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ASSESSMENT OF KEY ASPECTS OF A PROPOSED AID
PROJECT TO PROVIDE CREDIT TO GUYANA
SMALL RICE FARMERS FOR THE
PURCHASE OF FARM MACHINERY

Under Contract
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I. CONCLUSIONS AND RECOMMENDATIONS

On the basis of this study of the proposed Guyana small farmer machinery credit project, the following findings and recommendations are submitted:

1. Rice farm households are an appropriate target group for AID assistance through this project.
2. Farm size can be used as a way of identifying the target group. But there is a rather weak relationship between farm size and farm income and even more between farm size and total income. Therefore, farm-size standards of eligibility should be applied flexibly in terms of a maximum/large size for participation in the AID-sponsored program, not of a minimum small-size criterion that every loan recipient must meet.
3. In fact, AID-sponsored machinery loans should be concentrated more in the farms close to 15 acres in the 0-15 acre group and in the 15-25 acre group, not in the very small farms; otherwise the project will be helping businessmen in the machinery-renting business, not assisting machinery-owning small farmers. Such a result is certainly not intended. If the machinery purchased is to be widely and reliably available in rural areas, it should be operated by reasonably capable persons who are focusing on farming themselves.

4. Small and low-income farmers will benefit from an increase in tractor and combine availability; but for most this benefit will not be realized through profits from ownership, but rather from the better service and better price of machinery services available once the shortage of parts and/ or machinery is alleviated to some extent.

5. These small and poorer farmers most frequently report problems in obtaining such machinery services. It appears, however, that the inconvenience and discouragement that result from delayed services are the problem, more than an outright inability to get services. The data available do not show directly measured, strong, adverse effects on production caused by the problems.

6. Guyana rice farms generally did not report a substantial use of credit. The largest farms over 50 acres were most likely to ask for a loan and receive one. Guyana farmers generally appear to provide a high level of self-financing. What the proposed AID assistance responds to is not the need for credit per se, but rather the need for a claim on foreign exchange. Of course, this allocation is under GOG control. At least, the GOG can determine the priority for the purchase of farm machinery in a period of intense competition within the government and the country for the use of the scarce foreign dollars.

7. Group loans can increase the access of poor and small farmers to ownership of machinery. Generally, the traditional types of cooperation, especially among family groupings, should be used. More important than sharing of ownership is sharing of access, and the latter development should be emphasized along with the designation of one person to hold prime responsibility for ownership, maintenance, and operations.

8. The designation of the Guyana Co-operative Agricultural and Industrial Development Bank (GCAIDB) is appropriate as the carrier institution for distributing project funds through machinery loans to farmers. The bank appears capable of handling this job.

9. The portion of project funds designated for spare parts can be handled by the Guyana Marketing Corporation on the basis of cash sales. This organization will need institutional help in improving its inventory records and control.

10. All of the machinery and parts financed by AID should go to the private sector. None should go to the Guyana Rice Board (GRB) whose divestiture of all field machinery operations has been recommended by a GOG committee.

11. AID should not attempt to alter the loan criteria of the GCAIDB, either by asking that stipulations be added or waived. The exception could be the addition of a limitation on very large farms not receiving AID-funded tractor loans. The size limits should be higher for combines. GCAIDB requirements for collateral land and land rights should be maintained as the appropriate condition accompanying low interest rates.

12. The GCAIDB has the procedures and experience to work out group participation in a loan for which individual farmers do not have sufficient land and production for a tractor purchase to be financially feasible. These procedures already include agreements on the part of the prime recipient concerning other farmers' land that he will be responsible for plowing in addition to his own. However, group loans are still made quite infrequently. In the

negotiations for this project and loan, emphasis should be on increasingly GCAIDB's making of such group loans and its advertising of their availability.

13. The GCAIDB should not be pressed to increase the low number of loans handled per staff member. This ratio is appropriate to the level of experience of the bank and its new staff members, to the relatively high number of outstanding loans, and to the care and technical assistance to farmers that go into the processing of applications and the follow-up on loans. The new staff additions that are being made as part of the future further decentralization of the GCAIDB and the plans for further recruitment should provide sufficient additional staff to handle an increased volume of loans.

14. We suggest that the beneficial terms of the U.S. funds be granted directly by the GCAIDB, which can then charge its current regular near-market interest rates to farmers (12 percent for machinery loans). In this way, any surpluses generated will belong to the GCAIDB. Control by the GCAIDB provides the best possible likelihood that repaid funds will continue to be applied to agricultural development. In operating loans, the Bank should be encouraged to keep risk and interest rates low, rather than to combine higher rates with greater risk.

15. While the encouragement of domestic savings through high interest rates is certainly reasonable, the proposed project is intended mainly to alleviate a shortage of foreign exchange; this shortage is little affected by domestic currency. There is no reason, for example, to encourage farmers who have an apparent high rate of self-financing to deposit this money in Guyana banks so they can

borrow it back. Through strict direct import controls, the GOG has already encouraged consumer savings of foreign exchange.

16. The GRB raised prices paid to farmers for paddy in late 1979 and early 1980. It currently appears to have little margin for further price rises, as is discussed in the issue paper on potential policy components of a PL-480 Title III program in Guyana.

17. At least a part of the project grant for technical assistance might well be better spent on technical assistance to supplement other aid to the GNTC for upgrading the system for recording and distributing parts, rather than to the GCAIDB to buy audiovisual equipment and library materials for staff training.

18. The proportions of AID funds to be spent on parts, tractors, and combines as outlined in the original proposal, including the suggested supplementary funds, appear reasonable enough. However, the implementation of a line of credit from Brazil for the importation of Massey-Ferguson tractors may shift the relative priorities somewhat more to spare parts and combines. The agreement with the GOG for a machinery credit loan should be framed with flexibility for adjustments on the basis of an annual reassessment of needs.

19. For the present, imported tractors and combines for rice farming should be Massey-Ferguson equipment. Such a concentration on the make that has proven most popular in recent years will assist in the provision of parts for the new machines. The current ordering and distribution system for parts is too chaotic to handle the demands of stocking

parts for many different brands. This means that the tractors imported are likely to come from Massey-Ferguson manufacture and assembly in Brazil; the combines are likely to come from either Brazil or Great Britain. AID personnel involved in the preparation and review of this proposal will have to ascertain and rule whether an exemption to buy-American guidelines is needed for such purchases, or whether the participation in the overseas supplying companies by the U.S. Massey-Ferguson Company is sufficient to meet the legal requirements for U.S. purchase.

20. The possibility of the United States serving as the source of supply for plowing equipment would be increased if large tracked vehicles such as Caterpillar were used. Some data indicate that these large machines could provide for an efficient use of capital and fuel, although there are possible technical problems arising from the compaction of soil by these machines. However, the use of the large machines makes the involvement of small farmers in ownership more difficult and is not appropriate for the particular AID project under consideration.

21. Tests of smaller and simpler designed tractors used in other countries are worthy of continued and increased support. Oxen also appear appropriate for consideration as a source of power for plowing on very small rice farms.

II. THE TARGET GROUP

This section identifies the target group and its key characteristics related to the design of the small farmer machinery credit project and the assessment of the project idea as well as specific aspects of the proposal.

Low-Income Farmers

Rice farmers are an appropriate group to receive project assistance. In fact, three quarters of Guyana rice farm households fell within the U.S. target population for development assistance efforts, a higher proportion than for other types of farms. In 1978, this target level was about \$G600 per capita, or about \$G4,000 per household. In all, the rice farms accounted for 30 percent of rural farm households in the target population, and the "mixed farms," most of which also grew some rice, accounted for another 30 percent.¹

1. RRNA, The Income and Production of Guyana Rural Farm Households, 1980, Table 5-3 and discussion, pp. 56 and 5-8; also pp. 3-1 and 3-8 and determination of U.S. aid target level appropriate for Guyana, footnote 1, pp. 2-11. Rice farmers were defined as farms that obtained 75 percent of their gross receipt loan growing rice. Some rice farmers with substantial income from hiring out machinery and machinery services appear to have fallen in the "mixed farm" category, since their nonrice receipts were great enough to bring the rice proportion below 75 percent.

Four out of five rice farms had less than 15 acres of land. The households with small-sized farms had considerably lower income than the larger-sized farm households (Table II-1.)¹ Furthermore, the great majority of rice farms with less than 15 acres of land earned less than one-fourth of their meagre \$2,000 per year household income from their farming operations. However, small farm size was not highly correlated with target group stations, since many farm households with above 15 acres also had incomes below the poverty line, and this is especially true for rice farms. The farms with 15-25 acres actually averaged well below the target level.

Access to Machinery and Machinery Services

The main machinery services required for rice farming are tractors for land preparation, especially the series of disking and harrowing steps described in Chapter III, and harvesting by combine. The need of farmers for a truck or tractor and trailer to carry paddy to the mill is also important, but is not a major focus of this paper, although tractor trailers are discussed briefly in Chapter III.

About one rice farm in four owns a tractor, a far higher proportion than for other types of farms (Table II-2). Rice farms own over three-fifths of the approximately 3,400 farm tractors in the country (not counting tractors

1. The correlation between small size farms and low-income was stronger for rice farms than for the farms as a whole since feed crop farms and various types of livestock raising resulted in relatively higher returns per acre than did rice farmers; thus other small farmers were somewhat able to offset their size.

Table II-1. Rice Farm Household Average Income
by Source, by Size of Farm, 1978

Size (acres)	Households --Number--	Income			Farm as percentage of total -----Percent-----
		Total	Off-farm	Farm	
		-----Guyana dollars-----			
0 - 14	5,246	1,985	1,515	470	24
15 - 24	798	2,811	1,413	1,398	50
25 - 49	340	6,436	2,984	3,452	54
50 +	252	7,991	1,766	6,225	78
All households	6,635	2,525	1,572	953	38

Source: Computer printout Tables 576, 574A.

Table II-2. Ownership of Tractors and Combine by Rice Farms and Other Types of Farm Households, by Size of Farm, 1979

Size (acres)	Number of farms	Owning Tractors		Owning Combines	
		Number	Percent	Number	Percent
0 - 14	5,246	850	16	11	0 ^a
15 - 24	798	440	55	11	1
25 - 49	340	293	86	34	10
50 +	252	236	94	91	36
All Rice Farms ^b	6,635	1,818 ^c	27	147 ^d	2
All Mixed Farm Households ^b	6,691	755	11	104	2
Other Farm Households ^b	11,085	301	3	5	0 ^a
All Guyana Farms ^b	24,703	2,916 ^e	12	258 ^f	1

a. Less than 0.5 percent.

b. Rice farm and total tabulation are for all farms; the tabulation for mixed and other farms are available only for farm households, so the data do not all refer to the same universe (although differences are inconsequential) and individual totals do not add up to Guyana total.

c. With a total of 2,147 tractors.

d. With a total of 303 combines.

e. With a total of 3,393 tractors.

f. With a total of 270 combines.

Source: Computer printout Tables 511, 546A, 281, 316A, and 81.

owned by the GRB or sugar estates), and "mixed" farms owned most of the rest. The tractor ownership is much more concentrated in the rice farms of large acreage. Only one farm in six under 15 acres and over half in the 15-35 acre range have a tractor. Nevertheless, the farms under 25 acres account for 70 percent of the rice units with tractors. That is, most small farms have to rely on rented tractor services, but they still account for an important part of the total tractor stock.

Almost all rice farms of any size have to rent combine services for harvesting. Only 2 percent of the rice farms has a combine. Of all the inputs into farming, rice farms reported problems in obtaining combine work for harvesting above all other problems related to supplies and services (Table II-3). Difficulties in getting tractor services for plowing are named next in importance among problems of rice farms, followed by problems in obtaining trucks or trailers for carrying paddy to the mill.

The small rice farms under 15 acres fared worse than others in obtaining tractor services. The problems of these farms are worse than can be explained by their lower proportion of tractor ownership. A small size appears to be related to more frequent problems.

All but the largest farms over 50 acres face similar levels of problems in obtaining combine services: more than two out of five of these farms reported problems in getting combine services.

But do these problems make any substantial difference in the production and profitability of the farmers involved? The available data indicate only a slight difference that is

Table II-3. Rice Farms with Problems Obtaining
Machinery Servicing, by Size of Farm, 1978

Size (acres)	Number of farms	Problems related to machinery services: percentage of households reporting			
		Tractor for plowing	Combine	Machinery for cleaning land	Truck or trailer
		-----Percent-----			
0 - 14	5,246	30	45	2	26
15 - 24	798	9	42	4	22
25 - 49	340	6	45	3	18
50 +	252	3	28	0	19
All Farms	6,635	25	44	2	25

Source: Computer printout Tables 551, 562.

probably not very significant statistically. On the average, rice farms with or without tractors planted the same proportion of their land for the 1978 autumn crop: 91 percent (Table II-4). Those rice farms that reported trouble obtaining tractor services planted almost the same proportion as well: 89 percent. The 2 percentage points difference would be equivalent of about 250 rice acres left fallow nationwide because of problems in getting the land plowed.

The rice farms reporting trouble in obtaining combine services are much larger than the average, which may account in part for the problems (Table II-5). Otherwise, the group reporting such problems actually brought in the same proportion of its planted crops in 1979 on the average as did those who reported no problems. Yields also do not appear substantially related to this complaint (Table II-6). Those with combine troubles did receive a slightly lower price for their paddy. While the difference from the average was small, it did represent about \$0.20 per bag, or about G\$4 per acre of profit. This level of reduced price could be caused by deterioration of paddy while the harvest is delayed because of the unavailability of combining services. Of course, this matter is not completely out of the control of the great majority who do not own a combine. Block planting, and therefore block harvesting of adjacent fields maturing at the same time, could well increase the availability of combine services to the small rice farmers.

The rice farms in the 0-14 acre and 15-24 acre ranges that do not own tractors appear to pay at least 15 percent more per acre for tractor service than do the larger farms in the 25-49 acre group (Table II-7).

Table II-4. Proportion of Riceland Planted by
 Status of Tractor Ownership and Services,
 Autumn Crop, 1978

Status related to tractors	Number of farms	Rice land, acres owned	Average farm size, acres	Percentage of total land planted
Rice farms, total	6,635	87,155	13.2	91
Rice farms, not owning tractor	4,817	32,527	7.4	91
Rice farms, owning tractor	1,818	51,628	28.4	91
Rice farms, experiencing problems obtaining tractor services	1,666	12,543	7.5	89

Source: Computer printout Tables 511, 512, and 518.

Table II-5. Proportion of Planted Riceland
That is Harvested by Status of Combine
Ownership and Services,
Both Crops, 1978

Status related to combines	Number of farms	Riceland, acres planted ^a	Average acreage planted	Percentage of acreage harvested ^a
Rice farms, total	6,635	126,695	19.1	93
Rice farms, not owning combine	4,817	108,219	22.5	93
Rice farms, owning combine	1,818	18,476	10.2	92
Rice farms, experiencing problems obtaining combine services	1,666	53,106	31.9	93

a. Autumn and spring crops aggregated.

Source: Computer printout Tables 511, 518 521.

Table II-6. Paddy Yields per Acre and Average Price by Status of Combine Ownership and Service, Both Crops, 1978

Status related to combines	Riceland acres harvested ^a	Yield per acre, 140 lb. bags	Average value received per bag, G dollars
Rice farms, total	117,937	18.9	13.45
Rice farms, not owning combine	100,886	18.8	13.40
Rice farms, owning combine	17,051	19.5	13.76
Rice farms experiencing problems obtaining combine service	49,467	18.6	13.23

a. Autumn and spring crops.

Source: Computer printout Tables 518, 521.

Table II-7. Rice Farm Using Land Preparation Services,
Farms not Owning a Tractor by Size of Farm, 1978

Size, acres	No. of farms renting land preparation services ^a	No. of acres planted ^b	Amount paid, Guyana dollars	
			Total	Per acre
0-14	4,212	40,900	2,432,400	59
15-24	357	9,587	573,500	60
25-49	36	1,704	87,700	51
50+ ^c	--	--	--	--
All farms	4,620	53,503	3,147,800	59

a. Number planting autumn crop.

b. Autumn and spring crops.

c. There are not sufficient farms over 50 acres not owning tractors to provide statistically useful results.

Source: Guyana Rural Farm Household Survey, Tables 518, 521, 552, 554.

Farms as Suppliers of Machinery Services

For farms under 75 acres that are to receive tractor loans, the renting of tractor services is essential so that individual small farmers will be able to afford a tractor and pay back a tractor loan.¹ In this way the shortage of tractor services will be reduced and the benefits from the program widely spread. The same considerations apply to combine loans and combine services. However, for combines, full utilization is even more important. So it is helpful to review the current role of farms as suppliers of services. Chapter III discusses the GRB.

The level of receipts of farm households renting tractors and combines and the related services was generally much lower in 1978 than we would expect. For all farm households owning tractors and/or combines, earnings were less than G\$600 per piece of machinery and less than G\$500 per machinery unit, in which a combine is given a weight of 3 times a tractor (Table II-8). This low reported level of receipts from machinery rentals may be due to a deliberate or inadvertent underreporting of these noncrop expenses. Or it may reflect the reluctance of farmers owning machinery to rent out their equipment when parts are scarce, because they fear that if something breaks they might not be able to meet their own farming requirements. Almost half the farm households owning tractors reported problems in getting spare

1. GCAIDB, "An Examination of the Effect of the Increased Prices for Paddy on the Returns to Rice Farmers," [1980], estimates 77.5 to 80.0 acres are required to amortize a tractor loan.

Table II-8. Receipts from Machinery Hire, All Farm Households, 1978

Farm size, acres	Number of tractors ^a	Number of combines ^a	Number of machinery units ^{ab}	Receipts from machinery hire, Guyana dollars	
				Total	Per machinery unit
0-14	1,068	50	1,218	791,800	650
15-24	897	23	966	327,900	339
25-49	622	58	796	663,800	834
50+	743	132	1,139	248,500	218
All households	3,329	263	4,118	2,032,000	493

a. At the time of the survey in early 1979.

b. Each tractor = 1 machinery unit; each combine = 3 machinery units,
based on relative prices of new equipment.

Source: Computer printout Tables 136A, 154.

parts in 1978, with no distinction between small and large farms (Table II-9). It is helpful for the evaluation of these data to note that the reporting on spare parts shortages is not just a general complaint. Despite increasing diesel prices, almost no households reported problems getting fuel.

Farmers and Credit

In 1978, large rice farms over 50 acres were generally much more likely than smaller farms to receive credit; this observation applies to machinery loans in particular (Table II-10). Furthermore, the low average value per loan for the smallest farms indicates that very few loans were for tractors and combines. At least one reason the small farms received loans only infrequently appears to be that they seldom asked for credit. For the other size groups, the proportion of farms that had a loan application was also small. It may be that these farmers do not apply for loans because they believe they could not qualify or they do not like the terms and stipulations offered. In the data available on rice farms, however, there is no indication of a great unmet demand for credit, at least not of the magnitude of the machinery services.

It appears that in general there must be a substantial amount of self-financing by Guyana farmers of various kinds of purchases, although this may not apply generally to capital items as expensive as tractors and combines. For all kinds of farm households, just 10 percent reported asking for a loan in 1978; about half these applications were refused.¹

1. RRNA, The Income and Production of Guyana Rural Farm Households, 1980, pp. 5-46 to 5-50.

Table II-9. Farm Household Tractor Owner's Problems Obtaining Fuel and Spare Parts, by Size of Farm, 1978

Size, acres	Number of farms: owning tractors	Percentage of farms reporting problem	
		Fuel and Oil	Spare parts
0.00-14.99	11,042	2	47
15.00-24.99	831	1	43
25.00-49.99	552	1	41
50.00 and over	461	5	58
All households	2,836	2	46

Source: Computer printout Tables 136A, 151.

Table II-10. Rice Farms Receiving and Being Refused Machinery Loans, by Size of Farm, 1978^a

Size, acres	No. of farms	Machinery loans received				Percentage of farms refused machinery loan
		No. of farms	Percentage of farms	Ave. value per loan, G dollars	Ave. months for repayment	
0-14	5,246	77	2	2,300	17	0 ^b
15-24	789	36	5	9,800	13	2
25-49	340	5	2	13,000	28	5
50+	252	42	17	8,100	12	8
All farms	6,635	159	2	5,900	17	1

a. The sample that provides the basis for these data on loans is very small for each size category and no significance should be given to relatively small differences among the size groups.

b. Less than 0.5 percent.

Source: Computer printout Tables 511, 558, 55CA, 559, 560.

III. TECHNICAL CONSIDERATIONS OF RICE PRODUCTION MACHINERY

Tractors

Stock, Ownership, Age, and Working Condition

There are about 3,600 tractors in the Guyana rice industry, 95 percent of which are privately owned, with 5 percent belonging to the GRB (Table III-1).

Table III-1. Stock of Tractors, by
Age and Ownership, 1979

<u>Age, years</u>	<u>Total industry</u>	<u>Private</u>	<u>GRB</u>
1-5	557	532	25
5-10	744	614	130
10+	2,290	2,242	38
Total	3,591	3,398	193

Source: GRB, "Summation." This and subsequent citations of "GRB" refer to the unpublished working document "Guyana Rice Board Workshop and Field Service Data" prepared by P.J. Williams, [1979].

More than four-fifths of the tractors are at least 10 years old, with an average age of 10 years for the tractors owned by farms.¹ This high proportion of old equipment is related to the relatively high proportion of nonoperational tractors, 18 percent of which are not working. This proportion is even higher for the GRB, which has a third of its fleet out of order.

Table III-2. Working Condition of Present Stock of Tractors

<u>Condition</u>	<u>Total</u>	<u>Private</u>	<u>GRB</u>
Operational	2,947	2,811	126
Nonoperational	654	587	67
Total	3,591	3,398	193

Source: GRB, "Summation."

Size and Trends.

Mechanization of rice production in Guyana started with the importation of 35 HP tractors, and for many years thereafter the smaller 4-wheel tractors were used for land preparation. Private owners still operate many of these tractors, two-thirds of which are at least 10 years old.

The modern trend has been toward the use of larger tractors by those who can afford them. These trends are observable in the data on registrations of new tractors, which include all kinds of agriculture, not just cultivation. The very small tractors of less than 40 HP that were

1. Rural Farm Household Survey, 1979, Table 46A.

popular in the early 1960s were seldom imported in recent years (Table III-3). Tractors in the 41-45 HP range (mainly 45 HP Massey-Fergusons) retained considerable demand through the mid-1970s. The larger tractors over 55 HP have accounted for a steadily increasing share of imports.

There are no figures available on the horsepower sizes of the existing tractors in the rice industry alone. Of GRB tractors that are now operable, the medium-large sizes predominate (Table III-4).

Makes of Tractors

Massey-Ferguson (MF) tractors predominate in the Guyana rice industry (Table III-5). Ford tractors still have some popularity with the private owners but the trend of recent imports is toward the MF tractors. If the negotiated plans for importing tractors from Brazil are finalized, all tractors will be Massey-Fergusons. International Harvester (IH) tractors are on the decline in the rice industry. Nearly all the IH imports now go to the sugar industry where the demand for them remains high.

Guyana is looking, in a preliminary way, at tractors offered from Romania, which would cost less per unit than tractors now used. Four models were received in January 1979 and were evaluated by GRB and MOA. Three of the four have already been eliminated for various reasons. Twenty-five of the accepted models will now be ordered for further evaluation by GRB and Guysuco. They will be checked on performance and ability to be maintained or supported from the supplier. Romania is also offering the possibility of an assembly plant if the equipment is accepted.

Table III-3. New Tractors for Agricultural Use by Size, 1961-76

Size According to Horsepower	1961-65		1966-70		1971-76		Total	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Up to 40 HP	747	37	118	20	62	3	828	17
41-45 HP	760	38	378	33	352	20	1,490	30
46-55 HP	262	13	175	15	136	82	573	12
56-65 HP	209	11	319	28	365	21	893	18
66-80 HP	9	0 ^a	233	20	717	41	959	20
Above 80 HP	11	1	19	20	132	7	162	3
Total	1,998	100	1,142	100	1,765	100	4,905	100

a. 0.4 percent.

Source: Government of Guyana, Ministry of Economic Development, Statistical Bureau, Statistics Relating to Agricultural Machinery, 1961-1976, Table 1.1.

Table III-4. GRB Operable Tractors,
by Size, 1977

<u>Type of Tractor and Horsepower</u>	<u>Number</u>	<u>Percent</u>
<u>Wheeled:</u>		
below 40	3	1.6
40 - 50	29	15.9
55 - 65	64	34.6
66 - 80	83	44.9
81 - 91	0	--
100 - 140	3	1.6
<u>Tracked:</u>		
75 - 80	3	1.6
<u>Total:</u>	185	100.0

Source: GRB, p. 3.

Table III-5. Tractors Owned in Rice Industry, by Make, 1977

<u>Make</u>	<u>Ownership</u>			<u>Percent of Total</u>
	<u>Private</u>	<u>GRB</u>	<u>Total</u>	
	-----number-----			-----Percent-----
Massey-Ferguson	2,112	151	2,263	67
Ford	540	19	559	16
International Harvester (IH)	370	17	387	11
David Brown	18	6	24	1
Leyland	25	6	31	1
Others	123	29	152	4
Total	<u>3,188</u>	<u>228</u>	<u>3,416</u>	<u>100</u>

Source: Unpublished data from GRB.

Plowing Equipment and Land Preparation Technology

The majority of the plow equipment for tractors is the disk plow. There are a few moldboard plows used. Tractor owners have light harrows (disk type) for after-plowing work. Land leveling equipment is discussed in the section on "Other Pull Machinery." Disk plows, which have 2 or 3 blades, are used in the first and second cut. In the first cut, they are sometimes adjusted so one blade is used where the soil is firm or hard. The disk harrows used with wheel tractors are small and mounted on the 3-point hitch, but those used on the crawler tractors are a pull type and have large serrated blades that "turn" the soil as do the disk plows. Generally, the tendency is to complete the operation too fast for a really thorough job of plowing. The moldboard plow does a much better job but requires a narrower range of soil moisture conditions and is much slower than the disk plow. With the shortage of tractors and the restricted time between one harvest and the ensuing planting period, only a small amount of moldboard plowing is done and mostly by smaller farmers who own their tractors and have the desire and patience to do a better job of land preparation.

Work and studies of agricultural engineers at the Tapakuma project and in Surinam have shown that the first cut can be completed better by large wheel or crawler tractors in the 120 to 150 HP range. With appropriate soil moisture conditions, this work is done with large (disk) harrows on the first cut. This is usually completed during fairly dry weather but before the soil is too dry. After this type of land preparation, the second cut can then be handled more efficiently and easily with the smaller tractors, either with some rainfall or after irrigating.

These larger tractors not only do a good job of land preparation, but can cover the land 3 to 4 times faster than the small tractors with disk plows. However, they are so costly that only large farmers can afford them, and these farmers would likely be more inclined to do their own land and not hire out to a great extent.

The normal period of land preparation available to farmers is a maximum of 60 days for the small (spring) crop and 40 to 45 days for the large (autumn) crop. So the peak demand for machinery is in the preparation for the autumn crop (late April-May or early June).

Performance Levels

Information on the expected performance of the various sized tractors is important for the assessment of the current adequacy of equipment available and of future needs. The different operations include first and second cut for day and wet ploughing, and dry and wet harrowing, leveling, smoothing, and ramping. There is a small amount of rotovating. Figures will not be given here for each of these operations for each tractor size. By way of comparison, data on the first cut dry ploughing for all sizes is given, as well as on all the operations for the popular 55-65 HP Massey-Ferguson tractors (Tables III-6, III-7).

The above information can be applied to the question of how many acres a tractor should be able to handle with standard performance, but there needs to be an awareness of the other variables that enter into the picture besides the actual size of the tractor. Such factors as size, location, and fragmentation of fields to be worked have a bearing on

how much acreage can be covered. Distances between fields worked and accessibility also have a major effect. The range of acres covered by a tractor varies from 55 to over 100 per crop. Sixty to seventy HP tractors are expected to perform complete land preparation on 75 to 88 acres per crop. According to agricultural engineer Harry Dolphin at the Tapakuma project, tractor operators should concentrate their work within a radius of 5 miles. When this is possible, the smallest tractor (35 HP) is reported to be able to cover 65 acres per crop.

Table III-6. First Cut Dry Ploughing
Performance for 8-Hour Day,
by Type and Horsepower

<u>Type and horsepower</u>	<u>Acres</u>	<u>Acres/hr.</u>
Wheeled: 40 - 50	7	0.88
55 - 65	8	1.00
60 - 80	10	1.25
Crawler: 75 - 80	20	2.50
100 - 140	40	5.00

Source: GRB, p. 8.

Table III-7. Performance of 55-65 HP Tractor:
8-Hour Day

<u>Land Preparation Operation</u>	<u>Acres</u>	<u>Acres/hr.</u>
1st cut Dry ploughing	8	1.0
2nd cut Dry ploughing	12	1.5
1st cut Wet ploughing	7	0.9
2nd cut Wet ploughing	8	1.0
1st cut Harrowing, dry	12	1.5
2nd cut Harrowing, dry	16	2.0
1st cut Harrowing, wet	12	1.5
2nd cut Harrowing, wet	16	2.0
Leveling or smoothing	20	2.5
Ramping	12	1.5

Source: GRB, p. 9.

The performance differences of other tractor sizes with the various types of work performed has the same relationship as those shown with the 55-65 HP tractors. The crawler tractors are used mostly for first and second cut dry ploughing and some levelling and smoothing. Where a crawler type tractor is used for first and second cut dry ploughing (with a some type harrow, it is followed by wheel tractor harrowing under water or wet conditions.

Mr. Frank Butcher of Halcrow and Associates, a consulting agricultural engineer with the MMA project, states that the 8-hour day should be credited with actually only 6.75 hours work or 85 percent of the above figures. His conclusions are based on studies of time taken for servicing, repairs, and stoppage due to weather. This would apply particularly to the GRB equipment. Many private farmers

work 10 to 12 hours a day, especially if weather has delayed operations. Double shifts or working around the clock is not practiced in Guyana even though tractors are equipped with lights.

Combines

Stock, Ownership, Age, and Working Condition

There are 438 combine harvesters in Guyana, two-thirds of which are privately owned and one-third of which belong to the GRB (Table III-8).

Table III-8. Stock of Combines by Age and Ownership, 1979

Age	Total		GRB
	Industry	Private	
1-5 years	73	38	35
5-10 years	87	44	43
10 years plus	<u>278</u>	<u>215</u>	<u>63</u>
Total	438	297	141

Source: GRB, "Summation."

Almost two-thirds of the combines are at least 10 years old, with an average age of 12.5 years for the combines owned by farms.¹ This high proportion of old equipment is certainly one factor contributing to the current troublesome working condition of the machines, fully one-third of which

1. Rural Farm Household Survey, 1979, Table 46A.

are not operational¹ (Table III-9). The proportion of unutilized and GRB equipment is equally high for the privately-owned machines and GRB equipment.

Table III-9. Working Condition of Present Stock of Combines

Condition	Total industry			
	Number	Percent	Private	GRB
Operational	299	68	197	102
Nonoperational	<u>139</u>	<u>32</u>	<u>100</u>	<u>39</u>
Total	438	100	297	141

Source: GRB, "Summation."

Make of Combines

The Massey-Ferguson is the most popular model now. Two models of MF are used, the 400 and the 520 (Table III-10). The 520 has almost 30 percent more capacity than the 400 and is the more popular of the two in recent purchases. They are both 14-foot cut.

2. Another estimate places the proportions of operational and nonoperational combines at 75 percent and 25 percent, respectively. The estimates of total number of machines and of operational machines from different sources vary, in part due to different treatment of the categories "scrapped" and "not specified."

Table III-10. Stock of Combines by
Make and Ownership^a

Make	Private	GRB	Total	Percent
Massey-Ferguson (MF)	103	90	193	47.8
Case	60	53	113	28.0
Int. Harvester (IH)	50	1	51	12.6
Laverda	24	10	34	8.4
Other	<u>10</u>	<u>3</u>	<u>13</u>	<u>3.2</u>
Total ^b	247	157	404	100.0

a. See source.

b. Totals differ somewhat for different series, reflecting in part the difference in recording of scrapped and other nonoperating machines. See footnote on previous page.

Source: The date and source of these data were omitted from the draft of the table drawn up by Mr. Ronald Baskett, apparently from recent unpublished information supplied by the Guyana Rice Board. The missing reference notations will be supplied to AID once they can be ascertained from Mr. Baskett on his return from field work in Asia.

Case combines still comprise 28 percent of the total, even though the company has not been making combines for 8 years. Spare parts are still being imported now for Case combines but how much longer they will be available is uncertain. There are several GRB inoperable combines under cover in Black Bush. A special effort to get spare parts for these is desirable considering spare parts could become unavailable. The combines could be turned over or sold to farmers who can afford to operate them. This would provide an addition to the harvester work force at much less expense than importing new machines (see comments in section on "Spare Parts").

Some of the Case combines with a 10-12 foot cut are smaller than the 14-foot sizes now being purchased. The earlier Case combines did not have bulk bins, but rather sacking devices. The Case combines may have a lesser capacity than others, but they are more mobile than the larger machines.

In the last few years 34 Laverda combines have been imported from Italy. These are 14-foot cut machines with the same capacity as the MF 520, but they are lighter weight. Their cost is 30 percent less than the MF, the primary reason for the interest in them. So far they are performing and maintaining well but their durability has not been fully tested.

The IH model currently used is the 403, which does not have the capacity of the MF 520 (see below). It would appear that the lack of interest or aggressiveness by IH has resulted in fewer combines of this make in the country and there has been no introduction or testing in Guyana of larger models available for this company.

The Clayson and Leyland combines are also used in Guyana, and a few New Hollanders machines have recently been imported.

Performance and Field Technology

A comparison of the average expected maximum performance of the various makes and sizes of combines shows the MF 520 and Laverda with the highest productivity, although

these figures do not take into account variability in frequency of repair and downtime (Table III-11):

Table III-11. Combine Performance

Make/model	Per 8 hr. day			Acres per crop ^c
	Field bags ^a	Acres ^b	Bags per crop ^c	
MF 400 (14' cut)	280	16.4	11,200	656
MF 520 (14' cut)	360	21.1	14,400	844
Case (1000 or 1010)	160	9.4	6,400	376
IH 403	240	14.0	9,600	560
Laverda (14' cut)	360	21.1	14,400	844
Clayson (16' cut)	320	18.7	12,800	748
Clayson (12' -14' cut)	240	14.0	9,600	560

a. 140 pounds.

b. Based on national average yield 1979 -- 17.1 bags/ac.

c. Assuming 40 day harvest period.

Source: GRB, p. 9.

The harvest period lasts about 40 days for each of the two crops in Guyana. The combines can theoretically harvest for longer periods, in fact as long as needed. But this harvest period actually should and could be shorter, 30 days or less, if planting were carried out in a shorter period, allowing the majority of the crop to take proper advantage of the rainfall patterns. With organized or block planting in irrigated areas, the planting and harvesting would be more concentrated. Under present conditions, harvesters

cannot reach all the mature fields at optimum time, with resulting crop losses. If the improved practice of a shorter planting period were brought into practice, an increase in the number of operation combines would be required; otherwise a real shortage of harvestors on a time-of-need basis would result along with even greater crop loss in lower yields and quality of paddy. Reports reviewed in Guyana of combine capacities, numbers, and current capabilities generally do not take into account the requirements for wateruse efficiency and paddy quality improvement. The need for combines may be more critical in the country than commonly recognized, and more is involved in increased production goals than adding combine numbers on the basis of number of bags to be harvested. In any case, combine numbers should be somewhat in excess of those needed for the optimum harvest situation to offset irregular demand and the effect of weather on harvest schedules.

Combines are much less mobile than tractors and it is consequently more difficult to get them from field to field or for any distances on roads. Organized or block planting would increase the efficiency in use of combines in Guyana even more than with the use of tractors, and enable the farmers to operate in a minimal radial area as well.

The combines used in rice harvesting in Guyana are equipped with pick-up type reels and can handle lodged (fallen) grain. Although there is some lodging with the improved varieties now grown, there is only a small acreage left of traditional varieties that do lodge heavily. There are even stiffer-strawed hybrid varieties available than those used in Guyana. Movement towards these in the future will further improve the harvest situation.

There is adequate time between harvest operating periods for repair and preventative maintenance of combines. Anticipated problem areas can be thoroughly checked out and every aspect of the machine can be put into proper running order before it goes to the field.

Other Machinery

Other machinery used by rice farmers, besides tractors with plows and combines, are vehicles, bulldozers and scrapers, draglines, pumps, sprayers, small equipment, land levelling pull equipment, and pull trailers. This discussion focuses on the latter two items because they are pulled by tractors.

Land Levelling

The land levelling equipment can be important in raising the yield of rice in Guyana, which at 17.1 bags of paddy per acre (2,394 pounds/acre or 2.15 mt/ha) is not very high and well below the recognized potential. Even though nitrogen responsive varieties are needed for maximum yields to be obtained, at least yield increases of 50 percent or more can be potentially realized with the present improved varieties. The recognized constraints are land preparation, water management, and effective pest and weed control. A properly levelled field with adequate drainage is a prerequisite for good water management and high yields. Poor drainage results in harvester traction problems and the field is left with ruts that complicate land preparation. Uneven land results in poor stands in the deep areas and weed problems in the high areas. In established rice areas, farmers complete their levelling progressively over a period of several years. In the three new project areas of Tapakuma,

Blackbush-Frontlands, and MMA it is planned to properly layout and level fields before initial water delivery.

Present methods of levelling involve the use of back blades and scoops. This work is almost always done in partially flooded fields. Traction is curtailed under these conditions and even though the cuts can be made accurately, the fills are erratic. Generally the cuts taken are shallow so that not much topsoil is removed at one time.¹ The scoops are used to cut "slots" in the high spots instead of even removal from the total high area. The slots are subsequently flattened by harrowing. Spike tooth harrows on a tool bar are used for the harrowing.

Dryland levelling has the advantage of being able to move more soil per run and to make the fills more accurate. A one time thorough dryland levelling involves surveying on a grid and calculating cuts and fills. If much soil is to be moved, and for any distance, scrapers are the most effective equipment. They can be obtained in the 2 to 14 cu.yd. capacity range with the smaller ones adapted to conventional medium-sized tractors. Tractor mounted blades (front or rear) can be used for smaller cuts, but the accuracy depends on the tractor operator. The bottomless scraper, which has a limited capacity bowl, is a useful addition to this type of levelling and represents a cross between traditional scrapers and landplanes.

The landplane is used for very fine cuts and removing uneven areas on a levelled field in the final smoothing

1. An alternative technique of deep cuts into the subsoil that minimizes the proportion of topsoil in each cut was observed on a field trip in Essequibo.

processes. They do not carry much soil and depend on working length for their smoothing effect. These long landplanes are difficult to maneuver in fields and from site to site. A new design of a much shorter plane with a bucket has been tested at the MMA project by Mr. Butcher and his associates and is much more suitable for use in Guyana. These planes are pulled by tractors using the draft control system of the tractor and sensitive controls on the blade height.

The shorter landplane, tandem agricultural scrapers, and bottomless scrapers will be the most needed new equipment in the three irrigation project areas for land leveling to attain better water management. Wet levelling will continue with standard equipment on established rice fields and as routine followup on dry levelled fields.

Tractor Trailers

Tractor trailers are usually 2-wheel trailers and 4-wheel tractors. There are two sizes used and they transport the crop from the field to main roads or directly to dryer or mill. The rice industry could use more of the trailers to move the crop to shelter faster and avoid sacked grain being exposed to the weather. To respond to this problem, a small investment in canvases or heavy plastic covers is needed for the grain waiting in the field and for the trailers. There is very little of this in evidence in the country.

Some 4-wheel trailers could be useful where rice is delivered to the large GRB terminals and where there are long delays in unloading. The 4-wheel trailers could be left (with covers) and a shuttle tractor could move them to

the unloading area in turn. This system would not tie up both tractor and trailer as now happens. With the present system. A retractable pivot wheel on the tongue of 2-wheel trailers could also be used to free the shortage of tractor trailer combinations with less expense.

Spare Parts

The supply, distribution, and use of spare machinery parts and machinery maintenance and repair in general are crucial for the Guyana rice industry for a number of reasons: the high average age of tractors and combines in Guyana, the high proportion of nonoperating equipment, and the shortage of foreign exchange for the purchase of new equipment.

Parts Needed

For tractors, the hydraulic system, hydrostatic steering, drives, and transmissions are the major repair and overhaul items mentioned most frequently as spare parts needs. Even rings are not readily available when it is time to overhaul tractors. Generally overhaul items are more expensive and not carried on the shelves in Guyana, so even simple but important items that are usually fast moving are not sufficiently stocked. These include such items as spark plugs, condensers, coils, fan belts, oil filters, distributor caps, tie-rod ends, front axle bushings, steering pump repair parts, etc. Batteries are in short supply and replacements inadequate. Tractors are sometimes inoperable for lack of this item.

Private tractor owners do not have the facilities for major overhauls even if they could procure parts. Guyana

needs centralized and well-run regional workshops for this purpose. The Guyana National Trading Corporation (GNTC) will soon be building a major large workshop in Georgetown and updating its tools in the shop. This will be some relief for the problem but not accessible to many in the country who need the service.

GNTC is acquiring two new mobile workshops to handle emergency calls for tractor service. It is also forming three teams to follow up in the field on warranty problems with new tractors.

The major spare parts problems of combines, outside of overhauls of motors, are with the carriage system (tracks) and drive clutches. Rollers and seals are the parts needed to repair tracks, and tracks repair is expensive. Working in mud and saturated clay soil is hard on the carriage system, but most trouble can be avoided with the proper maintenance. This is apparently lacking since it is the major repair problem with combines in the country.

The straw-walker drive bearings and other bearings are important parts requirements but other needs are minor. Replacing cylinder teeth, belts, and other small items are some of the lesser needs.

Combines have the advantage over tractors of being occupied only one-third of the time in a year at the most, and this period is broken into 2 more periods. There is adequate time between operating periods for repair and preventative maintenance. Anticipated problem areas can be thoroughly checked out and everything put into proper running order before "going to the field."

To get inoperable combines in working order, it is necessary to survey carefully the exact parts needed for each machine. The parts would need to be ordered accordingly and then arranged so they reach the machine for which they were intended.

Problems in the Distribution System for Parts

There are many problems in the system for supplying the parts required to keep the tractors and combines of the rice industry running. These problems include the following: the recent low level of imports, delays in receipts of parts ordered, lack of a distribution system that makes parts often unavailable in the countryside, lack of working information system on the kind and location of parts already in Guyana, lack of a working information system on the kinds of parts needed or frequently required and stocked, and inappropriate priority given to the GRB in obtaining parts.

GNTC, the agent for MF equipment, is the largest importer of farm machinery and spare parts. Others listed as importing various amounts of farm machinery are Agricultural Bank (GAIDB), Guyana National Service (GNS), J.P. Santos, Guyana Gajraj Ltd., Geddes Grant Ltd., Demerara Marketing Corp., Guyana National Engineering Corp. (GUYNEC), and Guyana Sugar Corp. (GUYSUCO). All equipment arrives via Georgetown, and although there is no central coordinating agency per se, GNTC does obtain information on the imports of other agencies and corporations.

GNTC has two regional outlets for spare parts and has designated a few private dealers as outlets. The private dealers are allowed a specified markup on the items, but

are often unable to obtain the quantities of parts they could profitably carry. GRB has regional workshops that carry parts but there is no stock control and the shops are not well-managed.

Normally spare part suppliers would have items on hand that move fast or have the heaviest demand (from past experiences and records). With the shortage of foreign exchange and the 50 percent more reduction for 3 years now from normal levels of spare parts imports, the situation in Guyana is becoming critical. GNTC calculated that it should have a spare parts inventory of about G\$6 million; current levels are about two-thirds of that amount.

At present, a license must be obtained to buy spare parts before an order is placed. There is a 6 to 9 month delay for the order to arrive when foreign exchange is available. With the shortage of foreign exchange, the licenses, ordering, etc. are all a formality. Because of the foreign exchange limitation, many requests for licenses are turned down, so that there are far fewer parts ordered and received than the demand.

GRB, the producer of foreign exchange through rice sales, goes to the government to get foreign exchange for UNTC and then receives its spares back through GNTC. GRB is planning to start ordering spares directly. However, GRB already gets more than its proportionate share of the limited spare parts under the present system. Forty percent of all the spare parts in Guyana go to government agencies, and GRB gets the major share of this. Given the poor record of GRB's keeping machinery operable compared to the private owners, it would be much more effective to give the private owners priority in receiving spare parts.

With so many agencies and dealers involved in tractors in Guyana, a centralized, accurate inventory record for all of the spare parts in the country is difficult. Currently, there are no records of job cards or other ways to determine specific spare parts needs for government machinery or that owned by private individuals. A compilation of this would be time consuming and difficult but would be invaluable in attempting to solve the spare parts problems of farm machinery in Guyana. At present, there may be parts sitting on the shelf in one agency that are badly needed by another agency and there is no easy way of matching the supply and demand.

GNTC keeps manual records and inventories of spare parts. This is a slow process, but could probably serve adequately. According to the report on GOG owned machinery by P-E Int. Operations, Inc., not even had records been kept on a regular basis by most agencies. GNTC and GRB are now planning to combine records of their stocks by use of a computer. If this cannot be achieved, they will combine the present system since GRB has recently changed its inventory process to be similar to GNTC and the MF system. They both need technical assistance to improve the present inventory and distribution of spare parts. With the increased imports from MF, assistance should be requested from the company itself.

On the basis of the brief review of the parts information system made for this report, it appears somewhat doubtful that computerization alone will make a significant difference in inventory control unless the system is maintained more carefully.¹

1. In the Essequibo field trip, a relatively large private farm machinery repair shop and accompanying part inventory with well-kept records was observed. The entire record keeping was manual in this operation.

GNTC representatives believe they could handle the spare parts to be provided by the proposed credit project but would need to strengthen arrangements with GAIDB. They state the GNTC can assist in the project if it does not have to pay for the parts itself upon delivery or soon after. If the G\$800,000 amount proposed were made available to GNTC by the bank, GNTC would stock the parts and would then need 2 years to pay back the money to the bank, according to GNTC staff members. A quarterly review would be made of the movements of those parts that were slow moving, and they would be transferred to GNTC's general stock.

Alternate and Appropriate Technologies

Consideration of Options

Mechanization of the Guyana rice industry began mainly in the early 1950s and seemed especially appropriate for the rapid expansion of the Guyanese rice industry in that decade, when acreage more than doubled.

In 1952, almost all plowing was done with oxen with three-quarters of rice farmers transplanting rice shoots by hand. An even higher proportion cut the grain by hand and threshed it by "bull mashing," that is, having oxen walk over the grain, which was then winnowed by hand.¹

Three decades later the rice industry is marked by almost complete mechanization for both plowing and combine harvesting for both large and small rice farms. Broadcasting of rice seed and spraying are mainly by hand, but the use of airplanes for these tasks is also important.

1. O.P. Blaich, Agriculture in Guyana, Census 1952.

There are a number of reasons for reconsidering now whether the current technology is also appropriate for the long run in Guyana:

- . The increasing cost of fuel and oil;
- . The old age of the current machinery stock that will need to be replaced; this indicates the level of foreign exchange required for replacement as well as the opportunity offered by the retirement of the old machinery to initiate changes in the agriculture technology;
- . The rising foreign-exchange cost of parts;
- . The increased risk that highly import-oriented technology places on the industry as the country is open to international market factors not only on terms of the prices for rice, but also in terms of the cost of inputs;
- . The special burden that high-cost machinery places on small farmers who do not have sufficient size to make the ownership and control of the tractors and combines feasible.

Before the technological alternatives are listed, it is important to note that the consideration and recommendation of technologies must be practical rather than theoretical. A widespread return to human labor and animal technologies for the heaviest aspects of soil preparation and harvesting is as unlikely in Guyana as it would be in the United States. Mechanized farming is important socially in that it is the only approach to farming that would be able to attract to agriculture the young Guyanese with some secondary education who now make up the majority of the youthful Guyanese. An anecdote from a recent brief field trip in Essequibo illustrates this point. On a national holiday in the midst of the plowing season for the 1980 autumn rice

crop, virtually every tractor operator working the fields was accompanied by one or two tractor passengers, young people spending their day off from school observing the operations of the machine or just enjoying the 6-8 hour ride back and forth in the rice fields.

This report suggests that mechanized technologies using smaller-scale machinery be evaluated under properly controlled field-trial conditions, an option discussed in greater detail below. Following are other options considered:

Use of oxen for plowing. In 1951, Guyana farmers had 16,000 teams of work oxen. Well over half the 20,200 farms growing rice owned at least one team. On the average, about 8 acres of rice were plowed per oxen for the autumn rice crop.¹ Although currently the use of oxen for plowing and harvesting is rare, there is some renewed interest. In the last 5 years, the GCAIDB has actually made almost twice as many loans for the purchase of oxen as for the purchase of tractors.² For rice farms of under 10 acres, teams of oxen offer considerable possibility. Of course, larger farms could use more teams of oxen and hired labor, as for such tasks as cleaning trenches and spraying, both of which are often carried out by large teams of contacted workers. When combined with hand planting of rice shoots, the oxen-based technology produced relatively high yields per acre. In fact, yields per acre fell precipitously as new, less productive lands were added in Guyana in the 1950s and still further in the 1960s as mechanization became virtually complete. With the use of improved varieties of seed and substantial inputs of

1. Blaich, op. cit.

2. GCAIDB, "Annual Report 1979," Unpublished draft.

fertilizers and pesticides, Guyana national averages of rice yield per acre are just beginning¹ to approach the historic highs of the 1940.

Use of larger tractors and combines that might actually be more energy and capital efficient. This would require greater coordination in block planting among individual small and medium-sized rice farms, an improvement in technology that would probably be energy efficient with current machinery as well, in that it would cut down the distance tractor combines would have to drive before reaching the individual fields as well as the number of machines required to plow or harvest a given area. If the ownership and/or access to these larger machines were to be enjoyed by small and medium-sized farmers, ownership by the GRB, some other public entity, or various organized groups of farmers would be required. Nothing in the recent history of Guyana appears to offer much of a recommendation for any of these ownership and management forms.

Small Machinery Technology

Land Preparation

The clay soils of the rice area of Guyana are very heavy, and information from other rice areas of the tropics (excluding Surinam) may not be applicable. The goal should be to find simple, unsophisticated equipment that farmers with 5 to 15 acres of land can afford and equipment with the capability of doing a satisfactory job even if more time is required. Every farmer wants to own his own tractor and has many jobs for it but with larger tractors, the majority of small farmers have been left out.

1. Checchi and Company, Rice II Second Guyana Rice Modernization Project: Feasibility Study Report, 1979, Exhibit B.1, pp. B-2-B4.

The Japanese type hand tractors would fit the farm size need but are somewhat sophisticated and usually depend on rotovating, which would need plenty of power in the heavy soils. Several of these tractor types have already been tried and reported to be unsuccessful, but the reasons and circumstances are not documented. They would bear checking under controlled conditions. These tractors are usually in the 7 to 15 HP range.

In researching small tractors, Mr. Frank Butcher of Holcrow and Associates found three in the G\$11,400 to G\$14,500 price range (about 1/3 to 1/2 of the cost of the 55-60 HP MF tractors). The three are made in different countries: Germany (used in India), France, and the United States. They are all about 25 HP and 2 have diesel engines. One of the diesels is a 1 cylinder tractor with no electric system. The gasoline tractor is a 2 cylinder machine. All three are unsophisticated and should have fewer breakdowns and repair costs than the larger tractors. The accessories (disk plow, offset disk, cage wheels, leveller, etc.) would cost an additional three to G\$4,000.

Harvesting

Some small-scale methods of harvesting practiced in Asia may be also adapted to small farms in Guyana, but it is doubtful that Guyanese farmers would return to handcutting the standing rice. Small self-propelled mowers that do not bind the cut rice into bundles but bunch it instead are available. The soil would need to be well-drained for these to function.

If the rice can be cut and delivered short distances in the field by hand or some other method, there are several

small portable threshers that could thresh the rice in the field. The types of threshers developed by the International Rice Research Institute of the Philippines (IRRI) have a small motor and can be carried from field to field. Some larger but simple versions on a trailer can be towed from site to site. These machines are inexpensive and can harvest the rice from 2 to 5 acres per day. They have a minimum of moving parts and maintenance problems.

Evaluation Methods

In order to properly evaluate all these methods and machines and any other similar ones, funds would need to be provided to obtain all of the equipment and adequate operating expenses for the period of the investigations. A suitable location would be needed where the machines could be tested under controlled conditions. Equipped shops should be available to ensure that machines were kept operating. A well-qualified team of scientists would be required to conduct and evaluate the tests. They should be supplemented by operators and assistants with practical experience.

A self-contained experimental station or location is preferred where better information would be developed, but in lieu of this, testing on farms and under farm conditions is an alternative.

IRRI has supervised or carried out this kind of experiment under contract with other countries; some of these projects have been sponsored by USAID. If an IRRI team cannot be arranged, IRRI can usually assist in setting up a project and making recommendations as to procedures and levels of expected performance by the investigating team.

The investigations should evaluate the equipment's performance under all expected situations that would be encountered in the field and provide an economic analysis of the feasibility and capacity of the machines. A minimum of 2 years would be needed for the studies; 3 years would be preferable. Field trials and practical application or testing of the findings could be continued after completion of the investigations.

Needs, Shortfalls, and Annual Imports Required

The drop in rice acreage and production since the peak autumn 1977 crop has somewhat mitigated the shortage of combines and tractors in the past 2 years, although the cause and effect are somewhat interrelated.

Two factors contribute to a need for substantially increased availability of tractors, combines, and parts in the rice industry in the coming decade. The increasing age of machinery and the reduction in the regular replacement of machinery in recent years mean that the replacement of the current stock alone would require considerable imports. The return to recent rice acreage and production levels followed by the startup of the three major drainage and irrigation programs requires a net addition to the current stock of rice machinery.

Reduced Replacement

Given the very high average age of Guyana farm machinery, even the maintenance of the capital stock requires a relatively high level of imports, both of parts and new machinery. Instead, there has been a drastic reduction in the importation of both. For new machinery, farm machinery

imports in the most recent 3 years have averaged about one-sixth the value of the preceding 3-year period:¹

<u>Year</u>	Millions of Guyana dollars expended for <u>machinery imports</u>
1974	5.8
1975	22.6
1976	6.4
1977	1.0
1978	2.0
1979	2.8 (National import budget)

Estimates of actual replacement needs yield figures many times higher than the recent level of imports. The Committee on Field Machinery estimates replacement requirements at 450 tractors and 28 combines annually for 5 years, just to replace machines that are now over 10 years old.² This would cost an average of over G\$40 million per year.

New Land Development Needs

Not only is there great concern about the critical situation for farm machinery and spare parts to keep Guyana's rice production at normal levels on presently cropped land but new lands at Tapakuma, Blackbush-Frontlands, and MMA will soon be under production. These lands will demand an additional requirement for farm machinery. The present situation needs solving soon, but new land development needs compound the problem and must also be faced in the very near future.

1. Report of Committee on "Field Machinery Required for the Rice Industry," [1979], p. 4.

2. Ibid. pp. 4,5.

These new lands will come from development schemes in three major irrigation projects in Guyana viz Tapakuma, Blackbush-Frontlands, and MMA. Engineering works are well-underway at Tapakuma and MMA and are to begin soon Blackbush-Frontlands.

At Tapakuma, there will be about 3,000 acres of new land brought under production. Three to five hundred acres will be ready by the end of 1980 and 500 to 600 acres will be prepared each year until about 1985. There will be a need for 6 additional tractors and 1 combine each year of the development. This would total 38 tractors and 5 or 6 combines needed for the new lands of the Tapakuma project.

The MMA Authority states that there will be 10,500 acres of new lands in the project but flood control works will allow two crops of rice on a large acreage that is now growing only one crop.

The MMA Authority expects to arrange for a loan to cover the farm machinery needs of the project plus support needs (spares, work shops, etc.). This is presently estimated to be G\$46.6m. (US\$18.3). MMA will establish its own parts department and set up a distribution pattern for the equipment based on land area need. They will also establish a self-funding hire service in the project area and transfer equipment ownership to new settlement farmers as individual items or as a whole unit when the project scheme reaches full development. The hire service will have its own machinery workshop and spare parts depot.

The project also proposes to strengthen the nearby MARDS hire service of GRB and equip them with the D-4 type crawler tractors for land preparation. All subsidies would be removed from this type of hire service.

Construction work is expected to begin in the fall of this year (1980) at Blackbush-Frontlands and be completed by mid-1985. New lands in this project area would begin production in the fall of 1982 and be complete by mid-1985. About 2,500 acres of new rice land would be added to the project in this period of time. Additional machinery needed in this 1981-85 period for the new lands would be 32 tractors and 5 combines. Monies are allocated in this project for equipment and most needs may be taken care of with project loan funds. This will depend upon construction equipment requirements over-runs, project works timing as effects overruns, etc. The project also provides for tractor purchases for the purpose of research in land preparation research studies. This may include some small tractors and/or alternative methods.

The AID Small Farmer
Machinery Credit Project

Clearly the needs of the Guyana rice industry for imported machinery parts over the coming years will be far beyond the resources of the USAID program. Guyana is actively seeking other sources of credit for machinery as well. Therefore, any determinations of the mix of parts, tractors, and combines for the AID program should be left flexible enough in the contract so that the actual numbers can be fine-tuned on the basis of a review of the situation when the AID loan is finally signed.

Until that time, the basic proportions between parts and machinery in the Project Identification Document are an adequate guide for now: of a US\$5.6 million loan, \$800,000 would be for parts. However, if the GNTC is not able to raise its stock balance to the G\$4 million level,

which has been estimated as necessary, higher priority should be given to the importation of parts. Given the substantial, but unknown, number of machines that are not working already in the country, it would seem impossible to err in giving spare parts such priority.

The remainder of the funds, US\$4.4 million according to current plans, should be allocated among tractors and combines, not used for tractors alone. The exact proportions again should depend on the success of the GOG in obtaining other sources of credit. It appears that these other sources, such as the Massey-Ferguson credit from Brazil, will tend to favor tractors. The proportions suggested by the Committee on Field Machinery -- 16 tractors for each combine -- would amount to a proportion of about 5:1 in terms of value, or about US\$3.7 million for tractors and US\$0.7 million for combines. That would pay for only about 6 combines.

The proportion of tractors and combines relative to land working and harvesting needs is closer to 7:1, with the proportion in terms of value just over 2:1. This would be the equivalent to about US\$3.0 million for tractors and US\$1.4 million for combines, or about 6 combines in all. It gives a false appearance of precision, however, to place such definite numbers on these needs, given the unknown extent to which the currently reported stock for tractors and combines is actually working or salvagable. At best, it can be kept in mind that both types of services, plowing and combining, are equally essential and both are frequently reported by rice farming households to be difficult to obtain when needed.

Furthermore when a new tractor is purchased that is much different in make, size, also or model than the one previously owned, a purchaser will probably need to buy a different set of tools. These may sometimes be available secondhand but an owner of a new tractor would be inclined to want new tools for his new tractor. On the average, the cost of these would be about one fourth the cost of the tractor. In planning credit needs or individual planning, many times this extra cost is overlooked.

Farmers who will be settling on new land in the land development areas of the three major irrigation projects in the country will have some additional credit needs in addition to those for machinery. The cost of the land development itself (levelling, irrigation and drain ditches, etc.) would require a long-term type of loan. Housing, tool, and working capital would need financing to get farmers started, probably from medium term loans. A complete study is needed to determine the exact amount of these requirements, but it has been estimated to be about G\$10,000 for the small farmer. Small farmers presently growing rice in the irrigation scheme areas would need G\$2 to 3,000 loans for land improvement before the irrigation systems are completed.

Orientation and Training in Use of Equipment

When equipment purchases tend to become standardized or predominate with one company, more training and technical help can be expected from that company. The Brazilian line of credit will be mostly MF equipment, and total help and backup is anticipated from the manufacturer. This includes regular visits of technical personnel and free training

courses for operators and mechanics. A local spare parts depot by the manufacturer would be valuable. The manufacturer should recommend spare parts holdings for the country and train inventory personnel. It is hoped workshop and training facilities will be provided.

GRB has regional workshops but they are poorly run with a shortage of qualified mechanics. MF has conducted some training courses for them. Some employees of GRB and farmers have been given training in the operation of tractors and combines in the U.K. It is expected this will be continued on a larger scale.

The GRB and Machinery

No discussion of Guyana machinery needs is complete without a note on the GRB's machinery operations. The serious deficiencies of these operations have been covered by two recent reports, one prepared by outside consultants¹ and the more recent one by a committee of GOG.²

The bottom line of all the deficiencies is in the performance, both in terms of work accomplished in finances. As has been widely repeated in Guyana in the past year, in 1978 the GRB's 5 percent of tractors cultivated 5 percent of the land. The 30 percent of the combines, however, harvested only 13 percent of the annual crop. The GRB lost over G\$2 million in providing such services.³

1. United Kingdom Consultant Team, Report on the Use and Maintenance of Government Owned Mobile Mechanical Equipment, 1978.

2. "Report on Committee on Field Machinery required for the Rice Industry," 1979.

3. Ibid., pp. 6, 8.

It is tempting to suggest various crash programs of reform that would enable the GRB to fulfil its potential as an institution especially serving small farmer machinery needs. However, the still confidential recommendation of the GOG Committee on Field Machinery, that the GRB get out of the machinery business entirely, appears the more straightforward solution.

IV. THE GCAIDB AND CREDIT DELIVERY

Recent Performance of the GCAIDB

There is really no doubt that the Guyana Co-operative Agricultural and Industrial Development Bank (GCAIDB) is the appropriate institution to administer the machinery credit program in Guyana.¹

The RRNA team agrees with the descriptive sections of the paper presented by Lewis E. Clark of Ohio State University, even if there is not full agreement with all of the conclusions and recommendations.²

This paper will not repeat the information in Clark's report. Rather, it will cover developments in the GCAIDB since the previous report was prepared.

1. The revised statement of work for this study, with its focus on the GCAIDB as the only bank to be assessed in Guyana, is based on this assumption as well.

2. Lewis E. Clark, "Observations Relating to Agricultural Credit in Guyana with Emphasis on the Guyana Co-operative Agricultural and Industrial Development Bank," May 4, 1979. The RRNA assessment is based mainly on three meetings with GCAIDB staff in Georgetown; a field visit to the branch in Anna Regina; other conversations in Georgetown and during the Essequibo field trip; and review of documentation, including manuals, loan files, and the unpublished partial draft of the 1979 annual report.

Basically, the RRNA team found an apparently competent management and technical professional staff at the GCAIDB. There were a continuing low number of applications submitted, processed, and approved in 1979. The low ratio of approvals to staff does not necessarily mean a low level of work performance. The 1979 data also indicate that repayment continues to lag.

This condition, like the low number of new applications, reflects the economic squeeze in Guyana agriculture in recent years. The problems in securing repayments keeps the workload high for outstanding loans and also increases the priority of these outstanding loans for staff attention and effort, as the Bank seeks to maintain its reputation as a viable institution and to avoid any attitude that it does not really matter whether loans from the GCAIDB are repaid.

The relative importance of smaller agricultural loans, such as those for crop credit, has decreased.

Rate of Disbursement

The 557 loans approved in 1979 represent a modest increase from the low level of 1978, but were still well below the historic averages. Applications received in 1979 were the lowest in the 7-year history of the Bank (Table IV-I). Disbursements of G\$20 million were far above the earlier years averages for the second year in a row.

Size and Beneficiaries of Loans

The high level of disbursements and low level of loans in 1978 and 1979 reflect the sharp increase in the average

Table IV-1. GCAIDB Activity, 1973-79

	1973-78			
	Total	Annual average	1978	1979
	----- Number -----			
Applications received	8,596	1,433	863	644
Applications processed	9,041	1,390	1,018	719
Loans approved	4,656	683	496	557
	----- G dollars -----			
Value of loans approved (millions)	98.0	11.9	14.7	26.9
Amount disbursed (millions)	60.1	7.2	18.7	20.1
Average amount approved	21,000	17,420	29,600	48,300
	----- Percent -----			
Disbursements as percent- age of approvals	61	61	127	75

Source: GCAIDB, Annual Report 1978, page 8, and unpublished data for 1979.

size of loans approved. The average approval was over G\$48,000 in 1979, more than 2 1/2 times the average of the preceding 6 years (Table IV-1). Loans over G\$20,000 accounted for about 7 percent of the total in the 1973-78 period and 18 percent in 1979 (Table IV-2). Of course, a part of this increase is attributable to inflation, but only a small part.

The main cause appears to be an increasing number and proportion of very large loans to the public sector. The proportion of approved loans going to the public sector increased from 34 percent in 1977 to 51 percent in 1979. Although the breakout by sector for 1979 was not yet available at the time of the field work in Guyana, it appears that this proportion of public loans was even larger in 1979. Under reasonable assumptions about the value of the loans approved in each size class, the average size of the 28 loans in the G\$100,000 and above class must have been approximately G\$750,000. On the assumption that most loans of this size went to public enterprises, these public corporations must have been the beneficiaries of perhaps G\$16-21 million of the G\$27 million in loans in 1979.¹ Public enterprises would be the probable beneficiaries, for example, for most of 14 logging and sawmilling loans of G\$11.1 million or an average of about G\$800,000 each; three loans for food processing of G\$1 million, an average of G\$335,000 each; and three loans for metal products of G\$2.6 million or G\$860,000 each.²

1. AID/Guyana should check whether the 1979 figures on the proportion of bank approvals going to the public sector are available now from the GCAIDB. This would be an updating of the information appearing in the GCAIDB Annual Report 1978, Section 3, p. 7.

2. GCAIDB, Appendix XIII from unpublished 1979 annual report.

Table IV-2. Distribution of GCAIDB Loans Approved,
By Size of Loan, 1973-79

Size of loan, in thousands of G dollars	Percent of total	
	1973-78	1979
Less than 2	54.6	29.8
2-5	23.4	32.7
5-10	7.8	14.4
10-20	6.9	5.2
20-50	4.6	9.3
50-100	1.2	3.6
100+	1.5	5.0
Total	100.0	100.0

Source: GCAIDB, Annual Report 1978, page 9,
and unpublished data for 1979.

Some of this high proportion of large loans may reflect the impact of the CIDA funds for timber development that have been a significant part of the GCAIDB's new loan funds in recent years. A continuing high proportion of loans going to a relatively few enterprises in the public sector would indicate a change in the kind of credit institution the GOG is expecting the GCAIDB to be. In any case, the recent trends emphasize the importance of any AID/GCAIDB agreement specifying expectations about the placement of machinery and parts in the private or public sectors.

Loans for the Rice Industry

The number and value of GCAIDB loans disbursed in the rice industry picked up considerably in 1979 from the low level in 1978, when most approved machinery loans were not disbursed (Table IV-3). More than three-fourths of the G\$3 million disbursements in the rice industry were for tractors and combines.

The cost of these imported items has increased sharply: for tractors from an average of G\$18,000 in 1973-74 to G\$41,000 last year; for combines from G\$38,000 to G\$116,000 in the same period. This increase reflects not only inflation, but also the larger size of equipment being imported.¹

Repayments

While data on repayments and delinquencies are not available in a readily usable form, there are indications

1. The sharp increase in the average acreage benefits for these machines in 1979 may reflect a change in the way such acreage is counted for two crops, as was determined after some discussion of this issue with GCAIDB personnel.

Table IV-3. GCAIDB Investments Made in the
Rice Industry, 1973-78

	Units	1973-74	1975	1976	1977	1978	1979	Total
<u>Investment Items:</u>								
Loans Approved	No	348	214	141	118	87	193	1,101
Amount Approved	\$'000	2,858	2,488	1,391	1,817	1,375	4,403	14,332
Amount Disbursed	\$'000	1,689	2,225	1,330	1,473	1,617	3,017	10,351
<u>Investment Areas:</u>								
Tractors	No	54	51	36	34	3	35	213
	\$'000	974	1,112	839	936	75	1,448	5,384
Oxen	No - pairs	27	61	62	38	26	54	268
	\$'000	34	68	79	69	45	111	406
Combines	No	10	5	-	2	-	8	25
	\$'000	379	328	-	200	-	932	1,839
Land Development, Drainage and Irrigation	No	14	26	31	13	11	23	118
	\$'000	17	525	197	85	53	47	924
Establishing Crops	No	6	3	5	7	1	51	73
	\$'000	111	20	22	81	288	61	583
Miscellaneous	\$'000	174	172	193	102	156	418	1,215
Total Investment	\$'000.	1,689	2,225	1,330	1,473	617	3,017	10,351
<u>Acreage Benefits:</u>								
Tractors		4,760	5,170	3,153	5,100	173	8,192	26,548
Oxen		220	430	425	360	183	1,134	2,752
Combines		5,000	2,400	-	1,000	-	7,705	16,105
Land Development, Drainage and Irrigation		830	1,790	1,400	750	212	432	5,414
Establishing Crops		350	30	98	265	205	16	984
Total Acreage Benefits		11,160	9,820	5,076	7,495	773	17,479	51,803

Source: GCAIDB, Annual Report 1978, Appendix I, page 34, and unpublished data for 1979.

that the situation has not improved since Clark's estimate of about half of the principal sum of loans being delinquent at the end of 1978.¹ The G\$18.7 million in disbursements in 1978 amounted to 75 percent of all the disbursements from 1973-77. A large increase in repayments was to be expected for 1979 as interest and principal on the 1978 loans became due and as efforts were increased to collect on earlier loans. And, in fact, repayments increased from G\$4.65 million in 1978 to G\$5.14 million 1979.² However, this 10 percent increase is not proportionate to the previous increase in loans outstanding.

Staffing and Workloads

The Basic Numbers

Half the GCAIDB staff is assigned to the provision of credit. Including the supervisory staff, this credit function is currently staffed by 62 persons as follows:

8 Senior Credit Analysts
12 Intermediate Supervisors
42 Credit Analysts

In addition, the senior managers of the special loan projects also serve the credit function of the Bank. Under the coming decentralization of the Bank's credit analysis and disbursement activities, there will be 36 credit clerks. Locations for the receipt and processing of applications for credit are to be located in Moruka in the Northwest, Parika in West Bank Demerara, Charity and Anna Regina in Essequibo,

1. Clark, op. cit., p. 11.

2. Table IV-1 and GCAIDB, Appendix XIII from unpublished 1979 annual report.

a West Coast Berbice location and Rose Hall, and one other location in East Coast Berbice. The Anna Regina and Rose Hall locations, currently operating for the receipt and processing of applications, will also become disbursement centers.

A comparison of the number of processed and approved loans with the number of staff working on credit indicates an apparent low workload for each staff member. For the intermediate supervisors and credit analysts considered together, this yields an average of an approximately 13 loans processed and 10 loans approved for each staff person.¹

However, the observation of the loans/staff ratio alone is likely to be misleading in assessing the workloads of the GCAIDB.

The level of effort and technical assistance provided by the GCAIDB staff in the processing of loan applications is impressive, as described below. That this degree of care has still left the Bank with a low level of repayments in the current economic situation of Guyana is an indicator of the difficulty in maintaining a development bank such as the GCAIDB as both a responsive and a viable institution. Given the level of repayments, the Bank has little or no margin of error with which to experiment in the use of more streamlined but higher risk review procedures.

Furthermore, another implication of the low level of repayments is that many of the 9,242 loans made to date by the GCAIDB are still outstanding. Thus, the average portfolio of credit analysts in Demerara contains the records of

1. A similar comparison was made by Clarke, op. cit., p. 16.

45 to 50 farmers with outstanding loans made from previous years who must be visited regularly as part of the Bank's supervised credit approach. Analysts are expected to make 12 farm visits per month. In Essequibo, the portfolio size is about 30 outstanding loans per credit analyst and in Berbice about 20. Thus the actual workload may well be 2 to 5 times as great as the number of loans approved in a given year.

Loan Counseling, Analysis, and Supervision

The GCAIDB publicizes that it "offers free advisory services" and will "assist borrowers in preparing farm programmes."¹ A number of individual farmers' files were reviewed in the Bank offices and it appears that this service is, in fact, provided. The Bank's requirements for information gathering, analysis, and planning appear to be carefully met for each application. Each loan application is required to be accompanied by a detailed statement of the applicant's farming experience, past profitability, land, and other resources, so that the applicant's creditworthiness can be assessed objectively and the assessment can be reviewed by the intermediate and senior supervisors. Each loan application must also be accompanied by a detailed plan for the use of the funds along with cash flow projections and budgets. Necessary advice from the extension service, the GRB, and other needed technical assistance is identified.

In all, the completed file of a machinery loan application for rice farming ready for a decision contains the following:

1. GCAIDB pamphlet, n.d.

- . Personal and family data;
- . Details of land holdings, tenure, machinery, and other property;
- . Total financial statement, including debts and credit;
- . Farm layout and land condition and use;
- . Production history;
- . Revenue and cost history;
- . Details of loan requests;
- . Detailed work and repayment plan;
- . Record of visits; and
- . Record of review within the GCAIDB and the date on which each stage of the review was completed.

If the loan is approved, the record of repayments, follow-up visits, and any problems is added to the file.

Staff Recruitment and Training

The GCAIDB has followed a regular program of staff recruitment and training. Initial recruitment of credit analysis was mainly from the ranks of agricultural extension agents. More recently, such positions have been filled from the recent graduates in agriculture from the University of Guyana. However, the Bank has found that its staff and the experience and training they receive within the bank have been well thought of in other organizations and in the private sector, so that the turnover of younger staff has been relatively high as these persons accept outside job offers. The response of the GCAIDB to this problem is illustrative of the resourceful, management-by-exceptions

attitude that was observed in the visits to the Bank. The Bank is now recruiting new staff from the ranks of those who have not yet completed their university course. In return for a promise of a given number of years' service, the bank will support the young staff members in the completion of their education.

The Bank also gives considerable attention to the training of its other staff members. In 1977-78, 266 staff members participated in 25 training courses and six officers were granted release to pursue further university study. Given this history, there is a high likelihood that the GCAIDB would use the training grant portion of the project effectively. It is also understood that this kind of grant represents an institutional bonus to reward the Bank for the extra effort the administration of the project will require of technical and management staff. Nevertheless, the provision of a reference library and audiovisual equipment does appear less than urgent, either for the Bank or for the success of the GCAIDB and this particular project. Even more, technical assistance to the various institutions responsible for the stocking and distribution of parts and the repair of machinery should have a far higher priority as a contribution to the project purposes of increasing the availability of machinery services in Guyana and thereby the incomes of small farmers.

Terms of Loans

Eligibility and Loans to Groups

The GCAIDB assumes that a minimum of 75 acres cultivated in two crops of rice is necessary to make a tractor loan feasible. A recent study by the Bank puts the required

acreage even slightly higher at 77.5 to 80.¹ Furthermore, the Bank considers a tractor not to be secure collateral itself, so that other assets, particularly the value of land owned or of long-term leases, must be supplied as collateral.

Given these conditions, especially the minimum feasible land requirements, small farmers individually cannot qualify for a tractor loan. This is not a matter of Bank insensitivity; the figures on the minimum acreage requirements are quite convincing and match other intuitive estimates of the land that one new tractor can and must cultivate if the cost of the tractor is to be amortized.

Cooperatives offer other means for allowing farmers with smaller acreages to participate in loans of the size required for purchasing a tractor. From 1973-78, loans were made to 20 cooperatives engaged in rice cultivation. Only four of these cooperatives specialized in providing machinery. In all, 21 tractors and three combines were purchased by cooperatives through GCAIDB loans. In 1978, four loans to cooperatives provided C\$7,000,000 in credit, or 5 percent of the value of total loans, down from 10 percent a year earlier.² The GCAIDB personnel are lukewarm about loans to co-operatives because they feel they have constituted poor credit risks, although no data were available on co-op repayments.

Another possibility for small farmer participation in machinery loans is through loans to small groups of farmers whose total acreage reaches the feasibility minimum.

1. GCAIDB, "An Examination of the Effect of the Increased Prices for Paddy on the Return to Rice Farmers," 1980, p. 4.

2. GCAIDB, Annual Report 1978, pgs. 7 and 13.

Usually the groups consist of related persons. In such loans, a full application is prepared for each participant. If one person is designated as the prime carrier of the loan responsible for the care of the tractor, the names and acreage of the other participating farmers are also specified and included in the work plan and the primary loan carrier agrees to provide tractor services to these other persons.

Such joint loans have been made infrequently by the GCAIDB and the fact that the GCAIDB will work out such arrangements has never been widely publicized. The Essequibo office has 10 such loans in its portfolio, mainly for groups of relatives, and has had good experiences with them. In general, Bank personnel speak more highly of this kind of loan than they do of cooperatives. However, it was indicated that these group loans are time-consuming and expensive to process, given that the work of preparing the application and checking on creditworthiness are increased almost in proportion to the number of participants in the group.

One nonbank respondent knowledgeable about the rice industry in Essequibo stated that most of the group loans really consist of one person who is the actual owner of the tractor and other relatives who sign only to provide the requisite total acreage for the intended owner to qualify at the Bank. However, the same respondent did say that the real tractor owner would in fact provide tractor services to the other signers of the loan. So the effective result of this informal procedure is not far different from what the Bank intends. Actually, the informal arrangement is an

improvement in that responsibility for the care and maintenance of the tractor is not divided, even though the application of the tractor services is distributed among a number of smaller farmers.

Interest Rates

The GCAIDB interest rate for tractor loans was 12 percent in May 1980, compared with a commercial bank rate in Guyana of about 16 percent. The GCAIDB rate is higher than the 11 percent it charged in 1978 and the 10 percent in 1977. The effect of the higher current rate of interest is mitigated for farmers receiving machinery loans by an increase of about a year in the period for repayment, which is now generally 7 to 8 years.

Guyana will receive the AID loan funds for the project at highly concessionary rates of 2 to 3 percent. It was the recommendation of the Ohio State consultants to AID last year that the Government of Guyana, specifically the Ministry of Finance, should be considered the entity receiving the full concessionary rate. It would then make these funds available to the GCAIDB at an interest rate of 2 percent.¹ The main purpose of this process would be to induce the GCAIDB to charge a rate of interest very near the market rate (14 percent annually, in the 1979 situation considered by the Ohio team). In turn, this would enable and encourage the GCAIDB to begin offering a market rate of interest payment on loans so that it could mobilize capital itself, rather than just serve as a conduit for foreign funds.

1. Louis Clark and Millard Long, "Agricultural Credit Loan," Memo to Dwight Steen, RDO USAID/Guyana, May 3, 1979.

The relatively high rate charged on loans would enable the GCAIDB to just cover its own current administrative costs of 7 percent of the value of new loans. In fact, the Ohio State team contended that the high average size of machinery loans should produce proportionately smaller administrative costs for the GCAIDB, so that its administrative costs should drop to about 5 percent, with the additional 2 percent surplus from a 7 percent markup serving as a reserve for delinquent loans.

While the Ohio State recommendations represent an approach to improving the credit situation in developing countries that is quite logical, they do not appear fully appropriate to the particular project under consideration. Since the repaid loans are to be used for further agricultural purposes, specifically development loans for the new lands projects, denying the GCAIDB the full concessionary rate effectively reduces the funds available for relending. The GCAIDB appears to be a more reliable guarantor than the GOG that the benefits of the concessionary terms will be turned into agricultural benefits for farmers as well. Furthermore, the meeting of AID intentions that loans be given to smaller farmers and farmer groups will maintain or even increase GCAIDB administrative and delinquency costs for this project, rather than reduce them, despite the average size of the loans.

While the objective of increasing the mobilization of local funds is certainly worthwhile, such mobilization will not increase the amount of foreign exchange available. It is the need for this foreign exchange in particular, not for credit in general, to which this AID project is designed to respond. In effect, the rice farmers have already "saved" foreign exchange by the net surplus of foreign exchange

produced by their work. Their savings are also reflected in the apparent high level of self-financing, as was discussed previously.

It is possible for the GCAIDB to receive the full concessional terms and still have the Ministry of Finance initially make the foreign exchange directly available for the importations of the requisite amounts of machinery and parts. When the tractor or combine is delivered to a person approved by the GCAIDB for a loan, the GCAIDB will take over obligation to the Ministry of Finance for the value of the tractor, including the low interest payment required by AID. The actual loan to the farmers by the GCAIDB will be somewhat less because of the downpayment required. The Ministry of Finance could retain any surplus related to the discretionary rate and the importation of spare parts.

Loans for the Purchase of Combines

In the Bank's records, the 25 combine loans since 1973 have been associated with an average of over 500 acres of attributable benefits per combine, although this average may be inflated somewhat by loans to a few co-ops with large acreages. The average benefits approximate the 500-700 acres that a combine generally can harvest in one crop under normal conditions.

It is difficult to envision institutional arrangements for combine loans that could make them directly available to small farmers. The groups of relatives and other small farmers who have been appropriate for tractor purchases would have to be made too large and complex to handle the more than G\$100,000 for purchasing a combine. Nor would it be desirable to set up persons as full-time combine service

owners and operators, since they would be unlikely to have the experience in the actual maintenance and use of combines. Also, the GCAIDB personnel are doubtful that co-ops can handle large loans, so this second approval is also not attractive. A third possibility for assuring the widespread availability of the new combines among small farmers would be to make combine loans to medium-large farmers who provide about half the required 400-500 acres from their own land and that of close relatives. These farmers would be under contract to provide tractor services to specified small farmers at a given price (to be adjusted annually as required by inflation and fuel costs). Even this suggestion is not fully satisfactory in that it sets up a complex loan agreement with stipulations that would be difficult to monitor and enforce.

A fourth variation would be to give the combine loan to medium-large farmers and trust to the market mechanism and their need to secure additional revenues to pay for the combine to provide services to smaller farmers. This is, in effect, the system in effect now. However, even if the market mechanism were working, the other farms served could well be other larger farmers, and AID is likely to want more assurance that small farmers will benefit.

A fifth alternative, helping GRB improve its use of combines for supplying harvesting services to small farmers, is attractive theoretically, but this does not seem to be the direction that offers the best hope for improving the efficiency in the Guyana rice industry, as has been discussed above.

In all, the second possibility appears most promising. If the market forces rather than complex loan agreements can be relied on for the tractor loans, then the GCAIDB can

probably afford the additional time in the design and monitoring of the combine loans to specify just which small farmers are to enjoy priority in the receipt of harvesting services from combines purchased with loans under the AID program.