



KNOWLEDGE & SKILL DEVELOPMENT ON COCONUT BASED SECONDARY AGRICULTURE



(CAAST-KAU)
GOI & World Bank funded Project
Kerala Agricultural University

KAU Agri Business Incubator
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KAU CENTRE FOR ADVANCED AGRICULTURAL SCIENCE & TECHNOLOGY (CAAST)

To give a boost to coconut farming in the State, Kerala Agricultural University (KAU) has set up a Centre for Advanced Agricultural Science & Technology for developing **Knowledge and Skill Development on Coconut Based Secondary Agriculture** under the National Agricultural Higher Education Programme. KAU has selected coconut as the focus of the project considering the State government's thrust on coconut farming and the need to support the crop by all possible means & to ensure revival of coconut farming and support to growers with scientific protocols for value addition & processing.

NATIONAL AGRICULTURE HIGHER EDUCATION PROGRAM

NAHEP is designed to strengthen the national agricultural education system in India with overall objective to provide more relevant and high quality education to agricultural university students. This programme has been promoting efficiency and competitiveness through changes in working mechanism of agricultural universities, raising the teaching and research standards through improved research and teaching infrastructure and enhanced faculty competency and commitments, and making agricultural education more attractive to talented students. It is envisaged to improve the performance through quality enhancement, better employment and entrepreneurship opportunities

CENTRE FOR ADVANCED AGRICULTURAL SCIENCE AND TECHNOLOGY (CAAST)

The Centres of Advance Agricultural Sciences & Technology (CAAST) is envisaged to focus upon development of multidisciplinary faculty, innovative approaches to teaching and research, technology development and commercialization along with emphasis on industry orientation of agricultural science and technology generation system through strengthened association and partnership. The activities and research achievements under CAAST are spread over a number of thematic areas such as Conservation Agriculture, Precision farming / Farm Mechanization, Secondary Agriculture, Specialty Agriculture, Renewable Energy Sources, Integrated Farming System (IFS), Agriculture Market Intelligence, Good Agricultural Practices, Hitech/Protected Cultivation, Climate Resilient Agriculture, Food Safety, Big Data Analysis and Genomics-assisted Breeding.



Team CAAST at INTERNATIONAL COCONUT CONFERENCE

Objectives for the KAU Centre For Advanced Agricultural Science & Technology for Knowledge and Skill Development on Coconut Based Secondary Agriculture

- Capacity Building among Students for Entrepreneurship Development
- Facilitating establishment of coconut based industrial units on tie up with farmer collectives
- Promoting industry – research linkage for addressing the research gaps through postgraduate and doctoral research programmes
- Market Research and Analysis

Coconut-The Kalpavriksha

'Kalpavriksha' means the tree of heaven, known for their versatility of uses ranging from food to cosmetics. India is the largest producer of coconut (*Cocos nucifera L.*). Major coconut growing states in India are Kerala, Tamilnadu, Karnataka and Andhra Pradesh. Among them Kerala is the leading state in area under cultivation of coconut and its production. Coconut production in Kerala plays an important role in the state economy and culture of Kerala in south-western India. Kerala is actually named after the coconut tree with "Kera" meaning Coconut tree and "Alam" meaning land so means "Land of Coconut Trees".

Analysis of nutrients:

Coconut meat, raw, (*Cocos nucifera*),
Fresh, Nutrition Value per 100 g

Principle	Nutrient Value	Percentage of RDA
Energy	354 Kcal	18%
Carbohydrates	15.23 g	12%
Protein	3.3 g	6%
Total Fat	33.49 g	167%
Cholesterol	0 mg	0%
Dietary Fiber	9 g	24%
Vitamins		
Folates	26 pg	6.5%
Niacin	0.540 mg	3%
Pantothenic acid	0.300 mg	6%
Pyridoxine	0.054 mg	4%
Riboflavin	0.020 mg	1.5%
Thiamin	0.066 mg	5.5%
Vitamin C	3.3 mg	5.5%
Vitamin A	0 IU	0%
Vitamin E	0.24 mg	2%
Vitamin K	0.2 pg	<1%
Electrolytes		
Sodium	20 mg	1%
Potassium	356 mg	7.5%
Minerals		
Calcium	14 mg	1.4%
Copper	0.435 mg	48%
Iron	2.43 mg	30%
Magnesium	32 mg	8%
Manganese	1.500 mg	65%
Phosphorus	113 mg	16%
Selenium	10.1 pg	18%
Zinc	1.10 mg	10%

source : USDA National Nutrient database

Production Scenario of coconut

World wide	67128 Million Nuts
India	21384.33 Millions Nuts
Kerala	7631.35 Million Nuts.
Post harvest losses	5.36 ± 0.71 %
Average yield of coconut	80 nut/palm/year

source : Coconut Development Board



Glimpses of World Coconut Day Celebration & Launching of CAAST Project

EDIBLE PRODUCTS

COCONUT KERNELS/COCONUT MILK

Coconut oil, Virgin Coconut oil, Candy, Desiccated Coconut Powder, Cookies, Laddu and Bites, Chutney Powder, Lemonade, Coconut Chocolate, Burfi Coconut Milk Drinks, Milk Cream and Powder, Coconut Yoghurt, Coconut Pickles, White Soft Coconut Cheese, Coconut Chips, Coconut Soap, Coconut Flour, Skimmed Milk, Coconut Jam, Coconut Mayonnaise.



TENDER NUT

Snow ball, Minimally processed coconut, Tender nut juice

COCONUT WATER



NEERA

Neera drink, coconut honey, coconut jaggery, coconut sugar



NON EDIBLE PRODUCTS

COCONUT PALM

Furniture's and other kitchen and home utility items



COCONUT LEAF

Decoration, elephant feed, baskets, thatching houses, cattle sheds, temporary compound wall, fancy articles, tongue cleaner, cleaning living rooms



COCONUT HUSK

Coir Pith, composting bathing scrub, hand craft toys, mattresses, fibre board



COCONUT SHELL

Coconut Shell charcoal, Activated carbon, Hand craft items, Coconut shell powder, Coconut shell brackets, Agarbatti, mosquitos coil



COCONUT TESTA OIL

Main content of high fibre biscuit, dried to extract oil



VALUE ADDED PRODUCTS

COCONUT OIL

Coconut oil is used in the country as a cooking fat, hair oil, body oil and industrial oil. Made from fully dried copra with maximum moisture content of 6%, coconut oil has high export market. Refined coconut oil is mainly used in the manufacture of biscuits, chocolates and other confectionery items, ice cream, pharmaceutical products and costly paints. Generally, filtered coconut oil is used for cooking and toiletry purposes. Coconut oil for shallow cooking purpose is now being claimed to be the second best edible oil in the world, after Olive oil.



VIRGIN COCONUT OIL

Virgin coconut oil is extracted from fresh coconut kernel without any chemical processes. It is the purest form of coconut oil, water white in colour. This is done on a small scale by the traditional method which is now partially mechanised or on a large scale by adopting wet processing technology. Coconut milk is fermented and then by mechanical process, water is separated from oil. Virgin coconut oil (VCO) is abundant in vitamins, minerals and anti-oxidants, thus making it the 'mother of all oils'. Extracted from fresh coconut kernel without any chemical processes, it is the purest form of coconut oil, water white in colour. It has got an extended shelf life. Virgin coconut oil is a major source of Lauric Acid and Vitamin E. It is also rich in Vitamin C and slows down the ageing process. High quality of this oil makes it ideal massage oil for babies. It also helps in the absorption of fat soluble vitamins A, D and K. Technology for production of VCO have developed under Agri Business Incubator in Kerala Agricultural University.



NEERA

Neera is a delicious health drink, extracted from the inflorescence of various species of toddy palms. It is sweet, translucent in colour and susceptible to natural fermentation at ambient temperature within a few hours of extraction. It is good for digestion, facilitates clear urination and prevents jaundice. Diversified value added products like coconut flower syrup, jaggery and coconut palm sugar are produced from Neera. Agri Business incubator, Kerala Agricultural University is taking efforts for development of technology for collection and processing of Neera.



COCONUT VINEGAR

Coconut vinegar is a natural product obtained from process of natural fermentation, with no preservatives or chemicals added. Coconut vinegar is made either from coconut water or fermented coconut sap. Starter cultures such as *Saccharomyces cerevisiae* (yeast) and *Acetobacteraceti* (bacteria) are used to aid ethanol and acetic acid fermentation, respectively. Vinegar is produced by alcoholic fermentation of coconut water by adding 10-12% sugar. It involves the fermentation of sugar into ethanol or alcoholization and the oxidation of ethanol into acetic acid or acetification to produce vinegar.





NATA-DE-COCO

Nata De Coco, also marketed as coconut gel, is a chewy, translucent, jelly-like food produced by the fermentation of coconut water. Jelly obtained from the upper parts of fermented coconut water is dipped in sugar and used as a dessert.



COCONUT MILK

Coconut milk comes from the flesh of the coconut and is an emulsion of two fluids viz: coconut cream and coconut water. Sterilised coconut flesh is formed to paste with the use of hammer mill and then pass through screw press and vibratory screens to produce coconut milk in industrial level. It is a major ingredient for culinary purpose.

Processed coconut milk is used in various food preparations as a substitute to milk extracted from raw kernel in the traditional method. They are available in cans and tetra packs.



COCONUT MILK DRINK

Flavoured coconut drink is a vegan alternative for animal based milks. It can be used for peoples with lactose intolerance due to the absence of lactose in coconut milk.

Pro biotic coconut milk has great market potential for future.

Purified coconut milk mixed with coconut water, sugar, stabilizer, emulsifier and flavours to produce flavoured coconut milk, followed by treatments to extend shelf life such as retort pouch packaging.



COCONUT POWDER

Coconut Powder is made by evaporating coconut milk by the method of spray drying. it can be reconstituted in water to required consistency at the time of use.

The advantages such as less storage space; bulk packaging possible at low cost and long shelf life makes coconut powder consumer friendly.



COCONUT CHIPS

Coconut chips, is a ready to eat snack food prepared by the method of osmotic dehydration. Dehydrated mature coconut kernel slicers are dipped in osmotic medium like sugar syrup and dried to safe moisture levels. Coconut chips can store upto a period of six months without affecting its nutritional and biochemical changes. In order to avoid breakage of chips during transportation, nitrogen flushing is usually done in pouches.



SNOWBALL TENDER COCONUT

The snowball is obtained from tender coconut, white in colour and ready to serve.

The snow ball contains the tender coconut water, which can be consumed by just inserting a straw through the top of the kernel. Since the coconut water is not exposed to the atmosphere, it retains its sterility. If the snowball is individually packed and refrigerated under hygienic conditions, its shelf life can be extended upto 10 days.

Equipments & Facilities available at Agri Business Incubator

MAJOR FOOD PROCESSING EQUIPMENTS



Retort pouch processing machine



3D food printer



Spray dryer



Twin screw extruder



Vacuum frying & Impregnation Unit

Quality Testing Lab



Texture Analyzer



Non-Destructive Testing

Packaging & Bottling Units



Rapid Prototyping Facility



Micro Biology Testing Lab



Other Available Equipments

- VCO Processing Unit
- Mini rice mill with Parboiling unit
- Acoustic resonance system
- Pulsed light technology
- Fruit concentrator
- Blancher cum drier
- Humidifier cum dehumidified drier
- Fruit Slicer cum Dicer
- Rotary Baking Oven
- Blast freezer
- Refrigeration Centrifuge
- Ice cream maker
- Walk in cold chamber
- Banana slicer
- Pasta maker
- Infrared drier
- Hammer mill
- Coconut milk extracting machine
- Coleus peeler
- Homogenizer
- Analytical instruments & more

Artificial Intelligence and Robotics in coconut Applications of AI and robotics in coconut

The most popular applications of Artificial Intelligence in agriculture industry are three major categories which are Agricultural Robots, Predictive Analytics, Crop & Soil Monitoring, Computer vision & deep-learning algorithms are used to process data captured by drones and/or software-based technology to monitor crop & soil health, Machine learning models are used to track & predict various environmental impacts on crop yields, seed quality and maturity, simulation technologies are used to mimic different processes like drying, storage studies etc.

KAU Agri Business Incubator is aspiring to develop comprehensive application for real time inspection and diagnostic monitoring palms, application of plant protection measures, harvesting of nuts etc. using drones, integrating the concept of image processing, machine learning and robotics.

KAU Agri Business Incubator

The Agri-business Incubator (ABI) is a pioneering incubation centre of Kerala Agricultural University. KAU Agri Business Incubator has developed many innovative process protocols and food processing machineries to cater the needs of emerging food processing sector and has provided entrepreneur support to several food processing industries. The centre has also contributed towards the design and development of women friendly/gender neutral -small scale processing tools. The ABI also conducts regular workshops on entrepreneurship developments in food processing sector to potential food entrepreneurs.



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