

13. PORIM OCCASIONAL PAPER - ISSN 0127 – 2209

No. 1 #

THE PALM OIL INDUSTRY
Anuwar Mahmud

June 1982. 7 pages. RM 21.00 / USD 12.00

The paper traces the development of the palm oil industry in Malaysia.

No. 2 #

FOOD USES OF PALM OIL
Berger, K G

April 1981. 12 pages. RM 21.00 / USD 12.00

The article discusses the various food uses of palm oil which is a versatile general purpose product.

No. 3

A REVIEW OF TISSUE CULTURE OF OIL PALM AND OTHER PALMS
Paranjothy, K

July 1982. 22 pages. RM 21.00 / USD 13.00

Much information pertaining to culture of palms, especially that of oil palm, remains published. This is no doubt due to the commercial potential that advances in tissue culture of oil palm over the past decade have generated. Indeed at the present time, plans for commercial scale production and sale of clonal plants are well advanced.

An attempt has been made to collate as much published information as possible in this review in an effort to elicit an understanding of the essential features of tissue culture of oil palm. Work on coconut and date-palm has been included to gain further insight into tissue cultures of palms. Several stages are recognizable in the production of plantlets from callus cultures *in vitro* and some of these along with other aspects of *in vitro* culture of oil palm are discussed.

No. 4 #

FORMULATION, EVALUATION AND MARKETING OF COCOA BUTTER
REPLACER
Kheiri, M S A

August 1982. 35 pages. RM 21.00 / USD 15.00

No. 5 #

A SURVEY OF INDIAN AND PAKISTANI VANASPATI PRODUCTS
Kheiri, M S A

August 1982. 35 pages. RM 21.00 / USD 15.00

A total of 21 vanaspati samples from India and 3 samples from Pakistan were analysed for a number of physico-chemical characteristics. Indian vanaspati products are different in composition and consistency and higher *trans* acids values compared to Pakistani products.

A number of formulation based on higher amount of palm oil products show granular structure and consistency similar to average Indian and Pakistani products. Vanaspati produced from these formulations would result in substantial savings both in foreign exchange (USD 2.77 – USD 9.55 million) and in local currency (Rs. 60.95 – Rs.190.25 million).

No. 6

CURRENT STATUS OF *Elaeidobius kamerunicus* FAUST AND ITS EFFECTS ON
THE OIL PALM INDUSTRY IN MALAYSIA

Mohd. Basri b. Wahid; Hj. Abdul Halim b. Hj. Mohd Hassan and Hj. Ahmad b. Hj.
Hitam

March 1983. 39 pages. RM 21.00 / USD 15.00

With the introduction of the weevil, *Elaeidobius kamerunicus* into Malaysia in late 1981, two surveys, one covering oil palm estates and schemes, and the other covering palm oil mills were conducted between the months of April and September 1982. The main of former was primarily to determine the rate of distribution of the weevil and its initials effects, while the aim of the latter was to determine the nature and extent of problems faced by oil palm mills due to weevil-pollinated bunches. A total of 41% of estates/schemes responded to the survey questionnaire. For the mill survey, the responses was 61%.

The results of the first survey showed that the introduction of the weevil started in January 1981 reaching its peak in November 1981. A few estates (in Pahang) started introducing the weevil as early as January 1981 while others (in Sabah) introduced the

weevil as late as November 1981. By February 1982, all estates in Malaysia had introduced the weevil. Most estates bought the weevil for release.

The results of the second survey showed that serious problem at the mills occurs at the stripping and nut-cracking stations. Problems at the press station, depericarper station and cyclone separation are relatively minor. Mill problems were first reported in January 1982 and July 1982. Most mills reported a decline in oil extraction rates while only a few reported an increase.

No. 7

**BOTANICAL MUSEUMS AND GARDENS AND THEIR ROLE IN
CONSERVATION OF GERMPLASM**

Schultes, R E

April 1983. 20 pages. RM 21.00 / USD 14.00

No. 8 #

NUTRITION

Berger, K G

July 1983. 35 pages. RM 21.00 / USD 20.00

This is a collection of four articles, namely: The Nutrition Value of Palm Oil: Fat in the Human Diet; Dietary Energy and the Role of Fat in Preventing Undernutrition; The Role of Palm Oil in India.

No. 9 #

**A CRITICAL REEXAMINATION OF THE METHOD OF BUNCH QUALITY
ANALYSIS IN OIL PALM BREEDING**

Rao, V *et al.*

August 1983. 28 pages. RM 21.00 / USD 14.00

Palm oil and palm kernel oil yields depend on total fruit bunch yield and the oil and kernel content of the individual bunches. The latter are themselves determined by other factors such as the oil and kernel content of the average fruit. These component and sub-components of yield are important parameters in breeding and their precise and accurate estimation is necessary for yield selection process.

The basics method for the analysis of oil palm fruit bunches was established at the West African Institute for Oil Palm Research in the early sixties but has since been modified in different ways. Certain aspects of the original method and some subsequent modification were critically examined in a cooperative exercise among Malaysian bunch analysis laboratories. Recommended procedures have accordingly been established with

respect to ripeness standards, stalk length, spikelet sampling, spikelet and fruit storages, pericarp drying, sieving for peicarp samples, oil extraction and nut drying.

In the course of the work, it was noted that although the weevil *Elaeidobius kamerunicus* had altered certain bunch components through improved pollinated, this did not detract from the usefulness or earlier (pre-weevil introduction) bunch analysis data.

No. 10 #

QUALITY OF PALM OIL

Jacobsberg, B

October 1983. 14 pages. RM 21.00 / USD 13.00

The basic concept of quality is summarized. Quality in relation to the various processes such as hydrolysis, oxidation, refining and fractionation are described.

No. 11

THE GENETICAL BASIS OF INBREEDING DEPRESSION AND HETEROSIS: ITS IMPLICATIONS FOR PLANT AND ANIMAL BREEDING

Jinks, J L and Lawrence, M J

November 1983. 8 pages. RM 21.00 / USD 12.00

There is little genetical justification for the widespread belief that are the best phenotypes, particularly for yield produced by heterozygotes rather than homozygotes. Heterozygosity is not an essential pre-requisite for high performance or for uniformity and stability of that performance; rather it is the correct genic content of individuals that is important and that this can be achieved in a homozygote.

No. 12 #

ADVANCES IN OIL PALM NUTRITION, AGRONOMY AND PRODUCTIVITY IN MALAYSIA

Ng, S K

November 1983. 20 pages. RM 21.00 / USD 13.00

Major research and development advances in the inter-related areas of soil science, nutrition and agronomy, their impact on past, current and future productivity as well as some major challenges are highlighted.

No. 13 #

**SIGNIFICANCE OF PALM OIL AND ITS HARD FRACTIONS (PALM STEARIN)
AS FATTY RAW MATERIALS FOR SOAP**

Iftikhar Ahmed

June 1984. 19 pages. RM 21.00 / USD 12.00

Palm oil production in Malaysia has experienced an increase over the past few years and it is expected to attain a figure of four million tonnes by 1984. Associated with it is the development of the processing industry *i.e* refining and fractionation, which has enhanced its versatility through wider applications.

Palm oil and palm stearin which is a solid fraction of palm oil, are widely accepted as fatty raw materials for all kinds of soaps, the reasons being their availability in different processed forms and grades.

The factors involved in the selection of any oil or fat in a particular fat charge for any soap are discussed followed by explanation of the main technical point. Some information on the properties or soaps derived from various oils and fats is also provided.

No. 14 #

**THE EFFECT OF *Elaeidobius kamerunicus* FAUST, ON RAT CONTROL
PROGRAMMES OF OIL PALM ESTATES IN MALAYSIA**

Mohd Basri b. Wahid and Hj. Abdul Halim b. Hj. Hassan

June 1995. 50 pages. RM 21.00 / USD 15.00

A survey covering all the estates in Malaysia was conducted between October 1983 to June 1984 with the objectives of reviewing the rat control practices and determining the effects of the oil palm weevil on rat control. A total responses of 47.8% was received

The most widely practiced form of rat control in oil palm plantations is by baiting. Cultural and mechanical control is practiced on a limited scale. Rat control by barn oil is receiving attention. However, simultaneous usage of brodifacoum and the adoption of biological control should be discouraged.

Amongst the five types of anticoagulants in Malaysia, warfarin is the most widely used, followed by brodifacoum, which has also gained wide acceptance.

Consequent to the introduction of weevil it has been found that the rat population has generally increased; the rat damage to unripe fruits has also increased; male spikelets is widespread, the quantity of rat bait/ha/year and cost of application have also increased. It is estimated that the cost of rat control has increased from RM 11.80 million (pre-weevil) to RM 17.9 million (post-weevil) for the whole country.

In spite of this development, the data seem to suggest that a high proportion of the estates has not intensified their rat control programmes which probably accounts for many reports of early reinfestation. Further research on the evaluation of types and frequency of rat baits vis-à-vis biological control is essential.

No. 15

OIL PALM YIELDS IN THE ABSENCE OF N AND K FERTILIZER IN DIFFERENT ENVIRONMENTS IN PENINSULAR MALAYSIA

H L Foster; Mohd Tayeb Hj. Dolmat and Zin Z Zakaria

June 1985. 17 pages. RM 21.00 / USD 13.00

Oil palm yields obtained without N or K in a range of trials carried out in Peninsular Malaysia were related to palm, soil and climatic factors. Equations have been developed which allow prediction of oil palm yields in the absence of fertilizer from these factors. Tentative critical levels of these factors beyond which reduced yields can be expected are also presented.

No. 16

OIL PALM YIELD RESPONSES TO N AND K FERTILIZERS IN DIFFERENT ENVIRONMENTS IN PENINSULAR MALAYSIA

H L Foster; K C Chang; Mohd Tayeb Hj. Dolmat; Ahmad Tarmizi Mohammed and Zin Z Zakaria

June 1985. 23 pages RM 21.00 / USD 13.00

Oil palm yield responses to N and K fertilizers in a range of trials carried out in Peninsular Malaysia were related to palm, soil and climatic factors which influence the efficiency of fertilizer recovery. Equations have been developed which allow prediction of N and K yield responses curves from these site characteristics. Using these equations (and some additional equations reported in an earlier paper) the most profitable yield and the amount of N and K fertilizer required to achieve this yield can be estimated for any particular site within the region covered by the trials.

No. 17

CRYSTALLIZATION BEHAVIOUR OF PALM OIL

K G Berger and W B Wright

January 1986. 11 pages. RM 21.00 / USD 13.00

No. 18 #

SENSORY EVALUATION IN RESEARCH AND INDUSTRY

Nor Aini Idris

February 1986. 24 pages. RM 21.00 / USD 17.00

No. 19**RECENT DEVELOPMENTS IN CELL AND TISSUE CULTURE OF OIL BEARING PALMS**

Paranjothy, k

March 1986. 12 pages. RM 21.00 / USD 13.00

About a dozen plant species account for more than 90% of the world's production of vegetable oils and fats. The important oil production species include two palms: coconut and oil palm. Their yields are much higher than other oil producing species, averaging 2.6 and 5 tonnes/hectare/year respectively. Both these crops are not amenable to vegetative propagation by conventional horticultural methods. Furthermore, in common with other perennials, crop improvement in these is a slow process. Novel methods of crop improvement could clearly be useful adjuncts to conventional methods in palm.

No. 20**AVAILABILITY AND POTENTIAL UTILIZATION OF OIL PALM TRUNKS AND FRONDS UP TO THE YEAR 2020**

Mohamad b. Husin; Abd. Halim b. Hj. Hassan and Ahmad Tarmizi b. Mohamad

July 1986. 17 pages. RM 21.00 / USD 12.00

The policy of diversifying Malaysia's major crops led to intensive planting of oil palm beginning in the early 1960s. This crop is now due to replanting after an economic life of about 25 years. Thus, the year 1985 has been considered as the start of large scale replanting era for oil palm industry, the dry weight of palm trunk and fronds availability is estimated at 84 tonnes, fell fronds at 16 tonnes and pruned fronds at 11 tonnes per hectare per year. The expected total availability of these by-products of over 13 million tonnes in 1985 will be doubled in the year 2000. Previous work on the utilization of these by-products emphasized mainly on the agronomic aspects while technological research started only very recently. The suitability of oil palm trunks and fronds for value-added products are evaluated based on the physical, chemical and working characteristics. With proper planning and management the vast amount of by-products could be converted into value-added materials.

No. 21**OIL PALM AS A SMALLHOLDER CROP**

Collin Barlow

August 1986. 17 pages. RM 21.00 / USD 12.00

No. 22

**STATISTICAL AND ECONOMIC ANALYSIS OF OIL PALM FERTILIZER TRIALS
IN PENINSULAR MALAYSIA BETWEEN 1970-1981**

Ahmad Tarmizi Mohammed; H L Foster; Zin Z Zakaria and C S Chow

August 1986. 12 pages. RM 22.00 / USD 19.00

The results of twenty-three oil palm fertilizer trials carried out in different sites of coastal and inland areas of Peninsular Malaysia are presented in this paper. They have been analysed both statistically and economically. Yield response equations which take into account curvilinear response to each fertilizer treatment and two and three factor interactions between these treatments, were fitted to the plot data. Analysis of variance indicated the significance of the individual variables in these equations. Response equations of N and K fertilization were derived at non-limiting levels of other fertilizers and presented in the form of yield contour maps. The most economic fertilizer rates in each trial were determined and are presented for different market conditions of the commodity and N and K price ratios. These optimum fertilizer rates vary even within the same soil series due to different agronomic practices and available soil and weather conditions.

No. 23 #

BAGWORMS (*LEPIDOPTERA: PSYCHIDAE*) OF OIL PALMS IN MALAYSIA

Mohd Basri Wahid; Hj. Abdul Halim Hassan and Zulkifli Masijan

March 1988. 37 pages. RM 21.00 / USD 14.00

In view of the increasing seriousness of bagworms (*Lepidoptera: Psychidae*) as pest of oil palm, PORIM carried out a survey in 1985 to obtain more information on bagworm outbreaks between the period 1981 to 1985. A total of 722 estates, representing 51.4% of those contracted, responded. The results indicated that the bagworm is becoming more serious as a pest than in the past.

The following features of outbreaks, for the period under survey/review, were noted: the outbreak could occur more than once within the same locality; the reported total hectareage of bagworm attack appeared to be slightly more in the first half of the year than the second half; the most damaging species in Peninsular Malaysia is *Metisa plana*, while the most damaging in Sabah and Sarawak is *Mahsena Corbetti*; more than one species of bagworms could occur simultaneously in an outbreak situation; outbreaks could occur more than once within the same locality; the reported total on both young and old palms; and there may be an association between outbreaks and drought.

The survey results further discussed determine action and control measures the latter of which included chemical, physical and biological methods of control. The extent of usage of the economic threshold concept and the correct timing of pesticide application were also discussed.

No. 24**THE PRODUCTION STRUCTURE OF THE MALAYSIAN PALM OIL INDUSTRY
WITH SPECIAL REFERENCE TO THE SMALLHOLDER SUBSECTOR**

Malek Mansor and Colin Barlow

January 1988. 53 pages. RM 21.00 / USD 14.00

The objectives of this study are to investigate the production structure of the main subsectors of the Malaysian oil palm industry, to highlight the problems of the group and independent smallholdings, and to examine the future development of these smallholdings with reference to facilitating policies.

Following a brief history of the industry and an account of its major role in the modern Malaysian economy, a comparison is made between oil palm and rubber. The structures of the estates, group smallholdings and independent smallholdings are reviewed in turn, focusing on ownership, geography, holding sized, ages of stands, employment, yields, processing and economic performances.

The major problems of the smallholding subsectors are next discussed, and group smallholdings are seen to face high costs, scarcities of labour and land, and particular difficulties with small *in-situ* schemes. Independent smallholding have problems through poor extension and lack of access to finance for planting. Routes towards overcoming these problems are suggested. Where for group smallholding more judicious management, closer ex-ante scrutiny of rates of return from new ventures, and the possible withdrawal of sponsoring bodies from well-established schemes are thought appropriate. For independent smallholdings integrated and strengthened extension, together with improved finance for planting through Bank Pertanian, are judged most important.

The future expansion of all oil palm subsectors is finally reviewed, and given current prices and relative returns from other enterprises. It is thought that at least 2 000 000 hectares will be under the crop by year 2000.

No 25 #**PREDICTIVE MODELLING OF RATE POPULATIONS IN RELATION TO USE OF
RODENTICIDES OR PREDATORS FOR CONTROL**

Christopher Mark Smal; A H Halim and M Din Amiruddin

May 1990. 55 pages. RM 21.00 / USD 16.00

Rat populations in mature oil palm plantations were simulated in a computer model in relation to control episodes using typical chemical poisoning (baiting) techniques. Predation by barn owl *Tyto alba* was also simulated, using information obtained from field studies carried out in west Peninsular Malaysia, where trials investigating the use of

barn owls for biological control of rats have been in operation since 1986. Computer projections for baiting requirement were found to correspond with field records and the model's predictive capacity is therefore of value in rat control investigation. Interpretation of field data using the simulation revealed that mean rate survival rates after baiting episodes were c. 10% survival rates after baiting episodes were *ca.* 10% and that resistance of tolerance to warfarin baits was increasing on one area. Relatively low barn owl populations were responsible for reducing baiting needs on one plantation by between 29% and 40%. A reduction in bait use also occurred as a result of the chemical control programme itself. Projections with higher owl densities suggest that rat control (to economically acceptable damage levels) might be achieved with biological control alone or as part of a programme integrated with rodenticides. The implications of the model for different control techniques including the use of barn owls in rat control are discussed.

No. 26

THE NUTRITIONAL ROLE OF DIETARY FAT - SPECIAL REFERENCE TO PALM OIL

M I Gurr

June 1991. 14 pages. RM 21.00 / USD 15.00

No. 27 #

A SURVEY OF CURRENT STATUS AND CONTROL OF NETTLE CATERPILLARS (*LEPIDOPTERA: LIMACODIDAE*) IN MALAYSIA (1981-9190)

Norman Kamaruddin and Mohd Basri Wahid

October 1992. 22 pages. RM 21.00 / USD 20.00

PORIM carried out a survey on nettle caterpillars (*Lepidoptera: Limacodidae*) by distributing questionnaires to oil palm agencies in 1990. The questionnaires were designed to obtain information on the status of these oil palm leaf-eating caterpillars from 1981 – 1990. Serious outbreaks have occurred in Malaysia over the past few decades, but over the last years or so there have been very few reports of outbreaks.

It was seen from this survey that the nettle caterpillars were not serious pest of oil palm. An average of only five outbreaks per year were recorded during the 10-year period. The main species of nettle caterpillars were *Darma trima* and *setoranitens*. The threshold level for control, indicated by most estates, was 5 – 10 larvea per frond. Selective chemicals that were commonly used were trichorfon, monocrotophos and methamidophos.

With contemporary knowledge of biological control and awareness of environmentally safe products used for the control of nettle caterpillars, it is hoped that the best will be managed effectively without indiscriminate use of toxic chemicals.

No. 28

SENSORY EVALUATION IN FOOD PRODUCT DEVELOPMENT

Nor Aini Idris

December 1992. 15 pages. RM 21.00 / USD 15.00

No. 29

EXISTING AND POTENTIAL OIL PALM AREAS IN PENINSULAR MALAYSIA

Jalani Sukaimi *et al.*

December 1993. 25 pages. RM 21.00 / USD 14.00

No. 30

NEW OPPORTUNITIES FOR PALM OIL IN A CHANGING ENVIRONMENT UP TO
THE YEAR 2000 AND BEYOND

Thomas Mielke

April 1994. 17 pages. RM 21.00 / USD 14.00

No. 31

OIL PALM DEVELOPMENT IN THE EASTERN REGION OF SABAH

Zin Z Zakaria and Jalani Sukaimi

April 1994. 12 pages. RM 21.00 / USD 14.00

No. 32

FUNCTIONALITY OF PALM OIL, PALM OIL PRODUCTS AND PALM KERNEL
OIL IN MARGARINE AND SHORTENING

Leny deMan and John M Deman

November 1994. 16 pages. RM 21.00 / USD 14.00

No. 33

ENVIRONMENTAL IMPACTS OF OIL PALM PLANTATIONS IN MALAYSIA

I. E. Henson

December 1994. 27 pages. RM 21.00 / USD 14.00

This paper collates current information on effects of replacing natural rainforest with oil palm. The major effects considered are those on wildlife and biodiversity, regional climate, local water supplies and soil properties. The environmental implications of various management practices are also briefly reviewed, including use of mill waste products, plant protection chemicals, integrated of oil palm with other crops and livestock, and palm clearance methods.

Some recommendations are made for future research.

It is concluded that oil palm cultivation in general poses little direct environmental threat *per se*; rather it is during the forest clearance operations where problems arise. However, in view of the diminishing reserves of natural forest, further replacement of forest by oil palm should be minimized. Rather future increases in production should be met by either new plantings on reclaimed land (*e.g.* old tin mining areas), or increased yields of existing plantings and of replanted areas. The latter is especially feasible given the large gap between country average yields and potential yields and the increasing availability of improved planting materials.

No. 34

A REVIEW OF CONSUMER PACKAGING FOR PALM OIL AND PALM OIL PRODUCTS

Mohamed Razali Mahidin

September 1995. 17 pages. RM 21.00 / USD 14.00

No. 35CONTROL METHODS FOR RHINOCEROS BEETLE, *Oryctes rhinoceros* (L)
(COLEOPTERA; SCARABAEIDAE)

Norman Hj Kamaruddin and Mohd Basri Wahid

November 1995. 30 pages. RM 21.00 / USD 14.00

The rhinoceros beetle, *Oryctes rhinoceros* (L) is expected to become an important pest of young and matured oil palm in high beetle population areas where the zero burning concept is employed for oil palm replanting. The various control methods undertaken for the control of this pest in coconut and oil palm are discussed. These include the field propagation of natural enemies, notably of viral, fungal and bacterial origins and insect predators and parasitoids. Chemical and cultural control are also discussed.

No. 36**TRANS FATTY ACIDS FREE FOOD FORMULATION BASED ON PALM OIL AND ITS PRODUCTS: A PREVIEW**

Noor Lida Habi Mat Dian; Mohd Suria Affandi Yusoff and Razali Ismail

March 1997. 24 pages. RM 21.00 / USD 14.00

This paper reviews the application of unhydrogenated palm oil and its product which are free of *trans* fatty acids in various food formulations. Food products such as margarine, shortening, vanaspati, ice cream *etc.*, exhibit excellent characteristics when unhydrogenated palm oil and its products are used as starting raw materials. Thus the hydrogenation for starting raw materials is not required for the above product, but safer process such as blending and interesterification can be used.

No. 37**AN ESTIMATED AVAILABILITY OF OIL PALM BIOMASS IN MALAYSIA**

Kamarudin Hassan; Mohamad Husin; Ariffin Darus and Jalani Sukaimi

June 1997. 100 pages. RM 21.00 / USD 14.00

Oil palm biomass described in this paper did not take into consideration the oil but focused on the by-products that include the felled oil trunks (OPT), pruned oil palm fronds (OPF) and empty fruit bunches (EFB). OPT were fractioned into their fibre bundles, parenchyma and the bark fragments. The respective dry matter of each fragment was measured after oven drying. As for OPF, their leaf stalks were cut into the petiole and the rachis segment after stripping off their leaflets. The dry matter of each leaf stalk and its petiole segment was measured from the dry weight of sub-sample of each leaf stalk. For the FFB, the spikelets of fresh fruit bunches (FFB) were separated from the bunch stalks after removing the fruits. The dry matter of each FFB was measured after oven drying the bunch stalk and its spikelets. Data from 16 OPT, 130 each of OPF samples obtained at different palm age and two FFB samples for each age group of the standing palm were analysed.

Mean OPT bole length at replanting and its volume was 9.16 m and 1.77 m³, respectively. The average length of OPF leaf stalks and the petiole collected from a 9-year to a 27-year-old palms was 7.55 m and 1.44 m, respectively. On the FFB study, the average moisture content (dry basis) for the bunch stalk and its spikelets was 508.73% and 187.09%, respectively. The measurement on the dry matter of oil palm biomass are as follows: whole OPT, 274.70 kg per bole length of 8.16 m; whole EFB, 70.48 kg after the processing of one tonne of FFB. Also included is the biomass supply outlooks for Kedah, Pulau Pinang, Perak, Selangor, Negeri Sembilan, Melaka, Johor, Pahang, Terengganu, Kelantan Sabah and Sarawak in 1996 until 2020.

No. 38**FATTY ALCOHOL ETHOXYLATES**

Kang Yew Beng

June 1998. 36 pages. RM 21.00 / USD 24.00

No. 39**GLYCIDOL AND DIGLYCEROL: PREPARATION OF THE OXIRANE AND ETHER FUNCTIONALITIES**

Kang Yew Beng

July 1998. 43 pages. RM 21.00 / USD 14.00

No. 40**COMMERCIAL FEASIBILITY OF CLONAL OIL PALM PLANTING MATERIAL PRODUCTION**

Zamzuri I; Mohd Arif, S; Rajanaidu, N and Rohani, O

October 1999. 52 pages. RM 21.00 / USD 14.00

The demand for oils and fats is expected to increase due to exponential growth in population and income. Whilst there is a stagnation of animal fat production, most of annual demand for oils and fats is met by vegetable oil, in particular the palm oil. On worldwide basis, palm oil increased the most when compared with other vegetable oils. Being the most of productive oil bearing crop, it has attracted substantial amount of investments. Each oil palm tree is worth nearly RM 1200 and makes initial investment of RM 10 – RM 40 per clonal plantlet a worthwhile capital expenditure.

Based on demand for oil palms seeds, it is estimated that there is a ready market for more than 1000 million tissue culture plantlets in the world. In view of this, an attempt is made in this paper to outline a design of a tissue culture commercial production plant to serve as a financial guide to potential investors. Capital requirement for building/laboratories, production scheduling, input/output estimates, *etc.* are describe.

A comparative study between two production levels managed under single and double shift operations is made. With this, four models of production systems are generated namely; Model A1 with annual production of ca. 90 000 plantlets in a single shift, Model A2 of ca. 360 000 plantlets in single shift and Model B2 of ca. 700 000 plantlets in double shifts.

In conducting the financial feasibility analysis, the costs of establishment, operating and maintenance of the four production models were estimated. The units costs of production models RM 8.03, RM 6.85, RM 6.57 and RM 5.86, respectively for models A1, A2, B1 and B2. It was found that the venture is financially viable as long as the plantlets are sold at a price of RM 20.00 or more per plantlet. If the investor intends to sell at RM 15.00, he needs to operate at 700 000 plantlets annually on double-shift basis. The analysis also shows that there is no significant difference between Models A2 and B1. The former may be attractive due to its lower capital cost and the latter its scaling up.

No. 41**FINANCIAL APPRAISAL OF THE MULTIPLE EFFECTS EVAPORATOR SYSTEM**

Mohd Arif Simeh and Mohd Nasir Amiruddin

December 1999. 15 pages. RM 21.00 / USD 14.00

Wastewater treatment dealing with the increasing quantity of bulky, complex and intractable POME is sometimes accorded least priority as far as the maintenance budget is concerned. This is especially so when it becomes unmanageable as it is no longer efficient. Desludging of effluent pond is necessary to maintain the treatment system in working condition.

Recently, a new paradigm of effluent treatment system which focuses on zero-waste strategy has evolved and this is being pioneered by the innovation of the multi-effects evaporator system. This report attempts to determine whether the multi-effects evaporator is a feasible treatment.

In this report, the financial cost benefit analysis is highlighted to indicate such feasibility criteria and the conventional digestion method was used as a comparison. It is revealed that the effluent treatment itself was shown to be sufficient to pay back the initial capital outlay within seven years. A shorter pay back period of four years is expected for the digestion system because its capital cost is three times lower than multi-effects evaporator system. The viability of the multi-effects evaporator and the digestion system is further reaffirmed by their B:Cs which are more than unity and NPVs which continue to remain positive at higher rates. The IRRs are greater than the opportunity cost of capital; 15% for the multi-effects evaporator system and 26% for the conventional method. Nevertheless, the choice between the two system alternatives would largely depend on budgetary and land constraints.

No. 42**CURRENT STATUS ON LAND APPLICATION OF POME IN THE OIL PALM INDUSTRY – A SURVEY**

Zin Zawawi Zakaria; Khalid Haron and A Affendi Murdi

July 2000. 19 pages. RM 21.00 / USD 14.00

A survey was conducted by PORIM in 1998 to obtain information on the present status of utilization of palm oil mill effluent (POME) for land application by the oil palm industry. A total of 142 respondents (52.6%) out of 270 mills contacted responded to the survey. The survey results indicated that more than 57.0% of mills surveyed practiced land applications agencies, only 3.3% did not practice the scheme whilst the state and government owned agencies (49.2%) did not adopt land application of POME. The respondents that did not adopt the land application scheme cited various reasons such as land availability problem, management policy, logistic and environmental problem. The survey also indicated that if the above problems could be resolved by the owners or management, more POME could be utilized for land application.