TECHNICAL CHANGE AND REVIVAL OF THE BURMESE RICE INDUSTRY

S. K. JAYASURIYA

THE Burmese rice industry has registered a remarkable revival in recent years (Table I). Output has risen by over 40 per cent since 1977/78, and Burma appears to have the potential to reemerge as a major rice exporting country. This is a significant reversal of the trend of the early 1960s, when Burma gradually lost its leading position as a rice exporting country to the point where: "in good seasons it plays only a marginal role in international trade and in poor ones is hard pushed for supplies to satisfy its own urban and deficit area population" [19, p. 1]. The revival of the rice industry has been reflected in a commendable growth rate in the agricultural sector and in the gross domestic product of the country (Table II). In this paper we attempt to analyze these changes during the last twenty years and to relate them to the wider economic context and governmental policies.

A. *Early Developments*

Rice dominates Burma's economy. Traditionally it has accounted for 40–50 per cent of export earnings, occupies most of the cultivated area, employs some 70 per cent of the population, and is the major source of calories as well as protein in the native diet. The origin and growth of the Burmese rice industry have been well-documented (see, for example, [4] [1]). Rice has been cultivated in Burma since prehistoric times. As far back as the beginning of the sixteenth century, Burma is known to have exported rice to Malacca and Sumatra. However, the emergence of Burma as an important, and later as the world's major, rice exporter dates from the latter half of the nineteenth century when Lower Burma was opened up for large-scale rice cultivation. From an estimated 27,000 hectares in 1830, the rice area in Lower Burma grew to 540,000 hectares in 1860. By 1900 this was over 2 million hectares and by 1940 it had passed 4 million hectares. This rapid and enormous expansion was stimulated by a combination of factors: the rising demand for rice in Europe as well as in Asian countries such as Malaya, India, and Ceylon; improvement in transport and shipping facilities (e.g., the opening of the Suez Canal); and the removal of previous prohibitions on rice exports by the British colonial administration. Much of the rice output was exported overseas; substantial quantities were also sent to rice-deficit areas in Burma such as Upper Burma. Before World War II

Thanks are due to Ms. Thelma Paris for assistance and Dr. R. W. Herdt, Dr. R. M. Sundrum, and Mrs. Hazel Richter for comments on an earlier draft of the paper.

TABLE I

SUPPLY AND DISTRIBUTION OF RICE IN BURMA

Period	Sown Area (1,000 ha)	Yield (ton/ha)	Production (1,000 tons)	Government Procurement (1,000 tons)	%[a]	Exports (1,000 tons)	Domestic Availability[b] (1,000 tons)	Availability[b] per Capita (kgs)
1950–55	3,911	1.45	5,537	2,521	45.53	1,631	3,884	—
1956–60	4,189	1.56	6,190	2,773	44.80	1,750	4,355	—
1961–65	4,898	1.68	8,076	3,527	43.67	1,548	6,528	282
1965–66	5,014	1.66	7,928	3,239	41.37	1,179	6,749	230
1966–67	4,989	1.47	6,531	2,125	32.54	705	5,825	194
1967–68	4,935	1.65	7,647	2,240	29.29	398	7,249	280
1968–69	5,019	1.69	7,896	2,935	37.17	399	7,497	284
1969–70	4,955	1.71	7,859	2,974	37.84	798	7,131	264
1970–71	4,975	1.70	8,033	2,218	27.61	847	7,186	260
1971–72	4,978	1.72	8,046	2,218	27.57	776	7,270	257
1972–73	4,862	1.63	7,241	1,209	16.70	309	6,932	240
1973–74	5,089	1.77	8,466	1,484	17.53	104	8,362	283
1974–75	5,177	1.76	8,448	2,591	30.67	227	8,221	273
1975–76	5,203	1.83	9,062	2,743	30.27	487	8,575	278
1976–77	5,078	1.90	9,172	2,889	31.50	646	8,526	271
1977–78	5,136	1.95	9,312	2,246	24.12	210	9,102	283
1978–79	5,243	2.11	10,362	3,798	36.65	700	9,662	297
1979–80	5,026	2.36	10,283	3,524	34.27	600	9,683	290
1980–81	5,127	2.78	13,107	3,696	28.20	800	12,307	361

Sources: [3, various issues] [2].

[a] Government procurement as a percentage of total production.

[b] Does not exclude seed paddy and post harvest losses and does not take into account changes in inventories.

TABLE II

SOME ECONOMIC INDICATORS: ANNUAL GROWTH RATES

(%)

	1978/79	1979/80	1980/81	1981/82
Exports	−3	35	22	21
Imports	38	8	42	32
GDP	7	5	8	6.7
Agriculture	7.3	5.4	11.9	8.7

Source: [3, various issues].

drastically disrupted Burmese rice production, it was established as the world's largest rice exporter, contributing nearly half of total world exports in the immediate prewar years. This represented two-thirds of Burmese domestic production.

The role of government in this expansion was limited to supportive steps in the form of tax concessions, provision of infrastructure, etc. However, the nature of some of the developments in this period were to have an important bearing in molding independent postwar Burmese government policies. Chief among these was the role of foreign interests in the rice industry. While the actual cultivators were mainly ethnic Burmese (supported by seasonal migrants from India during peak labor-demand periods), milling and exporting were almost exclusively in the hands of British and Indians. Indians also played a major role as middlemen in the marketing system and Indian moneylenders, Chettiars, supplied most of the farm credit. By the 1920s, most farmers were deeply in debt to these moneylenders.

There was a widespread perception among Burmese that the profits of the rice industry did not accrue to the Burmese themselves. The depression of the 1930s aggravated conditions so seriously that large numbers of farmers who could not pay their debts lost their land to the Chettiars, who became owners of over 50 per cent of the rice area in Lower Burma [7]; therefore, "...the rice cultivator was only just eking out an insecure and inadequate living in the country which was the world's largest exporter of rice" [24, p. 8]. Much of the export earnings were remitted abroad or spent on imports; no stimulus was given to indigenous industrial development. According to Sundrum and Hlaing:

> At the conclusion of one and a half centuries of fairly close contact with the modern world, Burma has emerged as a typical "underdeveloped" country, by all the usual indices of incomes, investment and economic structure. But it is not so widely recognised that this has occurred at the end of a long period of intensive "development" of the country's resources. Further, this development occurred primarily under the influence of international trade under the most highly recommended free trade patterns [24, p. 8].

The Burmese saw foreign control of credit, domestic marketing, and exports as the root cause of this situation. The ideology of the independence movement was strongly influenced by this perception, and the assertion of Burmese control over the industry was seen as essential for capturing these benefits for national economic development. The political and economic policies of successive Burmese govern-

ments, in particular the Ne Win government, have been rooted in this colonial experience and reflected the reaction of the Burmese to that situation.

B. *Postwar Developments*

The Japanese occupation and the immediate postwar political instability severely reduced rice production in Burma. Output fell by 50 per cent or more during the war years and recovery after the war was slow [25]. In the immediate aftermath of the war, with acute worldwide rice shortages, emergency measures were taken by the British administration to secure supplies. An "Agricultural Projects Board" was established to purchase, collect, and export Burmese rice, with the entire amount being sold to the British Food Ministry. It then resold the rice to various importing countries in accordance with allocations made by the International Emergency Food Council [14]. This was the first major government intervention in the rice marketing system; in one form or another it has continued ever since.

The Agricultural Projects Board was superseded by the State Agricultural Marketing Board (SAMB) in 1947 when Burma attained its independence. This was granted statutory monopoly of rice exports. However, until 1962 some exports were handled by private merchants under license from the board [17]. The SAMB bought paddy from cultivators and milled rice from private millers at fixed prices. It also insisted that the private millers pay the official price to farmers. During the 1950s it usually bought about 30 per cent of the total output (of which 60 per cent came directly from farmers), and sold some rice in the domestic market in order to stabilize prices when domestic prices rose. Since domestic purchase prices were held consistently lower than the export prices, the SAMB made significant profits through its export monopoly which contributed a major share of government revenue, estimated to be at least 40 per cent in the 1950s [26]. However, the low procurement prices did not greatly reduce the level of purchases as the available marketable surplus was high; this was reflected in the fairly small difference between official procurement prices and the free market prices which prevailed during this period (Table III).

However, the low fixed price of paddy acted to discourage investments in rice cultivation and particularly in milling and storage facilities. Milling was in private hands but the government had announced plans for nationalization; profit margins were low and a flat rate payment method discouraged quality improvement [14]. The areas under paddy cultivation gradually increased, but at the end of the 1950s, it had still not reached prewar levels (Table I). While paddy price was held at a low level, many other crops (pulses, oil seeds, etc.) either had higher prices or were not controlled. Where technical conditions permitted, both area and production of such crops increased (Table IV).

The negative impact of the rice policies was reflected in the deterioration of rice quality during this period. The procurement system did not encourage better quality; indeed, until 1955 similar prices were paid for all grades. While over a dozen different grades were recognized before the war, SAMB decided that only one major low-grade rice would be exportable. While this policy was

TABLE III

PADDY AND RICE PRICES

(Kyat/metric ton)

Year	Paddy Price[a]			Retail Rice Price		
	Procurement Price	Free Market Price	Ratio	Official Price	Free Market Price	Ratio
1955–58	137	156	1.14			
1959–60	149	162	1.19			
1960–61	149	183	1.23			
1961–62	149	151	1.01			
1962–63	149	166	1.12			
1963–64	149	159	1.07			
1964–65	149	155	1.04			
1965–66	149	147	0.99			
1966–67	163	165	1.01			
1967–68	171	209	1.22			
1968–69	171	528	3.08			
1969–70	177	244	1.38	311	568	1.83
1970–71	177	281	1.59	311	628	2.02
1971–72	183	538	2.94	311	1,038	3.34
1972–73	210	582	2.77	427	1,109	2.60
1973–74	431	729	1.69	640	1,344	2.10
1974–75	431	744	1.73	710	1,368	1.93
1975–76	431	679	1.58	804	1,283	1.60
1976–77	431	579	1.34	870	1,123	1.29
1977–78	431	732	1.70	894	1,368	1.53
1978–79	446			935	1,674	1.79
1979–80	446			935	1,176	1.26
1980–81	472			935	1,647	1.76
1981–82	472			935	1,476	1.58

Sources: Data for 1955–58 to 1960–61 are from [17]. After 1961–62, see [3, various issues]. Free market prices from 1950–51 to 1968–69 were estimated from data given in [21].

[a] Prices are for Ngasein variety.

later changed, underinvestment in milling and storage facilities and the low price premium for high quality rice ensured that quality improvements did not take place. During the 1950s most Burmese rice exports were of the low-quality "small mill special" category with 42 per cent broken grains compared to the much superior Thai rice with 5–7 per cent broken grains. This was reflected in the export prices; Thai rice fetched consistently higher prices in the world market [14].

C. *The Era of the Revolutionary Government*

The year 1962 marks a watershed in postwar Burmese political and economic developments. The new military-dominated government that came to power instituted a series of measures which have had profound effects on both political and economic life.

Central to these changes has been the stated commitment to the "Burmese

TABLE IV

OUTPUT, SOWN ACREAGE, AND PRODUCTIVITY OF SELECTED CROPS

Crops		1951–52	1955–56	1959–60	1963–64
1. Wheat	I	5	5	10	53
	II	48	44	75	218
	III	3.88	3.90	4.61	8.38
2. Groundnut	I	144	146	167	332
	II	720	830	1,044	1,400
	III	21.60	21.08	20.06	21.54
3. Sesamum	I	43	40	62	53
	II	1,332	1,422	1,533	1,610
	III	1.93	2.00	2.54	2.32
4. Cotton	I	6	14	10	53
	II	247	426	370	674
	III	18.57	24.63	21.99	56.36
5. Jute	I	—	1.13	4.52	11.98
	II	—	5	21	54
	III	—	161.58	161.48	158.48
6. Gram	I	31	29	46	76
	II	240	214	303	377
	III	5.50	6.10	5.94	7.22
7. Tobacco	I	41	35	40	43
	II	123	410	120	133
	III	209.72	209.76	209.75	201.37
8. Sugarcane	I		842	1,005	1,152.1
	II	54	66	67	98
	III		12.76	15	11.76

Source: [13, p. 119].

Notes: 1. I: Output (1,000 tons).
II: Sown acreage (1,000).
III: Productivity per acre.
2. Productivity measurements:
Wheat : 72 lbs baskets
Gram : 69 lbs baskets
Groundnut: 25 lbs baskets
Sesamum : 54 lbs baskets
Cotton : viss
Jute : viss
Tobacco : viss
Sugarcane: tons
(1 viss=1.633 kilograms.)

way to socialism," which aims not only for the establishment of a socialist mode of production but also for "elimination of 'alien' influences from all spheres of activity...promoting 'Burmanization'" [6, p. 815]. In line with these aims, the government embarked on large-scale nationalization of major industries in both manufacturing and services. However, to date, small-scale industry which employs the majority of employees in this sector remains in private hands but their activities are heavily constrained by state control of the major marketing and distribution channels and by the state monopoly on foreign trade [9]. Nationalization of trade served both economic and political goals and was closely related to the Burmanization policy, as most trading was formerly in the hands of

TABLE V

SIZE DISTRIBUTION OF FARMS, 1981/82

Size of Holding	Numbers		Percentage	
	Peasant Families	Acres	Peasant Families	Acres
Under 5 acres	2,621,785	6,074,310	61.18	25.07
5 to 10 acres	1,053,768	7,506,839	24.59	30.99
10 to 20 acres	498,153	7,090,891	11.62	29.27
20 to 50 acres	109,127	3,014,992	2.55	12.45
50 to 100 acres	1,929	127,934	0.05	0.53
100 acres and above	610	410,186	0.01	1.69
Total	4,285,372	24,225,152	100.00	100.00

Source: [3, 1982/83, p. 50].

non-Burman groups. Stifel argues that this policy contributed to large-scale dislocation of domestic economic activities [23].

In the agricultural sector, small-scale production on the basis of privately operated farms continues (Table V). Land has been nationalized since 1950; however, its actual implementation resulted in little change in tenurial patterns until the Ne Win government came to power. Tenancy has been officially abolished since 1965, though there are indications that it has not disappeared. Land sales are prohibited, though some illegal transactions have been reported [20]. Since ultimate ownership is vested in the state, considerable pressure can be brought to bear on farmers to follow recommended production practices and to grow recommended crops.

Farmers are usually required to sell specified quotas of major crops (including rice) to the state at fixed prices; these quotas are regularly reviewed and revised. Any surplus can be sold, usually at higher prices, to the government trading bodies or (in practice) to private dealers. A considerable proportion of traded rice passes through private dealers and millers to consumers in urban and rice-deficit areas. An active open market, where consumers can freely purchase rice, is in existence.

During the 1960s, while these changes were taking place, the Burmese exportable rice surplus continued to decline. Richter has discussed in detail many factors which contributed to this [17] [18] [19]. While total rice area continued to expand, the pace of its expansion was so slow that even at the end of the 1960s it still remained below prewar levels. In Lower Burma, some land fell out of use and to a lesser extent, some was converted to other crops. In Upper Burma, where much of Burma's irrigated area was located, other crops expanded at the expense of rice until the mid 1960s.

Other factors contributing to this very slow growth were: a lower milling conversion rate of paddy to rice (owing to poor milling and storage), greater waste, and possibly heavier use of seed as many farmers shifted from the labor-intensive transplanting method to the lower-yielding broadcasting method for establishing the rice crop. Yields remained almost stagnant; traditional varieties

were planted and fertilizer use was low. Government intervention to eliminate private moneylending through various institutional credit schemes did not prove successful [16]. Indeed, it is likely that rural credit problems may have worsened during the period as private lending declined. The general scarcity of consumer goods, partly due to dislocation of internal retail trade, but more importantly due to reduced imports, further reduced incentives for producing rice for the market.

Consumption increases, too, contributed to the decline of the surplus. Rice consumption grew due to two main factors: rising population and greater per capita consumption. Per capita consumption in the rice-deficit areas rose when in 1964 the government standardized rice prices throughout the country. In addition, the low paddy prices reduced incentives for sale and encouraged greater domestic retention. For urban consumers, the depressed rice prices enabled maintenance of high levels of consumption; by 1964/65 rice formed only 10 per cent of the budget of a worker's household in Rangoon, a very low figure for the staple food [19].

In 1966/67, a low harvest reduced domestic rice availability and precipitated a political crisis which had far-reaching effects. The government had to undertake stringent measures to control rice distribution as retail prices rose and was compelled to permit direct farm gate sales to urban consumers [23]. Its most important effect was to make clear to the population and to the government the fact that Burma had ceased to be a country with a permanent rice surplus. In subsequent years, consumers tended to hoard rice whenever rumors of a shortage spread and the government tended to maintain higher levels of domestic stocks at the expense of exports. Another poor harvest in 1972/73 which led to widespread social unrest probably played an important role in pushing the government to undertake important policy initiatives.

Stagnation of the rice industry did not lead to a major expansion of other industries or crops. Actually, during the 1960s, production of most other crops also began to stagnate as they too came under state control. The government's attempt to monopolize farm-level purchases did not always prove successful. Procurement levels fluctuated substantially from year to year (Table I) reflecting not only output variations but also farmers' responses to market prices [21]. While the government distributed part of its procurements to consumers in deficit areas, the active open market, tolerated in practice, usually enabled consumers to purchase additional rice to meet their needs.

D. *Investment in the Rice Industry*

During the 1960s, the government followed a policy which, while acknowledging the importance of agriculture, nevertheless placed the emphasis on the development of a domestic industrial sector based on heavy industries. This was reflected in the allocation of government investment funds: agriculture received a very small part (less than 15 per cent) of government capital expenditure. While many developing countries of Asia expanded irrigation substantially during this period, it was largely neglected in Burma. Pump irrigation expanded to

some extent as farmers attempted to grow high-value cash crops. Though the area categorized as being irrigated rose from 1.3 million acres in 1961/62 to 2.2 million acres in 1971/72, this represented less than 12 per cent of the total sown area. The quality and level of irrigation was such that only about 13 per cent of this area was under multiple cropping.

Technical change in the rice industry was minimal. Fertilizer use had always been low, and traditional rice varieties in any case were not very fertilizer-responsive. Domestic fertilizer prices were kept high—higher than world prices by a substantial margin—and the fertilizer-rice price ratio was unfavorable [19].

In 1968/69, the government made an attempt to revive the rice industry. In 1966, the International Rice Research Institute (IRRI) released the first of the high-yielding dwarf rices to find wide adoption. The Burmese government imported a large quantity of fertilizer and the new varieties. In 1968/69, IR-8 (Yagyaw I) and another IRRI variety IR-5 (Yagyaw II) were widely promoted. However, results were disappointing. "The acceptance was unenthusiastic. The exotic high yielding varieties were short in stature and not really appropriate to the flooded field conditions of rice production in Burma. Above all, they had poor eating quality compared to local strains" [11, p. 1]. By 1973/74, exotic varieties occupied only 5 per cent of the total cultivated area, mostly in the irrigated areas of Upper Burma.

There was considerable government interest in promoting mechanization of agriculture, which had long been considered essential for improving productivity. A tractor scheme had operated since the 1950s. During the 1960s the government set up state tractor stations which hired out tractor services to farmers at subsidized rates. However, the operation was never a major success due to small farm sizes, technical problems in using large four-wheel tractors in wet paddy cultivation, frequent breakdowns, and shortage of spare parts. Utilization rates were low, and a third to a half of the tractors were often out of order. Animals continued to supply draught power for over 90 per cent of the area.

E. *Effects on the Economy*

The decline of rice exports had severe effects on the economy. The policy of self-sufficiency and emphasis on development of heavy industry was accompanied by a policy of self-reliance which discouraged foreign investments and borrowing as well as foreign aid. The decline in export revenues was met by progressive reductions in imports. The cumulative effect of all these policies was that the rate of economic growth slowed to a crawl. Between 1963/64 and 1973/74, real GDP grew by only 2.7 per cent per annum while population grew by 2.2 per cent per annum. Despite the strong emphasis placed on industrial development, industry grew only at 2.8 per cent and continued to be dominated by agricultural processing activities. With declining exports, imports declined and the isolation from the international market reached an extreme level. Exports were only 3 per cent of GDP in 1974, compared to around 20 per cent at the beginning of the 1960s. Similarly, imports were only 2 per cent of GDP in 1974.

The declining import capacity[1] meant that vital inputs into industry and services were in severe short supply and both industrial and nonindustrial development came to a virtual standstill. The need for some policy changes was very clear, even to the Burmese government, as it approached the end of a decade in power.

F. *Policy Changes*

In this situation, the government undertook a major policy review in 1971 and signalled its intention to make some important policy changes. These were expressed in the "Long-term and Short-term Economic Policies of the Burma Socialist Programme Party" promulgated in September 1972.

This program, commonly known as the Twenty Year Plan, indicated a change in emphasis from complete self-reliance and self-sufficiency. Exports were to be encouraged and the agricultural, forestry, and mining sectors with export potential were to receive increased government attention. This more "outward-looking" policy was to be accompanied by greater reliance on material incentives and market forces, with some limited encouragement of private sector activity (see [22] for a discussion of these changes).

G. *Changes in Regulated Prices*

In 1973/74, the official procurement price for rice was almost doubled; this was the first time in two decades that an increase of such magnitude had been made. To a large extent this was promoted by the urgent need to increase government rice procurements. Government sales of "rationed" rice to consumers as well as exports were endangered by low procurement levels. The bad harvest in 1972/73 raised open market prices enormously the following year and led to a major political crisis. Workers' strikes and demonstrations demanded higher rice rations; dockers refused to load rice for export and industrial unrest had to be suppressed by military means [15].

The increased official price and a better harvest the next year enabled the government to increase procurement. A further incentive to farmers was provided by a decrease in official fertilizer prices: price of urea, for example, which had already been lowered from K550/ton to K440/ton in 1971 was brought down to K360/ton, and has been maintained to date. Increased attention was also paid to revitalizing the supply of farm credit. The Myanma Agricultural Bank was set up in 1976 to extend agricultural credit.

In addition to the price changes, research efforts were intensified to develop new technologies suitable for the Burmese environment. Closer links were established with the International Rice Research Institute for both collaborative research and training of research scientists.

[1] This severe drop in imports despite its adverse effects on domestic economic activity was not altogether a result of a major foreign reserves crisis. According to Stifel, the Burmese foreign reserve policy until 1969 was one of the most conservative in the region: "In fact, the absolute size of the reserves rose to levels which had not been enjoyed since the post-Korean war slump in the rice trade and only started to fall in 1967" [23, p. 810]. Stifel attributes the conservatism in this respect to the fact that reserves were valued as "symbols of political independence and economic strength" [23, p. 811].

H. *Whole Township Rice Production Program*

In 1975/76 a pilot production program was launched in a village in Lower Burma, based on a package of new rice technology. The technology package and the subsequent launching of the Whole Township Rice Production Program in 1977/78 is described in detail by Khin Win, Nyi Nyi, and Price [12]. Essentially the new technology package consisted of the planting of modern varieties, increased use of fertilizer, improved transplanting methods with a higher plant density, and better weed control practices.

This program is considered one of the success stories of the Burmese rice industry and the entire agricultural sector in recent years. The program launched in two townships—Shwebo in Upper Burma and Taikke in Lower Burma—in 1978 was extended to forty-three townships in 1979/80; by 1981/82 it covered half of the area planted to rice. The government mobilized all its state and party resources to extend the program. The farmers participating in the program were provided with direct bank credit as well as a facility for advance sales of their paddy to the Agricultural and Farm Produce Trade Corporation (AFPTC), the successor to SAMB. Loans to paddy farmers increased from 1.6 million kyats in 1976/77 to over 700 million kyats after 1978/79. Available fertilizer was channelled to these areas and farmers. The state and party organizations provided additional manpower when labor shortages occurred and helped in other aspects of program implementation. Extention workers were recruited, trained, and sent to the program areas where "production camps" were established for each ten to twelve villages. These camps served as distribution centers for seed and fertilizer and meeting places and training camps for farmers [10].

The production increases, which were dramatic, are almost fully attributable to yield increases with little or no change in planted area. Production increased from 9.1 million tons in 1976/77 to over 13 million tons in 1980/81. Average national yields rose from 1.90 tons per hectare to 2.8 tons. This is the first example of modern rice varieties performing successfully under nonirrigated conditions on a large scale. Since irrigation investments were not necessary to obtain the production increases, it represented a relatively low-cost strategy requiring mainly additional fertilizer.

I. *Economics of the New Technology*

During the initial period of the program, there appears to have been considerable pressure on farmers in the selected townships to adopt the new technology. However, in subsequent years, adoption seems to have been largely voluntary, even enthusiastically so. Certainly, the new technology was economically attractive to farmers.

In Table VI, it is shown that even if output was entirely valued at official paddy prices the new technology was more profitable.[2] However, this considerably

[2] Two qualifications need to be made: (a) government credit may be inadequate and borrowing at high interest rates may increase capital costs, (b) local varieties have a price premium, but this is likely to be more than compensated for by the higher yields and marketable surplus of the HYVs.

TABLE VI

COSTS AND RETURNS OF HYV AND TRADITIONAL TECHNOLOGY, 1980–81

(Kyat/ha)

Items	Local	HYV
Material costs:		
Seeds[a]	30 (3.7)	44 (3.8)
Fertilizer	20 (2.5)	76 (6.6)
Manure[b]	26 (3.2)	67 (5.8)
Pesticides	1 (0.1)	7 (0.6)
Total material costs	77 (9.5)	194 (16.8)
Labor costs:		
Land preparation	218 (27.1)	273 (23.7)
Pulling seedlings and transplanting	150 (18.6)	183 (15.9)
Weeding	16 (2.0)	30 (2.6)
Crop maintenance	32 (4.0)	89 (7.7)
Harvesting and threshing	167 (20.7)	201 (17.4)
Total labor costs	582 (72.4)	776 (67.4)
Cost of cattle[c]	145 (18.0)	182 (15.8)
Total costs	804 (100.0)	1,152 (100.0)
Average yields (kg/ha)	2,200	3,556
Gross returns[d]	946	1,529
Gross margin	142	377

Source: Based on data from Agriculture Corporation.

Note: Figures within parentheses are percent of total costs.

[a] 1 basket per acre=local.
1.5 basket per acre=HYV.
Assumed cost of seeds=12 kyats/basket.

[b] Assumed price of manure: 15 kyats/cart (3 carts=1 ton).

[c] 10 kyats/day.

[d] Yield figures for HYV technology are estimated assuming 2,200 kgs/ha in local technology. Within the HYV program townships, the estimated average yields for HYV areas are considerably higher. Estimates give yields of around 4.3 tons/ha. We use the lower figure of 3.5 tons as a conservative estimate.

understates the actual additional benefits, as a larger proportion of the surplus would be sold in the open market. While official quotas have been raised, they have not been increased sufficiently to prevent the surplus marketable in the open market from rising substantially.

Most of the additional benefits from new technology adoption have accrued to the farm families (Table VII). There is a substantial increase in labor use (about 35 per cent), but much of this has come from the farm family. While the income of both farm families and hired laborers increased with the new technology, the farm family obtained a greater share. As has been widely observed elsewhere [8], the factor share of current inputs has increased.

The cultural practices associated with the new technology and its higher yields result in higher labor use. Thus, the new technology has contributed substantially to increased rural employment. The rise in labor demand has led to reports of

TABLE VII

FACTOR PAYMENTS AND INCOME SHARES (PER HECTARE) BASED ON TWENTY TOWNSHIPS

Factor	Factor Payment (Kyats)		Factor Share (%)	
	Local	HYV	Local	HYV
Value of output	946	1,529	100.0	100.0
Current inputs	77	194	8.1	12.7
Capital (total)	145	182	15.3	11.9
Hired	58	95		
Owned	87	87		
Labor (total)	582	776	61.5	50.7
Hired	371	440		
Family	211	336		
Total	804	1,152		
Residual	142	377	15.1	24.7
Income	**Income (Kyats)**		**Income Share (%)**	
	Local	HYV	Local	HYV
Value added	869	1,335	100.0	100.0
Farm family income	440	800	50.6	59.9
Hired laborer's wage earnings	429	535	49.4	40.1

Source: See Table VI.

labor shortages, particularly during crop establishment and harvesting periods [11]. This has generated much interest in labor-saving innovations, such as small-scale transplanters, harvesters, and threshers. However, their use to date is very low. Similarly, draught power shortages have been reported but no major initiative toward mechanizing tillage appears to be under consideration. Furthermore, the recent domestic oil shortages tend to discourage increasing mechanization.

Official purchase prices of many commodities, including rice, were increased during the 1970s. These increases followed the promulgation of new policies by the government, indicating greater reliance on producer incentives and the price mechanism to increase output. To what extent have the price changes in rice contributed to the production increases? Here, it is useful to examine the effects of government policies on relevant prices.

As discussed earlier, the most important direct interventions of the government have been: (a) purchase of a specified quota at fixed prices, (b) sales to consumers in urban areas and deficit regions at cost price to keep consumer prices low, and (c) maintenance of a monopoly on exports.

The direct effect of the government export monopoly has been to insulate the domestic market from international price movements. While official prices have been fixed by the government, open market prices have fluctuated substantially. Accurate estimates of the quantity traded in the open market are not available, though we have been quoted estimates of 5–10 per cent of total production.

TABLE VIII

NOMINAL RATES OF PROTECTION (NRP): RICE

Year	NRP[a] at Official Price (%)	NRP at Effective Domestic Price[b]
1969/70	−53	−29
1970/71	−33	+35
1971/72	−26	+99
1972/73	−17	+94
1973/74	−23	+47
1974/75	−56	−27
1975/76	−54	−35
1976/77	−25	−10
1977/78	−38	−13
1978/79	−49	−24
1979/80	−47	−22
1980/81	−56	−29

[a] Nominal protection rate=[(domestic price−f.o.b. price)/f.o.b. price]×100. (Domestic prices are Rangoon retail prices.)

[b] Effective domestic price=[official price×quantity procured by government+open market price×(total production−government procurements)]/total production.

In Table VIII, some rough estimates of the nominal protection (tax) rates are given. Since the farmer is able to sell the surplus over the quota at the higher free market price, this overestimates the actual nominal protection (tax) rate.[3] However, it is clear that the *immediate* effect of the government policy has been to impose a substantial tax on producers, in relation to the free trade situation. Further, the currency is known to be highly overvalued and the nominal protection rate greatly underestimates the implicit tax on rice producers due to the exchange rate policy. On the other hand, some of the inputs, fertilizer in particular, is substantially subsidized and mitigates to some extent the effects of the low procurement price policy.[4] Rough estimates of the nominal protection rates for urea suggest that they have been in the order of 70 per cent; in reality, again due to the overvalued exchange rate, the actual implicit subsidy is probably substantially higher.

The effects of the increase in rice price in 1973/74 should not be overestimated. Subsequent inflation, partly attributed to the rice price increase itself,[5]

[3] If the quantity not sold to the government is valued at the open market price, the (negative) nominal protection rates decline markedly; indeed during 1969–73, they became positive.

[4] Due to difficulties with obtaining sufficiently accurate data on milling, storage, transport, and other costs, we did not compute effective protection rates [5] which give a better estimate of the "net" effects of the various policies affecting both inputs and outputs. Nominal protection rates for other crops vary substantially, though rice seems to have been generally discriminated against when the structure of protection rates are examined.

[5] Burma has maintained domestic price stability relatively successfully during the past two decades except during the 1973–76 period when high levels of inflation were recorded. While this coincided with the international inflation in the aftermath of the oil price rise, Burma was probably only slightly affected by that as it was self-sufficient in oil and had

TABLE IX

REAL RICE PRICES

Year	Official Procurement Price: Ngasein Variety (Kyat per Metric Ton)	Consumer Price Index (CPI) 1975=100	Official Procurement Price Deflated CPI
1970	177	43.7	405
1971	183	44.0	416
1972	210	47.9	438
1973	431	60.7	710
1974	431	76.0	567
1975	431	100.0	431
1976	431	122.4	352
1977	431	121.0	356
1978	446	113.7	392
1979	446	120.1	371
1980	472	120.8	391
1981	472	121.2	389

Source: Based on data from [3, various issues].

TABLE X

RATIO OF OFFICIAL PROCUREMENT PRICE OF RICE TO THOSE OF SELECTED OTHER CROPS

Year	Maize	Jute	Cotton
1970	1.09	0.17	0.18
1975	1.06	0.32	0.20
1977	0.53	0.22	0.10
1979	0.55	0.23	0.10
1981	0.58	0.25	0.11

Source: [3, various issues].

Note: Relative price=price of other crop (kyat per ton)/price of paddy (kyat per ton).
Jute : price for grade I.
Cotton: price for long staple cotton, grade I.

has eroded its effect in real terms. Official rice price (as well as the free market price), when deflated by the consumer price index, has in fact declined during recent years from the pre-1973/74 level (Table IX). In contrast, official prices of many other agricultural crops (e.g., maize) have been raised relative to rice during this period (Table X). While no data are available on the free market prices of these crops, it is unlikely that the trends would be significantly different.

On the basis of available data, it appears that changes in official prices in the 1973/74 period have played only a minor role in stimulating farmer adoption of the new technology and the resulting output increase, except insofar as they helped maintain real prices during the 1973–76 period of high domestic inflation. Though the yield did not substantially increase after the changes in official prices,

only minor contact with the international economy at the time. It is likely that the doubling of rice price, the major wage good in the economy, would have been a more important factor.

TABLE XI
FERTILIZER USE AND IMPORTS

(Metric tons)

Year	Consumption		Imports	
	Urea	Other	Urea	Other
1977/78	108,636	27,207	—	25,200
1978/79	156,743	35,478	—	40,350
1979/80	155,161	53,811	9,000	58,000
1980/81	178,970	72,299	54,000	72,000
1981/82 (provisional)	170,149	69,227	99,000	99,000

Source: [3, 1982/83, p. 66].

it started to increase with the whole township program being implemented. Since 1976, domestic inflation has been minimal. Thus, it can be argued that the major government contribution to increased rice production has been the investment in research and extension and the supply of modern variety seeds and cheap fertilizer.

Clearly, the spread of the new technology would have resulted in a substantial increase in rural incomes, which would, in the absence of increased supplies of consumer goods, exert inflationary pressures. The government has been diverting available consumer goods to the program areas on a priority basis and surveys conducted by the Agriculture Corporation have shown a significant increase in the number of shops selling consumer goods (textiles, electrical goods, etc.) in such areas. Domestic production and official imports of consumer goods have shown no increase during the recent period; however, observations suggest that unofficial imports have increased significantly.

J. *Future Prospects*

The recent rapid growth in output has placed Burma again in the position of a potential major rice exporter. However, world market prospects for rice exports are not very encouraging, particularly as the present quality of Burmese rice is low and it has to compete with established exporters like Thailand. At present, substantial investments in improving milling, storage, and transport facilities are being made with funds from multilateral donor agencies such as the Asian Development Bank and the World Bank. These should help to improve rice quality and export prospects. An important constraint to increased production is the need to import substantial quantities of fertilizer (Table XI). Domestic urea production is expected to increase when new factories currently under construction begin production; however, other types of fertilizer will continue to be imported. As Burma is facing serious payments problems, fertilizer imports have been restrained, and fertilizer is rationed in the domestic market. This has resulted in per hectare fertilizer application levels declining in the program areas as the program coverage has expanded, though total use has continued to increase.

Increased output tends to reduce the differences between open market and official prices, thereby facilitating higher levels of government purchases and

potentially higher levels of exports. On the other hand, low open market prices depress effective producer prices while increasing consumer welfare. During the past two years, the differences between official and open market retail rice prices in Rangoon have been observed to have narrowed considerably. The government is at present very cautious about changing domestic rice prices, given the major importance of rice in the economy. As long as farmers are adopting the new technology with enthusiasm, it appears unlikely that there will be any significant changes in official prices, except to compensate for a possible increase in fertilizer price.

While precise estimates are not available, export demand for Burmese rice would be probably somewhat inelastic, and substantially increased exports would likely depress price levels. This, however, is an area where more detailed analysis is necessary. New investments in milling and storage now taking place may enable it to make a stronger challenge to more established suppliers. However, whether the technical change achieved in the rice sector can be the basis for sustained growth in the economy is an interesting and wider issue, which is not addressed in this paper.

REFERENCES

1. ADAS, M. *The Burmese Delta: Economic Development and Social Change on an Asian Rice Frontier, 1852–1941* (Madison: University of Wisconsin Press, 1974).
2. Burma, Ministry of Agriculture. *Agricultural Statistics (1962–1976)* (Rangoon, 1981).
3. Burma, Ministry of Planning and Finance. *Report to the Pyithu Hluttaw* (Rangoon).
4. CHENG SIOK-HWA. *The Rice Industry of Burma, 1852–1940* (Kuala Lumpur: University of Malaya Press, 1968).
5. CORDEN, W. M. *The Theory of Protection* (Oxford: Clarendon Press, 1971).
6. FENICHEL, A., and KHAN, A. "The Burmese Way to 'Socialism,'" *World Development*, Vol. 9, No. 9/10 (September/October 1981).
7. FURNIVALL, J. S. *An Introduction to the Political Economy of Burma*, 3rd ed. (Rangoon: Peoples' Literature Committee & House, 1957).
8. HAYAMI, Y., and KIKUCHI, M. *Asian Village Economy at the Crossroads: An Economic Approach to Institutional Change* (Tokyo: University of Tokyo Press, 1981).
9. HILL, H. "Industrialisation in Burma in Historical Perspective," *Journal of Southeast Asian Studies*, Vol. 15, No. 1 (March 1984).
10. HLAING, TIN. *Alternative Methods of Moving Cropping System Technology to Farmers* (Rangoon: Agriculture Corporation, 1981).
11. KHIN WIN, and NYI NYI. "The Special High Yielding Varieties Rice Program," Paper presented at the International Symposium on Cropping Systems at the International Rice Research Institute, Philippines in March 1980.
12. KHIN WIN; NYI NYI; and PRICE, E. C. *The Impact of a Special High Yielding Rice Program*, IRRI Research Paper Series No. 58 (Los Baños: IRRI, 1981).
13. KYI, KHIN MAUNG. "Modernization of Burmese Agriculture: Problems and Prospects," in *Southeast Asian Affairs, 1982* (Singapore: Institute of Southeast Asian Affairs, 1982).
14. MYINT, MAUNG. "Agriculture in Burmese Development" (Ph.D. diss., University of California, Berkeley, 1966).
15. PEIRIS, D. "Socialism without Commitment," *Far Eastern Economic Review*, September 13, 1974.
16. RICHTER, H. V. "State Agricultural Credit in Postwar Burma," *Malayan Economic Review*, Vol. 13, No. 1 (April 1968).

17. ————. "The Union of Burma," in *Agricultural Development in Asia,* ed. R. T. Shand (Canberra: Australian National University Press, 1969).
18. ————. "The High Yield Program in Burma," in *Technical Change in Asian Agriculture,* ed. R. T. Shand (Canberra: Australian National University Press, 1973).
19. ————. *Burma's Rice Surpluses: Accounting for the Decline,* Australian National University, Development Studies Centre, Occasional Paper No. 3 (Canberra, 1976).
20. SAITŌ, T. "Farm Household Economy under Paddy Delivery System in Contemporary Burma," *Developing Economies,* Vol. 19, No. 4 (December 1981).
21. SOE, MYINT. "Economics of Production and Procurement of Paddy in Burma" (M.S. thesis, University of Philippines at Los Baños, Laguna, 1978).
22. STEINBERG, D. I. *Burma's Road toward Development: Growth and Ideology under Military Rule* (Boulder, Colo.: Westview Press, 1981).
23. STIFEL, L. D. "Economics of the Burmese Way to Socialism," *Asian Survey,* Vol. 11, No. 8 (August 1971).
24. SUNDRUM, R. M., and HLAING, AYE. *The Role of Agriculture in Economic Development: The Burmese Experience,* University of Rangoon, Department of Economics, Statistics and Commerce, Economics Paper No. 6 (Rangoon, 1961).
25. TUN WAI, U. "Burma," in *Asian Economic Development,* ed. C. Onslow (London: Weidenfeld and Nicolson, 1965).
26. WALINSKY, L. J. *Economic Development in Burma, 1951–1960* (New York: Twentieth Century Fund, 1962).