PALM OIL ABSTRACTS

A. GENERAL: OILS AND FATS

A00004

KRITCHEVSKY, D. Dietary fats nutrition and heart disease. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

Fat has been implicated as a major dietary factor in the etiology of heart disease but, in fact, all dietary components – fats, protein, carbohydrate and fibre – can affect lipidemia and atherosclerosis. While the general view is that increased fat saturation increases risk, some fats such as peanut oil and cocoa butter do not fit the pattern. Most experimental protocols are based on the use of a sole source of dietary fat (or other component) and thus are not a true representation of the human diet. More studies of mixed fats are required to place the contributions of individual fats in proper perspective. Dietary protein can affect cholesterolemia and atherosclerosis, with protein of animal origin being more atherogenic than plant protein. However, a 1:1 mixture of animal and plant protein is no more lipidemic or atherogenic than plant protein alone. Not all dietary fibres have the same effects on lipid metabolism; insoluble fibre (such as wheat bran) has no effect, whereas soluble fibre (pectin, vegetable gums) is hypolipidemic. Experiments designed to investigate the nutritional and health properties of food components should be designed to provide accurate reflections of intake in man.

A00005

CARROL, K K. Dietary fats and cancer. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989, Bangi: PORIM, 1989.

Many studies over the past 50 years have shown that tumours of the skin, mammary gland, colon and pancreas develop more readily in experimental animals fed high-fat diets as compared with those fed low-fat diets. Dietary fat appears to act mainly as a promoter although it can also affect tumour initiation. The promoting effect is dependent on the type as well as the level of fat in the diet. Dietary fats are effective only if they contain adequate amounts of n-6

polyunsaturated fatty acids and the amount required is greater for mammary tumours and pancreatic tumours than for colon tumours. Because of this requirement, saturated fats often have little or no effect on tumour yield and fish oils that contain n-3 rather than n-6 fatty acids tend to inhibit tumourigenesis when fed at high levels. Analysis of epidemiological data from different countries has shown that cancer at sites such as the breast and colon is more common in countries where the diet is high in fat. Total dietary fat usually shows a stronger correlation with cancer than does any specific type of fat, perhaps because the diets of most countries provide adequate amounts of n-6 fatty acids. In spite of the strong positive correlation overall, countries with similar levels of dietary fat may show substantial differences in cancer incidence and mortality, and countries with differing fat intake do not always show differences in cancer incidence and mortality. This lack of correlation may be due in part to difficulties in collecting accurate epidemiological data, but effects of dietary fat may be modified by other dietary constituents and by other environmental variables.

A00006

Malaysia. Department of Statistics. Agricultural statistics: Time Series. Kuala Lumpur, Department of Statistics, 1988.

This publication is an attempt to bring together several sources of agricultural statistics in Malaysia. It incorporates not only data collected by the Statistics Department but also many sets of data collected by several ministries, departments and agencies in the field of agriculture. The contents are divided into two main sections on the principal statistics of crops, livestock, fisheries and forestry. Section A (Summary Tables) contains data on the importance and contribution of the agricultural sector to the national economy; the tables in this section carry basic information on a five-year interval basis on planted hectarages, production and yield of crops, and import/ export data for selected agricultural commodities. Section B (Time Series Tables) includes data on a number of important crops, *i.e.* rubber, oil palm, paddy, coconut, cocoa, pineapple, pepper, tobacco and tea. The livestock sector highlights data on the animal population, the known recorded slaughter and estimated meat production. Data presented in the forestry sector includes the forest area logged and the production of sawnlogs. The fisheries sector carries data on number of fishermen, number of licensed fishing boats, *etc.*

A00007

PATTERSON, H B W. Handling and storage of oilseeds, oils, fats and meal. United Kingdom: Elsevier Science Publishers, 1989.

This book examines in detail the physical and chemical causes of damage to and hence loss of oilseeds and their products. Descriptions then follow of the many ways in which this damage can be avoided or minimized. These range from construction of oilseed silos and oil storage tanks to the use of natural and synthetic antioxidants. Quality standards for 16 important vegetable oil crops and animal and marine sources are covered. Transport, the regulation of international trade, progressive acceptance of the most relevant analytical methods, quality control and safety in processing are all considered. The last chapter gives a glossary of chemical and commercial terms having particular relevance to oilseeds, oils and fats.

B. OIL PALM

Cultivation. Crop Management. Plant Protection. Palm Science. Breeding and Genetics. Biotechnology.

B00005

IRHO. Oil palm blast. In Oleagineux, 1989, Vol 44(1), 9-13.

Blast, which is a very common nursery disease in West Africa, was long considered to be caused by a parasite complex comprising two fungi, *Pythium splendens* and *Rhizoctonia bataticola*. IRHO research showed that the fungi associated with root decay were not responsible for the symptoms, but that the decay was induced by a vector insect. The means available for controlling blast are preventive and should be brought into play as soon as seedlings are planted in the nursery. Research is being carried out to find

other insecticides as effective as Temik in controlling blast.

B00006

CHUA, N-H. The impact of biotechnology on crop improvement: recent progress and future prospects. PORIM International Palm Oil Development Conference 1989-Module 2, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This lecture reviews recent progress on the impact of biotechnology on crop improvement. The author reviews the seven currently-available methods for DNA delivery into plant cells, namely *Agrobacterium* Ti-plasmid, electroporation, polyethylene glycol treatment, macro-injection into inflorescence, micro-injection into pro-embryos, pollen-tube transformation and the particle gun. Various applications which involve the introduction of new genetic traits are reviewed. Biotechnology is expected to have a significant impact on the modification of quality traits of crop plants, for example by manipulation of protein, polysaccharide and oil quality and their content in plant cells. It is emphasized that such genetic modifications are possible only if there is an efficient method for the regeneration of transformed cells into fertile transgenic plants. For most of the crop plants, this is still not possible. Therefore, efforts in cell biology have to proceed in parallel with those in molecular biology in order to obtain transgenic crop plants with interesting and new traits.

B00007

AHMAD Alwi and CHAN, K W. The future of oil palm yield forecasting: Guthrie's autoregressive integrated moving average method. PORIM International Palm Oil Development Conference 1989-Module 2, Kuala Lumpur, 2-9 September, 1989. Bangi: PORIM, 1989.

For profit maximization in a company growing oil palm, among the many important considerations is a reliable yield forecasting method. A precise forecast will enable the marketing personnel to take advantage whenever there is a differential in crude palm oil prices to realize higher returns. Only a few methods are currently used to forecast the monthly yield of oil palm. Other methods are not acceptable either because of high error or because they are too costly. Thus, in choosing a suitable forecasting method, two most important criteria must be satisfied, precision and reasonable costs. In practice, the accepted method would be one that strikes a balance between precision and costs. This paper presents a practical and cost effective method of forecasting the monthly yield of oil palm. The method, called Autoregressive Integrated Moving Average (ARIMA), has been tested against the tedious and more expensive forecasting method known as the Ulu Bernam System (UBS), for the past three years. With ARIMA, the results show, firstly, that the precision is as good as the UBS and secondly, that a saving in cost exceeding $300 per hectare per year for a company with over 60 000 hectares of mature oil palm was achieved.

B00008

MOHAMAD Husin, ABDUL HALIM Hassan, RIDZUAN Ramli and KAMARUDDIN bin Hassan. The processing of furniture from oil palm trunk. PORIM International Palm Oil Development Conference 1989-Module 2, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

The demand for furniture has been on the rise from both within and outside the country. Competition is very stiff, especially from more advanced countries which have been in the business for a long time. Malaysia has a good potential to become a leading wooden furniture exporter because of the ample supply of wood resources, especially wood with special properties such as that from oil palm. Oil palm wood is very attractive and possesses a unique pattern which resembles the stripes of a tiger. Accordingly, it is proposed that the wood be called 'TIGER WOOD' to add to its attractiveness and commercial value as a raw material for the furniture industry. From the preliminary study on the processing of oil palm trunk for furniture, it appears that TIGER WOOD is suitable for luxury furniture for the international market.

B00009

MOHD TAYEB Dolmat, FOSTER, H L, AHMAD TARMIZI Mohammed, HAMDAN Abu Bakar, KHALID Haron and ZIN ZAWAWI Zakaria. Sustaining oil palm FBB yield through optimum fertilizer management. PORIM International Palm Oil Development Conference 1989-Module 2, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper emphasizes the importance of optimizing fertilizer inputs to sustain oil palm FFB yield. The conclusions are based on results obtained from six 3^2 NK × 2P factorial trials carried out for a period of ten years on three inland and three alluvial soils. On all inland soil, a high yield of at least 30 tonnes ha^{-1} yr^{-1} FFB can be achieved and maintained over the ten-year period with adequate fertilizer application. Minimum fertilizer rates to achieve such yields are at least 4kg ammonium sulphate plus 4kg muriate of potash in all cases and (except on lateritic soil) at least 3kg Christmas Island Rock Phosphate per palm per year. There is a gradual increase in yield even in the control plots on lateritic soil, attributed to improved root distribution. On the other two inland soils, yields in the absence of fertilizer are observed to fall drastically with time to only about half the optimum levels. Leaf N, P and K all show a concomitant marked decline to levels far below optimum. Minimal fertilizer N is initally required on two of the alluvial soils, but the requirement increases with time. Optimum yields are maintained close to 30 tonnes ha^{-1} yr^{-1} on these two soils provided adequate N and K are supplied. On the other poorly drained soil, lower optimum yields were obtained initially and these fell further with time.

B00010

RAMASAMY, Ganesh. The development of normal palm oil 90 A clone flowers from the anatomical aspects: A thesis submitted to Universiti Kebangsaan Malaysia in partial fulfilment of the requirements for the degree of Bachelor of Science with Honours in Botany. Kuala Lumpur, Universiti Kebangsaan Malaysia, 1988.

A study was done to investigate the development of normal palm oil flowers in clone 90 A from the standpoint of morphology and anatomy. Female inflorescences from axils of fronds F 18 to F 21 were used in this study. It was found that female flower primordia differentiate to form a tricarpellary ovary at the F 19 stage. Further development of carpels involves an increase in vascular bundles, crystal bundles and hairs on the surface of stigmas, whereas the male flower primordia develop to form six stamens.

B00011

MOHD RAFIQ bin Norsham. Behaviour and movement of barn owls (*Tyto alba*) and rats (*Rattus* spp.): A thesis submitted to Universiti Pertanian Malaysia in partial fulfilment of the requirements for the degree of Bachelor of Science with Honours in Zoology. Kuala Lumpur, Universiti Pertanian Malaysia, 1988.

A study on barn owls (*Tyto alba*) and rats (*Rattus spp.*) was carried out in Raja Musa Estate, Kuala Selangor in November and December 1987. Eight barn owls and four rats were studied using a radio telemetry technique. Studies on regurgitated pellets and observations using microphones were also conducted on the barn owl. The aims of this study were to observe the movements and behaviour of the two species, and the relationship between them. The results show that the size of home range for male barn owls in the breeding season is bigger than for the female rats. Home range sizes for male rats are also bigger than for female rats. Every night both species have two activity peaks and their activity patterns are shown to be highly correlated. The studies on pellets showed that 100% of the prey eaten by the barn owls consists of rats from the genus *Rattus*. The mean minimum rat consumption is one rat per day. This study has shown that the barn owl has the characteristics required for a rat control agent. Its ability to adapt very well in nest boxes, with proper management, will increase the population of owls in target areas.

B00012

HARTLEY, C W S. The oil palm (*Elaeis guineensis* Jacq.). United Kingdom: Longman Scientific and Technical, 1988.

This book is a completely revised and updated edition of the only comprehensive text to give worldwide coverage of the oil palm. All aspects of the plant's growth and exploitation are covered in The Oil Palm, starting with the history of the African semi-wild palm groves, the early trade in palm oil and kernels, and the remarkable advances of recent decades. A comprehensive account is then provided of the oil palm as a plant, of the industry's growth to its present advanced state, and of the work done in diverse regions of the tropics to improve its cultivation and production, and the extraction of its products. Subsequent chapters cover the botany of the crop, the climate and soils suitable for its culture, the research done on oil palm physiology, selection and breeding, methods of cultivation, nutrition, diseases and pests, and the extraction of palm oil and kernels by village and industrial methods.

C. PALM OIL

Chemistry, Product Development and Quality. End Uses. By-Product Utilization.

C00010

DEFFENSE, E. Recent progress in palm oil fractional crystallization. In Rev Franc des Corps Gras, 1989, Vol 36(5), 205-212.

The improvement of the technique of fractional crystallization realized during this last decade leads to palm oil fractions of better quality with better yield. The principles of the dry fractionation as well as the factors which affect the crystallization of palm oil, *i.e.* the polymorphism, the intersolubility and the process itself are outlined. The Tirtiaux process, of which the performance is described, consists of two sections: crystallization and separation of crystals from the mother-oil. The filtration process developed and proposed by Tirtiaux uses either a vacuum technique with a Florentine filter, or a pressure technique with a membrane filter. The physical and chemical characteristics of different palm oil fractions obtained by the Tirtiaux process as well as the yields are given.

C00011

MUDERHWA, J M, PINA, M, MONTET, D, FEUILLARD, P and GRAILEE, J. 1-3 regioselective enzymatic interesterification in a melted medium and a continuous reactor: Valorization of palm oil. In Oleagineux, 1989, Vol 44 (1), 35-43, In French.

The application of 1-3 regioselective enzymatic interesterification in a tubular reactor with a fixed catalyst bed filled with Lipozyme (*Mucor michei* fixed lipase), follows on from development of the batch reaction: it forms the final stage in the study of vegetable oil biomanufacture by enzymatic interesterification in a melted medium catalyzed by 1 – 3 regioselective enzymatic lipases. Reaction kinetics reveal complete transformation within 5 hours in the reactor, along with conservation of 1 – 3 regioselectivity. It is possible to start from palm oil/counter oil blends in a defined ratio and manufacture products whose properties depend on reactor output and the composition of the initial blend: the properties of the product can therefore be stated at will. The aims, which are to raise the value of palm oil or its solid fraction, by obtaining either fat base for margarines without hydrogenated oils or liquid oils, for seasoning and frying, are achieved.

C00012

NOR AINI Idris, MOHD SURIA AFFANDI bin Yusoff and HANIRAH Hassan. Palm Oil: Sensory characterestics as affected by processing and storage. Conference on Food Processing: Prelude to the 1990s, PWTC, Kuala Lumpur, 12-14 September 1989. Bangi: PORIM, 1989. CP 00511.

The sensory characteristics of palm oil and palm oil products are evaluated. Crude palm olein is very rich in carotene (> 600 ppm) which gives it a very deep red colour. Crude palm stearin has less carotene (< 400 ppm) and is orange in colour. Freshly refined, bleached and deodorized palm olein is light golden yellow with a bland flavour. The temperature at which a palm oil product is stored affects its appearance. At an ambient temperature of 23 – 25°C palm olein is a clear liquid while at 10°C it solidifies and becomes opaque. Palm oil shortenings which are aerated during preparation develop a creamy

colour and become slightly firmer in texture. Shortening containing hydrogenated palm oil is comparatively more stable than other shortenings evaluated in the study.

C00013

SIEW Wai Lin and YASSIN Mohammad. Effects of refining on chemical and physical properties of palm oil products. In JAOCS, 1989, Vol 66(8), 1116–1119.

Some chemical changes in the composition and physical properties of palm oil products are discussed. The effects of bleaching and deodorization on oxidative properties and possible isomerization and interesterification of the fatty acids are indicated from laboratory experiments on refining palm oil. Investigation of commercial samples of refined palm oil products shows that the conjugated dienes and trienes formed are minimal, indicating the use of good quality raw materials and mild processing conditions. Very little isomerization occurs in commercial refined products as indicated by the level of *trans* acids, and changes in the POP to PPO triglycerides because of possible interesterification are insignificant. Changes in physical properties are inevitable due to the removal of free fatty acids and diglycerides and to minor impurities.

C00014

YAMAOKA, Masakazy, JENVANITPANJAKUL, Peesamai and TANAKA, Akio. Glycolipids of the recovered palm oil from spent earth in the physical refining process. In Yukagaku, 1989, Vol 38(7), 572–576.

Glycolipids in recovered palm oil from spent earth in the physical refining process used for Malaysian palm oil were determined. The content of glycolipids in the recovered oil is 3.8%, more than ten times that of crude palm oil, and the recovery of glycolipids from the spent earth is calculated as 0.86 per cent. The content of esterified steryl glycoside (ESG), monogalactosyl diglyceride, carebrosides, steryl glycoside (SG) and digalactosyl is estimated as well as that of monogalactosyl monoglyceride. Glycolipid composition of the recovered palm oil is almost the same as that of crude palm oil. The fatty acid composition of each glycolipid shows palmitic acid to be the major saturated acid and oleic acid, the major unsaturated acid. 4-Desmethylsterol compositions of ESG and SG showed the presence of sitosterol, campesterol, stigmasterol, cholesterol, 7-stigmasterol and avenasterol, in that order of importance.

C00015

YAP P H, DEMAN, J M and DEMAN, L. Crystallization rates of palm oil and modified palm oils. In Fat Science Technology, 1989, Vol 91(5), 178-180.

Differential scanning calorimetry and pulsed nuclear magnetic resonance are used in the estimation of the crystallization kinetics of palm oil and modified palm oils. Differential scanning calorimetry is found to be more sensitive and can differentiate between crystallization during cooking and crystallization under isothermal conditions. Hydrogenated palm oils crystallize quickly and completely when cooled from 60°C, while palm oil and fractionated palm stearin continue to crystallize when held isothermally at 20°C.

C00016

SPEED, R M. Palm oil in the oleochemical industry. PORIM International Palm Oil Development Conference 1989-Module 3, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

The oleochemical industry produces chemicals from natural oils and fats. It is also an important element within the Industrial Master Plan of Malaysia (IMP), which calls for a capacity of 750 000 tpa by 1995. The present combined capacity in Malaysia is 200 000 tonnes per annum. Recently a further 200 000 tonnes of capacity has been announced, mainly in fatty alcohol plants. More investment is expected and a combined capacity of 500 000 tpa by 1992 is not unrealistic. The IMP target, thought by many to be ambitious, has become realistic if the economic climate remains favourable. The fatty acid compositions of palm and palm kernel oil are compared with those of other common oils and fats. A range of applications of fatty acids and their derivatives is discussed. The Malaysian oleochemical industry must also produce downstream products to avoid the pitfalls of the commodity type market. Economic

feasibility and technological skills are also important determinants in 'creating' upmarket products for high-value applications. The Malaysian industry must therefore offer clear quality and cost advantages in order to be a candidate for the required technology transfer. Once the technology has been transferred, it is success in the market place which will determine the fate of the industry. To prepare for the future the industry must ensure that adequate training is given so that experienced personnel are available in sufficient numbers.

D. ENGINEERING AND TECHNOLOGY

Farm Mechanization. Palm Oil Surveying. Palm Oil Mill Engineering.

D00007

OMAR Tarsai. Palm oil carriers: Basic ship design. Third Palm Oil Ship/Shore Surveyors Course, Kuala Lumpur, 14-17 August 1989. Bangi: PORIM, 1989. CP 00505.

This paper traces the historical development of tankers with emphasis on palm oil carriers as regards basic ship design. The carriage of palm oil involves a strict standard of cleanliness, segregation for the grades of oil and above all, the avoidance of contamination. In view of this, it is concluded that the chemical/ parcel tanker is most suited for the job.

D00008

WONG S K. PORLA Standard Surveying Procedures and Practices for Palm Oil and its Derivatives. Third Palm Oil Ship/ Shore Surveyors Course, Kuala Lumpur, 14-17 August, 1989. Bangi: PORIM, 1989. CP 00505

The Standardized Surveying Procedures And Practice For Palm Oil And Its Derivatives are established by the Palm Oil Registration and Licensing Authority (PORLA) to help realize the Malaysian palm oil industry's aspiration of having a high quality standard of surveying at the point of export and giving quality assurance to buyers of Malaysian palm oil. This standard covers the surveyor's operational procedure, documentation of the actual survey carried out at the shore installation and on board the ship, and the usage of instruments recommended by relevant local Malaysian authorities, and international organizations. The standard also incorporates the following code of practices: 'Processed Palm Oil Storage, Transportation, Sampling And Survey Guide' established by PORIM, Federation of Oil Seeds and Fats Association (FOSFA) and Palm Oil Refiners' Association of Malaysia (PORAM); Recommended Code of Practices, Temperature Measurement And Gauging Equipment For Bulking Installations, Storing And Handling Palm Oil And Palm Oil Products' by PORIM (report: PO(117)87); 'Surveying Of Crude Palm Oil Exports From Malaysia' recommended by Malaysian Oil Palm Growers' Council (MOPGC); Recommended Practices for Storage And Transport of Edible Oils And Fats' by PORIM.

D00009

ABE, T. Palm oil mill intelligent control system (PICS). PORIM International Palm Oil Development Conference 1989-Module 3, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

The Palm Oil Mill Intelligent Control System (PICS) was developed in Jengka 8 Mill as a joint research project between FELDA Mills Corporation (FELMIC), PORIM, Mitsui & Co Ltd and the Ebara Corporation. In coventional palm oil mills, a vicious circle exists which affects the mill's energy balance and its productivity. In trying to overcome this, the most important question is how to store and feed fibre and shell as a fuel. PICS claims to be the first system in the world to store successfully and feed automatically and consistently. Based on the fuel feeding control and boiler combustion control, the pressure and quantity of steam generated in the boiler become stable. Once the steam pressure and flow rate become stable, so does sterilization. This is achieved by good sterilization scheduling and valve control. Enough fruits are conveyed to the digester continously and sufficient fuel is produced without interruption. Should the screw press or cake breaker conveyor break down, the fuel storage conveyor can still feed fuel for one hour to two boilers. Thus, as long as any processing problem is solved within one hour, the vicious

circle does not occur. Therefore, PICS is seen as a project that will generate both improved performance and financial savings with a payback period of less than four years, thus making it a viable project for existing or new mills.

E. NUTRITIONAL VALUES

Dietary Fats. Cancer and Carcinogenesis. Coronary Heart Diseases.

E00005

SUGANO, M, NAGATA, J and IMAIZUMI, K. Effect of palm oil on lipid and lipoprotein metabolism and eicosanoid production in rats. PORIM International Palm oil Development Conference, Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper reports on the effect of palm oil on production of eicosanoids. Eicosanoids – the oxygenated metabolites of arachidonic and eicosapentanoic acids – have been implicated in thrombosis and myocardial ischaemia as well as sudden death. There is increased production of the anti-thrombotic and vasodilatory prostacyclin in rat aortic tissues when a palm oil diet is fed.

E00006

QURESHI, Asaf A, QURESHI, Nilofer, SHEN, Z, KRAMER, G, ABDUL GAPOR Mohd Top, CHONG Yoon Hin, DE WITT, George F, ONG Augustine S H and BRADLOW, B A. Lowering of serum cholesterol in hypercholesterolemic humans by Palm Vitee. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper reports that a daily supplement of palm oil vitamin E tocotrienols leads to significant reduction of total plasma cholesterol and LDL-cholesterol in hypercholesterolemic swine as well as in human subjects with initially raised blood cholesterol levels. There is also a decline in thromboxane B2 production in the plasma. Of great significance is the finding by Qureshi that palm vitamin E supplementation in humans also leads to a significant reduction in platelet aggregation response induced by different agonists. *In vitro* experiments by B J Holub, University of Guelph, Canada with washed human platelet suspensions incubated with palm oil tocotrienols provide support to Qureshi's *in vivo* findings, thus indicating that tocotrienols possess a highly desirable anti-thrombotic effect in addition to their hypocholesterolemic effect.

E00007

HORNSTRA, G, SUNDRAM, K and KESTER, A. The effect of dietary palm oil on cardiovascular risk in man. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

Preliminary data presented in the paper indicate that maximum replacement of the habitual fats in the Dutch diet with palm oil in a group of 40 male volunteers (during 2 feeding periods of 6 weeks' duration) had no significant effect on blood cholesterol (190.0 mg/dl for habitual fats in the Dutch diet and 190.8 mg/dl for palm oil diet). In contrast, the palm oil diet caused a significant increase in the beneficial HDL-cholesterol and a significant reduction in the harmful LDL-triglycerides.

E00008

KOMIYAMA, K and YAMAOKA, M. Anti-tumour and anti-oxidant activities of tocotrienols. Application of tocotrienols to cancer chemotherapy. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper compares the effects of alpha and gamma tocotrienols isolated from palm oil on transplantable murine tumours. Both the tocotrienols show antitumour activity and prolonged the life span of mice with transplanted tumours. Tocotrienols also inhibit the growth of Hela and P388 tumour cells in culture but not tocopherol.

E00009

KLURFELD, D. Palm and other edible oils: atherosclerosis study in rabbits PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

The effects of consuming 32% of ener-

gy from a single fat source [plus 4% from corn oil for essential fatty acid (EFA)] are being studied in rabbits fed cholesterol-free, purified diets formulated to induce endogenous hypercholesterolemia. The test fats are: 1) hydrogenated coconut oil, 2) cottonseed oil, 3) hydrogenated cottonseed oil, 4) a blend approximating American fat intakes, 5) RDB palm oil, 6) Neutralized palm oil. Blood is collected at 4,8,10,12, and 14 months. Groups 1, 5 and 6 produced similar elevations in total serum cholesterol which was 2-3 times that of the other groups. HDL cholesterol dropped in all groups during the study; the two palm oil groups had the highest values. Serum triglycerides show no pattern as a result of diet. Aortic atherosclerosis at the end of 14 months (percentage of surface with lesions) was 1) 15 ± 11; 2)3 ± 1; 3) 1 ± 0.4; 4)2 ± 1; 5) 4 ± 1; 6)6 ± 1. None of these differences are statistically significant. A number of other analyses are in progress but these interim data provide evidence that consumption of large amounts of palm oil does not result in increased arterial disease.

E00010

HAYES, K C, PRONCZUK, A, LINDSAY, S and DIERSEN-SCHADE, D. Dietary palmitic acid (16:0) is not hypercholesterolemic in monkeys when compared to 12:0 + 14:0. PORIM International Palm Oil Development Conference 1989-Module 1, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper reports that increasing the amounts of palmitic acid, the major saturated fatty acid of palm oil, by 5-fold, in the diets of three species of monkey (cebus, squirrel and rhesus) not only does not raise blood cholesterol levels but that the total cholesterol actually declines by 22 mg/dl from 205 ± 11 mg/ dl to 183 ± 9 mg/dl. It is concluded that palmitic acid is neutral and the authors go on to show that the Hegsted and Keys equation predicts the response perfectly (r = 0.99) when this new finding is taken into account.

F. TECHNO-ECONOMICS

Production Costs. Socio-economics. Market Development. Futures Trading.

F00004

BATTERBEE, John E. Palm oil – the challenge of expanding its edible markets. PORIM International Palm Oil Development Conference 1989-Module 3, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

The production of palm oil is the second largest, after that of soyabean oil, in the world production of edible oils and fats. Production has grown strongly in the last decade, with Malaysia and Indonesia the dominant producers. In the same period, net imports have grown even more strongly, which suggests little, if any, problem in disposing of palm oil. This disguises the fact that there have been two periods of major price weakness by comparison with competing oils, and indeed problems in the refining industry in Malaysia due to poor margins. Palm oil production is expected to continue to expand strongly in the future. An examination of the major net importers, such as India, the EC, China, Pakistan, the Soviet Union, *etc.*, indicates possible limitations on off-take continuing to match production. This is the challenge for palm oil – to continue to expand its edible markets. Such expansion will require further determined technical and marketing efforts to generate not only new uses for palm oil, but indeed new palm oils to replace other oils in current uses. The key to successs probably lies in plant breeding to produce specific characteristics, as well as in technical developments to improve quality. Finally, every effort must be made to ensure that desirable, high quality products are delivered through a long export chain in that same condition.

F00005

LARSON, Donald F. Economic prospects for palm oil: a World Bank view. PORIM International Palm Oil Development Conference 1989-Module 3, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

Palm oil is part of a highly integrated market system of annual and perennial crops, of meals and vegetable oils, of free

markets and controlled markets. Output and consumption of products from this market touch all nations. The present paper examines the role of palm oil in an international multi-product market. Future prospects for this market in general and for palm oil in particular are presented, as well as a discussion of possible future policy environments.

F00006

TAKASE, Tamotsu. Trade barriers on tropical vegetable oils. PORIM International Palm Oil Development Conference 1989-Module 3, Kuala Lumpur, 5-9 September, 1989. Bangi: PORIM, 1989.

This paper describes the events at and achievements of the Uruguay Round of Multilateral Negotiations from 1987 up to the Montreal Mettings for the Mid-Term Review of the Uruguay Round in June-July 1989. The Negotiating Group on Tropical Products covers seven products, including notable 'certain oilseeds and vegetable oils'. The Negotiating Group on Tropical Products has produced concrete results among the negotiating groups dealing with market access questions: these are to be implemented on a provisional basis for the duration of the Round and can be modified or withdrawn in the light of further developments in negotiations. The contributions of the 18 countries involved are in various stages of implementation during the 1988-1993 period. Taking into account the results of the pre-Montreal negotiations, the paper then goes on to describe the tariff and non-tariff situation regarding on 'certain oilseeds and vegetable oils', namely (i) certain oilseeds (groundnuts, copra, palm nuts and kernels, castor oilseeds, shea nuts and other oilseeds, flour and meals of oilseeds, others); (ii) groundnut oil and fractions, palm oil, coconut oil and palm kernel oil or babassu oil and their fractions; (iii) certain other vegetable oils and processed oils [castor oil, jojoba oil and processed oils (physically or chemical ly modified)]; (iv) vegetable oil products (fatty alcohols and glycerol); and finally (v) oilcakes and other solid residues (oilcake of groundnut, copra, palm nut or kernel and other vegetable oils or fats).

F00007

MARTIN, Susan M. Palm oil and protest: An economic history of the Ngwa Region, South-eastern Nigeria, 1800-1980. New York, Cambridge University, 1988.

This book traces the rise and fall of the oil palm export industry in the Ngwa Region which lies in the heart of the Nigerian palm belt. It is shown that patterns of export growth and capital investment were heavily influenced by locally inspired changes in food production methods, gender and intergeneration relationships. The processes of change within the domestic and export economies became increasingly closely inter-twined after 1924, when African coastal middlemen began to settle further inland and to spread the knowledge of cassava and Christianity, and when colonial officials introduced direct taxation and consolidated their Native Court system. Ngwa women and their neighbours protested vigorously against government interference through the Igbo Women's War of 1929, but failed to reverse the trend. Since then, falling world market prices for palm produce and the introduction of Marketing Board levies have caused a steady decline in the incomes of both female and male palm producers. Many young men began to seek their fortunes outside the villages, while the women who remained turned to cassava as a new staple food and cash crop.