

COCONUT PROCESSING RESEARCH AND DEVELOPMENT

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ABSTRACT

Indonesia is the second largest coconut producing country among the APCC member states, and its production was around 1.9 million tonnes in 1983. The main utilization of the coconut within the country is for coconut milk and cooking oil. So far there is only a small utilization of coconut by-products.

Cooking oil is produced industrially by pressing the copra, and through "klentik" at home-industry level. While coconut milk is prepared at every home individually.

Industrialization of coconut processing is needed to improve the utilization of coconut as well as to improve the consumption pattern of coconut and the programme of industrialization through the development of agro-based industry.

To support the programme, IRDABI has been conducting various research and development projects on the improvement of traditional coconut processing industry, as well as in product diversification. Products (commodities) which have been studied up to 1983 are copra, cooking oil, preserved coconut milk, coco-honey, coco-beverage, nata de coco, charcoal and activated charcoal, liquid smoke, and single cell protein from coconut water.

The programme of IRDABI's R & D in the near future is to study the techno-economic possibility of establishing the coconut processing industry or coconut-based industrial complex, situated at the production area.

INTRODUCTION

1. Indonesia is the second largest coconut producing country among the APCC member countries, after the Philippines. Its production in 1983 is presumed to be about 1.9 million tonnes copra equivalent. This figure seemingly will increase in the near future, due to various national projects such as the establishment of a coconut nucleous estate, hybridization etc.
2. The utilization of coconut in Indonesia is mainly based on its milk and cooking oil. Coconut milk is used in daily cooking and is prepared at every house individually while the oil is prepared either by pressing the copra (dry process) or by the wet process to produce the "klentik" oil. The projection of coconut production and utilization up to 1988 is shown in Table 1.

Table 1. The projection of coconut production and utilization, 1983 - 1988 (000 tonnes copra equivalent).

	1983	1984	1985	1986	1987	1988
Production	1,869.9	2,015.0	2,177.0	2,315.9	2,656.7	2,914.1
Consumption²⁾	1,401.6	1,708.3	1,845.5	1,891.1	2,045.3	2,208.6
Coconut milk	486.4	529.8	640.4	656.2	709.7	776.4
"Klentik" oil	112.1	136.7	147.6	151.3	163.6	176.7
Copra	821.1	978.9	1,057.5	1,083.6	1,172.0	1,265.5
Export	468.3	306.7	331.5	424.8	611.4	705.5

Source: Directorate General of Estate Crops.

¹⁾ Presented at International Symposium and Exposition on Agricultural Products Processing and Technology, July 31st to August 2nd, 1984.

²⁾ The utilization of coconut into santan: 34.7%, klentik oil: 8%, and copra 57.3% of the total consumption.

3. Since the main utilization of coconut is only that related to coconut milk and cooking oil, the part of the fruit which is fully used at present is only the meat. There is only a little utilization of coconut by-products, although the figures are large as shown in Table 2.
4. To support industrialization through the development of agro-based industries, all agricultural produce including the by-products should be treated as raw materials for the industry. To maximize the utilization of coconut, efforts should be made to develop coconut processing industries that also include its by-products.
5. With respect to coconut processing industries that exist within the country and presuming that coconut production is increasing, the pattern of coconut processing should be projected at: a. increasing the utilization of the coconut; b. supporting the consumption pattern of coconut products; and c. supporting the programme of industrialization.
6. As a selected major commodity, coconut processing has been studied at the IRDABI since the seventies, and various research and development projects have been carried out on it. The main objective of these studies is to support the development of the coconut processing industry within the country.

APPROACH

7. To define the priorities of what is needed and what commodities are to be studied, the IRDABI drew up a diagram in the form of a "family tree" of selected agricultural produce. This diagram shows every possibility of processing or every chain of processing for the product, horizontal as well as vertical. The "family tree" processing of coconut is shown in Figure 1.

Table 2. Coconut by-products (thousand tonnes).

	1983	1984	1985	1986	1987	1988
Coconut for milk preparation¹⁾	486.4	529.4	640.4	656.2	709.7	776.4
Protein ²⁾	11.7	12.7	15.4	15.7	17.0	18.6
Oil ²⁾	41.3	45.0	54.4	55.8	60.3	66.0
Coir ³⁾	875.5	952.9	1,152.7	1,181.2	1,277.5	1,397.5
Coir fibre ⁴⁾	175.1	190.6	230.5	236.2	255.5	279.5
Coir dust ⁵⁾	612.9	667.0	806.9	826.8	894.2	978.3
Shell ⁶⁾	394.0	428.8	518.7	531.5	574.9	628.9
Coconut water ⁷⁾	569.1	619.4	749.3	767.8	830.3	908.4
Coconut for "klentik" oil¹⁾	112.1	136.7	147.6	151.3	163.6	176.7
Protein ⁸⁾	5.4	6.6	7.1	7.3	7.9	8.5
Oil ⁸⁾	9.6	11.7	12.7	13.0	14.0	15.2
Coir ³⁾	201.8	246.1	265.7	272.3	294.5	318.6
Coir fibre ⁴⁾	40.4	49.2	53.1	54.5	58.9	63.6
Coir dust ⁵⁾	141.2	172.2	186.0	190.6	206.1	222.6
Shell ⁶⁾	90.8	110.7	119.6	122.6	132.5	143.1
Coconut water ⁷⁾	132.2	159.9	172.7	177.0	191.4	206.7
Coconut for copra¹⁾	1,289.4	1,285.6	1,389.0	1,508.4	1,783.4	1,971.0
Coir ³⁾	2,320.9	2,314.1	2,500.2	2,715.1	3,210.1	3,367.8
Coir fibre ⁴⁾	464.2	462.8	500.0	543.0	642.0	709.6
Coir dust ⁵⁾	1,624.6	1,619.9	1,750.1	1,900.6	2,247.1	2,483.5
Shell ⁶⁾	1,044.4	1,041.3	1,125.1	1,221.8	1,444.5	1,596.5
Coconut water ⁷⁾	1,508.6	1,504.2	1,625.1	1,764.8	2,086.6	2,306.1
T o t a l						
Protein	17.1	19.3	22.5	23.0	24.9	27.1
Oil	50.9	56.7	67.1	68.8	74.3	81.2
Coir fibre	677.7	702.6	783.6	833.7	956.4	1,052.7
Coir dust	2,378.7	2,459.1	2,743.0	2,918.0	3,200.2	3,684.4
Shell	1,529.2	1,580.8	1,763.4	1,875.9	2,151.9	2,368.5
Coconut water	2,208.9	2,283.5	2,547.1	2,709.6	3,108.3	3,421.2

1) Copra equivalent.

2) The fibre contains 2.4% protein and 8.5% oil, calculated from the weight of coconut used.

3) 1.8 ton per ton of copra.

4) 0.36 ton per ton of copra.

5) 1.26 ton per ton of copra.

6) 0.81 ton per ton of copra.

7) 1.17 ton per ton of copra.

8) Fibre and curd contains 4.8% protein and 8.58% oil, calculated from the weight of coconut used.

Source: Somaatmadja, D. 1984.

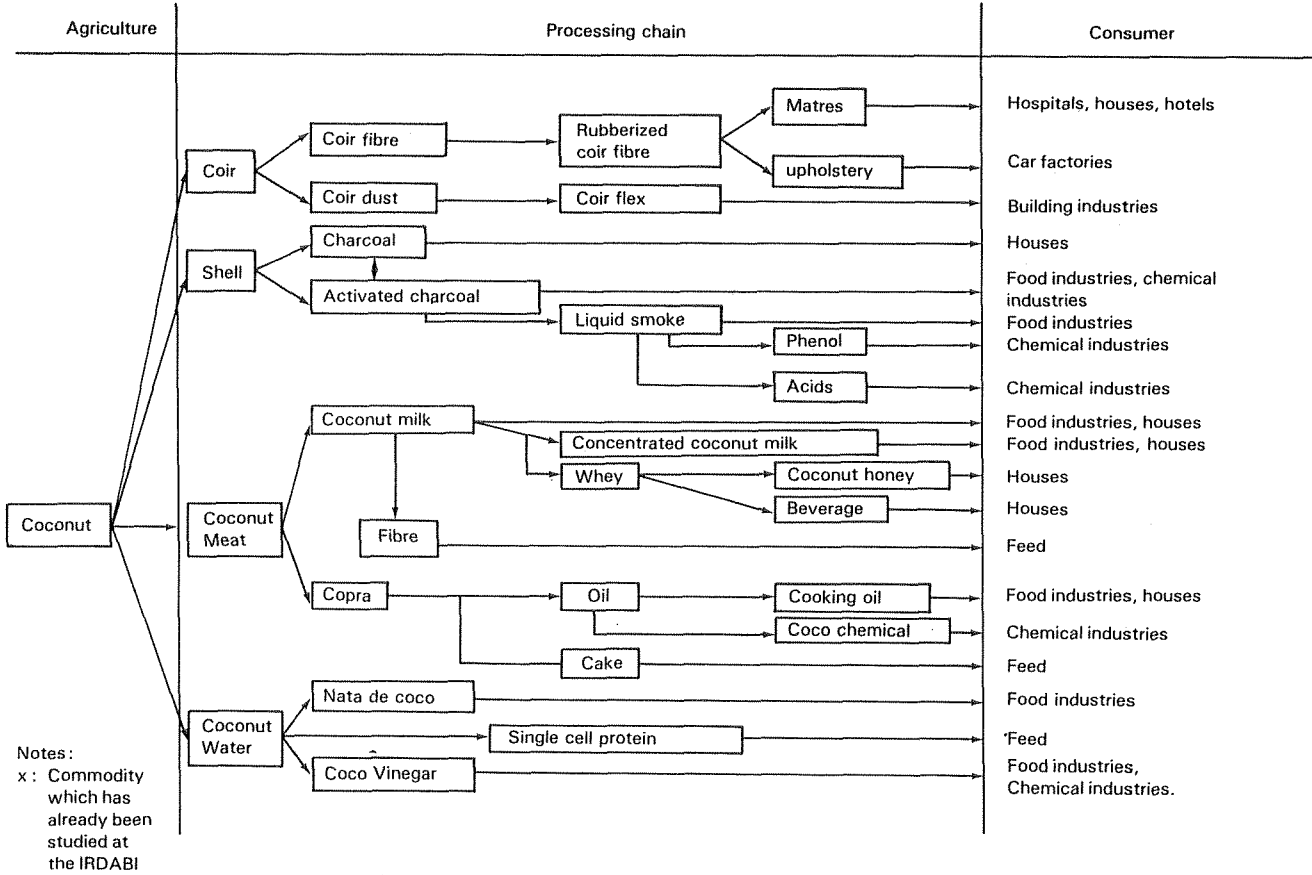


Fig. 1. "Family tree" processing of the coconut.

8. By using the "family tree", work can be carried out to determine which commodities are industrially processed already, what is the relation with other industry, how is the condition, what needs to be done to improve the process as well as the quality of the product, etc. The diagram is also used to decide which new commodity needs to be created or made, why, what needs to be studied, etc. With this mechanism, all research at the IRDABI is applied research, and is carried out only if it could be developed and used by the industry.

COCONUT R. & D. UP TO 1983

9. Research and development, which has been conducted up until 1983 are concerns:
 - a. Improving the quality of traditional coconut products i.e. copra and cooking oil (12, 15, 25).
 - b. Developing new products (product diversification), including:
 - preserved coconut milk (14, 16, 18, 26).
 - by products from coconut milk and oil processing, such as coco-honey, coco-beverage, utilization of oil cake and residual fibre (16, 20, 23).
 - establishing a new method for oil extraction (19).
 - activated charcoal from the shell and its by-product, i.e. liquid smoke (22, 24).
 - nata de coco from coconut water (17).

These products are denoted by (x) in figure 1.

10. Coir is the only part of coconut which was not specifically studied until 1983, because the rubberized fibres are already handled by another institute (Research Institute for Estate Crops). By scanning the available data, some of which was the result of work performed by the Research Institute for Estate Crops, an industrial profile for rubberized coir fibre was found to be already published.

PROGRAMME OF COCONUT R. & D. IN THE NEAR FUTURE

11. With respect to previous studies, the coconut R. & D. programme at the IRDABI will be linked to the techno-economic study of the establishment of coconut processing industries either at the centre of production or in the consumer area. For the centre of production, study is being carried out on the possibility of establishing a coconut-based industrial complex.

To support these industries (especially the small-scale ones), some R. & D. will be projected on providing of prototypes of simple machines and equipment that are needed.

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SUMMARY

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