COCONUT R and D

Proceedings of the Second National Coconut Research and Development Symposium
PCARRD, Los Baños, Laguna

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT
Department of Science and Technology
To Our Valued Readers:

This Book Series on Coconut R and D details the proceedings of the Second National Symposium on Coconut Research and Development sponsored by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, the Philippine Coconut Research and Development Foundation (PCRDF), the Visayas State College of Agriculture (ViSCA), and the USAID-PCARRD Technical Assistance Program.

This volume presents significant breakthroughs in coconut research. It discusses advances in the embryo culture of makapuno and in the use of chlorine for improved production. Likewise, it elaborates on the cause of cadang-cadang and the control of leaf spot, bud rot, bacterial leaf streak, and rodents. New products that can be derived from coconut are featured in this publication.

We hope you will find this volume of great use.

Sincerely yours,

RAMON V. VALMAYOR
Executive Director
COCONUT R and D

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Foreword

Coconut is one of the most important crops in the Philippines. The present slump in the price of coconut calls for a concerted effort to harness every known technology and skilled manpower to realize its full potential.

The first National Coconut Research Symposium was held on 17 to 19 November 1975 in Tacloban City. During that symposium, the status of coconut research and extension was reviewed and the framework for a coconut research program for the country was developed. Nine years later, the Second National Symposium on Coconut Research and Development was conducted to highlight breakthroughs in coconut research. This publication consolidates the papers presented during that Second Coconut R and D symposium.

In 1980, the National Coconut Commodity Research Team prepared the State of the Art for Coconut Research which was published in 1983. Substantial new information presented in this publication could be incorporated to update the State of the Art.

With the present economic difficulties, priorities in research are of utmost importance. Research areas in coconut are identified in this volume covering all disciplines from varietal improvement to marketing. Research and development efforts hope to increase production through coconut hybrids, improved farming systems, and agribusiness. It also aims to maintain the country's export industry through the introduction of new products.

This publication intends to keep the end-users abreast with research and development activities in coconut.

CRISANTO R. ESCANDO
Director
Crops Research Division
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INTRODUCTION

The wet method of processing coconut mainly for oil has been the subject of an extensive R and D and yet to date (1984), no commercial venture uses it. The London-based Tropical Products Institute (TPI) developed a wet process with very satisfactory oil yields of around 85% which is better than the overall performance of the existing copra-expeller method. But a subsequent report of the economics section of the same institute stated that “provided the processing of copra is carried out efficiently, it remains the most economically viable means of extracting oil from coconut”.

With this TPI experience, why should further efforts be given to develop a wet method of processing coconut? An added negative note is the failure of the industry to invest in the multi-million R and D conducted by Dr. R. Hagenmaier on the subject. It appears unnecessary to spend more attention to a very much studied topic.

IMPORTANCE OF THE WET PROCESS

At present, cooking oil and soap are produced from coconut through the wet process. The wet process yields coconut oil that is colorless, odorless, with high stability and is a “natural food” that has not undergone any nutritionally damaging refining. Thus, it is possible to recover at least the major portion of the coconut protein for human food in contrast to copra protein. The copra-derived oil has to undergo drastic refining and deodorizing processes which remove most of the much desired tocopherols originally present. The state of affairs is comparable to the effect of refining salt, polishing rice, and refining sugar.

It uses simple equipment that makes small- or medium-scale operation practical and hence the “factory” can be located right where the coconuts are, with large savings in transport and utilization of local labor. Local processing will lower the price of cooking oil and soap in rural communities. Prices of these commodities are high in the rural areas even when they are the supplier
of coconut since copra has to be shipped to the city where it is processed to oil, and is further refined into cooking oil or converted to soap, and then the cooking oil and soap have to be shipped back to the rural consumers.

The wet process apparently is the choice for communities that are far from a copra-processing center. It is the process for small-scale operation. By contrast, the copra-expeller or the so-called dry process requires an expeller which is run by a motor and presses out oil from ground copra. The copra-expeller, however, is usually used for big operations. The expellers are very expensive, high energy consumers, and produce oil that requires drastic refining and deodorizing.

The wet process has not gone commercial in spite of its high importance. Its oil recovery is generally lower than that of the copra-expeller. Besides, protein production in the powder form and the preliminary "comminuting" of coconut meat require expensive equipment. Thus, large investment in expellers and associated devices of present oil mills negate the advantages of the wet process. One enterprising group tried to assemble and sell a complete oil mill. It consisted of a small expeller made in Japan, an engine of the jeep-type running on gasoline that provides power, a gas producer which supplies the engine with fuel, and a drier for the coconut meat. It was a fine self-powered oil mill but only one unit was available and sold.

PROBLEMS IN THE WET PROCESS

Poor Oil Extraction

The rather poor oil extraction of the "gata" is attributed to the inadequate disruption of the tissues and cells of coconut meat. Hagenmaier and TPI employ expensive mechanical devices to achieve this disruption. In the Philippines, we find it sufficient to knead very well the finely grated coconut, without addition of water, and then press in cloth by a wringing motion.

Extracted "gata" yield can be increased by using an ordinary screw press, hydraulic jack, separators of wood or metal as press, and adding water in the second and third extraction.

Fuel

"Gata" can be made to "break" and yield oil by a number of procedures of which the most generally used is heating. Fuel can be saved by "creaming". "Gata" is allowed to stand undisturbed, thus forming a white upper layer (cream) and a lower layer (skim). After about one hour, the cream occupies about \( \frac{1}{4} \) of the total volume and is transferred to a pot for heating. The oil separates after all and water is evaporated and "latik" is formed.
Oil in the “Latik”

The “latik” can be voluminous and retains oil, which can be minimized by draining. When hot water is poured over the “latik”, the oil floats which makes it easier to recover.

Oil in the “Sapal”

The recovery of oil left in the “sapal” is a big problem. The traditional method is to allow the “sapal” to ferment spontaneously for a few days such that upon pressing it, oil and water are extracted. The cycle of fermentation with water added and pressing is repeated several times thus boosting the total oil recovery.

Solvent extraction is the “high tech” means of oil extraction and is useful only in very large operations, according to present day textbooks. However, older literatures reported the technology as simple and economical. A second closer look at solvent extraction deserves attention.

WET-DRY PROCESS

The dry or copra-expeller system is a well-established system used by industry but its expeller is imported and very expensive. We have the capability to construct small expellers, with the problem of power to run small expellers adequately solved through the use of gas producers, for example.

If the coconut first undergoes wet processing, the “sapal” can easily be dried and passed through an expeller to obtain more oil. A small expeller is needed since the “sapal” is only about 1/3 the dry weight of the coconut meat. This wet-dry process was originally used by Kraus–Maffei and adopted by Hagenmaier but not given the prominence it deserves.

The Wet-Dry process easily equals the performance of the Copra-expeller system. The example below uses raw material that contains 115.2 g oil.

**Wet-Dry Process**

Wet stage, 65% oil recovery

\[
\text{Wt. oil recovered} = 0.65 \times 115.2 \text{ g} = 74.88 \text{ g}
\]

Dry stage 85% oil recovery by expeller

\[
\text{Wt. oil recovered} = 0.85 \left(115.2 - 74.88\right) = 34.27 \text{ g}
\]

Total wt. of oil recovered = 74.88 + 34.27 = 109.15 g

**Copra-Expeller Process**

Oil recovery 92%

\[
\text{Wt. of oil recovered} = 0.92 \times 115.2 = 106 \text{ g}
\]