DOUBLE CROPPING OF RICE IN MALAYSIA

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ABSTRACT

Double cropping of rice in Malaysia started in 1942 with the introduction of the japonica varieties. Response was very localized and it was not until the 1960s when locally developed varieties were introduced together with irrigation facilities and relevant support programs that it gained momentum to reach 284,000 ha by 1985. The double cropping phenomenon brought with it increased labor demand at a time when rural-urban labor migration was also increasing due to industrialization which offers better opportunities. By 1983 some 90,000 ha of rice land were uncultivated. Mechanization in land preparation and harvesting was resorted to with attendant problems. Transplanting culture gave way to direct seeding culture under favorable field conditions and weeds, pests and diseases caused production to fall below the expected target. High production costs and uneconomic farm size are forcing the government to review its policy and emphasize support on the 8 major granary areas to maximize productivity and encourage "commercial" practices. Continuing research on varietal development and changing cultural practices indicate a possibility for an even higher cropping intensity once appropriate irrigation management systems are evolved.

Background

Double cropping of rice was first introduced into the country in 1942 when 3 non-photoperiod-sensitive japonica varieties were tried out. The varieties were not popular and double cropping was confined to the northwestern region of Peninsular Malaysia reaching only 8,000 ha by 1960. With the attainment of independence in 1957 the government adopted various intervention policies to promote rice production and increase farm income. The introduction of Malinja (1964) the first locally developed non-photoperiod-sensitive variety followed by Mahsuri (1965), Ria (1966) and Bahagia (1968) (AFIFUDDIN *et al.*, 1982) enabled rice double cropping to be established throughout the country. Concurrently large investments were made to extend and improve irrigation infrastructure, institution building, agriculture support services and paddy price support to sustain double cropping. As a result annual paddy production which hovered at just over 600,000 tons in the 1950s increased to about 2.0 million tons in 1980 with the off-season crop accounting for about 45% of the total. Currently the production has stabilized at between 1.3-1.5 million tons. Table 1 shows the cumulative area provided with irrigation facilities and rice production from 1960-1985.

As an effort to stabilize and increase productivity and reduce production costs, additional investments during the last decade were then concentrated on the intensification of the irrigation infrastructure including farm transportation network in most of the major rice-growing areas. Price support programs have been revised upwards and since 1980 Malaysia offers one of the highest support prices for paddy after Japan and Korea (AFIFUDDIN *et al.*, 1982).

Present situation

Presently there are 284,000 ha under double cropping made up of 210,000 ha under 8 major irrigation areas situated in the coastal plains within Peninsular Malaysia while the remainder is made up of hundreds of minor areas in inland riverine valleys. Figure 1 shows the distribution of the rice-growing areas in Peninsular Malaysia. These major areas, popularly

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Table 1 Cumulative area (hectares × 1,000) provided with irrigation facilities and gross production (tons × 1,000)

Year	1960	1965	1970	1975	1980	1985
Total area provided with facilities	210	223	260	308	331	335
Area with facilities for double cropping	8	29	123	220	240	284
Gross rice production	730	1,000	1,400	1,700	2,000	1,300

Source: TAYLOR (1981), Ministry of Agriculture and LIM (1986).

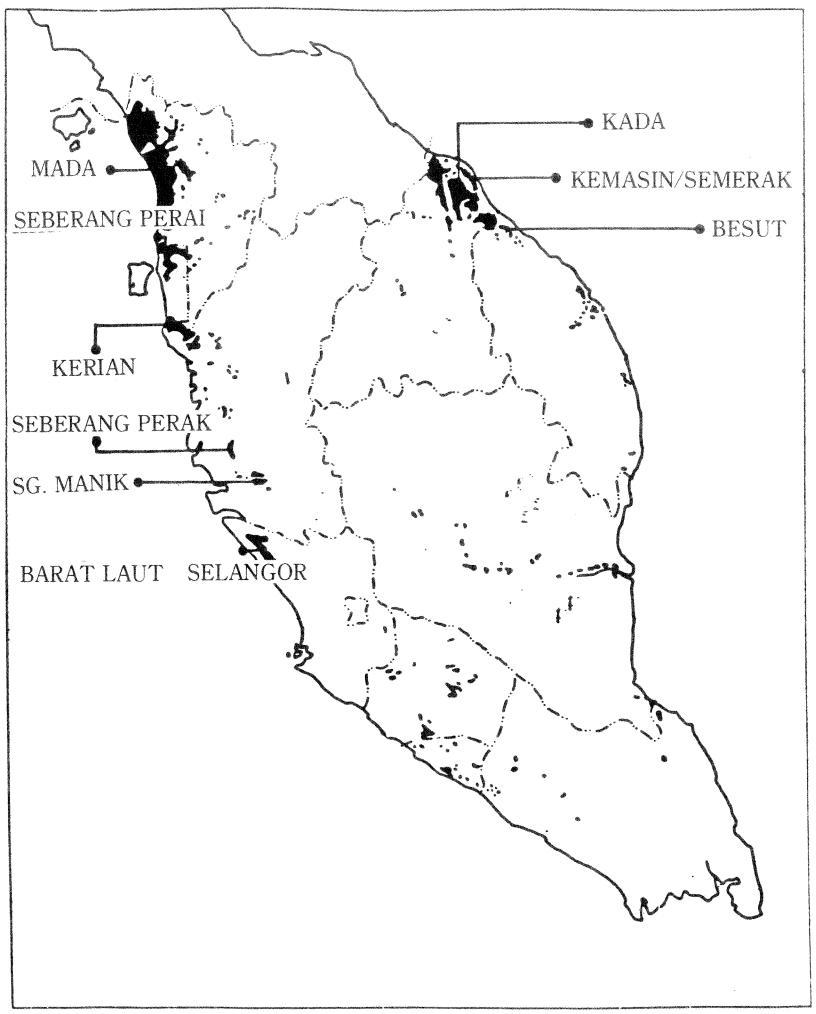

Fig. 1 Rice growing areas of Peninsular Malaysia.
Note: The granary areas are identified.

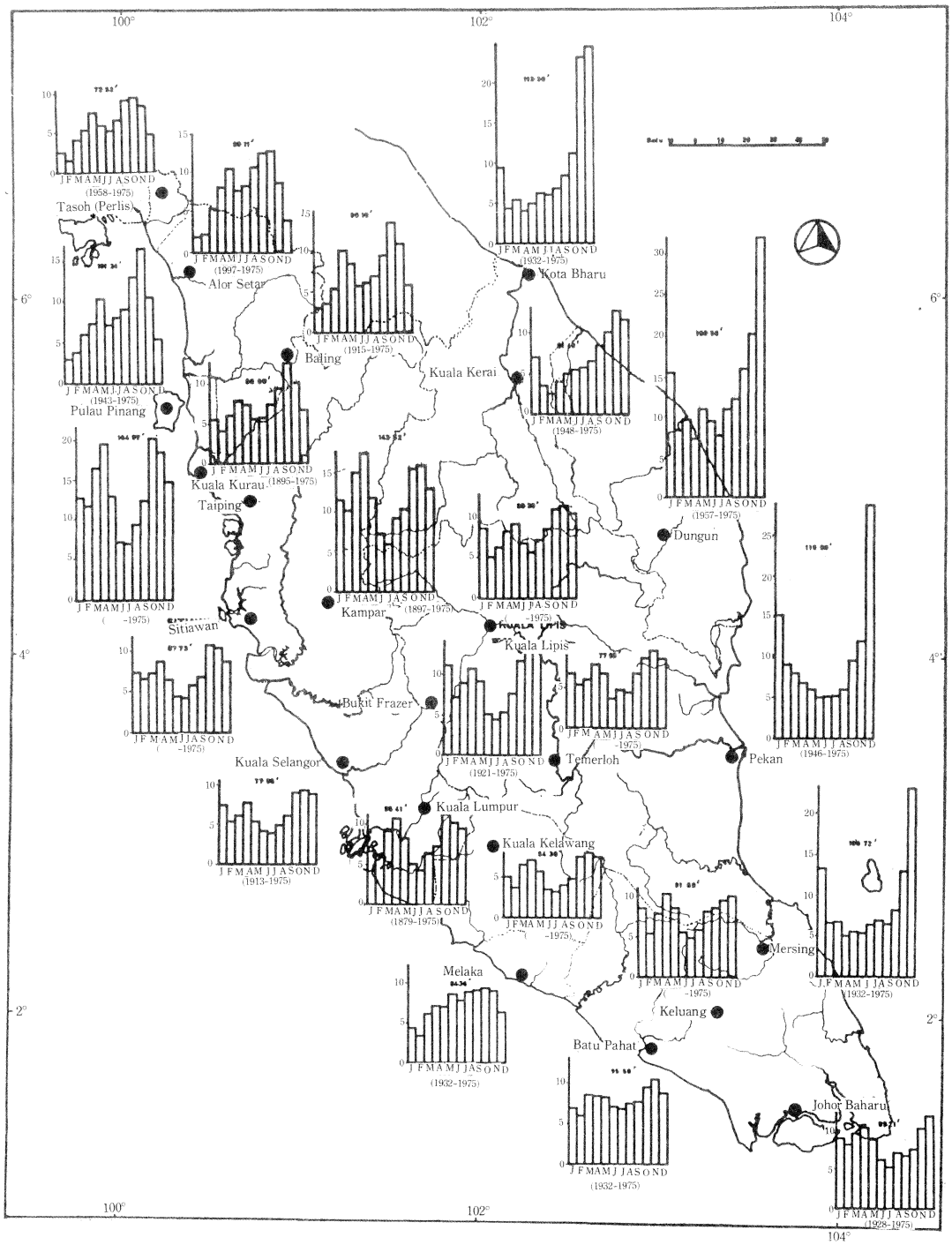

Fig. 2 Average monthly rainfall of selected locations in Peninsular Malaysia.

known as the granary areas, receive the thrust of the government's effort to increase rice production. They represent about 40% of the total rice-growing areas but contribute 75% of the nation's production.

The areas located in the West coast consist of soils derived from the marine alluvium and are poorly drained while the East coast areas are typically riverine alluvium. The existing irrigation facilities comprise storage reservoirs, large pump stations, diversion weirs, conveyance and distribution networks with a canal density of 10 m/ha and allow presaturation of up to 40 days. Intensification works are being carried out to provide tertiary irrigation systems including transportation networks to most of the areas which will enable presaturation to be completed within 20 days. These improvement works are carried out in phases and will result in a canal density of 30–35 m/ha triple that in the existing facilities but still below the ADB recommended 50–80 m/ha.

Usually the irrigation canals are aligned along lot boundaries to minimize truncating lots as it is socially unacceptable. The farmers are encouraged to carry out land levelling to overcome the field undulations but they seldom do so as they are reluctant to disturb the shallow top soil. The above features are maintained under the current intensification program. The farmers construct field dykes more for lot boundary demarcation than for water control. With poor on-farm water management, irrigation efficiency is low. In Barat Laut Selangor, ISHII (1984) expects the efficiency of rainfall utilization to double if the dykes are improved. With the additional canal density of 25 m/ha the distance between the canal and drain varies between 400 m to 200 m depending on whether the canal serves one or both sides. Most of these works are on-going and the performance has yet to be assessed.

The annual rainfall is about 2,500 mm with most of it occurring during the months of September to December (>200 mm monthly). The West coast areas experience another wet period in the months of March to May. Figure 2 shows the average monthly rainfall of selected

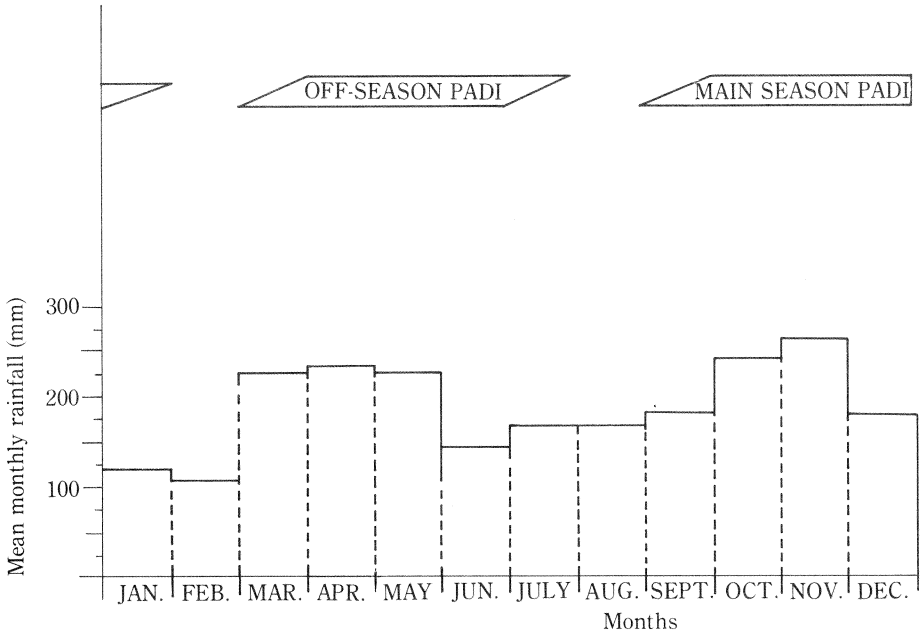

Fig. 3 Cropping calendar of main and off-season padi.

locations in Peninsular Malaysia. The cropping calendar is designed to coincide with the rainfall pattern. The main (wet) season crop is grown from September to February and the off-season crop from March to August. While the harvesting of the main season crop falls in the months of January and February, the driest period of the year, the off-season crop harvesting operation has to contend with wet field conditons. Figure 3 shows a typical cropping calendar.

The average farm holding size is 1.2 ha. In the minor irrigation areas the farm size averages at 0.8 ha while most of the granary areas have a larger farm size of about 1.5 ha. Main paddy varieties planted include MR 71, IR 42, MR 1, MR 27, "Seribu Gantang" (LIM, 1986; SYED AHMAD, 1986) and the newly released MR 84 with yield potentials ranging from 3.0 to 6.3 t/ha. The maturation period varies from 126 to 145 days while the mature plant height is between 95 and 120 cm. Both TAYLOR (1981) and LIM (1986) report that a wide range of varieties are usually planted in one geographical area in the minor irrigation areas. In the granary areas the farmers more or less follow the advice of the management and plant the recommended varieties.

LIM (1986) reported that the 1985 yields averaged 3.0 t/ha with the granary areas recording between 3.4-3.8 ton/ha. The national average cost of production is M$1,100 (ZULKEFLI, 1986) LIM (1986) found that cropping intensity also varies with a low 85% (60% and 25% for the main and off-season respectively) for the minor areas compared to 151% (78% and 73% respectively) for the granary areas. SUPAAD *et al.* (1986) reported that crop damages and losses due to pests and diseases amounted to 20%-35% of the total production made up of 11%-20% and 9%-15% pre-harvest and post-harvest losses respectively. The common pests are insects (brown planthopper, *Scotinophora,* stemborers, *Leptocorisa,* leaf folder), diseases (tungro, blast, bacterial leaf blight), rats and weeds (*Echinochloa* spp., *Scirpus grossus, Fimbristylis milliaceae, Monochoria vaginalis*). Tungro and rats are the major problems. With the direct seeding practice on the increase weed problem is causing concern. Integrated Pest Management (IPM) concept on pest control is being implemented by the Department of Agriculture (DOA), MARDI and the management agencies (such as MADA and KADA) to contain pest incidence. Figure 4 shows the extent of damage due to 4 principal pests in Peninsular Malaysia 1977-1984.

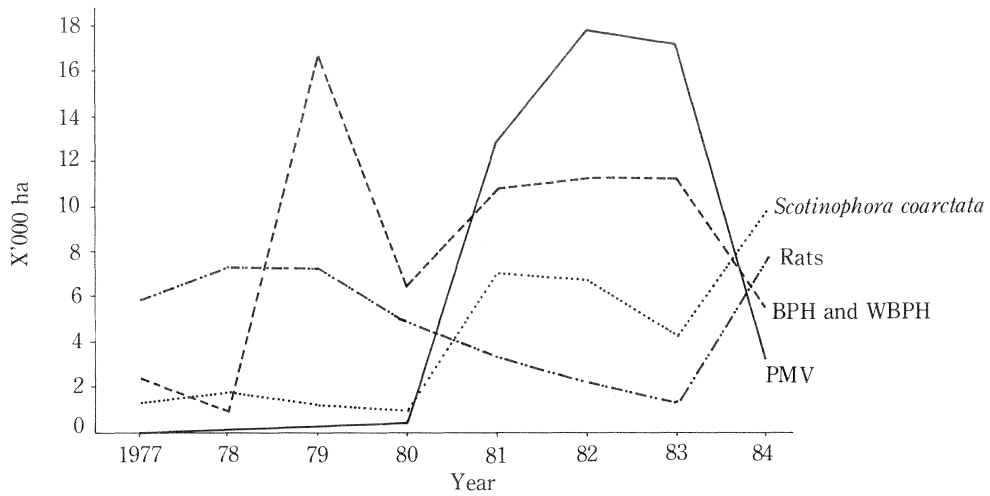

Fig. 4 Extent of damage caused by 4 principal pests in Peninsular Malaysia (1977-1984).

Source: DOA, 1985.

There are about 400,000 farm families involved in rice cultivation. Of these only about 140,000 families derive 75% of their income from rice production, the majority of which are found in the granary areas. The other farmers maintain other crops and activities to supplement their income. Table 2 shows the farmers' annual income distribution in selected double cropping areas.

Table 2 Sources of annual net household income, selected double-cropping area

Region, scheme, state	Year of study	Net paddy income		Non-paddy agricultural income		Off-farm cash income		Total M$	Converted price in 1980
		M$	%	M$	%	M$	%		
Northwest									
Muda Scheme, Kedah-Perlis	1962	609	56	148	13	335	31	1,092	4,009
Muda Scheme, Kedah-Perlis	1972-1973	1,483	71	203	10	409	19	2,095	5,597
Muda Scheme, Kedah-Perlis	1975	3,100	77	113	3	788	20	4,001	6,289
Muda Scheme, Kedah-Perlis	1982	3,077	86	85	2	405	12	3,567	-
West Central									
Province Wellesley	1972	788	78	96	10	128	12	1,012	2,704
Krian Scheme, Perak	1971	691	62	59	6	361	32	1,111	3,258
Sbg. Perak Scheme, Perak	1974	898	56	166	10	544	34	1,608	2,871
Tg, Karang Scheme, Selangor	1975-1976	2,802	63	693	16	925	21	4,420	6,947
Southwest									
Melaka	1965-1966	243	13	495	25	1,194	62		

Source: Adapted from ISHII (1984) and SYED AHMAD* (1986).
Converted rate is as follows:

1967 - 28.6	1971 - 35.8	1972 - 39.3	1973 - 46.9
1974 - 58.6	1975 - 66.8	1976 - 68.0	1980 - 105.0

There is a gradual depletion of the labor force within the farming community whose average age is about 47 and rising, especially in the minor areas (TAYLOR, 1981) as the younger generation, being more educated, migrates to the industrial sector. LIM (1986) reported that where better opportunities are available rice cultivation is usually the first activity sacrificed. EMBI (1986) reported that in 1983, 90,000 ha of paddy land were uncultivated. The farmers are usually not responsive to government efforts to increase rice production as the incremental benefit is marginal. They are reluctant to become members of Farmers' Associations (FAs) resulting in FAs being over-represented by the richer farmers owning 2.5 ha and more as they benefit more from the production credit and extension services (ISHII, 1984).

The ratio of owner:owner-tenant:tenant among paddy farmers is 48:25:27 and they operate 1.17:2.08:1.27 ha respectively (Taylor, 1981). The owners form the oldest group and tenants the youngest.

According to TAYLOR (1981), the 1977 crop shows that farmers prefer their own varieties to the official varieties (72:28% in the main season and 65:35% in the off-season). This trend is changing with more intensive extension and the release of more tolerant varieties. Most

farmers do not invest in more fertilizer than the subsidy provided and do not always apply it according to the advice of the extension workers.

For the timely and efficient operation in the double cropping cultivation more and more activities are being mechanized. Two- and four-wheel tractors dominate the land preparation and harvesting by large combines is prevalent in the major areas, gradually destroying the physical properties of the soil in the poorly drained fields (HAVE *et al.*, 1983). Except for a very limited scale, mechanization has not made any impact on transplanting activity. To overcome the labor shortage and high transplanting costs the farmers resort to direct seeding in the fields where better water control can be practiced especially for the off-season crop. In MADA 53% of the area practiced direct seeding in 1984 with a farmer spending 130 man-hours compared to 255 man-hours in the case of a transplanting crop (SYED AHMAD, 1986). Relevant agencies are encouraging farmers to form groups to pool resources and operate their lands collectively. Private sectors are also trying to manage rice cultivation on some uncultivated land on an "estate" concept with the owners sharing the profits. In fact, the Federal Land Consolidation and Rehabilitation Authority (FELCRA) pioneered this concept in Trans Perak area since 1971.

Major constraints

Government investments on rice double cropping have not been able to achieve the production targets envisaged. Pests and diseases and drought in the early 1980s caused widespread losses as well as a drop in production due to partial abandonment of the off-season crop. The introduction of free fertilizer subsidy in 1979 and additional paddy price support of about M$160 per ton in 1980 did not provide the impetus to increase production as the labor shortage and high wages force the farmer to curtail his operation costs. The depleting labor force is a major cause of concern to the rice-growing sector as it cannot compete with the industries for the younger and more educated generation who expects a better living standard. Without some form of incentive programs to make rice production a viable proposition labor shortage will remain a problem.

Tenancy and prevalence of uneconomic farm size continue to be the constraining factors in rice production. In MADA, one of the most successful double cropping areas with an average farm size of 1.5 ha and 26.6% pure tenant farmers, the poverty incidence in 1982 was 46% (SYED AHMAD, 1986).

A matter of growing concern is the lack of irrigation water management in the light of the current intensification program on irrigation infrastructure. With the existing facilities the low canal density and on-farm management tolerate a more basic level of irrigation management. However, with the sophistication of the irrigation system the effectiveness of management planning, control and operation is imperative to ensure the optimization of irrigation water utilization and ultimately the capability of the system to stabilize crop production. This will require a close involvement between the farmers and the irrigation staff, a situation which is found wanting at this moment. ISHII (1984) reports "a lack of information between the farmers and the DID" (Drainage and Irrigation Department irrigation staff) and recommends a certain level of farmer participation in operation and maintenance to achieve higher yield. On the other hand initial efforts by MADA to involve the farmers on the 0 & M of the new irrigation systems have not been encouraging (SYED AHMAD, 1986).

At the present level of irrigation and drainage facilities the increasing dependence of mechanization in rice cultivation poses a serious problem in maintaining stable field conditions so necessary for double cropping practices. Gradual decline in the physical properties of the soil and the destruction of microtopography of the rice field aggravate the existing inefficient irrigation and drainage practices and may seriously delay the cropping calendar (HAVE *et al.*, 1983).

Current research activities

WAHAB *et al.* (1986) reported that MARDI under its integrated Varietal Improvement Programme directed towards the development of new rice varieties and enhancing rice yields by adequate agronomic and plant protection practices is continuously promoting studies aimed at breeding and selecting varieties capable of sustaining high yields in location-specific environments while satisfying the requirements of the farmer, miller and consumer. The researchers develop and test for varieties that are shorter but sturdy to reduce lodging, have shorter maturation period to ensure that double cropping can be carried out in one calendar year, varieties with greater resistance against a wide range of pests and diseases and adverse climatic conditions. At the same time SUHAIMI *et al.* (1986) reported that studies are carried out to identify the impact of relevant technologies and agroclimatic environments on productivity.

MADA in conjunction with TARC, DID with JICA and MARDI carry out experiments, trials and observations to determine the impact of various cultivation activities and water management systems and practices on rice yields. Search for the appropriate machineries to be used in the various types of soils is also undertaken.

Studies on the impact of various canal system densities on yield performance are being carried out by MARDI (MOHD, SHAHRIN, 1986). KADA is understood to be evaluating the feasibility of land reorganization and improvement of the irregular and small farm lots.

Future prospects

With the gradual depletion of labor from the rice-growing areas the problem of uneconomic farms should diminish as the active farmers increase their holdings by leasing the uncultivated land. This may ultimately result in a change of ownership when the more educated heirs of the non-active farmers are willing to exchange their lands for some viable investments elsewhere. The farm size will gradually increase to a level which will support the farm family full time. ZULKEFLI (1986) reported that under the National Agricultural Policy the farmers will be encouraged to change to other more viable crops especially in the minor irrigation areas where major constraints exist. The Farmer's Organization Authority (FOA) will organize and actively involve the farmer groups in agricultural credit, input supply and marketing activities besides production to improve economic equity.

This will enable the government to concentrate its resources on the more productive granary areas. Programs to intensify agricultural infrastructure and provide support services to these granary areas can be further emphasized. With the government's commitment to upgrade the quality of life of the rice farming community it will no doubt continue to enhance support policies consonant with the demand expressed by the changes in the dynamic rice production process. Already the various agencies involved are well-coordinated in efforts to increase rice production. In MADA and KADA autonomous authorities already exist to organize collective action among the farmers. With adequate incentives a more disciplined and enterprising generation of full-time farmers involved in the farm water management practices will evolve. Appropriate use of machineries according to the field conditions together with improved varieties will further enhance productivity. Development of varieties more tolerant to agroclimatic constraints will stabilize double cropping and increase rice production. Development of shorter maturation varieties (about 120 days or less), adoption of separate nurseries and mechanized transplanting practices may well usher in an era of a much higher cropping intensity in the 210,000 ha granary areas.

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Discussion

Perez, A.T. (ADB): What is the government target regarding the production of rice in Malaysia?

Answer: The government will encourage the production of rice in the country according to the potential of the 8 major granary areas of the country which actually produce 60-65% of the national requirements in rice.

Dat Van Tran (FAO): I would like to know 1. How the government of Malaysia plans to carry out the review policy to place emphasis on the 8 major granary areas of the country and solve the problem of the small farmers and 2. How do you control tungro virus disease and what varieties are grown on irrigated lands in Malaysia.

Answer: 1. In the 8 major areas the government intends to provide intensive irrigation infrastructure and farmroad networks as well as relevant price support, agricultural support services and institution-building programs. In the minor areas, the government is deemphasizing the provision of irrigation systems due to the large number of absentee landlords and is promoting the cultivation of more viable crops, including oil palm with appropriate support programs. 2. To combat the incidence of tungro disease, the introduction of a one-month fallow period between the two cropping seasons has been found to be effective, particularly in the large schemes with highly intensive cropping. The introduction of more tolerant varieties than MR 42 such as MR 71 and MR 84 also helps together with early surveillance and monitoring programs.