

B.M.S. COLLEGE OF ENGINEERING

(Autonomous College, Affiliated to VTU)

Bull Temple Road, Basavanagudi, Bangalore - 560019



An internship project report on

"IOT BASED SOIL FERTILITY TESTING FOR ARECANUT CROPS"

Submitted in partial fulfillment of the requirements for the award of degree

MASTER OF TECHNOLOGY

IN

COMPUTER NETWORK ENGINEERING

By

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C E R T I F I C A T E

This is to certify that the group project entitled "**IOT BASED SOIL FERTILITY TESTING FOR ARECANUT CROPS**" is a bona-fide work carried out by **Susham H P (1BM22SCN11)** in partial fulfillment for the award of degree of Master of Technology in **Computer Network Engineering** from **Visvesvaraya Technological University, Belgaum** during the year **2022-2023**. The group project report has been approved as it satisfies the academic requirements in respect of group project prescribed for the Master of Technology Degree.

Signature of the Guide

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Signature of the HOD

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CHAPTER 1

COLLEGE INFORMATION

History

BMS College of Engineering was Founded in the year 1942 by the Late Sri. B.M Sreenivasaiah a Great Visionary and Philanthropist and nurtured by his illustrious son Late Sri. B.S. Narayan. BMSCE is the first private sector initiative in engineering education in India. BMSCE has completed 72 years of dedicated service in the field of engineering Education. Started with only 03 engineering courses, BMSCE today offers 13 Undergraduate and 16 Postgraduate courses both in conventional and emerging areas. 15 of its department are recognised as Research Centres offering PhD/M.Sc. (Engineering by research) degrees in Science, Engineering, Architecture and Management.

In the history of Karnataka, the name of Late Businayana Mukundadas Sreenivasaiah (BMS) occupies a prominent place in the field of philanthropy. The maharaja of Mysore honoured him with the title of Raja Karya Prasanktha in 1946. He started the BMS College of engineering in the same year. He had foreseen the urgent need for high quality technical education in India, even before the independence. The ideals, for which Sri.B.M Sreenivasaiah stood, continued to inspire the inheritors of his legacy.

Vision and Mission

Vision

Promoting prosperity of mankind but augmenting human resources capital through quality technical education and training.

Mission

Accomplish excellence in the field of technical education resource and service needs of society.

About BMSCE

Located in the heart of Bangalore, the Garden City of India, BMSCE is about 5 KMs from the Central Railway Station. The campus area is 15 Acres with a built up area of 62,068

Sqm. The College has been the most preferred destination not only for students of the state but also from various parts of the Country. The Institution is accredited to AICTE, New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belgaum, Karnataka, approved by Council of Architecture (COA), New Delhi, BMSCE is a AICTE recognized QIP Centre in Engineering & Technology, BMSCE is the only institution from India adopted by the Melton Foundation, USA.

BMSCE IS TEQIP Phase I and Phase II Institute (a World Bank project). Is accredited with A Grade by NAAC (2013-2023) and Accredited by National Board of Accreditation (NBA), New Delhi (BMSCE has the unique distinction of being one of the first Institution in India identified by National Board of Accreditation for evaluation under Tier-I NBA Accreditation Washington accord).

The College has one of the largest student populations amongst engineering colleges in Karnataka. Currently about 5000 students are pursuing their higher education. The academic performance of the students has been exceptional. More than 90% of the students secure first class/distinction. The Institution has an excellent Placement and Recruitment Cell. The Placement Centre provides career guidance, pre-placement training in soft skills to enable students acquainted with the current corporate requirements.

More than 100 reputed Core/IT/MNC companies visit the campus every year for recruiting students from various branches. 90% of the eligible students are getting placed every year. The College has a voluminous computerized library and information centre, which caters to the needs of students, research scholars and faculty.

The Institution has well-Qualified, Experienced & Dedicated faculty and staff members. BMSCE has the most advanced laboratories for practical training, state of the art computing facilities, spacious classrooms with good furniture and A/V aids, Wi-Fi campus and 24x7 internet facilities in the departments and hostels. The Institution has Collaborative & Extension Activities by way of MOUs with various Governmental and Non-Governmental organizations for fostering Academic/ Research/ Innovation. A strong alumni base of over 35,000 most of them occupying coveted positions in various Educational, Industrial and Research organizations.

College is being ranked consistently among the top 20 engineering colleges in the country by surveys conducted by various media sources.

Events

REV

16th International Conference on Remote Engineering and Virtual Instrumentation REV is a series of annual events concerning the area of remote engineering and virtual instrumentation. The REV conferences are the annual conferences of the International Association of Online Engineering. The general objective of this conference is to demonstrate and discuss fundamentals, applications and experiences in the field of remote engineering and virtual instrumentation. With the globalization of education the interest in and need of teleporting, remote services and collaborative working environments now increases rapidly. Another objective of the symposium is to discuss guidelines for education in university level courses for these topics.

ICNEWS

With the huge success of NEWS (Networking, Embedded and Wireless Systems) since its inception way back in 2010 at the national level, we are now aiming to reach out to a larger research community at international level. Keeping in line with the tradition of NEWS, ICNEWS has rightly coined the theme for the conference as “Wireless Technology - Building a Progressive World “The conference provides an interdisciplinary forum for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns, practical challenges and solutions adopted in the field of Networking, Embedded and Wireless Systems.

TEDx BMSCE

TED

TED is a non-profit organization devoted to Ideas worth Spreading, usually in the form of short, powerful talks (18 minutes or less). TED began in 1984 as a conference where three ideas that shape our future: Technology, Entertainment and Design converged. Today it covers almost all topics from science to business to global issues. TED believes passionately in the power of ideas to change attitudes, lives and, ultimately, the world. TED.com is a clearinghouse of free knowledge from the world's most inspired thinkers and a community of curious souls

to engage with ideas and each other, both online and at TED and TEDx events around the world, all year long.

TEDx

TEDx is a program of local, self-organised events that brings people together to share a TED-like experience. These local, self-organised events are branded TEDx Talks, where x = independently organised TED event.

TEDx BMSCE

TEDx BMSCE is returning this year, and aims to serve as a platform for eminent leaders and change makers of our society to voice their visions and views. Having a line-up of ten visionary speakers, TEDx BMSCE will be an event to watch out for. TEDx BMSCE is bringing together over one hundred open-minded, creative and forward-thinking individuals. They will include men and women representing all facets of Bangalore, including business people, educators, artists, homemakers, activists, doctors, lawyers, students, futurists.

TEDx BMSCE

It is inevitable that we walk through the path of life as time passes, sometimes if we are fortunate enough, we can choose the path we take. Irrespective of the path we take, we are bound to meet new people, and they are all unique in their own ways. Each one of them has a story to tell, have something new to offer, a varied perspective. This perspective is met aphorized as a dimension. Each of them contributes to a dimension that makes this world a better place by providing vision and a path for the future. This event on September 22nd is all about that, by the end of the event, you along with your own perspectives will have an additional dozen dimensions added to your consciousness, helping you walk through your path of life efficiently and more knowledgeable than before.

Facilities

Library

The primary objective of the library is to offer a fully integrated and dynamic environment suited for academic pursuits, study and research for the students and staff, by augmenting traditional print and electronic resources both local and global technologies. Also

provides the electronic resources such as online journals conference papers Springer papers etc.

Placement

The College has an exclusive Placement and Training Centre to facilitate on-campus Placement opportunities to the students. The Centre has a professor in-charge of the activities. The Centre provides pre-placement training in soft skills to all pre-final year students to enable them to acquaint to the current corporate requirements. The centre facilitates students to face interviews & get jobs of their choice. More than 100 top and well established companies across the country/abroad from all sectors visit the campus for recruitment. Every year more than 80% of students from all the programs are being placed.

Sports

The Department of Sports serves as a vital and integral part of student life on campus. The mission of the department is to provide a broad spectrum of sports, recreation and leisure activities for students, staff and faculty, as well as members of the local community. The primary direction is to provide services and programs that stimulate growth, development and retention of students in a contemporary and safe environment that develops fitness and wellness, social interaction and leadership opportunities.

Hostel

BMSCE Hostels are part of BMSET and BMSET Hostels in the campus of BMS College of Engineering (BMSCE) provide accommodation to the students wishing to reside in the hostels. BMSET Hostels gives a distinct advantage of befriending with students from across the globe and expose them different religions, languages and customs of countries. Additionally, living as a community in the hostel will lead to all-round development of personality of a hostelite and will definitely go a long way in fostering world-class citizens. Hostels are independent units in respects to its internal administration under the overall supervision of council of wardens and the hostel management.

ABOUT THE DEPARTMENT

Vision

Promote Quality Human Resource Capital by inculcating in every student the art of Creativity and Productivity in the field of Information Technology.

Mission

Offer High Quality Graduate, Post Graduate Programme in Information Technology to prepare students for higher studies and professional career in industry. Provide good Teaching and Research environment for Quality Education in the field of Information Technology.

Department Profile

The department of Information Science and Engineering was established in the year 1987 with an intake of 60 for UG programme. Since then the department has evolved over the years to portray its excellent academic performance. The department has attracted an increasing number of students aspiring for a technical career in information technology. The intake was enhanced to 90 in the year 2000. As an autonomous institution, the department has flexibility in designing the curriculum. The subjects offered cover the major upcoming technologies with more emphasis to fundamental concepts.

The innate strength of department is faculty. The department is well equipped with 25 experienced faculties. Among them, there are 3 Professors and 4 Associate Professors. Computing facilities in the department provide teaching and research needs for students and faculty.

All systems are upgraded to the latest configuration with campus wide internet connectivity. The department has close interaction with companies such as EMC, TCS, SAP and IBM to promote student projects. The department has an outstanding placement record with an average placement percentage of 95% over last 3 years

The PG programme, M. Tech in Computer Network and Engineering under VTU, was started in 2011 with an intake of 18. The PG students are encouraged to gain knowledge on practical aspects. The research activities were promoted in the department with the launch of Research Centre in the year 2011.

Information About Agriculture College

Brief History & Development of University

History

University of Agricultural and Horticultural Sciences (UAHS), was carved out of University of Agricultural Sciences (UAS), Bengaluru and University of Horticultural Sciences (UHS), Bagalkote. From UAS, Bengaluru (CoA, Shivamogga and CoF, Ponnampet (educated institutions)., all the research stations and KVKS of seven districts viz. Davanagere, Chitradurga, Shivamogga, Chickmagaluru, Kodagu, Dakshina Kannada and Udupi and from UHS, Bagalakote, CoH, Hiriyur and Mudigere (educated institutions) were separated and brought under the Management of University of Agricultural and Horticultural Sciences (UAHS), Shivamogga.

UAHS started its operation from 21-09-2012 through a special Ordinance passed by Govt. of Karnataka (Special Gazette Notification of Karnataka Act No. 38 of 2012, Part IV-J (No. 656). UAHS started functioning independently from 1st April, 2013 .

During 26-07-2021, the name of the UAHS was changed to Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences (KSNUAHS), through another Ordinance passed by Govt. of Karnataka, considering the substantial reforms in the field of Agriculture, by Shistina Shivappa Nayaka; a prominent ruler in the Keladi Dynasty. The new name was given by Govt. of Karnataka.

KSNUAHS is the first integrated University in the State of Karnataka, which has Agriculture, Horticulture and Forestry Sciences under its purview. It has an operational jurisdiction in seven districts viz., Shivamogga, Chikkamagaluru, Udupi, Dakshina Kannada, Kodagu, Davanagere and Chitradurga.

The University has a vision to transform itself into the “Light house of Knowledge”. The head quarter of the KSNUAHS is located at Iruvakki, a green campus located in the midst

of United Nation's -World Heritage Centre, truly a hot spot of Bio-diversity at Sagara Taluk of Shivamogga District. The new head quarter, of KSNUAHS, was shifted to Iruvakki campus in the SagarTaluk of Shivamogga District (located about 50 KM away from the Navile Campus on the Highway between Bengaluru – Honnavara – NH 13). The New campus is on the road between Shivamogga – Bairdur National Highway (NH206) hence well connected to Bengaluru through NH 13 and NH 206. It is also well connected by Train (nearest Railway Station is Anandapura) and nearest Airports are at Shivamogga (60) Mangaluru (225 KM), Hubli (265) and Bengaluru (315 KM)

Educational Centres:

The University has four educational institutions viz., College of Agriculture, Shivamogga, College of Horticulture, Mudigere, College of Forestry, Ponnampet, College of Horticulture, Hiriyur and two Diploma College of Agriculture at Kathalagere and Brahmavara

Research Centres:

One Main Agricultural and Horticultural Research Station at Iruvakki. Four Zonal Agricultural and Horticultural Research Station (ZAHRS) at Shivamogga, Hiriyur, Mudigere, Brahmavara, nine Agricultural and Horticultural Research Station at Kathalagere, Ullala, Thirthahalli, Ponnampet, Sringeri, Bavikere, Honnavile, Madikeri and Kademedkal.

Extension Centres:

University has four ICAR KVKS at Shivamogga, Chitradurga, Chikkamagaluru and Udupi. Two Extension Education Units at Kathalagere and Ponnampet, two Extension Units at Thirthahalli and Sringeri.

University Vision, Mission, Goals and Mandate

Vision:

- a. To strengthen and excel in Agricultural Education, Research and Extension for sustainable Agricultural Development.

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- b. To develop technocrats, technologies, disseminators by providing a strong knowledge base.
 - c. To inspire socio-cultural value-based thinking for harnessing our natural resources with a sound technical foundation.

Mission:

To build the University as a premier institution by providing the best professional education and consultancy, R & D solutions, addressing key issues, confronting the sector growth and achieves excellence with quality outputs in frontier areas of Agricultural, Horticultural, Forestry and allied Sciences, contract services in public and private domains at National and International level.

Mandate:

- a. Imparting education towards the development of quality human resource in different branches of Agriculture, Horticulture, Forestry and allied sciences.
- b. Furthering advancement of learning and conducting research in Agriculture, Horticulture, Forestry and other allied Sciences.
- c. Undertaking the Extension Education of Sciences and Technologies especially for the farming and rural people of the State.
- d. Promoting partnership and linkages with National and International Educational Research institutions and industries.



KVK, Shivamogga – at a glance

The Krishi Vigyan Kendra, Shivamogga established under the aegis of University of Agricultural Sciences, Bengaluru and functioning since the latter part of 2000. Very recently it is functioning under the Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga from 2014.

The Krishi Vigyan Kendra, Shivamogga committed for assessment and refinement of agricultural technology systems, organizing on farm trials and front line demonstrations to enhance production potential of various crops and enterprises in the farmers' field which includes popularizing, developing and dissemination of technologies, management of weeds, diseases and insect pests in various crops, introduction of new, short duration and high yielding crop varieties/hybrids.

Yearly around 5 lakhs farmers, farm women, SHG members, youth, extension workers are getting benefitted from different extension activities which are organized by KVK viz., field days, animal health camps, field visits, diagnostic visits in collaboration with Department of agriculture, horticulture and animal husbandry, organizing the exposure visits to farmers, farm-women, youth and FPO directors. Celebration of important days to create awareness viz., World environment day, world soil day, world coconut day, world milk day, women in agriculture day, Mahila kisan diwas, international women's day, world food day, kisan day, world honey bee day, National Girl Child Day. University level Krishi mela will be organized to showcase the latest technologies in agriculture in collaboration with all the line departments.

KVK, Shivamogga is designed to impart need-based and skill-oriented vocational capacity development programmes for the practicing farmers, farm women, rural youth and in-service

field level extension workers. Need based trainings are designed for farming community based on the information received through family and village survey.

KVK is involved in disseminating the latest technologies through consultancy services viz., field visits, farmers visit to KVK, consultancy over phone, through mail and mass media like radio talks and TV programmes. The latest technologies will be documented and published in local language through leaflets, folders and technical bulletins to meet the demands of farmers. KVK is also having soil, water and manure testing laboratory facilitates, setting up of demonstration units, production of quality seeds and planting materials. The KVK, Shivamogga acting as a link between university scientists and farmers.

Mandates of Krishi Vigyan Kendra

- Conducting on-farm testing to identify the location specificity of agricultural technologies under various farming systems.
- Organizing frontline demonstrations to establish production potential of various crops and enterprises on the farmers' field.
- Organizing need-based training for farmers to update their knowledge and skills on modern agricultural technologies related to technology assessment, refinement and demonstration, and training of extension personnel to orient them in the frontier areas of technology development.
- Creating awareness about improved agricultural technologies among various clienteles through an appropriate extension programme. Production of quality seeds, planting materials, livestock breeds, animal products, bio-products etc, as per the demand and supply the same to different clienteles.
- Work as resource and knowledge centre of Agricultural Technology to support the initiatives of public, private and voluntary sectors for improving the agricultural economy of the district.

CHAPTER 2

STUDY OF BASICS OF SOIL

Introduction

SOIL

Soil is a mixture of minerals, organic matter, gases, liquids, and the myriad of organisms that together support plant life. Soil is highly heterogeneous in nature. It is a natural body that exists as part of the pedosphere and which performs four important functions; it is a medium for plant growth; it is a means of water storage, supply, and purification; it is a modifier of the atmosphere; and it is a habitat for organisms that take part in decomposition of organic matter and the creation of a habitat for new organisms. Soil horizons(layers) soil is made of distinct horizontal layers; these layers are called horizons. They range from rich, organic upper layer (humus and topsoil) to underlying rocky layers (subsoil, regolith, bedrock)

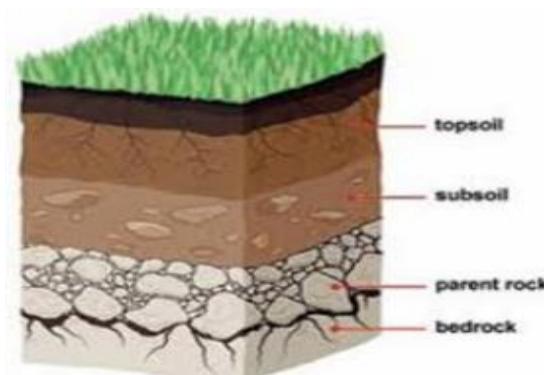


Fig: layers of soil.

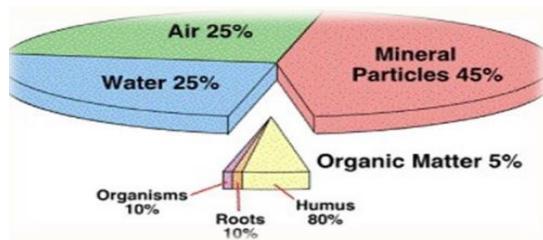
Formation of soil:

- **Physical weathering:** Weathering is the mechanical or chemical process by which rocks are broken down, into smaller pieces. As rocks are broken down, they mix with organic material, which are those materials that originate from living organisms.
- **Biological weathering:** It takes place because of activities of living organisms. It can be combined with chemical processes like chemosynthesis of bacteria.

- **Chemical weathering:** Result of chemical interaction between water and atmospheric gases and the bed rock of the region, like oxidation reaction with O₂ and hydrolysis with H₂O and acid action with acid like H₂CO₃, H₂CO₄, H₂SO₃.

Composition of soil

Soil composition is an important aspect of nutrient management. While soil minerals and organic matter hold and store nutrients, soil water is what readily provides nutrients for plant uptake. Soil air, plays an important role since microorganisms in soil needs air to undergoes the biological processes that release additional nutrients into the soil. Soil consists of approx. 45% mineral particles, 25% air and 20-30% water and 5% organic matter and 80% humus and 10% roots and 10% organism.



Parent Material

Soil formation depends upon the texture, structure as well as the mineral and chemical composition of the rock debris. Nature, rate, and depth of weathering are important considerations under parent materials. Generally young soils or the lowermost horizon shows similarity with the parent material.

Topography

The influence of topography is felt through the amount of exposure of a surface to sunlight, drainage condition, and slope angle etc. In middle latitudes pole-facing slopes may have slightly different soil conditions from equator-facing slopes due to poor exposure to sunlight. Soils on hillsides tend to be much better drained than those in valleys, where gleying may take place.

Climate

Major influence in governing the rate and type of soil formation. The effect of temperature is to influence the rate of chemical and biological reactions. Precipitation has a major influence in governing the rate and type of soil formation. In cool climates, bacterial action is relatively slow while

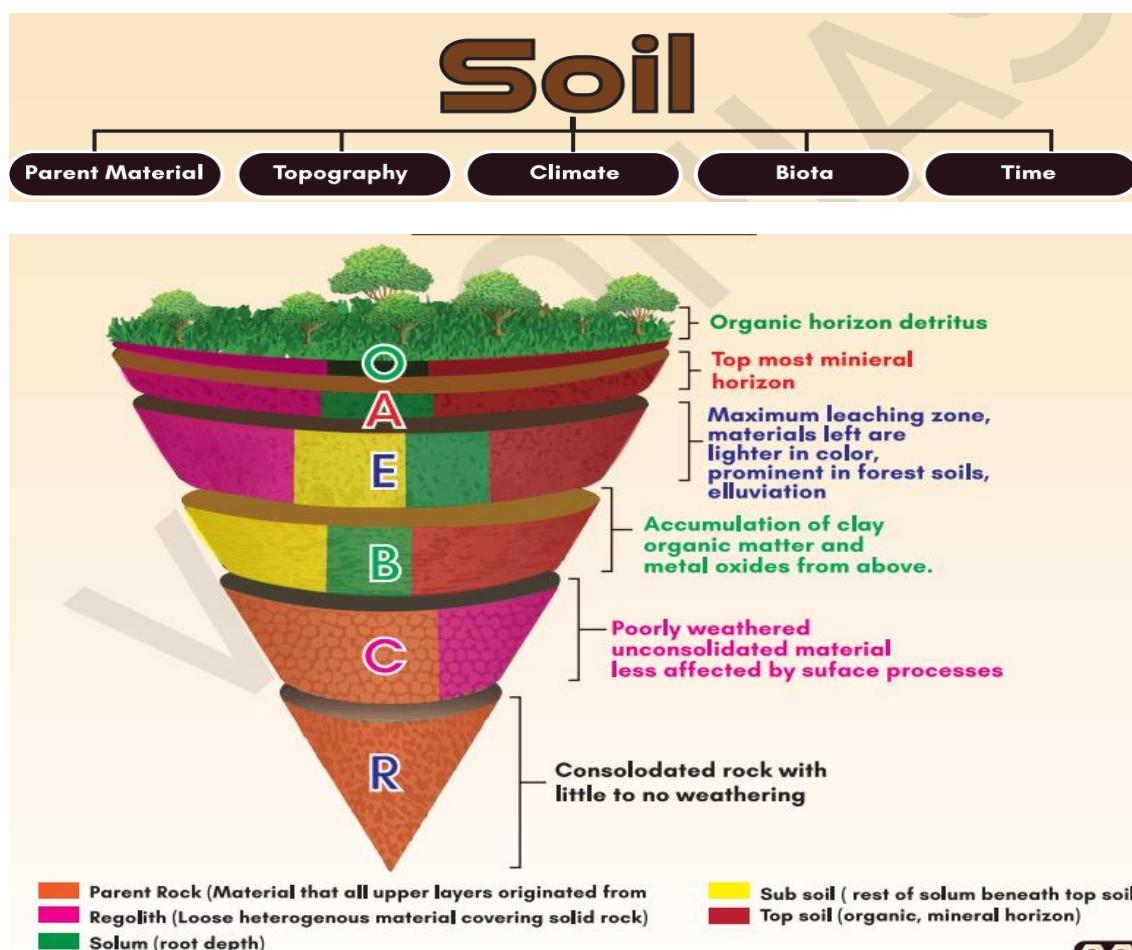
in tropics, bacteria thrive, Soil of hot tropical region show deeper profiles as compared to soils of cold tundra region.

Biological Activity

The vegetative cover and organism that occupy the parent materials from the start to later stages help in adding organic matter, moisture retention, nitrogen. Some organic acids which form during humification aid in decomposing the minerals of the soil parent materials. Humus accumulates in cold climate as bacterial growth is low and thus layers of peat develop in subarctic and tundra climates. Help in maintaining the fertility of soil by bringing bases (Calcium, Magnesium) from the lower parts of the soil into stems and leaves, and then releasing them into the upper soil horizons.

Time

The length of time a soil has had to form is important. The older the soil the more nutrients and clay materials may have been leached to deeper soil depths or leached away completely. Refer to 1.3 Soil Profile.



Soil Classification in India

The National Bureau of Soil Survey and the Land Use Planning an Institute under the control of the Indian Council of Agricultural Research (ICAR) did a lot of studies on Indian soils. ICAR has classified Indian soils into eight types based on their formation, colour, composition, and location.

Classification of soil: soils can be classified into:

- Alluvial soil.
- Regular/Black soil.
- Red and Yellow soil.
- Laterite soil.
- Saline soil.
- Peat soil.
- Forest soil.
- Arid soil.
- Sandy soil.
- Clay soil.
- Silt soil.
- Chalk soil.
- Loamy soil

Alluvial Soil

- Formed by rivers by depositing sediments brought from the mountains.
- The new alluvium is called Khadar while older deposited one is called Bangar. Khadar is renewed annually with fresh floods.
- Alluvial soils are most widespread in the northern plains and the covers about 40 percent of the total area of the country.
- Through a narrow corridor in Rajasthan, they extend into the plains of Gujarat.
- In the Peninsular region, they are found in deltas of the east coast and in the river valleys.
- These soils are loamier and more clayey in the lower and middle Ganga plain and the Brahmaputra valley.

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- The sand content decreases from the west to east.
 - They are generally rich in potash but poor in phosphorous. Alluvial soils are intensively cultivated.



Fig: Alluvial Soil.

Regur Soil/ Black Soil

- Formed from the volcanic lava. Because of high iron content and humus, it is of black colour. It covers most of the Deccan Plateau.
- In the upper reaches of the Godavari and the Krishna, and the north western part of the Deccan Plateau, the black soil is very deep.
- These soils are known for their 'self-ploughing' nature.
- The black soils are generally clayey, deep, and impermeable.
- They swell and become sticky when wet and shrink when dried. During the dry season, these soils develop wide cracks.
- Retains the moisture for a very long time, which helps the crops, especially, the rain fed ones, to sustain even during the dry season.



Fig: Regular/Black soil.

Red and Yellow Soil

- It is formed from weathering of crystalline granite (igneous rocks) and gneiss (metamorphic rocks) in areas of low rainfall in the eastern and southern part of the Deccan plateau.
- Along the piedmont zone of the Western Ghat, long stretch of area is occupied by red loamy soil.
- The soil develops a reddish colour due to a wide diffusion of iron in crystalline and metamorphic rocks.
- It looks yellow when it occurs in hydrated form.
- They are generally rich in minerals like Iron, lime, and potash but poor in nitrogen, phosphorous and humus.



Fig: Red and Yellow soil.

Laterite Soil

- Formed under specific monsoon conditions of climate.
- Under such conditions, leaching of soils is accelerated.
- This process reduces the silica content of rocks in soils leaving the soil rich in iron and aluminium content.
- Humus content of the soil is removed fast by bacteria that thrive well in high temperature.

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- These soils are poor in organic matter, nitrogen, phosphate, and calcium, while iron oxide and potash are in excess.
 - Not suitable for cultivation; however, application of manures and fertilizers are required for making the soils fertile for cultivation.
 - Red laterite soils in Tamil Nadu, Andhra Pradesh, and Kerala are more suitable for tree crops like cashews.
 - Laterite soils are widely cut as bricks for use in house construction.



Fig: Laterite soil.

Saline Soil or Usara Soil

- Contains a larger proportion of sodium, potassium, and magnesium, and thus, they are infertile, and do not support any vegetative growth.
- They have more salts, largely because of dry climate and poor drainage.
- Lack in nitrogen and calcium. Found in arid and semi-arid regions, western Gujarat, deltas of the eastern coast and in Sundarbans areas of West Bengal.
- In areas, especially in Punjab and Haryana, farmers are advised to add gypsum to solve the problem of salinity in the soil.



Fig: Saline soil.

Peaty and Marshy Soil

- Found in areas of heavy rainfall and high humidity such as Kerala, Odisha, Bengal, Coastal areas of Tamil Nadu.
- Large quantity of dead organic matter accumulates in these areas, and this gives a rich humus and organic content to the soil.
- The vegetation grows very dense in these areas.
- At many places, they are alkaline also due to presence of salt.



Fig: Peaty and Marshy Soil.

Forest Soil

- Formed in the mountain ranges of Himalayas, Purvanchal, Sahaydi etc. where sufficient rainfall is available.
- Soil is loamy and silty on valley sides and coarse grained in the upper slope.
- The lower valleys soil is fertile. On steep slopes, soil is very thin and less productive.



Fig: Forest Soil.

Arid Soil

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- In the deserts, accelerated weathering of rocks take place on account of heating during day and cooling during night.
 - In this type of soil mainly sand grains are found with little or no humus.
 - Has less capacity to hold moisture. Its colour varies from red to brown.
 - Nitrogen is insufficient and the phosphate content is normal.
 - Developed in western Rajasthan and semi-arid type in southern Punjab and Haryana.



Fig: Arid Soil.

Sandy soil.

- Sandy soil is light, warm, dry and tend to be acidic and low in nutrient.
- Desert soil is mostly sandy soil found in low rainfall regions.
- Sandy soil have quick water drainage; they are often known as light soil due to the high proportion of sand and little clay.
- This soil type has the biggest particles and the bigger size of the particles in a soil the better is aeration and drainage of the soil. This soil is granular and consists of rocks and mineral particles that are very small.



Fig: Sandy soil.

Clay soil.

- Clay soil is heavy soil that benefit from high nutrients, and it remains wet and cold in winter and dry out in summer.
- They cover the plateaus of Maharashtra, Malwa, Madhya Pradesh, Chhattisgarh and extend in south east direction along Godavari and Krishna valleys.
- This soil made of over 25% clay and spaces found between clay particles.
- Clay soil hold a high amount of water and this drains slowly and take long time to warm up in summer.



Fig: Clay soil.

Slit soil.

- Silt soil are light and moisture retentive soils with a high fertility rating. as silt soils comprise of medium sized particles they are well drained and hold moisture well.
- This soil found near the river, lake, and other waterbodies. This soil also used in agricultural practice to improve soil fertility.
- As the soil's particles are fine, they can be easily compacted and are prone to washing away with rain



Fig: Slit soil.

Chalk soil.

- This soil is rich in calcium carbonate, potash, lime, magnesium carbonate and has poor phosphorus content.
- It is mostly found in area such as Gujarat, Madhya Pradesh, and Maharashtra. it is also found in states like Tamil Nadu, Andhra Pradesh, and Karnataka.
- This soil can be either light or heavy but always highly alkaline due to calcium carbonate in structure, and these soils will not support the growth of ericaceous (acid lover) plants that require acidic soil to grow.



Fig: Chalk soil.

Loam soil.

- Loam soil is found in most successful farms in regions around the world known for their fertile land. In Punjab, Haryana, Uttar Pradesh, and Bihar this type of soil is found.
- Loam soils are the mixture of sand, slit, and clay that are combined to avoid the negative effect of each type.
- As the soils are perfect balance of soil particles. They are a gardener's best friends, but still benefit from topping up with additional organic matter.
- This soil provides good drainage.



Fig: Loam soil.

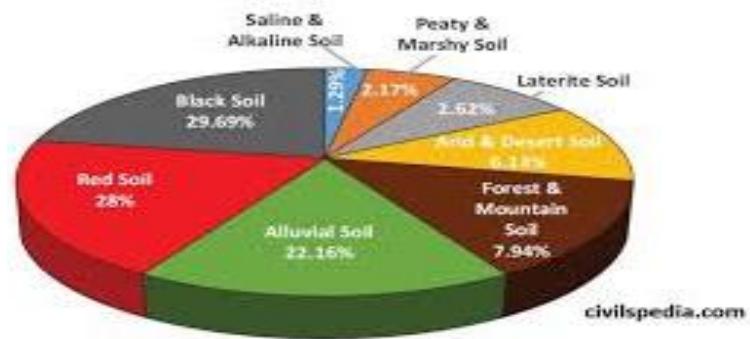
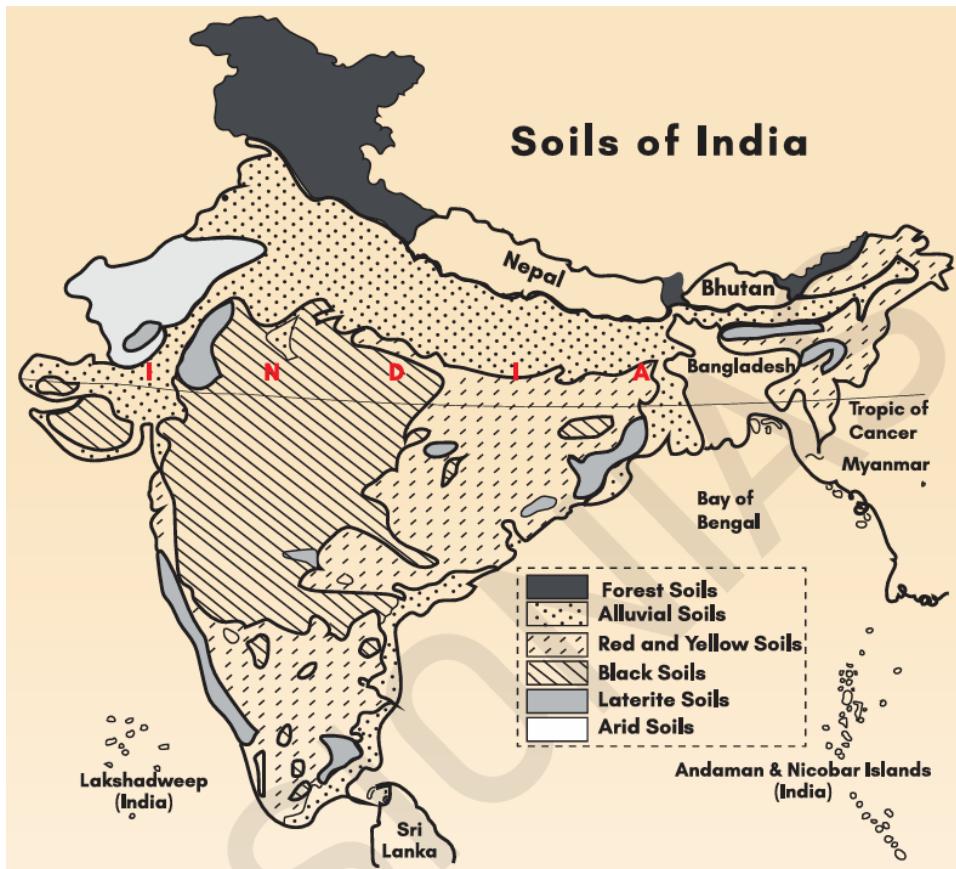


Fig: Percentage of Soil.



STUDY OF BASIC NEEDS OF AERCANUTS

Introduction

The common chewing nut, sometimes called Supari or betel nut, comes from the arecanut palm. It is widely utilized and closely associated with religious rituals by many segments of the Indian populace. Both as the world's biggest producer and consumer of arecanuts is India. Karnataka (40%), Kerala (25%) Assam (20%), Tamil Nadu, Meghalaya, and West Bengal are the principal states that grow this crop.



Fig: Arecanut- Plant and Bunch ready for Harvest.



Fig: Harvested bunch, single fruit, and nuts.



Fig: Betel leaves with arecanut and Disposable plates made from areca-Leaves.

Climate

Arecanuts are primarily grown within 28° north and south of the equator. It does not grow well at temperatures below 10°C or beyond 40°C. It grows best at temperatures between 14°C and 36°C. Temperature extremes and significant daily fluctuations are detrimental to the proper growth of palm trees. In Karnataka, arecanuts can be farmed in regions with 750 mm of annual rainfall in Maidan areas and 4,500 mm in Malnad districts. The palms are irrigated in regions experiencing extended periods of drought. A good harvest of arecanut cannot be obtained at an altitude of more than 1000 m MSL because to its susceptibility to low temperatures.

Soil

Red clay-type gravelly laterite soils contain the most area under agriculture. On addition, it can be grown on rich clay loam soils. Soils that are sticky clay, sandy, alluvial, brackish, or calcareous are not good for growing arecanuts.

Varieties

1. Swarna Mangala (VTL-12)



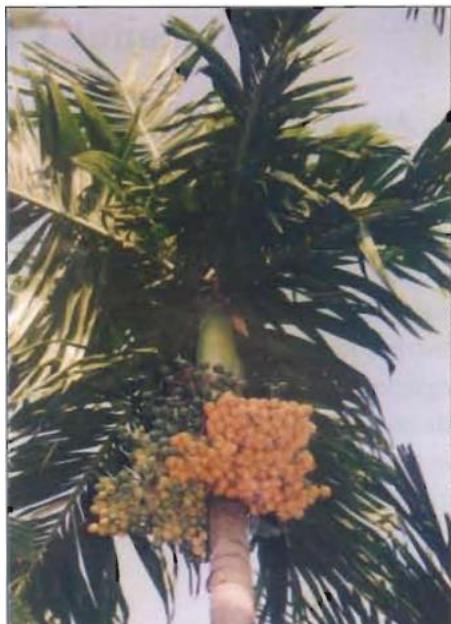
- Dependable yielder, regular bearing, and homogeneous population.
- Tall to semi-tall trees have robust stems and shorter internodes.
- Having strategically positioned bunches and a partly drooping crown.
- 3.90 is the average number of bunches/palm/year.
- Ripe nuts range in color from orange to deep yellow.
- Ripe nuts have a prominent, oblong to spherical shape.
- Embracing - By Year Four.
- Potential yield: 6.28 kg/year/palm/chali.
- 3.88 is the average yield (kg chali/palm/year).
- High recovery rate, with 26.52% of the chali from the fresh nut.
- Karnataka and Kerala's irrigated regions are suggested sites for farming.

2. Vittal Areca Hybrid- 1 (VTLAH-1)

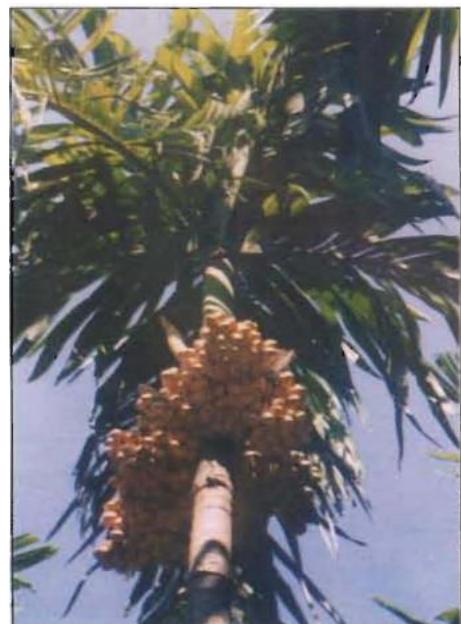


- Hybrid of Sumangala and Hirehalli Dwarf.
- Dwarf variety with a very strong stem and a smaller canopy.
- The superimposition of nodes on the stem provides palms with mechanical support.
- A crown that droops somewhat and has evenly spaced leaves.
- Moderate yielder, but nut yield stabilizes early.
- Oval, yellow to orange, medium size nuts.
- The average yield is 2.54 kg chali/palm/year.
- Yield: 5248 kg/ha.
- 26.45% was the recovery over fresh nuts.
- Advice for seed production: To produce hybrid seeds, artificial crossings between Hire Halli Dwarf and Sumangala are advised. After sorting and selection in the nursery, only sprouts or seedlings will be provided.
- Kerala and Karnataka's coastal regions are suggested for growing.
- Because of their dwarfing nature and lower production costs, they make harvesting and spraying simple.
- Because of nature's dwarfing, there is less harm from wind and sunburn.

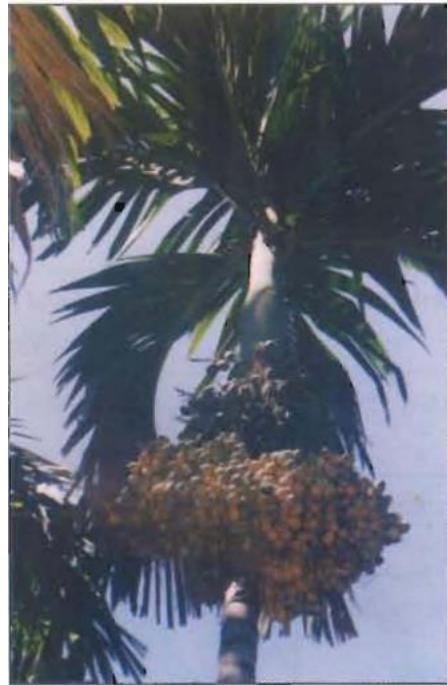
Variety	Growth habit	Shape and size of nut	Chali yield (kg/palm)	Recommended for
S.K.Local	Tall	Round, Bold	2.00	Coastal Karnataka & Kerala
*Mangala	Semi-tall	Round, Small	3.00	-do-
*Sumangala	Tall	Oval, Medium	3.20	Karnataka, Kerala
*Sreemangala	Tall	Round, Bold	3.28	-do-
*Mohitnagar	Tall	Oval to round, Medium	3.67	West Bengal, Karnataka and Kerala
SAS-1	Tall	Oval, Medium	4.60	Uttara Kannada District of Karnataka
Thirthahalli	Tall	Oblong small	2.60	Malnad areas of Karnataka
Sreevardhan	Tall	Oval, Medium	2.20	Raigad and Ratnagiri areas of Maharashtra.



Sumangala



Sree Mangala



Mohit Nagar



Kahikuchi Tall

Raising of Seedlings

Arecanuts can only be reproduced by seeds. The process of choosing and rearing arecanut seedlings involves four steps: choosing mother palms, choosing seed nuts, germination and raising the seedlings, and choosing seedlings.



Selection of mother palm

The mother palm is chosen based on several factors, including early fruit set, a consistent bearing habit, many leaves on the crown, shorter internodes, and a high leaf count.



Fig: Mother Palm



Fig: Seed Bunch.

Selection of seed nut

The nuts that weigh more than 35 grams and are fully matured should be chosen. When permitted to float on water, the chosen nuts should float upright with the calyx end pointing upward. These nuts result in more vigorous seedlings.



Fig: Seed Nut.

Primary and secondary nurseries

It is recommended to sow the seed nuts as entire fruits to achieve optimal germination. To ensure early and good germination, the nuts should be sown right away after harvest in either soil or sand and watered every day. The nuts should be sown vertically, with the calyx end barely covered, at a spacing of 15 cm. You can lightly mulch the beds with paddy straw or areca leaf.

The seedlings are to be moved to secondary nursery beds that are 150 cm wide, 15 cm tall, and a convenient length after six months in the main nursery. For a year of growth in the nursery, 30 centimetres is thought to be the ideal distance between seedlings. 25 x 15 cm, 150-gauge polythene bags filled with potting mixture Another option for raising secondary nursery is to use (top soil: FYM: sand = 7:3:2). Three-month-old sprouts ought to be utilized.

A base dose of 5 tons per hectare of decomposed farm yard manure should be applied to the secondary nursery. Because they are so fragile, areca sprouts and seedlings cannot tolerate being exposed to direct sunlight. Therefore, the nursery needs to have enough shade.

During the summer, the nursery should receive frequent watering, and during the rainy season, appropriate drainage should be supplied. Weeding should be done periodically to keep the nursery tidy.

Polybag nursery

Seed nuts may be sown directly in poly bags of 6"x9" size and 250-gauge thickness, with holes for drainage.

- **Potting mixture should be of Soil:** FYM: Sand in the ratio 7: 3: 2. Well decomposed farm yard manure or vermicompost and sieved sand should be used for potting mixture preparation.
- Solarization of soil by covering with black polythene sheet and sun drying of potting mixture for one week may be practiced to avoid any soil borne diseases.
- Daily watering during rainless period is needed to ensure desired growth.

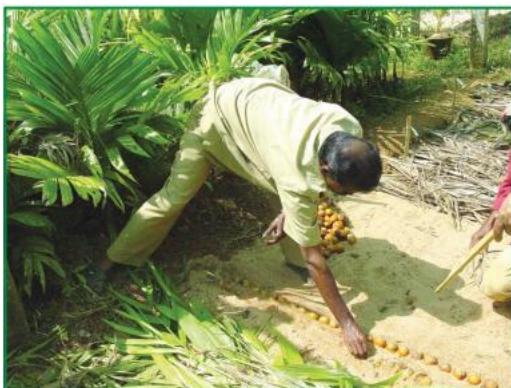


Fig: Sowing in nursery bed.



Fig: Poly bag nursery.

Nursery requirement

50,000 seedlings need 4,000 square meters of space to be maintained. Because they are so fragile, areca sprouts and seedlings cannot tolerate being exposed to direct sunlight. Therefore, the nursery needs to have enough shade. A pandal covered in coconut or arecanut leaves, a 50–75% shade net (green or black), or the planting of bananas or other quickly growing green manures around the nursery can all be used to provide shade. Throughout the

summer, the nursery should receive frequent watering, and during the rainy season, appropriate drainage should be supplied.

Regular mulching and weeding are necessary. Both widely spread arecanut gardens and the cracks between coconut plantations can be used for raising nursery plants. Polybag seedlings and arecanut nursery beds are excellent candidates for sprinkler, micro-jet, or hose irrigation systems.

Tissue cultured Areca:

The CPCRI has standardized the process of multiplying tissue culture from inflorescence to produce many plantlets of elite, dwarf, disease-free, and proven palms.



Fig: Tissue cultured area in tube and pot. Fig: Tissue cultured areca in field.

Selection of seedlings

Seedlings that are between twelve and eighteen months old should be chosen and moved to the main field. To plant, choose seedlings with the maximum number of leaves (five or more), minimum height, and maximum girth. To plant the chosen seedlings, a ball of earth should be removed and adhered to the roots.

Selection of site and layout

The crop grows best in damp environments that are shielded from strong winds and the harsh sun. The location should have excellent drainage and a sufficient supply of water for irrigation, as the areca palm is not resistant to drought or water logging. Extreme temperatures and direct sun exposure are too much for the arecanut palm to tolerate. Therefore, the chosen location needs to be shielded from the west and south. Two further factors to consider while choosing the location are the level of the water table and the depth of the soil. For optimal root

development, the soil should be deep ideally two meters or more and the water table should be low enough. Reduces the incidence of sun-scorch by aligning the rows in a north-south direction with a 35° deviation towards the south-west.

Spacing

This is dependent upon the crop's root system as well as soil depth and fertility. The best spacing for arecanut is 2.7 m X 2.7 m, according to research done at several locations with varying spacing.

Depth of planting

Deep planting is recommended in fields with adequate drainage and well-drained soils. Planting deeper creates more room for roots to grow and a stable anchorage. Shallow planting is recommended in locations with high water tables. Soil drainage should be considered while planting; in heavy soils, planting should be done no deeper than 60 cm.



Season of planting

Planting in September or October is advised in regions with a strong South-West monsoon. May and June are also good times to plant in other places.

Drainage

Adequate drainage is crucial for optimal plant growth and development. The kind of soil determines how many drainage channels are needed. There may not be as many channels in light soils, and in heavy soils, each row should have a channel constructed for the correct drainage of surplus water. The depth of the channels should be at least 15 to 30 cm lower than the planting depth of the seedlings.

Shading

The palms are quite vulnerable to sunburn. Protecting the seedlings from the sun's direct rays is imperative. This can be accomplished by growing crops like bananas in between two rows of arecanuts, or by covering the plants with areca or coconut leaves. Most cases of sunburn occur between October and January. Even the immature palm stems need to be shielded at this time. This can be accomplished by planting a fast-growing shade plant on the garden's western and southern borders.

Nutrient Requirement

It is advised to apply 100 g N (220 g urea), 40 g P₂O₅ (200 g rock phosphate), and 140 g K₂O (235 g muriate of potash) annually, along with 12 kg of compost and green leaves per palm. Two divided dosages of the fertilizers are to be applied. In May and June, one third of the fertilizer is applied; in September and October, the remaining two thirds are applied along with the organics. Fertilizers are sprayed in basins excavated to a depth of 15-20 cm and a radius of 0.5-1.0 m, with 20 cm remaining at the palm's base. The dirt is coated with soil and organic matter after application, and it is wrapped up.

Organic matter recycling

One hectare of areca garden can yield 5.5 to 6.0 tonnes of garbage annually on average. Areca palms can benefit greatly from using this as an organic source of nutrition. However, applying these wastes directly to the garden will not immediately supply the crop's nutrient needs because it will take a long time for them to decompose. Because of this, these materials can be efficiently composted by earthworms and utilized as organic manure in areca gardens.

Wastes from arecas are chopped into 10-cm-long pieces and then heaped to make vermicompost. The heap needs to be combined with 10 kg of slurry made from cow dung for every 100 kg of waste, and it should be watered every day for two weeks. Next, beds with a width of one meter and a convenient length are made of the chopped material. Trenches or cement tanks can be utilized for this. Earthworms are released at a rate of 1000 per square meter on top of a 2 cm layer of cow dung that alternates with a layer of waste material that is 10-15 cm thick. Within sixty days, the wastes are transformed into finely granular, odorless vermicompost. The population of earth-worms doubles currently. Vermicompost of about 8 kg

per palm year suffices to cover the crop's nitrogen needs in relation to nitrogen. You can utilize *Eisenia foetida* and *Eudrilus eugeniae*, two species of earthworms.



Vermicompost.



Earthworm.

Cultural operations

The cultural practices differ from place to place. The primary goal of farming in Maland tracts is to aerate the soil and restore its fertility following the monsoon's torrential downpours. Because the soils of maidan tracts are heavy, the goal of agriculture is to retain soil moisture and avoid hardening the soil. It was discovered that cultivation often increased yield by 10% to 20%. Digging can be done once every two years in light soils. However, annual digging is required in heavy soils.

A higher yield was obtained with clean cultivation. Contour planting produced the largest yields when planted on hill slopes. Another practice used in the arecanut gardens is mulching. This controls evaporation in the summer, erosion in the wet seasons, and weed growth. For use as mulch in areca gardens, chopped areca leaves, grass, arecanut husk, and dry leaves gathered from the forests can be used.

Crossing Technique

The hybridization process in Arecanut involves emasculating the section of the rachilla bearing male flowers shortly after the inflorescence emerges and covering the spadix containing the female flowers with a cotton bag. The intended male parent's anther is rubbed against the stigma or pollen is dusted on the stigmatic surface by removing the bag when the female flowers open. The moment pollination is complete, the bag is replaced over the inflorescence.

Every day for almost a week, the procedure is repeated until all the female flowers in the spadix open and, after 20 days, fruit set is visible. Male flowers that have fully opened are removed from the chosen palms and placed in a reagent bottle with a 0.5 percent solution to facilitate artificial pollination.



Emasculation



Pollination.

Mixed Cropping

The primary factors that make inter/mixed cropping imperative in arecanut plantations are the extended pre-bearing time, costly investment, and low returns in the early years. In coastal Karnataka and Kerala, interspaces can be used to cultivate a mixed crop of banana, pepper, and cocoa. In the Maidan regions of Karnataka and West Bengal, acid lime and betel vine are recommended.



Arecanut with Banana.



Arecanut with cocoa.



Areca nut with pepper.

In the middle of four palm trees, banana and arecanut can be planted together. In addition to the primary crop, two ratoon crops may be planted, and the entire crop must be replanted after three years. Two rooted pepper cuttings should be planted on the northern side of areca palms at 75 cm once the palms have reached the age of 6 to 8 years. A cocoa garden's perfect mixed crop is cocoa.

Crop	Pit size(cm)	Spacing (m)	Fertilizer N:P:K g/plant	Suitable varieties
Banana	50x50x50	2.7 x 5.4	160:160:320	Mysore poovan, Karpuravally, Robusta, Malbhog
Pepper	50x50x50	2.7 x 2.7	100:40:140	Karimunda and Panniyur-I
Cocoa	50x50x50	2.7 x 5.4	100:40:140	Grafts, F1 hybrids
Acid lime	50x50x50	2.7 x 5.4	300:250:500	-
Betelvine	50x50x50	2.7 x 2.7	100:40:140	-

High density multispecies cropping system

An arecanut garden that grows multiple mixed crops at the same time is referred to as a high-density multispecies cropping system. Cocoa, pepper, and bananas can all be cultivated together in coastal Kerala and Karnataka. In the maidan regions of Karnataka, it is profitable

to cultivate bananas, pepper, and acid limes together. For greater profits, it is advised in West Bengal to grow acid lime, betel vine, and bananas together in arecanut gardens.

Plant protection

Pests

Mites (red and white)

The lower surface of arecanut leaves is where mites feed. The colony is hidden by white spiderwebs. Leaf has a copper tint with yellow specks. Summertime is when the onslaught is most acute. Applying 2 millilitres of water with Kel thane (Dicofol) on the underside of infected leaves will help control the insect. If the bug reappears, spray again at IS-20 days.



Spindle bug (*Carvalhoia arecae*)

The disease manifests as linear, dark brown necrotic lesions on spindles, which are visible as patches on exposed leaves. The pest can be efficiently controlled by spraying 10 litres of water with dimethoate (Rogor 30EC) ISmV on the spindles of areca palms in affected areas. It is necessary to apply very fine spraying, avoiding the sun's rays during the day.



Fig: Spindle Bug.

In heavily infected regions, placing 2g of pharate granules (Thimet 10G) in perforated poly-sachets inside the inside leaves of areca palms during April is an efficient way to keep the gardens free of spindle bugs.

Root grub (*Leucopholis burmeisteri*)

Grubs consume developing roots. The sickly-looking, yellowing leaves, tapering stems, and decreased production are indicative of infested palms. The following actions can be taken to manage the pest:

- Ensure adequate drainage.
- Once eight to ten days of premonsoon showers have passed, gather mature beetles between 6.30 and 7.30 PM and dispose of them.
- For three years, apply ISg Phorate (Thimet 10G) to each palm twice a year in May and September–October. Use organic materials, such as neem cake (2 kilogram per palm year), to enhance the soil's structure and promote root regrowth.



Fig: Root grub

Leaf spot (*Colletotrichum gloeosporioides*; *Phyllosticta*)

The South West monsoon season is when the sickness first manifests. Up to ten years old plants are more vulnerable. On the lamina, there are tiny, spherical dots that range in color from dark brown to black.

Growth III seedlings are stunted because of severe infection. Strict observance of phytosanitary precautions is required, including the removal and destruction of sick leaves.

You can get control by misting either 0.3% Dithane M-45 (3g / l of water) or 1% Bordeaux combination.

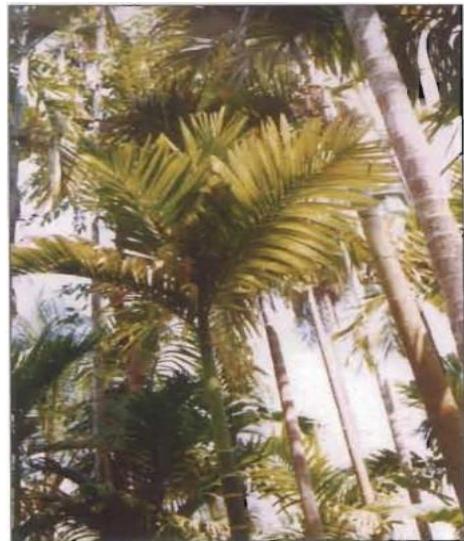


Yellow leaf disease

This is caused by Phytoplasma and transmitted by the vector, *Protista moesta*. Yellowing of leaves is the main symptom. Yellowing starts from the tip of the leaflets of the outer leaves and sometimes seen in the middle whorl. Yellowing spreads gradually extending from the margin to the middle of lamina; portions near the midrib remain green. In advanced stages, yellowing spreads to all leaves completely and they dry and falloff.

Kernel of the nuts of affected palms become soft, show blackish discolouration and assumes a spongy texture. Since the disease is not amenable to control by conventional plant protection measures, other means of controlling the harvested, which fetches only lower price in disease must be adopted. the market.

The harvested nuts will yield of the disease affected garden can be sundried for about 45 days. It is essential be sustained by adopting the recommended management practices such as balanced fertilizer application (NPK @ 100: 4140g/palm/year) and application of additional dose of Super phosphate with lime (1 kg/palm). Application of organic manure @ 12kg/palm/year along with provision of summer irrigation and drainage can improve the condition of the palms. Remove the diseased palms in the mildly affected areas to prevent the spread of the disease and adopt need-based plant protection measures against other pests and diseases.



CHAPTER 3

TASK PERFORMED

Learned about the many weather conditions needed for crop production, as well as the soil characteristics for various crops and how they impact cropping and can be regulated. information regarding the impact of weather and climate on agriculture is also included. studied how various projects address farmers' issues, various cropping technologies, soil testing, post-harvest methods, how satellite data can aid in agricultural advancements, how farmers will find crop yield prediction to be extremely helpful, and the agro forecasting system.

Learned how to analyse the soil and identify diseases to boost crop yields, as well as how to cultivate crops using various technologies.

INTERACTION

- Interacted with Dr. M.S. Dhananjaya Associate professor (OFRC) at Krushi Maha Vishva Vidyalaya on agro forecasting model. And got knowledge about arecanut yield forecasting to help farmers using different machine learning techniques.
- Interaction with Mr. Vilakar doing Ph.D. in horticulture course at Krushi Maha Vishva Vidyalaya Shivamogga got knowledge about crop production technologies like poly house planting, harvest technology, soil sampling, layout and planting and post-harvest technologies etc, got the information about soil testing, shade net cultivation, layout and planting, Soil formation, and outer planting and cultivation.

VISIT

Purpose

To have knowledge about current projects going on agriculture to solve Problems of farmers.

Outcome

I learned about an agro forecasting model that Mr. Vilakar created using various machine learning techniques. This model outputs the current arecanut market supply and demand, assisting farmers in making decisions about which crops to grow to reduce their risk in the event of a market failure.

Horticulture College

Purpose

To have the knowledge about basic needs of agriculture like soil testing, water irrigation and cropping techniques, Soil Sampling, different advanced crop cultivation techniques etc.

Outcome

Got information about soil sampling, polyhouse crop production, post-harvest technology and terrace gardening, shade net crop cultivation, soil formation, pathology (study of disease), outer cultivation, layout, and planting.



Fig 1: Visited College at Shivamogga.





Fig 2: Department of Horticulture.

Above figure represents the shade net crop cultivation technology where the crops are cultivated under the controlled sunlight conditions and maintaining shade inside the house using light controlled nets.

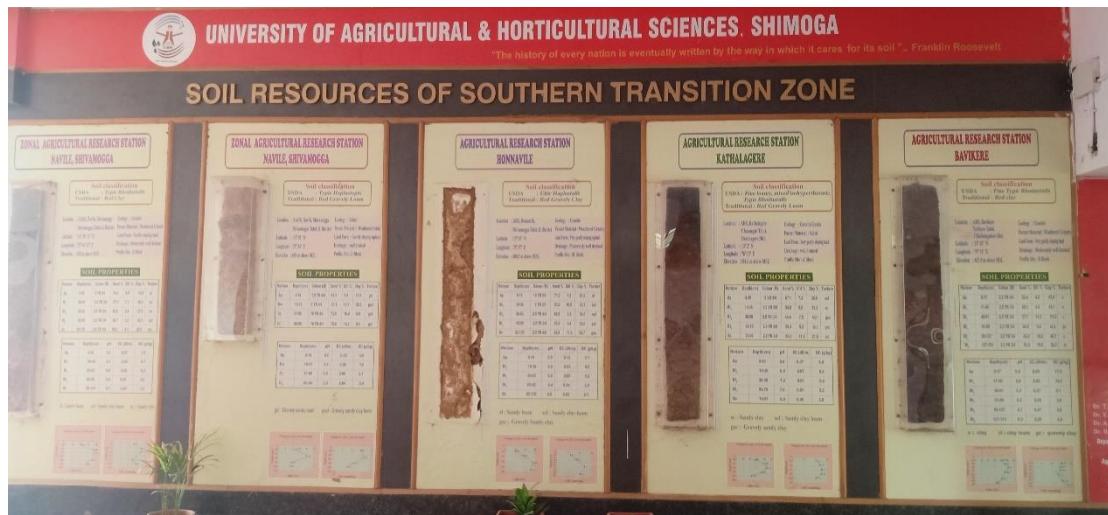


Fig 3: Different types of soils in different location.

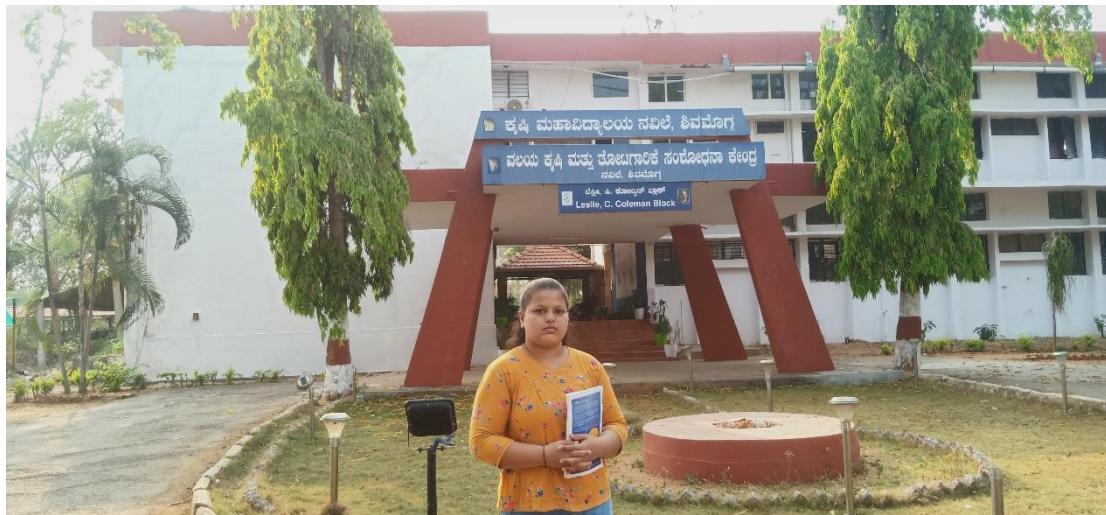


Fig 4: Soil testing Laboratory.



Above figure represents the polyhouse used to cultivate the crops under desired climatic conditions.



Fig: Different Variety of Soils.



Fig: Different Variety of Rocks and Minerals.



Fig: Repository shaker.

Above figure represents the Repository shaker used to shake the soil sample well while soil testing.



Fig: pH Spectro meter.



Fig: Atomic Absorption Spectro Photo meter.



Fig: KEL PLUS Auto Kjeldhal Nitrogen Analyzer.

Product Description

A. KEL PLUS Macro Six Sample PC Compatible System (250 ml capacity)

Model KES 12 L R TS

Application: For digestion of plants, soils, water, food & feed, Fertilizers & pesticides, cereals, pulses, heavy metals, general NPK digestion, etc.) Microprocessor based temperature controller (Ambient to 4500C), Digital display of temperature and time, Casted Aluminium Alloy Heaters for uniform heating and even digestion, Auto fix exhaust manifold system for absolute fume trapping, KEL FLOW suction assembly for pollution free analysis, Feather touch membrane keys with built in safety features

B. Acid Neutralizer Scrubber Model KEL VAC (4STAGE)

Four Stage Semi-Automatic Acid Neutralizer Scrubber (Regular Version)

C. Automatic Nitrogen Distillation System Model: CLASSIC DX

The Ultimate Fully Auto Run Completely Programmable Microtech PC Compatible Auto Sequencing Distillation System

D. Refrigerated Water Cooling System Model: KEL FREEZ - T

Refrigerated Water Cooling Circulating System with Digital Display



Fig: Flame Photo meter.

It is a micro-controller-based instrument designed to provide automation in operation, measurements, and end-result presentation. It does the estimation of Sodium (Na), Potassium (K), Lithium (Li), and Calcium (Ca) in single aspiration of a sample.

For user's convenience, the instrument offers two measuring modes:

- Low Concentration
- High Concentration.

There is facility of curve fitting correction for non-linear emission characteristics of element, at higher concentration, store (save) setup for frequently used, measurement and the same can be recalled whenever required with a press of a button. Also, re-standardization using single standard to minimize the effect of any unforeseen drift without going for the full recalibration. 4 Line 20-character LCD readout provides easy user interface & presentation of results. A Centronics printer port provides print out of results on EPSON compatible Dot Matrix Printer, Printer is an optional.

EASY MENU DRIVEN OPERATION

SYNTRONICS
FLAME PHOTOMETER -128
READY

0 - View Directory
1 - Delete Setup
2 - Delete All Setup
3 - Edit Date-Time

Display

Main Menu

4 - Set Flame
5 - Set Flame Temp.
6 - Backup Data
7 - Help For FPH 128

Main Menu

Adjust Flame
Flame Output. in mU

Set Flame

MM SETUP
1 - Low Concentration
2 - High Concentration

Conc. Measurement

SPECIFICATIONS

System Package : Main unit-128 & Compressor unit-126

ELEMENTS	LOW CONC. MODE (Max.) Without Dilution	HIGH CONC. MODE (Max.) Without Dilution
Na	10 ppm	100 ppm
K	10 ppm	100 ppm
Li	2 ppm	50 ppm
Ca	100 ppm	300 ppm

Suitable dilutions should be made for solutions of higher concentrations than given in the above table.

A curve fitting software is provided for the High concentration mode.

FULL SCALE SENSITIVITY

Na : 2 ppm	K : 1 ppm	Li : 1 ppm	Ca : 30 ppm
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Fig: Digital Conductivity meter.

El's Digital Conductivity Meters are reliable and accurate test instruments for measurement of Conductivity of aqueous solutions. They measure Conductivity and TDS in five ranges. The Resolution is $0.1 \mu\text{S}/\text{cm}$ and 0.1 ppm respectively, in the lowest range. The cell constant is flashed on a digital display & can be adjusted from the front panel.

These instruments are ideal for monitoring salt contents in water and soluble salts in soils. They are extremely useful instruments for agriculture and soil analysis labs, swimming pools, fertilizer plants, petroleum refineries, textile plants etc.



Fig: Spectro Photo Meter.

A spectrophotometer is an analytical instrument used for the objective calculation of visible light, UV light or infrared light emission or reflection. Spectrophotometers measure intensity as a function of the wavelength of the light source.

Conclusion

Gained knowledge of soil conditions for different crops, how it affects cropping and how it can be controlled, about different weather condition required for crop production. Also, about the information about how climate and weather conditions affect the agriculture.

Got the information about how crop cultivation can be made using different cultivation technologies and how soil testing, disease detection can be made to increase the crop yield.

CHAPTER 4

REFLECTION NOTES

SUMMARY

During a recent visit to an agriculture college, I had the opportunity to observe various aspects of agricultural education and research. The visit primarily focused on soil testing, a crucial component of agricultural management. I attended lectures by faculty members on soil science, where fundamental concepts such as soil composition, structure, and fertility were discussed. The lectures provided insights into the importance of soil testing in optimizing crop production and maintaining soil health. I toured the college's soil testing laboratory. I observed the process of soil sample collection, preparation, and analysis. The laboratory was equipped with modern instruments for assessing soil pH, nutrient levels, and other key parameters.

To gain practical experience, I participated in soil sampling exercises in the college's experimental fields. I learned proper sampling techniques and how to interpret soil test results to make informed decisions regarding fertilizer application and soil amendments. Throughout the visit, I had the opportunity to interact with faculty members and researchers specializing in soil science. They shared their expertise and experiences in addressing soil-related challenges faced by farmers and offered valuable insights into sustainable soil management practices. The visit concluded with a reflection session, where discussed the significance of soil testing in optimizing agricultural productivity while minimizing environmental impacts. I left with a deeper understanding of the importance of soil health and the role of education and research institutions in advancing agricultural practices.

Overall, the visit to the agriculture college provided a comprehensive overview of soil testing and its significance in sustainable agriculture. It emphasized the importance of integrating theoretical knowledge with practical skills to address real-world agricultural challenges effectively.

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