, investigate fresh coconut paste to reduce domestic consumption, introduce hard ice cream with longer life time and develop a coconut butter. b.. Four publications c. Promotional work shop on new coconut products	a. Develop 02 new proposals to investigate fresh coconut paste to reduce domestic consumption and develop a coconut butter	a. Carry out 36 trials to study organoleptic, microbial and chemical qualities of coconut paste and coconut butter seperately b. Introduce 02 new products; coconut paste in fresh form and coconut butter c. Investigate increasing shelf life of fresh coconut paste for reducing domestic consumption	a. Carry out 06 storage studies for coconut paste and coconut butter b. Develop 02 new proposals for ready to use dry kernel with multiple usage and to introduce hard ice cream with longer life time	a. Carry out 12 trials to produce hard ice cream b. Introduce hard ice cream c..Two publications d. Study storage time of dry coconut kernels for multiple usage	a. Publish newspaper articles and conduct promotional work shop on new coconut products

			a. Recipes / processes for packaging coconut water by addition of flavours, suitable sweeteners, blending of tender nut and mature coconut water and filtration and cool storage of coconut water. b. 04 publications c. Pilot plant for coconut water processing	a. Collect coconut water biweekly and carry out 24 trials b. Determine suitable sweetnener (low sucrose sources) c. Publication on effects of different sweeteners for tender coconut and mature coconut water	a. Collect coconut water biweekly and carry out 24 trials b. Determine addition of flavours (flavor concentrations, type of flavours) c. 01process improvement on filtration and cool storage of coconut wate before packaging d..01 publication on effect of addition of different flavours to coconut water	a. 02 publications on effect of blending of coconut and tender coconut water to organic leptic qualities and effects of different filtrations technique to physico chemical and organoleptic qualities of coconut water	Install pilot plant	Pack coconut water
			Two patents for sap collection equipment and coconut sugar	a. Tap 20 palm and collect sap to conduct 12 experiment on sugar making. b. Analyse samples for quality c. Complete.1st stage of sap collection equipment and 1st stage of coconut wine production	a. Conduct 06 sensory tests for quality of sugar b. Complete study on sap collection equipment c. Improve sugar production method.	a. Conduct 06 experiments on spray dry sap b. Apply for patent for sap collection equipment and coconut sugar c. Develop improved sap powder	a. Conducts 06 experiments to improve methods for sap based beverages	
			a. Method for preparation of protein from coconut kernel by product b. Method for production of extruded products form coconut kernel by products c. Drying technique of protein isolate d. Five promotional workshops	a. Develop proposal for development of a method for coconut protein powder and TVP) b. Conduct a promotional work shop for popularization of coconut products	a. Study suitable pH, keeping time, concentration methods of making protein isolate b. Develop 02 proposals for extruded products, energy bars, cereal mix c. Conduct a promotional work shop for popularizing coconut products	a. Identify drying technique of protein isolate 2. Carry out trials to identify suitable recipes to make several extruded products b. Recommend preparation of protein from coconut kernel by product c. Conduct a promotional work	a. Recommend production of extruded products form coconut kernel by products	a. Produce 02 publications on by products utilization of coconut industries b. Conduct a promotional work shop for popularizing coconut products

No.	Objective							
						shop for popularizing coconut products		
			a. Retting media using microbes b. Microbial consortium for coconut husk drying c. Method for making coir based mattress	a. Identify retting media using microbes (08 isolations and identifications) b. Develop a method for making coir based mattress with different types of mixed fibre and rubber latex for cottage industry		a. Recommend microbial consortium for coconut husk drying b. Develop mattress making method	a. Develop new proposal for physical methods for reducing retting time b. Provide 01 recommendation for specific growth media	
2.	**To identify nutritional and medicinal properties of coconut oil**	Studies in health effects of coconut products	a. Effect of coconut oil on lipid profile of rats known b. Glycermic index of coconut sugar determined. c. Effect of VCO oil on reducing Alzheimer/ dementia in human reported.	a. Collect 288 samples and analyse for lipid profiles b. Complete recruitment of patients and analyse base line data & starting feeding trials c. Complete 04 experiments (on going with University of Kelaniya) and continue 04 experiments.	a. Collect 300 blood samples from human and analyse for lipid profile. b. Carry out CT scanning of 60 people and Apo E testing c. Continue 04 experiments	a. Publish 02 papers on effect of coconut oil on lipid profile of rats and Glycermic index studies of coconut sugar b. Recruit people and do screening tests and carry out GI study with 60 healthy people	a. Produce reports on the effect of VCO oil on reducing Alzheimer/ dementia in human	
3.	**Mechanizing farm and industrial operations to reduce labor usage**	a. Low risk Ceylon drum. b. A flash dryer for drying coir pith c. Two patents for Ceylon drum and flash drier	a. Improve efficacy of Ceylon drum and reduce risk in current operation. b. Evaluate flash dryer to dry coir pith. c. Apply for 02 patents for improved Ceylon drum and flash dryer	a. Develop mathematical formula to evaluate flash dryer to dry coir pith	a. Recommend low risk Ceylon drum b. One patent for Ceylon drum			

Trust Area 6: Socio economic analyses of coconut production and processing

Goal: Developing environmentally sound and economically viable coconut industry

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets				
				Year				
				2016	2017	2018	2019	2020
1.	**To assist stakeholders and policy makers to minimize the risk caused by uncertainties in yield and markets**	1. Develop dynamic time series models for price forecasting	A price forecasting model to the industry	Formulate research proposal	Identify the suitable econometric model and collect monthly nut prices over 25 years and analyze the data	Continue data collection and data analysis : and validating the model and introducing the model		
		2. Assess impact of extreme climatic events	a. Impacts of management practices quantified b. Proposals to mitigate the situation c. Research needs identified	Formulate research proposal	Collect qualitative and quantitative data from most vulnerable areas in Kurunegala and Puttlam.	Collect data and analysis	a. Collect data and analysis b. Present the qualitative and quantitative impacts in short run and long run. c. Propose drought impact quantification model and required policies to mitigate the situation	
		3. Forecast and estimate coconut production and generate important statistics for the industry	a. Monthly coconut yield in Kurunegala, Puttalam and Gampaha districts predicted eight months in advance b. National yield predicted bimonthly (pick-wise) eight months in advance c. Annual national coconut yield estimated. d. Climate-driven process -based yield prediction model e. Dynamic model for coconut industry	a. Collection of field data monthly and forecasting coconut production for next eight months. b. Collect yield data from 25 districts monthly / bimonthly and estimation of national coconut production c. Collect data analysis for prediction models	a. Collect field data monthly and forecasting coconut production for next eight months b. Collect yield data from 25 districts monthly / bimonthly and estimation of national coconut c. Collect data, analysis and preparation of models	a. Collect field data monthly and forecasting coconut production for next eight months b. Collect yield data from 25 districts monthly / bimonthly and estimation of national coconut c. Develop climate driven process-based crop forecast model d. Develop industry model	a. Collect field data monthly and forecasting coconut production for next eight months b. Collect yield data from 25 districts monthly / bimonthly and estimation of national coconut	a. Collect field data monthly and forecasting coconut production for next eight months b. Collect yield data from 25 districts monthly / bimonthly and estimation of national coconut

2.	To increase competitiveness of coconut industry	1. Improve resource use and profitability in coconut industry trough intercropping, animal husbandry and through by products	Contributory factors for success and failures and appropriated technologies and propose necessary policies identified	a. Collect data and analysis b. Select most technically and socially viable cropping and animal husbandry systems and record their properties though monograph				
		2. Improve resource use and profitability in coconut industry trough organic farming	a. Identify highly profitable cropping systems for the coconut and to b. Identify the comparative advantages of organic coconut	a. Collect data from 200organic coconut growers	a. Collect data from processors. b. Identify salient features of organic farming systems c. Develop cost of production calculation system for nuts and products d. Propose required policies	a. Research proposal on price transmission system of organic coconut	a. Collect data from processors, exporters and international markets	a. Identify pricing mechanism b. Propose policy guidelines c. Provide feedback to the industry
		3. Analyze profitability of coconut production	Calculate cost of production and necessary policies to improve efficiency proposed	Collect data and calculate COP of coconut and coconut based products	Collect data and calculate COP of coconut and coconut based products	Collect data and calculate COP of coconut and coconut based products	Collect data and calculate COP of coconut and coconut based products	Collect data and calculate COP of coconut and coconut based products
		4. Analyze structure of value chains of coconut based products	a. Identify the properties of the value chains of DC, coir fiber, virgin coconut oil, coconut milk and powder and other products b. Propose necessary policies to improve value chain		Select around 30 processing units for each and collect data	Continue data collection and analyze the chain and present the monograph and necessary guidelines	Submit proposal to research committee on virgin coconut oil	Select around 60 processing units and collect the data
		5. Analyze comparative advantages, competitive edges for coconut products	Identify competitive products and markets	a. Analyze collected data of identification of relationship between world edible oil prices and crude oil prices. b. Propose necessary	a. Prepare research proposal	Collect data from exporters and international databases	Publish the results though monograph and journal articles.	

No.	Objective	Study	Expected output	Year 1	Year 2	Year 3	Year 4	Year 5
				policy interventions				
		6. Review of overall sector performances of kernel, fiber and other products	a. Identify the performances of the overall sector and b. Appropriate policy for the sector suggested	a. Collect data from DC industry by selecting 30 processing units. B. Publish results though monograph	a. Collect data from coconut water industry by selecting representative samples b. Publish results though monograph	a. Collect data from milk and milk powder industry by selecting 30 processing units. B. Publish results though monograph	a. Collect data from new products by selecting representative sample b. Publish results though monograph	a. Collect data from new products by selecting representative sample b. Publish results though monograph
		7. Consumer willingness to pay for high quality local coconut oil	Identify Consumer willingness to pay for high quality local coconut oil			Prepare proposal	Collect data and analysis	Identify the viability of the industry considering the price level which consumer willing to pay
		8. Determinants of profit efficiency among smallholder coconut producers	Main factors contributing in generating efficient profit identified			Prepare proposal	Collect data 200 farmers and collection and data analysis	Identify suitable policy implementation
3.	**To increase adoption of recommended technologies through socio economic analysis**	1. Asses consumer acceptability and preference for coconut based value added products at market	Identify marketable coconut based value added products. Rank coconut based value added products according to the consumer preference.	Complete data collection	Publish recommendations			
		2. Coconut growers training effectiveness in terms of changers in knowledge and attitude through the certificate course on coconut cultivation and value addition	Identify the effectiveness of the training programme as a percentage	Complete data collection	Publish recommendations			
		3. Assess the possibility of reducing fertilizer subsidy by enhancing other influential factors	Identify the influential variables of fertilizer application. Rank the contribution of identified variables to the fertilizer application behavior of the growers	Publish recommendations				
4.	**Improve**	Optimize field	Precise experimental	Prepare database	Analyse data s and			

research methodologies to enhance experimentation	experimental designs in coconut research	designs for field research		report writing			

Trust Area 7: Technologies for oil palm cultivation

Goal: Improving technologies for oil palm cultivation to increase national production of edible oils

Index No.	Objective	Programme/Project	Outcome/Output Indicator	2016	2017	2018	2019	2020
1.	**To assess land suitability and identify suitable areas to expand OP cultivation in Sri Lanka**	1. Identify new OP progenies and planting of new cultivation in different agro-ecological regions. 2.Soil Suitability assessment for cultivation of oil palm 3.Introduction of new cultivars of OP from different seed sources	a. Increase production of palm oil production up to 100,000 m.t/year b. Increase productivity of land for 6.0 m.t. of oil palm/ha/year c. Increase OP Production of existing marginal lands to 3.0 m.t.of oil palm/ha/year	a. Continue existing screening trials at BE, PSG, MOSG and Balangoda and start three more sites in IM2 and D2. b. Soil testing and scape studies c. Import new cultivars from Thailand, PNG	a. Continue existing screening trials at BE, PSG, MOSG and Balangoda and initiate three more sites in IM2 and D2. b. Soil suitability c. Land scape studies d. Import new cultivars from Nigeria	a. Two on farm trials in Welikanda and Matara. b. Soil fertility level analysis c. Import new cultivars from Thailand, PNG	a. Continue existing screening trials at BE, PSG, MOSG and Balangoda and initiate hree more sites in IM2 and D2 b. Soil fertility level analysis c. Import new cultivars from Thailand, PNG	a. Continue existing screening trials at BE, PSG, MOSG and Balangoda and three more sites in IM2 and D2 b. Soil suitability of Mahaweli area
		4. Assess yield data of existing selected OP plantations 5. Produce total biomass of OP palms 6. Assist for existing OP Plantation	d. Estimate annual oil yield. e. Forecast of oil production of mills and oil refineries f. Estimate annual removal of nutrients g. Identify other uses of biomass h. Import OP Seeds for RPC's and innovate small holders i. Nursery observations j Observe existing OP plantations of high production	e. Select 04 estates f. Maintain 02 sites g. Import 100,000 OP seeds h. Check 06 nurseries i. Assist planting 06 RPC's (3,000 ha)	e. Maintain experiments f. Import 150,000 OP Seeds g. Check 07 nurseries h. Assist planting 08 RPC's (7,000 ha)			
2.	**To increase competitiveness of coconut industry**	1. Analyze the profitability	Calculate the cost of production and propose necessary policies to improve efficiency	Collect data and analysis and publish though monograph	Collect data and analysis and publish though monograph	Collect data and analysis and publish though monograph	Collect data and analysis and publish though monograph	Collect data and analysis and publish though monograph
		2. Develop oil palm based data bank	Oil palm data base	Collect data and compile and publish	Collect data and compile and publish	Collect data and compile and publish	Collect data and compile and publish	Collect data and compile and publish

				booklet and though internet	booklet and though internet	booklet and though internet	booklet and though internet	booklet and though internet
		Analyze the structure of the value chains	Identifies the properties of the value chains and propose necessary policies	proposal preparation and submitting to the research committee	Data collection from the oil farm growers	Information compiling and publish in monograph and journals		
3.	**To develop management methods for porcupine and wild boar damage in oil palm**	Develop management methods for mammalian pests in oil palm	Management method for wild boar	-	Conduct 02 experiments	Conduct 02 experiments Make 02 recommendations	Make 01 publication	

Technology Transfer in coconut for increasing adoption of recommended technologies

Index No.	Objectives	Programme/Project	Outcome/Output Indicators	Targets				
				Year				
				2016	**2017**	**2018**	**2019**	**2020**
1.	To train growers and general public on production technologies	1. Conduct educational programs for coconut growers on different technical areas	40 educational programs for coconut growers on different technical areas	8 Programmes	8 Programmes	8 Programmes	8 Programmes	8 Programmes
		2. Conduct educational programmes for students and teachers at CRI	125 educational programmes for students and teachers at CRI	25 Programmes	25 Programmes	25 Programmes	25 Programmes	25 Programmes
		3. Conduct School student Projects	125 school students projects	25 Projects	25 Projects	25 Projects	25 Projects	25 Projects
		4. School Teachers' educational programmes on new technologies at zonal educational levels	Five Teacher training program	5 Programmes	5 Programmes	5 Programmes	5 Programmes	5 Programmes
		5. Training programmes for higher educational institutions and universities	60 training programmes for higher educational institutions and universities	12 Programmes	12 Programmes	12 Programmes	12 Programmes	12 Programmes
2.	Providing advisory services to growers and other stakeholders	1. Provide advisory services to growers who visit the institute, 2. Telephone calls and advisory correspondence seeking assistance to the field problems 3. Twenty advisory field visits	a. Provide advisory services to 5000 growers b.100 field Visits	1000 growers 20 Field Visits	1000 growers 20 Field Visits	1000 growers 20 Field Visits	1000 growers 20 Field Visits	1000 growers 20 Field Visits
3.	Transferring of coconut technology	1. Research and extension dialogues to update the technical knowledge of CDOs attached to all CCB regions	15 Research and extension dialogues	3 dialogues	3 dialogues	3 dialogues	3 dialogues	3 dialogues
		2. Conduct educational and awareness programs for trainers of state and private sector organizations.[Training of trainers (TOT)]	30 TOT programmes	6 TOT programmes	6 TOT programmes	6 TOT programmes	6 TOT programmes	6 TOT programmes
		3. Participate in agricultural exhibitions on request in different parts of the island	30 exhibitions	6 exhibitions	6 exhibitions	6 exhibitions	6 exhibitions	6 exhibitions
		4. Produce and distribute research, extension and advisory print materials	Produce new materials and update existing ones					
		5. Kapruka SMS Project	Develop 10,000 SMS recipients	1000 SMS recipients	1500 SMS recipients	2000 SMS recipients	2500 SMS recipients	3000 SMS recipients
		6. Develop a web based application to clarify and diagnose pest and disease problems according to the visual symptoms made by growers and upload video clips on coconut based products.	Develop a web based application for pest & diseases	Develop a web based application for pest & diseases	Develop a web based application for coconut based products	Develop a web based application for fertilizer application	Develop a web based application for moisture conservation	Develop a web based application for planting materials
		7. Use of mass media for technology	Publish 36 newspaper articles	06 newspaper	06	08	08	08

		transfer activities	Two Radio or TV programmes	articles 02 Radio or TV programmes	newspaper articles 02 Radio or TV programmes	newspaper articles 02 Radio or TV programmes	newspaper articles 02 Radio or TV programmes	newspaper articles 02 Radio or TV programmes
		8. Improve the exhibits at CRI museum to educate visitors	Improve the training and educational facilities of the Institute.	Develop 2 new models	Develop 2 new models	Develop 2 new models	Develop 2 new models	Develop 2 new models
		9. Development and maintain of Coconut Technology Park (CTP) as a one stop educational and information center for the benefit a large number of growers, produces and entrepreneurs	Create one stop educational centre for coconut growers and the general public	Develop one new site	Develop one new site	Develop one new site	Develop one new site	Develop one new site

Providing services to stakeholders for contributing to the national development by providing specialized services to the stakeholders of the coconut sector

Ind ex No.	Objectives	Programme/ Project	Outcome/output indicator	Targets				
				Year				
				2016	2017	2018	2019	2020
1.	**To supply sufficient improved seeds to meet the national requirement of planting**	Supply of seed coconut to National Replanting Programme and monitoring seed and seedling production	a. Establish one new seed garden for CRIC65 hybrids (Joint project with CCB). b. Establish one new seed garden for Kapsetha hybrids c. Maintain Kinmiyama seed garden (Joint project with CPL) d. Maintain Kehelhena block planted with tall x tall and dwarf brown as a seed garden function as a hand pollination seed garden (Assistance providing to Estate Management Division of CRI) e. Revitalize Plus Palm selection programme completed (Jointly with CCB) f. Print seedling certification tags and certify improved polybag seedlings g. Complete seed and seedling production monitoring.	a. Complete establishment of a 100 ac extent seed garden in eastern province b. Clear jungle clearance land preparation of the 65 ac seed garden at Margaret estate c. Complete planting of the 65 ac seed garden d. Maintain Kiniyama seed garden e. Maintain Kehelhena seed garden well f. Survey for new sources of plus palm through island wide survey g. Print 0.8M seedling certification tags and certification of 0.8 M improved polybag seedlings h. Monitor seed and seeding production in CRI, CCB and registered private nurseries	a. Manage newly establish 100 ac seed garden in Northern province well b. Manage newly establish 65 ac seed garden at Margaret estate well c. Maintain Kiniyama seed garden d. Maintain Kehelhena seed garden well e. Seed collection from plus palms f. Print 0.8M seedling certification tags and certification of 0.8 M improved polybag seedlings g. Monitor seed and seeding production in CRI, CCB and registered private nurseries	a. Manage newly establish 100 ac seed garden in Northern province well b. Manage newly establish 65 ac seed garden at Margaret estate well c. Start seed production at the Kiniyama seed garden d. Maintain Kehelhena seed garden well e. Seed collection from plus palms f. Printing of 0.8M seedling certification tags and certification of 0.8 M improved polybag seedlings g. Monitor seed and seeding production in CRI, CCB and registered private nurseries	a. Manage newly establish 100 ac seed garden in Northern province well b. Manage newly establish 65 ac seed garden in Northern province well c. Continue seed production at the Kiniyama seed garden d. Maintain Kehelhena seed garden well e. Seed collection from plus palms f. Print 0.8M seedling certification tags and certification of 0.8 M improved polybag seedlings g. Monitor seed and seeding production in CRI, CCB and registered private nurseries	a. Start seed production by artificial pollination at 100 ac seed garden in Northern province b. Manage newly establish 65 ac seed garden at Margaret estate well c. Continue seed production at the Kiniyama seed garden d. Start seed production at Kehelhena seed garden e. Seed collection from plus palms f. Print 0.8M seedling certification tags and certification of 0.8 M improved polybag seedlings g. Monitor seed and seeding production in CRI, CCB and registered private nurseries
2.	**To assist small and medium scale entrepreneurs**	Establish incubators for coir processing and production of virgin coconut oil,	a. Train and provide hands on experience to small and medium scale entrepreneurs to	a. Establish incubators a. Provide training to 200 coir producers and 60 value added	a. Establish incubators b. Provide training to 200 coir	a. Provide training to 200 coir producers and 60 value added producers	a. Provide training to 200 coir producers and 60 value added	a. Provide training to 200 coir producers and 60 value added producers

No.							
	to commence coconut processing industries	coconut milk and coconut milk beverages	develop own industries b. Training 1000 people on coir manufacturing. c. Train 300 people on production and value addition	producers	producers and 60 value added producers		producers	
3.	**To disseminate technology for king coconut export and issue certificates**	King coconuts for export market for beverage purposes	Increase export earnings from king coconut	Demonstrate the technology for improving shelf-life of tender king coconut for export market and issue certificates on request	Demonstrate the technology for improving shelf-life of tender king coconut for export market and issue certificates on request	Demonstrate the technology for improving shelf-life of tender king coconut for export market and issue certificates on request	Demonstrate the technology for improving shelf-life of tender king coconut for export market and issue certificates on request	Demonstrate the technology for improving shelf-life of tender king coconut for export market and issue certificates on request
4.	**To assist management of Weligama Coconut Leaf Wilt Disease by preventing spread**	Check buffer zone regularly and production of disease resistant coconut seedlings	a. Prevent spread of disease b. Disease resistant seedlings produced for planting	a. Continuously check palms in the buffer zone for disease and removing them b. Establishment of a mini seed garden in Welipitiya c. Production of disease resistant seedlings	a. Continuously check palms in the buffer zone for disease and removing them c. Production of app. 5000 disease resistant seedlings from hybridization of selected mother palms	a. Continuously check palms in the buffer zone for disease and removing them c. Production of app. 5000 disease resistant seedlings from hybridization of selected mother palms	a. Continuously check palms in the buffer zone for disease and removing them b. production of 35,000 resistant seedlings from the mini seed garden	a. Continuously check palms in the buffer zone for disease and removing them b. production of 35,000 resistant seedlings from the mini seed garden
5.	**To demonstrate live intercropping models and farming systems**	Live demonstrations on intercropping, integrated farming system, pasture, goat and sheep breeding and bio-gas production	Disseminate technology to coconut growers.	a. Maintain 30 intercrop models and disseminate the technology b. Establish integrated farming system model c. Maintain the two pasture fodder blocks d. Maintain the two animal units and disseminate the technology e. Maintain bio gas model	a. Maintain 30 intercrop models and disseminate the technology b. Maintain integrated farming system model c. Maintain the two pasture fodder blocks d. Maintain the two animal units and disseminate the technology e. Maintain bio gas model	a. Maintain 30 intercrop models and disseminate the technology b. Maintain integrated farming system model c. Maintain the two pasture fodder blocks d. Maintain the two animal units and disseminate the technology e. Maintain bio gas model	a. Maintain 30 intercrop models and disseminate the technology b. Maintain integrated farming system model c. Maintain the two pasture fodder blocks d. Maintain the two animal units and disseminate the technology e. Maintain bio gas model	a. Maintain 30 intercrop models and disseminate the technology b. Maintain integrated farming system model c. Maintain the two pasture fodder blocks d. Maintain the two animal units and disseminate the technology e. Maintain bio gas model

No.	Objective	Activity						
6.	To provide analysis reports to assure quality of products/processes	1. Quality certificates for exportation of coir pith and coir pith products	Analyze 640 coir pith samples and coir pith products for physical and chemical properties and issue 320 certificates for exportation of coir pith	Issue 65 certificates for exportation of coir pith	Issue 60 certificates for exportation of coir pith	Issue 70 certificates for exportation of coir pith	Issue 65 certificates for exportation of coir pith	Issue 60 certificates for exportation of coir pith
		2. Quality assurance of organic and inorganic fertilizers	Analyze inorganic fertilizer samples for N, P, K and Mg fertilizers and issuing 1850 quality reports. Analyzing organic fertilizer (Organic manure and compost) samples for moisture, N, P, K, Mg, organic carbon, C:N ration ,sand and issue 530 quality reports.	Issue 375 inorganic fertilizer analysis reports and 115 organic manure analysis reports.	Issue 400 inorganic fertilizer analysis reports and 110 organic manure analysis reports.	Issue 350 inorganic fertilizer analysis reports and 100 organic manure analysis reports.	Issue 325 inorganic fertilizer analysis reports and 105 organic manure analysis reports.	Issue 410 inorganic fertilizer analysis reports and 100 organic manure analysis reports.
		3. Analysis of nutrient composition of soil and leaf	Analyze soil and leaf samples for nutrient status and issuing 510 soil analysis reports and 710 leaf analysis reports	Issue 100 soil analysis reports and 150 leaf analysis reports	Issue 95 soil analysis reports and140 leaf analysis reports	Issue 105 soil analysis reports and130 leaf analysis reports	Issue 100 soil analysis reports and150 leaf analysis reports	Issue110 soil analysis reports and140 leaf analysis reports
		4. Water quality assessment for irrigation	Analyze water samples for irrigation and issuing 55 quality reports.	Issue 12 water quality assessment reports.	Issue10 water quality assessment reports.	Issue 9 water quality assessment reports.	Issue 11 water quality assessment reports.	Issue13 water quality assessment reports.
		5. Analyse composition of coconut products	Produce 1500 analysis reports	Provide reports on request	Provide reports on request	Provide reports on request	Provide reports on request	Provide reports on request
7.	To provide various services required by the stakeholders	1. Site specific fertilizer recommendation	Analyze 2350 leaf samples and issuing 520 DFR reports (on request)	Analyze 500 leaf samples and issuing 110 DFR reports	Analyze 525 leaf samples and issuing 125 DFR reports	Analyze 475 leaf samples and issuing 100 DFR reports	Analyze 450 leaf samples and issuing 90 DFR reports	Analyze 400 leaf samples and issuing 95 DFR reports
		2. Land suitability assessment for coconut	Assessing lands for suitability and issuing 198 reports.	Assessment of 40 lands and issuing reports.	Assessment of 35 lands and issuing reports.	Assessment of 45 lands and issuing reports.	Assessment of 40 lands and issuing reports.	Assessment of 38 lands and issuing reports.

		3. Evaluate yield data of state/ company / Board/ private-owned estates on request	Assist planning management strategies	Assess yield data on request	Assess yield data on request	Assess yield data on request	Assess yield data on request	Assess yield data on request
		4. Experimental designing and statistical analysis to researchers	Precise research methodology	Provide statistical consultancy on request	Provide statistical consultancy on request	Provide statistical consultancy on request	Provide statistical consultancy on request	Provide statistical consultancy on request
		5. Production of red weevil pheromone	Produce and issue of 100,000 pheromone vials	Produce and issue of 20,000 pheromone vials	Produce and issue of 20,000 pheromone vials	Produce and issue of 20,000 pheromone vials	Produce and issue of 20,000 pheromone vials	Produce and issue of 20,000 pheromone vials
		6. Importation/producti on black beetle pheromone	Produce and issue of 10,000 pheromone vials	Produce and issue of 2,000 pheromone vials	Produce and issue of 2,000 pheromone vials	Produce and issue of 2,000 pheromone vials	Produce and issue of 2,000 pheromone vials	Produce and issue of 2,000 pheromone vials
		7. Producce predatory mites for coconut mite	Produce and issue of 250,000 predatory mite sachets	Produce and issue of 50,000 predatory mite sachets	Produce and issue of 50,000 predatory mite sachets	Produce and issue of 50,000 predatory mite sachets	Produce and issue of 50,000 predatory mite sachets	Produce and issue of 50,000 predatory mite sachets
		8. Produce parasitoids of coconut caterpillar	Produce 4,000,000 parasitoids	Produce 800,000 parasitoids	Produce 800,000 parasitoids	Produce 800,000 parasitoids	Produce 800,000 parasitoids	Produce 800,000 parasitoids
		9. Import Monocrotophos	Import 8,000 L of Monocrotophos	Import 2,000 L of Monocrotophos	Import 2,000 L of Monocrotophos	Import 2,000 L of Monocrotophos	Import 2,000 L of Monocrotophos	Import 2,000 L of Monocrotophos
		10. Analyze and prepare viable projects for crop establishments and coconut based industries	Implemen viable projects	Provide services to the stakeholders	Provide services to the stakeholders	Provide services to the stakeholders	Provide services to the stakeholders	Provide services to the stakeholders
8.	To provide coconut information to the stake holders, policy makers and public	1. Maintain meteorological data base to monitor climate variability in coconut growing areas	a. Climate data base of coconut growing areas b. Provide monthly meteorological reports to stake holders	Daily collection of meteorological data in coconut growing areas	Daily collection of meteorological data in coconut growing areas	Daily collection of meteorological data in coconut growing areas	Daily collection of meteorological data in coconut growing areas	Daily collection of meteorological data in coconut growing areas

Management of Genetic Resource Centers and Research Stations to facilitate research and development

Ind ex No.	Objectives	Programme/ Project	Outcome/output indicator	Targets Year				
				2016	2017	2018	2019	2020
1.	To improve and maintain genetic resource centres and research centers to facilitate research and development activities	Under Planting	Expand coconut cultivation by 202.5 ac.	06 estates, 112.5ac	01 estate, 40ac	01 estate, 20ac	-	03 estates, 30ac
		Infilling	Fill 3950 vacancies	02 estates, 1300 nos	02 estates 950 nos.	02 estates 1100 nos.	02 estates 300 nos.	02 estates 300 nos.
		Inter Cropping	Increase income	02 estates, Pineapple -2 ac Pepper -500 ac	02 estates, Pineapple 05 ac., Pepper -100 ac.	03 estates, Guava-03ac, Pineapple - 5ac, Cashew -100	02 estates Cashew-4 ac, Mango 5 -ac	01 estate, Mango 5ac
		Fencing	Fence 7798 fathoms	06 estates, 3800 Fathoms	06 estates, 2848 Fathoms	05 estates, 2805 Fathoms	02 estates, 650 Fathoms	01 estate, 500 Fathoms
		Draining	35560 fathoms of drains	04 estates, 8000 Fathoms	06 estates, 9560 Fathoms	04 estates, 8500 Fathoms	05 estates, 9000 Fathoms	05 estates, 10200 Fathoms
		Husk Pits	11900 husk pits	07 estates, 2550 nos.	07 estates, 2900 nos.	08 estates, 3075 nos.	06 estates, 2800 nos.	06 estates, 3650 nos.
		Cover Crops	189.5ac of cover crops	06 estates, 119.5 ac.	01 estate, 40 ac	1 estate, 20 ac.	-	03 estates, 30ac.
		Organic manure application	3308 of palms manured with organics	03 estates 23637 palms	03 estates 22029 palms	03 estates 3442 palms	03 estates 22771 palms	03 estates 21429 palms
		Mite Control	Mite control in 72180 palms	08 estates 15396 palms	08 estates 14346 palms	08 estates 14646 palms	07 estates 13896 palms	07 estates 13896 palms
		Maintenance	Vehicle Repair (04 estates)	Double Cab- 01, Motor Bick-01, Double Cab- 01,Tractor- 02		Water Bowzer-01, Tractor- 02	T.Trailer-1, Tractor- 02, Cab-01	
			Building Maintenance	07 estates, 23 nos.	06 estates, 12 nos.	06 estates, 10 nos.	05 estates, 12 nos.	
		New purchases	Facilitate estate activities	Tractor Tailor -02 Harrow -03 Television -01, Slasher - 03 Sola Water Pump – 03, 2 wheel tractor – 01 Bicycle -01 Grass Cutter – 02 Computer – 01	Water Pump -01, Solar power-01, 4 wheel tractor – 01, Computer -01, Arm Chairs - 04, Slasher - 01, Motor Bick – 01, AC Unit -01	Bicycle -01, H. Tractor-01, Tailor – 01, Cab-01, 4 wheel Tractor – 01, Computer -01	4 Wheel Tractor-02, Photo Copier – 01, Filling Cabinet – 02,Slasher - 01	4 wheel tractor – 02, Motor Bick -02, 4 wheel tractor – 01, H.Tailor -01, UPS – 02

			Printer – 01, Office Chair – 01 Power Sprayer -01, Motor Bick – 01, Water pump –01, UPS – 02 Laser Printer -01 Fax Machine -01 Water Filter - 01 -0, Gate – 01, Water Bowser -01				

Human resource and infrastructure development

Index No.	Objectives	Programme/ Project	Outcome/output indicator	Targets Year				
				2016	2017	2018	2019	2020
1.	To improve and maintain library facilities for the use of scientists and public	1. Acquisition of publications	Purchase of 195 books	25 books	30 books	40 books	50 books	50 books
		2. Subscriptions of Journals	Acquire 10 journals per year	10	10	10	10	10
		3. Maintenance of Databases	a. Digitize coconut literature b. Conduct literature surveys c. Prepare Bibliographies	100 online access and 01 publication		01 survey		01publication
2.	To develop human resource for effective and efficient performance of duties	1. Recruitment of staff	Fill - staff vacancies	As arises	As arises	As arises	As arises	As arises
		2. Training of staff	Train – staff members	Train 07 research staff to post-graduate level, 05 familiarization visits to technical and field staff overseas, 05 staff on English (Diploma level), other short training as opportunity arise	Train 06 research staff to post-graduate level, 05 familiarization visits to technical and field staff overseas, 05 staff on English (Diploma level), other short training as opportunity arise	Train 07 research staff to post-graduate level, 05 familiarization visits to technical and field staff overseas, 05 staff on English (Diploma level), other short training as opportunity arise	Train 07 research staff to post-graduate level, 05 familiarization visits to technical and field staff overseas, 05 staff on English (Diploma level), other short training as opportunity arise	Train 07 research staff to post-graduate level, 05 familiarization visits to technical and field staff overseas, 05 staff on English (Diploma level), other short training as opportunity arise
		3.Provide medical benefits	Operate Medical fund	Operate Medical fund	Operate Medical fund	Operate Medical fund	Operate Medical fund	Operate Medical fund
3.	To improve infrastructure facilities	Construct new laboratory and buildings	New laboratory New cycle shed	a. Construct new laboratory b. Construct new cycle shed	Construct new laboratory			
		Renovate buildings	Renovate 30 staff quarters Renovate library	06 quarters	06 quarters	07 quarters	07 quarters	07 quarters
		Maintain buildings	Paint head office and laboratory buildings		Paint head office and laboratory buildings	Paint head office and laboratory buildings	Paint head office and laboratory buildings	