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GROUP I

"DEVELOPING THE REGION'S CEREAL (RICE AND MAIZE) INDUSTRY"

THE RICE INDUSTRY IN GUYANA:
Scope and Programmes for Expansion

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Introduction

The rice industry in Guyana dates back to the middle of the eighteenth century and owes its origin and development to our slave and indentured forefathers who operated under primitive conditions in order to feed themselves [1, p.12]. In fact, the industry began as a matter of expediency without active support from the political system of the day and this perhaps more than anything else underlines the hardy and independent spirit which is characteristic of the industry and which has been an inheritance from the early days.

In part, its beginnings can be considered an attempt to achieve a measure of emancipation not possible on the sugar estates where the participants - slaves and indentured immigrants were quartered. This spirit of individuality and independence stood them in good stead in that management and husbandry of their rice plots had to be provided by the early rice farmers themselves. Because of the small size of their holdings (which in turn was determined by the meagre savings accumulated during their stay on the estates or by land granted *in lieu* of repatriation) many rice farmers in the late nineteenth and early twentieth centuries could not transfer most of the experience of plantation management to a peasant situation. Marketing for example, was essentially an absent factor, as much, if not all rice cultivated at that time was consumed by the farmer's family.

Today, the industry is still basically a peasant industry with the average size of holdings of between 5 and 25 acres, although there are individual farmers with holdings above 500 acres with the Guyana Rice Board as the largest single unit cultivating about 5,000 acres (mainly for seed) and three State Farms. Up to 1971 when the Guyana Bauxite Company came into existence, the rice industry in Guyana was the only major industry fully-owned, controlled and managed by Guyanese.

It is important for efficient rice policy and programme formulation and implementation to be able to identify:

- (a) the key factors holding back development of the industry,
- (b) where these forces are operating, and
- (c) what types and amounts of development resources including time which will be required to eliminate or ease these restraints to development.

In relation to the rice industry, I have grouped these areas of concern into five categories:

- (i) water and land development;
- (ii) farmers' involvement in the industry;

- (iii) employment in the industry;
- (iv) production and consumption trends; and
- (v) some costs incurred in rice farming.

Water and Land Development

Water and land development defined to include drainage, irrigation, salinity control, land shaping, flood control and water conservation are some of the major problems facing the Guyanese rice industry.

The Need

This has been so for the past fifty years or more despite partly successful attempts in setting up various Land Development Schemes throughout the coastal belt at Onverwagt, Black Bush Polder, Cane Grove Brandwagt-Sari, Vergenoegen, Mara, Tapacooma and others like Garden of Eden, and Waune-Yarakita which have a non-rice bias. The fact is that the total acreage covered by these schemes, provided as they are with basic facilities in water control, is a mere fraction of the total land area under cultivation and of the acreage potentially cultivable. Guyana lying some 6½ degrees north of the Equator, with a coastal plain varying in depth from 2 to 40 miles and containing the rice belt, is flat and falls at a general rate of about 6 inches per mile. Soils are Demerara clay, some with an overlay of pegasse, mostly of a degenerate nature and from 4 to 18 inches deep. Rainfall of 90 inches annually appears in two seasons, December/January and May/June/July, the latter being the heavier and the growth season to the main Autumn rice crop. Much more important is the fact that the rice lands are for the most part under the level of high tides and require an elaborate and costly system of dykes to prevent inundation.

Water Development

Water controls is of paramount importance, therefore, and because of this, land layout can only be undertaken in a large scale in what is familiarly called "*Land Development Schemes*". In the light of these peculiar conditions, there is little scope for individual farm holders constructing their own earthworks without reference to and conformity with the overall grind of waterways as both drainage and irrigation depend upon the force of gravity in the main. Quite recently small pumps are being used on a wide scale to lift water levels and to drain fields but this type of equipment still does not form part of the basic equipment of most farmers.

In addition to natural precipitation, irrigation needs are met in three ways, firstly, via water conservancies feeding by gravity and regulated through appropriate control structures like kokers and sluices. This is what is termed "controlled" or "scheduled" delivery of water in that water is supplied to farmers when and where it is required for efficient crop production. The main hope for the large non-Drainage Board areas which have no planned facilities is that over time, they can be selectively modernized. This undertaking "to drain the entire coastal belt" has been given by Government and it is hoped to achieve this objective within 10 years. Irrigation needs are met, secondly, by large diesel centrifugal pumps lifting water from creeks and discharging it into channels known as "water paths", which may be up to 10 or 12 miles long. The third and most unsatisfactory way is river flooding, in which dependence on the flow over the banks is both uncontrollable and unplanned.

The main water system has been constructed out of Government funds, and, as such, are under the Drainage and Irrigation Board, which charges variable rates for the use of its facilities. Grave dissatisfaction has been expressed, not only with respect to the inadequate services provided by the Drainage and Irrigation Board but also to the fact that drainage and irrigation are national problems and should be financed from the general revenue of the country rather than by specific water rates payable by farmers to the Drainage and Irrigation Board. It should be clearly stated here that owing to the nature of our soils outlined above, drainage by percolation is practically non-existent with little or no abrasive material like stones or rocks of any kind, evaporation loss, too, is insignificant unless occurring over a long period of time. The new thinking behind a national drainage and irrigation policy is that the system should be integrated from national through village to farm levels.

Under normal conditions, a crop of rice required between 40 to 45 inches of rainfall. With our annual rainfall of 90 to 100 inches there is enough for at least two crops per year. But precipitation in the right amounts and crop growth do not coincide and even in recent years (1971 and 1972) where rainfall has been excessive - between 110 and 120 inches - the lack of adequate facilities for holding the water or releasing it as required, has resulted in a waste (discharged into rivers and creeks) of a significant proportion of this. The result has been intermittent floods followed by periods of drought with valuable topsoil being drained away in the process. With only 100,000 acres out of the present rice acreage of 250,000 acres having adequate drainage and irrigation facilities and an expenditure of over \$800 per acre required to provide these facilities for the remainder, massive financing possibly from the Caribbean Development Bank or other external sources seems necessary.

When future projections for doubling rice output by 1980 are taken into consideration, much better use will have to be made of existing lands, before expanding to virgin areas. For example, during 1960 to 1964, out of a total expenditure of G\$36 million for agriculture (mostly rice), G\$24 million were used for drainage and irrigation and G\$7 million for river and sea defences or a total of G\$31 million for water development. The planned expenditures for 1966 to 1972 and 1972 to 1976 were G\$40 million and G\$32 million respectively for drainage and irrigation exclusive of G\$14 million and G\$46 million for sea defences respectively. Such massive investment in social infrastructure is necessary for encouraging permanent settlement and efficient farming. The rice industry has benefitted mostly from these facilities.

Land Development

A brief examination of the land system shows that lands are held or occupied in three main ways:

- (i) freehold properties,
- (ii) leaseholds; and
- (iii) statelands.

It is without question that the development of a sound land system is of fundamental importance for expansion of the rice industry [2]. In practice, it has been found that a significant proportion of drained and irrigated lands are held as freehold properties, many of these being old and abandoned sugar estates with laid-on drainage and irrigation.

These estates are mostly found on the islands of Wakenaam and Leguan and on the Essequibo Coast, in which areas, the sugar industry is no longer active. In an attempt to continue the system of "landlordism" many of these properties of old estates have leased portions to small farmers, demanding payment sometimes in produce - especially in times of low prices and subjecting the lessees to various degrees of serfdom by charging exorbitant interest rates on loans to their tenants, providing milling facilities at high fees and sub-marginal employment in rice factories in some cases. To aggravate a very unsatisfactory landlord/tenant situation is the fact that the old estate drainage and irrigation systems, in most cases, have been allowed to lapse into decay and today are almost non-existent. Whilst the provision of these facilities is specifically covered in the Rice Farmer (Security of Tenure) Ordinance 1946, failure of a landlord in this respect can only be remedied by a recourse to the courts - an expensive and time-consuming solution which the tenant sometimes is unable to pursue. There is no recourse in the law for a resumption of State ownership in these cases.

Ramsahoye observed that as far back as 1913:

"official attempts to throw open Crown lands to private enterprise had only been a partial success. There were many persons to whom grants had been made, but they had failed partially to put all the land under beneficial occupation, and as a result there was a considerable acreage of land almost abandoned and over which the Government had no control. There was some machinery for resumption of Crown lands under the provisions of the Crown Lands (Resumption) Ordinance which had been enacted in 1905 but the procedure was cumbersome. A solution to the problem of securing the beneficial occupation of these lands became urgent and the Government of the day considered two alternatives. One was to impose a small tax on land to induce people to cultivate or otherwise occupy beneficially but the Law Officers advised the Government against it, their opinion being that to all intents and purposes a grant of Crown land became freehold and the tax would be improper and illegal. The other alternatives and the one adopted was to issue leases for 99 years ... These were in turn subject to conditions including forfeiture for non-payment of rent and for failure to cultivate or beneficially occupy the lands subject to the leases" [3].

Today, thinking on agrarian reform has gone further as it has been found that 99 years was too long a period which in fact confirmed "quasi freehold" rights rather than "leasehold" rights and which were subject to renewal. Modern thinking has been that the renewal length of the leases should be sufficiently long to allow a farmer to show productive effort and the period proposed is 10 to 15 years more or less, based upon the age of the occupier. Against this proposal is the argument that too short a period is not a sufficient incentive for a farmer to expend money on the minor drains, sluices, dams, etc. needed for successful rice cultivation if there is even the remotest chance of his losing the land after developing it or without being able to pass it on to his heirs and successors. Notwithstanding the length of lease eventually decided upon, administrative bottle-necks if not removed will tend to frustrate the attempts at land reform. For example, there are numerous tenants who have been occupying

lands for over five years without receiving leases because enough land surveyors are not available. Such inordinate delays not only serve as a disincentive to farmers staying on the land but also seriously affect farmers' ability to secure credit for inputs such as fertilisers, chemicals and spare parts from private suppliers. With land reform being implemented, thousands of leases will need to be issued and this underlines the urgency to plan to eradicate this bottleneck.

As can be seen from the above, much has taken place with respect to land reform although the need for action has been underlined. Last year, the Guyana Government set up a special committee (on which the Guyana Rice Board has a representative) to look into the entire question. The committee has visited many areas taking evidence both written and oral but the implementation of any agrarian reform programme will create a variety of political and administrative problems with difficulties in terms of human relationships, calculated risks and unexpected obstacles. Phillips [4, p.26] enumerates the deterrents facing a Government willing to carry out land reform as:

- (a) absence of cadastral and registration systems to allow sizes, rights and utilisation;
- (b) the criteria for deciding what land should be expropriated and redistributed and what should be regarded as fair compensation; and
- (c) the need for lawyers drafting such proposals to be in consonance with the concepts of social action and social justice.

Nevertheless, action must be taken especially in view of the cost of bringing new lands into production and the stated policy of the Guyana Government of making agriculture the basis of the economy. That is not to say that new lands are not available. Guyana has large tracts of land suitable for agricultural purposes. The coastal plain with an area of 4,613,000 acres has according to the maps of the FAO - UNSF Soil Survey 1960-64, about 1,730,000 acres of soil of moderate to good fertility. Of this approximately 453,000 acres were under crops in 1965, the figure for 1975 being about 600,000 acres. Rice occupies 250,000 acres, sugar cane about 110,000 acres and the perennials another 120,000 acres.

Farm Management

Apart from the Black Bush Polder and Tapacoma Land Development Schemes, a few areas in the rice belt need additional essential services for "living on the land". There is the tradition of living in the brightly-lit villages quite away from the farms which supply an economic return to the farmer. The quality of husbandry therefore, must suffer from this "absentee" farming because few take the effort of walking six or eight miles aback daily to inspect their farms. Criticism of the Land Development Scheme has also been made in that the present system of clusters of homesteads away from the main farm crop is also not conducive to proper farm management.

Equally important is the need to improve present dams and roads, and to transport inputs to the farm and produce out to the mills. The moisture content of paddy at harvesting time should be around 20 per cent. In recent years, where abnormal rainfall at crop time is experienced the moisture content is sometimes higher resulting in an inordinately high percentage of chalky grains and yellow rice. On the whole, paddy

should be dried down to a moisture content of 14 degrees farenheit within 36 hours of harvesting but inadequate roads and dams effectively prevent swift transportation resulting in deterioration of grades.

But land transportation is expensive. The original design and layout of the Black Bush Polder Scheme had placed much emphasis on providing adequate land transportation to the mills. In effect, in addition to serving as drainage and irrigation trenches, these canals should have provided a cheap and easy method of moving paddy from field to mill. In practice, this has not happened, and much-needed finance has now to be spent on clearing and maintaining the canals in the absence of the natural clearing which constant use by boats would have provided.

A Government Committee [5] which considered the needs for a better transportation system reported on March 23, 1974 that transportation of paddy by water could be implemented in about 40 per cent of the present rice producing areas if the handling aspect, the erosion of banks, etc., are studied in greater detail. The entire system should be designed so as to allow speedy movement from field to mill especially during wet-weather harvesting. There is no doubt that the provision of all-weather access roads is also vitally necessary in that they are more flexible than the water system. The Committee identified a number of advantages of access roads:

- better farm management
- better supervision of services
- quicker transportation of machinery; and
- handling being reduced to a minimum.

The proper management of water and land resources means, in effect, utilizing minimum resources for maximum result. In many areas, common water resources are not used collectively owing to the fact that individual rice farmers sow (and also harvest) at different times. The result is that one farmer or a group of farmers would need irrigation water whilst others need to drain their lands instead, all at one point in time. With many of the waterways serving a dual purpose, that of both drainage and irrigation, it is not difficult to imagine the recrimination, violence and confusion which erupts. There is thus need for a more disciplined approach and the Guyana Rice Board has been advocating "block cultivation" of rice, especially in areas such as Land Settlement Schemes where adequate services have been provided. This system is an attempt at the cooperative use of resources while still pursuing individual goals. Its advantages are many including:

- improved water control
- increased output of tractors and harvesters (that is frog-hopping over scattered plots, rather than servicing contiguous plots, will be eliminated)
- less damage to access roads
- vandalism (tampering of structures) will be reduced
- aerial spraying becomes a possibility to a group of small farmers
- better yields are achieved; and
- better insect and pest control can be achieved.

One school of thought advocates that the creation of new arable land for distribution to settlers should be undertaken on a self-liquidating basis with the Guyana Agriculture Cooperative Development Bank (which comes closest to a Land Bank) undertaking the administration after infrastructural works have been done by Government. Such works should not be a charge against the General Revenue but on a long-term basis should be met from rent collectible in cash or kind. Produce will be assignable to the Bank as in the case of proceeds from rice sold to the Guyana Rice Board.

Farmer Involvement in the Rice Industry

There are about 50,000 rice-farming families engaged in the Guyana rice industry. In terms of individuals, the figure is probably 250,000 which represents the largest involvement of the people in any single industry in the country. There is a producers' organisation established by Ordinance No. 7 of 1946, Chapter 250 for the protection, promotion and advancement of the rice industry, but the activities of this body over the past few years have led the Guyana Government to believe that it has not been functioning with the original objectives in view.

Since 1968, District Rice Action Committees were established to fill the vacuum created by the malfunctioning of the producers' organisation referred to above and the main tasks of these committees was to seek greater co-ordination and involvement of farmers at the local "grass roots" level in bringing improvements to the industry. In recent times, the Guyana Association of Local Authorities has become closely associated with these Committees especially in the execution of infrastructural works over which the Village leaders have jurisdiction, in educating farmers in correct methods of husbandry and in helping with the administration of various programmes of assistance to the rice industry. There are eight such committees in operation and membership is made up of rice farmers in the main, supported by representatives of government agencies in the Guyana Rice Board.

Every activity in rice cultivation must be executed at the correct times using recommended and tested methods in order to have successful harvests. As such, therefore, time is crucial to the industry and solving farmers' problems does not allow for delays. This is the *raison d'etre* for the name "Rice Action" Committees so termed by Dr. the Honourable P.A. Reid, Deputy Prime Minister, then Minister of Finance and the Minister responsible for the rice industry at that time. But for action to have positive results, rice farmers' problems must be interpreted by rice farmers themselves and thus membership of these Committees is made up of active rice farmers who hold the vital positions of Chairman and Vice Chairman and direct the affairs of the Committee. Because many of the facilities (dams, trenches, culverts, bridges, etc.) were owned and controlled by the various Local Authorities, it was thought that the key members of the Rice Action Committees should be able not only to make their influence felt in contributing to the decision-making process but also they should have the power to implement these decisions as Local Village

Councillors. In short, this is an experiment in involving village leaders with their main economic activity, for if agriculture was not successful, taxation at village level will be meaningless.

Farmer-members of each Rice Action Committee also have a very important additional function of representing fellow-farmers on the Appeals Committees engaged in the purchasing of paddy at the Guyana Rice Board's mills and silos. Each Appeals Committee is comprised of a Ministry of Agriculture representative, a G.R.B. official and a R.A.C. representative, all fully trained in rice grading practices. Thus any dissatisfaction with the awards of grades is adjudicated by this Appeals Committee which curiously only has the power to upgrade a farmer's produce but not to downgrade the same. The system works well and is designed to ensure farmer confidence in this vital operation of buying farmers' produce.

Officials of the Rice Action Committee include:

- the senior Police Officer in the area who is co-opted specially to arrange for the shooting of wild ducks which destroy sizeable proportions of a crop if left unchecked. The Police presence also served to ensure that no harassment of farmers is done especially at ploughing time when tractors coming from the fields on to the public highways, may breach various traffic laws (no lights, number plate covered with mud etc.);
- the Cooperative Officer serves the rice cooperatives, and machinery cooperatives among others in the area. Rice Co-operative Societies have been outstanding successes in the cooperative movement. On the Corentyne Coast, the Port Mourant Follow-up, Babylon, Port Mourant Unity, No. 43 Koker and a host of others, have pioneered the way and over the past three or four years, the Prime Minister and Mrs. Burnham have been instrumental in the formation and operation of over 22 rice cooperatives in the East Demerara area. In total, there are more than 60 active societies in the rice industry with another 10 operating but pending registration by the Commissioner of Cooperatives. The growth of these societies has made possible the acquisition of tractors, combine-harvesters and other expensive equipment which would not have been possible by the individuals comprising the cooperative working on their own. The first successes in applying the system of "block planting" have also been achieved in co-operatives. (Thus, the cooperative movement is considered an important instrument for implementing changes in rice practices and in the propagation and spread of extension work among farmers and will assume an even more significant role as the industry expands.)
- the Community Development Officer's role on the Rice Action Committee is to mobilise disparate groups in the areas to work together on community projects, e.g., the grading and building of dams, the installation of kokers, sluices, fencing, digging and clearing of trenches, building bridges, culverts, etc. All of these community projects are based

on the principle of self-help, with labour being supplied by the rice farmers and materials financed by the Guyana Rice Board. A tremendous amount of minor-infrastructural works has been carried out on this basis with the G.R.B. supplying over \$4 million in materials over a five-year period and labour costs totalling about 25 per cent of that figure. Apart from the economic benefits derived in allowing farmers to reap better harvests (in some cases where no cultivation was possible before these works enabled farmers to reap a crop and so earn a living), community projects have the added benefits of laying the foundation for farmers to work together on future projects and also to reduce vandalism (a frequent occurrence perpetrated against public works) referred to elsewhere in this paper.

- the Hydraulics Officer is probably the most important government official upon whom the farmer depends for the successful cultivation of his crop. (Drainage and irrigation facilities in some areas are provided on a less-than-minimum scale and much has to be done in making the system flexible enough to permit small farmers to obtain enough water for their crops and to drain lands for harvesting.)
- the Guyana Rice Board Officers are of two types: administrative and technical. The administrative officer advises the Rice Action Committee on procedures laid down for farmers to obtain loans for inputs-harvesting and ploughing services, fertilisers, chemicals, spare parts, etc. and to transmit information and give explanations about general rice policy. The technical officers might be concerned with machinery or with husbandry. With these latter personnel field days, demonstrations, field trials, etc. are planned.

Further involvement of rice farmers is seen at the level of the District Rice Assessment Committees which were set up following the enactment of the Rice Farmers (Security of Tenure) Ordinance 1956. These Assessment Committees comprise a Magistrate, who is specially appointed to perform this task throughout the rice belt as Chairman, two tenants, representatives and two landlord representatives with an official of the Ministry of Agriculture completing the team.

Invariably the two tenants and two landlord representatives are rice farmers sitting on the Rice Action Committees as well. The main functions of the Rice Assessment Committees which have juridical power, is to assess rentals being charged for rice lands and to look into the justice of eviction notices issued by landlords. The law also places responsibility on landlords for the maintenance of certain basic infrastructural works and the Rice Assessment Committee is empowered to look into these also.

At the highest rung in the ladder, rice farmers are involved in the policy formulation of the industry at the level of the directorate of the Guyana Rice Board where they have four members out of a total of eleven. It should be noted that these four members although not in the majority form the largest lobby within the directorate and their views and aspirations therefore carry much weight and are in the main accepted and implemented.

Employment in the Rice Industry

As stated elsewhere in this paper, employment in the rice industry is provided for about 250,000 persons in the fields, factories, warehouses, ships and offices. The greater proportion of this employment is engaged in primary production, processing and marketing of rice and paddy. Quite recently there has been an upsurge of interest in the by-products of the industry mainly rice-bran and an advanced stage of negotiations has been reached with the Government of the German Democratic Republic for the erection of a modern rice-bran oil complex. The intention here is to locate this complex near to the M.A.R.D.S. mill in view of the bulky nature of its main input, viz. bran, and the fact that it must be utilised within 48 hours of paddy processing. Although the capital investment in this project is expected to be fairly high, employment of more than 100 persons directly in its operations is not anticipated. There will be, of course, secondary employment created in the transportation of whatever bran is needed other than that obtainable at M.A.R.D.S., but this is not expected to be significant.

Employment for about 25 persons has been provided in the production of Purina Stock Feeds which utilise stockfeed rice as a main ingredient and a smaller number in rice flour and rice wine manufactures. This is a peasant industry and the basic labour on the farms is family labour and the extent of their involvement has been restricted over the past 25 years since there has been increased mechanisation of the industry in terms of the introduction of tractors and combine harvesters.

Mechanisation in fact was first introduced around 1910 at Plantation Onverwagt in the form of huge tractors but was discontinued immediately prior to World War I [6]. Sporadic attempts at mechanisation were not successful during the twenties and early thirties due to the world-wide economic recession. It was only with the intervention of the Japanese in World War II which threatened traditional suppliers from the East, that attention was paid by the British to other sources. With finance supplied by Colonial Development and Welfare, British Guiana Rice Marketing Board and the British Guiana Government, M.A.R.D.S. covering 11,000 acres was started in 1944 and with this large acreage there was the necessity for mechanisation on a grand scale. The M.A.R.D.S. success story in terms of the application of tractors to the industry, however, sounded the death knell to traditional ploughing with oxen and a reduction in the numbers employed.

Only on small plots of 5 acres or less, are animals still used to pull ploughs and to help with the puddling and smoothing [1]. In addition to the elimination of the back-breaking nature of animal ploughing, tractor ploughing has the advantage in that it is faster, allowing an operator to cover a larger acreage and this becomes more vital as acreages increase.

Some 90 per cent of the crop is now reaped by combine harvester rather than by manual labour using the sickle or grass knife, followed by bulk-mashing. The greater part of this development has taken place despite astronomical increases in machinery prices over the years and was due in fact to the provision of the "Hire Services" at M.A.R.D.S. as far back as 1948, a system which has spread throughout the rice belt enabling small farmers to obtain machinery services at highly subsidised

rates. By contrast, the Thailand rice industry which is one of the largest and most important rice production areas in the world has not increased mechanisation to the stage where a significant reduction of employment has resulted. In Guyana, in a recent drive to harvest by hand all acreages below 5 acres, the fact was revealed that such skills were in short supply having been lost in some cases due to an over-dependence on machines. It was advocated that school holidays should be revised as in former times, to allow school children to join in the harvest. This would ensure not only an adequate supply of labour but also guarantee that the skills would be transmitted from generation to generation. There is basic opposition to all this by a few uniformed farmers for the simple reason that agriculture has not yet attained the level of respectability which should be attached to its importance in the economy. Many successful rice farmers prefer to have their children pursue careers in medicine, law, engineering rather than an agricultural career despite the fact that the last named might be more rewarding. The Guyana Government is moving swiftly to re-orient persons away from such thinking but this takes time.

Mechanisation can serve to modernize the industry when it is considered that exports form a vital percentage of total production. On the other hand, there is evidence of a degree of over-mechanisation stemming from a normal farmer's conservatism - that of insulating himself as far as this is possible, against the vagaries of the weather both at ploughing and reaping time. The larger size of the holdings now cultivated gives a farmer little choice whether to use the tractor versus oxen and the combine harvester or manual labour. Each type of operation requires that it be done before the weather changes and the farmer has found mechanisation faster even if more costly and less efficient. Increased use is also being made of the aircraft for seeding, fertilising, pest, disease and weed control.

Table 1. Average yield per acre 1945/46 to 1973/74 in bags of 140 lb. paddy

Year	Average yield per acre (bags)
1945/46	16.10
1950/51	16.90
1954/55	14.70
1959/60	15.30
1960/61	12.70
1961/62	14.10
1962/63	13.60
1963/64	13.40
1964/65	13.00
1965/66	12.70
1966/67	12.30
1967/68	10.70
1968/69	9.60
1969/70	10.70
1970/71	11.76
1971/72	12.20
1972/73	11.65
1973/74	8.27

Source: Guyana Rice Board, Annual Reports.

The fact of the matter is that increased mechanisation meant reduced man-hours in the field and this led to poor husbandry. Mismanagement of tractors and combines and their disastrously cumulative effect on the soil year after year, are major problems which our Research and Extension Services staff is tackling with much success.

Orthodox economic theory has shown that a nation cannot hope to be prosperous and industrialized until its agriculture is efficient to such an extent that output in agriculture has produced surpluses to offer for export whilst simultaneously releasing excess labour to the industrial sector. Guyana has not yet reached its agricultural potential in order to start shedding labour to industry. Modern farm equipment used by farmers in industrialised countries have been adopted in the rice industry without being able to obtain comparable yields with those in the rich countries. Such yields must perforce cover the amortised value of the equipment and other inputs.

Production and Consumption Trends

The Second Development Plan (Draft) 1972-76 envisaged an expansion of nearly 55,000 acres in the rice industry with the average yield expected to move from 12.90 bags of paddy per acre to about 20.00 bags per acre by the end of the plan period. In total figures, a target of 350,000 acres should be achieved yielding 280,000 tons of rice per annum in 1976 valued at \$44 million and contributing \$21 million to the Gross Domestic Product, both being stated at 1972 prices. In terms of the total acreage, this figure of 350,000 acres has practically been achieved in 1974/75 but there is still much to be done to approach an average yield of 20 bags per acre. The following table shows rice production in Guyana 1964/65 to 1973/74.

Table 2. Rice acreages and yields, 1965-1974, Guyana.

Crop year	Area (acres)	Estimated yields (tons)
1964-65	316,000	163,927
1965-66	216,514	149,000
1966-67	342,366	167,600
1967-68	294,000	131,000
1968-69	304,000	113,000
1969-70	315,921	123,745
1970-71	304,146	134,150
1971-72	258,800	118,440
1972-73	225,420	98,438
1973-74	355,000	110,052
1974: Autumn	n.a.	120,000
1975: Spring	n.a.	45,000*

* Estimate of crop now being reaped.

Source: Guyana Rice Board, *Annual Reports*.

After the record 1964/65 crop year in which Guyana was forced to sell a sizeable quantity of rice at give-away prices on the world market thereby suffering heavy losses, farmer-optimism waned for a short time and production declined. Prices paid to farmers were reduced and the industry generally needed a shot in the arm. The Guyana Government, ever mindful of the need to have a viable industry,

- (a) wrote off loans totalling \$9.326 million and issued a new loan of \$4.5 million to the rice industry;
- (b) employed management/engineering consultants to analyse the industry and form their recommendations;
- (c) the present \$30 million Rice Modernization Project was embarked upon - by 1976 this project would have been completed, with six drying and storage complexes (four are now in operation and work is in progress on the remainder) and a milled-rice storage facility in Georgetown; and
- (d) one of the most modern rice research stations has been constructed at M.A.R.D.S.

In the interim, greater emphasis has been placed on raising the average yield per acre rather than on expansion per se. Nevertheless, as the figures from 1968/69 onwards show, increased acreages were again being cultivated until the 1971/72 - early 1973 era when disastrous weather conditions put paid, for a while, both to the expansion programme and to the achievement of higher yields. This variable weather was not singular to Guyana but acted as a scourge across the face of Asia and Africa. You may recall the rice riots in the Philippines (where the International Rice Research Institute is located) and firing squads operating against hoarders and profiteers in Indonesia. As Chancellor Efferson [7] puts it, "*variable weather conditions are likely to continue to be the most important factor affecting the production of rice.*" This was cold comfort at a time when the world was just proclaiming that the "miracle" rices had ushered in a Green Revolution. But production in Guyana regained its momentum and last calendar year, an output of 163,000 tons of rice, was achieved. Our target for the future has been expressed by the present Minister of Agriculture - Mr. Garvin B. Kennard, C.C.H., when he says: "*For we expect that by 1980 sufficient land will have been drained and irrigated to double the present production of rice. That is to say, the output should reach some 300,000 tons of rice.*" [8]. There is no doubt that this projection is feasible and attainable and will be more than sufficient to meet not only the needs of the region as presently comprised but an extended community including Cuba, Haiti, the Dominican Republic, Curacao, Aruba and the French West Indies.

In order to analyze this claim, it is necessary to look at the consumption projections for the region. It has been estimated that the regional demand for rice is in the vicinity of 350 million pounds (156,000 tons) [9]. Guyana has been the main supplier to the region and in times of bad harvests due to variable weather conditions, any deficit has been made up from purchases emanating from outside of the region. However, in 1964/65, when Guyana produced 163,927 tons of rice all territories in the region were

requested to receive accelerated shipments in view of vast stockpiles in Guyana. The regional demand, however, was a mere 63,443 tons which included 6,883 tons to Cuba, with the remainder which was available for export, that is, 34,654 tons being sold to East Africa, Singapore and Europe. If this figure of 63,446 tons less 6,883 tons plus 20,000 tons imported by Jamaica from outside of the region is used as a guide, we have the region consuming a then maximum of 77,000 tons. After making adjustments for population growth during the period 1965 to 1975, it is estimated that 94,000 tons of rice could be consumed by the region.

A look at the suggested figures of 156,000 tons is needed. If consumption in the producer-countries in the region is included in this figure, then the figure is understated by about 40,000 to 50,000 tons. On the other hand, if Guyana and Belize are excluded, then the consumption projection should be revised to slightly over 100,000 tons (see table below).

Table 3. Annual Regional Rice Consumption Estimates

Territory	Tons of Rice
Jamaica	48,000
Trinidad	35,000
Barbados	9,000
Windward Is.	6,700
Leeward Is.	3,900
Total	102,600

This new projected figure of 102,600 tons takes into consideration a slightly higher consumption per capita than previously, as the assumption is made here that shortages due to shipping deficiencies will not occur. Statistics show that most territories in the region can increase their per capita consumption significantly. At the suggested consumption levels suggested in the table above, the per capita consumption is still far below that of other countries as seen in the following table.

Table 4. Per capita rice consumption in lb. per annum

Non-Caricom Territories		Caricom Territories	
Burma	- 315	Guyana	- 123
Thailand	- 312	Barbados	- 80
Taiwan	- 295	Leeward Is.	- 75
Japan	- 244	Trinidad	- 68
Philippines	- 198	Jamaica	- 54
India	- 152	Windward Is.	- 40
Brazil	- 106		
Cuba	- 92		

Source: F.A.O., *Recent Trends and Patterns in Rice Trade*, OCP 70/6, 1970.

The skeptics might well question the desirability of eating more rice instead of other cereals such as corn, wheat flour, oats or sorghum which have higher protein or vitamin values. It is true that of the cereals named above, rice shows the lowest protein concentration and the highest carbohydrate content. But rice has much to commend it. In terms of an energy giving food, rice has few equals. However, the protein components of a food is of nutritional significance only in terms of its essential amino acid content. Bressani [10] summarizes the amino acid concentration in the following table reproduced here:

Table 5. Essential amino acid content of various cereal grain and milk (expressed ad g/16 gN)

Amino Acid	Rice	Corn	Wheat Flour	Rolled Oats	Milk Protein
Isoleucine	4.89	4.62	4.19	4.82	6.51
Leucine	7.84	12.96	7.02	6.99	10.02
Lysine	4.27	2.88	2.08	3.42	7.94
Total sulfur amino acids	3.45	3.15	3.02	3.41	3.41
Phenylalanine	5.55	4.54	5.01	4.98	4.94
Threonine	4.10	3.98	2.62	3.09	4.70
Tryptophan	1.35	0.61	1.12	1.20	1.44
Valine	6.24	5.10	3.94	5.55	7.01

From the table above, it will be seen that isoleucine, total sulfur, amino acids and phenylalanine present similar values while there are marked differences in lysine and tryptophan among others. The higher lysine value in rice suggests that among cereal grains, rice protein is the one with the highest biological value. However, Bressani concluded that the proportions in which these essential nutrients are present are also of some importance. For instance, the corn protein is not only deficient in lysine and tryptophan but the poor balance between the isoleucine to leucine ratio is also partially responsible for the very low quality of corn protein. This situation is not seen in rice protein. In summary, the quality of rice protein is high but the concentration or quantum is low.

Among rice eaters also, there are different culinary tastes - with consumers in some Caribbean territories following the North American and European preferences for "white" rice as against "parboiled" rice. To produce white rice, the hull, bran and polish are removed in milling whereas in parboiling, the paddy is soaked, steeped in hot water, drained, steamed under pressure and dried before milling. In this manner most of the vitamin B content of the paddy is retained in the edible rice. The steeping process, however, results in a slight smell, which is hardly noticeable but to some consumers this is objectionable. Nutritionally, parboiled rice is superior to white rice as seen from the following comparison.

Table 6. Vitamin content of processed rice in micrograms per gram of rice

Types of rice	Niacin	Riboflavin	Thiamine
White rice	18.1	0.25	0.60
Brown rice (bran & parboiled not removed)	53.8	0.50	3.69
Parboiled rice	39.8	0.36	2.57

Some Costs Incurred in Rice Farming

Any attempt to assess the costs and revenues pertaining to the industry is fraught with grave difficulty in the face of continually rising costs of equipment and inputs as a result of the energy crisis. External inflationary pressures have been exerting a most adverse effect on the profitability of the industry. The situation is most frustrating since every yield increase achieved by farmers in the field by the use of high-yielding varieties and better husbandry, especially since 1970, has been absorbed by spiralling costs of imported inputs. In the Guyana Rice Board mills and warehouses, every improvement of mill efficiency, whether brought about by better management or higher levels of performance, is similarly nullified by higher costs of spares or fuel or some other input which has to be imported. The result of all this is that the Guyana Rice Board has to cushion the effect of these increases by highly subsidising inputs and services sold to farmers.

Through the Guyana Rice Board, new high-yielding varieties like Blue Belle and Starbonnet were introduced in order to improve the yield per acre. Recently, through its own research programme a number of other varieties - hybrids "S" and "N" were introduced to farmers, the latter having special blast resistant properties. But here is a paradox, because these varieties are all fertiliser intensive strains. Ten years ago, the entire industry used a few hundred tons of fertilizer. Today, the industry needs at least 15,000 tons. With prices rising from \$200 per ton in 1970, through \$300 in 1972 to \$1,000 in 1975, there is little doubt that the industry is struggling against severe odds, financing the inflationary policies of the richer nations.

One source which must remain un-named was bemoaning the fact

that in 1968 and 1969 only 374 and 392 additional machines, (tractors and combines) respectively were added to the existing fleet when compared with an average of over 450 per year for the first five years in 1960. This mid-summer madness was bound to end. Recent Government measures which were introduced, places the disposition of all such importations in the hands of a competent authority and mark-ups are controlled as well. With over 2,300 tractors and about 350 combines presently operating in the industry, yearly increments are needed both in terms of replacement and also to tackle new lands being brought under cultivation. Such purchases, however, have to be monitored carefully to obtain maximum use. New trade strategies involving increased purchases from Socialist countries, have also been embarked upon in an attempt to maximise the use of scarce foreign exchange. The following table shows the movement of equipment prices.

Table 7. Cost of equipment and inputs, 1960 to 1975 (in G\$)

Equipment	1960	1967	1972	1975
MF 165 tractor	4,000	6,400	10,200	17,500
MF 135 tractor	3,500	4,900	7,100	13,500
MF 400 combine	-	30,000	45,000	68,000
Tractor parts e.g. piston ring	1.00	3.25	7.50	9.00
Combine parts e.g. chain	n.a.	1,000	1,750	2,500
Jute bags	0.30	0.65	1.05	1.64
Fuel per gal.		0.33	0.38	1.40
Insecticides e.g. agrosan (1 lb.)	-	0.28	0.36	0.80

Fertilizers and chemicals are subsidised to the tune of over 70 per cent of cost along with other levels of subsidy on bags, coastal and riverain, insurance, research and development and machinery services. Production loans to the tune of over \$5 million annually are made available to farmers for spare parts and other inputs with repayment over two or three crops. In addition, the Guyana Agricultural Co-operative Development Bank issues capital loans for the purchase of machinery, rice mills and for infrastructural works.

The pricing policy of the Guyana Rice Board is geared towards enabling the average-sized farmer with a 15-acres holding who is fairly efficient to achieve an economic living for his efforts. His return on his investment and labour is calculated to be not less than he would have earned in other semi-skilled employment at minimum rates. All surpluses earned by the Guyana Rice Board are returned to the industry in the form of remunerative prices to farmers, are invested in infrastructural works to increase yields and are made available to farmers in the form of loans for the acquisition of inputs. Plans are underway for the setting up of a stabilization fund to guarantee price levels to farmers against fluctuating world market trends.

Regarding subsidies granted to farmers, these are intended to help the small farmer to achieve higher yields which would in turn mean a higher income for himself and family. Representation has been made to pay higher prices of farmers' produce and to remove or reduce the level of subsidies. There is evidence that if such subsidies are added to the prices paid to farmers that only the large farmer would benefit because he is already efficient and enjoying the economies of large scale production. Such increases would not benefit the majority of producers in the industry who would tend to cut back on their use of what would now be, very high-priced fertilisers and other vital inputs, thereby reducing their yields still further. In addition, recent price increases have resulted in the primary producer - the farmer, receiving an even smaller net return than before the increases, as the transporter, combine owner and miller, upon whom he is dependent, raised their charges out of proportion to the increase in price which he received.

In this paper, I have tried to outline the problems dealing with land and water development, and the steps which are being taken to solve these problems. It is obvious that some measure of agrarian reform is necessary in order to provide necessary infrastructural works on old estates and to make lands available to those who can utilise it. At present, only the Land Settlement Schemes are provided with minimum facilities. Farmer involvement in the rice industry is taking place at various levels through the Rice Action Committees, Rice Assessment Committees, Grading Appeals Committees and Directorate of the Guyana Rice Board and thus farmers do have a strong say in the formulation and implementation of rice policy.

Employment in the industry has been affected owing to the advance of mechanisation. Certain guidelines should be established for mechanisation to take place foremost of which is the size of the farm and the possibility of cooperative ventures to establish machinery pools and to introduce "block planting". In this regard, a recent development in local agricultural engineering is the introduction of the stationary thresher which would reduce the use of self-propelled combines especially by small farmers.

In production terms, Guyana can supply all of the present and future rice needs of the region, even taking into consideration future expansion in terms of Cuba, Haiti, etc. The other territories of the region can therefore turn their attention to other production for which they are suited. Further, the per capita consumption of rice can be higher in the region as rice has much nutritional value to commend it.

The paper did not deal with costs in detail but attempted to show the effect of the recent energy crisis on major inputs. Because of spiralling prices of inputs, a heavy subsidisation programme has been embarked upon as it is the policy of the Board to plough back the profits into the industry. In summary the paper stresses the scope and capacity of the programmes now on the ground to satisfy regional rice needs.

The Guyana rice industry is efficient and will become even more so with the increased provision of adequate drainage and irrigation

facilities. The region, therefore, can be assured that the Guyana rice industry has the resources (soil, climate, technology and farmers) and ability to provide cheap and adequate supplies of this most important cereal - rice.

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