

Stakeholder Consultation for Identifying
Research Priorities of the Coconut Processing Sector

HIGHLIGHTS AND RESEARCH PRIORITIES



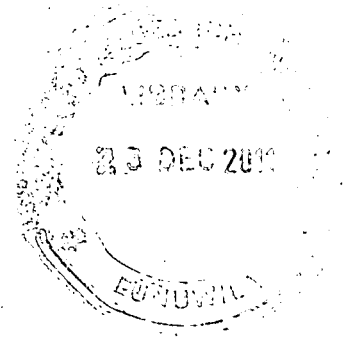
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Coconut Research Institute, Lunuwila, Sri Lanka

9th September 2011



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FOREWORD

Prof. H.P.M.Gunasena

Chairman
Coconut Research Board

Previously the coconut industry was mandated under the Ministry of Plantation Industries with the other two major plantation crops, tea and rubber. In 2009, a separate ministry for the development of the coconut industry was established named as the Ministry of Coconut Development and Janatha Estate Development. Mandated under the new ministry there are five institutions; the Coconut Research Institute (CRI), the Coconut Cultivation Board (CCB) and the Coconut Development Authority (CDA). Besides, there are also two plantations companies, the Chilaw Plantations PLC and the Kurunegala Plantations PLC.

The new ministry was established during the coconut crisis in 2010 when the nut prices were skyrocketing and this provided an excellent opportunity to initiate several development programmes. The main focus was to increase the yield of the present plantations which expand over 394,386 ha. The analysis of the yield variations in different parts of the country revealed that the yields are low, particularly in the smallholder coconut plantations. The management level of these smallholdings was below par compared with the estates. One major contributory factor was the non use of fertilizers by the smallholders' due to high cost. It was at this stage that the government intervened to provide a subsidy for the fertilizers. Under this subsidy scheme 50 kg of straight fertilizer will cost only Rs. 1200/- and mixed fertilizer is Rs. 1300/- It is expected that the fertilizer use will increase and concurrently increase the yield of coconut. The Ministry also developed the Coconut Development Strategy 2011-2016 for the overall development of the coconut sector. This strategy is currently being implemented by the institutions under the ministry. It is expected that the coconut production will reach about 3500 million nuts in 2016. This increase will be able to meet the requirements for domestic consumption and leave adequate nuts for the industry.

The coconut processing sector has been a neglected area of the coconut industry. The Coconut Processing Research Division of the CRI undertakes research and development activities on various aspects of processing and value addition to coconut products. These include kernel, coir, husk and shell products. Some achievements have been made such as the development of technologies for virgin coconut oil and coconut paste. However, a comprehensive R&D programme has to be developed and implemented to reap the full potential of this sector.

The processing sector of the coconut industry include various stakeholders such as desiccated coconut manufacturers, coconut oil millers, those who trade in coir husks and shell charcoal. Besides, there are also the producers of handicrafts, brooms, mats etc. This stakeholder consultation was organized to initiate a dialogue with

different groups of industrialists to get a feedback on their R&D requirements. The R&D programmes are expected to provide technologies to add value to the coconut products and enable to industry to enhance their incomes.

I am very pleased that the industry has shown excellent response to this consultation. The CRI with the support of the sister organizations, CCB and CDA plans to implement the new research and development initiatives on processing identified by this consultation to support the industry.

PREFACE

Dr. H.A.J.Gunathillake

Director
Coconut Research Institute

Coconut plays a dominant role as a food and livelihood crop in Sri Lanka. The mature nuts are used in cooking and young coconut water is a refreshing natural beverage. The per capita consumption of coconuts is about 116 nuts per capita, which accounts for 70- 80% of the total annual production which is about 2700 million nuts.

In 2010 a serious shortfall in coconut production was noted and the total production fell to 2300 million nuts. While the producers benefitted due to the high farm gate prices, the consumers suffered as retail prices exceeded Rs. 60 -65 per nut. Although the reasons for the reduction in nut production is yet unknown, this episode prompted the Ministry of Coconut Development and Janatha Estate Development to rethink on the future development of the coconut industry. About 700,000 smallholders dominate the coconut sector and the management practices adopted by them are below the recommended standards. The smallholders are not economically stable to apply fertilizer which is the primary reason for the declining nut production. It was reported that only 8% of the coconut growers apply fertilizers on their lands.

In 2010 the government took a decision to provide fertilizers under a subsidy scheme to promote fertilizer application. At the same time the Coconut Research Institute also launched a programme on soil rehabilitation to improve the fertility status of coconut soils. Several other initiatives on land management and integrated pest management were introduced to uplift the coconut industry.

While these programmes are being implemented, the Ministry also developed a Coconut Development Strategy 2011-2016. This strategy is an overall plan to develop the coconut sector and to achieve a yield level of 3500 million nuts by the year 2016. It is also expected that an excess of nuts will be available over and above the domestic consumption needs to meet the industrial requirements.

Under the above strategy the coconut production as well as processing and value addition is to be enhanced. Currently, the processing research undertaken by the Coconut Processing Research Division is limited due to lack of adequate staff. However, it was thought necessary to identify the research priorities in different sectors such as desiccated coconut, coconut oil, coir and shell products in partnership with the private industry.

The objective of this consultation with the stakeholders was to initiate a dialogue and to identify priority research areas and to develop a comprehensive research agenda for the research division. This consultation has fulfilled the above need, and I am pleased that research priorities have been identified and a link between the Coconut Research Institute and the private industry had been established for implementation.

I also take this opportunity to thank Mrs. C.Yalegama, Head, Processing Research Division and Prof. S Mohanadas, Consultant for organizing this consultation and to Mr. Henry Nimal, Head, Technology Transfer Division for facilitating the consultation and assisting in printing of the proceedings. Thanks are also due to for Ms. D.Tharanga Dilani Danapala for meticulously typesetting this document.

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STAKEHOLDER CONSULTATION FOR IDENTIFYING RESEARCH PRIORITIES OF THE COCONUT PROCESSING SECTOR

INTRODUCTION

This stakeholder consultation was organized by the Coconut Processing Research Division of the Coconut Research Institute to identify the priority research areas of the processing sector. The coconut processing and value addition in the coconut industry of Sri Lanka is not well organized in spite the enormous potential for expansion. This may be due to the lack of interest and entrepreneurial skills among the growers, particularly the smallholders. The lack of market facilities and market intelligence may be the other factors constraining the development of the coconut processing sector. These constraints can be overcome by the development of matching technologies to suit different client groups. It was with this view that a consultation was organized to identify the interests of the industrialists, coconut smallholders and the medium-large estate owners to develop tailor-made technologies for processing and value addition to kernel, coir and husk products. This consultation was most timely as the Ministry of Coconut Development and Janatha Estate Development has launched a Strategic Plan 2011-2016 to develop the coconut Industry.

HIGHLIGHTS OF THE STAKEHOLDER CONSULTATION

Prof. H.P.M. Gunasena, Chairman, Coconut Research Board welcomed the participants of the consultation and spoke on the current status of the coconut sector. He said that the coconut is the largest of the plantation crops occupying 394,386 hectares of land and that it is the major food and livelihood crop of Sri Lankans. Coconut products such as desiccated coconut, coconut oil, husks, and charcoal are also exported and earn foreign exchange contributing about 1.1% to the national gross domestic product. He also mentioned that the annual production is low due to various reasons such as low average production per acre, low farm gate prices for fresh coconuts, non application of fertilizers due to high costs, farmers' reluctance to use the technologies recommended by the Coconut Research Institute, lack of machinery and equipment for product diversification, lack of entrepreneurial skill among the coconut growers, poor market facilities due to limited access to markets and poor market intelligence. Apart from these lands fragmentation has become a serious problem to sustain the production of coconuts.

With the establishment of the new Ministry of Coconut Development and Janatha Estate Development the situation has considerably changed and there is hope that the country can become a premier coconut producing nation meeting the domestic consumption needs leaving sufficient nuts for the desiccated coconut and coconut oil manufacturing industries and other value added products.

Prof. Gunasena extracting from the Strategic Plan 2011-2016 stated that the Ministry plans to increase the annual production of coconuts from the current level of 2700 million nuts to 3650 nuts by the end of 2016. Although this is an ambitious target, several strategies by which coconut production could be increased have been outlined. The development of high yielding coconut varieties is one such strategy and the CRI plans to develop several varieties with desirable characteristics within the five year period. According to this strategy two hybrid varieties of coconut will be released within the next two years. The coconut estate management will be improved with the promotion of good agricultural practices coupled with subsidized fertilizers made available by the government recently. The fertilizer subsidy provided by the government will be a boon to the coconut growers which will have a direct effect on coconut production. The CRI will expand its services to the coconut growers by recommending the differential fertilizer application procedure to save on fertilizer cost.

Also, there will be a vigorous awareness campaign by the CRI and the CCB to improve and maintain soil fertility by using nitrogen fixing trees, farm residues and organic manures. Intercropping with high value cash crops such a mango, rambuttan, pineapple, cashew, coffee, cinnamon, cocoa and other spice crops will also be given priority under this strategic plan. There will be intensive research on the control of pests and diseases, particularly black beetle, red palm weevil and the coconut mite. Regarding the control of coconut mite (*Aceria guerreronis*) Ministry plans to establish 20 mite laboratories to release a predator mite (*Neoseiulus baraki*) in all the major coconut growing areas within the next two years. Already four mite laboratories have been established.

A major reason for low yield in most of the coconut plantations is the sub optimal plant density. Although the optimum plant density should be 64 palms per acre, actual field counts indicate that it is between 44-46 palms, which is less by 18-20 palms per acre, The Ministry has already commenced programme to infill the vacancies and to establish new plantations on unplanted lands. Also, plans are head to remove and replant senile palms which are over 60 years old.

The Ministry has also mobilized community based organization called Kapruka Purawara in a number of Divisional Secretariat Divisions (DS Divisions) to uplift the coconut industry. Each Kapruka Purawara under the guidance of a committee will undertake several programmes which will include nurseries, processing units for coir and coir products and handicrafts. These are self supporting units with community empowerment to develop the coconut industry at local level. Finally, the Kapruka Purawara will achieve self sustaining status, evolving as medium to large industrial units. While developing the coconut based industries, they will also expand into cocotourism under the banner of ecotourism.

The research and extension has been given priority under this strategy. The CRI will develop result oriented research projects to support the growers and the industry. The development of high yielding varieties for different agro-ecological regions will receive priority as the Ministry plans to expand the cultivation to all areas including

the Eastern and Northern provinces. Intensive research will be undertaken to develop packages of management practices, with particular emphasis soil fertility improvement and pest and disease control. The technology transfer will be strengthened by joint efforts between the CRI and the CCB. These will include farmer training, field days, group discussion, demonstrations and training of trainers. Finally, this strategy it is expected to develop the coconut industry and support the economic prosperity of the nation.

Dr. H.T.Wicramasinghe, Consultant Pediatrician, Faculty of made a presentation on the health benefits of coconut products giving special reference to coconut oil. He explained the distribution of fatty acids in coconut oil. Coconut oil contains 64% MCFA. When myristic acid which is a C 14 fatty acid is also considered as Milium chary fatty acids (MCFA), it becomes 84%. Therefore less than 8-10% is saturated fat. It also contain 5-8% unsaturated fatty acid. He explained the importance of MCFA for nutrition as an energy source. Highly value added coconut oil is available in foreign markets. One example is citronella oil is substituted to virgin coconut oil to increase the absorption and reduce the evaporation of citronella oil. This combination is used as a mosquito repellent and sold at a high price. We have to address such type of products. Coconut oil is used in hospitals in other countries while we use imported olive oil in our hospitals. So there is a big misunderstanding among people regarding the health benefits of coconut oil.

Micronutrients of coconut water should be analyzed and make available for reference. It contains lots of proteins, amino acids and some growth hormones. Therefore, we have to find out methods to concentrate them. Whole coconut water is more nutritious and should be promoted as a beverage.

Statistics for coconut oil should be available in the country. We have to address to the quality of production of coconut oil. The coconut oil industry needs quality control and the current production system is not carried out to maintain quality.

Mrs. C. Yalegama, Officer In-Charge, Coconut Processing Research Division (CPRD), CRI stated that the division plays major role in developing technologies to meet the current needs of the industry. The current research programmes have been designed to add value to several coconut products such as kernel based products, coconut oil, nut water and sap based products, coir processing and process improvement. Besides, the division also provides technical support to the industry. During last few years CRI has introduced new kernel based products like coconut paste, pasteurized coconut milk, coconut jam, value added coconut paste (instant curry paste recipes and frozen coconut products). Some of these products are very popular among people and the acceptability has been very high.

The production of virgin coconut oil on dry basis was developed by the CPRD and the technology was disseminated to ten entrepreneurs. Nut water and sap based beverages were developed while traditional sap based products were improved. In husk based research techniques are being developed to reduce the retting period to obtain quality coir.

Kernel based products

Coconut paste:

The total coconut production of Sri Lanka is about 2.7 billion nuts per year. It is well known that 80-85% of the total coconut production is consumed at domestic level and used for making coconut milk and polsambol which are the popular food ingredients in Sri Lankan traditional diet. About 30% of the fat present in the kernel is wasted in domestic cooking. Therefore, coconut paste was developed to reduce the domestic wastage and as an alternative to fresh coconut during period of high nut prices. The processing steps of coconut paste are shown in Plates 1-4.



Plate 1. Feeding the dehydrated coconut kernel to the domestic grinder



Plate 2. Production of coconut paste (Creamy consistency)



Plate 3. Packed coconut paste under ambient condition

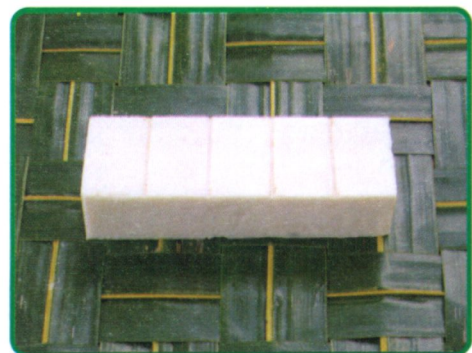


Plate. 4. Coconut paste under refrigerated condition

Usage of coconut paste

Preparation of thick milk:

The normal thick milk (*Miti kiri*) could be made from coconut paste by adding 6 times water (V/V) to the paste. At the time of addition of water, the milky colour is not seen but during cooking the colour intensifies.

Preparation of thin milk:

The normal thin milk (*Diya kiri*) could be made from coconut paste by adding 10 times water (V/V) to the paste. This amount could be increased up to 15 times depending on the thin milk required.

Storage of coconut paste:

The paste can be stored under ambient conditions for 3 months and the storage period can be increased up to two years under refrigerated conditions. Under refrigerated conditions the paste becomes solid and very convenient for handling. The composition of coconut paste resembles that of dehydrated coconut kernel (DC); hence the paste recovers 100% fat in the coconut kernel and wastage is minimized (Table 1).

Table 1. Composition of coconut paste

Constituent	Percentage
Moisture	2
Fat	68
Protein	7
Sugar	9
Minerals	2
Carbohydrates	12

Coconut milk preservation technology

Coconut milk is the traditional cooking medium in Sri Lanka. During domestic usage coconut milk is extracted by using water and this method is inefficient. The mechanical extraction will increase the milk extracting process and by products also can be utilized. Therefore, the technology for preservation of coconut milk was developed by the CPRD to extend the shelf life of coconut milk and to obtain the maximum utilization of the nut. The small and medium level factories can benefit by processing all the by products such as shell, water, paring and residue in the processing line of coconut.



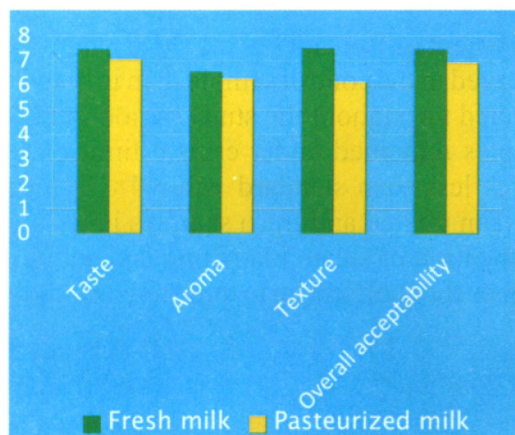
Plate 5. Coconut milk extractor

In order to manufacture processed coconut milk the following parameters were carried out.

1. Pasteurizing milk at 72° C for 30 minutes
 2. Packaging in aluminum laminated low density polyethylene
- The coconut milk has a storage time of maximum one month at 4° C

The CPRD has developed technology to store coconut milk without added preservatives and stabilizers. The majority of the consumers prefer the product with natural qualities. Figure 1 shows that fresh coconut milk has higher preference than the pasteurized coconut milk due to the texture of the milk resulting from added stabilizers.

Figure. 1. Sensory attributes of fresh and processed coconut milk



Frozen coconut scrapings

This technology was developed to extend the shelf life of scraped / disintegrated coconut to meet the needs of busy urban housewives. The product was developed without added preservatives. However, addition of vitamin E as an antioxidant could extend its shelf life.

There was no significant difference in sensory attributes among the samples blanched with or without vitamin E and the fresh kernels throughout the three months of storage period (Table 2).

Table 2. Effect of storage period on sensory ratings of frozen scraped coconut

Treatment	Time (months)	P values				
		Odor	Taste	Color	Texture	Overall acceptability
Blanched	1*	0.427	0.533	0.113	0.432	0.546
	2*	0.527	0.459	0.629	0.204	0.425
	3**	0.995	0.667	0.420	0.532	0.544
Blanched with Vitamin E	1*	0.250	0.705	0.159	0.304	0.614
	2*	0.839	0.486	0.345	0.438	0.234
	3**	0.543	0.673	0.329	0.673	0.456

** Samples compared with the fresh scraped coconut

* Samples compared with control (without blanching)

(p values > 0.05 are not significant)

Blanched samples with or without adding vitamin E were compared with fresh coconut scrapings.

Increment of free fatty acids (FFA) values and total plate counts (TPC) values were observed in the control sample than in blanched samples. There was no peroxide value detected throughout the study period in both control and treated samples. FFA of all samples remained under critical limit of 1% as Lauric acid. All samples had TPC values less than standard value 4×10^4 cfu/g. There was no significant difference between treated and fresh samples in terms of sensory attributes up to three months. Application of steam blanching and addition of vitamin E on fresh scraped coconut extends the shelf life up to three months under domestic frozen conditions.

Coconut Oil

CPRD improved the existing copra kiln for the production of white copra by upgrading it to operate with charcoal. This copra kiln can recover 95% white copra in 5 days. This purpose of the upgrading the copra kiln was to make high quality copra as the quality of oil depends on the quality of copra. Quality copra gives oil which has extended shelf life. Plate 6 shows the mixed copra resulting from kiln drying. The charcoal operated kiln improves the colour and quality of copra.



Plate 6. Mixed copra

Copra was stored under ambient conditions until the oil is expelled. The fungal contaminations and the insect attacks can be seen in open storage of copra. The changes that occur on the surface of copra directly affect the quality of oil. Therefore long storage of copra is not advisable for extraction of oil. At the time of oil extraction fungal / insects attacked copra should be rejected. Suitable packaging system was studied for storage of copra. It was observed that polyester polyethylene and polynylon polyethylene are good packaging materials for extending shelf life of copra. This method can extend the shelf life of copra for more than 3 months.

Different types of coconut oil have different shelf life during storage. A study carried out with different types of oil: Dry processed virgin coconut oil (DVCO), wet processed virgin oil (WVCO), white oil and paring oil to determine their storability. The study showed that virgin coconut oil has a longer shelf life than white oil. Paring oil has the lowest shelf life. Addition of vitamin E improves the storability of all types of coconut oils. Table 3 shows the formation of free fatty acids at various temperatures. Virgin coconut oil shows highest stability towards heating.

Table 3. Variation of FFA values with different oil at different temperatures (initial stage)

Oil type	Percentage of FFA as lauric acid		
	30°C	100°C	150°C
DVCO	0.041	0.039	0.063
WVCO	0.035	0.041	0.045
WCO	0.116	0.093	0.096
PCO	1.280	1.284	1.315
SO	0.054	0.056	0.062

Virgin coconut oil (VCO)

Virgin coconut oil is prepared at the CPRD from pared and dehydrated coconut kernels (DC) at 70°C and oil is expressed between 60-65°C. The production of virgin coconut oil was initiated at the CPRD in 2003. All measures were taken to control different steps in the virgin coconut oil production to gain the natural qualities of coconut. The composition of virgin coconut oil is shown along with other common vegetable oils in Table 4.

Table 4. Fatty acid composition of VCO and other common vegetable oils (%)

	Virgin Coconut oil	Palm oil	Palm kernel oil	Olive oil
Caproic acid	2-3	-	<0.8	-
Caprylic acid	4-8	-	2.4-6.2	-
Capric acid	5-8	-	2.6-5.0	-
Lauric acid	47-50	-	41-55	-
Myristic acid	20-21	1-2	15-18	<0.1
Palmitic acid	8-10	38-47	6.5-10	7.5-20
Stearic acid	2-3	5-8	1.3-3.0	0.5-5
Oleic acid	5-10	38-42	12-19	55-83
Linoleic acid	1-2	10-12	1.0-3.5	3.5-21
Linolenic acid	<1.5	-	<1.0	<1.5

It has shelf life of about one year at ambient conditions. The most important is the usage of the residue which has potential for human consumption.



Plate 7. Dry processed virgin coconut oil extraction



Plate 8. Bottled virgin coconut oil

Table 5. Nutritional composition of virgin coconut oil residue

Constituent	Amount %
Moisture	4.5
Fat	6.6
Protein	19.7
Sugar	25.4
Minerals	4.5
Other carbohydrates	39.3

Virgin coconut oil residue when ground into fine powder can be added to wheat flour to produce many food items (Plate 9). The studies have shown that virgin coconut residue flour can be added up to 30% when making roti, pittu, thosai and hoppers, with good sensory properties.

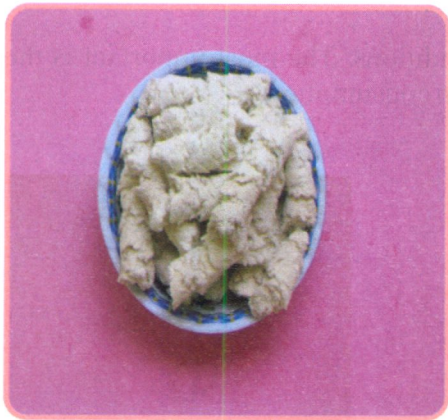


Plate 9. Virgin coconut oil residue

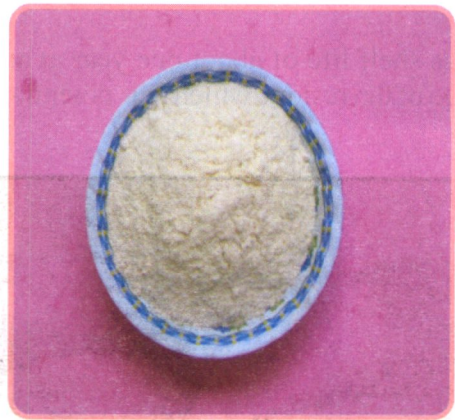
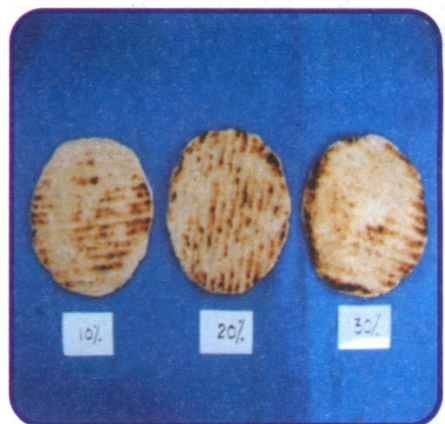


Plate 10. Powdered virgin coconut oil residue (coconut flour)



Coconut flour added pittu



Coconut flour added roti



Coconut flour added bakery products

Plate 11. Various food items prepared with coconut flour

Other kernel based products developed include:

1. Coconut jam
2. Sweetened coconut chips
3. Coconut jelly
4. Nata de coco (fermented product)
5. Dehydrated papapi (haustorium)
6. Coconut bukayo (sweetened coconut kernel)

Coconut sap based products

Coconut water beverages: CPRD has carried out studies to process both mature coconut water and immature coconut water into a beverage. The bottling technology was developed under laboratory conditions and experiments were extended to develop a technology for cold and frozen preservation of coconut water. The research for extension of shelf life of cold and frozen coconut water is in progress. Their demand is increasing in Western markets, mainly in USA and UK.

Coconut water based vinegar: CPRD has carried out research on developing a technology for making coconut water based vinegar. The conventional vat method of making vinegar takes 6-8 weeks. Therefore, the generator process was developed to accelerate the coconut water vinegar making process. The improved process can produce vinegar in 4-6 days.

Other coconut sap based products: The technology was developed to prepare different sap based beverages. The sap contains 15% natural sugars.

The beverages developed are;

- * Natural sap beverage
- * Ginger flavored sap beverage
- * Pineapple flavored sap beverage

The products were subjected to sensory evaluation. The results indicated that the above beverages have good acceptability. Further studies are being conducted to refine these technologies.

Coconut husk based products

In coconut husks based research priority was given to accelerate the retting period for fibre making. The traditional retting process takes 4-6 months to produce good quality fibre. Therefore there is a need to accelerate this process to obtain similar or better quality fibre with a shortened retting period. The research involved the development of a microbial method to accelerate the retting process. The microbial consortium was isolated and the pilot experiments were carried out to find the effectiveness of the retting process. The results indicated that the retting process could be completed in 21

days and the quality of the fibre was better than the traditionally retted fibre.

Further experiments are in progress to isolate more efficient microorganisms for retting in collaboration with the University of Kelaniya.

CPRD also initiated research on the development of other coir products. Under this project preliminary studies were carried to develop coir fibre cement composite boards, coir fibre reinforced boards, weed mats and turfs (Plate 12).

Weed mat

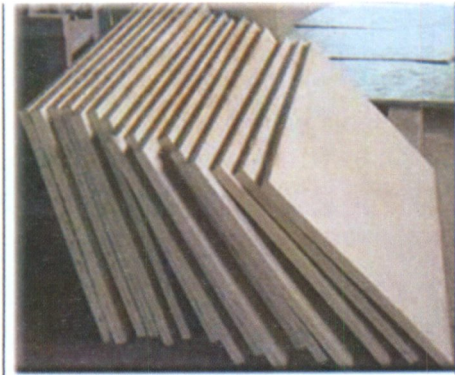


Plate 12. Fibre boards

Turfs



Grass being grown on an embankment after laying of Geotextiles

Process improvements

Heat recovery systems:

CPRD has designed a gassifier which could produce good quality charcoal and the heat generated could be used for the operation of dehydrators for drying many items including copra and disintegrated coconut.

Pilot scale oil recovery system from DC effluent:

The objective of this study was to recover the oil in DC effluent. The effluent water generated in a DC factory is over 40,000 litres per day. The process water contains considerable amounts of oil which can be recovered for other purposes. Well designed effluent treatment unit can recover good quality oil. This system was able to isolate oil which has similar qualities like marketed edible oil when free fatty acids, moisture content and peroxide values were considered.

Process of virgin coconut oil production:

Coconut Research Institute has introduced the technology of virgin coconut oil production by the dry process. This technology was transferred to entrepreneurs and they are carrying out production at commercial level with good profits.

Improvement to copra drying technique:

The coconut shell operated copra kiln was modified and recommended for industrial use. Copra making process was further improved by upgrading it to a charcoal operated kiln. The charcoal operated kiln is able to dry copra in 5 days instead of 8 days and the new process can make 95% white copra which can produce good quality oil.

HIGHLIGHTS OF GROUP DISCUSSIONS

Group A (Desiccated coconut, coconut milk and other products)

The participants in this group were involved in the production of desiccated coconut, coconut milk, coconut oil, copra defatted DC and coconut paste.

The current problems in the production system were highlighted. These included the shortage of skilled labour for plucking, paring, de-shelling and cleaning machineries. They mentioned that the size of the nut is not up to the standard when compared with those of other countries.

Also copra processing takes about five days and copra producers wanted it to be shortened. They also expect to mechanize their production line with the help of the Coconut Research Institute. The participants want to expand their production through improved knowledge on coconut products.

All the participants were keen to plan their production according to the crop forecast and government tax policies. The crop forecast is very important to have a stable production line in the coconut industry. The unstable tax system affects the pricing of products. The uncertain policy on importing palm oil also affects the stability of coconut oil industry.

Group B (Coconut oil, virgin coconut oil and copra)

The participants in Group B were involved in coconut oil, virgin coconut oil and copra manufacture. They manufacture more than one product such as virgin coconut oil and oil cake, RBD coconut oil (free from PAH and other impurities), margarine, bread fat, specialty fat, ice cream, biscuits, white coconut oil, copra, hair oil, soap and king coconut oil. The coconut oil producers were keen to introduce better quality bottled coconut oil to the consumer. Coconut oil based cheese and milk replaces some of the oil based value added products which will be developed in the future. They have identified potential new products and markets for infants milk powder, bottled virgin oil for retail market, virgin coconut oil residue based products like defatted milk beverages, confectioneries, protein isolates and bakery products.

They also identified some problems in the present production process. Oil industry is based on old technology and it needs improvement. Quality standards are not available and development of standards is very important for the oil industry. The customer awareness on the quality coconut oil is not sufficient and needs promotion. The accurate statistics of coconut oil production and coconut products should be available. They also need a proper pricing policy.

Sedimentation of coconut oil was a problem as observed by some producers. An

improved production process will be able to solve this problem. They need technical support and observed that CRI, CCB, and CDA can help them to improve the process.

Some of them pointed out that certified coconut seedlings are not readily available. The organic coconut oil industry needs organic pest control methods for red beetle and other common pests of coconut.

The coconut oil industry requested for regular communication with CRI, CCB and CDA to overcome the problem in present production system. The participants proposed that an industry – institute partnership should be established to scale up laboratory technologies to commercial level.

Group C (Coir based products)

The participants in group C were involved in production coir fibre of different qualities. They produce bristle fibre, mattress fibre and coco pith using Ceylon drum, omatte, mattress fibre and coco pith using defibring machine, mix fibre and coco pith using D 1 machine and producing husk chips.

They expect to expand the production to make geo textiles, brushes, ceiling sheets, tiles, partition boards and doors.

Limited availability of husks, skilled and unskilled labour are some of the problems which affect their production. They require modern technologies for extraction of bristle fibre, coir pith drying, and quality testing of coir. The quality standards for raw and finished products should be available. The financial constraints hinders further expansion of this industry. They also expect proper pricing policy for their products.

The coir industry is affected due to recommendation of husk burial for soil moisture conservation in coconut lands. Husks chip industry should be discouraged in areas where husks are not available on large scale. Identification of suitable lands for coconut cultivation, husk retting and processing was also mentioned. Introduction of new machinery to extract bristle fibre was considered very important for the development of the industry.

In the future, they expect the state to intervene to introduce an insurance scheme, in-house training of workers and provide additional payments for workers.

Group D (Shell charcoal)

The participants in this group were involved in charcoal and activated carbon production.

The serious issue on their production line is environmental pollution due to shell burning. Scarcity of shells and high prices and less dense shells are some of the barriers of the activated charcoal industry. As significant percentage of coconut shells are wasted at household level, it was suggested to establish a central collection

point enabling these shells to be diverted to the charcoal industry. They also requested to promote alternate energy sources for the copra industries as coconut shells are used for generating energy. This will release the coconut shells for the charcoal industry. The industry requested the CRPD to develop low cost environment friendly methods of charcoal making, efficient shell collection methods and ban or increase high export taxes which are barriers to the charcoal producers.

There are also very few who make ornamental and handicraft items from shells and other coconut products. These entrepreneurs should be encouraged and training facilities should be organized.

Group E (Coconut water and sap based products)

The participant was from Distilleries Corporation of Sri Lanka (DCSL). The DCSL produces coconut arrack to the market. The DCSL needs a quick maturation process for coconut arrack. Adulteration of toddy is a major problem in the production system. Besides, there is a shortage of raw material for the production of arrack and other sap based products.

The need for the development of quality standards for toddy was emphasized. The DCSL expects assistance from CRI to develop the standards. A field kit will be a good solution to identify pure toddy. A method for quick maturation within the vat for arrack is also needed. This work has to be initiated by the CRI in collaboration with the Sri Lanka Standards Institute (SLSI).

Some suggested increasing the number of palms for tapping, to increase the sap yield and to improve the tapping techniques.

The training of tappers and their social recognition, breeding varieties for high sap yield and by product utilization were some of the other areas for which assistance was sought from the CRI.

IDENTIFICATION OF RESEARCH AND DEVELOPMENT PRIORITIES OF THE COCONUT PROCESSING SECTOR

The groups identified the following research and development priorities of the coconut processing sector.

1. Technology transfer

1. Publish a quarterly newsletter to disseminate the research and development information of the CRI
2. Provide accurate crop forecasting and quick communication to stakeholders (growers, processors, marketers and policy makers) for planning the production line
3. Establish a Coconut Training Institute to build human capacity for the coconut industry. This institute should develop training programmes for skilled workers, harvesters, toddy tappers, estate supervisors, managers and other stakeholders, giving them social recognition.

2. Establishing quality standards for coconut products

1. Introduce local standards in par with international standards for coconut products to maintain product quality throughout the production chain.
2. Create customer awareness on the importance of quality standards for coconut products
3. Develop quality standards and methods to identify pure toddy

3. Technical supports

1. Coir sector

1. Introduce low cost, novel technologies for the coir sector
2. Facilitate quality testing under subsidized price scheme
3. Introduce machines for coir drying during rainy seasons
4. Allocate suitable government land for coconut cultivation; also provide suitable lands for coir millers.
5. Improve the quality of geotextiles.

2. Coconut oil sector

1. Develop a filtering process of coconut oil to remove sedimentation
2. Improve mechanization of oil expelling industry
3. Promotion of health benefit of coconut oil

3. Kernel and sap based coconut products

1. Initiate research and development programmes on potential applications of kernel products
2. Initiate research and development programmes on the sap products, young coconut water and utilization of waste coconut water for commercial use
3. Develop technology for quick maturation coconut arrack

4. Shell products

1. Develop low cost, environment friendly methods for charcoal production
2. Increase shell availability for the charcoal production by giving alternate sources of energy for industries that use shells for energy

5. Mechanization / production process

1. Initiate research on mechanization of harvesting, husking, shelling paring and cleaning of equipments
2. Develop of new technology for copra manufacture
3. Develop new technologies for the coconut oil industry

6. Others

1. Provide accurate statistics coconut oil production and export of coconut products.
2. Develop short stature coconut varieties bearing within 3-4 years and easy for harvesting.
3. Development of certification standards for coconut seedlings.
4. Develop methods for organic pest control (red weevil & plesispa and other coconut pests).
5. Increase national coconut production to meet the domestic and industrial demand.
6. Breeding low stature coconut varieties for high sap yield.
7. Establish a pricing policy for coconut and by products, impose high import taxes to promote local industries.

7. Establishment of institute – industry link

The consultation suggested establishing a link between the Coconut Research Institute and the Industry to undertake joint/collaborative research and development programmes. This was unanimously approved by the participants and a committee was appointed to develop the modalities of operation of this link. The industry was willing to provide financial and logistical support for research and development programmes.

The following members were nominated as members of this committee.

MEMBERS OF THE CRI – INDUSTRY LINK COMMITTEE

Mr. Felix Fernandopulle Kudaweve Mills, Kudaweve
Mr. M.B.R.Perera, Dunagaha Coconut Producer's Cooperative
Society Ltd., Dunagaha
Mr. Suresh Silva, Silver Mill Holds Ltd, Loluwagada Mills,
Loluwagoda
Mr. Manjula Narayana. 18B, Alfred Place, Colombo-03.
Mr. G. F. de Silva, Serendipol Pvt Ltd., Pannala Road., Kuliypitiya
Mr. Ranjith Pathiraja, Secretary , CNO Mills Association,
Munamaldeniya
Mr. Surendra Perera, President, Fiber Millers Association, 774,
St. Savier, Mawatha, North Ulhithiyawa, Wennappuwa
Mr. Bonifes Nissanka. Mawathagama, Dankotuwa
Mr. S.K. Tennakoon, Botanicair Company (Pvt) Ltd, Yogyana

Mr. Sanjaya Perera, Haycarb (Pvt) Ltd, 400, Deans Road, Colombo-10.
Mr. R.K.M.M. Bandara, Tajeed & Company (Pvt) Ltd. 137, Mahena
Road, Siyambalape, Biyagama.
Dr. K. Sivaraj, Distilleries Corporation of Sri Lanka, Seeduwa.

Annex 1.

LIST OF PARTICIPANTS

Group A (Desiccated coconut, coconut milk and other products)

Rapporteur : Dr. (Mrs.) W.S. Madurapperuma, Senior Research Officer , Plant Physiology Division, CRI

Mr. H.D.L. Appuhamy, Baduwattha Mills, Jubili Mawatha., Katana.

Mr. M.B.R.Perera, Dunagaha Coconut Producer's Cooperative Society Ltd., Dunagaha.

The Chairman, Coconut Producers Co-operative Societies Union Ltd.,127, Grandpass Road., Colombo 14.

Mr. T.N. Assan, General Manager, Coconut Producer's Cooperative Societies Union Ltd.,

127, Grandpass Road., Colombo 14.

Mr. Suresh Silva, Silver Mill Holds Ltd, Loluwagada Mills, Loluwagoda.

Mr. N.H.L. Fernando, Coconut Products Co-operative Society, Wennappuwa

Mr. D.H.Upul Jayalath, Upali DC Mills, Thawila , Medahaththiniya., Marawila.

Mr. Felix Fernandopulle. Kudaweve Mills, Kudaweve.

Dr. (Mrs) P. Fernando, Head, Crop Protection Division, CRI

Dr. Lalith Perera, Head, Genetics and Plant Breeding Division, CRI

Group B (Coconut oil, virgin coconut oil, copra)

Rapporteur : Dr. S. Idirisinghe, Officer in Charge and Senior Research Officer, Agriculture Economics and Agribusiness Division, CRI

Dr. (Mrs.) C. Jayasekara (Former Director/ CRI), 61/ 12B, Manel Mawatha, Old Kesbewa

Road, Delkada, Nugegoda.

Dr. H.P. Wickramasinghe, 138A, Thibirigasyaya Road, Colombo-05.

Mr. G. F.de Silva, Serendipol Pvt Ltd., Pannala Road., Kuliyaipitiya.

Mrs. Inosha Panandeniya, Serendipol Pvt Ltd. Pannala Road., Kuliyaipitiya.

Miss.Nishadi Sasanka. Serendipol Pvt Ltd., Pannala Road., Kuliyaipitiya.

Mr. Dinusha Wanigasinghe, Adamjee Lukmanjee & Sons Ltd., No.140/5 Granpass Road,

Colombo 14.

Mr. B.M.Sumith Sisira, Kumara Project, 200, Nattandiya Road, Kudawewa.

Mr.Manju Narayana. 18B, Alfred Place, Colombo-03. Mr.Chandana

de Silva, No.370, Nugape, Uswetakeiyawa.

Mr.Ranjith Pathiraja, Secretary, CNO Mills Association, Munamaldeniya.

Mr. Navas, Veyangoda Oil Mills, Veyangoda.

Group C (Coir based products)

Rapporteur : Mrs. N. Nilmini Jayalath, Research Officer , Agriculture Economics and Agribusiness Division, CRI

Mr. Surendra Perera, President, fiber Millers Association, 774, St. Savier Mawatha, North Ulhithiyawa, Wennappuwa.

Mr Nihal Weerakkodi. Fiber Millers Association, 774, St. Savier Mawatha, Wennappuwa.

Mr. Sanjaya Gunathilake, Operation Manager, Coir Research and Development Institute, Kota Ambagaha Road., Dunkannawa, Nattandiya.

Mr. Bonifes Nissanka. Mawathagama, Dankotuwa.

Mr. Graham Gunathilake, J.M Fiber Mills, Kakkapalliya.

Mr. S.P.S. Silva, Holy Family Mills, Dummaladeniya, Wennappuwa

Mr. Indika Fernando, C.R.I. Road, Lunuwila.

Mr.S.K. Tennakon, Botanicoir Company (Pvt) Ltd, Yogyiana.

Mr.D.B.M. Abeysekara, Chairman, Coconut Millers Association, 43/68, Seeduwa.

Mr.H.L.Ariyapala, Gunasiri Exports.

Mr. P.M.R.P. Perera, Gunasiri Exports.

Mr. P. Sirisena, Torues International (Pvt) Ltd, 1, IBD, Industrial Trade Zone, Pannala

Mrs. J.A.K.M. Fernando, Assistant Mechanical Engineer, CPRD, CRI, Lunuwila

Dr. A. Thennakoon, Head, Soils and Plant Nutrition Division, CRI

Mr. J. Subasinghe, Technical Officer, Agriculture Economics Division, CRI

Group D (Shell charcoal)

Rapporteur: Dr. (Mrs) S. Ranasinghe, Head, Plant Physiology Division, CRI

Mr. S. Fernando, Haycarb (Pvt) Ltd., 400, Deans Road., Colombo-10.

Mr. Sanjaya Perera, Haycarb (Pvt) Ltd, 400, Deans Road, Colombo-10.

Mr. R.K.M.M. Bandara, Tajeed & Company (Pvt) Ltd. 137, Mahena Road, Siyambalape, Biyagama.

Mr. H. A. Thilakerathne, 18B, Temple Road, Kalubowila.

Dr. (Mrs) L.K. Weerakoon, Head, Tissue Culture Division, CRI

Mr. Kelum Asanka, Assistant Chemical Engineer, Coconut Processing Research Division, CRI

Group E (Coconut water and sap based products)

Rapporteur : Dr. E. Jayamanna, Deputy Director (Research), CRI

Dr. K. Sivaraj, Distilleries Corporation , Seeduwa.

Dr. A. Nainanayake, Acting Head, Biometry Division, CRI

Dr. C. Herath, Senior Technology Transfer Officer, Technology Transfer Division, CRI

Mrs. P.S.U.C. Dharmapala, Assistant Librarian, CRI

Annex 2.

PROGRAMME OF THE CONSULTATION

Stakeholder Consultation for Identifying Research Priorities of the Coconut Processing Sector

Venue: Coconut Research Institute, Bandirippuwa Estate, Lunuwila

Date: 09th September 2011

Conveners: Dr. E.Jayamanne, Prof. S.Mohanadas, Mrs. C.Yalegama

Agenda:

09.15 – 09.30 Registration

Inaugural Session (9.30 – 1030 am)

09.30 – 09.45 Background and Objectives of the Consultation
Prof. H.P.M. Gunasena, Chairman, Coconut Research Board

09.45 – 10.00 Current trends in coconut industry
Dr. Jayantha Gunathilake, Director, CRI Current Coconut Processing

10.00 – 10.30 Research and Development studies at the Coconut Research Institute

Mrs. C. Yalegama, OIC, Coconut Processing Research Division

10.30 - 11.00 am Tea

Technical Sessions (11.00 am – 13.00 pm)

11.00 – 13.00 pm Group discussion on Research priorities

Group A - Desiccated coconut, coconut milk and other products

Group B - Coconut oil / virgin coconut oil/ copra

Group C - Coir based products

Group D - Shell charcoal

Group E - Coconut water and sap based products

Facilitators: Prof. S. Mohanadas, Consultant, CPRD

Mr. Henry Nimal, Head, TTD

13.00 – 14.00 pm	Lunch
14.00 - 15.00 pm	Presentations on Research priorities by groups
15.00 - 15.30 pm	Discussion
15.30	Closing Remarks and vote of thanks Dr. Everard Jayamanna Deputy Director Research, CRI