

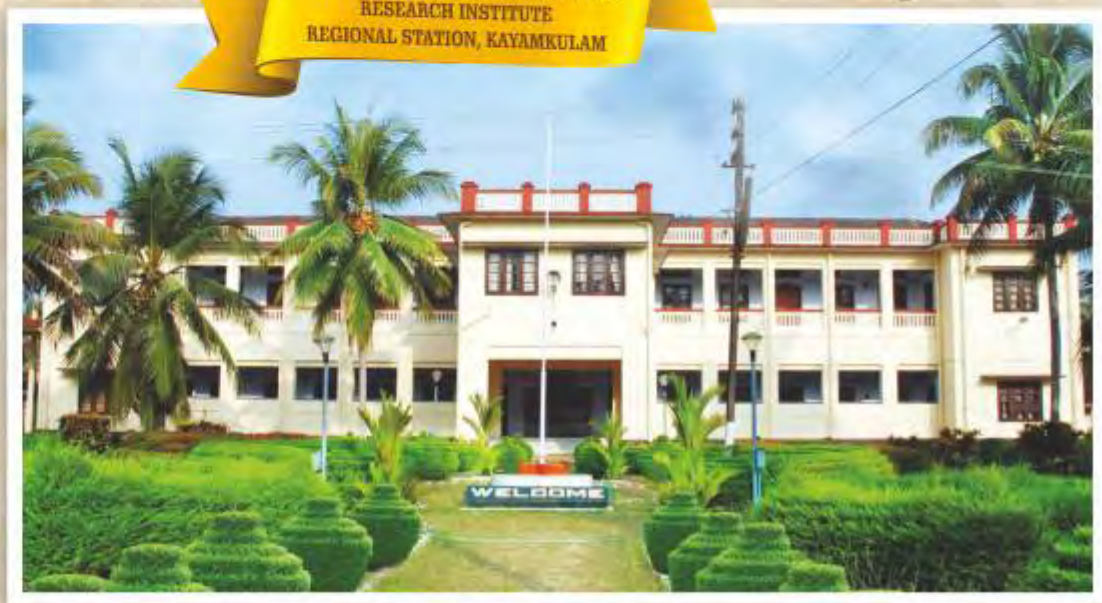
ICAR-CPCRI

Regional Station, Kayamkulam

ICAR-CPCRI Publication No.302



@75
Serving Coconut
Farmers Since 1947



ICAR - CENTRAL PLANTATION CROPS
RESEARCH INSTITUTE
REGIONAL STATION, KAYAMKULAM



भाकृअनुप - केंद्रीय रोपण फसल अनुसंधान संस्थान
ഐ.സി.ഐ.ആർ - കേന്ദ്ര തോട്ടവിള ഗവേഷണ സ്ഥാപനം
ICAR-CENTRAL PLANTATION CROPS RESEARCH INSTITUTE



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*ICAR-Central Plantation Crops Research Institute
Regional Station, Kayamkulam*

WELCOME

FOREWORD



I am extremely delighted that our Regional Station at Kayamkulam is celebrating a historic journey of 75 years of scientific excellence and connectivity to coconut farmers. The foundation stone of this prestigious Institute was laid by His Highness Marthanda Varma BA, Elayaraja of the princely State of Travancore on 24-04-1947 embarking upon the historical commitment of state leaders even before independence towards the path of science to society. From the challenges of root (wilt) disease highlighted by none other than the then Imperial Mycologist, Sir EJ Butler, the station under the umbrella of scientific luminaries Drs KPV Menon, KM Pandalai, KK Nirula and TA Davis has definitely attained the glory of technology deliverance to coconut farmers of the country in general and to the region in particular.

Some of the outstanding accomplishments include the development of root (wilt) disease resistant varieties/tolerant hybrid, tissue-culture coconut from inflorescence as explant, inclusive farming through systems approach, integrated nutrient management for improving palm health and maximising nut yield, micro-fertigation, customised nutrient mixtures, molecular diagnosis of the phytoplasma-associated lethal wilt disease, serological detection of root (wilt) disease, augmentative biocontrol of leaf eating caterpillar and rhinoceros beetle, conservation biological control of exotic whiteflies, virulent entomopathogenic nematodes subduing pests, digital agriculture including E-Kalpa, e-crop advisory services, red palm weevil detector, farmer-participatory and area-wide technology outreach programmes including farmer FIRST programme, upskilling and entrepreneurship development programmes including formation of OFPC are few to mention.

I thank all the former Directors, Joint Directors, Heads, Acting Heads, Scientists, technical and administration personnel, skilled support staff for their sincere contributions in the overall development of the station. I wish many more scientific outcomes to emerge and compliment the team under the leadership of Dr P. Anithakumari, Principal Scientist and Acting Head to keep up the flying colours in years to follow. I wish all scientists, officers and staff a platinum touch to the Kalpa Vajra celebrations of the glorious science-travel for 75 years on 24-04-2022 of this Institute and for the launching of coffee table book reminiscing history.

CPCRI, Kasaragod
24-04-2022


Dr. Anitha Karun
Acting Director

Prologue - A glimpse on the legacy

The legacy of ICAR-Central Plantation Crops Research Institute, Regional Station, Kayamkulam which travelled a glorious journey of 75 years serving coconut farmers through science is reflected in this coffee table book. The research work at the Station started with far sighted vision of the rulers of State of Travancore which is evident from the fact that the foundation stone of erstwhile Central Coconut Research Station (CCRS) was laid by His Highness Marthanda Varma, Elayaraja of the princely State of Travancore on 24.04.1947. Though the governance later shifted to Indian Central Coconut Committee (ICCC), it had the patronage of ICAR from 1948 onwards, as Vice President of ICAR was the *ex-officio* of ICCC. The station was taken over by ICAR during 1966 at the behest of Dr BP Pal (former DG, ICAR). The renaming of Central Coconut Research Station as CPCRI was done in 1970 to accommodate the research work done in other stations dealing with plantation crops (*viz.*, oil palm, cashew and spices). The founding fathers Drs KPV Menon, KM Pandalai, KK Nirula and TA Davis and their contributions are still revered in Journals like *Nature*. Taking strides from Sir EJ Butler (1908) and Sri MK Varghese (1934), root (wilt) disease was the prime focus which evolved its association from fungus to phytoplasma.

The station delivered resistant coconut varieties, tissue culture plants, farming systems approach aimed at doubling farmers income, customised nutrient mixtures/fertilizers, micro-fertigation, climate-smart agriculture, farmer-participatory outreach of pest and disease management technologies, Farmer FIRST programme, diagnosis of phytoplasma associated lethal wilt disease, serological ELISA, biological pest suppression of black headed caterpillar and rhinoceros beetle, conservation biological control of exotic whiteflies, virulent entomopathogenic nematodes, digital farming tools like e-Kalpa and red palm weevil detector. The library and agrometeorological station leverage sound linkages with the society. Visit of Nobel Laureates, international delegations, commencement of first remote sensing experiment with NASA during 1970, overseas projects IFAD, APCC, FAO, World Bank speaks volumes of international collaboration. Nevertheless, projects funded by ICAR (AICRP on Biological Control, Ad hoc, NATP & Network), DBT, DST, CBD, NABARD have produced significant outcomes and the technology deliverance support extended by the nationally acclaimed ICAR-KVK, Alappuzha as well. Easy access to disease resistant coconut seedlings, technology integration for inclusive farming, prediction of pest and disease outbreak and management, evolving environmentally responsible farming through digital agriculture are ways ahead. Celebrating *Kalpa Vajra* on the year of *Azadi Ka Amrit Mahotsav* is a matter of pride and imprints on the golden words of history. We express gratitude to ICAR, New Delhi, Dr Trilochan Mohapatra, Director General, ICAR, Dr AK Singh, DDG (Horticulture Sciences) and Dr Anitha Karun, Acting Director, ICAR-CPCRI, Kasaragod in realizing the dream of the Institute and the technology deliverance to the farming fraternity.

24-04-2022

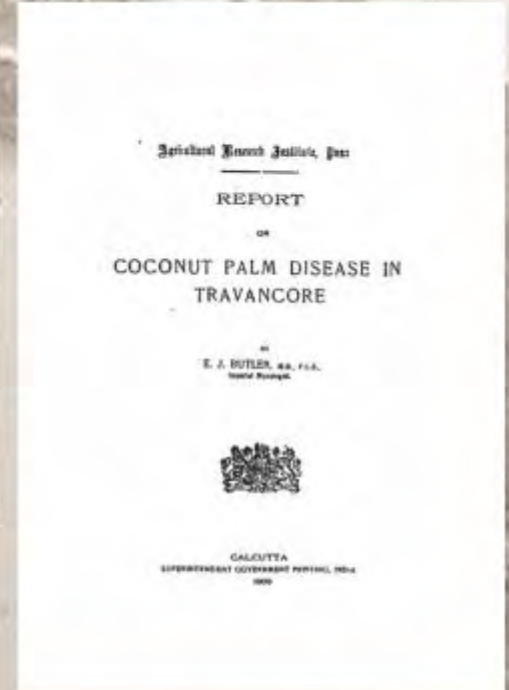
*Nariyal Dwara AtmaNirbhar Krishi**Editors*

Tracing the roots...



Outbreak of the coconut palm disease in Meenachil and Thiruvalla taluks of Travancore State after heavy floods of 1882. The inhabitants of Thiruvalla taluk presented a petition in 1897 to the Government on damage due to this disease

Mr BS Narayana Swami Iyer Superintendent of Govt. Agricultural Farm, Karamana (1900), Mr TF Bourdillon, Chief Conservator of Forests (1907) and Sir EJ Butler, then Imperial Mycologist (1908) reported the possibility of association of fungal pathogens with the disease



Coconut palm disease widespread after the greater flood of 1882



In 1934 Travancore applied for and was admitted to the membership of the Imperial Council of Agricultural Research. The Government of Travancore nominated a member of the Governing Body and the Director of Agriculture and Fisheries, a member of the Advisory Board. Although the Government have the right to nominate another member to the Advisory Board to represent Animal Husbandry interests, no additional member has so far been nominated, as the Veterinary or Animal Husbandry work in the State is also being conducted by the Director of Agriculture.

Soon after Travancore received membership on the Council a scheme for an intensive investigation of the root disease of the coconut palm was prepared and submitted through the Government to the Council with an application for a research grant. This scheme was approved with slight modifications made by the Expert Committee of the Council and a grant of Rs. 25,000 spread over a period of three years in the first instance has been sanctioned. A qualified Plant Pathologist, with an Assistant and other necessary subordinate staff, has been appointed to carry on this investigation from March 1937.

Indian Central Coconut Committee & formation of Central Coconut Research Station

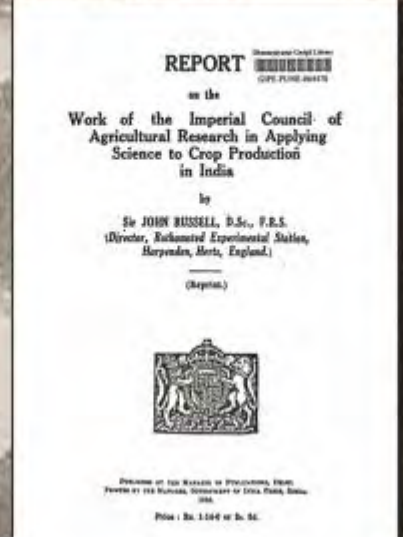


Group photograph taken on the occasion of the inaugural meeting of the Committee held at Trivandrum on the 24th April, 1945.

Seated from left to right: Sir S. S. A. K. Menon, Mr. K. B. Jureja Singh, Mr. G. P. Srinivasan Pillai, Mr. B. S. Srinivasan, Mr. B. Srinivasan, Mr. C. P. Srinivasan Ayyar, Mr. H. R. Srinivasan, C.I.C., Mr. D. S. Malappa, Mr. A. C. Mulla Gunda, Mr. S. Krishna Ayyar, Mr. G. A. Baker and the Hon'ble Mr. M. C. K. Chidambaram Chettyar.

Standing from left to right: Messrs. Raji Krishna Pillai, K. P. Mahalingam Nair, V. B. Srinivasan, Mr. Srinivasan Srinivasan, K. K. Jatin, Subrahmanya Aiyar, A. R. Srinivasan Sub., K. Gopala (Secretary), K. R. Srinivasan Ayyar, K. C. Karayalar, R. M. Peter, M. J. Srinivasan, A. Srinivasan Pillai and A. G. Srinivasan.

Department of Agriculture established Agricultural Research Laboratory with Quilon as headquarters and field station at Kayamkulam



The research on diseases of coconut in Travancore was initiated in 1937 under the Imperial Council of Agricultural Research funded scheme

No.	Class of work.	Name of Scheme.	Sanctioned cost.	Name of the person who is doing the work.	Place or Institution in which some of the grant is made.
10	Cultivation	(1) Research on the growth of sugar cane.	27,400	Mr. E. K. Janki Ammal	Government of India.
		(2) Chemistry of Making olefin.	11,000	Mr. Ranga Nanyan	Madras Government.
		(3) Sugar cane Scheme, Madras	1,80,100	Mr. Kasai Raj, Mr. B. B. Patrode Gera.	Do.
		(4) Dry Farming Scheme, Madras	1,50,000	Dr. Subba Rao, Mr. C. V. Jayaramalingam.	Do.
		(5) Fruit Research Scheme, Madras	85,000	Mr. E. C. Naik	Do.
		(6) Potato breeding Scheme, Madras	10,000	Mr. D. G. Moore and V. Subramanian Madalar.	Do.
11	Trivandrum	(1) Root disease of coconuts (Travancore scheme).	25,000	Mr. H. K. Varghese. (The scheme was recently started.) (Myologist.)	Travancore Government.

1946-Indian Central Coconut Committee recommended the establishment of Central Coconut Research Stations at Kayamkulam and Kasaragod

1947-Indian Central Coconut Committee took over the scheme from ICAR

1948-Amalgamated the scheme with Central Coconut Research Station at Kayamkulam



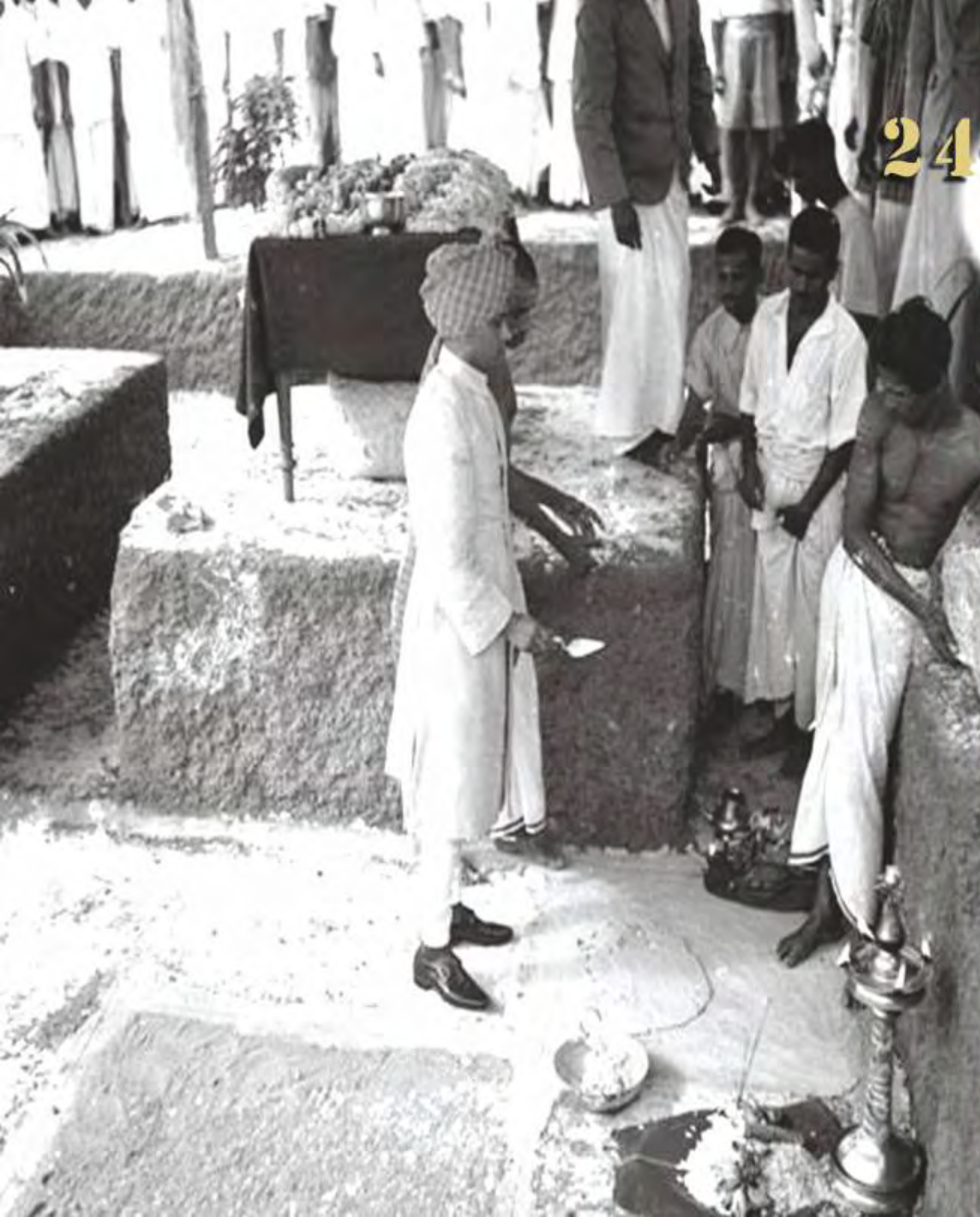
THE FOUNDATION...



മ. മ. മ. മി
1947 ഏപ്രിൽ 26-ാം തീയതിയാളി
നാളികേര ഗവേഷണം
കേരളയിൽ ഒരു സർവ്വം ഇൻസ്റ്റിറ്റ്യൂട്ട്
കിരീടം 24
ഇന്ത്യൻ ചെറുനാളികേര കമ്മിറ്റിയുടെ ഇടപെടലിൽ കായംകുളം സമാധാന കേന്ദ്രഗവേഷണ ഇൻസ്റ്റിറ്റ്യൂട്ടിന്റെ ശില്പസ്ഥാപനം. തന്മൂലം ഉൾപ്പെടെ നാളികേര വിവരസംഗ്രഹം പോയിട്ടില്ലാത്തവയെ സംബന്ധിച്ച് സംശയമുണ്ട്. തിരുവിതാംകൂർ, കോട്ടയം, മലപ്പുറം, തൃശ്ശൂർ, കേരളം എന്നിവിടങ്ങളിലുള്ള 14 പേർക്കുവേണ്ടി പ്രത്യേകം വകുപ്പുകൾ തുടങ്ങി. കേന്ദ്ര ഗവേഷണ റിപ്പോർട്ടുകളിൽ 14 പേർക്കുവേണ്ടി പ്രത്യേകം വകുപ്പുകൾ തുടങ്ങി. കേന്ദ്ര ഗവേഷണ റിപ്പോർട്ടുകളിൽ 14 പേർക്കുവേണ്ടി പ്രത്യേകം വകുപ്പുകൾ തുടങ്ങി. കേന്ദ്ര ഗവേഷണ റിപ്പോർട്ടുകളിൽ 14 പേർക്കുവേണ്ടി പ്രത്യേകം വകുപ്പുകൾ തുടങ്ങി.

25/04/1947 മി. മി. മി

24-04-1947



THIS STONE WAS LAID
BY
HIS HIGHNESS
MARTHANDA VARMA B.A.,
ELAYA RAJA OF TRAVANCORE,
ON THE 24TH APRIL 1947.
||TB MEDAM ||22.

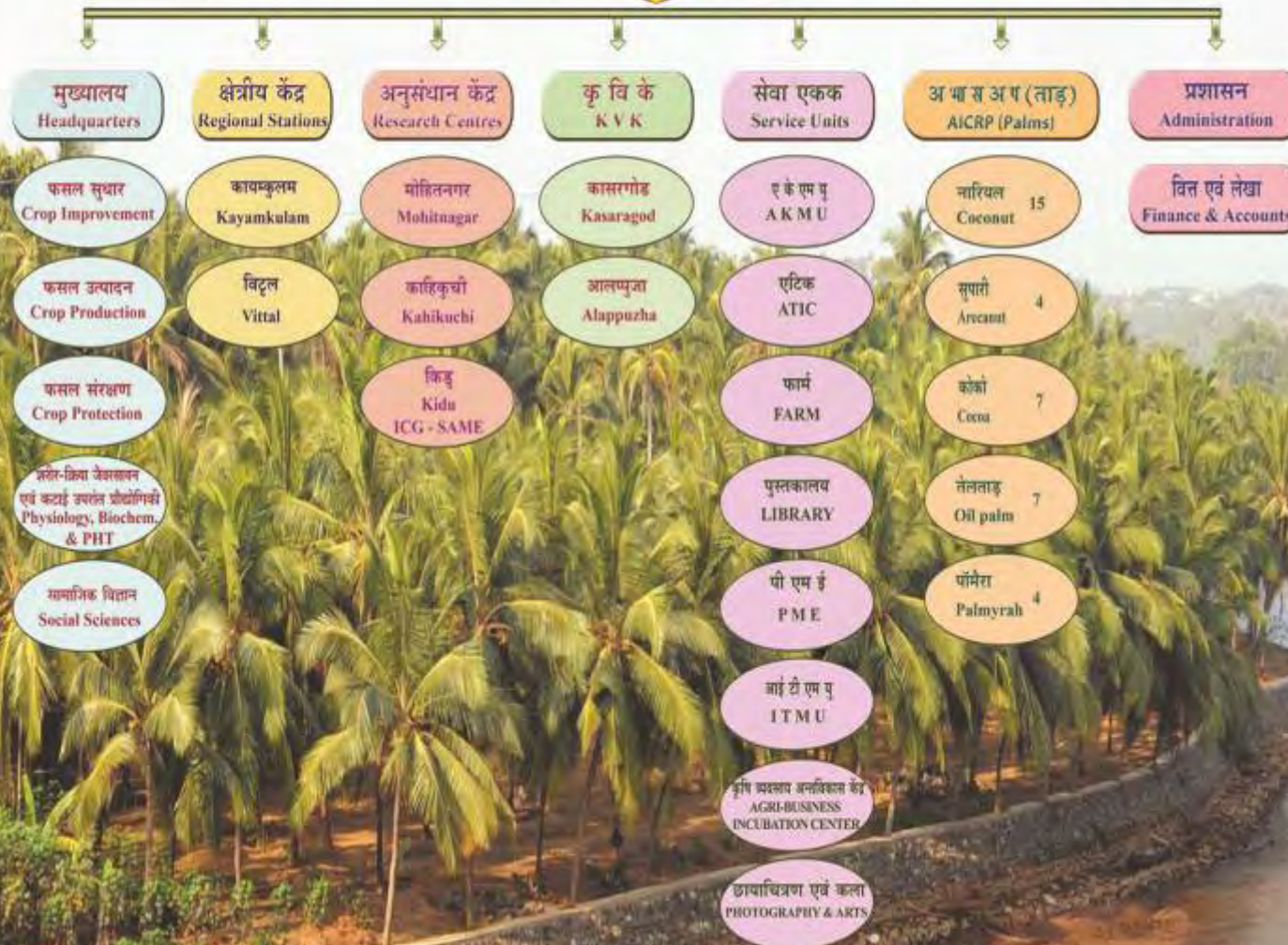
भा कृ अनु प - कें रो फ अ सं का संगठन चार्ट

ORGANOGRAM OF ICAR - CPCRI, KASARAGOD

अनुसंधान सलाहकार समिति
Research Advisory Committee

निदेशक
Director

संस्थान प्रबंधन समिति
Institute Management Committee



Vision

Develop ICAR-CPCRI as a technology generation and repository centre, wherein the Institute strives to showcase, demonstrate and compare world-wide technologies in the commodity chains of coconut, arecanut and cocoa to make India the global leader

Mission

To develop technologies that enhance resource use efficiency, profitability and livelihood security of people who depend on plantation crops

Mandate

Basic, strategic and applied research to enhance sustainable productivity, quality and utilization of coconut, arecanut and cocoa

Repository of plantation crops genetic resources and scientific information

Transfer of technology, capacity building and impact assessment of technologies

Coordinate research and validation of technologies on plantation crops through AICRP on Palms

ICAR-CPCRI Family..



ICAR-CPCRI, Kasaragod



Regional Station, Kayamkulam

- Location** : Geographically it is situated at 9°8' N latitude and 76° 30' E longitude with an altitude of 3.05m above MSL.
- Area** : Farm and experimental fields total area is 24,17 ha
- Mandate** : Investigate the etiology and develop management practices for diseases affecting coconut palm with special emphasis on root (wilt) disease. Conduct research on pests (insects), mites and nematodes and to develop a suitable management strategies. Studies on nutritional and agronomic aspects to develop effective crop management practices. Evolve high yielding coconut cultivars with resistance/tolerance to root (wilt) disease. Transfer of technologies developed by the Institute to farmers, extension workers and other clients through regular training programmes, group meetings, seminars, *kisan melas*, supply of good quality coconut seedlings demonstration and distribution of extension publication.



Regional Centre, Mohitnagar



Regional Centre, Kahikuchi



Regional Station, Vittal



Regional Centre, Kidu

SOURCE OF MAP:- https://bhuvan-app1.nrsc.gov.in/mhrd_ncert/images/political.JPG

The Pioneering Stalwarts

Dr KPV Menon

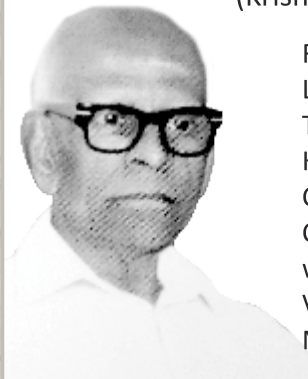
(Kuttiezhathu Puthenveetil Velukkutty Menon)



Graduated from Bombay University. Completed Ph.D. in 1932 from London University. Worked as Personal Research Assistant in the Rust Research Scheme of ICAR at Agra College (1935-37). Inspired by Sir EJ Butler, he joined as Plant Pathologist at Agriculture Research Laboratory, Quilon in March 1937. Became Director, CCRS, Kayamkulam (1948-1963).

Dr KM Pandalai

(Krishnan Madhusudanan Pandalai)



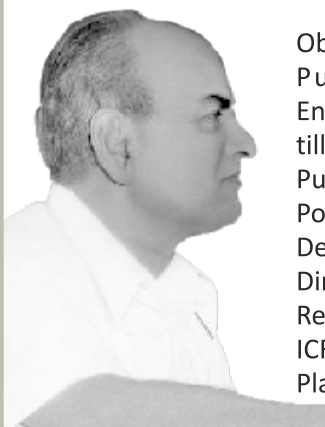
Fellow of the Royal Institute of Chemists, London. Became Assistant Biochemist of Travancore. Joined as Chemist at CCRS, Kayamkulam during 1948. Became Director, CCRS, Kayamkulam (1963). Later as Director, CCRS, Kasaragod (1963-1966). Served as guest worker in Rothamsted Experimental Station. Visited UK, France, West Germany, the Netherlands and Rome.

The Coconut Palm : A Monograph by KPV Menon and KM Pandalai (1958)



Dr KK Nirula

(Kanwal Kishan Nirula)



Obtained M.Sc. (Zoology) Hons. in 1939 from Punjab University, Lahore. Served as Entomologist at CCRS, Kayamkulam from 1948 till 18-04-1957. Awarded Ph.D. in 1955 from Punjab University, Chandigarh. Later, joined Potato Research Institute, Patna, Bihar. Became Deputy Director (Training) and further as Project Director, CPPTI (Presently NIPHM) at Hyderabad. Re-employed as Plant Quarantine Officer by ICRISAT, Hyderabad and further functioned as Plant Quarantine Consultant to FAO, Rome.

Dr TA Davis

(Trupapur Antony Davis)



Graduated from Madras University in 1944. Obtained M.Sc. in Crop Physiology from Madras Agricultural Research Institute, Coimbatore in 1947. Served as Research Assistant at Sugarcane Research Station, Karnal, Punjab. Joined as Crop Physiologist at CCRS, Kayamkulam in 1952. As per the invitation from Prof. JBS Haldane, FRS he joined Indian Statistical Institute, Calcutta in 1960. Later joined FAO in 1977 as a Coconut Specialist and started Haldane Research Centre at Nagercoil in 1982.

The Torch Bearers

Directors of CCRS, Kayamkulam (1948 – 1969)



Dr KPV Menon
1948 to 19-03-1963



Dr KM Pandalai
20-03-1963 to 15-07-1963



Dr SB Lal
16-07-1963 to 31-12-1969

Joint Directors of ICAR-CPCRI, RS, Kayamkulam (1970 – 1994)



Dr SB Lal
01-01-1970 to 29-04-1971



Dr K Radha
30-04-1971 to 22-10-1979



Dr NP Jayasankar
23-10-1979 to 09-08-1991



Dr PK Koshy
10-08-1991 to 24-11-1994

Heads/Acting Heads, ICAR-CPCRI, Regional Station, Kayamkulam (Since 1994)



Dr PK Koshy
25-11-1994 to 28-02-2002



Dr JJ Solomon
01-03-2002 to 31-03-2003



Dr CPR Nair
01-04-2003 to 31-05-2009



Dr VK Sosamma
01-06-2009 to 31-08-2009



Dr Mathew George
01-09-2009 to 18-02-2010



Dr PM Jacob
19-02-2010 to 31-08-2012



Dr VK Chaturvedi
01-09-2012 to 02-01-2013



Dr V Krishnakumar
03-01-2013 to 30-09-2019



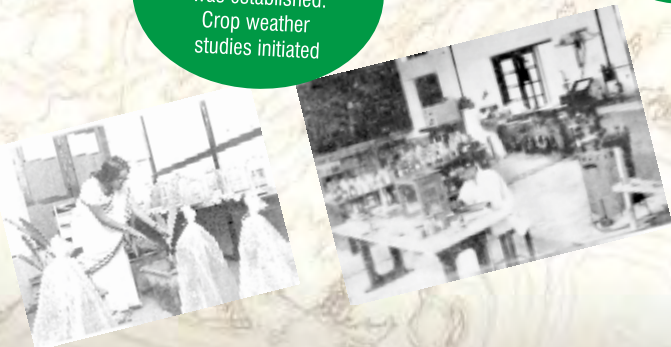
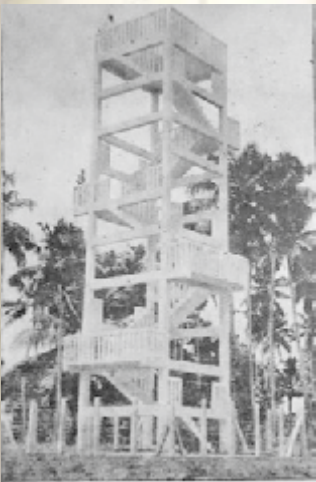
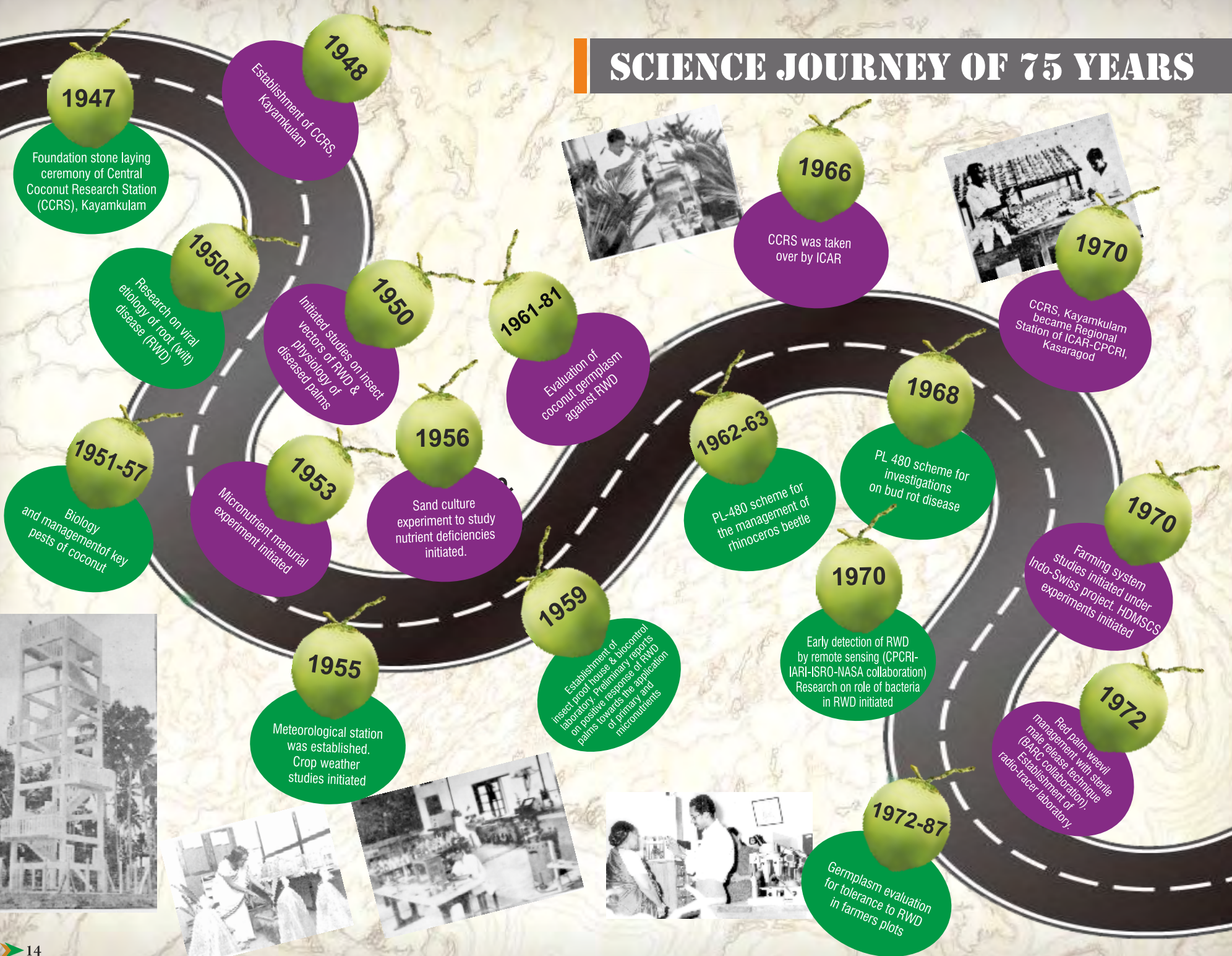
Dr S Kalavathi
01-10-2019 to 01-03-2022



Dr P Anithakumari
From 02-03-2022

Leaders par excellence...

SCIENCE JOURNEY OF 75 YEARS



SCIENCE JOURNEY OF 75 YEARS

1979

Superpalm (200-471 nuts/palm/year) reported from RWD prevalent tract

1977

Collaboration with the Commonwealth Institute of Biological Control (presently ICAR-NBAIR), and became part of AICRP biological control of crop pests

1973

Method for computation of disease index of RWD affected palms

1978

Kerala Agricultural Development Project initiated. Established field station at Immalakuda to check the northward spread of RWD. Identification of CCD palms as tolerant to RWD

1975

Pathogenicity study of burrowing nematode in coconut

1980s

Studies on correlation between the physico-chemical properties of soil and the incidence of RWD

1982

Electron microscopic evidence on presence of phytoplasma in RWD affected palms

1983

First report of baculovirus from black beetle with genomic characterization of the virus. Initiated cage studies on vector transmission of RWD. Boron was found as the limiting nutrient of crown choking disorder of coconut.

1985

RWD survey report. Simplified method for RWD indexing developed.

1984

Basin management using leguminous crops for integrated management of RWD

1986

Impaired water regulation and abnormal stomatal opening in RWD affected palms

1988-89

Biochemical changes in inflorescence sap of RWD affected palms. Development of prototype of RPW detector using electronic amplifier

1987

Hotspot breeding for RWD resistance

1993

Established pathogenic potential of burrowing nematode infesting coconut

1999

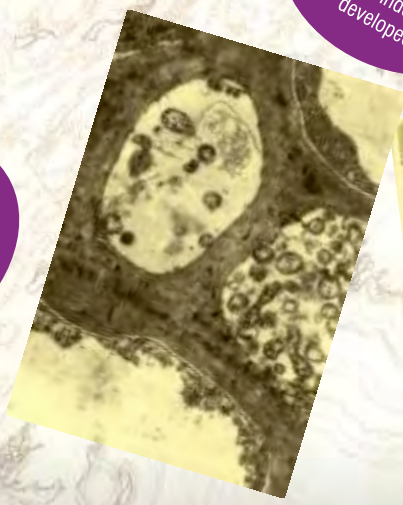
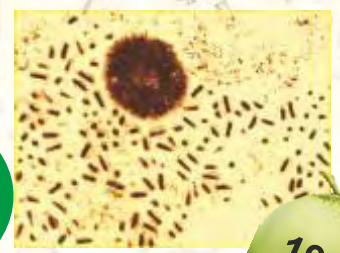
Initiated participatory technology transfer and area wide demonstration of integrated root (witi) management practices in farmers' field

1998

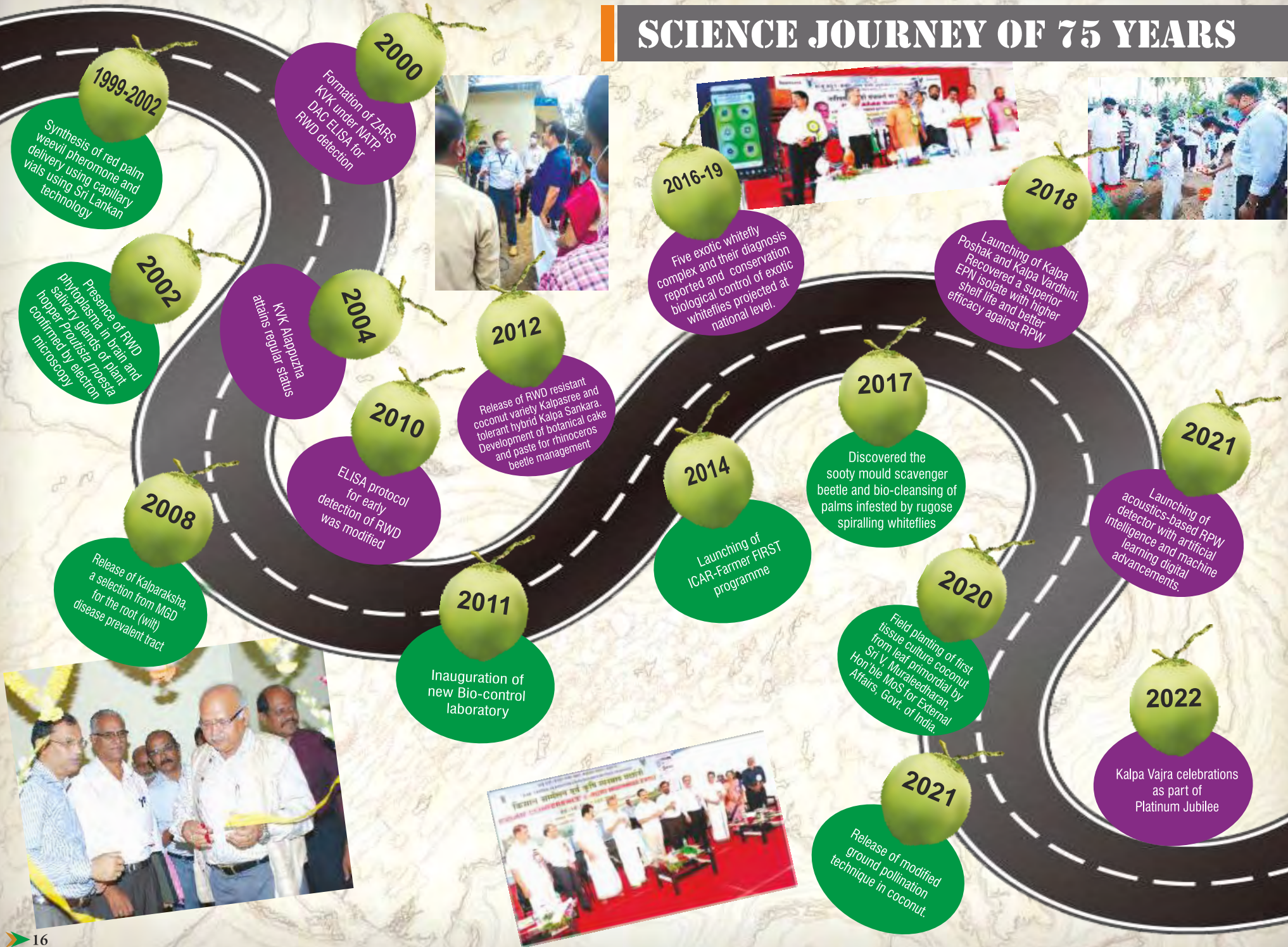
Discovery of the invasive coconut eriophyid mite, *Aceria guerreronis* from Kochi, Kerala

1991

Initiated the work on coconut tissue culture



SCIENCE JOURNEY OF 75 YEARS



Imbibing Scientific Expertise...



Answers to the Malady

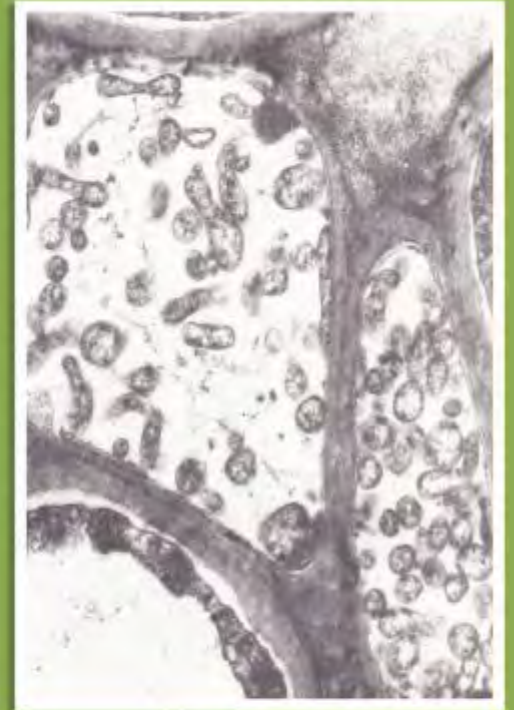
Systematic research on etiology of root (wilt) disease (RWD) of coconut ruled out the role of fungi, bacteria and viruses

Established the association of phytoplasma with RWD of coconut based on electron microscopy (EM), antibiotic therapy, dodder transmission and molecular characterization

The vectors transmitting RWD were identified and the role established through EM and cage transmission trials



RWD affected coconut palm



RWD phytoplasma



Lace bug - *Stephanitis typica* Distant



Plant hopper -
Proutista moesta Westwood

Deep insights for better management

Bionomics and weak links in biology of coconut pests were determined for evolving effective pest management programmes

Leaf rot along with root (wilt) disease drastically reduce the productivity of coconut palms

Extensive research has been undertaken in elucidating and establishing the fungal pathogens associated with the disease





Rhinoceros beetle: *Oryctes rhinoceros* (L.)

Biological Control

Balancing with Nature

Identified and characterized green muscardine fungus (*Metarhizium majus*) for the bio-suppression of rhinoceros beetle.

Release of *Oryctes rhinoceros* nudivirus infected rhinoceros beetles in Lakshadweep and Bay Islands suppressed the damage potential of coconut rhinoceros beetle and emerged as another classical success story

Spraying talc-based preparation of the acaropathogenic fungus (*Hirsutella thompsonii*) subdued infestation by coconut eriophyid mite.

Characterized *Pochonia chlamydosporia* for the bio-suppression of root-knot nematodes in coconut-based cropping system.



Augmentative release

A classical success story

Developed the field release norms of the stage-specific parasitoids *Goniozus nephantidis*, *Bracon brevicornis* and *Brachymeria nosatoi* in the area-wide bio-suppression of black headed caterpillar



Conservation Biological Control

Conservation biological control using the aphelinid parasitoid (*Encarsia guadeloupae*), the predator (*Apertochrysa* sp.) and the sooty mould scavenger beetle (*Leiochrinus nilgirianus*) reduced the invasive potential of the exotic rugose spiralling whitefly in the country



Refinement and Adaptations – Continuous Scientific Process

Integrated Pest Management strategies are refined constantly based on the farmer's feedback. Environmental-friendly and nature-protective approaches including botanicals, biorationals, semio-chemicals, agro-ecosystem based module are compatibly integrated. IPM strategies were implemented area-wide through farmer-participatory community mode.



Green defenders for coconut care



Botanicals with insect growth regulatory activities were refined and developed as botanical cake and paste for the management of rhinoceros beetle. Neem based botanical formulations are found effective in the bio-suppression of coconut eriophyid mite.



Clerodendrum infortunatum

Early Detection – The Key for Successful Management

The institute has developed sero-diagnostic and nucleic acid based techniques for the early detection of phytoplasmal diseases of coconut



Developed an acoustic-based detection system embedded with machine learning algorithm for early diagnosis of red palm weevil infested palms achieving 80% accuracy



Changing Climate Emerging Threats....

Lethal wilt disease



ICAR CPCRI in collaboration with AICRP on palms centre, CRS Veppankulam, TNAU established the association of phytoplasma with lethal wilt disease of coconut- an emerging disease of concern in Thanjavur, Thiruvarur and Pudukottai districts of Tamil Nadu



Four exotic whiteflies from Neotropical region are reported on coconut in India since 2016. Whiteflies are diagnosed by puparium, adult features and molecular identification by *COI* gene. Strengthening quarantine and evolving preparedness module are the need of the hour.



Rugose spiralling whitefly:
Aleurodicus rugiopectus Martin



Paraleyrodes minei Iaccarino *Paraleyrodes bondari* Peracchi *Aleurotrachelus atratus* Hempel

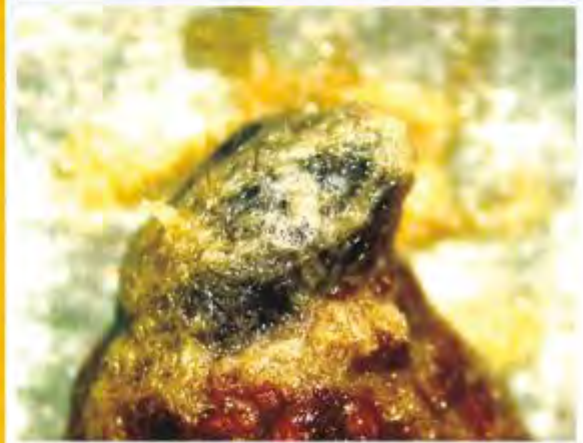
Nematodes - Friends & Foes



Investigations on plant parasitic nematodes associated with coconut initiated during 1964 and organized research programmes started from 1972 onwards. More than 30 plant parasitic nematodes were documented from coconut rhizosphere, which includes many new descriptions. Systematically studied distribution, pathogenicity, host range, biology & life cycle of burrowing nematode infesting coconut and evolved effective management strategies. Over the years many biocontrol agents are evaluated against plant parasitic nematodes which include the recent isolation of a native nematode pathogenic fungus, *Pochonia chlamydosporia*. The root knot nematodes infesting coconut intercrops are documented and efforts are initiated for developing the farmer participatory management strategies.



Isolated and characterized many entomopathogenic nematodes (EPN) from coconut system which includes one superior EPN isolate (*Steinernema* sp.) with higher shelf life and better efficacy against red palm weevil as well as a promising EPN isolate, *S. hermaphroditum*, the only hermaphroditic steinernematid and developed a cadaver based bio-capsule formulation of EPN.



The search for resistance..... leading to trait specific ecotypes

Efforts to locate resistance to root (wilt) disease was first attempted by Varghese in 1934. Based on the recommendations of ISOCRAD-1, extensive survey was conducted in the root (wilt) affected areas to identify elite super palms exhibiting high yield potential. In the effort to identify highly adaptable and disease resistant genotypes, we could identify unique cultivars like 'Jappanan' and also types with special traits like pink husk.



Jappanan

Germplasm screening to hotspot breeding

Screening of available germplasm in the root (wilt) affected tracts was initiated in 1961. The initial research outcome of the comprehensive breeding programme during 1987-2012 (25 years) has resulted in the release of two resistant varieties (Kalpasree and Kalparaksha) and one tolerant coconut hybrid (Kalpa Sankara). Efforts were also made to improve the resistant West Coast Tall through recurrent selection.



Evaluation of dwarfs and D x T hybrids of coconut



Evaluation of green dwarf varieties of coconut



Evaluation of tall accessions of coconut



Hotspot breeding



West Coast Tall ecotypes

Quality imprinted coconut seedlings



Visit of NHB accreditation team

QR coded coconut seedling – Mark of quality assurance: Traceability of planting material is a smart tool in the planting material production chain. QR coded tags are definitely a greater stride towards digital coconut farming. For assuring quality, we are distributing Unique Identification Number (UID) protected QR code affixed coconut seedlings.



QR code label – A mark of quality assurance



Distribution of coconut seedlings

Assisted pollination: Shifting control from crown to ground

Efforts for making the hybridization technique farmer friendly has resulted in development of modified ground pollination technique. The technique facilitates efficient artificial pollination with comparable fruit set which will substantially reduce the cost of hybrid seed production in coconut.



Coconut pollen cryopreservatory



Modified ground pollination



Pollination from top



Training on modified ground pollination

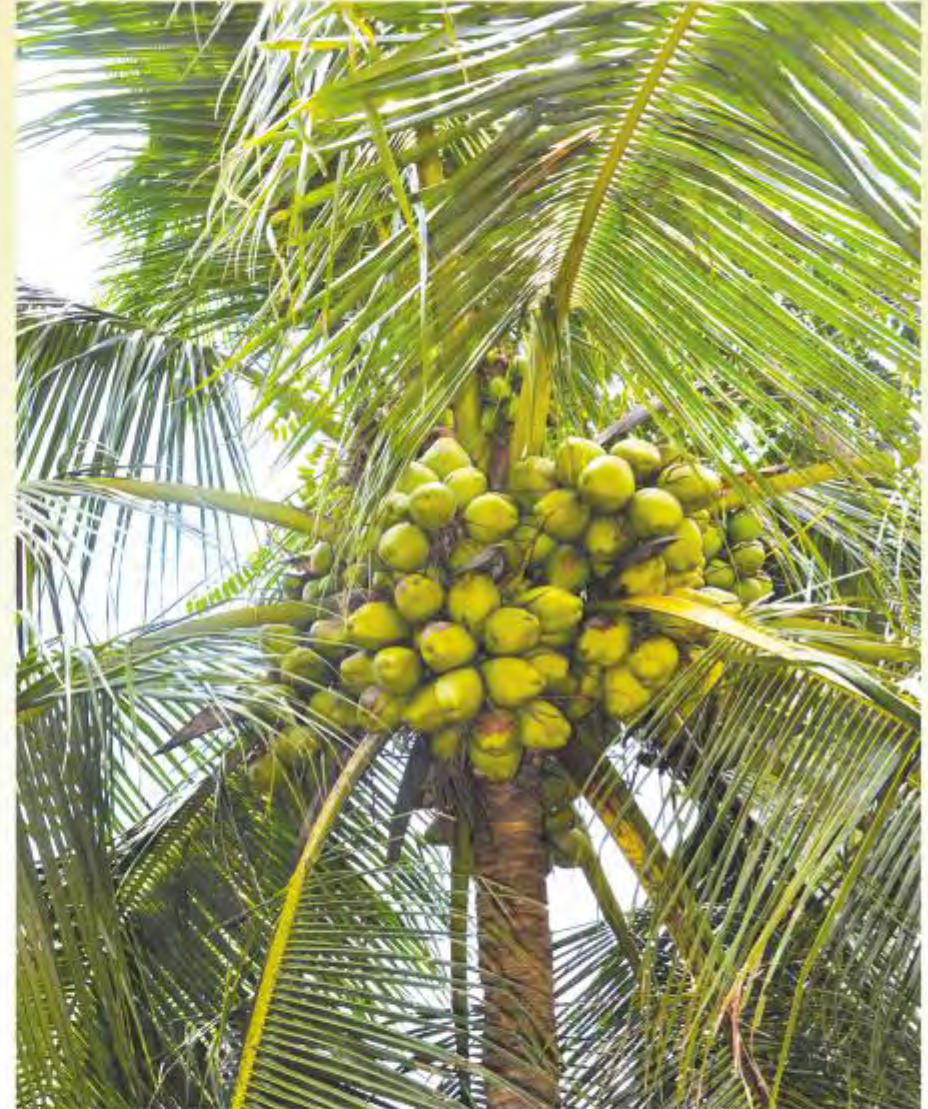
Varietal release

Kalparaksha



Kalparaksha : A selection from Malayan Green Dwarf population. It is a semi-tall variety having large sized nuts with good quality copra and is also an excellent tender nut variety. The average yield is 88 nuts/palm/year. It was notified and released for cultivation in the Gazette of India as Notification of Ministry of Agriculture (Dept. of Agriculture and Co-operation) S.O.17 E dated 18th July 2008

Kalpasree



Kalpasree : Selections made from Chowghat Green Dwarf population identified from the root (wilt) diseased tract. It is recommended for cultivation in the root (wilt) disease prevalent tracts specifically for homesteads. This is dwarf variety with average yield of 90 nuts/palm/year and it commences bearing in three years. It was notified and released for cultivation in the Gazette of India as Notification of Ministry of Agriculture (Dept. of Agriculture and Co-operation) S.O.456 (E) dated 16th March 2012

and notification

Kalpa Sankara



Kalpasankara: First coconut hybrid released for cultivation in the root (wilt) disease tract. This hybrid was developed by crossing root (wilt) disease-free CGD as female parent and root (wilt) disease free WCT as male parent. The average yield is 84 nuts/palm/year. It was notified and

released for cultivation in the Gazette of India as Notification of Ministry of Agriculture (Dept. of Agriculture and Co-operation) S.O.456 (E) dated 16th March 2012



Kalpa Raja (Ready for release)

Regeneration from

Clonal propagation of elite, disease-free coconut palms is a promising technique for producing planting materials with high yield and root (wilt) disease resistance. Attempts were made to clonally propagate healthy WCT palms using immature inflorescence. The first *in vitro* raised coconut seedling was planted by Shri. V. Muraleedharan, Hon'ble Minister of State for External Affairs, Govt. of India on 27.11.2020.



immature inflorescence explants of coconut





Elephant yam intercropped in coconut garden



Sweet potato raised as intercrop in coconut garden



High density multi species cropping system model

Systems approaches for doubling farm income



Cropping/farming system in coconut garden for sustainable farm income



Per drop more crop

Enhancing water use efficiency through micro-fertigation



Fortnightly delivery of nutrients through fertigation resulted in early flowering and higher yield in coconut



Quest towards nutrient angle on RWD



Soil and leaf nutrient status of RWD and healthy palms

Inducing nutrient deficiency symptoms in seedlings

Beyond NPK..., the customised nutrient mixtures



Boron deficit palms and malformed nuts are corrected by borax supplementation

**KALPA
POSHAK**

Nutrient Mixture for Coconut Seedlings
and Juvenile Palms



ICAR-Central Plantation Crops Research Institute
Kasaragod, Kerala 671 124

Kalpa Poshak for juvenile palms contains potassium, boron, sulphur, zinc and copper (I year 40 g/palm; II and III year 100 g/palm)

**KALPA
VARDHINI**

Nutrient Mixture for Adult palms



ICAR-Central Plantation Crops Research Institute
Kasaragod, Kerala 671 124

Kalpa Vardhini for adult bearing palms contains potassium, magnesium, sulphur, zinc and boron (500 g per palm in two splits)

Beneficial Soil Microbes - *The Hidden Treasures*

Microbiological investigations initiated on palm-microbe interaction since 1948 continued in a phased manner from exploring etiological significance of microbes to harnessing the potential of beneficial microbial communities for enhancing soil and plant health. Differential microbial assemblages in rhizosphere soil microbiota of healthy and root (wilt) diseased palms provided insights for integrated disease management strategies such as basin management using leguminous green manure and cover crops as well as biopriming of seedlings using microbial bioinoculants.

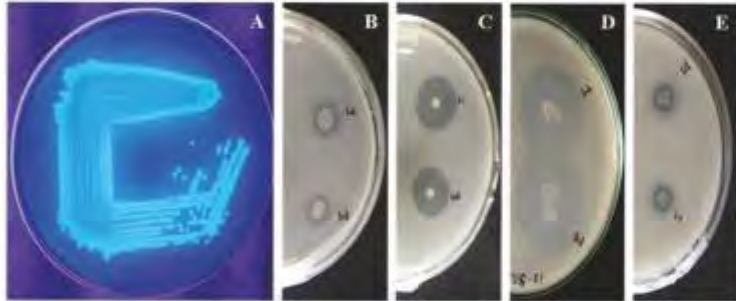


Fig. 1. Root system of apparently healthy 10-15-yr-old Philippine palm in the five common root rot...

e kalpa : Mobile App

Link address and QR code of e kalpa:
<https://goo.gl/b3GTk0>



Digital Agriculture

<p>Knowledge Base</p>	<p>Farmer Support</p>	<p>Farmer Diary</p>
<p>Technology Snippets Crop Improvement Crop Production Crop Protection Post Harvest</p> <p>Knowledge Base</p>	<p>Real Time Reporting of field problems Online and offline images/ video clippings/ audio (real time or from gallery) Live chatting facility Connection to knowledge base</p> <p>Farmers Issue management</p>	<p>Online Diary of farming milestones e Documentation of farming activities Sequential Recording, Tracking and obtaining technical advisories Useful for FLD/OFT</p> <p>Farmers Diary</p>

In this new age digital farming internet of things are linked with real time soil nutrient profiling and correcting disorders, decision support system, remote sensed irrigation system, pest surveillance by unmanned aerial vehicle as well as monitoring plant health. QR-coded coconut seedlings for traceability, Interactive mobile app., digital archives of e-technological solutions, e-crop advisory services, e-manuals, interactive CDs etc. attract and empower the new generation towards farming.






VIP Visits

Hon'ble Chief Ministers of Kerala, Union Ministers for Agriculture, State Ministers for Agriculture Govt. of Kerala, DGs and DDGs, ICAR visited the premier institute and interacted with the scientists during different periods. Based on their critical inputs and suggestions, the research targets were revised to cater to the needs of the coconut farming community.



KVK, Alappuzha

Krishi Vigyan Kendra, Alappuzha hosted by Central Plantation Crops Research Institute (Regional Station), Kayamkulam has achieved the status of one of the leading Frontline Extension providers in the district during the last decade. Started functioning from June 2000 as RZARS to take up the mandate of KVK under NATP of ICAR, it was regularized to KVK status from April 2004. Since then it has been successfully conducting technology assessment, refinement and demonstration programmes in addition to trainings to farmers, farm women, rural youth, and extension officials. Besides, it acts as a source of seeds, planting materials and inputs for agri-based activities, and technology support center including soil testing facilities to the farmers.



Farmer FIRST Programme

Participatory technology integration to empower and ensure livelihood security of farmers in Alappuzha district.



Shifting Paradigms...

*From Farmer to Community and
from Individuals to Area-wide*

- Participatory Technology Transfer Approach (PTTA)
- Area wide management of pests and diseases
- Bioresource management and climate smart farming
- Scheduled caste sub plan
- Farm level production of bioagents
- Decentralized seedling production



Converging International Collaboration

Need-based refinement of technology to perfection was accomplished through interactive learning between scientists and collaborating agencies. International delegations and outstanding scientists visited the premier institute and exchanged ideas for the development of innovative technological solutions. Experiments of international standards for decoding challenges experienced by the coconut were conducted.



Cross Learning & Celebrations

ARYA to MAYA.... Attracting the young generation to Agriculture



Infusing farming instincts to the new generation is a well-organized programme to attract students to the agriculture profession. Such motivational programmes for school students are conducted during Agricultural Education Day, ICAR-Foundation Day, National Science Day, World Environment Day. Here, scientists come close and interact with students and inspire to answer critical questions of their imagination and dreams. Inspirational talks, scientific quiz, debates, elocution contests were conducted and prizes were distributed. Gifted students of the district are routinely empowered in this mission.

Trainings/Workshops/Seminars

Technology generation for the welfare of the farming community is the key focus area. Empowering the stakeholders with the novel technologies developed from the institute for effective and timely outreach among the farmers is accomplished. Refinement at the technology generation point and rapid dissemination for the end users is effectively targeted. Cross learning among experts and technology sharing across the crops is achieved.



Celebrating the Celebrations...

National Days (Republic Day, Independence Day), National weeks (Hindi week, Vigilance Awareness Week, Swachhata Hi Seva,) National festivals (Onam, Diwali), National Days (Gandhi Jayanthi, Ambedkar Jayanthi, Science Day), International days (Yoga Day, World Environment Day, World Food Day) etc are commemorated with national pride, respect and joy exhibiting dignity and fervour with all scientists, officers and staff as ICAR-CPCRI family. Annual club days for infusing recreation and igniting creativity among the members with more enthusiasm and bio-happiness.

Pan India Outreach

Technology outreach programmes have been conducted in all coconut growing belts of the country for effective dissemination and timely adoption. The expertise and experiences of the scientist of the institute was readily made available in any emergencies or outbreak of pests and diseases in all the coconut growing states of India. The services of scientists for the documentation, policy level interventions and technology advisories were made available. Sensitization campaigns were also organized at pan India level during the introduction of exotic pests (whitefly) and diseases [lethal wilt, root (wilt)] as well as other potential invasive pests (Leaf beetles, scale insects) benefiting all farming fraternities across the country.



Science to Society

Mera Gaon Mera Gaurav

Taking technologies to the farmer's doorstep by the scientists is the hallmark of *Mera Gaon Mera Gaurav* programmes. Transforming *Amma thengu* (Mother palm) into *Kera Nanma* at Bharanikavau, inclusive farming with emphasis on fish cultivation at Cherthala, value addition-based capacity building initiatives in Kandalloor are salient success stories.



DAESI

ICAR-CPCRI, Regional Station, Kayamkulam as the Nodal Training Institute, organize one year Diploma in Agricultural Extension Services for Input Dealers (DAESI) Programme for the agricultural input dealers of Alappuzha District in collaboration with ATMA, Alappuzha, SAMETI, Kerala and MANAGE, Hyderabad. The programme is envisaged to enable them to serve the farmers through the delivery of right information and quality inputs for sustainable development in agriculture. The course comprised of 80 theory sessions and 8 days of field visits, which are designed in such a way that the participants get an exposure to various branches of agricultural sciences.

Exhibitions & linkages

The exhibition is a mass extension tool for displaying technology products showcasing the relative advantages of innovations offering choices to the farming community, extension officials and stakeholders for improving their farming and technology integration. Cross learning among farmers and technology expansion to larger population is achieved. Linkages with relevant agencies and institutions results in mutual sharing of knowledge, manpower and investment leading to multiple and mutual outcome and impacts.



Accolades and Recognitions



Awards are recognitions of the society on the quality outcome of the institute. Which also add feathers on the cap of scientists and officers. The other recognition to the institute includes fellows from Royal Societies and National Societies as well as ICAR and other National awards.



Publications

Impact of the Institute and technologies generated are quantified based on the quality of publication made by scientists. Delivery of high ranking to the institute through publication of research findings in high-impact Journals (International and National): *Nature to Current Science*. Higher citation index of research articles is another quality yardstick.



Radioactive studies to elucidate absorption pattern of nutrients in RWD affected palms

J. Nuclear Agric. Biol., Vol. 8 (1979)

Absorption, Distribution and Utilization of Radioactive Phosphorus in Healthy and Root (Wilt) Diseased Coconut Palms

R. SHEET DUTTE*, P. K. RAY AND SONNY NIKAN

Central Plantation Crops Research Institute, Regional Station, Kayangulam, Krishnagaram-690533

ABSTRACT

Radioactive ^{32}P was fed to coconut leaves and palm under laboratory and field conditions. In healthy palms the absorption of phosphorus by roots and its accumulation in apical and first fully opened leaves was found to be significantly higher (80%) as compared to that of diseased palm, but at later stages the reverse pattern was observed. The time required for ^{32}P to reach the apical (top-most leaf) situated at 3.5 m height in both diseased and healthy palm was found to be 3 hr only. In contrast to the leaves, the activity of ^{32}P differed insignificantly in stem and roots of healthy and diseased palms and also the native P remained higher in the stem and roots of former palm as compared to latter. The analysis of total and different fractions of phosphorus and entry of ^{32}P in the different forms of organic phosphorus indicated that although total P was more in the case of diseased palm but the organic phosphorus especially the nucleic acid P was significantly less as compared to healthy ones. This revealed less utilization of absorbed P in the synthesis of P-coordinated organic substances in diseased palms.

The disorders in the Physiological and biochemical processes are usual phenomena in diseased plants. In many diseased animals and perennial the

Materials and Methods

The laboratory and field conditions...

First Remote sensing experiment

The first national initiative on remote sensing in agriculture was attempted way back in 1970 at ICAR-CPCRI, Regional Station, Kayamkulam with the international collaborative project by Indian Space Research Organization, ICAR-Indian Agricultural Research Institute, New Delhi, ICAR-Central Plantation Crops Research Institute, Kasaragod and National Aeronautics and Space Administration, USA for the early diagnosis of root (wilt) disease in coconut.

Abstract of paper presented at the 7th International Symposium on Remote Sensing of Environment Ann. Arbor, May 1971.

REMOTE SENSING AND COCONUT WILT

G. Dhanalakshmi, S. Krishnaswamy, A. S. Somanath, P. Sharma & P. V. Pisharoty

Abstract

India has successfully carried out a small remote sensing project on the early detection of the coconut wilt disease. India is the second largest copra producer in the world with about 0.64 million hectares of land under coconut plantation. Kerala state in the southern west part of India occupies the largest area under coconut plantation. The plantations are heavily affected by wilt/dieback disease resulting in an annual loss of about 10 million tonnes. The disease is characterized by leaf fall. Systematic investigations have proved that the disease is caused by soil-borne virus pathogen.

Insightful foresights

Vegetative propagation of coconut...

Way back in 1960s, attempts were made for clonal/vegetative propagation of coconut by inducing production of suckers through splitting the growing point & roots from trunk by hormonal treatment. They concluded that induction of meristematic activity in coconut is possible by hormone treatment.

NATURE December 1, 1962 VOL. 198

Vegetative Propagation in the Coconut

Concept and feasibility of vegetative propagation of the coconut palm (*Cocos nucifera* L.) was discussed in a seminar, Bombay, the 10th of October, 1961. It was then that "There was no sign of anything new in any of the treatments so far". They state that they induced root formation from the stem and ground level with certain hormones and later conclude that "subsequent meristematic activity in the coconut is possible".



Fig. 1. A horizontal cut in the stem of a coconut palm, intended for vegetative propagation.



Fig. 2. A young coconut palm sucker growing from the base of a parent palm.

T. A. DAVIS

NATURE September 16, 1961 VOL. 197

Possibilities of Vegetative Propagation in the Coconut (*Cocos nucifera* L.)



Fig. 1. A horizontal cut in the stem of a coconut palm, intended for vegetative propagation.

The coconut is a perennial palm which takes 4-6 years to begin bearing, but later continues to bear right through the year and all through its life, extending during a period of 80 years or more depending on local conditions. It is highly susceptible to X-disease, particularly the tall variety, and is propagated only through seed. These factors, namely, the long interval between propagation and the highly heterogeneous nature of the plant population, are proving to be great handicaps in making quick headway in coconut breeding. The present nature of the palm, on the other hand, is of advantage, in that the benefit from any improvement can be enjoyed over a very long period.

Vegetative propagation in the one new method of propagating line to type, and it could be very valuable in coconut research, as has been recently pointed out by (1-3). In the coconut, which is a monozygotic plant devoid of mutation, the prospect of vegetative propagation is alluring, but there are indications that the problem is worth following up. In Nature, London on the 16th September 1961.

R. S. GANESAN S. M. PILLAI



Establishment of laboratory with transmission electron microscope

A modern lab with electron microscope was established in 1983. The facility helped in establishing the phytoplasmal etiology of root (wilt) and tatipaka diseases of coconut, yellow leaf disease of arecanut and spear rot of oil palm.

Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz
Journal of Plant Diseases and Protection
90 (3), 295-297, 1983. ISSN 0340-8159
© Eugen Ulmer GmbH & Co., Stuttgart

Kurze Mitteilung/Short Communication

Association of mycoplasma-like organisms with the root (wilt) disease in India
Verbindung mykoplasmaähnlicher Organismen mit der Wurzelkrankheit in Indien

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Received 10 February 1983; accepted 17 February 1983

Journey continues...

- ✓ Green and clean farming through biological and digital tools
- ✓ Evolve coconut varieties for tolerance to biotic stresses and nut-yield
- ✓ Large-scale in vitro production of coconut seedlings
- ✓ Decentralized hybridization through ground pollination approaches
- ✓ Inclusive farming with systems approach for climate resilience
- ✓ Natural farming for sustainable income and conserving biodiversity
- ✓ Resource efficient production technologies for RWD areas and development of crop cafeteria
- ✓ Decision support system for smart nutrient delivery and yield maximization
- ✓ Microbial consortia by metagenomics auguring palm health and enhancing yield
- ✓ Robust diagnostic protocols for coconut diseases through transcriptome analysis
- ✓ Refined IDM/IPM strategies through environmentally responsible approaches
- ✓ Up-scaling and smart delivery of bioagents in pest and disease suppression
- ✓ Preparedness for exotic and potential invasive pests and diseases
- ✓ Forecasting pest and disease outbreak through simulative modelling and digital surveillance
- ✓ Technology integration for inclusive farming and doubling income
- ✓ Farmer-participatory technology utilization through responsive extension
- ✓ Technology commercialization and empowering FPOs for business sustenance

Outpouring Gratitude



Editors express profound gratitude to the Director, Directorate of State Archives-Govt. of Kerala, Media Archives (*Deepika & Mathrubhumi* dailies), Sree Padmanabhaswamy Temple Trust for providing rare evidences pertaining to the Foundation Stone laying ceremony by His Highness Marthanda Varma (Elayaraja of Travancore), and thereby turning remembrance with elegance to history. Our gratitude is due to Sri. K. Harikumar, Krishnapuram Palace Museum-In-Charge who connected us with renowned historians to verify the authenticity of the rare photographs. The knowledge and wisdom from the two great books “The Coconut Palm - A Monograph” by KPV Menon and KM Pandalai and the “Diseases of Coconut palms” by MK Varghese are the greatest treasures that added value to this document. We profusely thank all the research, technical, administration and other distinguished base-line workers associated with coconut research since the inception of Agricultural Research Laboratory in Quilon and the Field Station at Kayamkulam during 1937 and thereafter the foundation stone laying ceremony of Central Coconut Research Station on 24-04-1947.

Research guidance from esteemed former DGs, DDGs of ICAR are deeply revered and acknowledged. We express our deep sense of gratitude to Dr Trilochan Mohapatra, DG, ICAR and Dr A.K. Singh, DDG (Horticulture Sciences) for their unstinting support towards the deliverance of science-studded, farmer-centric research outcomes auguring the welfare of the coconut community. Thanks are due to former Directors, Joint Directors, Heads and Acting Heads of the Regional Station whose strenuous commitments and long-term vision made the station reach all glory in the present saga and for being a source of inspiration to this compilation. Sincere thanks are due to Dr Anitha Karun, Director, ICAR-CPCRI, Kasaragod for her deep sense of patronage in the overall development of the station and more specially for this unique compilation. Special thanks are due to all former scientists, technical and administrative personnel and skilled support staff for their ever-standing contributions towards the hallmark achievements of this Station. Our sincere thanks and compliments to Sri. S. Thajudin, former CTO (Library) for having excavated old documents for glorifying this book's contents. We revere with profuse gratitude the coconut farming fraternities, distinguished farmer societies, federations, companies, line departments and other stakeholders, national and international collaborators for their bountiful support in fine-tuning technologies for better outreach.

The whole nation celebrates *Azadi Ka Amrit Mahotsav* and our Kalpa Vajra celebration on this historic event becomes a rare coincidence and will remain in the golden words of history. We thank all the well wishers and the ICAR-CPCRI family for their overwhelming support to make this book '**ICAR-CPCRI, Regional Station, Kayamkulam @75 - Serving Coconut Farmers Since 1947**' a dream come true of the historical remembrance on 24-04-2022 and research outcome-deliverance.

The quest on unearthing documents for the historic 75 years of ICAR CPCRI, RS, Kayamkulam journey made us travel through some rare paths of science history. We submit and are fully aware of the missing links warranting more exploration and critical decoding. The process of empirical documentation is still continuing and this publication is only a first stepping stone in this process. Let us all be together and contribute magnanimously to fill the gaps, offer available evidences and pin point errors or missing information, if any...we remain receptive and open to suggestions, corrections, inclusion and modifications

24-04-2022

Editors

1963



Sitting : Mrs. V.G.Lilly, Messrs.P.V.George, K.N.Sahasaraman,Dr.Ramdas,Dr.Kurien,Dr.K.Radha,Mrs Suseela V Menon,Dr.K.P.V.Menoni(Out going Director), Dr.K.M.Pandela(Present Director),Dr.P.Santa, Messrs. Thomas Kappen, N.Narayana Pillai, J.Antony,P.KRaghavan and Miss.B.Sumathikutty Amma.
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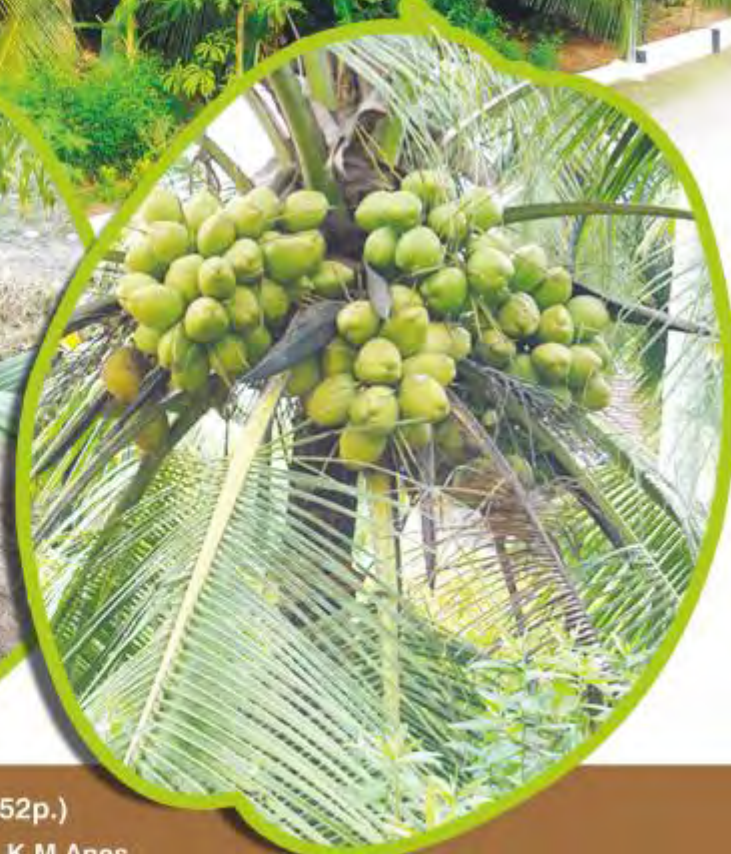
2022

ICAR-CPCRI RS Kayamkulam Family

Celebrating 75 years of service to coconut community
KALPA VAJRA
2022-2023

ICAR - CENTRAL PLANTATION CROPS
RESEARCH INSTITUTE
REGIONAL STATION, KAYAMKULAM

Seed to System



Printed & Published by : **Dr. (Mrs.) Anitha Karun, Acting Director, ICAR-CPCRI, Kasaragod (52p.)**

Compiled & Edited by : **P. Anithakumari, Regi Jacob Thomas, A. Josephraj Kumar, A. Abdul Haris, K.M Anes, Merin Babu, M. Shareefa, K. Nihad, Jeena Mathew & S. Indhuja**

Published on 24th April 2022