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INTRODUCTION TO AGRICULTURE

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Content

Summary

e book introduction to agriculture developed as an initial guide for agro technology diploma students at Polytechnic Sandakan Sabah.

This book focus in the development of technology in the field of technology, the agencies responsible for helping the development of agriculture in the country and the importance of agriculture industry to the country.

With the production of this book, it is hoped that it can be a guide for students at Sabah Sandakan Polytechnic for them to better understand the importance of agriculture industry and help strengthen their interest in this field

Topic 1

INTRODUCTION TO AGRICULTURE

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WHAT IS AGRICULTURE

- According to the oxford dictionary, agriculture is define as the science or practice cultivation, generating and harvesting crops, as well as raising and managing livestock and preparing and marketing the goods at various stages.

Topic 2

HISTORY OF AGRICULTURAL DEVELOPMENT

BEFORE CENTURY

8000 B.C

- Wheat, barley, chickpeas, beans, legumes and flax.
- Goat and sheep farming.

6500 B.C

- Millet is grown as the main crop in China.
- Rice probably started in India and spread all over Asia by 5000 B.C.

5500 B.C

- Simple irrigation systems started to be used in the Mesopotamian region to increase crop production

3000 B.C

- Animals were used to reduce the load in agriculture.
- In addition to being used as a source of meats and wool in some areas of the Andes range

2500 B.C

- Grain farming was the foundation of the Harappa civilization in the Indus River valley in Pakistan and India.

After Century/Decade (A.D)

800 A.D

- Open field planting systems are widely practiced in western Europe.
- The land was divided into two or three huge fields, with one field left uncultivated and the other fields rotated crops annually..
- Figure 1 shows a picture of an open field planting system.

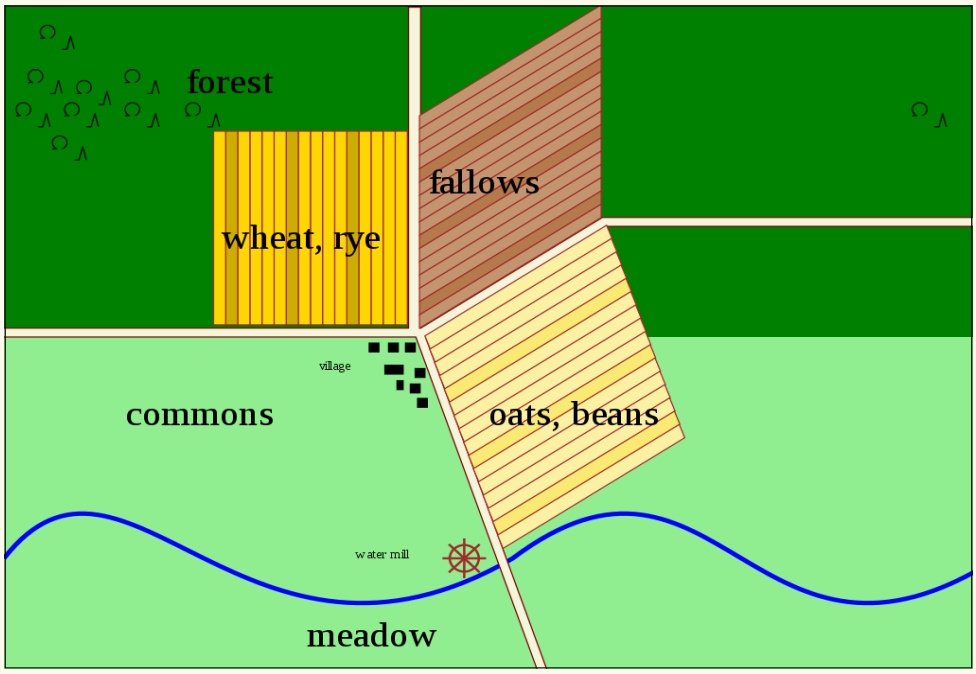


Figure 1: Open field planting system.
(By MScharwies - Own work, CC BY-SA 4.0,
https://commons.wikimedia.org/w/index.php?curid=64722749)

1400-1500 A.D

- Agricultural goods from Asia and the Americas were brought into Europe by explorers.
- Indigo, coffee, and tea were brought back from Asia.
- Meanwhile, among the plants carried over from the Americas were potatoes, tomatoes, corn (maize), and beans.

18th century (1700-1799)

- Improvements from earlier systems and new crop rotation techniques emerged in England and Europe's low countries. In Norfolk County, England, Charles Townshend introduced the four-field method.
- To improve soil fertility and boost yields, he discovered that turnips could be alternated with other plants such as barley, clover, wheat, and turnips.
- Jethro Tull invented the seed drill to English farmers. A device that cut furrows and dropped in seeds.
- This invention expedites and simplifies the time-consuming and tedious process of manually sowing seeds.

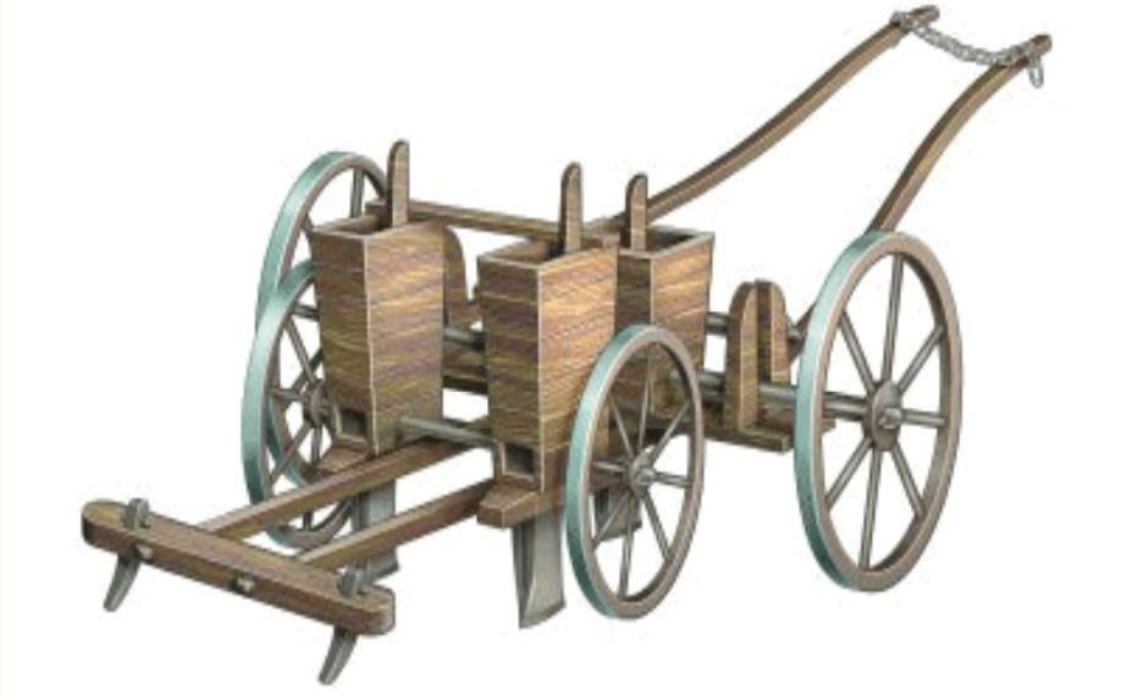


Figure 2: Seed drill model invented by Jethro Tull

(Valavanidis, and Vlachogianni, 2013)

- Robert Bakewell made the discovery of selective breeding of sheep and cattle to create healthier animals in England.

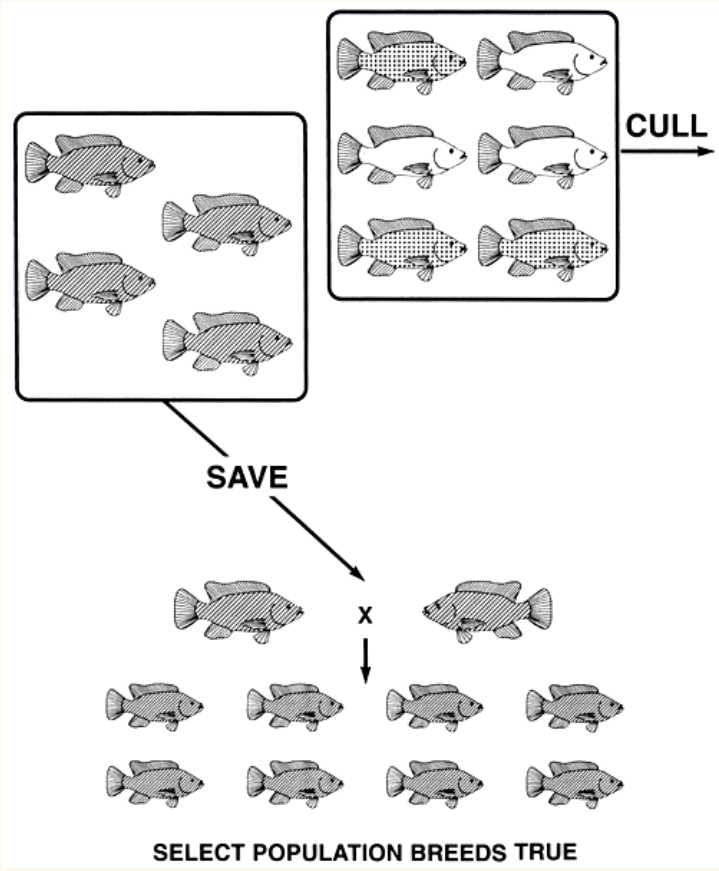
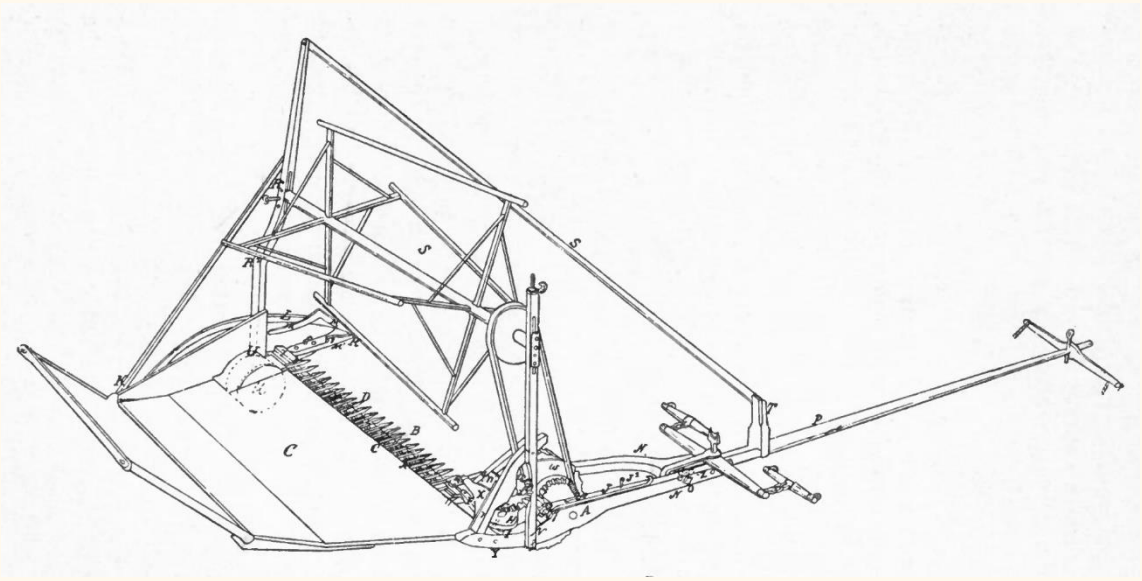


Figure 3: Selective breeding in tilapia (FAO, 1994)

- Eli Whitney constructed the cotton gin in the United States, a device that separated fibre from seed a lot faster than individuals could do it by hand.
- Andrew Meikle, a Scottish agricultural engineer, created the first threshing machine in 1786. The grain was rubbed between a concave metal sheet and a metal drum.

19TH CENTURY (1800-1899)

- The first practical reaper, or grain harvesting tools, was developed in the United States in 1834 by Cyrus McCormick.

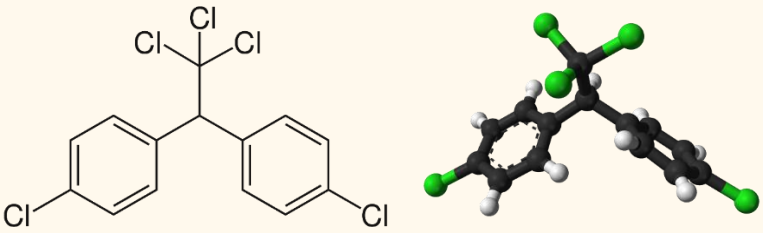


Grain harvesting machine (Iles, 1912)

- John Deere patented the steel plough in the US in 1837. Compared to wooden or iron ploughs, it was more effective, sharper, and stronger.
- Sir John Bennet Lawes established the first superphosphate manufacturing facility in England in 1842. The market for chemical fertilisers officially began with this.
- Railroad and steamship lines were expanded between the 1850s to the early 1900s, creating new markets. Long-distance shipping of perishable agricultural goods was made possible by advancements in refrigeration and canning techniques.
- Gregor Mendel's heredity research findings were published in Austria in 1866. Mendel conducted study on pea plants to understand how features

are handed down from one generation to the next. His work paved the path for genetically modifying crops.

- The first gasoline-powered tractors were constructed in the early 1890s. In many parts of the world, they eventually supplanted draught animals and steam-powered tractors.
- 1890s - The combine harvester that combined the cutting and threshing of grain harvests, became widely used in California. Then, it expanded to other western states gradually. 20TH CENTURY (1900-1999) 1920s - Improved nutrition, disease control methods, and breeding procedures considerably boosted cattle productivity. One hectare of wheat was harvested in 6.25 man-hours instead of 37 thanks to the combine.
- The 1920s saw significant improvements in cattle production across many nations due to better nutrition, disease prevention strategies, and breeding procedures.
- Scientists improved the corn seeds used by farmers in the late 1920s. The most advantageous traits of many types of seeds were blended. Farmers were able to get more from each plant thanks to fertilizers.
- The introduction of DDT in 1939 signaled the start of the widespread use of chemical pesticides in agriculture in emerging nations. DDT was outlawed in the United States in 1972 due of environmental damage.



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- 1950s–1960s – The green revolution occurred in a number of emerging nations, including India and the Philippines. Improved grains were developed, significantly increasing output and local resources.
- From the 1970s to the present, genetic engineering has been practiced for the first time by researchers in California. Through genetic engineering, it is possible to improve the hardiness, disease resistance, and productivity of plants and animals.
- Beginning in the early 1980s, farmers in industrialized nations started utilising computers to manage farm finances, keep track of crop pricing and weather data, and make irrigation and drainage scheduling decisions.

21ST CENTURY (2000-2099)

- Focusing more on organic farming and biotechnology field which agriculture is not just on producing foods but also for commercialization.
- Tissue culture, genetic engineering & robotics leading for this century to provide humans in agriculture.
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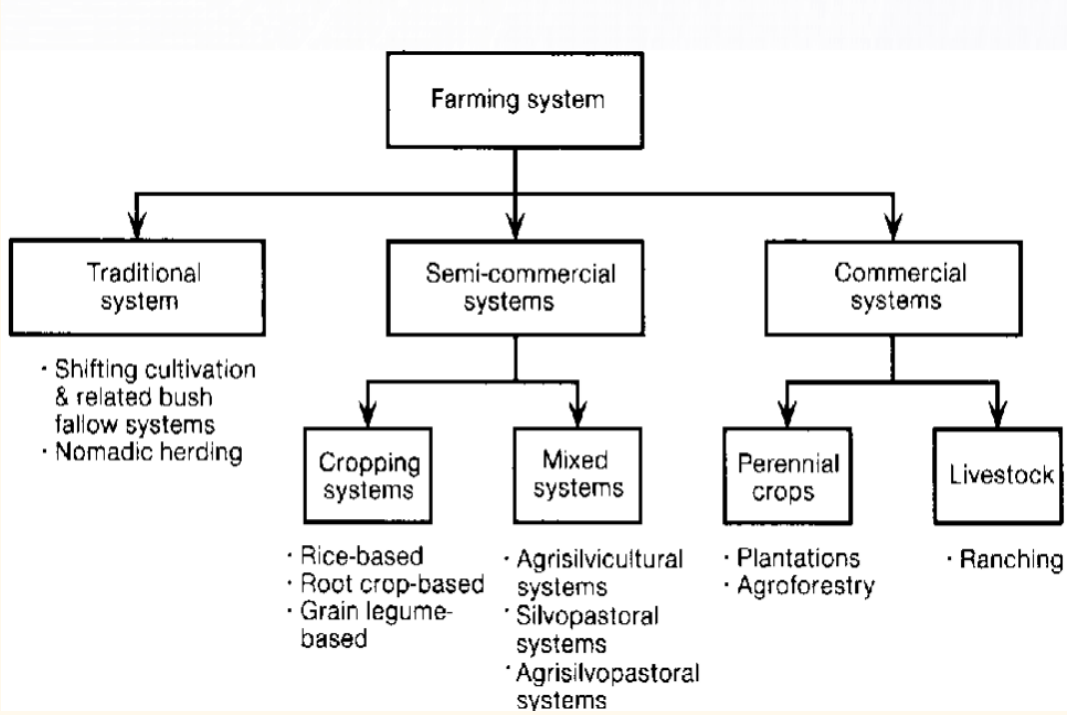
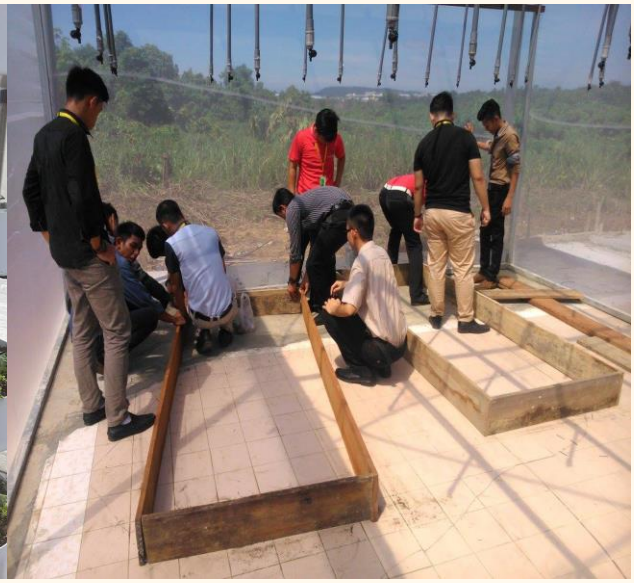
Topic 3

DISCOVERIES AND INNOVATIONS AGRICULTURE

SYSTEM AND PLANTING TECHNIQUE

- The change from the traditional system to a more modern system and increasing commercial production.
- The oldest system is forest gardening
- Aim to increase yield/economic



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PLANT BREED & VARIETY TECHNOLOGY

- Better breed with disease resistance, high fertility etc. through Research and Development in biotechnology.

TOOLS AND EQUIPMENT TECHNOLOGY

- The technology used in the cultivation of such use equipment machinery and chemicals to help optimizing results.
- Organic farmers innovate and improve tools and equipment to improve the e fficiency of their labour because the technology that is now accessible was created for the conventional style of agriculture.


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POST-HARVEST TECHNOLOGY

- The technology is more focused on post-harvest processing into a commercial product.

Topic 4

AGENCIES IN AGRICULTURE

MINISTRY OF AGRICULTURE AND FOOD INDUSTRIES (MAFI)

- The ministry's primary purpose is to assess, formulate, monitor, and implement Malaysian agricultural development policies, strategies, and initiatives.

- The ministry's mission is to lead transformation activities in the agricultural sector in a planned, integrated, and comprehensive way, based on the mobilisation of all organisations' ideas and energy toward the achievement of the National Agrofood Policy's goals.

2. MINISTRY OF PLANTATION INDUSTRIES AND COMMODITIES (MPIC)

- To formulate policies and strategies for the overall development of the plantation and the commodity sectors.

- To supervise departments and agencies under the Ministry on financial management and implementation of plantation and commodities development programs.

3. DEPARTMENT OF AGRICULTURE (DOA)

- Evaluate, modify and generate a technology package derived from agencies/research bodies according to local environment and requirement and to disseminate these technologies to agriculture entrepreneurs.

- Provide consultation services and technical support in a package format to entrepreneurs, private organizations and agriculture development agencies. Develop Agriculture Food and Soil Information Center for planning purposes and implement development programmes for the sector.

- Conduct training at the agriculture Institute/Training Centre in order to fulfill the requirement for a skilled workforce within the agriculture sector.

- Monitor the quality of the country's agriculture resource/seedlings

- Implement the enforcement of Pesticide Act 1974 to ensure that pesticides which are imported, distributed and sold in our country are of quality and will not cause harm to consumers, livestock, food crops and the environment.

- Implement the enforcement of Plant Quarantine Act 1976 to prohibit the entrance of deadly foreign pathogen into our country and also to facilitate the export of our country's products so that they comply with the quarantine regulations imposed by the importing country.
- Create liaison and working collaboration between organizations in the public sector and local/foreign private sectors that are involved in development, enforcement and international trade.

4. FARMERS’ ORGANIZATION AUTHORITY (LPP)

- To boost, encourage and strive for economic and social progress of Farmers' Organisations

- To register, control and supervise Farmers' Organisations and make provision for related matters.

- If a declaration was made through announcement under section 10, to design and implement any agricultural development in Farmers' Organisation of those area

- To control and coordinate the implementation of the activities.

5. FEDERAL AGRICULTURAL MARKETING AUTHORITY (FAMA)

- To coordinate agricultural marketing activities involving both the private sector and the government departments/ agencies

- To improve the marketing system and to expend as well as develop new markets for agricultural produce of Malaysia

- To collaborate with the private sector and government departments / agencies in creating an efficient and effective agricultural marketing system

- To develop and enhance efficient management in the agricultural industry related to marketing activities or processing of agricultural products

- To be directly involved in the agriculture industry, especially in marketing activities or processing of agricultural products

6. MALAYSIAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE (MARDI)

- Technology development to enhance competitiveness in the food processing industry.

- Technology development in the production of fruits, vegetables, flowers, cereals and others related to the crop industry.

- Technology development related to the livestock industry.

- Technology development in biotechnology, mechanization as well as resource and environment management.

- Sosio-economic studies and technology management for the food and agriculture industries.

- Transfer of technologies and commercialization to improve agriculture productivity and food quality, as well as to create viable agri-businesses.

Topic 5

CHALLENGES IN AGRICULTURE

- Transitioning small-scale agroindustries into profitable businesses.
- Ensuring stable supply of high-quality, nutritional, wholesome, and affordable food
- Reducing the agricultural sector's whole reliance on labour
- Ensuring the agricultural sector develops sustainably
- Improving the competitiveness of the country's agriculture industry
- Fostering the growth of the agricultural industry, promoting private sector investment, and strengthening the agricultural industry.
- To position the agricultural sector as the third driver of national economic expansion (new source)
- The new scope now covers the agricultural sector
- The sector's development encompasses every facet of production and supply chain management.

Topic 6

IMPORTANCE OF AGRICULTURE

- The sector that furnishes other industries with the raw materials required for industrialization. It supplies, for instance, wood for the paper industry and skin and hides for the leather industry.
- It generates foreign currency by marketing agricultural products. Through generating income and creating a market for industrial goods, the population's purchasing power is strengthened. It raises people's standard of living by providing the population with a source of employment through agriculture, business, and research activities.
- Food security and a consistent supply of food are assured by agriculture, that also keeps the workforce well-fed and capable of working in other economic sectors and industries.
- Agriculture ensures the population has a reliable source of food and food security; this keeps the labour force well-fed and able to work in other economic sectors and industries.
- Additionally, it saves the nation money that would have been better spent on importing food from other nations. This facilitates the country's balance of payments and clears up various funds for investment in other economic sectors including social costs, infrastructures, and healthcare.

Topic 7

NATIONAL POLICIES

1ST NATIONAL AGRICULTURE POLICY (1984-1991)

- Concerned primarily with increasing exports of oil palm and cocoa
- New agricultural land projects were anticipated to generate foreign exchange as well as prospects for employment and income generation as well as contribute to the reduction of rural poverty.
- Aiming to modernise and commercialise agricultural activities in order to boost the productivity, efficiency, and competitiveness of the agricultural industry.

2ND NATIONAL AGRICULTURE POLICY (1992-1998)

- This policy sought to solve the difficulties the agricultural industry was having in fulfilling the demand for agro-food items on both the on local and international markets.
- Increases the emphasis the effectiveness and productivity of agro-food production to enable this industry to support economic expansion.
- The goals were to boost output, competitiveness, and sustainably produced output.

3RD NATIONAL AGRICULTURE POLICY NAP 3 (1997- 2010)

- Following the government's realisation of the impact the Asian Financial Crisis (AFC) of 1997–1998 and the deregulation of the financial markets had on Malaysia's economy, this strategy was developed.
    - The Asian Financial Crisis serve as a wake-up call for the government on the value of agriculture as a source of sustenance for the populace.

- The NAP 3 was created to solve the difficulties this sector was experiencing, including:
    - The economic structure changes due to lack of arable land
    - Shortage of labor due to competition with other sectors The efficiency and the utilization of resources to improve competitiveness
    - The concern is also on the availability of food for domestic consumption.
    -

- NAP 3 objectives are:
    - To enhance food security
    - To increase productivity and competitiveness of the sector
    - To deepen linkages with other sectors
    - To create new sources of growth within the sector
    - To conserve and utilize natural resources on a sustainable basis

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NATIONAL AGRO-FOOD POLICY (2011- 2020)

- Developed by Malaysia's Ministry of Agriculture and Agrobased Industry (MOA), which the Malaysian Cabinet approved on September 28, 2011, to replace the NAP3
- Focuses primarily on the topic of Malaysia's food supply in light of consumer demands for quality, safety, nutrition, usability, and environmental sustainability.
- Aims to make the agro-food sector a sustainable, competitive industry and to boost the revenue of agro-based entrepreneurs.
- Main objectives
    - To address food security and safety to ensure availability, affordability and accessibility
    - To ensure the competitiveness and sustainability of the agro food industry
    - To increase the income level of agro preneurs

- Strategic directions
    - Ensure national food security
    - Increase the contribution of agro-food industry
    - Completing the value-chain
    - Empowering human capital
    - Creating the environment for private sectors-led business
    - Strengthen the activities of R&D, innovation and the use of technology
    - Strengthening the delivery system

NATIONAL COMMODITY POLICY (2011- 2020)

- To revitalize commodities as a crucial industry for the growth of the Malaysian economy, specifically oil palm, rubber, lumber, cocoa, pepper, tobacco, kenaf, and sago.
- The National Commodity Policy's (2011-2020) primary objectives are:
    - To increase the contribution of plantation industrial commodities to the nation's economy.
    - To modernise and transform the commodity industry towards a more competitive and sustainable level.
    - Encourage the development of the commodity industry along the value chain.
    - To increase the income of operators and smallholders in the commodity industry.
    - To promote Malaysia as the centre of excellence in R&D, technology development and the downstream processing of industrial commodities.

11TH MALAYSIA PLAN: AGRICULTURE

- The agriculture industry is projected to develop at a rate of 3.5% annually and contribute 8.2% to overall GDP in the Eleventh Malaysia Plan.
- The livestock, aquaculture, and vegetable sectors are predicted to contribute the majority of the sector's 5.4% annual growth, with the demand for food expected to reach 14.8 million metric tonnes in 2020.
- Agrifood is expected to contribute 42.2% of the value added to agriculture, while industrial commodities will account for 57%.
- By 2020, it is anticipated that the agro-based sector will contribute 18.3% of the value added in manufacturing.

MACRO STRATEGIES

- Improving productivity and income of farmers, fishermen and rearers
- Building capacity of agricultural cooperatives and associations along the supply chain
- Promoting training and youth agro-preneur development
- Strengthening institutional support and extension services
- Improving market access and logistics support
- Scaling up access to agricultural financing.

NATIONAL KEY ECONOMIC AREA: AGRICULTURE

- Focus on transforming a traditionally small-scale, production-based sector into a large-scale agribusiness industry that contributes to economic growth and sustainability.
- Based on an integrated and market-centric model that focusses on economies of scale and value chain integration
- 4 key themes:
    - Capitalizing on competitive advantages
    - Tapping premium markets
    - Aligning food security objectives with increasing Gross National Income (GNI)
    - Participation in the regional agriculture value chain

- 16 Entry Point Project (EPPs):

    1. High-Value Herbal Products
    2. Edible Bird's Nest Swiftlet Farming
    3. Mini Estate Farming for Seaweed
    4. Integrated Cage Farming
    5. Cattle Integration in Oil Palm Estates
    6. Replicating Integrated Zone for Aquaculture Model (IZAQs) to Tap Market for Premium Shrimp
    7. Premium Fruits and Vegetables
    8. Food Park
    9. Fragrant Rice Varieties in Non-Irrigated Areas
    10. Strengthening Productivity of Paddy Farming in MADA
    11. Strengthening Productivity of Paddy Farming in Other Granaries
    12. Expansion of Cattle in Feedlots
    13. Dairy Clusters
    14. Seed Industry Development
    15. Participation of MNCs
    16. Overseas Acquisition/JV of Cattle Farms

- Under NKEA Agriculture, 11 Business Opportunities (BOs) have been identified, with the potential to produce RM 2.8 billion in GNI and 14,840 jobs by 2020.
    - Business Opportunity 1: Nutraceutical Products
    - Business Opportunity 2: Foreign Distributor
    - Business Opportunity 3: Ornamental Fish Farming
    - Business Opportunity 4: Aquaculture Feed Mill
    - Business Opportunity 5: Aquaculture Export Centre
    - Business Opportunity 6: Snacks Industry
    - Business Opportunity 7: Free-range chicken rearing
    - Business Opportunity 8: Button mushroom farming
    - Business Opportunity 9: Packaged fruit production such as jackfruit
    - Business Opportunity 10: Foreign Direct Investment in Herbal Products
    - Business Opportunity 11: Snack Food Industry (SFI)/County Food Facilities

National Key Economic Area: Agriculture

- 5 key enablers to support

    1. Provide incentives for anchor companies
    2. Strengthen the adoption of Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP) to enhance market access
    3. Change regulations and policies
    4. Strengthen logistics infrastructure
    5. Ensure sufficient pipeline of human capita


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INTERNATIONAL POLICIES

1. EU AGRICULTURAL POLICY IN 2012

- To enable farmers in the EU to compete globally and to ensure that they react to market signals. While using non-trade distorting mechanisms and drastically lessening payments tied to production rates, export, or market management, the impact on global market pricing is lessened.

2. WORLD TRADE ORGANIZATION (WTO)

- With 157 member countries and counting
- Founded in 1995, outlines the global standard that govern global trade.
- World Trade Organization (WTO) The WTO is a a member-driven group whose primary goals are:
    - Multilateral negotiations aimed at progressive liberalization of markets
    - Setting the legal ground-rules for trade in the form of agreements.
    - Resolving trade disputes between States
    - Monitoring Members' trade policies.

3. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

- It also serves as a repository of knowledge and information that aids transitioning countries and developing nations in reforming and improving their methods for farming, forestry, and fishing to ensure everyone has access to adequate food and nutrition

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