Malaysia

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PRESENT SITUATION

Introduction

MALAYSIA IS LOCATED between latitudes 1° and 7° North, and longitudes 100° and 119° East. The country comprises two regions, Peninsular Malaysia and the States of Sabah and Sarawak, separated by 640 km of the South China Sea. Together, the two cover an area of over 330,000 sq km. The population of Malaysia is approximately 18 million with an estimated growth rate of 2.6 percent per annum.

Malaysia enjoys a tropical climate influenced by the northeast and southwest monsoons. The former, prevailing between November and January, brings heavy rainfall, predominantly to the east coast of Peninsular Malaysia. The latter prevails during April and May for Peninsular Malaysia and between May and July for Sabah and Sarawak. Rainfall during these periods is generally less than during the northeast monsoon.

The annual average rainfall is 2,420 mm for Peninsular Malaysia, 2,630 mm for Sabah and 3,830 mm for Sarawak, the heavier precipitation being in the east coast of Peninsular Malaysia and the coastal regions of Sabah and Sarawak.

Temperature and humidity are consistently high, being 26°C and 80 percent, respectively. Daily temperature variations are about 5°C and monthly variations even less, of the order of 2°C. The mean annual open water evaporation varies from 1,800 mm in the north to 1,600 mm in the south, with the minimum in November and December.

About 22 percent of the land in Malaysia is utilized for agriculture. Townships, mining activities and other uses take up another 10 percent, leaving 68 percent under forest cover. Approximately half the agricultural lands are cultivated with perennial crops. The other half is taken up for annual crops, mixed horticulture, shifting cultivation and, to a much lesser extent, for fish ponds.

The Gross Domestic Product (GDP) in 1990 was M$ 79,103 million (at constant 1978 prices) with the major exports being electrical and electronic products, crude oil, rubber, palm oil, timber, liquid natural gas (LNG) and some manufactured goods.

The agriculture sector is targeted to be grown by 3.5 percent per annum during the next 10 years. While this rate of growth is relatively lower compared with other sectors of the economy, agriculture will continue to be important in the nation's development, particularly in the rural sector. In addition, it will provide the resources and the market to support the development of the other sectors of the economy, in particular the industrial sector, as agriculture becomes increasingly integrated with the former.

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Presently, the agriculture sector contributes more than a quarter of the country's total export earnings, one fifth of the Gross Domestic Product and nearly one third of the total employment. Value added per worker in the agriculture sector however is half that of the manufacturing sector.

Policy

Agriculture, in particular, irrigated agriculture will continue to play an important role in the Malaysian economy. Irrigated agriculture producing food crops such as rice, vegetables and other short-term food and animal feeds as well as producing high-value floriculture crops will continue to be given focus for fresh consumption as well as for downstream processing into higher value-added commodities. The production of rice, the staple food of the Malaysians will be intensified in existing primary and secondary granary areas with suitable irrigation infrastructure, to fulfill a 65 percent self-sufficiency level. However, the production of all other food commodities would be market-led and domestic resource cost considerations will predominate. Even in the case of rice, the industry will be closely monitored and reviewed in tandem with research and development and other efforts to continually reduce both the cost of production and the comparative disadvantage. The formulation of a specific National Food Policy will guide the production of the various food crops, including irrigated food crops.

Irrigated Agriculture: The Present Situation

Irrigation development in Malaysia has gone through a number of distinctive phases which were directly linked to the changing trend of the rice industry in the nation.

Rice is said to have been cultivated in Malaysia for the last 2,000 years. The rice areas were generally located in small pockets in the flood plains adjacent to the banks of major rivers. Technically, the irrigation systems were rudimentary with dual-function channels, i.e., irrigation during the growing months and drainage towards the end of the planting season. Water distribution within the rice areas was from plot to plot with irrigation relying largely on rainfall.

Towards the turn of this century and in the early 1900s there were initial efforts by the government and private enterprises to develop irrigation infrastructure. There were also notable successes such as the Kerian Irrigation Scheme in the North Perak (23,400 ha) which had the first irrigation reservoir in the country and the Wan Mat Saman Scheme in Central Kedah (28,700 ha).

The food crisis in 1918-1920 and escalating import prices prompted the government to review the rice-deficient situation. Subsequently, a policy was formulated to increase rice production in the country.

In 1932, the Department of Irrigation and Drainage (DID) was formed and together with the Department of Agriculture (DOA), formed the basis of organized and systematic irrigation development. Apart from expanding the existing irrigation schemes, substantial new areas were also reclaimed for rice.

The new schemes were generally constructed by having separate systems for irrigation and drainage. The need for a separate drainage system was necessitated to carry away flood waters normally associated with the monsoon rains. This, in retrospect, must have been the most important move in irrigation sustainability, as it precluded the possibility of salinization, not withstanding heavy rainfalls.

The 1960s saw a shift of emphasis from purely food security aspects to the need to improve the socioeconomic status of the rural poor. Irrigation now was not just a means to increase rice production but also became a vehicle for rural upliftment. The government's development plans for the rural poor were through the development of irrigation to meet the twin objectives of poverty alleviation and food production.

The above objectives were largely met through the widespread introduction of double cropping in already developed schemes. Water resources development became an important component of irrigation projects. Storage dams, barrages and pumping stations were constructed. Irrigation canals were upgraded to meet the increased water demands for the off-season crops. More farm roads were constructed in line with the intensification of canals and drains.

With the general completion of the double-cropping program, yield increase per unit area per season was the next option to maintain irrigation sustainability. Thus, the momentum of irrigation development continued into the late 1970s and early 1980s.

In the late 1980s, the rice industry in the country faced a number of problems relating to labor shortage and escalating production costs. There was a competing shift of the available farm labor to industry resulting from the country's priority on industrialization. Consequently, the smaller irrigation schemes were affected severely and many were left idle.

The priority for irrigation development then, took a new dimension with the need to rationalize rice cultivation with production cost and profit considerations. Since Malaysia does not have a comparative advantage in rice production due to high investment and production costs, there evolved the policy to confine irrigation development to eight large irrigated areas, designated as Granary Areas where economy of scale could be practiced. Increasing productivity in these areas totaling some 210,500 ha became the main thrust.

These areas were developed under the concept involving not only engineering aspects but also social, agronomic, cultural and economic aspects. Irrigation and drainage facilities were intensified and extended to the tertiary level to provide good water management at the farm level enabling the cultivation of high yielding varieties. Farm mechanization was successfully adopted and more significant, direct seeding began to replace the labor-intensive transplanting method.

Farm mechanization and direct seeding necessitated some upgrading of the infrastructures in the Granary Areas. For mechanization, field drainage and farm roads had to be improved to allow easy machine movement in the farm. Land leveling and also on-farm drainage, became imperative due to the need for precise water distribution and control at the farm level necessary for direct seeding. Farm management also underwent fundamental changes in attempts to cope with labor constraints, irrigation scheduling and farm mechanization. Farmers had to be sensitized to the new system, adjusting their cultivation activities accordingly. Attempts were made to convert farms which had been traditionally operated by individual farmers to estate-type management for more organized and economical operation of the various cultivation activities. Rice production from these Granary Areas increased significantly to the current level of 5.7 tons per ha.

The small irrigation schemes (the Non-Granary Areas) were designated to be gradually phased out from rice to diversified land use such as more remunerative cash crops and aquaculture. The Crop Diversification Study in Non-Granary Irrigated Areas completed in 1990 had identified existing rice irrigation schemes totaling 54,000 ha for conversion, and this can be extended to other suitable rain-fed rice areas totaling 70,000 ha currently not served with irrigation facilities. These areas were revitalized through appropriate farming systems to support growth of selected crops. Provision and management of suitable irrigation systems and related infrastructure will be required to maximize production. Modern irrigation methods such as micro-irrigation systems (drip and trickle) and overhead sprayers will be introduced.

Malaysia has also embarked on a nation-wide program to rehabilitate idle rice lands. The rehabilitation program basically comprises numerous small Integrated Agricultural Development Projects where the construction of infrastructural facilities for irrigation, drainage and farm roads constitute an important component. In the program, rice landowners have been persuaded to revitalize their lands and they are encouraged to diversify cultivation for non-rice crops which can generate higher remunerative farm incomes.

During the period 1971 to 1990, about M$1,500 million have been expended on irrigation development, the bulk of which was to upgrade irrigation facilities for the eight Granary Areas. Under the Sixth Malaysia Plan (1991-1995) M$ 9,019 million or 16.4 percent of the total expenditure is allocated to agriculture and rural development. Of this amount, M$ 628 million are for projects in which irrigation is the main component. At the same time, some M$ 18.1 million will be spent on crop diversification programs in selected Non-Granary irrigated areas.

Needs

With farm-production objectives becoming more commercially oriented and to satisfy the expectations of the consumers for consistently high quality produce, irrigation is considered an agricultural input and its necessity will continue to increase in importance. This is especially so when the constituents of the "food basket" for the average Malaysian become more mixed and varied, with greater demand for protein-rich and fiber foods. Thus, more areas for a wider variety of food crops can be expected to be irrigated.

Estate-type management, commercial orientation and labor constraint will need farm sizes to be economically larger together with less labor-intensive methods of cultivation and better water management. Mechanization and automation will inevitably be the main features. With mechanization and better water management, land leveling will have to be an integral part of the overall farm infrastructural development. Subsurface drainage will need to be introduced to improve on-farm drainage in order to increase soil strength and structure and facilitate machinery mobility. Piped water distribution system too will reduce barriers to farm mechanization, provide flexibility of operation, minimize losses and allow for faster supply-response time compared to open channel systems. Pumps and on-farm storage facilities will become a standard feature at the on-farm level.

While surface irrigation systems will be necessary for rice, there will be an increasing use of modern irrigation methods such as micro-irrigation systems (drips and trickle) and overhead sprayers. Integrating the various components will also facilitate various degrees of automation at the on-farm level.

At the main system level, selected existing open channels will be replaced by piped conveyance and distribution networks. More irrigation water storage reservoirs will be constructed to complement water source management. Apart from improving efficiency, such a system will provide for better control of water use and facilitate regulating supply to the end users and possibly moving towards metering of water for those users. Again automation will be incorporated into the management.

For better accuracy and to improve water savings, irrigation prediction models, water demand forecasting models and efficient water-management systems will have to be developed. The use of the telemetry system is expected to be extended to all major schemes. Remote sensing applications in irrigation management are also likely be developed.

Issues and Challenges

While irrigation will continue to play an important role, future trends in its development will have to face a variety of issues and challenges.

Land Utilization Alternatives

The competing uses of available land for both nonirrigated agriculture and nonagricultural purposes such as industrial and housing needs pose severe constraints for irrigated agricultural

farming. Consequently, the need to increase productivity per unit of land becomes increasingly important and pertinent in the context of irrigated agricultural farming. The whole issue of the economics of irrigated agriculture will have to be addressed.

Labor Shortages

Labor shortages are expected to continue to plague agriculture including irrigated farming. Whilst for the immediate run, foreign labor will be relied upon, mechanization, labor-saving techniques, modern machinery and technology-intensive farming methods and systems will be emphasized. The Human Resources Development Plan will embody the emphasis on farming and agrobusiness management and operation to complement the overall efforts.

Water Supply for Irrigation

Whilst labor shortages will be more acute, the shift of priorities of water use from irrigation to domestic and industrial demands imposes further stress on irrigation sustainability. Irrigation for agriculture is currently the largest consumer of water, amounting to about 75 percent of the total fresh water withdrawal in the country.

The issues to address will be related to quality and quantity. Since domestic and industrial sectors have higher priorities, irrigation may have to resort to lower quality water and also look into the use of groundwater and recycling of surface drainage water. Water harvesting techniques will have to be further developed and promoted. Water will have to be regarded as an economic good and every means of economizing water use will have to be taken up by incorporating automation and water-saving measures. Issues of pricing of water to reflect its scarcity value in the light of competing and sustainable uses will need to be addressed.

Water Demand for Irrigation

Actual consumption of crop water depends on systems efficiency, a product of efficiency during conveyance, distribution and field application. Generally, in Malaysia, the overall efficiencies are around 35 percent to 44 percent. Future rehabilitation and modernization programs must urgently address irrigation efficiency improvements at each level of the system. Such efforts include canal lining, control structures, improved irrigation methods and application, crop selection and diversification, water reuse and recycling.

Water Management

Water management must be addressed comprehensively at all 3 levels of the total system: resource management within the watershed and headworks, within conveyance and distribution systems and on-farm.

Each of these levels of management would require appropriate institutional arrangements both private and public with competent and committed participation, to enable the multiplicity of issues related to good soil and water conservation practices to be addressed. Complete databases, modeling techniques for systems operation and continued monitoring and control are essential elements in addition to education, training and extension.

Environment

All the proposed changes and developments will have to take into consideration the need for sustaining the environment, particularly the need to preserve the water ecosystems. Environmental issues resulting from greater usage of chemical pesticides, herbicides and fertilizers will also need to be addressed. It will be necessary for them to be changed to environment-friendly products. Irrigation, on the whole, will need to consider soil conservation techniques and management of farm chemical residues to preserve water quality, environmental and health issues.

Strategies

Rice production will continue to be concentrated in the Granary Areas. To cater to the increasing population which is projected to grow to 22.6 million by the year 2000, productivity of these areas will need to be increased, especially if the target production is to meet 65 percent of the local demand.

Designated areas would need to be developed to their full potential. Consideration must be given for structural changes, aimed at creating larger and more viable production units, through increased mechanization and improvements in the land-farmer ratio. This would call for rehabilitation and modernization of irrigation systems to support efforts in raising cropping intensities and crop yields.

Irrigation sustainability will depend on the ability to adjust within an industrialized economic environment. This could take the form of automation of irrigation systems, estatisation, efficient use of water through new irrigation technologies, diversification into more remunerative crops and greater flexibility of irrigation systems to cope with rapidly changing situations.

On-farm development will have to be undertaken by individual farmers and private enterprises. To accelerate the distribution of this responsibility, irrigation extension will need to be further developed. Research and development and capacity building through human resources development (training, education and extension) both in the public and private sectors cannot be overemphasized.

Management-related activities would require complementary enhancement of irrigation management training and extension involving both the users and systems operators, thereby paving the way for possible transfer to the users for entire operation, maintenance and management of completed systems. This will be applicable to those schemes operated by public sectors within the context of desirable cost-recovery efforts.

Future Directions

The wide range of management-, pricing- and technology-related challenges accompanying future trends in irrigated agriculture calls for concerted, integrated and coordinated efforts from departments and agencies involved in agriculture within the public sector, the private sector and the end-user (be it the individual farmer or the developer). The Ministry of Agriculture will continue to play the pivotal role in ensuring a balanced growth of the agriculture sector, whilst the private sector (both corporate and individual) is expected to lead investments in this sector.

Public-sector irrigated-agriculture programs involving participation of all departments and agencies as integrated components should be strengthened, expanded or suitably linked to involve the private sector, that will have a larger role to play in the future, especially in crop diversification and commercial farming ventures.

The emphasis will be on in-situ development, aimed at revitalizing existing cultivated or abandoned areas for fuller utilization of resources for agricultural production. This will involve mainly land consolidation, rehabilitation, replanting, drainage and irrigation as well as effective

adoption of technology by farmers to modernize and commercialize the smallholder sector. Sustainable irrigated agriculture would require appropriate irrigation systems to be not only effective and efficient but also sufficiently flexible to support crop diversification programs and changing farming systems.

There is also a need to intensify agriculture by specializing in the production of high value-added and market-oriented crops.

Supporting programs on research and development, agricultural extension, human resources development and marketing will continue in tandem with implementation activities. Agriculture-related departments and agencies will need to interact with institutions of higher learning and the private sector through appropriate networking and cross-linkages. This will ensure timely interventions through active research on a continuing basis which can benefit the agriculture sector.

While maintaining close in-country links, there is an equal need to maintain and expand connections and interactions with external, regional and international organizations such as FAO, ICID, IIMI, IRRI and ESCAP as they serve as useful windows to facilitate the scanning and access to contemporary management and technological advances and developments in irrigated agriculture from around the globe. Collaboration and participation in regional and international programs and activities will continue to be encouraged.

VISION STATEMENT

Irrigated agriculture beyond 2000 shall be directed towards greater commercialization using appropriate technology and sustainability, and complemented by capacity building through human resources development programs.

Development of irrigated agriculture shall be achieved through the optimal and efficient use of resources in harmony with the environment to ensure sustainability.

Summary of Discussion of the Vision Statement

1. A vision statement on irrigated agriculture must be guided by the larger country vision and related economic, food and agriculture policies. For Malaysia, Vision 2020 is to achieve industrial status by the year 2020. For the medium term up to year 2000, the Second Outline Perspective Plan (1991-2000) targets the growth of the agriculture sector at 3.5 percent per annum. The National Agricultural Policy (NAP) for the period up to 2010 calls for a balanced growth with other sectors emphasizing a more commercial approach in agriculture, coupled with efficient utilization of resources. Hence, agriculture, and in particular, irrigated agriculture will play an important role in the Malaysian economy.

2. While competing with the manufacturing and service sectors in providing improved incomes for those remaining in the agriculture sector, complementary growth in agriculture must also ensure a reliable and sufficient supply of agricultural inputs to the other sectors. Against labor constraints, the thrust will therefore be towards the use of appropriate modern technologies in the production system while enabling products to be globally competitive through quality enhancement and to be used in downstream processing into value-added commodities.

3. For the staple food, rice, self-sufficiency levels shall be guided by those set by the NAP; currently the level is set to be not lower than 65 percent.

4. Rice production shall continue to be a main player in irrigated agriculture and shall be confined within existing areas. Areas irrigated for high-value crops shall be expanded, the production of which shall be market-driven.
5. With the accelerated growth of the industrial sector, greater competition in the use of available water resources is inevitable. Water as a resource with economic value must be efficiently utilized and use of lower quality water for agriculture may well become an option for consideration. At the macro-level, the formulation and implementation of a Master Plan for the planning, management and allocation of water resources are urgently required inclusive of accompanying legislation.
6. In moving towards greater commercialization, private-sector involvement shall be encouraged.
7. Irrigation systems, be it surface, overhead or micro, and associated technologies and techniques currently in use for increasing agricultural production, shall be expanded and upgraded through adaptive research and development to suit local conditions and towards greater water use efficiency.
8. Human Resources Development shall be focused on all aspects of improving the skills and capabilities of both the public and private sectors to operate and manage as a commercialized system of agriculture.
9. Development of irrigated agriculture should be balanced between the resources available and the environmental implications so as to achieve sustainable development.
10. Above all, irrigated agriculture shall also be targeted to improve the quality of life and contribute towards greater parity between the urban and rural population.
11. The Vision Statement is complete in itself. However, in order to avoid misinterpretation it requires appending definition of certain keywords like commercialization, appropriate technology and sustainability.

MEANS TO ACHIEVE THE VISION

Policy

1. There will be a need for periodic review of the agriculture policy especially in relation to rice sufficiency levels.
2. Rice land use must be flexible for diversified cropping. The choice of crops should permit easy reversal to rice, should the need arise.
3. A Master Plan for the planning and management of water resources on a basin-wide approach must be developed.

Legislation

In order to enable commercialization, efficient use of resources and protection of the environment, existing laws pertaining to land and water will need to be amended and strengthened. In formulating the legislation, the rights of the low-income farmers should be safeguarded.

Institutions

With greater involvement of the private sector, the role of the existing public-sector institutions in the long term shall be reduced to policymaking, regulatory functions and major resources development and allocation. The existing public institutions shall be corporatized in stages towards ultimate privatization. Farmers' institutions shall be strengthened to manage diversified businesses and to participate in the privatization process.

Human Resources Development

Human Resources Development shall be targeted both to the public sector and to the private sector. Training should focus on skills needed to manage commercialized farming.

Capital Irrigation Investment

1. Capital investment in irrigation at the farm level shall be borne by the farmers and shall be gradually extended to include the tertiary, secondary and the main systems. The capital investment for large-scale water resources development and bulk transfer shall still rest with the government.
2. To encourage farmers to venture into commercialized farming and agro-business, incentive packages shall be provided to cover for infrastructure and equipment.

Support Infrastructure

1. An efficient and effective marketing infrastructure shall be promoted and developed to address the need to continuously remain competitive, specifically oriented to changing market and land-consumer preferences, and responsive to market needs and opportunities.
2. Research capability shall be continuously enhanced and more public-private sector Research and Development programs will be promoted. The technology and knowledge developed shall then be in the public domain.

Cooperation/Information Needed

The issues that need to be addressed in attaining the vision targets are categorized as follows:

Issues	A Domestic Research	B Regional Cooperation	C Collaboration with International Organizations
1. Policy			
* Resource planning	x		x
2. Legislation and Institutions			
* Water-related legislation			x
* Institutional aspects of privatization	x		x
3. Human Resources Development			
* Entrepreneurship, technical, managerial	x	x	x
4. Supporting infrastructure			
* Water management for direct seeding	x	x	x
* Water management for diversified cropping	x	x	x
* Rice varieties for direct seeding	x	x	x
* Product quality enhancement for marketing	x	x	x