...the steward of the Malaysian palm oil industry
Foreword

The Malaysian Palm Oil Board (MPOB) has played an active role in developing new technologies which have contributed to the advancement of the Malaysian oil palm industry.

In leading the industry, MPOB provides and promotes strong scientific and technological support through its commitment to R&D, the commercialisation of its research findings and the transfer of knowledge and innovation. It also plays a significant role in matters relating to registration, licensing and enforcement.

MPOB has continued to provide leadership and has developed strong research expertise in various areas. A remarkable count of more than 340 technologies including new products and services have been launched for commercialisation and adoption by the industry. This has contributed towards accelerating the development of the industry and provided opportunities for investments in oil palm-related business.

MPOB will continue to contribute to the industry’s well-being and future growth. It is MPOB’s vision to strive for quality R & D outputs and to become Malaysia’s first R & D institution to produce a Nobel Laureate.

Corporate Profile

Premier Government Agency

MPOB is the premier government agency entrusted to serve the country’s oil palm industry. Its main role is to promote and develop national objectives, policies and priorities for the well-being of the Malaysian oil palm industry.

It was incorporated by an Act of Parliament (Act 582) and established on 1 May 2000, taking over, through a merger, the functions of the Palm Oil Research Institute of Malaysia (PORIM) and the Palm Oil Registration and Licensing Authority (PORLA). Each of these respective organisations has been involved in the oil palm industry for more than 20 years and it is to render more effective services as well as to give greater national and international focus to the industry that MPOB was instituted.

Funding

MPOB derives its funding mainly from cess imposed on the industry for every tonne of palm oil and palm kernel oil produced. In addition, MPOB receives budget allocations from the government to fund development projects and for approved research projects under the Intensification of Research in Priority Areas (IRPA) programme.
Vision
To become the premier Nobel Laureate-producing research and development institution, providing leadership and impetus for the development of a highly diversified, value-added, globally competitive and sustainable oil palm industry.

Mission
To enhance the well-being of the Malaysian oil palm industry through research, development and excellent services.

Strategies
- Expand and improve the current uses of oil palm products.
- Find new uses for the products.
- Improve production efficiency and quality of products.
- Optimise land utilisation in oil palm areas.
- Promote the use, consumption and marketability of oil palm.
### Policy

- To adopt strong market and industry-oriented research and development programmes.
- To aggressively undertake transfer of technologies and commercialisation of research results.
- To forge an active partnership in technology development and utilisation with the private and public sectors.
- To strengthen international linkages and research collaboration in selected areas.
- To promote global awareness, appreciation and demand for Malaysian oil palm and products.

### Functions

- Implement policies and development programmes to ensure the viability of the oil palm industry of Malaysia.
- Conduct and promote research and development activities relating to the oil palm industry.
- Regulate, register, co-ordinate and promote all activities relating to the oil palm industry.
- Develop, promote and commercialise research findings as well as provide technical, advisory and consultancy services to the oil palm industry.
- Develop and maintain markets for oil palm products as well as promote efficient marketing.
- Liaise and co-ordinate with other organisations inside or outside Malaysia to further enhance the oil palm industry of Malaysia.
- Plan and implement training programmes and human resource development in line with the needs of the oil palm industry.
- Be the resource and information centre of the oil palm industry including the publication and dissemination of information on oil palm as well as other oils and fats.
MPOB Board members lead the organisation to be the leader in the Malaysian oil palm industry

The Board Members

Members of the Board which comprises a Chairman, representatives from the government and the industry, and the Director-General of MPOB are appointed by the Minister of Plantation Industries and Commodities. The Board plays a leadership role in giving direction to the organisation.

Several committees serve the Board in the following areas:

- Research (Programme Advisory)
- Finance & Development
- Tenders
- Establishment
- Registration & Licensing
- Audit
**The Programme Advisory Committee**

The Programme Advisory Committee comprising eminent scientists and experts from Malaysia and abroad annually examines and makes recommendations on research activities for the Board’s consideration.

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**Organisation**

The Director-General is responsible for the administration and management of MPOB. In executing his duties, the Director-General is supported by the Deputy Director-General (Research & Development) and the Deputy Director-General (Services).

Eight directors head the following divisions:

1. Biological Research
2. Engineering & Processing Research
3. Advanced Oleochemical Technology
4. Product Development Research & Advisory Services
5. Economics & Industry Development
6. Finance, Management & Development
7. Information Technology & Corporate Services
8. Licensing & Enforcement

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**Organisation Chart**

- **Minister of Plantation Industries and Commodities**
  - **Chairman / Board**
  - **Director-General**
  - **Deputy Director-General (Research & Development)**
  - **Deputy Director-General (Services)**
  - **Finance, Management & Development Division**
    - Development & Maintenance
    - Finance & Procurement
    - Human Resource Management
    - Human Development & Conference Management
  - **Economics & Industry Development Division**
    - Techno Economics
    - Trade Development
    - Industry Development
  - **Advanced Oleochemical Technology Research Division (AOTD)**
    - Oleochemical Products Development
    - Oleochemical Products Services
    - Oleochemical Methods Services
    - Oleochemical Start-up Business Unit
  - **Engineering & Processing Research Division**
    - Milling & Processing
    - Agro Product
    - Energy & Environment
  - **Product Development Research & Advisory Services Division**
    - Analytical & Quality Development
    - Food Technology & Nutrition
    - Technical Advisory Services

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*The placement of the divisions in the Organisation Chart does not reflect their order of importance.*
Research and Development (R&D)

Operations

Pilot plant producing polyol for polyurethane products

Research and Development is the thrust of MPOB’s activities. A whole spectrum of R&D work ranging from upstream production to downstream processing is carried out by the various research divisions namely Biological, Engineering & Processing, Product Development & Advisory Services and Advanced Oleochemical Technology.

Strategy

The research activities are aimed at maximising productivity, improving production efficiency and quality, and increasing value creation by expanding the palm oil and palm kernel oil value chain to promote a globally competitive and sustainable industry.

To achieve this, MPOB has embarked on a three-pronged R&D strategy:

- **High Income**
  - Increasing the yield of oil palm through the application of modern technologies such as genetic engineering and tissue culture as well as implementing good plantation management practices, farm mechanisation and integrated farming to increase the income of oil palm producers.

- **Zero Waste**
  - Optimising the utilisation of oil palm waste and biomass such as empty fruit bunches, fronds and trunks for field-mulching and commercial products like pulp and paper, medium density fibre-board, automobile components and biogas for energy generation.

- **Value-Addition**

  The Genome Analysis Laboratory for Oil Palm (GALOP) acts as the core facility providing services and gene resource management for MPOB.

Sample of MDF undergoes strength test

Farm mechanisation and integrated farming help to increase income of oil palm producers

From waste to wealth – utilisation of oil palm biomass is essential in sustainable agriculture
• Value-Addition
Increasing the value of palm-based products, both edibles and non-edibles, for consumer and industrial uses by going downstream.

- Biological Research Division
  This division undertakes all aspects of research relating to crop production and management, and advanced biotechnology.

  The R&D areas are:
  • Agronomy and fertilisers
  • Entomology and mammalia
  • Plant pathology and weed science
  • Plant physiology
  • Farm mechanisation
  • Gene expression
  • Metabolics
  • Genomics
  • Transformation
  • Breeding and genetics
  • Tissue culture
  • Crops and livestock integration
  • Extension, consultancy and training
  • Smallholders’ development

  The following four divisions are responsible for R&D:

  - Production of callus of palm’s shoot
  - Oil palm tissue culture
  - Vitamin E
  - Palm-based personal care products
Advanced Oleochemical Technology Research Division (AOTD)
This is a division that focuses on research in oleochemicals. Its objective is to spearhead the development of oleochemical downstream activities, thus increasing the country's earnings through oleochemical products.

The R&D areas are:
- Cosmetics, personal care and pharmaceutical products
- Surfactants and specialty chemicals
- Polyols, polyurethanes, polymers and coatings
- Household and industrial chemicals
- Agrochemicals
- Oleochemical methods and standards
- Oleochemical Process Development

AOTD has established analytical, efficacy and physical testing services for the benefit of the industry.

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Engineering and Processing Research Division
The thrust of this division is on enhancing the quality of oil palm products, expanding their uses, developing new milling and refinery processes as well as technology for increased efficiency and cleaner environment.

Continuous Sterilisation - a modern milling technology
Effluent Treatment System - an effective method in treating discharge from mills
Plant-wide automation to facilitate control of mill operation from a control room
Palm Oil Milling Technology Centre (POMTEC) in Labu, Negeri Sembilan
Palm-based polyurethanes
Palm-based oleochemical products - towards a cleaner environment
It undertakes economic research and statistical analyses on production, marketing and new technologies in the oil palm industry; embarks on economic development programmes and the registration, collection and dissemination of market and industry information.

Its main activities relate to:

- Market Development
- Techno Economics
- Econometrics
- Industry Development
- Trade Development

The R&D areas are:

- Product formulation and performance evaluations of palm-based solid fats and frying oils
- Fractal and synchrotron radiation studies of crystallisation of oil palm products
- Production of oil palm reference standards
- Development of new analytical techniques and instruments
- Environmental impact of agrochemical practices
- Research into health benefits of oil palm and oil palm-based products
- Development of palm-based nutracueticals
- Market expansion through Technical Advisory Services
The Finance, Management and Development Division, the Information Technology and Corporate Services Division and the Licensing and Enforcement Division provide support services designed to enhance the effectiveness of R&D and the growth of the palm oil industry.

Finance, Management and Development Division
The division oversees the management of the organisation and its finances, and provides services in matters relating to:
- Human Resources
- Finance and Procurement
- Development and Maintenance
- Human Resource Development and Conference Management

Information Technology and Corporate Services Division
The division provides expertise in the following areas:
- Palm Information Centre and Library
- Corporate Implementation and Consultancy
- Computer and Multimedia
- Public Relations and Publications

Licensing and Enforcement Division
The division is responsible for registering, coordinating, regulating and promoting all relevant activities for the healthy and orderly growth of the industry, and for ensuring that oil palm products produced and exported meet the trading contractual specifications and customer needs.

The division’s four main activities are:
- Licensing
- Enforcement
- Quality Control
- Legislation and Policy Studies

In rendering its services the division is assisted by regional offices.

Services

State-of-the art and interactive Palm Information Centre

Technical Consultancy

MPOB extends technical consultancy and other services to support the oil palm industry through its:
- Pilot Plant Facilities
- Efficacy Testings
- Microbiology Testings
- Analytical Testings
- Biodegradation Testings
- Ecotoxicity Testings
- Efficacy Testings
- Microbiological Testings
- Physical Testings
- Information & Library Services
- Market Information
- Technical Advisory Services
- Technical Consultancy
- Feasibility Studies on Oil Palm Planting
- Scientific Publications
- Technical Trainings
- Conferences & Seminars
- Transfer of Technology
- Extension Services
Achievements

The Malaysian Palm Oil Board has developed strong research expertise in various disciplines such as biology, chemistry, physics, engineering and other areas in carrying out R & D relating to the oil palm industry. Among its many successes include the utilisation of oil palm and oleochemicals in non-food applications and the development of oil palm biomass as a raw material for pulp, paper and furniture products such as the medium-density fibreboards and energy sector – biofuel.

MPOB has won many awards for its achievements in developing the Malaysian oil palm industry. Among the prestigious awards are the top-ranking Prime Minister’s Quality Award and scientific excellence awards for outstanding research projects, at both the national and international levels. The Islamic Development Bank (IDB) has awarded the prestigious - Prize for Science & Technology award in the category for “Institutions Having Achieved Outstanding Scientific or Technological Contribution to the Development of a Member Country”.

Upstream Research

MPOB has successfully assembled the world’s largest collection of oil palm germplasm, which has contributed tremendously to the development of planting materials. The range of high quality oil palm planting materials, PS1 and PS2, besides high yield, is known for dwarfishness and high iodine value, respectively. Breeding populations developed are PS3 (high kernel content), PS4 (high carotene), PS5 (thin shell), PS6 (large fruit), PS7 (high bunch index), PS8 (high vitamin E), PS9 (bactris), PS10 (long stalk), PS11 (high carotene E.guineensis) and PS12 (high oleic acid). The planting materials and breeding populations developed are for the betterment of the oil palm industry.

Gene sequences are archived in the Palm Genes database and are used to build the oil palm DNA chips for the development of diagnostic tools for breeding and tissue culture.
In Agronomy research, MPOB has developed an expert system known as the Oil Palm Efficient Nutrient System (OPENS) to increase site yield potential. This system determines the status of nutrients in the oil palm environment so that suitable fertilisers can be applied to plantations in appropriate dosages. OPENS, which considers soil characteristics, rainfall, age-profiles, soil and foliar data, can significantly increase productivity in the plantations. Tools such as Remote Sensing and Geographical Information System (GIS) can enhance precision agriculture and plantation management.

The fertilisers, namely MPOB F1 and MPOB F2, have balanced nutrients that optimise nutrient uptake, and deliver more yield. Their continuous application provides good growth and higher yields in the long term.

MPOB has also embarked on several farm mechanisation programmes to promote efficiency in the industry, address labour shortage, increase worker’s productivity and reduce plantation management costs. New technologies have been introduced and these include the hand-held mechanical cutter, harvesting machine for tall palms and a cable-way system for evacuation of fresh fruit bunches in peat and hilly areas.

In the field of genomics, MPOB has constructed genetic linkage maps of the oil palm genes associated with economics traits. The genomic in-situ hybridisation (GISH) technique, or chromosome painting, has been applied for distinguishing E. oleifera and E. guineensis chromosomes in hybrids and their backcross progenies. The application of automated DNA sequencing and bioinformatics tools has resulted in over 9,000 oil palm genes being partially sequenced. The gene sequences are archived in the Palm Genes database and are being used to build an oil palm DNA chip, or micro-array, for the development of diagnostic tools for breeding and tissue culture.

The Genome Analysis Laboratory for Oil Palm (GALOP) acts as the core facility providing services and gene resource management for MPOB, the industry and the scientific community. Research in tissue culture and the development of alternative methods of cloning have been aggressively undertaken.

In the industry, address labour shortage, increase worker’s productivity and reduce plantation management costs. New technologies have been introduced and these include the hand-held mechanical cutter, harvesting machine for tall palms and a cable-way system for evacuation of fresh fruit bunches in peat and hilly areas.
MPOB has succeeded in transforming the oil palm milling technology with its continuous sterilisation process. This new process eliminates the use of steriliser cages, rail tracks, overhead cranes, tippers, transfer carriages and tractors. In the conventional batch sterilisation process, bunches are loaded into cages and pushed into sterilisers where they are steamed in batches, for more than one hour. Considerable space and a system of rails are required in this method, which is also labour-intensive. The cost of building a new mill based on continuous sterilisation is estimated to be about 15 per cent less than a mill based on the conventional process. At the same time, MPOB is pioneering the use of a plant-wide control system to facilitate comprehensive monitoring of the milling process and equipment from a control room.

In Entomology and Mammalia research, the beneficial plant Cassia cobanensis is proven effective in propagating parasitoids and predators for the control of bagworms. A local Bacillus thuringiensis (Bt) isolate has potential to control bagworms and nettle caterpillars. Bio-agents such as the Metarhizium and Oryctes virus have the potential to control the rhinoceros beetle, Oryctes rhinoceros and reduce damage, especially in zero-burn replanting areas.

Plant Pathology research is focused on developing control methods and seeking early detection of Basal Stem Rot (BSR), the oil palm disease caused by Ganoderma. The molecular method can now be used to detect pathogenic Ganoderma species. To prolong the lifespan of diseased palms, hexaconazole can be applied with a pressure injection apparatus. A mechanical trunk injector has also been developed which will hasten the field application of the fungicide. Sanitation is considered extremely important in avoiding field occurrence of this disease. Apart from chemical and cultural practices, other microbes or antagonists which could reduce the infection or spread of Ganoderma are being studied.

Research in Crop Physiology is geared towards understanding the above-ground and below-ground resource capture, storage and utilisation, the regulatory processes involved in the reproductive phase (e.g. sex determination, abortion and fruit bunch development) and the physiological responses to environment stress, diseases and agronomic practices. Research tools such as minirhizotron and root auger were developed to further enhance the observation and study of the oil palm root development and turnover.

MPOB has introduced various formulations for food. Oil palm is so adaptable that it can be used for a wide range of food products. These include margarines, shortenings, fat spreads, ice-cream, cheese, non-dairy creamer and other non-dairy products, salad dressing, chocolates and palm-based coconut-milk (santan) and others.
The versatility of palm oil is not limited to food applications. Its attractiveness as raw material for non-food application is well-known. Industries prefer to use plant-derived raw materials since these are renewable, environmental-friendly and is cost competitive.

In non-food applications, research has focused on the development of value-added oleochemical consumer products such as soaps, shower products, shampoos, conditioners, grease, detergents and softeners as well as agricultural and industrial products.

MPOB has introduced a technology to produce surfactant from palm oil that can compete with other petrochemical-derived surfactants, in terms of costs and performance. Palm-based surfactants have proven to clean as effectively as other surfactants. It is biodegradable, mild towards enzymes and less sensitive to water hardness. It can also easily be formulated into powder and liquid detergents. MPOB estimates the potential demand for palm-based surfactants to be high.

The versatility of palm oil enables it being used in a wide range of food products.
About 10 per cent of the output of the oil palm tree is palm oil while about 90 per cent, in the form of trunk and fibre, are biomass (waste) which has yet to be economically exploited fully. The utilisation of the oil palm biomass is essential in sustainable agriculture.

MPOB, through its research, has made it possible for this biomass to be converted into a wide range of industrial applications and has proven that the conversion of oil palm biomass into certain higher-value products is technically feasible. The fronds, trunks and empty fruit bunches have been turned into plywood, pulp and paper products, medium-density fibreboard, moulded particleboard and thermoplastic composites. Others include composite boards of various kinds used for making furniture and automotive components. The oil palm biomass is also being used in the feedstock and chemical industry for fertiliser and animal feed production.

Commercialisation

The new technologies and products emanating from MPOB research and development programmes are actively promoted for adoption and many have been transferred for commercialisation by the industry and Malaysian entrepreneurs.

MPOB’s commercialisation efforts owe their success to effective transfer of technology methods which are implemented through seminars and exhibitions, technology demonstration month, technology website, pilot plants and incubation centres, the MPOB intellectual property policy and commercialisation agreements.

The transferred technologies have contributed significantly to the oil palm industry. The findings generated from transfer of technology efforts are multifarious, and may be classified into the following categories:

- **Planting Materials and Breeding Populations**
  - PS1, PS2, PS3, PS4, PS5, PS6, PS7, PS8, PS9, PS10, PS11 and PS12.

- **Farm Mechanisation**

- **Crop and Livestock Integration**
  - MPOB’s mixed farming design with distinct features. In a defined, systematic way, two commodities, cattle and oil palm, are managed in a single piece of land.

- **Pests and Disease Control**
  - The biological technique developed to control rhinoceros beetle. *Metarhizium anisopliae*, a fungus which kills the rhinoceros beetles that damage the oil palm tree at the immature stage.
• Milling and Processing

• Food Use
  – Red Palm Oil, Vitamin E, Palm Oil-Based Specialty Animal Fats Replacer (SAFaR™) Formulation, Pourable Margarine and Smart Balance™ range of products.

• Oleochemical
  – Detergents, cosmetics, personal care products, polyols and polyurethanes, coatings and adhesives, agricultural products and industrial products.

• Biomass Utilisation
  – Pulp & paper and fibremat from oil palm fibres, OP-Fibre Moulded Plastic Composite and Automobile Components

MPOB has released more than 340 technologies and many of these have been commercialised. Several more of these technologies, which are to be commercialised through the licensing of patents, are currently under negotiations.
The MPOB head office is located in Bangi, Selangor. It encompasses its research facilities which include the Oil and Fats Technology Centre (OFTEC), Advanced Biotechnology and Breeding Centre (ABBC), Palm Biodiesel Pilot Plant, Margarine Pilot Plant, Continuous Frying Pilot Plant, High Oleic Pilot Plant, Alpha SME Pilot Plant and Microbial Technology Engineering Centre (MICROTEC). It also houses the Palm Information Centre and Library.

Facilities

The Advanced Oleochemical Technology Division (AOTD), located in Bandar Baru Bangi, Selangor, is well-equipped with state-of-the-art R&D facilities enabling it to provide specialised services to the industry. Two other facilities located a distance away are the Farm Mechanisation Centre and the Biomass Technology Centre. The Wisma Sawit in Kelana Jaya, Selangor, accommodates the Economics and Industry Development Division as well as the Licensing and Enforcement Division.

MPOB has set up a fully-automated modern mill at the Palm Oil Milling Technology Centre (POMTEC) in Labu, Negeri Sembilan. The installation encompasses up-to-date milling technologies which include a plant-wide control system and continuous sterilisation. With this modern mill, the oil palm industry will have access to technology-transfer in commercial mills which would lead to increased productivity, better quality oil palm and reduced processing costs.

MPOB and FELDA Agricultural Services Sdn Bhd (FASSB), a subsidiary of FELDA, have set up the Metarhizium Technology Centre (METEC) in Jerantut, Pahang. The launching of METEC is a landmark event in the development of collaborative efforts between MPOB and FELDA in promoting the effective application of R&D. The introduction of bio-agents such as the Metarhizium fungus will benefit the plantation industry and assure high returns.

The Energy and Protein Centre (EPC) is located in Keratong, Pahang. The centre is entrusted to find technical solutions, formulation and feasible practices for utilising and incorporating more total palm fat energy in commercial livestock feed.

A network of research stations, regional and sub-regional licensing and enforcement offices, as well as port stations have been established throughout the country to ensure the orderly development and growth of the industry.
MPOB has also set up technical advisory offices at various major oil palm consuming countries.

At home, a network of 6 regional and 10 subregional offices, 7 research stations and 5 port stations has been established.

It also maintains linkage with international institutions related to oils and fats, universities and various R&D institutes. This is done through collaborative or contract research in areas of common interest. Such linkages help MPOB keep abreast with the latest developments in the oils and fats sector.
... a total of more than 340 technologies/products have been launched.
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<td>15. PORIM Series No.1-Planting Material</td>
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Palm-Based Whitening Gel

Palm-Based Cleansing Milk

Palm-Based Day Cream with Sunscreen

Palm-Based Night Cream

Palm-Based with Tawas

Palm Soap with Stabbing Agent

Hi Reach Harvesting Pole

Goats Milk Ice Cream

Recovery of Glycerol and Valuable Components from Glycerol Residue

Recovery of Glycerol and Valuable Components from Glycerol Pitch

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Speciality Animal Fats Replacer For Meat Products

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