The Complete Book on Coconut & Coconut Products
(Cultivation and Processing)
<table>
<thead>
<tr>
<th>Code:</th>
<th>ENI178</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format:</td>
<td>Paperback</td>
</tr>
<tr>
<td>Indian Price:</td>
<td>1100</td>
</tr>
<tr>
<td>US Price:</td>
<td>125</td>
</tr>
<tr>
<td>Pages:</td>
<td>496</td>
</tr>
<tr>
<td>ISBN:</td>
<td>8178330075</td>
</tr>
<tr>
<td>Publisher:</td>
<td>Pacific Business Press Inc.</td>
</tr>
</tbody>
</table>
Coconut is one of the oldest crops grown in India and presently covers 1.5 million hectares in this country. Found across much of the tropic and subtropical area, the coconut is known for its great versatility as seen in the many domestic, commercial, and industrial uses of its different parts. Coconuts are part of the daily diet of many people. Its endosperm is initially in its nuclear phase suspended within the coconut water. As development continues, cellular layers of endosperm deposit along the walls of the coconut, becoming the edible coconut flesh. When dried, the coconut flesh is called copra. The oil and milk derived from it are commonly used in cooking and frying; coconut oil is also widely used in soaps and cosmetics. The clear liquid coconut water within is a refreshing drink and can be processed to create alcohol. The husks and leaves can be used as material to make a variety of products for furnishing and decorating. It also has cultural and religious significance in many societies that use it. India stands third in the production of coconut in the world. There are only two distinguishable varieties of coconut; the tall and the dwarf. As a result of cross pollination in the tails, a wide range of variations occur within the same variety. Coconut based cropping/farming systems promote on farm diversity and strengthens ecological base of coconut farming. Coconut husk is the raw material for the coir industry. It is also used as a domestic fuel and as a fuel in copra kilns. Coconut oil comes under edible/industrial group, is used as cooking oil, hair oil, massage oil and industrial oil. It is dominated by saturated fats and high percentage of lauric acid. India accounts for the 18% of total coconut production in the world and it is the third largest coconut producing country in the world. Coconut processing adds value, and a number of products like coconut oil, desiccated coconut, coir fibre, pith, mattresses, desiccated coconut (DC), coconut cream, coconut milk, spray dried coconut milk powder, coconut shell products, shell charcoal, shell powder, virgin coconut oil are obtained. The demand for coconut oil increases 15 to 20 % during the festival season. Coconut oil for edible purposes is now being claimed to be the second best edible oil in the world, after Olive oil. Coconut shell charcoal is most widely used as domestic and industrial fuel.

Some of the fundamentals of the book are product diversification in coconut, future of coconut oil, scope for product diversification, varieties of coconut, farming systems in coconut, organic farming of coconut, spices and herbs, establishment and maintenance of organic coconut plantations, production of organic spices, medicinal and aromatic plants along with coconut, crop improvement, green manuring in coconut garden organic recycling in coconut, soil moisture conservation in coconut garden, harvest and post harvest technology, integrated farming in coconut holdings for productivity improvement, machinery and processing of desiccated coconut, coconut processing sector in India, etc.

Coconut plays an important role in the economic, social and cultural activities of millions of people in our country. India is a major producer of coconut in the world. Coconut provides food, edible oil, industrial oil and health drink to humanity. All parts of coconut tree is useful in one way or other and the crop profoundly influences the socio economic security of millions of farm families. The present book contains the methods of cultivation and processing of coconut. This book is very beneficial for agriculturist, researchers, professionals, entrepreneurs, agriculture universities etc.

Content:
1. PRODUCT DIVERSIFICATION IN COCONUT

Future of Coconut Oil
Scope for Product Diversification
Philippines
Sri Lanka
India
Other Uses
Conclusion

2. VARIETIES OF COCONUT

Tall Variety
West Coast Tall
East Coast Tall
Lakshadweep Ordinary
Lakshadweep Micro
Andaman Ordinary
Andaman Giant
Kappadam
Laguna
San Ramon
Macapuno
Spicata
Performance of exotic cultivars under Indian conditions
Dwarf Variety
Ghowghat Green Dwarf
Chowghat Orange Dwarf
Malyan Dwarf
Gangabondam
Ayiramkachi
Thembili (King Coconut)
Coonino
Mangipod
Niuleka

3. FARMING SYSTEMS IN COCONUT

Rooting Pattern
Crown Structure And Light Transmission
Water Use Efficiency
Nutrients
Choice of Inter / Mixed Crops
Criteria For Selection Of Inter/
Mixed Crops

4. ORGANIC FARMING OF COCONUT, SPICES AND HERBS

Organic Coconut Scenario
Scope For Organic Production of Coconut In India
5. PLANTING MATERIAL
Collection of Seednuts
Raising Nursery
Nursery Care
Seedling Selection
Polybag Nursery
Care of Polybag Nursery

6. GARDEN ESTABLISHMENT
Site Selection
Time of Planting
Planting System
Land Preparation And Preparation of Pits For Planting
Replacement of Unproductive Palms
Replanting
Under Planting
After Care

7. CROP IMPROVEMENT
Varieties
Tall Group
West Coast Tall
East Coast Tall
Lakshadweep Ordinary
Lakshadweep Micro
Andaman Ordinary
Kappadam
VPM-3
ALR (CN) 1
Dwarf Group
Dwarf Green
Dwarf Orange
Malayan Dwarf
Gangabondan
Choughat Orange Dwarf
Tall And Dwarf Hybrids
VHC 1
VHC 2
VHC 3

8. CROP PROTECTION
Insect Pests
Rhinoceros Beetle, Oryctes rhinoceros L.
Management
Red Palm Weevil, Rhynchophorus ferrugineus Oliv. (Curculionidae: Coleoptera)
Management
Black Headed Caterpillar, Opisina arenosella Meyr. (Cryptophasidae: Lepidoptera)
Management
Termite, Odontotermes obesus Ramb. (Termitidae: Isoptera)
Management
Lacewing Bug, Stephanitis typicus Dist. (Tingidae: Hemiptera)
Scale Insect, Aspidiotus destructor Sign. (Diaspididae: Hemiptera)
Management
Mealybug, Pseudococcus longispinus (T.), P. citriculus G., Palmicultor palmarum (Eh.) (Pseudococcidae : Hemiptera)
Management
Slug Caterpillar, Latoia lepida Cram (Cochliidiidae: Lepidoptera)
Slug Caterpillar, Contheyla rotunda H.,
Slug Caterpillar, *Macroplectra nararia* M. (Cochlidiidae: Lepidoptera)
Management

White Leaf Roller, *Gangara thyrsis* M. (Hesperiidae: Lepidoptera)
Green Leaf Roller, *Suastus gremius* F. (Hesperiidae: Lepidoptera)
Bag Worm, *Manatha albipes* M. (Psychidae: Lepidoptera)
Management

Nut Borer, *Cyclodes omma* V.H. (Noctuidae: Lepidoptera)
Lesser Coconut Spike Moth, *Batrachedra arenosella* Wlk. (Cosmopterygidae: Lepidoptera)
Flower Caterpillar, *Syntomis passalis* Fab. (Cosmopterygidae: Lepidoptera)
Ash Weevil, *Myllocerus curvicornis* Fab. (Curculionidae: Coleoptera)
Stem and Bark Weevil, *Diocalandra stigmaticollis* G. (Curculionidae: Coleoptera)
Management

Shot Hole Borer, *Xyleborus perforans* W. (Scolytidae: Coleoptera)
Management

Coreid Bug, *Paradasynus rostratus* Dist. (Coreidae: Heteroptera)
Management

Root Grub, *Leucopholis coneophora* Burm. (Melolonthidae: Coleoptera)
Management

Ant, *Dorylus orientalis* W. (Formicidae: Hymenoptera)
Red Ant, *Oecophylla smaragdina* F. (Formicidae: Hymenoptera)
Non Insect Pests

Mites
Management

Package of Recommendations
Management

Nematodes
The Burrowing Nematode, *Radopholus similis* (Nematoda: Rhabditidae)
Management

The Coconut Nematode, *Rhadinaphelenchus Cocophilus*
9. INTEGRATED DISEASE MANAGEMENT

Bud Rot Causal Organism
Symptom
Control
Preparation Of 1% Bordeaux Mixture
Bordeaux Paste
Root Disease
Symptoms
Management

Preparation Of 1% Bordeaux Mixture
Bordeaux Paste
Leaf Rot
Causal Organisms
Symptom
Control
Stem Bleeding Disease
Causal Organism
Symptom
Control
Thanjavur Wilt/Ganoderma Disease
Causal Organism
Symptom
Management
Mahali (Fruit Rot And Nut Fall)
Causal organism
Symptom
Control
Leaf Blight Or Grey Leaf Spot
Symptom
Control
Tatipaka Disease
Symptom
Management
Crown Choke Disease
Symptom
Control

10. GARDEN MANAGEMENT
Intercultivation
Fertilizer Recommendations For
Coconut - A Summary
Deficiency Of Nutrients
Nitrogen
Potassium
Magnesium
Boron
Sulphur
Chlorine
Green Manuring In Coconut Garden
Organic Recycling In Coconut
Organic Recycling in Coconut Based Farming System
Leguminous Green Manure Plants for Sustaining Coconut Yields
Basin Management with Legume Cover Crops
Growing of Gliricidia as green leaf manure crop
Recycling of organic wastes from coconut palm
Direct utilization of coconut wastes as mulch
Vermicomposting
Coir pith composting
Water Management
Automatic Irrigation System
Drainage
Weed Control
Soil Moisture Conservation In Coconut Garden
Coconut Based Cropping Systems
Rooting Pattern
Canopy Structure And Light Utilization
Criteria For Selection Of Subsidiary Crops
Intercropping Systems
Tuber Crops
Rhizome Spice Crops
Cereals
Vegetables
Pulses
Oil Seeds
Fruit Crops
Floriculture
Medicinal And Aromatic Plants
Mixed Cropping
Cocoa
Pepper
Clove
Nutmeg
Cinnamon
High Density Multispecies Cropping System
Coconut Based Mixed Farming System
Coconut Based Sericulture System
Economic Aspects Of Coconut Cultivation

11. HARVEST AND POST HARVEST TECHNOLOGY
Harvesting
Storage And Seasoning
Post Harvest Processing
Husking
Copra Processing
Sun Drying
Solar Dryer
Indirect Drying
Small Holder's Copra Dryer
Smoke Free Copra Dryer For Medium Holdings
Large Holder's Copra Dryer
Electrical Copra Dryer
Ball Copra
Copra Grading
Copra Moisture Meter
Coconut Products And Byproducts
Desiccated Coconut
Tender Coconut Water
Snow Ball Tender Nut (Sbtn)
Matured Coconut Water
Nata-De-Coco
Coconut Milk And Milk Products
Coconut Cream
Coconut Spray Dried Milk Powder
Toddy
Coconut Byproducts
Byproducts From Husk
Coconut Shell Charcoal
Activated Carbon
Shell Flour
Coir And Coir Products
Handicrafts From Coconut
Coconut Wood Processing
Mushroom Cultivation Using Coconut Byproducts

12. INTEGRATED FARMING IN COCONUT HOLDINGS FOR PRODUCTIVITY IMPROVEMENT

13. FINANCIAL ASSISTANCE TO PROCESSING INDUSTRIES

14. COCONUT HUSK
Coir
Coir Geotextile
Coir Pith

15. COCONUT OIL
Properties Of Coconut Oil
Extraction Of Coconut Oil
Coconut Oil Based Oleochemicals
Coconut oil based Oleochemicals:
Coconut Oil Cake

16. MACHINERY AND PROCESSING OF DESICCATED COCONUT
Abstract
Introduction
Desiccated Coconut
Processing Of Desiccated Coconut
Plant & Machinery For Desiccated Coconut
Drying Of Desiccated Coconut
The Pilot Plant
Results And Observations
Scale-Up
Quality Of Desiccated Coconut
Conclusions

17. QUALITY STATUS OF DESICCATED COCONUT
Abstract
Introduction
Materials And Methods
Results And Discussion

18. COCONUT PROCESSING SECTOR IN INDIA
Trend In Area, Production And Productivity
Coconut Industry Vs Indian Economy
Present Status Of The Coconut Processing Sector
Traditional Coconut Products And Technological Innovations
Copra
Sun drying
Kiln drying
Indirect hot air drier
Solar drying
Improvement in drying
Coconut Oil
Desiccated Coconut
Coir and Coir Products
Emerging Technologies In The Processing Sector
19. VINEGAR FERMENTATION WITH SPECIAL EMPHASIS ON POSSIBILITIES OF UTILIZATION OF MATURED COCONUT WATER

Production And Volume
Raw Materials
Production Of Vinegar
Acetification Methods
The Orleans Process or Slow Process or French Process
Quick Process or German Process
Submerged Method
Other Modern Processes
Coconut Water As Possible Substrate For Vinegar Fermentation
Preparation of Coconut Water Medium
Pfa Specifications For Vinegar Standards
Problems In Vinegar Manufacture
Ageing Of Vinegar

20. ACTIVATED CARBON FROM COCONUT SHELLS: SIGNIFICANCE AND PROSPECTS

Protection Against Toxic Gases
Air Purification And Recovery
Purification Of Various Gases
Filters For War Gases/ Nuclear Fall-Outs
Purifying Working Environments And Elimination Of Odours
Recovery Of Solvents And Other Vapours
Typical Plants where Such Solvents are Recovered
Separation Of Hydrocarbon Mixtures
Purification Of Fermentation
Carbon Dioxide
Recovery Of Gold
Carbon Batteries
Miscellaneous Applications
Activated Carbon As Catalyst
And Catalyst Carriers
Impregnated Carbons
Activated Carbon In Pollution
Control
Conclusion

21. COMMERCIAL EXPLOITATION OF COCONUT PITH
Introduction
Coconut Pith
Utilisation Of Pith : Problems
Utilisation Of Pith : Prospects
Pith Fuel Briquettes Briquetting With Binders
Pith As An Ingredient In Agricultural/
Horticultural Farms
Pith As A Heat Insulating Material
Conclusion

22. MODERN SEMI AUTOMATIC COPRA MANUFACTURING UNIT USING
WASTE HEAT RECOVERY SYSTEM
Introduction
Present Uses Of Coconut Shell In India
Charcoal Manufacture And Waste
Heat Recovery Unit
Chemical Analysis And Calorific Value
Whu And Pyrolysis Process
Modern Semi-Automatic Copra
Drying Unit
Economic Of A Modern Copra
Drying Unit
Inference

23. COCONUT KERNEL PRODUCTS
Virgin Coconut Oil
Desiccated Coconut
Coconut Milk
Spray Dried Coconut Milk Powder
24. FOOD PRODUCTS
The Wet Meat Or Kernel
Coconut Milk and Related Products
Coconut Skim Milk And Related Products
Coconut Protein And Edible Oil
Krauss-Maffei/C.F.T.R.I. Process
Texas A & M University Process
The TPI Process
The Modified Solvol Process
Desiccated Coconut
Removal of the Karnels and Paring
Washing
Sterilising
Disintegrating and Desiccating
Edible Copra
Coconut Water
Foods uses of Coconut Water
Other Miscellaneous Uses
Toddy And Toddy Products
Tapping
The yield of Toddy
Suitability of Dwarf Palms
Tapping and Subsequent Yield of Nuts
Composition and Uses of Fresh Toddy
Jaggery
Refined Sugar
Treacle
Fermented Toddy
Arrack
Coconut Vinegar
Miscellaneous Products Of Food Value

25. COMMERCIAL PRODUCTS
Milling Copra
Preparation of Coconuts before Drying
Copra Drying Process and Methods
Sun Drying
Smoke Drying or Drying by Direct Heat in Kilns
Drying by Indirect Heat
The Quality of Copra
Oil Content of Copra
Storage of Copra
Deterioration of Copra
Grading of Copra
Moisture Determination
Coconut Oil
Oil Milling
Yield Of Oil From Copra
Physical Properties
Chemical Properties
Rancidity
Ensuring the Quality of Oil
Quality Standards for Coconut Oil
Uses of Coconut Oil
Consumption Of Coconut Oil And Heart Ailments
Coconut Cake
Use Of Coconut Cake
Coir Or Coconut Fibre
Natural Retting
Mechanical and Chemical Methods of Retting
Extraction of White Fibre
Extraction of Brown Fibre
Yield Of Fibre From Husk
Varieties Of Fibre And Grades
Chemical Composition
Spinning of Coir Yarn
Utilisation of Coir Fibre and Yarn
Rubberised Coir
Coir Pith Or Coir Dust

26. COCONUT SHELL AND MISCELLANEOUS PRODUCTS
Coconut Shell Charcoal
Covered Pit Method
Modified Pit Method
The Drum Method
Uses
Properties
Distillation Of Coconut Shells
Activated Carbon
Coconut Shell Flour
Other Uses
Miscellaneous Products

27. BY-PRODUCTS UTILISATION
Commercial Exploitation Of
Coconut Pith
Pith as a Heat Insulating Material
Coconut Oil
Coconut Product Diversification
Copra Making
White Copra Production
Ball Copra
Vinegar Making
Bio-Confectionaries from Coconut Water
Benefits from Bio-Sweets
Desiccated Coconut
Canning of Coconut Haustorium
Coconut Cream
Coconut Shell Powder
Coconut Milk
Coconut Oil Derivatives
Coconut Oil as an Edible Oil
Production Of Cocopeat
Granulated Charcoal
Biodiesel Plant-Oleochemical
Rubberised Coir Fibre Cushions
Coir Industry
Coconut Shell Based Products
Shell Charcoal
Coconut Shell and Wood Handicrafts
Activated Carbon from Coconut Shells
Protection against Toxic Gases
Purification of Various Gases
Recovery of Solvents and Other Vapours
Typical Plants Where Such Solvents are Recovered
Separation of Hydrocarbon Mixtures
Purification of Fermentation Carbondioxide
Recovery of Gold
Carbon Batteries
As Catalyst and Catalyst Carriers
Impregnated Carbons
Global Competitiveness Of Coconut Industry
Exports
Competition from Other Oilseed Crops
Low Profitability
Fluctuating Prices
Inconsistent Supplies of Product
Strategies For Future

28. MATURE COCONUT
Optimum Stage For Harvesting
Coconuts
Dehusking
Home Preservation Of Split Coconuts
Mature Coconut Water Products
Coconut Water Beverages
Coconut Vinegar
Nata-De-Coco
Other Products

Sample Chapter:
Farming Systems in Coconut
A perennial crop like coconut, which is committed to the land for decades, utilizes the natural resources like light, water and nutrients only to a very limited extent due to the peculiarity of its rooting pattern and canopy structure. Therefore, there is scope for exploiting the unutilized natural resources in a coconut garden so as to enhance the income of coconut farmer.

ROOTING PATTERN
The rooting pattern of coconut is such that only 25 percent of land area is effectively utilized. A spacing of 7.5 m in the square system is recommended for coconut (175 palms/ha) for optimum production. Coconut palm, like other monocots, has a typical adventitious root system. Under favourable conditions, as many as 4000 to 7000 roots are found in the middle aged palms. About 74 percent of these roots produced by a palm under good management do not go beyond 2 m lateral distance (Fig. 1) and 82 per cent of the roots are confined to 30 to 120 cm depth of soil. Thus, the active root zone of coconut is confined to 25 percent of the available land area and the remaining area could be profitably exploited for raising inter/mixed crops.

CROWN STRUCTURE AND LIGHT TRANSMISSION
As coconut canopy’s space utilization is very low (Fig. 2), plenty of sunlight infiltrates and falls on the ground unutilized. The venetian structure of the coconut crown and the orientation of leaves allow part of the incident solar radiation to pass through the canopy and fall on the ground. In an inter/mixed cropping system, light is the major limiting factor for the growth of inter/mixed crops since light penetration is reduced through interception and absorption by the taller canopy plants. The light interception in a cropping system influences the growth, productivity and biomass production of the component crops. Although the full yield potential cannot be realized in many crops under the system as much as that obtained under monocropping system, the reduced yield itself is indicative of their adaptability to low light profiles. Age, spacing, soil fertility, varietal characteristics, leaf area and time of the day influence the light penetration through the canopy. It has been estimated that as much as 56 percent of the sunlight is transmitted through the canopy during the peak hours (10.00-16.00 hrs.) in palms aged around 25 years. The diffused sunlight facilitates growing a number of shade tolerant crops in the interspaces. The nature and amount of sunlight...
transmitted through coconut canopy and falling on the ground shows temporal as well as spatial variations. The angle of the sun rays influences the amount of light passing through the coconut canopy. The distribution of light at different positions in the canopy zone of coconut varies much because of the non-random distribution of leaves. This causes differences in the growth and yield of intercrops at different positions of the plantation floor.

Based on the growth habit of the palm and the amount of light transmitted through its canopy, the life span of coconut palm could be divided into three distinct phases from the point of view of intercropping (Fig. 3).
NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are:
Pre-feasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of Plant and Machinery, Manufacturing Process and or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes varies technology books, directory, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureau, consultants and consultancy firms as one of the input in their research.

NIIR PROJECT CONSULTANCY SERVICES
106-E, Kamla Nagar, New Delhi-110007, India.
Tel: 91-11-23843955, 23845654, 23845886, +918800733955
Mobile: +91-9811043595
Email: npcs.ei@gmail.com ,info@entrepreneurindia.co
Website: www.entrepreneurIndia.co