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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROGRAM MEMORANDUM

FY 1970

INDIA

ANNEXES A — B — C — D — E — G

DEPARTMENT OF STATE

SEPTEMBER 1968

BEST AVAILABLE

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ANNEX A

NATIONAL INCOME ESTIMATES
Indian Fiscal Year 1969/70

This Annex and Annex B develop four alternative pictures of what might happen to the economy during 1969/70. As such they provide the bulk of the raw material from which the conclusions of Part I of the Program Memorandum have been derived.

Cases II, III and IV assume that NDP grows at approximately 4.5%, 5.25% and 6%, respectively, in all cases with 5% gross output of foodgrains. Case I assumes a 4% growth in foodgrain output and dampens down the other sectors sufficiently to avoid the inflationary pressure that this may cause. The 4.5% rate of growth was chosen because it is the minimum sustainable rate compatible with approximately a one percentage point per year improvement in personal per capita consumption, a rate of improvement which most observers feel represents the bare minimum necessary for political stability. The 6% rate of growth was chosen because it comes close to what the economy could easily accomplish, if only imports were available. Sufficient excess capacity is available, we feel, to sustain this growth rate at least for a couple of years. The 5.25% was chosen because it reflected an intermediate case which may prove to be more realistic given feasible aid levels.

Actually, to obtain internally consistent pictures, we were forced to deviate slightly from these overall rates of growth. The results, in terms of growth rates principal aggregates, are given below and in terms of sectors are given in Table 1.

	Cases			
	I	II	III	IV
1. Foodgrains, non-foodgrain crops (major crops) and livestock output (percent change over 1968/69 levels)	4	5	5	5
2. Gross fixed investment (percent[a/] change over 1968/69 level)	6.2	8.5	11.6	15.3
3. Net fixed investment (percent [a/] change over 1968/69 level)	6.0	9.0	13.0	18.0

The procedures adopted to forecast growth rates in individual sectors are explained in the following paragraphs.

Agriculture and allied activities: The net product originating from agriculture is estimated to increase by 3 percent in Case I and by 3.7 percent in Cases II to IV. The increment in net value added to gross value of output roughly works out at 0.64 in both cases. The detailed calculation for deriving net product originating from this sector is as follows:

ESTIMATION OF NET PRODUCT IN AGRICULTURE, 1969/70
(Rs. Crores, 1960/61 Prices)

	1968/69	1969/70 (Increment over 1968/69) Case II to IV	Case I
Gross value of output			
(i) Foodgrains	4,429	221 a/	177 b/
(ii) Non-grain major crops	1,909	95 a/	76 b/
(iii) Other crops & by-products	2,143	75 c/	64 c/
(iv) Livestock	1,875	94 a/	75 b/
Total Agriculture (proper) and Livestock	10,356	485	392
Inputs, depreciation & other minor adjustments	-2,516	-195 d/	-157 d/
Net output from Agriculture and Livestock	7,840	290	235
Plus net product from forestry and fisheries	332	12	10
	8,172	302	245
% Change in net product over the previous year level		3.7%	3.0%

a/ + 5% over 1968/69 level. b/ + 4% over 1968/69 level.

c/ + 3.5% over 1968/69 level in Case II to IV and +3% in Case I. The slower growth rate is on account of by-products of main crops -- as yield of straws and stalks (main by-product of grains) is not expected to increase at the same rate as the yield of grains.

d/ Fertilizer, alone, will increase the purchased inputs by Rs. 80 crores in Cases II to IV and Rs. 64 crores in Case I. Added to these are costs for pesticides, seeds, irrigation charges, diesel oil, electricity, depreciation and maintenance charges on capital equipment and livestock feed.

Large Scale Manufacturing: The net product originating from this sector is estimated to increase by 5.8 percent, 7.9 percent, 9.6 percent and 11.4 percent in Cases I, II, III and IV, respectively. The differences in rates of growth reflect the expected variations in demand patterns, availability of industrial raw materials from domestic and foreign sources, and utilization factor of existing plant capacity. The assumed growth rates in three major components of large-scale manufacturing are as follows:

	% Share 1968/69	Case I	Case II	Case III	Case IV
Agro-based industries	37.2	4.0	5.0	5.7	6.5
Metals and equipment	35.8	6.5	10.0	13.0	16.0
Other manufacturing	27.0	7.5	9.0	10.5	12.0
Total-Large Scale Manufacturing	100.0	5.8	7.8	9.6	11.4

Having more or less the same external trade deficit for Cases I and II, the higher rate of growth in Case II reflects larger increase in consumer demand due to higher rate of growth in agriculture and its multiplier effect on the rest of the economy and larger investment demand with matching supplies made available from domestic sources.

The differences in rates of growth between Case II on one hand and Cases III and IV on the other are essentially due to multiplier effect of larger investment demand with matching supplies made available from domestic sources via better plant capacity utilization, lesser inventory accumulations and larger imports on all counts.

The other sectors are projected on the basis of relationship of activity, levels in agriculture and large scale manufacturing to the activity levels in other sectors.

The table below summarizes the increments in net product over 1968/69 levels by four major components of net domestic product in four cases.

INCREMENTS IN NET PRODUCT
(Rs. Crores at 1966/67 Prices)

	I	II	III	IV
Agriculture	441	543	543	543
Industry	275	353	424	499
Transport & Trade	186	244	306	377
Services & Others	120	149	189	231
Total	1,022	1,289	1,462	1,650

On the above basis, net domestic product can be expected to increase by 3.7 percent in Case I, 4.6 percent in Case II, 5.2 per cent in Case III and 5.9 percent in Case IV. Adding the estimates for depreciation and indirect taxes less subsidies (which grow at 1.5 times the rate of growth in net domestic product) to estimates of net domestic product, the GNP growth rates are derived.

Table 2 presents the projected levels of total available resources and their dispositions. The assumptions underlying the various components of the disposition segment of the table are:

(i) Net fixed investment is projected to increase at 6, 9, 12 and 18 percent in Cases I, II, III and IV, respectively.

(ii) An inventory investment increase at 12.5 per cent of the increment in gross national product in Case I and II, while this rate decreases in Cases III and IV due to demand pressures.

(iii) Public consumption is projected to increase at the same rate as the net product originating in public administration and defense. The implicit rates of growth are 4, 5, 6-1/2 and 8 percent in Cases I, II, III and IV, respectively.

This results in the following macro-economic aggregate for the four Cases:

Macro-Economic Aggregates 1969/70
(Rs. Crores at 1966/67 Prices)

	I	II	III	IV
Δ GNP	1,202	1,525	1,741	1,975
Δ Gross Investment	286	419	546	661
Δ Net Foreign Balance	- 25	- 12	53	128
Δ Gross Saving	311	431	493	533
Δ Gross Savings/Δ GNP Ratio	(.26)	(.28)	(.28)	(.27)
Δ NDP at Market Prices	1,166	1,471	1,668	1,882
Δ In Net Savings	221	323	366	387
Δ Net Savings/Δ NDP Ratio	(.19)	(.22)	(.22)	(.21)

TABLE 1

PROJECTION OF GROSS NATIONAL PRODUCT FY 1969/70

(Rs. crores at 1966/67 prices)

Sector		Income Originating in 1968/69 a/	Income Originating in 1969/70 (Rs. crores)			
			Case I	Case II	Case III	Case IV
1.	Agriculture & allied activities	14,688	15,129	15,231	15,231	15,231
2.	Mining & Quarrying	267	283	286	291	299
3.	Large Scale Manuf.	2,156	2,281	2,326	2,363	2,400
4.	Small Scale Manuf.	1,442	1,500	1,514	1,526	1,536
5.	Construction	1,160	1,218	1,230	1,241	1,253
6.	Electricity, gas, etc.	198	216	220	226	232
7.	Transport & Comm.	1,133	( )	( )	( )	( )
8.	Trade, Storage, etc.	2,857	(4,623)	(4,681)	(4,743)	(4,814)
9.	Banking & Insurance	447	( )	( )	( )	( )
10.	Real Estate & Ownership of Dwellings	663	683	686	690	693
11.	Public Admin. & Defense	1,272	1,323	1,336	1,355	1,374
12.	Other Services	1,643	1,692	1,705	1,722	1,742
	NET DOMESTIC PRODUCT	27,926	28,948	29,215	29,388	29,576
	NET EARNED INCOME FROM ABROAD	-310	-364	-364	-364	-364
	DEPRECIATION	1,510	1,600	1,618	1,637	1,656
	INDIRECT TAXES LESS SUBSIDIES	2,624	2,768	2,806	2,830	2,857
	GROSS NATIONAL PRODUCT	31,750	32,952	33,275	33,491	33,725

a/ See Part II-A., for estimation procedures for FY 1968/69 estimates.

TABLE 1 (Continued)
PROJECTION OF GROSS NATIONAL PRODUCT FY 1969/70

	Sector	Implicit Percent Growth Rate in 1969/70			
		Case I	Case II	Case III	Case IV
1.	Agriculture & Allied Activities	3.0	3.7	3.7	3.7
2.	Mining and Quarrying	6.0	7.0	9.0	12.0
3.	Large Scale Manufacturing	5.8	7.9	9.6	11.4
4.	Small Scale Manufacturing	4.0	5.0	5.8	6.5
5.	Construction	5.0	6.0	7.0	8.0
6.	Electricity, Gas, etc.	9.0	11.0	14.0	17.0
7.	Transport & Communications	( )	( )	( )	( )
8.	Trade, Storage, etc.	(4.2)	(5.5)	(6.9)	(8.5)
9.	Banking & Insurance	( )	( )	( )	( )
10.	Real Estate & Ownership of Dwellings	3.0	3.5	4.0	4.5
11.	Public Administration & Defense	4.0	5.0	6.5	8.0
12.	Other Services	3.0	3.8	4.8	6.0
	NET DOMESTIC PRODUCT	3.66	4.62	5.24	5.91
	NET EARNED INCOME FROM ABROAD				
	DEPRECIATION	5.96	7.15	8.41	9.67
	INDIRECT TAXES LESS SUBSIDIES	5.49	6.93	7.86	8.87
	GROSS NATIONAL PRODUCT	3.79	4.80	5.48	6.22

TABLE 2

DISPOSITION OF TOTAL AVAILABLE RESOURCES
(Rs. crores at 1966/67 prices)

FY's	1966/67	1967/68	1968/69	1969/70 Case I	1969/70 Case II	1969/70 Case III	1969/70 Case IV
1. Gross National Product at market prices	27,700	30,600	31,750	32,952	33,275	33,491	33,725
2. Net Foreign Balances a/	1,034	980	1,010	985	998	1,063	1,138
3. Total Available Resources = (1 + 2)	28,734	31,580	32,760	33,937	34,273	34,554	34,863
DISPOSITION							
4. Gross fixed investment of which:	4,120	4,142	4,324	4,590	4,693	4,825	4,985
(a) Net Investment	(2,816)	(2,738)	(2,814)	(2,990)	(3, 075)	(3,188)	(3,329)
(b) Depreciation/replacement	(1,304)	(1,404)	(1,510)	(1,600)	(1,618)	(1,637)	(1,656)
5. Changes in Stocks	-100	600 b/	130	150	180	175	130
6. Total consumption of which:	24,714	26,838	28,306	29,197	29,400	29,554	29,748
(a) Public	(2,684)	(2,710)	(2,790)	(2,900)	(2,930)	(2,970)	(3,010)
(b) Private	(22,030)	(24,128)	(25,516)	(26,297)	(26,470)	(26,584)	(26,738)
7. Gross Savings = (4+5-2)	2,986	3,862	3,444	3,755	3,875	3,937	3,977
8. Net Savings = (4a+5-2)	1,682	2,358	1,934	2,155	2,257	2,300	2,321

a/ Equals balances on goods and services. Trade balance figures are taken from "Annex B: Balance of Payments", while balance on services are "approximates" as they are derived from C-4 table of 1969 Program Memorandum.

b/ Includes foodgrain inventories to be built up from 1967/68 foodgrain crop. Therefore, it includes buffer stock provision of Rs. 140 crores in 1968/69 plan outlay, as the buffer stock is to be built up from 1967/68 foodgrain crop.

TABLE 3

ESTIMATES OF GROSS FIXED INVESTMENT IN PUBLIC AND PRIVATE SECTORS: FY's 1960/61 TO 1969/ 70

(Rs. crores at current price)

FY's	Net Investment			Depreciation/Replacement b/			Gross Fixed Investment Total
	Public Sector a/	Private Sector	Total	Public	Private	Total	
1960/61	790	387	1,177	116	620	736	1,913
1961/62	960	501	1,461	131	679	810	2,271
1962/63	1,166	540	1,706	160	770	930	2,636
1963/64	1,439	653	2,092	172	819	991	3,083
1964/65	1,701	690	2,391	205	895	1,100	3,491
1965/66	1,914	810	2,724	229	970	1,199	3,923
1966/67	1,916	900	2,816	255	1,049	1,304	4,120
1967/68	1,902	975	2,877	290	1,185	1,475	4,352
1968/69 c/	1,929	1,035	2,964	314	1,265	1,579	4,543
1969/70 c/ d/							
Case I	2,024	1,118	3,142	350	1,330	1,680	4,822
II	2,093	1,138	3,231	370	1,330	1,700	4,931
III	2,191	1,159	3,350	370	1,350	1,720	5,070
IV	2,318	1,180	3,498	370	1,370	1,740	5,238

Sources: a/ Planning Commission's data on plan investment in Public Sector up to FYs 1968/69. FY 1968/69 figure does not include investment foodgrains buffer stock, and is adjusted upwards by Rs. 70 crores on account of larger provision in the States' budgets for plan expenditures.

b/ Figures up to FY 1966/67 are taken from "White Paper" on national income. For the subsequent years, the projections are based on historical relationships between income growth and depreciation/replacement provisions.

c/ At 1967/68 prices.

d/ Net Investment is projected to increase at 6 per cent, 9 per cent, 13 per cent and 18 per cent in Cases I, II, III & IV, respectively, While private net investment is projected to increase at 8, 10, 12 and 14 per cent, respectively. The residual investment in each case is allocated to public sector.

TABLE 4

ESTIMATES OF GROSS FIXED INVESTMENT AND NET FIXED INVESTMENT AT CONSTANT PRICES FOR FY's 1960/61 TO 1969/70

(Rs. crores at 1966/67 prices)

	Gross Fixed Investment		Net Fixed Investment		Investment Cost Index (1966/67 = 100)
	Total	% Change from prev. year	Total	% Change from prev. year	
1960/61	2,755		1,695		69.44
1961/62	3,145	(+14.2)	2,023	(+11.9)	72.22
1962/63	3,515	(+11.8)	2,275	(+12.5)	75.00
1963/64	4,000	(+13.8)	2,714	(+19.3)	77.08
1964/65	4,371	(+9.3)	2,994	(+10.3)	79.86
1965/66	4,483	(+2.6)	3,113	(+4.0)	87.50
1966/67	4,120	(-8.1)	2,816	(-9.5)	100.00
1967/68	4,142	(+0.5)	2,738	(-2.8)	105.07
1968/69	4,324	(+4.4)	2,821	(+3.0)	
1969/70					
Case I	4,590	(+6.2)	2,990	(+6.0)	
II	4,693	(+8.5)	3,075	(+9.0)	
III	4,825	(+11.6)	3,188	(+13.0)	
IV	4,985	(+15.3)	3,329	(+18.0)	

ANNEX B

BALANCE OF PAYMENTS

Introduction

This annex will approach the balance of payments problem from the point of view of import requirements on the one hand, and the means of financing through different sources of foreign exchange (food aid, project aid, exports, etc.) on the other. To arrive at requirements, different categories of imports will be related to the relevant sectors of the domestic economy. Once these requirements are determined, they will be related to foreign exchange availabilities. The analysis of import requirements will make it possible to identify the reasons for changes in the composition and level of imports while the analysis of the means of payment will show what effect imports and other foreign exchange requirements have on India's overall liquidity position.

This approach will be used to (1) review the 1967/68 balance of payments situation, (2) discuss the outlook for 1968/69 and (3) evaluate the implications of alternative U.S. aid levels in 1969/70 from the point of view of foreign exchange bottlenecks.

I. Review of 1967/68

The balance of payments situation in 1967/68 was characterized by a marginal drop in imports, higher exports, increased aid utilization and increased foreign exchange reserves. On balance, the trade deficit was reduced by $78 million and reserves increased by $82 million. The increase in reserves, made possible by a $90 million loan from IMF and a $30 million special deposit by IBRD*, was more than offset by a $96 million drop in the non-project pipeline.

A. Imports

Imports during 1967/68 dropped slightly to $2750 million from the abnormally low 1966/67 level of $2,770 million. In general, foodgrains declined, fertilizers increased and industry related imports remained unchanged. Foodgrains dropped from a record level of $893 million in 1966/67 to about $710 million in 1967/68. This was due to the exceptionally good harvest which saw a 26 million ton increase in foodgrain production over the previous year. This plus foodgrain imports of close to 9 million tons made it possible for India to raise its per capita consumption in 1967 to 15.8 ounces per day, a 9.8% increase over 1966.

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* The deposit was actually $45 million of which $15 million is counted as part of the 1967/68 debt rescheduling.

In addition, India was able to build a buffer stock of approximately 3 million tons by the end of Indian agricultural procurement year 1967/68 (November-October).

Excluding foodgrains, imports rose from $1,877 in 1966/67 to $2,040 in 1967/68, an increase of $163 million. When the $169 million increase in fertilizer imports is taken into account, it becomes evident that industry related imports remained virtually unchanged. There was expected to have been some recovery from 1966/67 when these imports dropped by 20 per cent but in view of the recession in the industrial sector in 1967/68 (production increased by only 0.7 per cent in real terms over 1966/67) the low level of imports appears to be warranted.

Table 1a gives some indication of what happened in individual categories. The industry related imports, i.e. total imports excluding foodgrains and fertilizers, are divided into: (1) cotton and jute, (2) machinery and transport equipment, (3) basic metals and (4) others.* While cotton and jute are used in industrial production, imports of these commodities fluctuate more with changes in agricultural output than with changes in industrial production. 1966/67 was an exceptionally bad year for raw jute production and imports totalled $75.8 million. In 1967/68 imports dropped to about $6.5 million. This combined with an increase in cotton imports resulted in a net decline of $25 million for the group as a whole.

The next category of imports in Table 1a, machinery and transport equipment, is closely related to investment and large scale manufacturing. A scatter diagram relating machinery and transport equipment imports to these sectors of the domestic economy for the period 1956/57 to 1965/66 shows stable relationships with very little year to year variation. (See Chart I.) These relationships, however, did not continue through 1966/67 and 1967/68. In 1966/67 there was a sharp drop in investment and a much greater than proportionate drop in imports. In 1967/68 investment remained virtually unchanged while imports dropped further.

Three significant developments during this period can help explain this phenomenon: (1) the June 1966 devaluation raised the costs of machinery imports, (2) the drop in investment was accompanied by continued growth in the output of domestic machinery and transport equipment industries and (3) project aid utilization, virtually the only source of foreign exchange for machinery and transport equipment imports, dropped substantially in both years. In Annex B-1

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* Strictly speaking this group of imports includes commodities which are agriculture or consumer oriented, but since they probably constitute no more than 10% of the total, the group as a whole can be considered to be industry related.

machinery and transport equipment imports are divided into whole machinery and machinery parts. Up to 1965/66 the whole machinery figures are based on actual data. For 1966/67 and 1967/68 imports of whole machinery were equated to project aid utilization.

If this is the case, imports of machinery and transport equipment for the last three years can be shown as follows:

($ millions)

	1965/66	1966/67	1967/68
Whole machinery	429.3	494.0*	387.0
Machinery parts	599.7	265.8	274.4
Total	1,029.0	759.8	661.4

Assuming that in 1966/67 project aid financed imports included a substantial amount of basic materials and that imports of whole machinery actually declined in that year, it appears that imports of whole machinery have been affected more by the showdown in economic activity than by devaluation. On the other hand, imports of machinery parts declined sharply in 1966/67 and remained at that level the following year reflecting a large drop in domestic demand brought about by the increased rupee costs of imported parts.

Imports of basic metals appear to have been affected by devaluation in the same way as machinery parts. After rising continually during the Third Plan, they dropped sharply to $244 million in 1966/67 and rose slightly to $260 million in 1967/68.

The final category of imports in Table 1a consists mostly of industrial maintenance goods. These imports declined slightly during the Third Plan period and dropped sharply in 1966/67 mainly because P.O.L. imports went from a level of $143.5 million in 1965/66 to $87.3 million in 1966/67. Since P.O.L. imports bounced back to $166.7 million in 1967/68 it seems possible that the low 1966/67 figure was due to under-reporting. The 1967/68 level of imports for the miscellaneous industrial maintenance group as a whole was $687 million. The increase was spread throughout P.O.L. industrial chemicals and miscellaneous raw materials indicating that

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* Very likely includes imports other than whole machinery. Project aid dropped from $684 million in 1965/66 to $494 million in 1966/67. If changes in project aid utilization are any indication of changes in whole machinery imports, it would appear that whole machinery imports dropped in 1966/67. The assumption that 1967/68 imports of whole machinery were equal to project aid utilization is based on information received from MOF.

India has had to replenish stocks which were drawn down because of abnormally low 1966/67 imports and/or there has been a slowdown in the rate of import substitution.

Evidence of a possibly lower rate of import substitution can be seen in the leveling off in imports of many commodities which had been declining since 1960/61. Although India has been able to import substitute in many areas, there will always be a minimum amount of imports which will never be produced domestically. India is rapidly approaching that minimum for several large groups of commodities. For example, whereas India was able to reduce its rubber imports from $21.2 million in 1961/62 to $6.0 million in 1967/68 and to an estimated $1.2 million in 1968/69, it is expected that minimum requirements of special synthetic rubber will remain at about $2.4 million for the foreseeable future. The same applies for petroleum products, miscellaneous manufactured goods and other categories.

Based on the above analysis, India's imports during 1967/68 can be summarized as follows. Foodgrain and jute imports dropped sharply due to increased domestic availability while fertilizer imports increased as a result of the current policy of maximizing foodgrain production. In the industrial sector, imports of whole machinery dropped for the second consecutive year reflecting depressed investment levels, and machinery parts and basic metals increased slightly from their abnormally low 1966/67 levels. Imports of industrial maintenance goods increased by about $96 million, $79 million of which was accounted for by P.O.L. This reflects a reversal in the declining trend of past years indicating a possible slowdown in the rate of import substitution for these commodities.

B. Exports

Exports in 1967/68 were $1,600 million, only $58 million higher than the extremely low 1966/67 level and over $100 million less than the previous high set in 1964/65. The poor 1966/67 export performance was due mainly to the 1965/66 drought and to the unstable conditions following devaluation. Major declines were recorded in jute manufactures, tea and cotton textiles, India's three largest foreign exchange earners. The expected recovery of these commodities in 1967/68 did not materialize as is shown in the following table.

	Exports ($ millions)			
	1964/65	1965/66	1966/67	1967/68
Jute manufactures	353.3	384.3	334.8	315.0
Tea	261.8	241.2	214.7	240.0

	1964/65	1965/66	1966/67	1967/68
Cotton textiles	134.7	132.9	102.8	106.0
Iron ore	78.5	88.4	93.6	100.0
Leather & products	57.4	59.8	83.0	71.0
Other	828.5	785.9	713.1	768.0
Total	1,714.2	1,692.5	1,542.0	1,600.0

Tea exports increased but not to the extent expected while jute manufactures continued to decline and cotton textiles remained unchanged. It appears that tea imports would have been higher if there had not been over-crowded stocks in the London market during the latter months of 1967/68. In the case of jute, exports dropped because of continued competition from Pakistan. Similarly exports of leather and leather manufactures dropped because of a recession in the world leather market and intense competition from Pakistan and China. Besides tea, commodities which experienced increased exports in 1967/68 were tobacco, iron ore, iron and steel and engineering goods. In general, however, very few commodities performed as well as expected.

C. Financing the Deficit

The trade deficit in 1967/68 was $1,150 million. Table 2a shows how this compares with 1966/67 and earlier years. The table also gives figures for the overall deficit, aid utilization and changes in reserves. In general, it appears that India's balance of payments situation improved during 1967/68.

In the first place, exports increased by $58 million. Then, while total imports of foodgrains declined by $183 million, food aid declined by only $78 million. The net result was a drop of $105 million in free foreign exchange expenditures on food. Project aid and non-foodgrain PL 480 imports are of course completely aid financed. The remaining imports amounted to $1,563 million, an increase of $215 million over 1966/67. This increase was almost offset by a $196 million increase in non-project aid utilization. On balance, the above developments in merchandise trade and aid utilization resulted in an improvement of $144 million in India's free foreign exchange position.

In the area of debt servicing and other invisibles, the situation was affected by offsetting developments. On the one hand the Consortium rescheduled $65 million of debt obligations resulting in a drop in debt repayments of $34 million. On the other hand there was an adverse shift in invisibles and miscellaneous transactions from a net inflow of $49 million in 1966/67 to one of $9 million in 1967/68.

A major factor in this shift was the end of the National Defense Remittance Scheme which accounted for about $35 million in 1966/67. Taking all the above changes between 1966/67 and 1967/68 together, we arrive at a net improvement in India's balance of payments, excluding monetary transactions, of $138 million.

In India, the two major types of large monetary transactions are IMF loans and repayments and changes in foreign exchange reserves stemming from developments in the current and capital accounts. In 1967/68, liabilities to the IMF increased by $32 million compared to a $130 million increase in 1966/67. The $32 million increase was the net result of a $90 million loan (compensatory financing) and a $58 million repayment. In addition to the increased IMF liability, India also received a $30 million non-recurring special deposit from IBRD. The IMF and IBRD inflows amounted to $62 million, $68 million less than the net IMF inflow in 1966/67. This combined with the $138 million increase in inflows from the current and capital accounts resulted in an $82 million increase in reserves in 1967/68 compared to a $12 million increase in 1966/67.

The net effect of India's international transactions on its balance of payments position can best be analyzed from the point of view of non-project pipelines and changes in reserves. As far as the non-project aid pipeline is concerned, 1967/68 was a tight year for India. Details of non-project aid commitments and disbursements are given in Table 3. In 1966/67 $1,247 million was available in the form of non-project aid (a $347 million beginning pipeline plus $900 million in new commitments), and only $417 million was utilized. As a result, the pipeline at the end of 1966/67 was $830 million. During 1967/68, however, India utilized $603 million in non-project aid while new commitments only amounted to $507 million.* In fact, much of this $507 million was actually pledged after IFY 1967/68 had ended. As a result of the shortfall in commitments, the non-project aid pipeline was drawn down by $96 million in 1967/68.

The 1967/68 situation with respect to changes in foreign exchange reserves was brighter but still not very encouraging. Reserves increased by $82 million but if India had not borrowed from the IMF and had not received a $30 million special deposit from IBRD, reserves would have fallen by $38 million. This, however, is an improvement over 1966/67 when reserves increased by only $12 million including a $188 million loan from the IMF.

In short, despite a drop in foodgrain import requirements, low investment and industrial maintenance goods imports and increased exports during 1967/68, India's balance of payments situation continued to be characterized by a shortage of foreign exchange. The next section will show that the situation will most likely become worse before getting better.

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* This excludes a $125 million IDA loan which is counted as 1967/68 aid but which will not be committed until late 1968/69.

II. Outlook for 1968/69 to 1970/71

A. Imports

Import projections extending through 1970/71 are given and explained in Annex B-1 to this annex. Two types of projections were made. One was year to year projections. Import requirements were derived for individual commodities whenever possible based on anticipated domestic production and demand. In most cases year to year changes in aggregate economic activity were assumed to have no effect on demand. Notable exceptions to this rule are: (1) machinery parts, POL, industrial chemicals and miscellaneous raw materials which were related to industrial production, and (2) iron and steel and non-ferrous metals which were related to gross fixed investment. These six categories of imports accounted for $1,292 million in 1967/68 out of a total of $2,750 million. Demand for the remaining commodities was simply projected on the basis of population growth, past trends or, as in the case of foodgrains, on minimum consumption levels. Of course import requirements of all commodities are affected by changes in domestic economic activity but, except for the six categories mentioned above, other factors, especially fluctuations in domestic production and official GOI import policy, have a much greater effect on actual import levels.

The other type of import projection given in Annex B-1 pertains to alternative levels of domestic economic activity within a given year. The objective was to estimate alternative import requirements consistent with alternative NDP growth rates. This paper discusses three NDP growth rates for 1969/70 and 1970/71: Case II, 4.5%; Case III, 5.2%; and Case IV, 5.9%. (See Annex A: National Income Estimates) In all cases agriculture is assumed to grow at 5 per cent per annum. In making these projections, imports were related as closely as possible to different levels of domestic economic activity even where this was not done in the year to year projections. Thus, in the case of foodgrains imports were projected to be 5.3 million tons in 1969/70 which, when combined with domestic production, resulted in a per capita availability of 16.4 ounces per day. This projection was based on desired levels of consumption. However, in estimating alternative foodgrain requirements for 1969/70, imports of 5.3 million tons of foodgrains were assumed to be consistent with Case II and alternative import levels were derived using the per capita incomes implicit in Cases III and IV.

The results of the import study are shown in detail in a covering table to the appendix and are summarized in Table 1a of this annex. Since the projections are explained in the appendix, they need not be discussed here. However, the industrial maintenance import projections should be mentioned briefly. The projections arrived at by using the disaggregated approach are significantly higher than if they had been

based solely on past trends. There are several reasons for this difference. First, although iron and steel imports dropped from $226 million in 1961/62 to $205 million in 1965/66, they are expected to increase to about $220 million by 1970/71. This reversal has been caused by a change in the types of iron and steel required by the industrial sector. In the past, India used large amounts of bars and structurals in dams, railroads and construction. Recently, however, demand has shifted to flat products and special steels which the domestic iron and steel industry is not set up to produce. As industrial growth and investment return to normal it is expected that iron and steel import requirements will rise rapidly. The situation should be rectified by 1971/72 as new capacity comes on stream.

This same phenomenon appears to have taken place with respect to non-ferrous metals. Based on the expected structure of the industrial sector in 1970/71 and the projected investment level for that year, non-ferrous metal import requirements are estimated at $197 million. This is a $79 million increase over a three-year period compared with a $30 million increase during the period covering 1961/62 to 1967/68.

In general, it looks as if the expected economic recovery, both in the agriculture and industry sectors, will be accompanied by lower food-grain imports, increased fertilizer imports and rather large increases in industry related imports. Within the industry related category, imports of machinery and transport equipment will rise with a resumption of investment and with increases in large scale manufacturing. Industrial maintenance imports, also, will increase substantially as demand for iron and steel and non-ferrous metals, not produced domestically, increases.

B. Exports

For the purposes of this paper, exports are placed at $1,750 million in 1968/69 and are projected to grow by 5 per cent in 1969/70 and by 6 per cent per annum thereafter. The $1,750 million figure represents a 9.4 per cent increase over 1967/68 but this merely reflects a recovery bringing exports back to their 1964/65 level. The bulk of the increase is expected to take place in jute, tea and cotton textiles. In addition there are indications that the GOI is taking more positive action with respect to "instant exports". As a result silver is being exported for the first time and cement and iron and steel exports are expected to rise substantially in 1968/69. Based on past experience the projections for future years appear to be on the optimistic side but in view of the dismal prospects regarding foreign exchange availabilities, it seems likely that the GOI will introduce measures to help correct the situation.

C. Financing the deficit - 1968/69

India's balance of payments for 1968/69 is shown in Table 2a. It will be noted that India is expected to get through 1968/69 with no IMF borrowing, no drawdown in reserves and with less non-project aid than in 1967/68. There are a number of reasons for this relatively optimistic outlook. In the first place, exports are expected to increase by $150 million. On the import side, foodgrain imports are expected to decline by $135 million while food aid increases by $34 million thereby freeing $169 million for non-foodgrain imports. In addition, project aid financed imports plus non-foodgrain PL 480 imports are projected to increase by $48 million. The net improvement resulting from the above changes amounts to $161 million. After taking account of the $49 million increase in debt repayments and the $29 million deterioration in invisible and miscellaneous transactions, the net improvement becomes $83 million. This is the difference shown in the basic deficit in Table 2a.

Assuming that non-project aid commitments in 1968/69 will be $700 million, India will end the year with a non-project pipeline sufficient to meet the required expenditures in all four 1969/70 cases. This is shown in Table 3.

D. Outlook for 1969/70 and 1970/71

Since the implications of alternative foreign exchange requirements and availabilities for India's balance of payments position are covered in detail in Part I of the Program Memorandum, they need not be discussed here. However, several of the more salient prospects can be mentioned. First, it can be seen from Table 2a that the trade deficit is expected to level off in 1969/70 and decline slightly in 1970/71. This is partly due to a continued drop in foodgrain imports and a fairly high export growth rate. During this same period, imports of non-foodgrains increased fairly rapidly. It should also be noted that the overall deficit which takes debt servicing into account increases slightly in 1969/70 and declines in 1970/71.

Despite these favorable trends, the basic deficit which must be financed by non-project aid, IMF loans or changes in reserves rises continually through 1970/71. This is due to the fact that foodgrain imports and PL 480 aid are declining rapidly while non-foodgrain imports are rising. The increase in non-project aid requirements should therefore be considered as reflecting a change in aid requirements from food aid to non-food aid rather than an absolute increase in total requirements.

Basically, India is becoming self-sufficient in foodgrains on the one hand and requires increasing amounts of industrial maintenance imports on the other. The increase in maintenance imports will continue with the growth in the industrial sector. The obvious implication is that since aid will not continue indefinitely, India must either increase its rate of import substitution or increase exports or both, if it is to continue meeting its foreign exchange requirements without going further into debt.

Note on the US non-project pipeline

The Mission estimates that the minimum non-project pipeline required at the end of any Indian fiscal year to prevent a break in arrival of commodities is 12 months. This estimate is based on the following considerations:

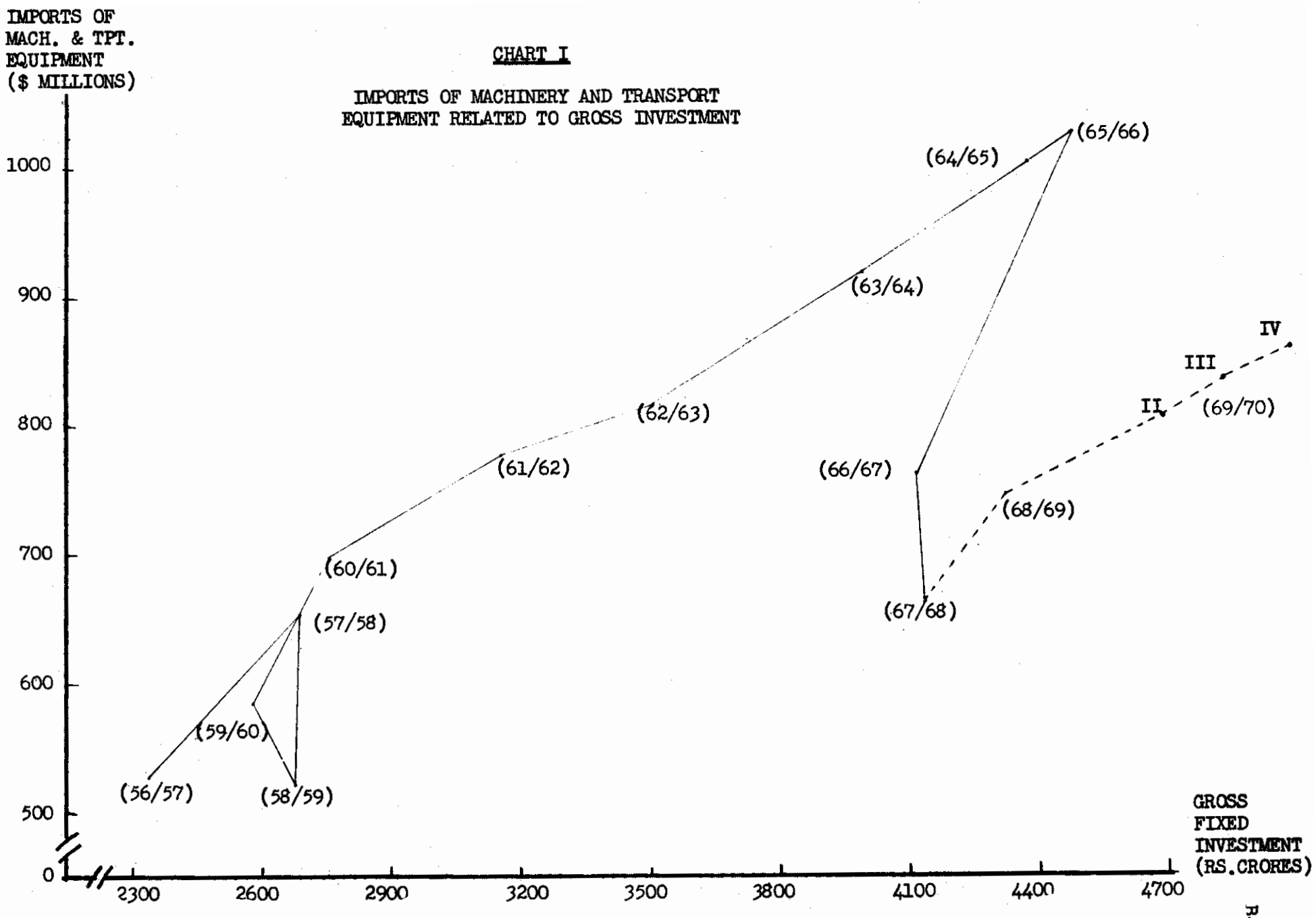
At March 31, 6 months' worth of funds will be obligated in Letters of Authorization (to open Letters of Credit) and Letters of Credit. For items yet to be delivered, these obligations will of course mature at different times depending upon the lead time for the commodity involved.

At March 31, 6 months' worth of additional funding will be needed for processing new Letters of Authorization and Letters of Credit since it is normally a minimum of 6 months from March 31, the end of the Indian fiscal year, until funds for the next US fiscal year are appropriated and a loan is authorized, signed and becomes available for new commitments.

Given the lead time between licenses and actual disbursements and the fact that new AID loans are not normally available until half or even more than half of the respective Indian fiscal year has passed, it is usually too late for such AID loans (e.g. for 1968/69) to have much effect on GOI expenditures in the corresponding Indian FY. For all practical purposes, then, the AID non-project pipeline at the end of any Indian fiscal year represents close to the maximum that can be spent from non-project funds in the following fiscal year. In the past several years the pipeline as of March 31 has always been in excess of the next twelve months expenditures.

The only way this pipeline can be shortened significantly is for the GOI to commit its own funds for opening Letters of Credit while awaiting AID funds and then seek reimbursement from AID when funds are available. Such an action on the part of the GOI would require that they place complete faith in AID's ability to provide sufficient funds in the following US fiscal year to meet the disbursements the GOI had already made and in addition to fund the next year's commitments against AID financing. AID is obviously not in any position to make promises about next year's assistance. The GOI would also have to have faith that AID would maintain its policy relating to commodity eligibility intact over this period. There is no recent precedent for assuming that the GOI would take such risks, since in previous years they have not advanced free foreign exchange until the AID loan from which they were to be reimbursed was signed.

Thus, it appears that the minimum feasible AID non-project pipeline at March 31 is twelve months' expenditures.


IMPORTS OF MACH. & TPT. EQUIPMENT ($ MILLIONS)
CHART I
IMPORTS OF MACHINERY AND TRANSPORT EQUIPMENT RELATED TO GROSS INVESTMENT
1000
900
800
700
600
500
0
2300
2600
2900
3200
3500
3800
4100
4400
4700
GROSS FIXED INVESTMENT (RS.CRORES)
(56/57)
(57/58)
(58/59)
(59/60)
(60/61)
(61/62)
(62/63)
(63/64)
(64/65)
(65/66)
(66/67)
(67/68)
(68/69)
(69/70)
II
III
IV

R-11a

Table 1

Indian Imports - 1961/62 to 1965/66
($ millions)

	1961/62	1962/63	1963/64	1964/65	1965/66
Foodgrains	245.4	302.9	377.2	592.4	649.2
Fertilizers and raw materials	31.5	62.4	79.1	69.0	94.1
Raw Cotton and jute	144.8	126.9	107.1	137.4	142.0
Machinery and transport equipment	771.8	813.5	917.6	1,003.3	1,027.9
Basic metals	330.3	301.8	311.2	342.0	348.8
Other	765.3	768.5	775.8	689.4	661.1
TOTAL	2,289.1	2,376.0	2,568.0	2,833.5	2,923.1

Source: DGCIS, Monthly Statistics of Foreign Trade.

Table 1a

Import Requirements for Alternative NDP Growth Rates*
($ millions)

	1966/67	1967/68	1968/69	1969/70			1970/71		
				II (4.5%)	III (5.2%)	IV (5.9%)	II (4.5%)	III (5.2%)	IV (5.9%)
1. Foodgrains	893	710	575	425	450	475	240	265	290
2. Fertilizers and raw materials*	129	315	316	360	360	360	385	385	385
3. Cotton and jute	143	118	135	127	140	153	133	146	160
4. Machinery and transport	760	661	745	806	831	857	848	876	910
5. Basic metals	244	260	336	389	399	413	442	474	515
6. Others	591	687	714	732	738	744	748	757	766
TOTAL	2,770	2,750	2,821	2,839	2,918	3,002	2,796	2,903	3,026

* Fertilizer import requirements for 1969/70 and 1970/71 are conservatively estimated at about $25 million below the detailed estimates given in Attachment I.

Table 2

Balance of Payments - 1961/62 to 1965/66
($ millions)

	1961/62	1962/63	1963/64	1964/65	1965/66
Imports	2,292	2,376	2,568	2,834	2,770
Exports	1,387	1,439	1,666	1,714	1,692
Balance of trade	- 905	- 937	- 902	-1,120	-1,231
Debt service obligations	- 223	- 235	- 261	- 321	- 357
Other invisibles and misc. transactions	+ 281	+ 209	- 3	- 197	+ 39
Overall deficit	- 847	- 963	-1,166	-1,638	-1,549
Aid disbursements (excl. non-project)	454	641	938	1,167	1,204
1. PL 480 foodgrains	185	258	389	433	451
2. Other PL 480				25	53
3. Other food aid	7	-	1	8	16
4. Project aid	262	383	548	701	684
Basic deficit	- 393	- 322	- 228	- 471	- 345
Net IMF liabilities	- 123	+ 25	- 50	-	+ 62
Change in reserves	+ 13	+ 5	- 23	+ 118	- 101
Non-project aid	257	292	301	353	384

Table 2a

Balance of Payments Projections
($ millions)

	1966/67	1967/68	1968/69	1969/70			1970/71		
				II (4.5%)	III (5.2%)	IV (5.9%)	II (4.5%)	III (5.2%)	IV (5.9%)
Imports	2,770	2,750	2,821	2,839	2,918	3,002	2,796	2,903	3,026
Exports	1,542	1,600	1,750	1,840	1,840	1,840	1,950	1,950	1,950
Balance of Trade	-1,228	-1,150	-1,071	- 999	-1,078	-1,162	- 846	- 953	-1,076
Debt service obligations	- 413	- 444	- 528	- 605	- 605	- 605	- 620	- 620	- 620
Other invisibles and misc. transactions	+ 49	+ 9	- 20	- 20	- 20	- 20	- 20	- 20	- 20
Overall deficit	-1,592	-1,585	-1,619	-1,624	-1,703	-1,787	-1,486	-1,593	-1,716
Aid requirements	1,067	1,002	1,119	999	1,037	1,075	817	855	894
1. PL 480 foodgrains	445	400	457	325	350	375	155	180	205
2. Other PL 480	35	90	100	87	100	113	87	100	114
3. Other food aid	93	60	37	37	37	37	25	25	25
4. Project aid	494	387	425	450	450	450	450	450	450
5. Debt rescheduling		65	100	100	100	100	100	100	100
Basic deficit	- 525	- 583	- 500	- 625	- 666	- 712	- 669	- 738	- 822
IBRD special deposit		+ 30	- 15	- 15	- 15	- 15	-	-	-
Net IMF liabilities	+ 130	+ 32	- 48	- 120	- 120	- 120	- 195	- 195	- 195
Change in reserves	- 12	- 82	-	93	93	93	-	-	-
Non-project aid	407	603	563*	667*	708*	754*	864*	933*	1,017*

* Represents a total resources shortfall to be made up by non-project aid or further drawdowns of reserves.

Statistical notes to Table 2a:

1. Debt service obligations are based on the debt repayment schedule given in Table 6.

2. PL 480 foodgrain imports for 1968/69 and Case II in 1969/70 and 1970/71 are Agricultural Attache estimates. The levels for Cases III and IV are based on the assumption that additional foodgrain import requirements will be met by PL 480.

3. Non-foodgrain PL 480 imports for 1968/69 and Case III in 1969/70 and 1970/71 are Agricultural Attache estimates. Alternative levels were derived in the same way as foodgrains.

4. Other food aid consists mostly of Canadian wheat grants. It is assumed that these will be continued until India attains self-sufficiency,

5. Project aid utilization figures for 1968/69 and onward are based on IBRD and MOF estimates.

6. IBRD special deposit of $45 million in 1967/68 was part of the Consortium debt rescheduling exercise, and represents IBRD debt rescheduling of $15 million per year for 1967/68, 1968/69 and 1969/70. Accordingly, in each of these years $15 million is subtracted from the deposit and included in debt rescheduling.

7. IMF repayments for 1968/69 and onward are contractual obligations.

Table 3

Non-project Pipeline Analysis
($ millions)

	1966/67	1967/68	1968/69	1969/70 (a)	1969/70 (b)	1969/70 (c)	1969/70 (d)	1970/71 (a)	1970/71 (b)	1970/71 (c)	1970/71 (d)
Beginning year pipeline	347	830	859	872	872	872	872	805	864	933	1,017
Commitments	900	632	576	600 a/	659 b/	769 b/	899 b/	600 a/	822 b/	892 b/	977 b/
Disbursements c/	417	603	563	667	667	708	754	864	864	933	1,017
Year-end pipeline d/	830	859	872	805	864	933	1,017	541	822	892	977
Commitments breakdown:											
U.S.	382	295	276 e/								
Other Consortium	303	212	200								
IDA	215	125 f/	100								
	900	632	576	600	659	769	899	600	822	892	977

Notes:

a/ Represents amount of commitments which would result if U.S. level were limited to $260 million in 1969/70 and 1970/71.

b/ Amount of commitments needed to meet current year requirements and leave a 12 month year-end pipeline.

c/ Disbursement figures are non-project aid requirements as shown in Table 2a.

d/ Year-end pipelines for Cases (b), (c) and (d) in 1969/70 and 1970/71 are equal to the next year's non-project aid requirements for the following year.

e/ Includes: (1) $2.7 million vehicle loan; (2) $23 million fertilizer loan; (3) $200 million AID non-project loan and (4) $50 million EX-IM loan.

f/ Committed in 1968/69 but counted against 1967/68 pledge.

Table 4

Non-project aid pipeline commitments and disbursements 1967/68
($ millions)

	Pipeline on April 1, 1967	Commitments a/	Disbursements a/	Pipeline on April 1, 1968
1. Austria	7	5	5	7
2. Belgium	1	3	2	2
3. Canada	19	28	5	42
4. France	17	15	10	22
5. Germany	63	56	50	69
6. Italy	34	-	2	32
7. Japan	42	46	30	58
8. Netherlands	13	11	7	17
9. U.K.	35	48	39	44
10. U.S.A.	408	295 b/	285	418
11. I.D.A.	191	-	168	23
TOTAL	830	507	603	734

Notes:

a/ Excludes debt rescheduling as follows:

Canada	$2.2	million
Germany	7.3	"
Japan	6.1	"
U.K.	33.6	"
	49.2	"

b/ Includes: $275 million AID non-project loans, and $20 million from EX-IM.

Source: 1. Commitment and disbursement figures: MOF

2. Debt rescheduling figures: IBRD.

Table 5

Expected Consortium Commitments
in 1968/69 to be counted as non-project aid
($ millions)

	Non-project	Project	Debt Rescheduling*	Total
1. Austria	0.5	-	0.9	1.4
2. Belgium	2.0	-	0.9	2.9
3. Canada	35.0	-	-	35.0
4. France	15.0	-	5.0	20.0
5. Germany	17.5	17.5	27.5	62.5
6. Italy	-	-	5.5	5.5
7. Japan	28.5	-	16.5	45.0
8. Netherlands	9.2	-	0.6	9.8
9. U.K.	37.2	28.7	18.1	84.0
10. U.S.A.	275.0	-	-	275.0
11. Denmark	9.4	-	-	9.4
12. I.D.A.	225.0	-	-	225.0
	654.3	46.2	75.0	775.5

* Does not include the following debt rescheduling which is additional to non-project pledges:

Canada:	$1.1	million
USA :	8.7	"
IBRD :	15.0	"
	24.8	"

Table 6

Debt Service Schedule for India's External Public and Private Debt
($ millions)

	1967/68	1968/69	1969/70	1970/71	1971/72
Existing debt: 1/					
Loans payable in foreign currency	346.18	417.88	443.31	442.85	437.63
of which:					
IBRD/IDA	85.04	78.47	92.61	93.16	86.72
U.S.A.	27.84	93.85	76.68	87.42	83.67
U.K.	50.14	54.98	57.25	48.70	55.11
West Germany	52.35	67.49	72.82	75.35	76.53
France	7.16	18.05	18.96	18.72	17.49
Italy	6.76	10.13	16.05	16.03	17.53
Japan	35.38	52.80	62.02	69.25	66.87
Loans payable through export of goods	97.57	99.22	120.98	126.36	144.00
of which:					
USSR	85.79	73.03	87.72	85.35	97.28
Total loans repayable on existing debt	443.75	517.10	564.29	569.21	581.87
Loans repayable on new debt 2/		10.00	40.00	50.00	70.00
Total		527.10	605.29	619.21	651.87

Notes: 1/ Debt outstanding on March 31, 1968
2/ Based on expected utilization of new debt after 3/31/1968.

Sources: 1. Repayment of existing debt: MOF

2. " " new " : IBRD

ANNEX B.1

IMPORT PROJECTIONS

The basic approach used in making these import projections was to estimate anticipated demand for each commodity, match it against expected levels of domestic production and arrive at a gap between demand and supply to be filled by imports. Where production and demand could both be quantified the import requirements were explicit. This was the case for foodgrains, fertilizers, iron and steel and several other categories of imports. However, there were other categories which included such heterogeneous groups of commodities that domestic production could not be estimated. In these instances, attempts were made to relate import levels directly to aggregate measures of domestic economic activity. For example, imports of miscellaneous raw materials were related to industrial production and imports of machinery and transport equipment parts were related to large scale manufacturing. There were still other imports which, because of their low priority in foreign exchange allocations or because of strict government controls, are not affected by domestic supply and demand relationships. These are mostly consumer-oriented commodities. This group of imports was projected exogenously and was assumed to remain constant irrespective of the level of domestic activity.

The 1967/68 import figures used in this annex were compiled as follows. Starting with the DGCIS Monthly Statistics on Foreign Trade which gave imports totalling $2,632 million, the mission made adjustments in those categories which it knew to be in error. Foodgrain imports were raised from $691 million to $710 million in accordance with information obtained from the Ministry of Food and Agriculture and the Agricultural Attache's office. Fertilizer imports were raised by $82 million and POL was raised by $67 million based on information obtained from the Ministry of Finance. Some sources have maintained that the under-reporting of fertilizer imports is due to misclassification. Where the Mission was able to verify such misclassifications, adjustments were made accordingly. Thus, chemical imports were reduced by $25 million because of an unexplained increase in chemical urea imports which was almost certainly fertilizer, and miscellaneous transactions were reduced by $25 million because they were substantially higher than they had been in past years. The net result of all these adjustments was a $118 million increase in total imports to a level of $2,750 million.

The import projections for 1968/69 onwards are based on the following assumptions regarding domestic economic activity. These assumptions are explained in detail in Annex A.

Table B-1.1

	1968/69 (Rs. crores at 66/67 prices)	1969/70 Growth Rates			
		I	II	III	IV
Net Domestic Product	27,926	3.66	4.62	5.24	5.91
Agriculture	14,688	3.00	3.70	3.70	3.70
Industry	5,223	5.26	6.76	8.12	9.55
of which large scale manuf.	2,156	5.80	7.90	9.60	11.40
Transport & Trade	4,437	4.20	5.50	6.90	8.50
Services & Other	3,578	3.35	4.16	5.28	6.46
Gross Fixed Investment	4,324	6.20	8.50	11.60	15.30

The agriculture growth rates are in terms of value added and are therefore somewhat less than the projected growth rates for total production. Agricultural output is assumed to grow by 4 per cent in Case I and by 5 per cent in Cases II, III and IV.

TABLE B-1.2

INDIA's IMPORTS - 1961/62 TO 1966/67
($ millions)

	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67
1. Foodgrains	245.4	302.9	377.2	592.4	649.2	893.0
2. Fertilizers	31.5	62.4	79.1	69.0	94.1	128.9
a. manufactured	(25.7)	(56.1)	(72.5)	(60.8)	(81.7)	(117.6)
b. raw materials	(5.3)	(6.3)	(6.6)	(8.2)	(12.4)	(11.3)
3. Raw Cotton and Raw Jute	144.8	126.5	107.1	137.4	142.0	143.0
a. cotton	(131.6)	(119.5)	(102.8)	(122.0)	(97.0)	(67.2)
b. jute	(13.2)	(7.0)	(4.3)	(15.4)	(45.0)	(75.8)
4. Machinery and Transport Equipment	771.8	813.5	917.6	1,003.3	1,027.9	759.8
a. non-elect. machinery	(497.7)	(526.1)	(590.3)	(657.4)	(698.1)	(543.3)
b. electrical machinery	(133.4)	(136.0)	(178.1)	(191.6)	(183.1)	(137.1)
c. transport equipment						
- railway vehicles	(32.6)	(56.8)	(57.1)	(48.0)	(52.2)	(21.0)
- others	(108.1)	(94.6)	(92.1)	(106.3)	(94.5)	(58.4)
5. Iron and Steel	226.4	186.1	195.6	220.4	205.3	129.7
6. Non-ferrous Metals	103.9	115.7	115.6	121.6	143.5	114.3

Table B-1.2 (cont'd)

India's Imports - 1961/62 to 1966/67
($ millions)

	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67
7. POL	201.3	184.7	219.4	144.2	143.5	87.3
a. crude petroleum	(89.0)	(63.3)	(96.9)	(57.2)	(73.2)	(50.6)
b. petroleum products	(112.3)	(121.4)	(122.5)	(87.0)	(70.3)	(36.7)
8. Industrial Chemicals	139.1	135.5	110.7	118.4	119.4	119.6
9. Raw Materials, n.e.s.	55.7	66.4	75.7	78.8	69.9	51.9
10. Miscellaneous of which:	369.2	382.3	370.0	348.0	328.3	342.5
a. paper and paperboard	(33.5)	(28.6)	(28.3)	(27.6)	(28.1)	(28.7)
b. food other than cereals	(63.4)	(73.9)	(73.0)	(85.3)	(66.5)	(69.3)
c. beverages and tobacco	(3.5)	(3.5)	(2.3)	(1.6)	(1.2)	(0.6)
d. copra	(19.8)	(20.9)	(18.4)	(13.5)	(13.1)	(5.6)
e. crude rubber	(21.2)	(21.5)	(20.5)	(11.4)	(10.3)	(15.6)
f. raw wool and tops	(25.6)	(25.5)	(33.0)	(20.2)	(10.8)	(15.8)
g. oils and fats	(18.1)	(11.8)	(10.2)	(11.8)	(32.2)	(19.8)
h. med. and pharm. products	(23.7)	(19.5)	(18.1)	(17.2)	(18.4)	(23.2)
i. manufactured goods n.e.s.	(146.2)	(162.4)	(153.8)	(137.1)	(115.5)	(87.0)
j. misc. transact. & commod.	(14.2)	(14.2)	(14.7)	(22.4)	(32.2)	(32.2)
TOTAL	2,289.1	2,376.0	2,568.0	2,833.5	2,923.1	2,770.0

Source: DGCIS

TABLE B-1.3

IMPORT REQUIREMENTS FOR ALTERNATIVE NDP GROWTH RATES
($ Million)

	1967/68	1968/69	1969/1970				1970/1971			
			Case I	Case II	Case III	Case IV	Case I	Case II	Case III	Case IV
1. Foodgrains	710.0	575.0	475.0	425.0	450.0	475.0	350.0	240.0	265.0	290.0
2. Fertilizers	315.0	316.0	350.0	360.0	360.0	360.0	360.0	385.0	385.0	385.0
a. Manufactured	(279.6)	(267.8)	(293.7)	(304.0)	(304.0)	(304.0)	(289.0)	(314.0)	(314.0)	(314.0)
b. Raw Materials	(35.4)	(48.2)	(56.3)	(56.0)	(56.0)	(56.0)	(71.0)	(71.0)	(71.0)	(71.0)
3. Raw Cotton and Raw Jute	117.8	135.0	113.9	126.9	140.0	153.1	119.0	133.0	146.0	160.0
a. Cotton	(111.3)	(120.0)	(108.9)	(121.9)	(135.0)	(148.1)	(114.0)	(128.0)	(141.0)	(155.0)
b. Jute	(6.5)	(15.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)
4. Machinery & Transport Equip.	661.4	745.0	780.0	806.0	831.0	857.0	818.0	848.0	876.0	910.0
5. Iron and Steel	141.6	163.0	183.0	187.0	192.0	199.0	204.0	215.0	227.0	243.0
6. Non-Ferrous Metals	118.2	173.0	198.5	201.9	207.3	214.0	213.0	227.0	247.0	272.0
7. POL	149.8	172.0	175.9	178.0	179.9	181.9	180.0	182.0	184.0	186.0
a. Crude Petroleum	(103.1)	(132.0)	(135.9)	(138.0)	(139.9)	(141.9)	(140.0)	(142.0)	(144.0)	(146.0)
b. Petroleum Products	(46.7)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)
8. Industrial Chemicals	129.8	138.7	144.9	147.0	148.9	150.9	153.0	157.0	161.0	165.0
9. Raw Materials, n.e.s.	73.7	78.6	82.5	83.1	84.8	86.8	87.0	89.0	92.0	95.0

TABLE B-1.3 (Continued)
IMPORT REQUIREMENTS FOR ALTERNATIVE NDP GROWTH RATES

	1967/68	1968/69	1969/1970				1970/1971			
			Case I	Case II	Case III	Case IV	Case I	Case II	Case III	Case IV
10. Miscellaneous of which	332.8	323.9	324.0	324.0	324.0	324.0	319.8	319.8	319.8	319.8
a. Paper & Paperboard	(23.5)	(23.0)	(21.5)	(21.5)	(21.5)	(21.5)	(20.0)	(20.0)	(20.0)	(20.0)
b. Food & Other Cereals	(81.1)	(80.8)	(83.0)	(83.0)	(83.0)	(83.0)	(82.2)	(82.2)	(82.2)	(82.2)
c. Beverages & Tobacco	(2.3)	(0.8)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)
d. Copra	(5.9)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)
e. Crude Rubber	(5.9)	(1.0)	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)
f. Raw Wool & Tops	(15.7)	(16.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)
g. Oils and Fats	(44.5)	(45.3)	(46.1)	(46.1)	(46.1)	(46.1)	(46.2)	(46.2)	(46.2)	(46.2)
h. Medical and Pharmaceutical Products	(23.3)	(22.0)	(20.0)	(20.0)	(20.0)	(20.0)	(18.0)	(18.0)	(18.0)	(18.0)
i. Manufactured Goods, n.e.s.	(91.7)	(90.0)	(90.0)	(90.0)	(90.0)	(90.0)	(90.0)	(90.0)	(90.0)	(90.0)
j. Miscellaneous Transactions and Commodities	(38.9)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)	(40.0)
TOTALS	2,730.0	2,821.0	2,829.0	2,839.0	2,918.0	3,002.0	2,804.0	2,796.0	2,903.0	3,026.0

Foodgrains

Indian foodgrain production and availabilities in 1967/68 rose sharply from the drought-induced levels of 1966/67. As a result, it is estimated that net per capita availability will increase by over 20 per cent in 1967/68. Because this past year was an abnormally good year, production is expected to decline slightly in 1968/69. Thereafter, production is assumed to grow at 5 per cent per annum. Total supply and distribution of foodgrains for the period 1966/67 to 1970/71 is shown in the following table.

Table B-1.4

Supply and Distribution of Foodgrains 1/

(million metric tons)

	1966/67	1967/68	1968/69	1969/70	1970/71
Net production 2/	65.67	87.51	85.70	90.18	93.50
Imports 3/	8.67	8.50	7.30	5.30	3.00
Total supply	74.34	96.01	93.00	95.48	96.50
Δ in government stocks	-0.24	+3.00	+2.00	+2.00	+1.00
Total availability for human consumption	74.58	93.01	91.00	93.48	95.50
Net per capita availability (oz/day) 4/	14.2	17.1	16.4	16.4	16.4

1/ All figures refer to agricultural year: July-June.

2/ Gross production minus 12.5% for feed, seed and waste.

3/ Projections were obtained from Agriculture Attache's office. Valued at about $80 per ton.

4/ Based on a population growth rate of 2.5 per cent per annum.

Table B.1.4

ALTERNATIVE FOODGRAIN IMPORT REQUIREMENTS FOR 1969/70

	I	II	III	IV
1. National Income (Rs. crores)	28,768	29,004	29,226	29,472
2. Deviations in National Income from II Case (%)	- 0.8	-	+ 0.8	+ 1.6
3. Deviations in foodgrain consumption from II Case (%) 1/	- 0.32	-	+ 0.32	+ 0.64
4. Deviations in foodgrain consumption from II Case (m.m.t.) 2/	- .300	-	+ .300	+ .600
5. Deviations in net domestic production of foodgrains (m.m.t.) 3/	- 0.930	-	-	-
6. Foodgrain import requirements (m.m.t.)	5.93	5.30	5.60	5.90
7. Foodgrain import requirements ($ million) 4/	475	425	450	475

1/ Percentages in line 2 multiplied by .4.

2/ The 1969/70 foodgrain consumption level shown in Table 1 multiplied by the percentages in line 3.

3/ Case I reflects a 4% growth rate over 1968/69.

4/ Imports are valued at $80 per ton.

Table B-1.6

Fertilizer Projections - 1967-68 thru 1973-74

Demand, Production & Imports, and cost of imports (finished fertilizer and fertilizer raw materials)

	Unit of Measurement	1967-68	1968-69	1969-70	1970-71
N					
Demand b/	Thousand Tons	1,350	1,700	2,000	2,400
Production a/	Thousand Tons	365	590	905	1,302
Imports	Thousand Tons	963f/	1,050f/	1,095g/	1,098
Unit value of imports c/	$/Ton C&F	205	220	210	200
Value of imports	$ Million	197.4	231.0	230.0	219.6
P_2O_5					
Demand b/	Thousand Tons	500	650	800	1,000
Production a/	Thousand Tons	181	337	402	445
Imports	Thousand Tons	418f/	136f/	398g/	554
Unit value of imports c/	$/Ton C&F	140	145	145	145
Value of imports	$ Million	58.5	19.7	57.7	80.3
K_2O					
Demand b/	Thousand Tons	300	450	550	700
Imports a/	Thousand Tons	296f/	214	550	700
Unit value of imports	$/Ton C&F	80	80	75	75
Value of imports	$ Million	23.7	17.1	41.3	52.5
Total Value of Fertilizer Imports	$ Million	279.6	267.8	329.0	352.4
Raw Materials					
1. Nitrogenous - Ammonia e/					
Imports d/ h/	Thousand Tons	-	-	-	28
Unit value of imports	$/Ton C&F	-	-	-	40
Value of imports	$ Million	-	-	-	1.1
2. Phosphatic - Rock Phosphate, Sulfur, Phosphoric Acid					
Production h/	Thousand Tons	272	370	434	539
Unit value of imports	$/Ton (C&F) of Production	130	130	130	130
Value of imports	$ Million	35.4	48.1	56.4	70.1
Total Value of Fertilizer Raw Materials	$ Million	35.4	48.1	56.4	71.2
Total Value of Finished Fertilizers and Fertilizer Raw Materials	$ Million	315.0	315.9	385.4	423.6

Note: a/ Production: Mission estimates of 8/1/68. Potash production assumed to be zero.
b/ Demand: Targets are those recommended by the 4th Plan Working Group and concurred in by the Mission's Fertilizer Committee. Demand is defined as incremental requirement for distribution.
c/ Prices: Mission estimate. Increase in cost between 1967/68 and 1968/69 due to increased use of US-flag vessels from U.S. P_2O_5 finished product prices are meaningful only in conjunction with the N (unit value of imports) price for the same year.
d/ Ammonia Imports: 1.25 x Nitrogen output of Okha and Bombay area projects.
e/ The cost of Naptha for nitrogen production is assumed to be included in petroleum import estimates.
f/ 1967-68 imports are actual orders placed. 1968-69 import targets for P_2O_5 and K_2O have been reduced due to excess inventories.
g/ In 1969-70 GOI currently plans to import 1,024,000 tons of N and 420,000 tons of P_2O_5 based on their production estimates of 976,000 tons N and 380,000 tons P_2O_5. Actual imports will be based on latest available production estimates.
h/ Assumes six month inventories of raw materials. Therefore production figures used to calculate raw materials import requirements are two year moving average.

DP/IR:8/6/68

The Agricultural Attache's office estimates that in 1967/68 private stocks will be replenished by about 7 million tons. This would imply a per capita consumption level of only 15.8 ounces per day. Assuming that the subsequent years are normal and that stocks remain unchanged, consumption will equal availabilities. Under these assumptions per capita consumption increased by 12.1 per cent in 1967/68 and will rise by 3.8 per cent in 1968/69, and will remain constant through 1970/71. In other words, the import levels projected in the above table would make it possible for India to build up an 8 million ton buffer stock by 1970/71 while maintaining per capita consumption at close to 16.5 ounces per day. What this means in terms of self-sufficiency and adequate consumption levels is explained in Annex E.

In estimating the alternative foodgrain import requirements for Cases I, II, III and IV in 1969/70 it was assumed that the per capita consumption level of 16.4 ounces per day used in Annex E is the minimum level consistent with a 5 per cent growth rate in foodgrain production in 1969/70 and that the income elasticity of demand for foodgrains is .4. The alternative foodgrain import requirements for 1969/70 were then derived as shown in Table 2. The same approach was used in determining alternative 1970/71 foodgrain import requirements.

Raw Cotton

Raw cotton import requirements are projected under the following assumptions:

1. Domestic production of raw cotton in 1968/69 will not be any higher than the exceptionally good 1967/68 crop, but will grow by 4 per cent and 5 per cent in 1969/70 and 1970/71. These growth rates are slightly lower than for foodgrains reflecting the current emphasis on maximizing foodgrain production.

2. Consumption of raw cotton is estimated to have increased by 7.7 per cent in 1967/68 (5 per cent on a per capita basis). Per capita consumption of raw cotton is projected to grow by 2.4 per cent in 1968/69 and by 1.5 per cent in 1969/70 and 1970/71. It will be noted from Table B-1.7 that, despite rather large increases in total consumption, on a per capita basis consumption is only returning to the levels prevailing during the early 1960s.

3. Stocks of domestic raw cotton are projected to increase gradually from the extremely low 1967/68 year-end levels.

TABLE B-1.7

COTTON CONSUMPTION RELATED TO PER CAPITA INCOME

Year	Consumption (000/Bales)	Population (Millions)	Bales per Million of Population	Change in per Capita Consumption	Per Capita Income a/	Change in per Capita Income
1955/56	5,224	397.8	13.1		267.8	
1956/57	5,500	405.8	13.6	+ 3.8	275.6	+ 3.1
1957/58	5,336	414.3	12.9	- 5.1	267.3	- 3.0
1958/59	5,384	423.3	12.7	- 1.6	280.1	+ 4.8
1959/60	5,415	432.7	12.5	- 1.6	279.2	- 0.3
1960/61	5,664	442.7	12.9	+ 3.2	293.2	+ 5.0
1961/62	6,025	453.4	13.3	+ 3.1	294.3	+ 0.4
1962/63	5,992	464.3	12.9	= 3.0	293.4	- 0.3
1963/64	6,403	475.5	13.5	+ 4.7	306.1	+ 2.6
1964/65	6,735	487.0	13.8	+ 2.2	317.0	+ 5.3
1965/66	6,122	498.9	12.3	- 10.9	291.0	- 8.2
1966/67	6,176	511.3	12.1	- 1.6	289.0	- 0.7
1967/68	6,650	524.0	12.7	+ 5.0	309.0	+ 7.0
1968/69	6,982	537.1	13.0	+ 2.4	312.7*	+ 1.2
1969/70	7,256	550.5	13.2	+ 1.5	316.5*	+ 2.4
1970/71	7,546	564.0	13.4	+ 1.5	320.3*	+ 2.4

* - Based on the following National Income growth rates:

1967/68 - 9.7 Percent
1968/69 - 3.7 "
1969/70 - 5.0 Percent
1970/71 - 5.0 "

a/ (Rs. 1948/49 Prices).

TABLE B-1.8

SUPPLY AND DISTRIBUTION OF RAW COTTON IN INDIA
(000/Bales - 393 lb. each)

	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71
Beginning Stocks	1,929.5	2,520.9	3,002.7	2,837.2	2,700.3	2,658.4	3,082.4	2,898.4	2,772.4
- India	(1,675.8)	(2,253.5)	(2,575.9)	(2,342.3)	(2,272.2)	(2,036.3)	(2,036.3)	(2,100.0)	(2,150.0)
- Foreign	(253.7)	(267.4)	(426.8)	(494.9)	(428.1)	(622.1)	(1,046.1)	(798.4)	(622.4)
Production	6,040.0	6,400.0	6,000.0	5,600.0	5,600.0	6,300.0	6,250.0	6,500.0	6,800.0
Imports	913.5	768.2	817.6	556.1	762.0	1,024.0	800.0	900.0	850.0
- 1 3/16 and over			(312.6)	(265.9)	(305.0)	(318.5)			
- 1 1/16 to 1 3/16			(435.0)	(163.7)	(320.0)	(400.0)			
- 1" and under			(70.0)	(126.5)	(137.0)	(305.5)			
Total Supply	8,883.0	9,689.1	9,828.3	8,993.3	9,062.3	9,982.4			
Consumption	5,992.9	6,403.0	6,735.2	6,121.6	6,175.9	6,650.0	6,977.0	7,256.0	7,546.0
- Domestic	(5,093.1)	(5,794.2)	(5,985.7)	(5,498.7)	(5,607.9)	(6,050.0)	(5,929.3)	(6,180.0)	(6,530.0)
- Foreign	(899.8)	(608.8)	(749.5)	(622.9)	(568.0)	(600.0)	(1,047.7)	(1,076.0)	(1,016.0)
- 1 3/16 and over			(283.7)	(274.8)	(312.7)				
- 1 1/16 to 1 3/16			(375.8)	(235.6)	(218.2)				
- 1 and under			(90.0)	(112.6)	(37.1)				
Exports	369.2	283.4	247.9	171.4	228.0	250.0	257.0	270.0	270.0
Closing Stocks	2,520.9	3,002.7	2,837.2	2,700.3	2,658.4	3,082.9	2,898.4	2,772.4	2,606.4
- Indian	(2,253.5)	(2,575.9)	(2,342.3)	(2,272.2)	(2,036.3)	(2,036.3)	(2,100.0)	(2,150.0)	(2,150.0)
- Foreign	(267.4)	(426.8)	(494.9)	(428.1)	(622.1)	(1,046.1)	(798.4)	(622.4)	(456.4)

Source: 1. Historical data was taken from Agricultural Attache Cotton Reports.
2. Projections are the Agricultural Attache estimates used in Annex F of this Program Memorandum.

Note: Imports valued at $150 per bale.

The supply and distribution figures reflecting these assumptions are given in Table B-1.8. In addition, the table breaks down raw cotton imports into long, medium and short staple. It will be noted that consumption of long staple foreign cotton has usually been equal to imports while consumption of short staple foreign cotton has been falling short of imports. This implies that the continually increasing stocks of foreign cotton are of the short staple variety and therefore similar to domestically produced cotton. The sharp increase in consumption of foreign cotton in 1968/69 and subsequent years basically reflects a drawdown in the short staple foreign cotton pipeline and increased use of PL 480 short staple cotton to meet the shortfall in domestic production.

The cotton consumption projections were not related to changes in per capita income. However, for the purpose of estimating alternative import requirements for 1969/70 it is assumed that the cotton import figure estimated by the Agricultural Attache's office is consistent with Case III, i.e. a 5.3 per cent growth in National Income in 1969/70. The income elasticity of demand for cotton was estimated to be about 1.5. Using the same approach as for foodgrains, the cotton import requirements for 1969/70 Cases I, II, III and IV in $ millions were estimated to be 108.9, 121.9, 135.0 and 148.1 respectively.

Raw Jute

Imports were exceptionally high in 1965/66 and 1966/67 because of bad crops. In March 1967 the open general license on jute imports was stopped because of the good harvest and imports dropped to about $7 million. Indian demand for raw jute is solely related to the export market for jute manufactures which is neither volatile nor fast growing. Domestic production, on the other hand, experiences sharp fluctuations as shown below:

Area and Production of Jute and Mesta

Year	Area (thous. hectares)	Production (thous. bales)
1960/61	903	5,263
1961/62	1,342	8,236
1962/63	1,242	7,185
1963/64	1,270	7,976
1964/65	1,199	7,604
1965/66	1,096	5,756
1966/67	1,116	6,562
1967/68	n.a.	7,600

Source: Area, Production and Yield of Principle Crops, Ministry of Food and Agriculture.

Although India is attempting to attain self-sufficiency in raw jute as soon as possible, imports will continue to fluctuate with changes in production. In 1968/69 it is expected that there will be a shortfall in domestic production. Accordingly, imports are projected at $15 million. Imports in 1969/70 are projected to drop back to $5 million on the assumption that production will return to 1967/68 levels.

Machinery and Transport Equipment

Imports of machinery and transportation equipment, are closely related to the level of investment. A scatter diagram relating this group of imports to investment for the period 1956/57 to 1965/66 shows a stable relationship between changes in investment and changes in imports with very little year to year variation. This relationship, however, did not continue through 1966/67 and 1967/68. In 1966/67 there was a sharp drop in investment and a much greater than proportionate drop in imports. In 1967/68 investment remained virtually unchanged while imports dropped further.

Three significant developments during this period can help explain this phenomenon: (1) the June 1966 devaluation raised the costs of machinery imports, (2) the drop in investment was accompanied by continued growth in output of domestic machinery and transport equipment industries and (3) project aid utilization, virtually the only source of foreign exchange for machinery and transport equipment imports, dropped substantially in both years. Until the economy returns to normal and a new relationship between these imports and domestic economic activity is established, one can only hypothesize on what role each of these played in the large decline in imports in 1966/67 and 1967/68. The assumptions regarding these factors which were used in projecting future imports will become clear in the following paragraphs.

In making these projections the machineryand transport equipment category of imports was divided into whole machinery and machinery parts. For the period 1961/62 to 1967/68 the breakdown is as follows:

$ Millions

	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68
Whole machinery	379.7	384.5	448.5	428.1	429.3	494.0	387.0
Machinery parts	395.7	428.5	469.5	573.9	599.7	265.8	274.4
TOTAL	775.4	813.0	918.0	1,002.0	1,029.0	759.8	661.4

The figures up to 1965/66 are based on a DGCIS study separating whole machinery from parts. For 1966/67 and 1967/68 whole machinery was equated to project aid and the parts figures were arrived at as a residual. Until recent years project aid has always been larger than imports of whole machinery but, according to the Ministry of Finance, in 1967/68 the amount of basic materials financed by project aid was about equal to imports of whole machinery not financed by project aid. This situation is expected to continue for several years.

It will be noted from the above table that in recent years, except for the 1966/67 figure which almost certainly includes imports other than whole machinery, whole machinery imports have been remaining constant in the $400-$450 million range. India's demand for machinery has been increasing greatly but domestic capacity has grown at least as fast and can be expected to continue doing so. Rather than simply project whole machinery imports at a level within the $400 - $450 million range, we have equated them to expected levels of project aid utilization. These are $425 million in 1968/69 and $450 million in 1969/70. In estimating import requirements for the alternative 1969/70 and 1970/71 cases it was assumed that $450 million related to Case III and that requirements for the other cases would vary in proportion to the differences in investment levels. The imports of whole machinery relating to Cases I, III and IV are projected to be $428.0, $438.0 and $465.0 million respectively. The levels for Case IV are slightly higher than past levels reflecting the increased requirements of imported machinery resulting from an exceptionally high investment growth rate.

It will be noted from the above that devaluation is assumed to have no effect on whole machinery imports. The decline is analyzed only from the point of view of an overall drop in investment demand and a drop in project aid utilization. In 1966/67 gross investment dropped by 7 per cent, and project aid dropped from $684 million to $494 million. The following year project aid dropped by another $107 million while the investment level remained unchanged. The 1967/68 decline in project aid utilization was probably due to inventory drawdowns stemming from the recession in the industrial sector. In any case it is assumed that India has a continuing demand for about $400 million of whole machinery imports most of which will be unaffected by devaluation.

The drop in imports of machinery parts, on the other hand, appears to have been greatly affected by devaluation. After increasing from about $400 million in 1961/62 to about $600 million in 1965/66, these imports dropped to $266 million in 1966/67 and rose slightly to $274 million in 1967/68. These movements in machinery parts imports are related to large scale manufacturing in Chart I.[illegible]. It will be noted that the downward shift in

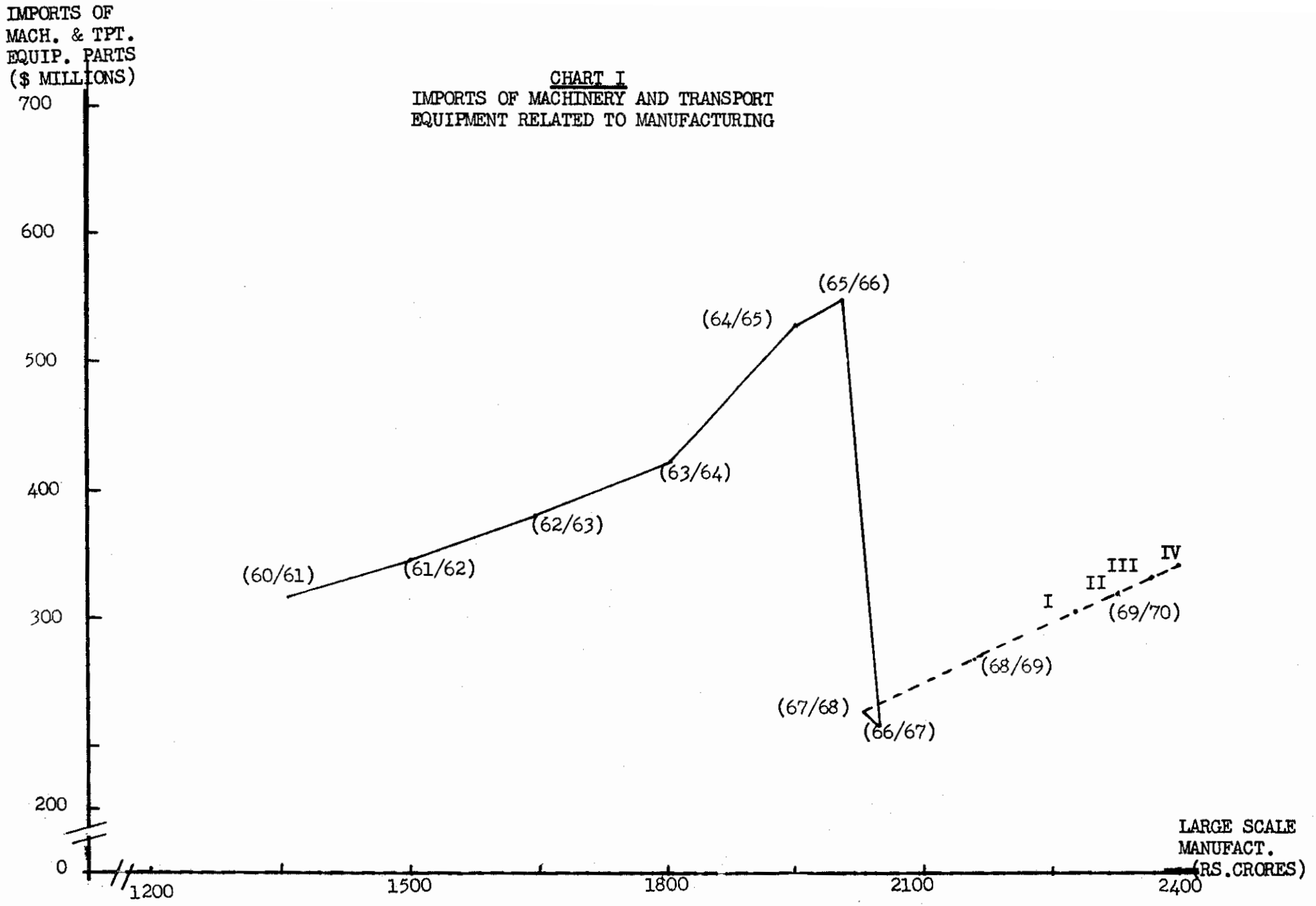


CHART I
IMPORTS OF MACHINERY AND TRANSPORT
EQUIPMENT RELATED TO MANUFACTURING

1966/67 was accompanied by a slight increase in manufacturing. Assuming that imports did in fact drop because of devaluation, imports of machinery parts are projected to grow in 1969/70 at more or less the same rate as during the Third Plan from the 1967/68 base. In 1970/71, the rate of increase is expected to decline slightly as the rate of import substitution increases.

Total machinery and transport equipment requirements based on the above analysis can be shown as follows:

($ Millions)

		Whole Machinery	Machinery Parts	Total
1968/69		425	320	745
1969/70	I	428	352	780
	II	438	368	806
	III	450	381	831
	IV	465	392	857
1970/71	I	428	390	818
	II	438	410	848
	III	450	426	876
	IV	465	445	910

These projections are at best tenuous because of exceptional developments in the last two years. Only after the Indian economy as returned to normal for two or three years will it be possible to establish new relationships between imports and domestic activity.

Iron and Steel

Iron and steel imports are projected to grow at 15 per cent per year from the 1967/68 base reflecting a change in the types of iron and steel required by the industrial sector. In the past, India used large amounts of bars and structurals in dams, railroads and construction. Recently, however,

demand has shifted to flat products and special steels which the domestic iron and steel industry is not set up to produce. It is expected that as investment levels and industrial production return to normal, the shortage of flat products will be reflected in rapidly rising iron and steel imports.

The 15 per cent growth projection used in this annex is the lower limit of a 15 - 20 per cent range estimated by the Ministry of Finance. An attempt was made to verify this by using the requirements estimates derived by the Planning Commission when they compiled the material balances for the original Fourth Plan. These balances also show a shortage of flat products but they also show much higher import requirements than is implied in the import levels of the last two years. The Mission has assumed that the Planning Commission projections were based on inaccurate and outdated norms and has accepted the more conservative Ministry of Finance estimate.

In estimating import requirements for the alternative 1969/70 and 1970/71 cases it was assumed that the level of imports would vary in proportion to the changes in gross fixed investment and that the 15 per cent growth rate relates to Case II.

Non-ferrous Metals

As with iron and steel, import requirements of non-ferrous metals were projected by matching expected demand for each metal against domestic capacity. The demand projections were based on the relationship between non-ferrous metal consumption and gross investment which was used by the Perspective Planning Commission in the Fourth Plan, Material and Financial Balances. The levels used in that publication for 1970/71 were adjusted to reflect the 1970/71 investment levels used in this annex instead of the PPD estimate of Rs. 6,920 crores (1966/67) prices. The Mission demand estimates for 1970/71, as well as production estimates and import requirements are given in Table B.1.9 .

Estimates of import requirements for 1968/69 and for the 1969/70 alternatives were made in the aggregate. Imports for 1965/66 and 1970/71 were calculated as a per cent of gross investment. Applying the extrapolated percentages to the expected levels of gross investment in 1968/69 and 1969/70 yielded the import levels shown in the summary table.

Petroleum and Petroleum Products

The projections assume that India will continue to import about $40 million in petroleum products through 1970/71 the bulk of which will be lubri-

TABLE B-I.9

DEMAND, PRODUCTION & IMPORT REQUIREMENTS OF NON-FERROUS METALS 1970/71 a/

	Units	Aluminum	Copper	Lead	Tin	Zinc	Other	Total
Case I								
Demand	000/Tons	196.5	117.0	69.7	5.4	93.6		482.2
Production	"	165.9	23.9	14.6	-	38.0		242.4
Imports	"	30.6	93.1	55.1	5.4	55.6		239.8
Imports	$ Million	18.9	114.5	13.8	18.9	16.7	30 b/	212.8
Case II								
Demand	000/Tons	205.2	122.2	72.8	5.6	97.8		503.6
Production	"	165.9	23.9	14.6	-	38.0		242.4
Imports	"	39.3	98.3	58.2	5.6	59.8		261.2
Imports	$ Million	24.2	120.9	14.6	19.6	17.9	30 b/	227.2
Case III								
Demand	000/Tons	217.0	129.2	77.0	5.9	103.4		532.5
Production	"	165.9	23.9	14.6	-	38.0		242.4
Imports	"	51.1	105.3	62.4	5.9	65.4		290.1
Imports	$ Million	31.5	129.5	15.6	20.7	19.6	30 b/	246.9
Case IV								
Demand	000/Tons	231.6	138.0	82.2	6.3	110.4		568.5
Production	"	165.9	23.9	14.6	-	38.0		242.4
Imports	"	65.7	114.1	67.6	6.3	72.4		326.1
Imports	$ Million	40.5	140.3	16.9	22.1	21.7	30 b/	271.5

a/ The alternative cases refer to the NDP assumptions given in the introduction. The corresponding investment levels are as follows: Cases I - 4,875; II - 5,092; III - 5,385; and IV - 5,748.

b/ Platinum, antimony ore, magnesium, nickel, ferro-alloys.

cants in which India is not expected to become self-sufficient for some time. Domestic production is expected to exceed the demand for kerosene and thus zero imports are projected for this item.

Crude petroleum imports are likely to grow during the Fourth Plan. On the basis of proprietory information, domestic crude output in CY 1971 is expected to be 8.5 million tons. On the basis of refinery throughput of 22.2 million tons; India will need to import 13.7 million tons of crude in 1971 costing an estimated $164.4 million at $12 per ton.

In estimating import requirements of crude petroleum for the alternative 1969/70 and 1970/71 cases it was simply assumed that the level of imports would vary in proportion to the changes in industrial growth and that the requirements given in Table below relate to Case III.

Petroleum and Petroleum Products - Projections CY 1967-1971 *

(million tons)

	1967	1968	1969	1970	1971
Crude Processed	16.0	17.5	18.5	20.5	22.2
Domestic Crude	6.0	6.5	7.0	8.5	8.5
Import Requirements	10.0	11.0	11.5	12.0	13.7
Production of Products **					
Light Distillates	1.4	2.8	3.1	3.6	3.9
Kerosene	3.0	2.8	2.1	3.5	3.8
Diesels	3.7	4.3	4.8	5.4	5.8
Heavy Ends	4.8	5.1	5.7	6.6	7.2

* Allow approximately 7% for losses and refinery fuel. Balance of product mix: lubes, asphalts, solvents, LPG, etc.

** Indian Institute of Petroleum, Expansion of Refining Capacity In India 1971 to 1975, February 1968. Overall the estimates fall about midway between the Energy Survey Committee estimates related to 5% to 6% growth in national income.

Industrial Chemicals

Imports of industrial chemicals declined slightly during the early 1960's and remained more or less constant between 1963/64 and 1966/67. In recent years, however, this category of imports has been affected by a sudden spurt in imports of high quality urea. While imports of urea were negligible during the Third Plan period they amounted to about $28 million of 1967/68 accounting for most of the rise in chemical imports since 1965/66. Although a major use of high quality urea is in the production of plastics and two large plastics plants have come on stream in the last 18 months this could not account for more than two or three million dollars worth of urea imports. A more likely explanation for the sharp rise is the misclassification of fertilizer imports as chemical urea. Since it is fairly certain that the Customs import data understate fertilizer imports the Mission has revised the Customs fertilizer figures for 1966/67 and 1967/68 upward and subtracted urea from the Customs industrial chemical figures in those years. The resulting figure for 1967/68 is $129.8 million and imports for future years are projected to grow at the same rate as industrial production.

Raw Materials, n.e.s.

This category of imports includes such commodities as hides and skins, oilseeds n.e.s., wood and lumber products, crude animal and vegetable materials, sulphur and metallic-ferrous ores. These items are used in large parts of the industrial sector and are therefore projected to increase at the same rate as industrial production. The figures after 1965/66 are not comparable with the previous ones because, from 1966/67 onwards sulphur used in fertilizer production is excluded. Rock phosphate and sulphur for fertilizers are projected as fertilizer raw materials.

Food Other than Cereals

This category consists of cashew nuts, dairy products, betelnuts, and fruits and vegetables (largely from East Africa, Tanganyika, Iraq, and Iran). Import projections in this group are made under two heads: cashew nuts and others. Past trends of imports of this group of commodities are shown below:

	Total	Cashew	Others	(U.S. $ million) Three-year Moving Average for "Others"
1958/59	62.8	16.1	46.7	
1959/60	65.8	15.2	50.6	48.5
1960/61	68.6	20.2	48.4	49.4
1961/62	63.4	14.1	49.3	50.8
1962/63	73.9	19.2	54.7	51.4
1963/64	73.1	22.9	50.2	51.9
1964/65	85.3	34.5	50.7	45.5
1965/66	66.6	31.6	35.7	41.7
1966/67	69.3	30.6	38.7	41.5

Total supplies of cashews are projected on the basis of the export forecast for processed cashews. Internal production in 1965/66 was 89,600 metric tons against the Third Plan target of 134,000 metric tons for that year. Thus the original Fourth Plan target of 294,000 metric tons in 1971 has to be revised drastically. New cashew plantations cannot be economically exploited for a period of from 5 to 7 years; hence Third Plan and earlier production programs have a delayed impact on production levels. A figure approximating the Third Plan target thus appears to be the more likely estimate of production in 1971. Import figures decline gradually for the latter years of the Fourth Plan, with a sizeable dip in 1968 due to extensive cyclone damage to the Tanzania and Kenya crops in November 1967. This projected reversal of the trend in imports is based on the expected growth of the processing industry in Africa and its consequences for Indian exports and imported raw nut supplies. If these expectations do not materialize, the trend may be sustained with import requirements geared to higher export levels.

Table B-I-12

Projected Levels and Pattern of Raw Nut Supplies
(in metric tons)

	Total Supplies	Internal Production c/	Imports Quantity	Imports Value a/
1967/68 b/	235,000	85,000	150,000	29.2
1968/69	230,000	90,000	140,000	27.3
1969/70	250,000	104,000	146,900	28.8
1970/71	258,200	118,000	140,200	27.3

a/ Average 1967 price of $195 per ton
b/ Trade estimate for current year
c/ Applies only to amount available for kernal processing

For the remaining food imports, two series of import projections are given below: one based on the expected rate of population growth of 2.5 per cent a year (A); the other on the trend in the growth of these imports, i.e. 1.35 per cent a year (B). Both are based on 1964/65 -- the last relatively normal year. The demand for commodities in this category may be expected to increase at a rate proportional to the increase in population. Imports of these commodities, however, are largely financed through bilateral trade arrangements which are likely to grow at the trend pace, i.e. series B.

	(U.S. $ Millions)	
	A	B
1966/67 (actual)	38.7	38.7
1967/68	50.0	50.0
1968/69	55.9	53.5
1969/70	57.3	54.2
1970/71	58.8	54.9

Beverages and Tobacco

Projected to remain at about 1965/66 levels. The trend has been downward and import restrictions are expected to remain tight.

Rubber

The substantial progress made toward India's self-sufficiency in rubber is indicated by the attached table. The stepped-up efforts made during the second and third Plans for new rubber tree plantings and better seeds are now paying off; further, the Barielly synthetic rubber plant has surmounted its initial growing pains.

The 1966/67 import level is most unlikely to be a harbinger of future trends. Following an increase in local prices, the Government issued licenses for import of 2,700 tons in July 1965 and further licenses for 10,000 tons in 1965/66. The latter related to the tire industry's status as a priority industry under the liberalization program. The resulting imports of 26,288 tons between September 1966 and June 1967 represented a record level, which also coincided with peak local production. The result was a glut on the market, a decline in prices, and a revision in rubber import policy.

TABLE B-I-13

PRODUCTION, IMPORT AND CONSUMPTION OF ALL KINDS OF RUBBER
(metric tons)

YEAR	PRODUCTION		IMPORT		PRODUCTION/ IMPORT	TOTAL	CONSUMPTION			
	Natural Rubber	Synthetic Rubber	Natural Rubber	Synthetic Rubber	of reclaimed rubber		Natural Rubber	Synthetic Rubber	Reclaimed Rubber	Total
1950/51	15830	-	4170	-	NA	20000	19854	-	NA	19854
1955/56	23730	-	4428	1201	2853	32212	28445	461	2647	31553
1961/62	27446	-	22528	10121	6422	66517	48410	10186	6046	64642
1962/63	32239	-	23360	10297	6839	72735	53553	10723	6850	71126
1963/64	37487	8075	26275	8812	8251	88900	61155	11959	7982	81096
1964/65	45616	11633	15003	3315	9349	84916	61057	15285	9369	85711
1965/66	50530	14741	16357	2735	9764	94127	63765	21553	9774	95092
1966/67	54818	22358	23544	5606	11507	117833	68685	23592	10913	103190

NA: Not available

Source: Indian Rubber Statistics, Volume 10, 1967

For 1968/69 natural rubber production is expected to approximate 65,000 tons, synthetic 25,000-29,000 tons, and carryover stocks (including reclaimed materials) to run 35,000 -- yielding a comfortable supply of 130,000 tons. Accordingly, the 1968/69 and forward projections limit imports to 4,000 tons of special purpose synthetic rubber, priced at $600 per ton.

Copra

The withdrawal of export incentives following devaluation resulted in a sharp decrease in copra imports. The GOI import policy statement announced April 1 continued the tight policy with respect to copra, restricting imports to those made by the State Trading Corporation and allocations of imported copra to actual users.

Assuming that the current tight foreign exchange situation will persist through 1970/71, the projections show copra imports marginally lower than the already reduced level of 1967/68, financed mainly under rupee trade agreements with neighboring countries.

Raw Wool and Wool Tops

India exports low quality wool (mainly for carpets) and imports better qualities (mostly tops) needed for manufacture of finer fabrics.

During the Third Plan domestic wool production levels moved erratically upward at a rate approximating 2 - 3 per cent per year -- reaching 80 million pounds in 1966. A U.N. Technical Assistance Program (started in 1962, scheduled to terminate in 1968, and programmed for $6.0 million) is designed to provide experimental stations with research and training facilities in sheep husbandry, wool shearing, grading, test-technology and processing. Taking a reasonably optimistic view, this sizeable project -- and hopefully other efforts -- should provide larger quantities of higher grades of wool by 1970/71. In any event, it is assumed that the bulk of domestic demand for better grade woolen materials will be met from domestic wool supplies whether the supplies in fact satisfy domestic demand or if import restrictions enforce this situation. A notional item of $15.0 million has been retained for 1970/71 imports of high grade woolens needed for the export trade and some marginal domestic consumption.

Oils and Fats

This category of imports is influenced mainly by PL 480 imports of tallow and soybean oil. These two commodities were, therefore, projected on the basis of information obtained from the Agricultural Attache's office and the remainder of oils and fats was projected in line with the growth in population. Estimates for 1967/68 and projections for subsequent years are as follows:

($ Millions)

	Soybean oil 1/	Tallow 2/	Other	Total
1967/68	20.3	19.5	4.1	43.9
1968/69	30.6	10.5	4.2	45.3
1969/70	30.6	11.2	4.3	46.1
1970/71	30.6	11.2	4.4	46.2

1/ Assumed c.i.f. value of $235 per metric ton
2/ Assumed c.i.f. value of $140 per metric ton

Medicinal and Pharmaceutical Products

Although imports have risen in recent years, domestic production is expected to meet a continually increasing portion of the demand for standard medicines shortly after 1970/71 but imports will continue because of newly developed drugs, special products and family planning requisites.

Manufactured Articles, n.e.s.

This category of imports consists of many consumer-oriented commodities such as books, and photographic equipment, and specialized items such as scientific measuring equipment. These imports have been declining steadily since the early 1960's -- presumably a reflection of tighter import controls over non-priority uses and growing import substitutions. The projections assume that they will remain constant at $90 million through 1970/71 implying a minimum requirement of various commodities not produced in India.

ANNEX C

DEVELOPMENT PLANNING

In the analysis of Part I of this Program Memorandum, an examination is made of the implications for the Indian economy of different growth rates and aid levels over the next few years. This Annex explores the alternatives and potential for India's growth over a somewhat longer horizon - the eight-year period from 1967-68 to 1975-76. Specific attention is given to the implications for India's economic development of different levels and time-patterns of net aid over this longer time-span.

If due allowance is made for differences in assumptions, methods, and time horizon, the conclusions reached in this Annex and in Part I, especially in the Appendix to Part I, strongly support each other. Superficially, however, they may not appear to. For example, for the same increments in aid, Part I seems to suggest that much larger increments in growth can be obtained than does this Annex. If in this introduction we point out the reasons for this seeming difference, the reader may have a better basis for comparing the two analyses. First, the highest aid level considered in Part I is higher than the highest considered here. Second, the model used here starts with the assumption that there is no substantial amount of excess capacity in the economy and then searches for a short-term rate of growth that can be sustained and increased in the future; it does not permit the possibility of a more rapid initial growth rate, based on improved utilization of excess capacity, which would drop to more sustainable levels in later years. Since Part I takes into account the excess capacity and the possibility of higher aid levels, it reaches the conclusion that a higher rate of growth is possible at least for a few years. Properly interpreted, the results given here add to this picture by corroborating the fact that this higher rate of growth cannot be sustained unless the higher rate of growth over the next few years can boost the investment base level sufficiently or aid levels higher than those considered in this Annex are available.

The longer-term analysis given here is especially of interest this year in anticipation of the formulation of India's delayed Fourth Five Year Plan. The new Plan - now to cover the period 1969-70 to 1973-74 - will set the framework for India's development over this period. A description of the current status of the preparation of the new Fourth Plan and of the recent institutional changes in the planning process which underly it is given in Annex C-1. In this Attachment a summary is given of the major aspects of the recent Planning Commission document "Approach to the Fourth Five Year Plan" which was placed before the National Development Council in May 1968 with the purpose of seeking guidelines for the Plan from this Council. Briefly, the "Approach" document and the ensuing discussion by the NDC consider an overall growth rate during the Fourth Plan period of 5 to 6 percent for the Indian economy, with agriculture to grow at 5 percent, net foreign aid (including food aid) to be reduced to half the current level by the end of the Plan, and exports to grow at a 7 percent rate if possible.

Decision-making under uncertainty

In approaching its next decade of development, India faces only one element of certainty - population pressures will become worse before they become better. On any realistic assumptions with respect to newly launched family planning programs, the annual population growth rate is not likely to drop below 2.5% until late in the 1970's - if then. Indeed, to the extent that per capita incomes and nutrition improve during the decade, population pressures are likely to intensify. There is no early prospect that urbanization and industrialization will offset these Malthusian problems.

Aside from population growth, there are uncertainties in almost every other parameter that enters into a development planning calculation: future aid levels, export growth rates, agricultural growth rates, improvements in utilization of capacity, and in the ability to mobilize domestic savings. With sufficiently high performance in each of these dimensions, it is possible to construct an internally consistent set of balances that imply a growth rate of 6% for national income during India's Fourth Plan. (Between 1960-61 and 1967-68, the growth rate averaged 4% annually.) Among the essential components of a 6% plan would be: a sustained input of external assistance, growth rates of 7% for exports and 5% for agriculture, improved capacity utilization and shortened gestation lags leading to an incremental output-capital ratio of 50%, and a marginal propensity to save of 25%. Each of these ratios or growth rates would represent a highly welcome improvement over past history. To strive for this type of performance is desirable in itself, but it is wishful thinking to commit the Fourth Plan's aggregate investment outlays as though these were firmly assured parameters.

A 6% income growth plan would be associated with net investment outlays of Rs. 230 billions or more. This size plan - though logically consistent - would be highly vulnerable to inflation in the event of failure to achieve any one of the specified targets. Given the uncertainties on performance, it is improbable that India's present political leadership will gamble on a recurrence of inflation. Instead, it is likely to opt for a slower pace of development. Prudence would suggest an initial commitment to a "core plan" ranging between Rs. 180-200 billions - to be followed by a stepup in new investment starts during the early 1970's - if and when the growth of national income exceeds 5%. It is this general viewpoint - a plan that would be manageable even in the face of temporary setbacks - that underlies the macroeconomic balances presented in this annex.

Agricultural performance

From the bumper crop of 1967-68, an important lesson in development planning has been learned. Indian agriculture - despite obsolete share-cropping institutions of land tenure - is like other industries. Given adequate physical inputs and price incentives, the supplies of food and fiber need not remain stagnant as they did during most of the 1960's.

Just as it was lacking in historical perspective during 1965-67 to have supposed that Indian agriculture was doomed to stagnation, so today in 1968 - despite all our hopes for a "Green Revolution" - it is reckless to draw up plans for the rest of the economy as though a 5% agricultural

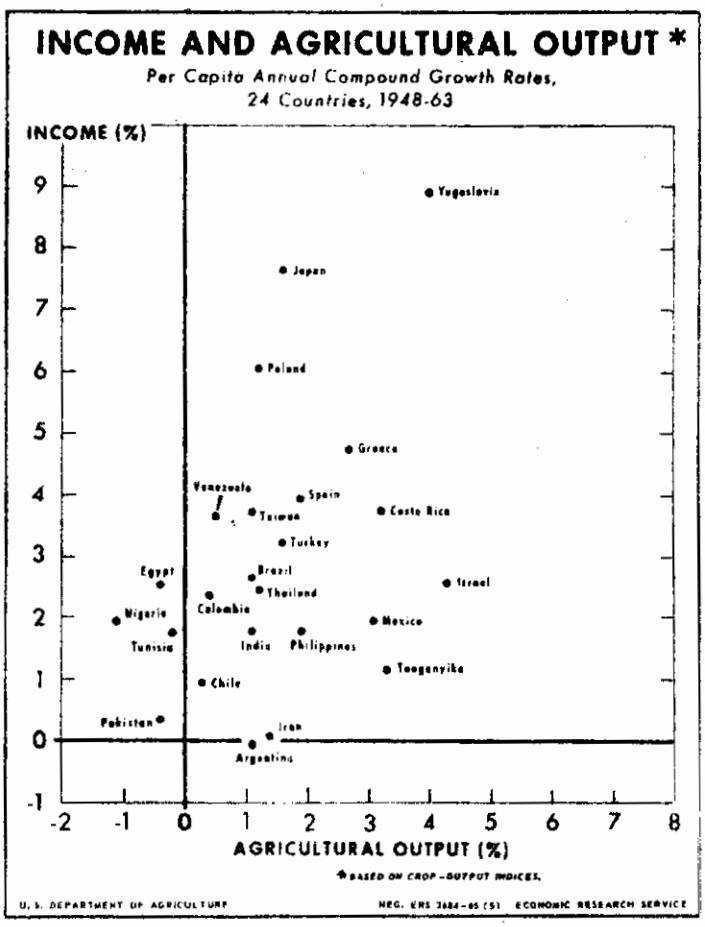
growth rate were assured. A sensible plan would ensure that enough inputs of fertilizer, HYV seeds, pesticides and minor irrigation be provided to enable the agricultural sector to produce that growth rate. Past experience with the instability of agricultural "yardsticks" should deter us, however, from advocating that Fourth Plan aggregate investment outlays be committed as though agricultural output will grow at a steady 5% pace each year. If this type of growth does occur - and aggregate income also increases at a 5% rate during the Fourth Plan - the annual increase in domestic demand will be at least 4%. 1/ This would leave a margin of no more than 1% for import substitution, export expansion, and additional buffer stocks.

Underlying the Planning Commission paper "Approach to the Fourth Five Year Plan" are two propositions - neither of which are sure bets. First, Indian agriculture will grow at 5% per year. (This may be termed the fallacy of counting chicks before they are hatched.) Second, a 5% growth rate in agriculture implies a 5-6% growth rate in the economy as a whole. To dispel the notion that there need be a direct linkage of this type over a particular five-year plan period, it is sobering to examine the following chart which summarizes the experience of 24 developing nations over a 15-year period, 1948-63. Note that in Japan's case, aggregate income grew far more rapidly than did agricultural output; and that in Israel and Mexico the converse was true. Evidently, there are many paths to successful development. It is quite possible that India's agricultural output increases could be channeled into improving her balance-of-payments position during the Fourth Plan.

1/ Derivation of 4% estimate as a lower bound:

$$\text{\% Domestic demand increase} = \text{\% Population increase} + \begin{pmatrix}\text{Per capita income elasticity of demand}\end{pmatrix}\begin{pmatrix}\text{Per capita income growth}\end{pmatrix}$$

$$4.0 = 2.5 + (.6)\quad(2.5)$$



Source: "Changes in Agriculture in 26 Developing Nations", Foreign Agricultural Economic Report No. 27, USDA, 1965.

A dynamic multi-sector model

In the balance of this annex, we present numerical results from a dynamic multi-sector model of the Indian economy. 1/ These calculations are intended to be not only logically consistent but - more important - are intended to fit in with a "robust plan" - one that is not vulnerable in the event of performance failure in any single dimension. Depending upon specific assumptions with respect to external assistance and export performance, our dynamic multi-sector model (for short, DMS) implies a Fourth Plan growth rate in the neighborhood of 5%, and cumulative net investment between Rs. 180 and 200 billions.

When interpreting the results of a computer-based model like DMS, it is essential to realize that a computer is not omniscient. It is not a black box that relieves human decision-makers of responsibility for intelligent thinking. At best, it summarizes a consistent picture of the alternative choices available. No one model - and no one human being - can take account of all the complexities that actually confront the Indian economy. The reader is urged to be skeptical of all numbers reported here, and to cross-check each result against all other sources of information. There is good reason to believe that the sectoral details - imports, exports, outputs and investment allocations - are less reliable than the macroeconomic totals for national product, savings, and consumption.

The basic technical assumptions for DMS are these:

a. As a labor-surplus economy, India's development will continue to be constrained by the availability of foreign exchange and by the requirements for providing a growing population with a rising per capita level of consumption. No specific limits on growth are imposed by the size and skill composition of the labor force available. Indeed, India's "brain drain" problem arises precisely because of the lack of attractive employment opportunities for skilled engineers and doctors. The rural unemployment problem will grow even more intractable unless the economy gains momentum.

1/ The technical aspects of this model were originally developed in A.S.Manne and T.E. Weisskopf, "A Dynamic Multisectoral Model for India, 1967-75", Memorandum No. 57 (revised), Research Center in Economic Growth, Stanford University, May 1968. Professor Weisskopf is not affiliated with USAID, and is not responsible for the computer runs nor for the policy interpretations presented here.

b. No limits are postulated with respect to the economy's ability to mobilize domestic savings. Indirectly, such limits arise from the DMS requirement that consumption be maximized, and that the consumption increments are to grow at the "asymptotic" rate of 8% per year. The tradeoff between near future and distant future growth of consumption may be calculated by setting the asymptotic growth rate at a different value than 8%. A comparison of this nature (6 versus 8%) is provided in the Manne-Weisskopf paper, Table 4. Since that table suggests that the marginal productivity of external assistance is not heavily dependent upon whether the asymptotic growth rate is taken at 6 or at 8%, the present calculations are all based upon 8% as the value of this policy parameter.

c. The terminal conditions for DMS depend directly upon the asymptotic growth rate. The economy is required to be in a configuration during the terminal year (1975-76) so that investment is capable of rising at 8% per year thereafter. Over the very long run, DMS implies that consumption, savings, and output would all approach the identical growth rate. For the next two decades, however, the implied rates are quite different as between sectors. In particular, domestic savings would rise at a faster rate, and consumption at a slower rate than the net national product.

d. Investment requirements are calculated as though the average lag between an investment and the corresponding capacity increase were two years. Clearly this interval is too short for steel and fertilizer plants, and is too long for housing, roads and minor irrigation. The two year average is intended only as an approximation for macroeconomic calculations, and must be supplemented by sectoral information wherever available.

e. DMS operates as though the sectoral investment allocations for the initial year (1967-68) may be optimized subject only to an upper bound on their total. 1/ This treatment of initial conditions is by no means satisfactory, but it avoids detailed data as to the initial status of all investment projects. Most important, it allows for considerable flexibility with respect to the sectoral composition of short-term output increases.

1/ In the runs reported here, there was a minor modification of the initial conditions from that specified on pp. 13 and 25, equation (F70) of the Manne-Weisskopf paper. Here the only restriction for 1967-68 is that the sum of net fixed investments in the 17 production-oriented sectors must add up to Rs. 8 billions.

f. Since these calculations are intended to produce a robust plan, they do not reply upon the existence of excess capacities to produce a favorable short-term movement in the aggregate output-capital ratio. In effect, we assume that the absolute amounts of excess capacity - and of projects under construction - remain the same as in the initial year.

g. The domestic technology is assumed to be of the Leontief type - fixed coefficients of intermediate goods and of capital goods per unit increment in output of each sector. An attempt has been made to have these coefficients reflect "best practice" new technology rather than that prevailing during the data base period - the middle 1960's. The original data for this model had been disaggregated into 147 separate sectors - many defined in physical units of output - and each with its own set of current and capital account coefficients. These 147 sectors were aggregated at 1967 prices into a 30 sector interindustry framework, which in turn was reduced to a 17 sector model for linear programming purposes. The 17 sectors that appear explicitly in the linear programming calculations are termed "production-oriented" sectors. These supply current and capital account inputs to the balance of the economy.

h. The agricultural sector's supplies and demands are treated in a highly aggregative fashion. Fertilizer inputs are treated as a first charge on the economy's resources, and are those which have been estimated as sufficient to allow for a 5% growth rate in agriculture. Investment inputs for irrigation, tractors, etc. are taken to be proportional to the rate of growth of agriculture - which in turn is proportional to the growth of consumption and of export demands for food and fibers. The marginal propensities to consume and to export individual items are taken to be constant, but not necessarily identical to their initial proportions in the consumption and export product-mix.

i. Make-or-buy choices are included for oil, metals, and machinery. These import substitution choices are constrained by upper bounds specified for domestic production of minerals and by lower bounds for the absolute levels of machinery imports. Subject to the upper and lower bounds, the make-or-buy choices are optimized on the basis of comparative advantage. To allow for tariffs, import licensing and other forms of protection to domestic producers, DMS evaluates one dollar's worth of machinery imports f.o.b. as though this were equivalent to Rs. 10.0 rather than the official Rs. 7.5 worth of domestically produced machinery.

Effects of alternative aid levels and export growth rates

DMS reverses the dictum that has governed many earlier calculations: "needs not resources determine the plan size". Reflecting tight constraints on near future availability of aid, the time pattern of aid inputs is predetermined for each run of DMS, and optimal values are deduced for consumption, investment and national product.

DMS does not purport to quantify two considerations - factors that are partially offsetting, and that would become operative at low levels of aid: First, India's import liberalization program might be substantially curtailed or abandoned. Without this program, a substantial element of allocative efficiency would be lost - a factor over and above the loss of comparative advantage included directly within DMS. Second, without the "soft option" of aid available, the Government of India might take more vigorous action to solve the country's development problems. We leave it to the reader to allow for these factors.

For the cost-effectiveness comparisons that appear in Table 1, we have attempted to specify a fairly wide range of possibilities for aid arrivals during IFY '69-70. This is the year that will be most heavily influenced by IDA and USAID commitments of nonproject loans during USFY '69 and '70. Here the measure of costs is taken to be India's trade deficit with all countries, excluding foodgrains. (The foodgrain import calculations appear in the merchandise trade balance below, Tables 10-15) "Realistic" values for the nonfood trade deficit are assumed to lie between $400 and $600 millions during IFY '69-70, and to return to levels of $600 millions during the post-Viet Nam years of '71-72 and thereafter. Hopefully, by '75-76, India's economy will have progressed to the point where it can begin to reduce its dependence on external assistance. Our calculations do not suggest that satisfactory growth rates could be achieved if aid were phased out completely by the middle 1970's.

Each case in Table 1 is identified by two digits indicating, respectively, the export growth rate and the '69-70 aid arrivals. E.g., in case 64, the export growth rate is taken to be 6% and the '69-70 nonfood trade deficit is $400 millions. The criterion of effectiveness is India's net national product in '73-74, the terminal year of the Fourth Plan. In order to measure costs and effectiveness in identical units, India's NNP has been converted into dollars at the official exchange rate.

If one starts from the premise that external assistance can solve all of India's problems, Table 1 presents a discouraging picture indeed. The sum of $100 millions is a large amount of aid, and yet when divided among over half a billion people, it amounts to less than 20¢ each. Given India's population, a one year increase of $100 millions would make less than a 1% increase in the absolute level of India's NNP at the end of the Fourth Plan. There is no quick and easy way to lift the average Indian's annual income above $80 per head.

Table 1. Cost-effectiveness comparison

Effect of alternative aid patterns and
export growth rates upon India's net national product
(unit: $ millions)

Case Identification		Annual export growth rate,%	Aid pattern (trade deficit excluding foodgrains)				Net national product '73-74	
			'69-70	'71-72	'73-74	'75-76	absolute level	difference between cases
66	Alternative	6	600	600	600	500	52,943	
								373
65	"realistic" aid	6	500	600	600	500	52,570	
								594
64	patterns	6	400	600	600	500	51,976	
68	Effect of sustained	6	800	800	700	500	54,088	
								1,145
66	"adequate support"	6	600	600	600	500	52,943	
76	Alternative export	7	600	600	600	500	53,401	
								458
66	growth	6	600	600	600	500	52,943	
								437
56	rates	5	600	600	600	500	52,506	

More relevant than the absolute impact is the difference that aid can make. With a $500 rather than a $400 million rate of aid arrivals during '69-70, Table 1 indicates that there would be a difference increasing to $594 millions in the '73-74 NNP and growing each year thereafter. By itself, this amount would not abolish poverty in India, but it would be a step in the right direction. A journey of 1000 miles begins with a single step.

According to DMS - even though aid is subject to diminishing marginal productivity - the payoff would remain dramatically high throughout the range of "realistic" levels of assistance. In moving from a $500 to a $600 million aid input for the one year '69-70, there would be an associated difference of $373 millions in India's '73-74 NNP.

To evaluate the effects of a sustained level of "adequate support" - one that is committed in such a form as to minimize year-to-year uncertainties - case 68 may be compared with case 66. For case 68, we assume that an $800 million input during '69-70 would be matched by corresponding amounts during the immediately following years. (This would be necessary to avoid initiating a recession through too rapid a cutoff of aid.) Comparing case 68 with 66, it can be seen that a $200 million difference in '69-70 aid - phased down to a $100 million difference in '73-74 and no difference in '75-76 - could lead to a difference of $1,145 millions in India's Fourth Plan NNP growth.

How could such small differences in aid produce such dramatic differences in NNP? In part, this happens because of the assumption of a labor-surplus economy in which any increase in the initial endowment of physical capital can be converted into substantial increases in output. E.g., with a 50% incremental annual output-capital ratio, a one-year gestation lag, and no immediately induced rise in consumption, an initial injection of $100 millions of capital would grow to $506 millions at the end of four years.

At "realistic" aid levels, it is partly this lack of aggregate physical capital resources that implies a high productivity of external assistance - and partly the specific bottleneck of foreign exchange. The presence of a foreign exchange bottleneck can be verified through comparing cases 56, 66, and 76. In each of these, the aid inputs are maintained at identical levels, the annual export growth rate is increased from 5 to 6 to 7%, and optimal values are deduced for consumption, investment, national product, etc. According to Table 1, the payoff for a 1% increase in the annual rate of growth of exports is of the same order of magnitude as that for a $100 million injection of aid. Despite the fact that exports require substantial inputs

of domestic resources, these inputs are enough lower than those of the import substituting sectors (e.g. steel and machinery) so as to produce a favorable movement in the economy-wide incremental output-capital ratio. With a 7% rather than a 5% export growth rate, the Indian economy would be moving in the direction of comparative advantage. No originality is claimed for this particular implication of DMS!

Table 2 contains further evidence on the presence of a specific foreign exchange bottleneck. This table is normalized so that the marginal productivity of '69-70 aid is taken to be 100 for case 66. Two propositions are illustrated by this table: (1) Given India's absorptive capacity, the sooner aid is available, the better. E.g., under case 66, an extra dollar's worth of aid available during '73-74 would be only 43% as productive as one available during '69-70. (2) The less aid is available, the more valuable becomes each extra dollar. Under case 64, an extra dollar available during '69-70 would have 366% the productivity of an extra dollar available under case 66.

Six alternative cases are summarized in Table 1. The year-by-year macroeconomic balances that underlie these alternatives are presented in Tables 3-8. Particular note should be taken of the Fourth Plan summary indicators: the growth rates of NNP, consumption and investment. (This intermediate-range forecast is believed to be more reliable than the short-term forecast between '67-68 and '69-70). 1/ At the aid levels and performance characteristics assumed for these cases, the annual Fourth Plan NNP growth rate would range between 4.3 and 4.9%. Given India's needs and her opportunities, the lower end of this range cannot be considered a politically acceptable outcome.

The requirements for domestic savings mobilization present difficult but not impossible tasks. The marginal propensity to save turns out to be of the order of 20% in most cases. In Annex C-2, it is shown that this - although well above the initial average propensity to save of 8% - is compatible with past performance during periods of rising per capita income.

1/ The structure of the DMS model requires a short-term growth rate which can be sustained and increased in the future. It does not permit the possibility of a more rapid initial growth rate (based on such factors as fuller utilization of existing capacity) which would then drop to sustainable and more normal levels in later years. The implications of these factors for the short-term growth rate are discussed in Part I of this Program Memorandum.

Table 2. Marginal productivity of aid

Identification number	Case description: Export growth rate,%	Case description: '69-70 aid ($ millions)	Shadow prices of external assistance a/: '69-70	'71-72	'73-74
64	6	400	366	92	70
65	6	500	150	65	52
66	6	600	100	60	43
68	6	800	95	57	37
76	7	600	102	62	40
56	5	600	100	60	43

a/ Definition of these shadow prices = $\frac{\text{change in activity C 2 (Rs. billions)}}{\text{change in constraint G1t ($ billions)}}$

(normalized so that shadow price = 100 for '69-70, Case 66)

Table 3. Case 64. Macroeconomic balances (1967-68 prices)

export growth rate: 6%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit excluding foodgrains	465	400	600	600	500
Rs.billions	Net national product	310.00	329.29	357.53	389.92	427.80
" "	Consumption	286.00	305.29	327.78	354.02	384.62
" "	Domestic savings	24.00	24.00	29.75	35.90	43.17
" "	Net investment	33.00	30.19	35.00	40.40	46.92
" "	Trade deficit, total	9.00	6.19	5.25	4.50	3.75
Percent annual growth rate	NNP		3.1	4.2	4.4	4.7
	Consumption		3.3	3.6	3.9	4.2
	Net investment		-2.0 a/	7.7	7.4	7.8
%	Marginal propensity to save		11.4 a/	20.4	19.0	19.2
%	Incremental output - capital ratio		31.3 a/	46.8	46.3	46.9
	Fourth Plan summary:					
	Percent annual growth of NNP			4.3		
	" " " " Consumption			3.8		
	" " " " Net investment			7.6		
Rs.billions	Trade deficit, total			26.5		
Rs.billions	Net investment			175.9		

Note:

a/ Adjusted to make '67-68 inventory investment comparable with values projected for subsequent years. During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs. 30.80 and 21.80 billions respectively.

Table 4. Case 65. Macroeconomic balances (1967-68 prices)

export growth rate: 6%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit excluding foodgrains	465	500	600	600	500
Rs.billions	Net national product	310.00	330.26	360.52	394.37	433.34
" "	Consumption	286.00	305.99	329.30	356.49	388.20
" "	Domestic savings	24.00	24.28	31.22	37.88	45.13
" "	Net investment	33.00	31.22	36.47	42.38	48.88
" "	Trade deficit, total	9.00	6.94	5.25	4.50	3.75
Percent annual growth rates	NNP	3.2	4.5	4.6	4.8	
	Consumption	3.4	3.7	4.0	4.4	
	Net investment	0.7 a/	8.1	7.8	7.4	
%	Marginal propensity to save	12.2 a/	22.9	19.7	18.6	
%	Incremental output - capital ratio	32.9 a/	48.5	46.4	46.0	
	Fourth Plan summary					
	Percent annual growth of NNP			4.5		
	" " " " Consumption			3.9		
	" " " " Net investment			7.9		
Rs.billions	Trade deficit, total			27.7		
Rs.billions	Net investment			183.3		

Note: a/ Adjusted to make '67-68 inventory investment comparable with values projected for subsequent years. During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs. 30.80 and 21.80 billions respectively.

Table 5. Case 66. Macroeconomic balances (1967-68 prices)

export growth rate: 6%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit, excluding foodgrains	465	600	600	600	500
Rs.billions	Net national product	310.00	331.39	362.32	397.17	436.79
" "	Consumption	286.00	306.42	330.24	358.01	390.41
" "	Domestic savings	24.00	24.97	32.08	39.16	46.38
" "	Net investment	33.00	32.66	37.33	43.66	50.13
" "	Trade deficit, total	9.00	7.69	5.25	4.50	3.75
Percent annual growth rates	NNP	3.4	4.6	4.7	4.9	
	Consumption	3.5	3.8	4.1	4.4	
	Net investment	3.0 a/	6.9	8.1	7.2	
%	Marginal propensity to save	14.8 a/	23.0	20.3	18.2	
%	Incremental output - capital ratio	34.7 a/	47.4	46.7	45.4	
	Fourth Plan summary:					
	Percent annual growth of NNP			4.7		
	" " " " Consumption			4.0		
	" " " " Net investment			7.5		
Rs.billions	Trade deficit, total			28.8		
Rs.billions	Net investment			189.1		

Note: a/ Adjusted to make '67-68 inventory investment comparable with values projected for subsequent years. During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs. 30.80 and 21.80 billions respectively.

Table 6. Case 68. Macroeconomic balances (1967-68 prices)

export growth rate: 6%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit, excluding foodgrains	465	800	800	700	500
Rs.billions	Net national product	310.00	334.47	367.85	405.76	447.78
" "	Consumption	286.00	307.79	333.19	362.83	397.39
" "	Domestic savings	24.00	26.69	34.66	42.93	50.39
" "	Net investment	33.00	35.88	41.41	48.18	54.14
" "	Trade deficit, total	9.00	9.19	6.75	5.25	3.75
Percent annual growth rates	NNP	3.7	5.0	5.0	5.1	
	Consumption	3.7	4.0	4.4	4.7	
	Net investment	7.9 a/	7.4	7.9	6.0	
%	Marginal propensity to save	20.0 a/	23.9	21.8	17.3	
%	Incremental output - capital ratio	39.7 a/	46.5	45.8	43.6	

Fourth Plan summary:

	Percent annual growth of NNP	4.9
	" " " " Consumption	4.2
	" " " " Net investment	7.6
Rs.billions	Trade deficit, total	35.2
Rs.billions	Net investment	208.9

Note: a/ Adjusted to make '67-68 inventory investment comparable with values projected for subsequent years. During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs. 30.80 and 21.80 billions respectively.

Table 7. Case 56. Macroeconomic balances (1967-68 prices)

export growth rate: 5%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit, excluding foodgrains	465	600	600	600	500
Rs.billions	Net national product	310.00	330.23	360.08	393.89	431.44
" "	Consumption	286.00	305.59	328.44	355.09	386.17
" "	Domestic savings	24.00	24.64	31.64	38.80	45.27
" "	Net investment	33.00	32.35	36.89	43.30	49.02
" "	Trade deficit, total	9.00	7.69	5.25	4.50	3.75
Percent annual growth rate	NNP	3.2	4.4	4.6	4.7	
	Consumption	3.4	3.7	4.0	4.3	
	Net investment	2.5 a/	6.8	8.3	6.4	
%	Marginal propensity to save	14.0 a/	23.5	21.2	17.2	
%	Incremental output - capital ratio	32.8 a/	46.1	45.8	43.4	
	Fourth Plan summary:					
	Percent annual growth of NNP			4.5		
	" " " " Consumption			3.8		
	" " " " Net investment			7.6		
Rs.billions	Trade deficit, total			28.8		
Rs.billions	Net investment			187.3		

Note: a/ Adjusted to make '67-68 inventory investment comparable with values projected for subsequent years. During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs. 30.80 and 21.80 billions respectively.

Table 8. Case 76. Macroeconomic balances (1967-68 prices)

export growth rate: 7%

unit		'67-68	'69-70	'71-72	'73-74	'75-76
$ millions	Trade deficit, excluding foodgrains	465	600	600	600	500
Rs.billions	Net national product	310.00	332.47	364.39	400.61	441.85
" "	Consumption	286.00	307.19	331.91	360.75	394.38
" "	Domestic savings	24.00	25.28	32.47	39.87	47.48
" "	Net investment	33.00	32.97	37.72	44.37	51.23
" "	Trade deficit, total	9.00	7.69	5.25	4.50	3.75
Percent annual growth rate	NNP	3.6	4.7	4.9	5.0	
	Consumption	3.6	4.0	4.3	4.6	
	Net investment	3.5 a/	7.0	8.5	7.5	
%	Marginal propensity to save	15.5 a/	22.5	20.4	18.5	
%	Incremental output - capital ratio	36.5 a/	48.4	48.0	46.5	

Fourth Plan summary:

	Percent annual growth of NNP	4.8
	" " " " Consumption	4.1
	" " " " Net investment	7.7
Rs.billions	Trade deficit - **Total**	28.8
Rs.billions	Net investment	191.4

Note: a/ Adjusted to make '67-68 inventory investment comparable with values **projected for subsequent years.** During '67-68, inventory and net fixed investment are estimated at Rs. 5.00 and 28.00 billions respectively. For subsequent years, inventory investment is projected at 10% of net fixed investment. This adjustment leads to '67-68 net investment and savings at Rs.30.80 and 21.80 billions respectively.

Sectoral results

Underlying the macroeconomic balances, Tables 3-8, are production, import, export, and investment details for each of the 17 "production-oriented" sectors distinguished within the DMS linear programming model. This underlying detail must be interpreted with considerable caution. The make-or-buy choices tend to be made in a particularly unrealistic "bang-bang" fashion. Frequently, it turns out that the optimal level of imports for an individual item lies either at its lower limit, or else at the upper limit compatible with no increase in domestic production over the 1967-68 level. Before dismissing the whole DMS exercise on these grounds, the reader should recall that the purpose is to estimate the aggregate implications of aid, export, and domestic savings policies - not to optimize the individual sectoral allocations.

One further note of caution: It is known that there are many near-optimal solutions. E.g., in the iterations for case 66, there were 15 feasible solutions - each with a slightly different allocation of imports, investments, etc. - and each of which yield a level of the maximand (activity C 2) within 2% of the optimal solution. There is considerable additional evidence that the individual make-or-buy choices could be rearranged - e.g. spending more foreign exchange on steel and less on crude oil, with corresponding shifts in the allocation of investment funds - without making a substantial difference in the macroeconomic results. Little significance, therefore, should be attached to the fact that the import requirements for individual items turn out to differ in these tables from those shown elsewhere in this Program Memorandum.

Table 9 contains the net investment allocations by broad sectors, comparing the results for DMS case 66 with those proposed in the Planning Commission's Draft Outline of September 1966. Not only is case 66 based upon a lower rupee total, but also upon a different percentage composition. The percentage shares are higher for agriculture, irrigation, housing and social services - lower for manufacturing, power, transport and communications. This shift in the interindustry mix of investments goes a good part of the way toward explaining the more favorable output-capital ratio of the various DMS alternatives (roughly 45%; see Tables 3-8 above) than has actually been experienced by India in the recent past.

Merchandise trade balances are presented for each of the six cases in Tables 10-15; '73-74 gross output levels in Tables 16 and 17; the import substitution limits in Table 18; and other details (for case 66 only) in Tables 19-22.

Table 9. Comparison between net investment allocations, Fourth Plan

DMS sectors		Case 66 Rs. billions (1967-68 prices)	Case 66 %	Draft Outline September, 1966, p.42 Rs. billions	Draft Outline September, 1966, p.42 %
1-30,33-35	mining, manufacturing, power, transport and communications	100.4	53	125.5	59
31, 32	agriculture and irrigation	35.7	19	34.4	16
36, 37	housing and social services	35.8	19	34.6	16
	inventories	17.2	9	19.0	9
	total	189.1	100	213.5	100

Table 10. Case 64. Merchandise trade projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	685	715	750	790
Crude oil	122	133	175	221	269
Petroleum products	45	0	0	0	0
Steel	145	138	298	175	0
Aluminum	25	19	0	0	0
Copper	51	65	94	101	104
Lead and zinc	27	49	55	67	80
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	500	600	800	917
Electrical machinery	111	120	120	130	220
Transport equipment	105	170	180	244	295
Total imports	2,775	2,665	2,767	2,923	3,110
Exports, 6% growth after '69-70	-1,600	-1,840	-2,067	-2,323	-2,610
Trade deficit	1,175	825	700	600	500
Trade deficit, excluding foodgrains	465	400	600	600	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68

Table 11. Case 65. Merchandise trade projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	686	718	755	796
Crude oil	122	136	177	224	274
Petroleum products	45	0	0	0	0
Steel	145	205	234	158	0
Aluminum	25	41	0	0	0
Copper	51	87	95	106	114
Lead and zinc	27	51	58	69	83
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	500	631	800	953
Electrical machinery	111	120	120	120	145
Transport equipment	105	153	204	256	310
Total imports	2,775	2,765	2,767	2,923	3,110
Exports, 6% growth after '69-70	-1,600	-1,840	-2,067	-2,323	-2,610
Trade deficit	1,175	925	700	600	500
Trade deficit, excluding foodgrains	465	500	600	600	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68.

Table 12. Case 66. Merchandise trade projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	687	720	757	800
Crude oil	122	136	179	228	265
Petroleum products	45	0	0	0	0
Steel	145	264	207	140	0
Aluminum	25	43	0	0	0
Copper	51	90	96	108	119
Lead and zinc	27	51	59	71	85
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	528	647	800	968
Electrical machinery	111	120	120	120	120
Transport equipment	105	160	209	264	318
Total imports	2,775	2,865	2,767	2,923	3,110
Exports, 6% growth after '69-70'	-1,600	-1,840	-2,067	-2,323	-2,610
Trade deficit	1,175	1,025	700	600	500
Trade deficit, excluding foodgrains	465	600	600	600	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68.

Table 13. Case 68. Merchandise trade projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	690	726	766	812
Crude oil	122	138	183	243	211
Petroleum products	45	0	0	0	0
Steel	145	374	289	0	0
Aluminum	25	49	0	0	0
Copper	51	96	102	107	126
Lead and zinc	27	50	61	77	90
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	584	728	864	1,049
Electrical machinery	111	120	120	233	120
Transport equipment	105	178	228	298	267
Total imports	2,775	3,065	2,967	3,023	3,110
Exports, 6% growth after '69-70	-1,600	-1,840	-2,067	-2,323	-2,610
Trade deficit	1,175	1,225	900	700	500
Trade deficit, excluding foodgrains	465	800	800	700	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68.

Table 14. Case 56. Merchandise Trade Projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	686	718	754	794
Crude oil	122	136	178	234	202
Petroleum products	45	0	0	0	0
Steel	145	264	171	53	0
Aluminum	25	43	0	0	0
Copper	51	90	96	109	120
Lead and zinc	27	51	61	73	85
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	531	650	800	895
Electrical machinery	111	120	120	120	120
Transport equipment	105	158	205	259	315
Total imports	2,775	2,865	2,729	2,837	2,966
Exports, 5% growth after '69-70	-1,600	-1,840	-2,029	-2,237	-2,466
Trade deficit	1,175	1,025	700	600	500
Trade deficit, excluding foodgrains	465	600	600	600	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68.

Table 15. Case 76. Merchandise Trade Projection (unit: $ millions)

	'67-68 a/	'69-70	'71-72	'73-74	'75-76
Foodgrains (including cereal preparations)	710	425	100	0	0
Fertilizers and raw materials	316	361	430	435	435
Imports not elsewhere classified	664	688	722	761	805
Crude oil	122	137	180	227	279
Petroleum products	45	0	0	0	0
Steel	145	264	245	111	0
Aluminum	25	42	0	0	0
Copper	51	89	95	97	108
Lead and zinc	27	51	58	70	83
Fabricated metal products	19	0	0	0	0
Non-electrical machinery	435	525	646	801	988
Electrical machinery	111	120	120	243	237
Transport equipment	105	163	211	267	326
Total imports	2,775	2,865	2,807	3,012	3,261
Exports, 7% growth after '69-70	-1,600	-1,840	-2,107	-2,412	-2,761
Trade deficit	1,175	1,025	700	600	500
Trade deficit, excluding foodgrains	465	600	600	600	500

Note: a/ Preliminary estimate by USAID - DP/E, 7/10/68.

Table 16. Gross output by sector (Rs. millions, 1967-68 prices)

Sector	1967-68	1973-74			
		Case 64	Case 65	Case 66	Case 68
1. Minerals	1,230	1,727	1,753	1,770	1,835
2. Crude oil	540	540	540	540	540
3. Coal	2,091	2,608	2,641	2,662	2,738
4. Coke	991	1,368	1,398	1,420	1,509
5. Electricity	3,131	4,692	4,783	4,841	5,015
6. Petroleum products	1,805	3,127	3,168	3,193	3,271
7. Cement	1,070	1,373	1,412	1,437	1,519
8. Pig iron and ferro alloys	2,172	3,267	3,378	3,460	3,837
9. Steel	4,130	6,464	6,781	7,025	8,287
10. Aluminum	325	693	736	755	753
11. Copper	70	70	70	70	70
12. Lead and zinc	20	20	20	20	20
13. Fabricated metal products	6,789	9,197	9,379	9,513	9,883
14. Non-electrical machinery	5,173	5,173	5,173	5,173	5,173
15. Electrical machinery	2,913	6,690	7,211	7,463	7,146
16. Transport equipment	2,292	2,292	2,292	2,292	2,292
17. Rail transport	7,879	11,505	11,659	11,755	12,048
Total, 17 production-oriented sectors	42,621	60,806	62,394	63,389	65,936

Table 17. Gross output by sector (Rs. millions, 1967-68 prices)

Sector	1967-68	1973-74		
		Case 56	Case 66	Case 76
1. Minerals	1,230	1,763	1,770	1,791
2. Crude oil	540	540	540	540
3. Coal	2,091	2,670	2,662	2,665
4. Coke	991	1,448	1,420	1,420
5. Electricity	3,131	4,852	4,841	4,825
6. Petroleum products	1,805	3,179	3,193	3,202
7. Cement	1,070	1,413	1,437	1,462
8. Pig iron and ferro alloys	2,172	3,618	3,460	3,463
9. Steel	4,130	7,616	7,025	7,102
10. Aluminum	325	758	755	674
11. Copper	70	70	70	70
12. Lead and zinc	20	20	20	20
13. Fabricated metal products	6,789	9,577	9,513	9,403
14. Non-electrical machinery	5,173	5,173	5,173	5,173
15. Electrical machinery	2,913	7,504	7,463	6,094
16. Transport equipment	2,292	2,292	2,292	2,292
17. Rail transport	7,879	11,672	11,755	11,818
Total, 17 production-oriented sectors	42,621	64,165	63,389	62,014

Table 18. Import substitution limits for all cases

		'69-70	'71-72	'73-74	'75-76
Upper bounds on domestic production (Rs. millions)	Crude oil	698	832	975	1,125
	Copper	70	185	300	300
	Lead and zinc	39	59	80	94
Upper bounds on imports ($ millions)	Petroleum products	no limit	0	0	0
	Aluminum	no limit	0	0	0
Lower bounds on machinery imports ($ millions)	Non-electrical machinery	500	600	800	800
	Electrical machinery	120	120	120	120
	Transport equipment	80	80	80	80

Additional notes on import projections:

No import substitution limits were specified for steel or for fabricated metal products.

"Imports not elsewhere classified" were projected as a linear function of net national product, with the marginal propensity to import specified as half the average propensity during 1967-68.

Foodgrain and fertilizer imports are identical in all cases shown. Foodgrains were valued at $80 per ton. Fertilizer requirements taken from Mission estimate of 5/8/68.

Table 19. Case 66. Net investment - 17 Production-oriented sectors (Rs.million/year)

Year	1967-68	1969-70	1971-72	1973-74	1975-76
Sector					
1. Minerals	226	213	244	299	332
2. Crude oil	0	0	0	154	45
3. Coal	271	258	291	324	141
4. Coke	151	132	166	199	212
5. Electricity	2,319	3,078	3,152	3,744	4,028
6. Petroleum products	127	166	184	197	178
7. Cement	107	182	156	350	331
8. Pig iron and ferro-alloys	412	390	508	637	606
9. Steel	582	1,136	1,472	2,004	1,609
10. Aluminum	0	509	139	132	238
11. Copper	0	0	0	0	8
12. Lead and zinc	0	0	0	0	12
13. Fabricated metal products	722	488	651	667	1,042
14. Non-electrical machinery	0	0	0	52	422
15. Electrical machinery	1,018	168	410	319	641
16. Transport equipment	0	0	0	0	238
17. Railway rolling stock	2,065	2,008	2,323	2,653	2,792
Total, 17 production-oriented sectors	8,000	8,728	9,696	11,731	12,875
Investment, sectors 1-17 as % of net investment, total	26.0 a/	26.7	26.0	26.9	25.7

Note: a/ Net investment total is adjusted to Rs. 30.80 billions for comparability with subsequent years' inventory investment.

Table 20. Case 66. Net investment - 37 sectors (Rs. million/year)

DMS sector number	Sector description	1967-68	1969-70	1971-72	1973-74	1975-76
1-17	mining, manufacturing, power and railway rolling stock	8,000	8,728	9,696	11,731	12,875
25	fertilizer manufacturing	1,000	1,270	1,270	1,270	1,270
18-24 and 26-30	other mining, manufacturing and transport sectors	4,824	5,195	6,056	7,006	8,303
31 and 32	agriculture and irrigation	5,207	6,073	7,084	8,263	9,697
33	rail construction, excluding rolling stock	649	645	753	865	1,054
34	road construction	840	834	974	1,119	1,364
35	other transport and communications	856	850	993	1,141	1,390
36	housing	2,695	3,143	3,667	4,277	4,989
37	social services	2,532	2,953	3,445	4.018	4,687
	Net fixed investment	26,603 (28,000)	29,691	33,938	39,690	45,569
	Net inventory investment	5,000	2,969	3,394	3,969	4,557
	Net investment, total	33,000	32,660	37,332	43,659	50,126

Table 21. Case 66. Gross output by sector (Rs. millions)

Sector \ Year	1967-68	1969-70	1971-72	1973-74	1975-76
1. Minerals	1,230	1,409	1,578	1,770	2,007
2. Crude oil	540	540	540	540	633
3. Coal	2,091	2,280	2,460	2,662	2,887
4. Coke	991	1,135	1,261	1,420	1,610
5. Electricity	3,131	3,595	4,210	4,841	5,589
6. Petroleum products	1,805	2,174	2,657	3,193	3,768
7. Cement	1,070	1,159	1,309	1,437	1,726
8. Pig iron and ferro-alloys	2,172	2,577	2,961	3,460	4,086
9. Steel	4,130	4,658	5,689	7,025	8,843
10. Aluminum	325	325	663	755	843
11. Copper	70	70	70	70	70
12. Lead and zinc	20	20	20	20	20
13. Fabricated metal products	6,789	7,846	8,560	9,513	10,490
14. Non-electrical machinery	5,173	5,173	5,173	5,173	5,262
15. Electrical machinery	2,913	5,815	6,293	7,463	8,374
16. Transport equipment	2,292	2,292	2,292	2,292	2,292
17. Rail transport	7,879	9,131	10,348	11,755	13,363
Total, 17 production-oriented sectors	42,621	50,199	56,084	63,389	71,863

Table 22. Case 66. Shadow Prices for Material Balance Constraints

Year	1969-70	1971-72	1973-74
Sector			
1. Minerals	.597	.421	.307
2. Crude oil	.519	.314	.226
3. Coal	.980	.591	.394
4. Coke	.763	.500	.348
5. Electricity	.615	.965	.747
6. Petroleum products	.487	.350	.249
7. Cement	.603	.379	.275
8. Pig iron and ferro-alloys	.532	.356	.257
9. Steel	.574	.339	.240
10. Aluminum	.481	.417	.330
11. Copper	.468	.282	.203
12. Lead and zinc	.486	.293	.211
13. Fabricated metal products	.429	.275	.200
14. Non-electrical machinery	.390	.235	.070
15. Electrical machinery	.292	.225	.168
16. Transport equipment	.390	.235	.169
17. Rail transport	.585	.268	.148

Definition of these shadow prices $= \dfrac{\text{change in activity C 2 (Rs. billions)}}{\text{change in constraint Ait (Rs. billions)}}$

ANNEX C-1

RECENT DEVELOPMENTS IN INDIA'S PLANNING PROCESS

The current year (1968-69) is the third of India's "holiday" from comprehensive five-year plans. The Fourth Five Year Plan, originally slated for the years 1966-67 through 1970-71, reached the draft stage in August 1966 but was shelved soon after as a consequence of the effects of two drought years on the economy. Annual plans, prepared each year in conjunction with the annual budget, served to carry India from year-to-year in the absence of a formal longer-term plan. Now a new Fourth Plan is under preparation for the period 1969-70 through 1973-74.

During this interim period between plans, a number of changes have been made in India's mechanism for planning. These changes are not directly related to the difficulties with getting the Fourth Plan under way. Rather, they have been influenced strongly by a comprehensive examination of the workings of the administrative organization of the Government of India by a special Administrative Reforms Commission (ARC). The topic of "Machinery for Planning" is only one of those which has been examined by this Commission. The special study team on "Machinery for Planning" first met in May 1966 and has submitted interim and final reports to the ARC. 1/ The ARC in turn submitted interim and final reports to the Prime Minister. 2/

The interim report of the ARC on the Machinery for Planning dealt with the problem of reorganizing the Planning Commission, including its setup, the distribution of work among its members, the role of the National Development Council, and the constitution of planning boards in the States. After the recommendations of this report were examined by the GOI and discussed with the Chief Ministers of the States, the following decisions were announced: 3/

(1) The Prime Minister should continue as Chairman of the Planning Commission.

(2) A full-time Deputy Chairman should guide the Commission.

(3) The Finance Minister should be ex officio member of the Commission.

(4) The National Development Council should be reconstituted.

1/ Report of the Study Team on Machinery for Planning, Administrative Reforms Commission, GOI, New Delhi, December 8, 1967.

2/ Report on Machinery for Planning, Administrative Reforms Commission, GOI, March 14, 1968.

3/ Statement by the Prime Minister in the Lok Sabha, July 17, 1967.

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It was also agreed that the role of the Planning Commission should be mainly to formulate plans and to evaluate plan performance, and that the Commission should be relieved of its burden of executive functions. In September 1967 the new Planning Commission took office with Dr. D.R. Gadgil, a well-known Indian economist, as Deputy Chairman and four full-time members in addition to the Prime Minister and Finance Minister.

In October 1967 a resolution by the Cabinet Secretariat redefined the role of the National Development Council. Nominally this Council, composed of the Prime Minister, Chief Ministers of all States, and the Members of the Planning Commission, had always been the supreme economic-political body in Indian planning, with the somewhat vague function "to review the working of the National Plan from time to time." However, in the past its approval of a Plan had been a more-or-less rubber stamp acceptance of the scheme worked out by the Planning Commission in consultation with the various Central Ministries and State Governments. The National Development Council as reconstituted now includes the Prime Minister, all Union Cabinet Ministers, Chief Ministers of all States and Union Territories, and the Members of the Planning Commission, and has been given the following functions:

(1) To prescribe guidelines for the formulation of the National Plan, including the assessment of resources for the Plan.

(2) To consider the National Plan as formulated by the Planning Commission.

(3) To consider important questions of social and economic policy affecting national development.

(4) To review the working of the Plan from time to time and to recommend such measures as are necessary for achieving the aims and targets set out in the National Plan.

This redefinition of the Council's role placed the Planning Commission in more of an advisory position in making planning proposals. The change is regarded as a move to broaden the political base for acceptance of a Plan, and in particular as part of an effort to involve the States more directly in the planning process. The political necessity for more participation by the States was accentuated by the Congress Party's loss of power in several States in the 1967 General Election. The reconstituted National Development Council at its first meeting in early December 1967 endorsed the recommendation of the Planning Commission that the Fourth Plan be rescheduled for the period 1969-70 to 1973-74, and dealt somewhat inconclusively with the problem of resource mobilization under changing circumstances. 1/

1/ See New Delhi A-572, December 21, 1967.

The final report of the ARC on Machinery for Planning is now under consideration by the GOI. Major recommendations of this report include:1/

(1) The Planning Commission when seeking guidelines from the National Development Council for the formulation of the National Plan should give a tentative framework of the Plan considered feasible by it and also indicate other alternative approaches calling for different degrees of effort. The basic features involved such as the rate of growth, the resources required, and the sacrifices involved should clearly be brought out. Detailed work on the formulation of the Plan should proceed in the light of the guidelines given by the National Development Council.

(2) When the Commission lays down the lines of a Five Year Plan, it should have before it a perspective of development over a longer period.

(3) The Five Year Plan should take into account only such foreign aid as can be reasonably assumed to be forthcoming, should also take into consideration internal contingencies like failures of monsoons which are a normal cyclical feature, and should provide for the maximum possible effort, based on a realistic assessment of resources.

(4) Each scheme or project involving foreign aid should clearly set out the measures for dispensing with such aid in the shortest possible time and should also spell out the precise obligations involved.

(5) Plan Working Groups should be broad-based, including non-official and State members as commensurate with subject matter.

(6) Each Ministry concerned with developmental programs should have a separate Planning Cell.

(7) At the time of the formulation of a Five Year Plan, Development Councils representing private sector industries should be asked to submit their own plans in the light of general guidelines to be given by the Planning Commission.

(8) As much as possible, detailed sectoral planning, including preparation of individual schemes and programs, should be left to the State Governments.

1/ Report on Machinery for Planning, Administrative Reforms Commission, GOI, March 14, 1968.

(9) The amount of total Central Assistance to be given to a State should first be determined. A portion of this assistance should be tied to schemes of national importance; the state should have discretion over allocating the remainder to schemes qualifying for Central assistance. In case of shortfalls in mobilization of Plan resources by the States, a corresponding reduction should be made in Central assistance.

(10) State Planning Boards should assess State resources and formulate development plans within the framework of the National Plan.

(11) The Planning Commission should submit each year a progress report on plan performance, and should establish a separate Evaluation Wing to study plan programs in the Center and States.

What can be expected from all this examination and recasting of India's planning process? Many of the proposals are yet unacted upon, and even after the establishment of new institutions some time must pass before their real impact can be assessed. But the formulation of India's revised Fourth Plan is now in progress under a reconstituted National Development Council and a reorganized Planning Commission (though reorganization of its supporting staff may not be completed), and an observation of this progress is the best evidence as to what these changes mean.

In May 1968 the Planning Commission presented a paper entitled "Approach to the Fourth Five Year Plan" to the National Development Council. 1/ The avowed purpose of this paper was to seek guidelines from the Council to be used in developing a draft outline of the Plan. The overall theme of the "Approach" document was put forth as "growth with stability". Salient features of this paper were:

(1) Agriculture: A growth rate of about 5 percent in agriculture was proposed as reasonable. It would be desirable and possible for all imports of foodgrains under concessional terms to cease within three years. Buffer stocks were proposed to even out supplies between years and ensure stable growth.

(2) Industrial production: The industrial sector was assessed as capable of growing at an annual rate of 8 to 10 percent.

1/ "Approach to the Fourth Five Year Plan," Planning Commission, GOI, May 1968. See also New Delhi A-1028, April 25,1968, A-1093, May 14, 1968 and A-1168, May 31, 1968.

(3) Overall growth: An overall annual rate of growth for the economy of 5 to 6 percent was proposed as practicable, with the ultimate rate dependent on the degree of resource mobilization considered desirable.

(4) Foreign aid: Net foreign aid (inclusive of food aid) should be reduced to half the current level by the last year of the Fourth Plan. Concerted effort both in reducing imports and increasing exports was needed to reduce the trade deficit.

(5) Exports: To achieve the trade deficit objectives, an export growth rate of 7 percent per year would be necessary. A significant increase in exports would be needed from non-traditional commodities, including iron ore, iron and steel, engineering goods, and chemicals.

(6) Imports: Imports would be kept to a minimum. Aside from specialized components and raw materials, a program of import substitution would be studied to reduce imports of other items, including fertilizers, iron and steel, and machinery and transport equipment.

(7) Domestic resources: To achieve a 5 percent overall growth rate, the average rate of domestic savings would have to be stepped up from 8 percent to 12 percent, and the public sector would need to mobilize an additional Rs. 200 crores per year. A 6 percent growth rate would call for greater effort and involve mobilization of additional resources to the extent of Rs. 250 to 300 crores per year by the Center and States.

Among the other important areas of economic development discussed, the most notable were the need for attention to the "weaker sections" in the rural economy (landless laborers, dry farmers, small farmers) and the operation of the "mixed economy". Under the operation of the "mixed economy" are included the role and effectiveness of the public sector, the relative mix of market forces and administrative direction in the economy, and the encouragement of private enterprise while avoiding excessive concentration of wealth and power. With conditions of a general shortage of foreign exchange, it was suggested that the State Trading Corporation and other public agencies might usefully take a larger role in importing and exporting. Generally, however, it would be desirable to reduce price and import controls to the minimum. The present system of

industrial licensing and import controls was criticized, and the need for further study was stated. 1/ A compromise solution for selectively delicensing investment in private sector industries was proposed. Under this proposal, investment licensing would be required only for basic and strategic industries and would include guarantee of foreign exchange and scarce raw materials. Other industries would be controlled only to the extent that they would require significant amounts of foreign exchange. Some restrictions would continue in order to protect small-scale industries. Another topic mentioned for exploration was the extent to which import controls could be replaced by only a customs duty.

The "Approach" document placed before the National Development Council some indication of the developmental choices available for India - especially the necessity to make a political commitment to a resource mobilization effort compatible with the growth rate desired. In this aspect the process determining the new Fourth Plan differs from that behind the original Fourth Plan, originally structured on the decision by the Planning Commission that "planning should proceed on the basis of the needs of the country rather than financial resources". 2/ Other important choices included the degree of reduction in external assistance (and the relative degree to which this should be accomplished through import substitution or export promotion) and the emphasis to be given to the different aspects of the "mixed economy". But while the National Development Council was presented with some alternatives to be considered in deciding on guidelines for the new Fourth Plan, it is questionable whether the implications of the alternatives (and the interrelations between the different goals) were indicated in a clear or detailed enough fashion to permit an adequate assessment.

The key economic issues in the NDC's discussion of the "Approach" document were mobilization of domestic resources, foreign aid, and exports. The State Chief Ministers reacted negatively to the possibility of raising further resources through taxation, and the Ministry of Finance saw little latitude for either additional taxation or reduction of other expenditures, although more efficient tax collection could provide some additional revenue. This left the public sector resources question to the hope for increased profits from public enterprises and Dr. Gadgil's proposal of selling rural debentures to the farmers. With no commitment made on the raising of resources, the choice of an overall target growth rate was left open. There

1/ See Annex J, "Liberalization of Controls," for a general discussion of import policy, industrial licensing and decontrol, and other controls on pricing and distribution. This area has also been studied by the ARC under the topic "Economic Administration." (Report of the Study Team on Economic Administration, Administrative Reforms Commission, GOI, New Delhi, April 15, 1967. A final report on "Economic Administration" has recently been submitted to the Government of India.)

2/ "Industrial Growth in Fourth Plan: Needs, Not Resources, to be Basis," Economic Times, July 20, 1964.

was, however, endorsement by the National Development Council of the desirability and feasibility of a 5 percent growth rate in agriculture.

On the question of foreign aid, there was general agreement on the desirability of the targets of eliminating food aid within three years and reducing total net aid (including food aid) to half the current level by the last year of the Fourth Plan. Dr. Gadgil, in his introductory address, called for a "direction of reducing dependence on foreign aid as much as possible", which would require "strict regulation of imports" and "large effort in promotion of exports." The Ministry of Finance seems to be the least anxious to eliminate aid rapidly, since this would make the domestic resource squeeze even tighter.

Doubts on the feasibility of a 7 percent growth rate in exports were widespread. The Ministry of Commerce expressed the opinion that 4 percent was the maximum possible. The implications of a lower export growth rate taken together with the aid reduction targets did not receive much attention.

On the basis of the exchange of views at this Council meeting, the Planning Commission is going forward with preparation of a draft outline of the Fourth Five-Year Plan, to be published in November 1968. This Plan will be coordinated with a longer perspective plan for the next ten years. Some 49 working groups have been established and are working to prepare reports on different sectors and subjects. The reports will be adapted and incorporated into the overall Plan. These groups have been instructed to keep a ten-year perspective in view and to work within general guidelines based on the "Approach" document. The groups have also been informed that sectoral outlays for the new Plan are not likely to be larger than as indicated in the earlier Fourth Plan Draft Outline; they are to work out their proposals within this general resource constraint.

Meanwhile the Deputy Chairman of the Commission, Dr. Gadgil, is encouraging discussion of the approach to the Plan on wide scale. Views of university members, national political parties, and business leaders are being sought in special meetings. A group of agricultural economists has been asked to assess the agricultural program of the Plan.

The highly sensitive political subject of allocation of Central assistance to the States was discussed in July 1968 by the National Development Council Committee on Central Assistance. After heated discussion among the various State Chief Ministers, it was agreed that population, per capita income, and tax effort would be the main criteria for allocation of assistance. The decision on how these factors should be weighted was deferred until the Planning Commission could provide data on assistance already committed under continuing schemes. The list of Centrally-sponsored

schemes was reduced substantially, and it was proposed that such schemes be restricted to those of national importance or of a regional or inter-state character. Total assistance for each State would be allocated on the basis of an entire plan period and would remain the same regardless of fluctuations in annual assistance.

In summary, the tendency of the "planning process" in India today seems to be toward a more decentralized pattern of operation. Dr. Gadgil is an outspoken advocate of decentralized planning, and talks of planning on the State, District, and even village level. More effort is being made to involve the States and private sector in plans concerning their activities. This does not mean that the commitment to a planned economy is any less; it means that in the absence of dictatorial powers for implementing plans, more effort to achieve acceptance of the plans by the parties involved has been recognized as essential to their accomplishment.

AGGREGATE SAVINGS ESTIMATION AND THE DMS PROJECTIONS

The purpose of this annex is to give a brief statistical analysis of aggregate savings performance in India during the 1960's and to compare the implications for future savings performance of this analysis with the projections of the DMS model reported in the main body of Annex C. Two types of functions relating savings to income levels are tested: one in terms of aggregate behavior, and the other on a per capita basis. It is found that the per capita formulation gives a slightly better fit to the observed data than the aggregate relationship, and that the per capita marginal savings rate seems to be significantly more stable over time than the marginal savings rate on an aggregate basis. Sample projections for the per capita formulation are given with growth rates in net national product of 5 and 6 percent to illustrate the implications for aggregate savings performance. For DMS Case 66, the model's projections are compared with savings estimates determined by the per capita estimating equation. The results are found to be consistently within the likely margin of error of these estimates.

The savings equation in aggregate terms is defined as

$$S_t = a(N_t - \frac{b}{a}) + e_t$$

where

S_t is net domestic savings in year t

N_t is net national product in year t

e_t is an error term for year t

a,b are constants to be estimated

The coefficient a is the aggregate marginal propensity to save. The coefficient (b/a) may be considered as a "subsistence" level of income at which net savings would be zero.

The per capita savings equation is defined as

$$(S_t/P_t) = a\left[(N_t/P_t) - \frac{b}{a}\right] + e_t$$

where P_t is the population in year t and hence (S_t/P_t) and (N_t/P_t) are respectively per capita net savings and net income. The coefficient a in this case is the per capita marginal propensity to save, and (b/a) may be regarded as the "subsistence" level of income in per capita terms. Once the coefficients a and b are found, this equation may be used to estimate aggregate savings given aggregate net national product and population if rewritten in the form

$$S_t = a N_t + b P_t$$

Savings, income, and population data are given in Table 1 for the period 1960-61 through 1967-68. Standard regression methods have been used to estimate the coefficients a and b for each equation with this data. These estimates are

$$S_t = \underset{(.04152)}{.13905}\, N_t - \underset{(10,055)}{13,959}$$

with an r^2 of .651, and

$$(S_t/P_t) = \underset{(.06890)}{.28472}(N_t/P_t) - \underset{(37.40)}{108.92}$$

with an r^2 of .740. Standard errors for the estimated coefficients are given in parentheses below the values of the coefficients. The higher r^2 value for the per capita formulation indicates a slightly better fit, with 74.0 percent of savings variation explained by the equation in this case compared with 65.1 percent by the aggregate savings equation. The magnitude of the standard errors relative to the coefficients is also somewhat smaller for the per capita formulation.1/ A comparison of the actual observed savings levels with those estimated with the two equations is given in Table 2.

1/ The per capita savings equation also has a lower indication of serial correlation of errors, with a Durbin-Watson d value of 1.380 compared with 1.284 for the aggregate equation. Neither value is significant at the 5 percent level.

Table 1

Savings, Income, and Population Data
(values at 1966-67 market prices)

Year	Net domestic savings (Rs.millions)	Net national product (Rs.millions)	Population (millions)	Per capita savings (Rs.)	Per capita income (Rs.)
1960-61	15,610	220,740	429.3	36.36	514.18
1961-62	17,750	231,370	439.2	40.41	526.80
1962-63	20,130	237,980	449.3	44.80	529.67
1963-64	24,630	252,090	459.6	53.59	548.50
1964-65	25,470	269,940	470.6	54.12	573.61
1965-66	21,840	259,170	481.9	45.32	537.81
1966-67	18,470	263,670	494.0	37.39	533.74
1967-68	26,000	290,000	507.0	51.28	571.99

Source: I.Marwah/A.S.Manne table of 7/5/68

Table 2

Savings Estimates and Errors
(Rs. millions at 1966-67 market prices)

Year	Observed savings	Aggregate estimate 1/ Estimated savings	Aggregate estimate 1/ Error	Per capita estimate 2/ Estimated savings	Per capita estimate 2/ Error
1960-61	15,610	16,740	+1,130	16,090	+ 480
1961-62	17,750	18,210	+ 460	18,040	+ 290
1962-63	20,130	19,130	-1,000	18,820	-1,310
1963-64	24,630	21,090	-3,540	21,720	-2,910
1964-65	25,470	23,580	-1,890	25,600	+ 130
1965-66	21,840	22,080	+ 240	21,300	- 540
1966-67	18,470	22,700	+4,230	21,270	+2,800
1967-68	26,000	26,370	+ 370	27,350	+1,350

Notes:

1/ $S_t = .13905\ N_t - 13{,}959 \quad (r^2 = .651)$
$\quad\quad (.04152) \quad\quad (10{,}055)$

2/ $S_t = .28472\ N_t - 108.92\ P_t \quad (r^2 = .740)$
$\quad\quad (.06890) \quad\quad (37.40)$

To provide a rough test of the stability of these estimated coefficients over time, separate estimates of the coefficients for the five-year predrought period 1960-61 through 1964-65 have been made for comparison with the estimates for the entire eight-year period. With the aggregate savings equation, the estimate of a for the five-year period is .21519 , more than 50 percent above the estimate of .13905 for the entire eight-year period, while b is estimated at -31,449 compared with -13,959. With the per capita savings function, the estimates are much more stable. The estimate of a becomes .31392 , a change of 10 percent from the value of .28472 for the entire period, while b is estimated at 123.21 compared with 108.92.

To illustrate the implications of the per capita savings formulation, savings estimates for the period 1967-68 through 1975-76 (at two-year intervals) are given in Table 3 under assumed growth rates of 5 and 6 percent in net national product. Calculated values for the aggregate marginal propensity to save are also given for each two-year period. Since income is growing at a faster rate than population in either case, the apparent aggregate marginal propensity to save rises gradually over time. The aggregate marginal propensity to save is also raised by the higher growth rate. In Table 4, savings levels and average savings rates are given for a range of per capita income levels. These calculations indicate that a 40 percent increase in per capita income - from Rs. 500 to Rs. 700 - would lead to more than a 90 percent increase in the average savings level.

The range of aggregate marginal savings rates - 18 to 20 percent - indicated in Table 3 for a 5 percent growth rate is roughly that required for the DMS model results reported in the main body of Annex C. For a more careful examination, consider the typical DMS Case 66 (6 percent export growth rate, $600 millions net non-food aid in 1969-70). In Table 5, the DMS projections of savings and net national product under Case 66 are given together with savings estimates 1/ based on the per capita estimating equation and using the same values for net national product. The differences between the DMS and estimated savings figures are shown, and a standard statistical test has been used to determine the probability of a difference at least this large occurring by chance (or within the limits of accuracy of our estimating equation). These probabilities are shown in the last column of Table 5. Even in the case of the largest difference (in 1969-70, when DMS calls for a lower level of savings than the estimate suggests), a difference of this size or larger could occur one time in three from chance alone. For later years the difference is well within the accuracy of our estimate. Calculations of this detail have not been made for the other DMS cases, but their savings behavior would also appear to fall within the range of probable estimates.

1/ Note that savings estimates have been adjusted to 1967-68 prices for consistency with the DMS projections.

Table 3

Aggregate Marginal Savings Rates Determined by
Per Capita Savings Function

(All value figures: Rs. millions at 1966-67 prices)

	5% annual growth in NNP			6% annual growth in NNP		
Year	Net national product	Net domestic savings 1/	Aggregate marginal propensity to save	Net national product	Net domestic savings 1/	Aggregate marginal propensity to save
1967-68	290,000	27,346		290,000	27,346	
			18.6%			20.3%
1969-70	319,725	32,869		325,844	34,611	
			18.8%			20.6%
1971-72	352,495	39,040		366,116	42,919	
			19.4%			21.2%
1973-74	388,626	46,060		411,368	52,535	
			19.7%			21.6%
1975-76	428,461	53,916		462,214	63,527	

Note:

1/ As estimated by the per capita savings function:

$$S_t = .28472\ N_t - 108.92\ P_t$$

Population figures are interpolated from GOI Expert Committee 1964 High Projection of 494 millions in 1966, 563 millions in 1971, and 643 millions in 1976.

Table 4

Per Capita Savings and Average Savings Rates
at Different Per Capita Income Levels

Per capita income, N_t/P_t (Rs.)	Per capita savings,[1/] S_t/P_t (Rs.)	Average savings rate S_t/N_t (percent)
500	33.44	6.7
525	40.56	7.7
550	47.68	8.7
575	54.79	9.5
600	61.91	10.3
625	69.03	11.0
650	76.15	11.7
675	83.27	12.3
700	90.38	12.9

Note:
1/ As estimated by the per capita savings equation

$$(S_t/P_t) = .28472\ (N_t/P_t) - 108.92$$

Table 5

Comparison of DMS Savings Projections with
Savings Estimated by Per Capita Equation

(All value figures: Rs. billions at 1967-68 prices)

Year	DMS Case 66 Net national product	DMS Case 66 Net domestic savings	Estimated savings 1/	Difference-estimate vs. DMS	Probability of larger difference occurring by chance 2/
1967-68	310.00	24.00	25.25	+ 1.25	61%
1969-70	331.39	24.97	27.78	+ 2.81	33%
1971-72	362.32	32.08	32.47	+ .39	91%
1973-74	397.17	39.16	38.03	- 1.13	80%
1975-76	436.79	46.38	44.55	- 1.83	75%

Notes:

1/ As estimated by the per capita savings function:

$$S_t = .28472\ N_t - 108.92\ P_t$$

with adjustments made to 1967-68 prices.

2/ As determined by a "t" test with 6 degrees of freedom.

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ANNEX D - FOOD PRODUCTION

This annex will analyze the foodgrain production record for 1967-68 and develop output projections, input requirements, and the supporting policy recommendations for 1968-69 and 1969-70.

Three points must be made explicit at the beginning:

1. A fundamental analysis was presented in FY 1969, Annex B. The annex this year will supplement that exercise on the basis of an additional year of experience.

2. In keeping with the current Mission focus, the discussion will be concentrated on foodgrains.

   In these two aspects, this annex can be considered an interim report.

3. The Mission is initiating a research effort on long-term agricultural analysis to be carried out during FY 1969. This study will focus on long-run adjustment potentials and problems. It will extend our analysis to non-food crops. The results of this study will form the basis for the Agricultural Annex in FY 1971 PM.

The Mission feels that the Green Revolution is well on its way toward becoming an integral part of the Indian economy. Although the influence of weather on any particular year's output cannot be completely buffered, we believe that Indian foodgrain production has shifted to a higher trend line.

We shall attempt to justify our optimism (and, in balance, our concerns) with this annex. The first three sections discuss the statistical basis for foodgrain production projections through 1969-70 and the relationship of production to needs at that time. The fourth section discusses economic policy which will assume an increasingly important role as the New Strategy of Agricultural Development takes hold. The fifth section attempts to analyze the strengths and weaknesses - is there a Green Revolution? - as we see them at this early time. The final section presents the assistance program in agricultural development.

I. 1967-68 PRODUCTION

1967-68 was a bumper year for Indian agriculture. After two years of drought in which foodgrain production slumped from 89 million tons in 1964-65 to 72 million tons in 1965-66 and 75 million tons in 1966-67, 1967-68 production is estimated at 100 million tons. 1/

In the FY 1969 PM, the Mission developed a model which projected 1967-68 output as 93.6 million tons under normal weather conditions, 6.8 per cent below actual output.

An additional year of experience gives the Mission the opportunity to:

A. re-evaluate the assumptions on which the model was based,

B. re-calculate 1967-68 output on the basis of revised assumptions and actual inputs, and

C. calculate the relative contributions of new technology and weather to the 1967-68 performance.

The re-evaluated model will then be used to project 1968-69 and 1969-70 output on the basis of expected input achievements.

A. Re-evaluation of the Model

The model hinges on two groups of estimates. In the first group are those which determine the amount of land, water, and fertilizers put into foodgrain production. The second group consists of the rates of fertilization and the corresponding response coefficients to estimate production increments from the areas under high yielding varieties and irrigated and unirrigated local varieties. A review of these assumptions is made here based on the recent information available on fertilizer trial experiments and practices followed by the farmers and on the GOI program for agricultural development during the Fourth Plan. The 1967-68 estimate from FY 1969 PM is given in Table 1.

1/ According to the all-India final foodgrain production estimates released by the Ministry of Food and Agriculture, foodgrain production in 1967-68 totaled 95.6 million tons.

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Table 1

Model for estimating 1967-68 foodgrain production

Inputs and outputs	Units	Estimates of grain output increases from 1959-60 to 1961-62 (Ave) to 1967-68 with following inputs increases 1/					1959-60 to 1961-62 average 2/	Total Estimates for 1967-68 3/
		Area	High Yield Varieties	Irrigation with local varieties	Non-irrigated local varieties	Total increase		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inputs								
Grain area	1000 acres	3,181	-	-	-	3,181	287,044	290,255
Gross irrigated grain area	1000 acres	605	15,067	8,243	-	23,915	55,125	79,040
Fertilizer for grain	1000 tons	1	366	133	944	1,444	131	1,575
High-yielding varieties	1000 acres	-	15,067	-	-	15,067	-	15,067
Increments to output	1000 tons	885	4,941	1,197	6,136	13,159	80,465	93,624

1/ Increase in grain output estimated as follows:

Col.3 - Yield held constant; production, irrigated area, and fertilizer increases at rate of area increase (1.1 per cent).

Col.4 - High yield varieties grown on irrigated land and fertilized at 53.4 lbs/acre assumed yield response of 13.5 lbs. grain for 1 lb. of fertilizer.

Col.5 - Fertilizer applied at 35.6 lbs/acre; assumed yield response of 9 lbs. grain for 1 lb. fertilizer.

Col.6 - Residual amount of fertilizer available assumed to have a yield response of 6.5 lbs. grain for 1 lb. fertilizer.

2/ Irrigated grain area accounts for about 80 per cent of total irrigated area. It is assumed that 40 per cent of total fertilizer was applied to grain.

3/ Irrigated grain area accounts for 80 per cent of total irrigated area. It is assumed that 75 per cent of total fertilizer was applied to grains. Output expected with average weather conditions and with indicated inputs.

Source: W.E. Hendrix, J.J. Naive, and W.E. Adams, Accelerating India's Foodgrain Production, 1967-68 to 1970-71 Requirements and Prospects for a Yearly Growth Rate of 5 Per Cent (USDA/ERS, Foreign Agricultural Economic Report No.40, 1968) page 12.

1. Foodgrain Area

The model allocates 75 per cent of the gross sown area to foodgrains.

The principal competitors for the area under foodgrains are cotton, sugarcane and groundnut. Of 388 million acres of total cropped area in India during 1963-64 (the latest year for which complete data are available) foodgrains occupied as much as 290 million acres or 75 per cent of the total. The corresponding areas under cotton, sugarcane and groundnut were respectively 5, 2 and 4 per cent of the total.

Cultivators would be expected to adjust relative acreage to relative price changes. The following index numbers of wholesale prices give some indication of relative price changes since 1962-63 (Table 2).

Table 2

Price Relatives of Selected Agricultural Products 1962-68 (financial years) (1962-63 = 100)

	Rice	Wheat	Foodgrains	Sugar & Gur	Oilseeds	Raw Cotton
1962-63	100.0	100.0	100.0	100.0	100.0	100.0
1963-64	112.2	110.0	110.0	130.2	101.8	105.3
1964-65	121.1	149.6	136.5	129.8	132.3	111.5
1965-66	127.4	153.7	142.6	109.2	158.8	114.2
1966-67	155.6	176.4	169.2	133.3	198.4	123.0
1967-68	185.8	224.6	211.2	246.1	188.3	140.7

Source: Derived from Bulletin on Food Statistics, February 1968, pp. 186-7. This source uses 1952-53 = 100 as the base.

It appears that there has been some shift in relative prices of oilseeds and raw cotton in favor of foodgrains. Sugar and gur price index increased in 1967-68 relative to foodgrains, but this would influence 1968-69 acreage. Yields of foodgrains, in particular the high yielding varieties, have risen more than yields of non-foodgrains. In summary, one would expect that foodgrains would retain at least 75 per cent of the total cropped area in 1967-68.

2. Gross irrigated foodgrain area

The model allocates 80 per cent of gross irrigated acreage sown to foodgrains.

The gross irrigated area in 1967-68 is estimated at 95.8 million acres. In 1964-65, the last year for which crop-wise irrigated acreage data are available, it was 77 million acres of which 74.3 per cent was under foodgrains.

Foodgrains area, particularly rice and wheat, has increased. A major share of the increase in irrigated acreage has gone to the production of these crops.2/ The new strategy for food production envisages optimum utilization of irrigation facilities. By 1970-71 the plan is to cover 32.5 million acres with high yielding varieties and increase the multiple cropping acreage to 30 million acres, both of which will demand assured water.

In summary, one would expect foodgrains to have demanded a more than proportional part of the increase in irrigated acreage since 1964-65. The allocation of 80 per cent of gross irrigated area to foodgrains seems realistic.

3. Per Cent of Total Fertilizer Used on Foodgrains

The model allocates 75 per cent of the total fertilizers for foodgrains.

A series of studies conducted during the Second Five Year Plan period reported that approximately 75 per cent of the total consumption of nitrogenous and phosphatic fertilizers was applied to foodgrains.3/ Among foodgrains, fertilizers are applied mainly to rice, wheat, maize and hybrid varieties of jowar and bajra. For non-foodgrain crops the major consumers of fertilizers are sugarcane, cotton, tobacco, and plantation crops.

The Fourth Plan (original) Working Group on Fertilizers of the Department of Agriculture had estimated that foodgrains would require

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2/ Among non-foodgrains the crops mostly irrigated are cotton, sugarcane and oilseeds. For each of these crops, the overall area has remained stationary in recent years although the irrigated area has shown some increase.

3/ Agricultural Situation in India, Vol. XIX, No.3, page 213.

70 per cent of the total quantity of nutrients by 1970-71 based on cropped area and recommended doses.[4] This estimate was made before the introduction of high yielding varieties and new strategy of intensive cultivation. On the basis of more recent experience, the latest Working Group estimate is that foodgrains would require 80 per cent of the total nutrients by 1973-74.

In summary, the allocation of 75 per cent of total fertilizer to foodgrains for 1967-68 appears realistic.[5]

4. Fertilizer dosages

The model used for 1967-68, the rate of fertilization for HYV and irrigated local varieties as 53.4 and 35.6 lbs. per acre respectively. The model was calculated to allocate fertilizer to local varieties only on land brought under irrigation during the year. In effect, the original model assumed that the 55.125 million gross acres which were irrigated or rain-assured as of 1959-62 average received the 131,000 tons of fertilizer available then,[6] but no more thereafter so that average dosages were:

(a) 53.4 lbs/acre for HYV,
(b) 35.6 lbs/acre for local on newly irrigated land,
(c) 5.2 lbs/acre for local on old irrigated land, and
(d) 1.0 lbs/acre on local varieties, unirrigated land.

or if (b) and (c) are summed, we obtain an average of 9.1 lbs/acre on all irrigated land under local varieties. Under the existing

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4/ Cited in Report on the Committee of Fertilizers, Ministry of Food and Agriculture (Department of Agriculture), Government of India, 1965, page 8.

5/ An additional check was made by aggregating (by crops) Donahue's estimated 1970-71 fertilizer requirements. His data gave 75.12 per cent of total nutrients to foodgrains. See Roy L. Donahue, Estimates of Fertilizer Consumption in India in 1970-71 (New Delhi: The Fertilizer Association of India, 1966).

6/ This assumption is not explicitly stated in the original model. 131,000 tons is 40 per cent of total fertilizer use in average 1959-62.

price ratio these are much below the economic optima. 7/

Although we have some notion of what "could" be used, very little is known about the fertilizer practices actually followed by the farmers. There is a high correlation between the proportion of irrigated area and the fertilizer use.[8] For all the crops the rate of application was much below the recommendations[9] (Table 3).

7/ Analysis of all-India coordinated trials gives the following approximate optimal dosages of nitrogen:

Rice	Year	(lbs/acre) approximate optimal dosage
Dwarf	1966-67	114
Local indica	1966-67	79
Wheat		
Sonora-64	1966-67	131
Lerma Rojo	1966-67	109
C-306	1966-67	96
Local irrigated	1964-65	88
Local unirrigated	1964-65	61
Jowar	1965	118
Maize	1961, 1962, 1963	131-175
Bajra	1965	138

These are based on roughly a 3.5 to 1 fertilizer to foodgrain price ratio. Data from all-India coordinated agronomic trials were fitted to quadratic response functions and then solved for optimum levels.

8/ Consumption of total plant food ($N+P_2O_5+K_2O$) per acre under cultivation in each of India's then (1963-64) major 15 states correlated with proportion of irrigated foodgrains acreage to total acres in foodgrains gives an r of 0.823 (significant at 1% level). See W. David Hopper, "Planning Yardsticks for Fertilizer and Irrigation," Agricultural Situation in India, September 1965, pages 463-477.

9/ Recommended dosages for local varieties differ widely from region to region but generally fall within the following ranges of $N/P_2O_5/K_2O$ (lbs/acre): Rice, 15/15/0 to 40/40/40; maize, 20/20/0 to 50/25/25; jowar, 15/0/0 to 40/20/0; bajra, 20/0/0 to 40/20/0; and wheat, 15/15/0 to 45/25/25.

Table 3

Summary of the Fertilizer Practices followed by the Farmers

	Percentage of irrigated area	Percentage of total area benefited by fertilizers	Percentage of the recommended dose applied	
			Nitrogenous Fertilizer	Phosphatic Fertilizer
Paddy	64	48	58	58
Wheat	77	30	24	64
Millets	-	4	19	12
Maize	19	16	13	-
Jowar	15	-	-	-
Bajra	1	7	63	-

Source: Derived from Agricultural Situation in India, Vol.XIX, No3, page 213.

Comparison of data collected in the early 1960's with data from the late 1950's indicates that there has been a substantial increase in the percentage of area fertilized but no increase in dosage.[10] In summary, what information we do have on local varieties indicates that

(a) irrigation is an important determinate of the dosage,
(b) little fertilizer is used on unirrigated crops unless rain is assured.

During the kharif (summer) of 1967 the Program Evaluation Organization of the Planning Commission conducted a survey in the high yielding varieties area and reported fertilizer application

10/ Agricultural Situation in India, Vol. XIX, No.3, page 213.

generally below the recommended dose.[11] Among the surveyed plots, the nitrogenous fertilizers were applied on 42.2 per cent of the paddy plots only with an average rate at about half of the recommended dose. The phosphatic fertilizers were applied for 35.2 per cent of the paddy plots and the average dose applied for these plots was about 70 per cent of what recommended. About one-tenth of the paddy plots received K_2O but the average dose given was nearer to the recommended range. For hybrid varieties, the proportion of plots covered by nitrogenous fertilizers was the highest for irrigated maize followed by jowar and irrigated bajra. The largest proportion of plots covered with more or less the recommended dose was observed in the case of hybrid maize. For jowar and bajra the rate of application was much below the recommended level. Similar practices were reported in case of phosphatic and potashic fertilizers.[12]

A comparison of the fertilizer trial experimental results with the data pertaining to range of yields and average yield per acre in respect of different high yielding varieties obtained during the kharif and rabi season of 1966-67 (Table 4) provides further indirect information on the rate of fertilization.

11/ Recommended dosages of $N/P_2O_5/K_2O$ (lbs/acre) are approximately as follows: rice, wheat, and hybrid maize, 80/60/40 except in Punjab where it is 100/60/40; hybrid jowar and bajra, 60/40/30.

12/ Ludhiana district fertilizer use on high yielding varieties of wheat during 1966-67 was as follows:

Nutrient	Average Rate	X	% Application	=	Weighted Rate
N	86 lbs/acre		100		86 lbs/acre
P_2O_5	30 "		71		21 "
K_2O	57 "		35		20 "
					127 "

Ford Foundation, IADP, Ludhiana District Analysis of Bench-mark and Assessment Surveys Under the IADP Crop-Cutting Schedules, November 1967, page 3.

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Table 4

Summary of the range of yields of different high yielding varieties during kharif and rabi 1966-67, all-India

(lbs. per acre)

	kharif (summer)		rabi (winter)	
	Yield range	Normal yield range (minus extreme cases)	Yield range	Normal yield range (minus extreme cases)
Paddy				
T.N.-1	165-9955	2200-4960	1760-10318	3520-5093
Tainan-3	822-9291	2549-4730	1500-7500	2526-6250
Taichung Native 1	1984-9259	4525-5142	-	-
Taichung 65	1984-8598	3638-4484	1430-8800	2860-5014
ADT-27	905-9214	3821	1320-7510	3520-3577
Mexican wheat	-	-	820-8200	1650-4536
Hybrid jowar	110-6614	1540-2866	1100-10120	3639-4036
Hybrid bajra	661-6331	1645-3371	660-6160	1650-2897
Hybrid maize	902-8377	2200-4101	660-8800	3003-4180

Source: A Note on High-Yielding Varieties Program - Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Cooperation.

The average yield for all the varieties showed wide variations. The reasons attributed for these included variations in soil and water conditions and variations in farmers skills, particularly in water management and application of fertilizers and plant protection measures. Weighting the state averages with the corresponding area under the particular variety, the all-India average yields of the different high yielding varieties corresponds favorably with those obtained in the fertilizer trial experiments at a level equivalent to 50 lbs. of plant nutrient per acre. These experiment results include, however, a whole complex of practices rather than fertilizers alone. If allowances are made due to the variation in the rate of adoption of package of practices it seems that an average of 60 lbs. per acre would be a reasonable rate at which the plant nutrients are presently applied on high yielding varieties by the farmers.[13/]

5. Fertilizer Response Ratios

The fertilizer response ratios used in the original model were: (a) 13.5 for high yielding varieties, (b) 9.0 for irrigated local varieties, and (c) 6.5 for non-irrigated local varieties.

We have eliminated the 6.5 response ratio and assumed that all fertilizer goes to irrigated or rain-assured acreages for two reasons.

1. Little fertilizer appears to be allocated to unirrigated acreages unless rain-assured.

13/ The relative dosages used in the model would come close to equating the marginal responses of local and HYV. These relative marginal rates at the assumed dosages are given in a footnote to section II-D.

For every lb. of NPK moved from local to HYV in this model, there is a gain of 4.5 lbs. of foodgrains. The fertilizer; foodgrain price ratio is approximately 3.5:1.

2. An average ratio of 6.5 is at an economically marginal level if one includes some risk factor.[14]

The limitations of using aggregate response ratios to estimate production increments needs to be emphasized. Responses to fertilizers have shown wide variation by crop and by region to the application of different plant nutrients.

The Institute of Agricultural Research Statistics has conducted over 10,000 experiments on fertilizer response based on cultivator's field trials over India. These "yardsticks" are based on local varieties and do not include the interaction terms between various agronomic practices such as fertilizers, crop varieties, pest control, improved cultivation practices, etc.

The results of tests running from the beginning of the First Five Year Plan up to 1963 of response curves fitted by quadratic

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14/ The quadratic function fitted to yield data for unirrigated local wheat in 1964-65 is approximately:

$$Y = a + 10.67x - 0.1016x^2$$

At a 6.5 <u>average</u> nitrogen response ratio, the <u>marginal</u> ratio is 2.54 which is well below the fertilizer/foodgrain price ratio of approximately 3.50. If one uses fertilizer to the point where the <u>marginal</u> response ratio is close to the nutrient:fertilizer price ratio plus a risk factor, the <u>average</u> response ratio would be closer to 9 to 1. In any case, with scarce fertilizer resources, unirrigated local wheats would not be economically competitive for fertilizer with the high yielding varieties. See R.W. Cummings, Jr., R.W. Herdt, and S.K. Ray, "New Agricultural Strategy Analyzed - Revisited," 1968, mimeographed.

functions and standardized to 20 and 40 lbs. per acre are summarized below in Table 5.

Table 5

Crop	Nutrient	20 lbs/acre average	40 lbs/acre average
Rice	N	10.8	8.2
	P_2O_5	7.1	5.5
Irrigated wheat	N	14.1	11.5
	P_2O_5	8.7	7.5
Unirrigated wheat	N	7.6	
	P_2O_5	4.1	
Maize	N	12.0	9.6
	P_2O_5	6.8	5.8

Sources: Derived from Yardsticks of Additional Production of Certain Foodgrain, Commercial and Oilseed Crops, by V.G. Panse, T.P. Abraham, C.R. Leelavathi, Institute of Agricultural Research Statistics, ICAR, 1964.

A 9 to 1 ratio appears to be a reasonable average for total nutrients at 20 lbs. per acre.[15]

15/ The GOI assumes 10 to 1 response ratio for N and 6 to 1 for P_2O_5. W.D. Hopper came to the conclusion that 10 to 1 for N was about right but 6 to 1 for P_2O_5 was conservative. The addition of irrigation would further raise these response ratios. See W.D. Hopper, "Planning Yardsticks for Fertilizer and Irrigation," Agricultural Situation in India, September 1965, pages 463-477.

If we accept the 10 to 1 and 6 to 1 ratios, a weighted average (by N and P_2O_5 availability in 1966-67) would give a 9 to 1 ratio.

Agronomic trials on high yielding varieties crops have reported high responses to nitrogenous fertilizers. The average response coefficients of Sonora-64 and Lerma Rojo at a level of 60 lbs. N/acre are respectively at 27.7[16] and 23.9[16]. The corresponding responses for hybrid jowar, bajra and maize at 60 lbs. N/acre level are respectively 18.3,[17] 20.4[17] and 19.8.[18] Different high yielding varieties of paddy have shown wide variation in response to fertilizer with an average of 24.7 at the level of 60 lbs. N/acre.[16]

These data may be interpretted to suggest that the assumed response ratio of 13.5 for high yielding varieties was too conservative. However, it must be kept in mind that these high reported response ratios are for nitrogen only. We have no new data for P_2O_5 and K_2O. The responses to these other elements are generally lower than to N. Secondly, these data refer to experimental trials and our production projections apply to cultivators over a wide variety of conditions.[19] We have, therefore, retained this overall ratio for the computational purpose and will re-evaluate the coefficient when more information is available.

6. Summary of re-evaluation of assumptions

There does not appear to be sufficient new information to challenge the basic assumptions of the model developed last year. The one change

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16/ Preliminary analysis of 1966-67 all-India coordinated trials by fitting the nitrogen response data to quadratic functions are summarized in Table 6.

17/ Response of Hybrids of Sorghum and Pennisetum to Nitrogen - B.R. Murty, Journal of the Post-Graduate School, June 1967, Vol.5, No.1.

18/ An analysis of Response to Hybrid Maize to Nitrogen - V.H. Shah, Journal of the Post-Graduate School, June 1967, Vol.5, No.1.

19/ IADP analysis of Ludhiana district fertilizer use and yield data indicates that progressive cultivators approximate these experimental results. In 1966-67, cultivators in Ludhiana district had average yields of 4310 lbs/acre from Mexican varieties with average use of 86 lbs/acre of N (in addition to 21 lbs/acre of P_2O_5 and 20 lbs/acre of K_2O). Inserting 86 lbs/acre of N into the 1966-67 equation for Lerma Rojo from experimental data gives an output of 3524 lbs/acre of foodgrains which is below actual performance.

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Table 6

Preliminary Estimates of Response to Nitrogen of High Yielding Varieties from 1966-67 All-India Coordinated Trials

	Rate of Fertilization (lbs/acre)									
	20	40	60	80	100	120	140	160	180	200
	Additional Yield (lbs/acre)									
1. Rice										
a. Dwarf	579	1074	1483	1808	2048	2203	2274	2259	2160	1976
b. Ponlai	376	703	981	1210	1391	1523	1606	1640	1625	1562
c. Local Indica	403	726	970	1133	1216	1219	1142	986	749	432
2. Wheat										
a. Sonora-64	635	1190	1663	2056	2368	2599	2750	2819	2808	2716
b. Lerma Rojo	563	1041	1436	1746	1973	2116	2174	2149	2039	1846
c. C-306	429	785	1067	1275	1410	1471	1459	1373	1213	980
	Average Response									
1. Rice										
a. Dwarf	28.96	26.84	24.72	22.60	20.48	18.36	16.24	14.12	12.00	9.88
b. Ponlai	18.79	17.57	16.35	15.13	13.91	12.69	11.47	10.25	9.03	7.81
c. Local Indica	20.16	18.16	16.16	14.16	12.16	10.16	8.16	6.16	4.16	2.16
2. Wheat										
a. Sonora-64	31.76	29.74	27.72	25.70	23.68	21.66	19.64	17.62	15.60	13.58
b. Lerma Rojo	28.13	26.03	23.93	21.83	19.73	17.63	15.05	13.43	11.33	9.23
c. C-306	21.46	19.62	17.78	15.94	14.10	12.26	10.42	8.58	6.74	4.90

Source: Data from 1966-67 all-India coordinated agronomic trials fitted to quadratic response functions.

that will be made is to allocate no fertilizer to land with unassured rainfall. The residual fertilizer will therefore be put on irrigated or rain-assured land with a response ratio of 9.0 to 1.

B. Readjustment of 1967-68 projection on basis of re-evaluated assumptions and actual inputs

Table 7 compares projected (in FY 1969 PM) and actual input availabilities for 1967-68.

Table 7

	Projected	Actual
Foodgrain area (mil. acres)	290.2	291.5 a/
Gross irrigated foodgrains area (mil. acres)	79.0	76.6 b/
Fertilizer applied to foodgrains (mil. nutrient tons)	1.6	1.18 c/ d/
High yielding varieties area (mil. acres)	15.1	16.0

Notes: a/ The GOI all-India final estimate of foodgrain acreage for 1967-68 is 300.187 million acres compared to approximately 285 million acres for 1966-67. A large portion of the increment is marginal land sown only because of very favorable rains. We have adjusted the reported figure to acreage which we think would be consistent in quality with the historical acreage data.

b/ 80 per cent times 95.8 million acres.

c/ 75 per cent times 1.576 million tons of nutrients of which 1.071 million tons was N, 0.335 million tons was P_2O_5, and 0.170 million tons was K_2O.

d/ This fertilizer shortfall was due in part to the facts that arrivals for the 1967-68 kharif period were late because of the closing of the Suez Canal and uncertainty regarding U.S. aid.

Inputs for gross foodgrain area and area under high yielding varieties must be raised while those for irrigated area and fertilizer applied must be lowered. With the input base actually available in 1967-68, the model provides a "normal-weather" production estimate of 93.1 million tons of foodgrains. The calculations are shown in Table 8.[20]

C. Effect of Weather

The final question is whether the remaining 6.9 million tons of output can be explained by the usually favorable weather.

Estimation of "weather effect" could be made from comparable agricultural and meteorological data for a long period. We do not have this data. Alternatively, as a rough measure, the influence of favorable or unfavorable weather can be obtained from the trend analysis of the historical peaks and troughs of the India crop production data.

An analysis of 30 years production data of the Indian Union from 1936-37 to 1965-66 shows the degree of instability of foodgrains production due in part to weather.[21] Upto 1950-51, representing the pre-plan era, food production showed a downward trend (0.68 per cent per annum) with declining trends both in peak points and trough points respectively of 0.54 and 0.50 per cent per annum on the average. Peak and trough trend lines continued to converge and the production was fairly stable although the general trend was one of stagnation. Production declined from the peak on five occasions and only once it was more than 5% (Table 9).

During the plan periods (1951-52 to 1965-66), growth rate increased, but both the peak points and the trough points also increased at a rate of 2.76 and 2.20 per cent per annum respectively. Production declined from the peak on five occasions and changes varied between 2 per cent and 19 per cent. Thus, while plan programs tended to increase crop output, instability also tended to increase with the rate of growth.

20/ On the basis of these calculations, average yields are as follows: local, unirrigated, 607.5 lbs/acre; local, irrigated, 857.5 lbs/acre; and HYV, 1,417.5 lbs/acre.

21/ S.R. Sen, "Growth and Stability in Indian Agriculture," Agricultural Situation in India, Vol. XXI, No.10, pp.827-839.

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Table 8

1967-68 Production Estimate From The Model

Inputs and Outputs	Units	Estimates of grain output increases from 1959-60 to 1961-62 (Ave) to 1967-68 with following input increases 1/				1959-60 to 1961-62 Average 2/	Total Estimate for 1967-68
		Area	High Yielding Varieties	Local Varieties	Total Increase		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inputs:							
Grain Area	1000 acres	4,416	-	-	4,416	287,044	291,460 3/
Gross Irrigated grain area	1000 acres	827	16,060	-	21,445	55,125	76,570 4/
Fertilizer for grain	1000 tons	2	438	611	1,051	131	1,182 5/
High Yielding Varieties	1000 acres	-	16,060	-	16,060	-	16,060 6/
Increments to Output	1000 tons	1,207	5,913	5,499	12,619	80,465	93,084

1. Increases in grain output estimated as follows:
   Col. 3 - yield held constant; production, irrigated area, and fertilizer increases at rate of area increase (1.5 per cent).
   Col. 4 - high yielding varieties grown on irrigated land and fertilizer at 60 lbs/acre; assumed yield response of 13.5 lbs grain for 1 lb. of fertilizer.
   Col. 5 - residual amount of fertilizer assumed used on irrigated area or rain-assured land with a yield response of 9 lbs. for grain for 1 lb. of fertilizer.
2. Refers to the figures used in FY1968 program document.
3. Based on the first estimate of the area under foodgrains announced by the Directorate of Economics and Statistics and the estimate provided by the Office of the Agricultural Attache.
4. Based on the data collected by the Water Management Division of USAID. 80 per cent of the gross irrigated area is assumed for foodgrains.
5. 75 per cent of the likely total consumption. Total estimated by Capital Projects Office, USAID.
6. The estimated coverage during the Kharif of 1967 was 5.90 million acres. The revised target during the rabi of 1968 was 10.16 million acres and the indication is that this target might have been crossed.

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Table - 9

Adjusted production of foodgrains in the Indian Union

Year	Adjusted estimate of production of foodgrains. (Million tonnes)	Diff. between peak and subquent trough (Million tonnes)	No. of years over which diff. in col. 3 relates to	Percentage diff. per annum
1	2	3	4	5
1936-37	64.7			
1937-38	63.4	5.8	2	4.5
1938-39	58.9			
1939-40	61.0			
1940-41	58.9	3.5	2	2.9
1941-42	57.5			
1942-43	64.2			
1943-44	65.1			
1944-45	63.1	8.1	3	4.2
1945-46	57.6			
1946-47	57.0			
1947-48	58.7	1.7	1	2.9
1948-49	57.0			
1949-50	59.8	5.7	1	9.5
1950-51	54.1			
1951-52	54.5			
1952-53	60.5			
1953-54	71.2	2.4	1	3.4
1954-55	68.8			
1955-56	69.0			
1956-57	72.3	7.0	1	9.7
1957-58	65.3			
1958-59	78.1	1.6	1	2.0
1959-60	76.5			
1960-61	82.0			
1961-62	83.9	5.9	1	7.0
1962-63	78.0			
1963-64	81.3			
1964-65	89.9	17.3	1	19.2
1965-66	72.6			

Source: Sen, S.R., "Growth and Instability in Indian Agriculture" - Agricultural Situation in India, Vol. XXI, No. 10.

The traditional crop varieties with lower response to fertilizer, water and other inputs were systematically replaced by improved varieties with higher yields but sensitive to imbalances in the input-mix. At the beginning of the First Five Year Plan the proportion of sown irrigated area was 17%; the corresponding figures at the end of First, Second and Third Plan were only 16.7, 18.3 and 18.0 per cent respectively.

Therefore, historical experience leads us to believe that it is reasonable to expect an additional 6 to 7 million ton production contribution from unusually favorable monsoons.

D. Relative role of new technology vs. weather

In conclusion, our analysis indicates that the difference between 1959-62 average production of 80,465,000 tons and the 1967-68 production of 100 million tons might be accounted for as follows:

	Million tons
a) HYV including fertilizer and irrigation	5.9
b) Area expansion alone	1.2
c) Increased coverage of irrigated and rain-assured lands with fertilizer	5.5
Total explained by inputs	12.6
d) Weather	6.9
Total increase	19.5

There is no single accepted way to divide the 12.6 million tons between new technology and "something else." This depends on one's choice regarding where to include the irrigation and fertilizer and what weight to give to the interaction of these inputs as compared to the specific contribution of any input in the absence of the others.

The 93.1 million tons output which our model projected for 1967-68 approximated the 1967-68 trend estimate projected from past production data by means of a three-year moving average.[22] The contribution of the new technology in 1967-68 is only beginning to make an impact on total production. This should not be surprising; 1967-68 followed on two successive drought years and the kharif crop was sown before the success of the monsoon was assured. Fertilizer availability for the kharif crop was short. The trend was projected at liberal rates which were based on substantial increments of inputs. In short, the 1967-68 performance was impressive, but the real impact will come in the following years.

II. PROJECTED PRODUCTION FOR 1968-69 AND 1969-70

Assuming that the objective of a 5 per cent growth rate from 1967-68 is an acceptable goal - and we will demonstrate that it is an attainable goal - foodgrain productions in 1968-69 and 1969-70 should be 98 and 103 million tons respectively. The projected inputs of land, water, fertilizer and seed variety on the next two years crop output are shown in Table 10 based on their known availability, estimated projections, or the targets fixed by the GOI for 1968-69 and 1969-70.

A. Area Sown and Irrigated Area

The net sown area in 1964-65 was 340.89 million acres. Since then roughly 350,000 acres were added every year. Assuming this trend to continue, the net sown areas at the end of 1968-69 and 1969-70 are expected to be 342.29 and 342.64 million acres respectively.

22/ W.E. Hendrix, J.J. Naive, and W.E. Adams, Accelerating India's Food Grain Production 1967-68 to 1970-71, Foreign Agricultural Economic Report No.40, U.S. Department of Agriculture, Economic Research Service, 1968, page 3.

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Table 10

Estimated production for 1968-69 and 1969-70

Inputs and Output	Units	Estimates of grain output increases from 1959-60 to 1961-62 (Ave.) from High Yielding, Local varieties area 1/				1959-60 to 1961-62 Average	Total Estimates for 1968-69 and 1969-70
		Area	High Yielding Varieties	Local Varieties	Total Increases		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inputs:				1968-69			
Grain Area	1000 acres	6,216	-	-	6,216	287,044	293,260
Gross irrigated grain area	1000 acres	1,213	22,600	-	27,255	55,125	82,380
Fertilizer for grain	1000 tons	3	719	673	1,395	131	1,526
High Yielding Varieties	1000 acres	-	22,600	-	22,600	-	22,600
Increments to Output	1000 tons	1,770	9,706	6,059	17,535	80,465	98,000
Inputs:				1969-70			
Grain Area	1000 acres	8,196	-	-	8,196	287,044	295,240
Gross irrigated grain area	1000 acres	1,544	27,000	-	30,435	55,125	85,560
Fertilizer for grain	1000 tons	4	982	780	1,766	131	1,897
High Yielding Varieties	1000 acres	-	27,000	-	27,000	-	27,000
Increments to Output	1000 tons	2,253	13,257	7,025	22,535	80,465	103,000

1/ Increases in grain output estimated as follows:

Col.3 - Yield held constant, production, irrigated area and fertilizer increases at rate of area increase (2.2 and 2.8 per cent for 1968-69 and 1969-70 respectively).

Col.4 - High Yielding Varieties grown on irrigated land with rates of fertilization of 70 and 80 lbs/acre respectively for 1968-69 and 1969-70; assumed response of 13.5 lbs grain for 1 lb. of fertilizer for both the years.

Col.5 - Residual amount fertilizer assumed used on irrigated area or on rain-assured land with yield response of 9 lbs. of grain for 1 lb.of fertilizer.

Because of the limited scope in bringing new land under cultivation, the prospect of increasing gross sown area will depend upon cropping intensity in irrigated and non-irrigated areas. The new strategy for intensive cultivation is expected to increase the cropping intensity in irrigated areas from the present level of 1.19 to 1.21 in 1968-69 and to 1.23 in 1969-70. However, for unirrigated areas, the proportion of double-cropped to net sown area is expected to remain at the present level of 12 per cent. The projected gross sown area and the gross irrigated with the corresponding allocation for foodgrains production for 1968-69 and 1969-70 are as follows:

	Million Acres	
	1968-69	1969-70
1. Gross sown area	391.02	393.66
2. Gross area under foodgrains (75% of the gross sown area)	293.26	295.24
3. Gross irrigated area	102.98	110.70
4. Gross irrigated grain area (80% of the gross irrigated area)	82.38	88.56

We are retaining the assumptions that 75 per cent of gross sown area and 80 per cent of gross irrigated area will be in foodgrains. At this time, we do not have adequate guesses on anticipated price changes and the resulting acreage reactions to predict adjustments. Price policy will play an important role in this matter.

On the one hand, while foodgrain prices in 1967-68 were lower than those in 1966-67, they were backed up by effective price support at incentive levels and presumably this policy will be followed in 1968-69, and 1969-70. On the other hand, with the record foodgrains production largely due to the high prices and popularization of the high yielding varieties, government officials fear some diversion of land from cash crops to foodgrains.

The anxiety to check any such possible shift in area from cash crops to foodgrains is reflected in the recent prices announced by the government for sugarcane. Cane acreages and production was low in 1967-68. In order to encourage more cane production, and in particular, in order to encourage more cane for mills rather than to be used for gur, price controls were relaxed on refined sugar in order that mills would pay higher prices to growers. There is a growing realization that price policies used to provide economic incentives to encourage foodgrain production should not lead to, if possible, shifts in acreage from non-foodgrains.

To summarize, with limited scope to bring new land under cultivation, it seems that the area under foodgrains would remain at approximately 75 per cent of the total cropped area for at least the next few years.

B. High Yielding Varieties

The targets for the high yielding varieties program for 1968-69 and 1969-70 are 22.6 and 27.0 million acres respectively.1/ The success of this program will be developed in more detail in Section V. These targets are reasonable.

C. Fertilizer

We have assumed that the rate of fertilization in high yielding varieties area will increase due to two factors:

1. Sufficient fertilizer will be in place at the beginning of each crop season during the next two years,

2. Relative prices will remain favorable for the producers and provide incentive to apply fertilizer at higher rate.

1/ These targets are based on an average annual increase between 16 million acres in 1967-68 and 32.5 million acres in 1970-71 (which was the original Fourth Plan target). The tentative target now projected by the GOI for 1973-74 is 60 million acres; if this is finally agreed on, the yearly targets may be revised upward.

It is assumed that the high yielding varieties area will be irrigated and the rate of fertilization will increase from 60 lbs. per acre in 1967-68 to 70 and 80 lbs. per acre in 1968-69 and 1969-70 respectively. The proportion of fertilizers for foodcrops is assumed to remain same at 75 per cent of the total. The fertilizer response ratios for foodcrops are assumed to remain same as in 1967-68 i.e., 13.5 for high yielding varieties and 9.0 for local varieties.2/

D. Results given by the 'Revised' Model

The model first estimates the additional output resulting from the area increase holding yield constant. The second step measures additional output obtained by using fertilizers on high yielding variety acreage. Fertilizer requirements for high yielding varieties are obtained from the target acreages and the rates of fertilization of 70 and 80 lbs. for 1968-69 and 1969-70 respectively. The final step calculates the additional fertilizer on irrigated and rain-assured acreages necessary to bring total production to 98 and 103 million tons in 1968-69 and 1969-70.

If we apply that the residual amount of fertilizer required to give foodgrain outputs of 98 and 103 million tons solely to irrigated acreage, the average rate of fertilization on irrigated acreage will increase from 27.8 lbs. per acre in 1967-68 to 29.7

2/ This assumption does imply some increase in technology and management since, otherwise, the average response ratio at an extra 10 lbs/acre of NPK would decline from 13.5.

and 34.4 lbs. per acre in 1968-69 and 1969-70 respectively.[3] Alternatively we could assume that two-thirds of the remaining fertilizer is put on irrigated acreage and one-third on rain-assured unirrigated acreage. This would lower the average rate on irrigated acreage and give some small average rate for dry land areas (which would in fact all be on rain-assured dry land areas).[4]

Minimum fertilizer requirements for foodgrains alone estimated by the model for 1968-69 and 1969-70 are 1.53 and 1.90 million tons respectively. When the requirements for non-foodgrains are also taken into account, then the minimum total fertilizer requirements for these two years work out as 2.04 and 2.53 million tons respectively.

3/ The relative marginal responses of varieties on the bases of data from the all-India coordinated trials at the assumed dosages for 1967-68 through 1969-70 are as follows:

Dosage/Variety	1967-68		1968-69 (lbs/acre)		1969-70	
	27.8	60	29.7	70	34.4	80
	(Marginal responses, lbs. foodgrain : lb. N)					
Rice						
Dwarf	-	18.36	-	16.23	-	14.12
Local indica	16.60	-	16.22	-	15.28	-
Wheat						
Sonora-64	-	21.66	-	19.64	-	17.62
Lerma Rojo	-	17.63	-	15.53	-	13.43
C-306	18.18	-	17.83	-	16.96	-
Minhas local unirrigated	10.88	-	10.26	-	8.72	-

4/ The average yields resulting from the first assumption of fertilizer distribution and the relevant response ratios are (lbs/acre):

	1967-68	1968-69	1969-70
Local, unirrigated (no NPK)	607.5	607.9	607.3
Local, irrigated	857.5	874.9	917.3
HYV	1417.5	1552.9	1687.3

Fertilizer supply targets for 1968-69 and 1969-70 are 2.75 and 3.33 million tons respectively. If these are attained, there will be an adequate supply of chemical nutrients in India, but great demands will be placed on capacity for growth of the distribution to get the nutrients to the right place at the right time.

At the time of the writing of this Annex (August 1968), we have preliminary indicators of two important inputs, fertilizer and weather. Fertilizer orders have virtually been completed for the 1968-69 crop season and aggregate fertilizer supply should be adequate for that crop year. The monsoon has started slowly, but appears to be about average for India as a whole with rains being good in the north but low and irregular in parts of the south and west (the major rice area). It should be kept in mind that this reading is based on only the first two to three months of the monsoon.

E. Other Crops

Foodgrains account for over half of the value added in the agricultural sector. The other important non-animal food products in the agricultural sector are chillies, fruits, and vegetables; oilseeds; and sugarcane.5/ These crops have not experienced the technological breakthroughs which have characterized the cereals. Therefore, output increases must come from either:

1. acreage expansion induced by relative price changes or

2. increased use of other inputs, particularly inorganic fertilizers and irrigation.

5/ The percentage breakdown by major product groups is as follows in 1967-68:

Foodgrains	(cereals)	(45.6)
	(pulses)	(5.9)
	Total	51.6
Straws and stalks		8.1
Chillies, fruits and vegetables		11.0
Oilseeds		7.2
Sugarcane		4.9
Cotton		4.1
Jute and mesta		1.9
Tea		1.2
Others		9.9

1. Sugar

Sugarcane is a year-round crop in India. 1967-68 output was also favorably affected by weather but was still relatively low for two reasons:

a. Acreage was down because the sugar-gur/foodgrain price ratio[6/] fell from 162.6 in 1963-64, to 134.4 in 1964-65, to 105.3 in 1965-66 and rose only to 111.3 in 1966-67, the year which would have influenced sowing decisions for 1967-68.

b. The sugar/gur price ratio shifted from 77.5 in 1966-67 to 40.2 in 1967-68. As a result deliveries to mills which can get a higher recovering rate than village-processed gur declined significantly.

The 1967-68 sugar and gur/foodgrains price ratio rose to 160.2 and the GOI has allowed sugar mills to freely distribute up to 40 per cent of production, thereby raising delivery prices. All this means that 1968-69 cane acreage will be above 1967-68 - perhaps by 20 per cent. More fertilizer will be used. Since a high percentage of cane is irrigated, overall sugar production will be substantially above 1967-68.

The income elasticity of demand for sugar is over double that of foodgrains (roughly 0.90 compared to 0.40). The government is aware of the sensitivity of cane acreage to relative price changes. Therefore, 1969-70 sugarcane production is projected to increase above 1968-69.

2. Oilseeds

We can say less about oilseeds. 1967-68 estimated production of the five major oilseeds was of the order of 8.65 million tons as compared to 6.49 million tons of 1966-67. A low proportion of oilseeds acreage is irrigated. Weather will considerably influence 1968-69 acreage under oilseeds.

3. Chillies, fruits, and vegetables

We have no educated guesses about the 1968-69 and 1969-70 production of chillies, fruits, and vegetables.

6/ Using a rough index of ratio of wholesale price indices of sugar and gur relative to foodgrains calculated on a 1952-53 base.

III. THE PROJECTED LEVELS OF OUTPUT IN TERMS OF DRIVE FOR FOODGRAIN SELF-SUFFICIENCY 1/

"Foodgrain self-sufficiency" is an ambiguous term. Presumably it is defined with regard to the satisfaction of human demand (related to either income or nutrition) together with the elimination of food imports. However, estimates of the level of foodgrain output necessary to enable India to be "self-sufficient" in 1970-71 have ranged from 106 to 120 million tons; there is a substantial disagreement over what this term means with regard to specific output targets.2/ Therefore, we will discuss three possible criteria.

The first criteria might be nutrition. Table 11 shows the calculated availabilities of cereals and pulses from reported production (minus 12½ per cent for feed, seed, and waste), imports, and changes in stocks from 1950-51 through 1966-67 and for projected availabilities for 1967-68 through 1969-70.

The 100 million tons foodgrain output in 1967-68 plus imports of 8.2 million tons gives a record per capita availability of 17.1 oz. per day in addition to building a buffer of 3 million tons. In the following two years our calculations give total foodgrain availabilities of 16.4 oz. per person per day in addition to a total buffer of seven million tons at the end of 1969-70.

The major weakness of this calculation is that a substantial portion of 1967-68 production will not be consumed immediately but be used to rebuild private stocks depleted during the drought years. If we can assume that 1966-67 was a "normal" year (so that private

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1/ We do not use the term "self-sufficiency" by choice. It is a term which figures prominently in GOI discussions of planning targets. We hope our discussion highlights the difficulty of a single meaningful definition.

2/ 106 million tons was projected by USAID in FY 1969 PM. 120 million tons was projected by the GOI in the original draft of the Fourth Plan.

Assuming a 2.5 per cent compound population growth rate and subtracting 12.5 per cent of production for waste, seed, animal feed, etc. (a generally used GOI adjustment, which is probably low), these targets represent approximately 15.7 and 18.0 oz. of foodgrains per person per day if all is consumed.

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Table 11

Availability of Cereals and Pulses in India

Year	Population	Cereals: Net Production	Cereals: Net Imports	Cereals: Govt. Stocks	Cereals: Net. Avail.	Pulses: Net Avail.	Total per cap. net avail.: Cereals	Total per cap. net avail.: Pulses	Total per cap. net avail.: Total	Total Domestic Foodgrains
	Mil.	m.t.	m.t.	m.t.	m.t.	m.t.	oz.	oz.	oz.	oz.
1950-51	363.4	40.02	4.80	+0.59	44.23	8.03	11.8	2.1	13.9	12.8
1951-52	369.6	40.60	3.93	+0.62	43.91	7.97	11.5	2.1	13.6	12.8
1952-53	376.1	45.37	2.04	-0.48	47.89	8.59	12.3	2.2	14.5	13.9
1953-54	382.9	53.44	0.83	+0.20	54.07	9.72	13.6	2.5	16.1	15.9
1954-55	390.2	51.60	0.60	-0.75	52.95	10.10	13.1	2.5	15.6	15.3
1955-56	397.8	50.34	1.40	-0.60	52.34	10.21	12.7	2.5	15.2	14.7
1956-57	405.8	52.68	3.63	+0.86	55.45	10.61	13.2	2.5	15.7	15.0
1957-58	414.3	49.36	3.22	-0.27	52.85	8.82	12.3	2.1	14.4	13.6
1958-59	423.3	57.30	3.86	+0.49	60.67	11.54	13.8	2.6	16.4	15.6
1959-60	432.7	56.77	5.13	+1.40	60.50	10.32	13.5	2.3	15.8	15.0
1960-61	442.7	60.65	3.49	-0.17	64.31	11.11	14.0	2.4	16.5	15.6
1961-62	453.4	62.08	3.64	-0.36	66.08	10.29	14.1	2.2	16.3	15.4
1962-63	464.3	60.05	4.55	-0.02	64.62	10.09	13.5	2.1	15.5	14.2
1963-64	475.5	61.75	6.26	-1.24	69.25	8.81	14.1	1.8	15.9	14.3
1964-65	487.0	66.99	7.44	+1.06	73.37	10.88	14.6	2.2	16.7	15.5
1965-66	498.9	54.45	10.34	+0.14	64.65	8.58	12.5	1.6	14.2	12.2
1966-67	511.3	57.86	8.67	-0.24	66.77	7.81	12.6	1.5	14.1	12.4
1967-68	524.1	76.12	8.20	+3.00	81.32	11.38	15.1	2.0	17.1	16.1
1968-69	537.2	75.2	7.30	+2.00	80.50	10.50	14.5	1.9	16.4	15.4
1969-70	550.1	78.8	5.30	+2.00	82.10	11.38	14.4	2.0	16.4	15.8
1967-68 a	524.1	71.0	8.50	+3.00	76.50	10.7	14.1	2.0	16.1	15.1

Source: 1950-51 through 1966-67 data were taken from Bulletin on Food Statistics, February 1968, Pages 202-204.
1967-68 through 1969-70 data are estimates developed or cited elsewhere in this Program Memorandum.

stocks were at "normal" levels), that 1967-68 output was a projected 93.1 million tons,[3] and that 1968-69 and 1969-70 output increased at the five per cent rate, then a more gradual consumption path would emerge. This is shown by substituting the "1967-68a" calculation for "1967-68".

We are using very rough figures, but these calculations indicate that - if the projected output, import, and buffer stock volumes are forthcoming - the total average foodgrain availability during 1968-69 and 1969-70 will be above the average historical levels but will be below levels recommended on the basis of nutrition (as shown in Table 12). The availability of cereals will be above this norm while availability of pulses will be only two-thirds of what is needed.

The availabilities calculated in Table 11 are average figures. Around this average is a wide variation; even if the average reaches the norm, a large portion of the population will still be below recommended nutrition levels. Therefore, some program to subsidize food distribution programs for low-income consumers may be required for some time.

It should also be kept in mind that while average total availability in 1969-70 is 16.4 oz. per person per day, availability from domestic production alone is only 15.8 oz. So we may ask, how long will a 5 per cent growth rate in foodgrain production take to give a 17.0 oz. average availability from domestic sources alone? If we assume no additions to buffers - above the seven million tons in 1969-70 - and a 2½ per cent population growth rate - then the 17.0 oz. average could be attained with a continuous 5 per cent foodgrain growth rate by 1972-73.

A second criterion might be <u>price stability</u>. Aggregate demand grows as a function of population and income changes. Assuming a 2½ per cent population growth rate and an income elasticity of demand of 0.4, a 5 per cent increase in foodgrain production could be consistent with price stability at up to a 8½ per cent income growth rate.[4] In

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3/ For example, this would be an assumption that the difference between actual production and a "normal weather" production goes into private stocks.

4/ The standard formula is:

per cent change in demand = per cent change in population + income elasticity of demand (per cent change in per capita income)

$$5\% = 2\tfrac{1}{2}\% + 0.4\ (6\%)$$

we will comment on the implications of this apparent supply-demand gap on cropping pattern shifts in the Section V.

Table 12

Recommended and Estimated Daily Intake of Foods*
(in oz.)

	Recommended	Actual	Difference
Cereals	14.0	14.1	+0.1
Pulses	3.0	2.2	-0.8
Dairy	10.0	3.0	-7.0
All meats	4.5	0.5	-4.0
Leafy vegetables	4.0	4.7	+0.7
Other vegetables	6.0	3.3	-2.7
Fruits	0.5	0.1	-0.4

* As of 1962.

Source: Diet Atlas of India, Nutrition Research Laboratory, 1964 and The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets, 1966.

fact, some foodgrains will be diverted to animal feed for the production of meat, milk, and eggs - which have higher income elasticities of demand than direct human foodgrain use - and some certainly will be used to build up the buffer. A five per cent growth in foodgrain production will mean less than five per cent increase in foodgrains available for direct human consumption. Therefore, the price-stable rate of income growth would be lower than 8½ per cent, perhaps in the neighborhood of six to seven per cent. Assuming that six per cent is a probable upper limit and that four and one-half per cent is a probable lower limit to national income growth for the next year or two, a five per cent annual growth in foodgrain production should lead to a gradual decrease in foodgrain prices.

At least two qualifications must be made in this analysis. First, the increases in production of different foodgrains will proceed at different growth rates. For example, in the near-term, the success of wheat appears to be much more assured than that of rice; in the short-run, there may be upward price pressures on rice but downward price pressures on wheat. Second, the five per cent aggregate production increase is an average; the year-to-year changes will not be this steady. In order for 1968-69 production (projected at 98 million tons compared to output of 100 million tons in 1967-68) to be sufficient to hold down aggregate foodgrain price increases, private stock changes will play some important role in year-to-year adjustments. In summary, our discussion of "price stability" is developed in terms of a trend in supply and demand and in aggregate terms; the appropriate qualifications must be explicitly taken into account in any policy actions.

In the last resort, "foodgrain self-sufficiency" comes down to <u>absence of imports</u>. Annex F works out the import needs with particular relevance to PL 480 on the basis of a slighly different scheme than we have set up, but a scheme that is, in general, consistent with our reasoning.5/ The role of PL 480 imports during the next two years is to give the GOI flexibility in order to build up the buffer stock which can become an essential tool of future economic policy. In the absence of imports, domestic production alone would give 16.1 oz. per person per day in 1967-68, 15.4 oz. in 1968-69, and 15.8 oz. in 1970-71 - with no build up in buffer stock. With imports, these

5/ That annex attempts to directly estimate the change in private stocks and uses a different seed, feed, and waste deduction.

figures are raised to 17.1, 16.4, and 16.4 oz. plus a seven million ton buffer by 1969-70. In other words, if overall economic growth is active, the elimination of PL 480 imports during 1968-69 and 1969-70 might put the GOI in the position of having to choose between the buffer and inflation.

In summary, it appears that:

1. India is well on the road to foodgrain "self-sufficiency" if they can maintain a five per cent growth rate in production.

2. Concessional imports during the next two to four years will make it easier to implement the policies necessary for sustaining this growth over the longer-run.

IV. ECONOMIC POLICY

Since Independence, India has achieved an average rate of growth in agricultural production which has been sufficient to keep pace with the rate of growth in population. However, in large part due to the over-riding influence of the monsoon, this production progress has been uneven. Thus

1. When production troughs have occurred, foodgrain availability reached low levels and prices rose to high levels which forced low income groups to spend a disproportionately high amount of their earnings on food if they were to subsist, and

2. The fluctuating prices introduced uncertainty about income prospects on which the cultivator based his production decisions thereby weakening the incentive to adopt new technology and use inputs up to recommended levels.

No long-term policy consistent with these short-term problems has evolved. Whenever foodgrain shortage has threatened in the recent past, the government has reverted to foodgrain zones reinforced by urban rationing to cope with the "crises." As such, allocational

problems have plagued production and consumption, the private foodgrain trade has faced recurring uncertainty in its operations, and Center-State relations have been strained.

Agriculture is primarily a state responsibility. While the Center can state general policy objectives, make recommendations about prices and procurement targets, provide finance, and even provide organizations to carry out programs, the states are still the final arbiters of how effectively the policies are implemented.

The introduction of the high yielding varieties has changed the physical base of agriculture. Empirical evidence supporting the responsiveness of farmers to prices is accumulating. Therefore, an appreciation of the role of economic policy to provide incentives for agricultural development is increasing. Economic policy will receive special attention during this transitional period when the cultivator is being persuaded to change from the relatively secure, if low income, traditional methods of farming.

The objective of economic policy is to create a favorable economic environment for long-term economic development. This environment can be brought about by three broad inter-related programs: 1/

1. Buffer stocks of sufficient average volume and operated in such a way as to promote seasonal and inter-year stability including procurement and distribution policies, which will permit the establishment of this operation.

1/ The GOI has stated its objectives of a National Food Policy as follows:

"(i) to ensure a reasonable price to the producer to sustain his interest in increasing production by adoption of improved methods of cultivation;

(ii) to ensure that consumer prices do not rise unduly and the interests of the vulnerable groups are safeguarded; and

(iii) to build up a sizeable buffer stock with a view to avoiding intra-seasonal and inter-seasonal fluctuations in supply and prices.

Food management is the art of the possible and the strategy to be adopted to achieve the objectives mentioned above must be flexible and pragmatic." Review of the Food Situation in India, GOI, July 1968, pages 12-13.

2. Assured support prices which are announced early enough to influence production planning and which are high enough to provide production incentives (procurement policies must be related in such a manner as to assure the effectiveness of support prices).

3. Free private inter-state trade in foodgrains such that crop production can be allocated (through the price mechanism) efficiently on an all-India basis.

FYs 1969 and 1970 may represent a turning point in the implementation of this new economic environment. Effective content has been given to programs for the establishment of a buffer stock, support and procurement prices, and procurement volumes. Wheat zones were eased in late FY 1968 and promise for additional relaxation is good. Each of these areas will be discussed in turn.2/

A. Buffer stocks

Buffer stocks are the cornerstone of the new economic environment and represent a market-compatible method to cope with short-term problems as well as allow economic signals to direct inter-crop and inter-spatial acreage and input allocations.3/ In order to initiate this policy, the GOI will build up a buffer stock of three million tons of foodgrains by October 1968.

2/ Agricultural Credit will be discussed in Section V.

3/ To re-emphasize, the particular reason to seriously consider this longer-term policy perspective at the present time is that the introduction and spread of the high yielding varieties will undoubtedly change the relative profitabilities of agricultural crops to a significant degree during the next few years. If the adjustment mechanism (i.e., cultivators reallocating acreage and variable inputs to obtain the greatest return) is freed, a pattern of comparative advantage corresponding to the new technology can be attained whereby resources may be used most efficiently in all parts of the country. The buffer stock policy can be used to promote price cum consumption stability while allowing the necessary acreage adjustments, dictated by relative crop profitabilities, to be made.

The basic idea of the buffer stock is to maintain a quantity of foodgrains over time to offset (buffer) the production irregularities (and thus rapid short-term price swings) by adding to private consumption availability (i.e., drawing down public stocks) during shortage and withdrawing from consumption availability (i.e., building up stocks) during relative abundance. If the policy is to be effective, the stock must be self-regenerating.

There are few precedents elsewhere of a buffer stock of the type India will operate. The primary complicating factor of this operation is that while India has been a food-deficit country, it is in a potential position to attain food self-support by the end of the Fourth Plan. This transitional period presents a mixed bag of problems which are somewhat different than the usual situations which the buffer stock is designed to cope. The size and flexibility of the buffer operation is constrained by procurement objectives to support prices at incentive levels in order to promote production, distribution objectives to achieve (in addition to stabilizing) minimum levels of consumption especially to low-income groups, and presumably, budget constraints on expenditures available to support the total program.4/

Parts of such a program are already in place. A public distribution system is functioning to attempt to counter some of the short-term consumption difficulties. A domestic procurement mechanism, the Food Corporation of India (FCI), is developing - although as yet, its contribution to public foodgrain availability has been overshadowed by imports. The basic problem now is to coordinate these systems to well thought-out objectives and to program these systems over the next few years. The Mission is carrying out studies of the various aspects of this program to help in the solution of these difficult problems.

B. Support, Procurement and Distribution Prices

A very closely related area is price policy, or more specifically, policy directed toward influencing the level of agricultural prices. Three types of prices, support, procurement and distribution prices, are relevant.

4/ The budget constraint enters primarily in terms of influencing capital expenditures for storage, etc. and in terms of the levels at which "incentive prices" can be set. Once the "incentive price" is established, it appears that the GOI is committed to back up this price even if it means over-drafts at the Reserve Bank.

1. Support prices

Support prices are announced prior to the sowing season and provide a guaranteed minimum price on which production decisions may be made. Support price levels for the six major foodgrains since 1964-65 are given in Table 13. Support prices have been raised significantly over the last three years but are well below market prices. No recent government purchases have been made at the support price level.

2. Procurement prices

The second set of prices, procurement prices, are announced just prior to the marketing season and stand as the level which the GOI will pay for foodgrains which it purchases. In this regard, procurement prices take over some of the support price role although they are announced too late to influence production decisions for the crop year to which they apply.

The procurement price levels are first recommended to the Center by the Agricultural Prices Commission and then negotiated between the Center and respective States. A comparison of Tables 14 and 15 with Table 13 shows that procurement prices for rice and wheat have been well above the support prices. The methodology for calculating procurement prices appears to be based on extensions of past market price trends in an effort to keep the terms of trade of agricultural commodities relative to non-agricultural commodities from becoming too unfavorable. Cost of production studies, as yet, have not given much guidance in these calculations.

Mission opinion is that present procurement prices are sufficiently high to provide incentives to producers. For example, the average yield for Mexican wheat in Ludhiana district, which is one of the more progressive IADP districts, during 1966-67 was 4310 lbs. (or 20 quintals) per acre. The procurement price of Rs.76 per quintal (for 1967-68) provides a gross income of approximately Rs.1500 per acre. Production costs (including returns for family labor and rental value of owned land) will approximate Rs.400-500, leaving a net income of approximately Rs.1000 per acre for the single-season. Market prices, without price support, would probably have settled around Rs.60-65 per quintal for Mexican wheat, reducing net income to Rs.700-800 per acre.

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Table 13

ALL INDIA MINIMUM SUPPORT PRICES

Foodgrains/Variety		1964-65	1965-66	1966-67	1967-68
Paddy (standard varieties)		34.00 to 40.00	35.00 to 40.00	35.00 to 40.00	42.00 to 44.00
Wheat	Red	34.83	45.50	49.50* (52.75)	52.00* (55.00)
	White	37.51	49.50	53.50* (56.75)	56.00* (59.00)
	Superior farm	40.19	53.50	57.50* (60.75)	60.00* (63.00)
Jowar	Yellow	38.00	38.00	38.00	42.00
Bajra		40.00	40.00	40.00	42.00
Maize		36.00	36.00	36.00	42.00
Gram			40.00	43.00	46.00

- Bulletin on Food Statistics, February 1967, page 158.
- Prices relate to the crop year of the respective crop.
* For states of Bihar, Haryana, Madhya Pradesh, Punjab Rajasthan, Uttar Pradesh, and Himachal Pradesh. The prices in brackets are for other states.

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Table 14

TRENDS IN PROCUREMENT PRICES* - RICE

(Rs. per quintal)

State	Variety	1964-65	1965-66	1966-67	rec. 1967-68
Andhra Pradesh	Akkullu	63.00	63.00 to 63.45	64.82 to 72.50	68.00
Assam	Winter Sali	61.23	63.34	80.90	74.00
Bihar	Coarse	59.67	68.00 to 69.66	69.66 to 125.00	74.00
Gujarat	Sathi	64.10	68.10	72.20	72.00+
Haryana	Begmi	60.00	60.00	69.50	71.00+
Kerala	Palghat Matta	71.76 to 76.18	76.18	76.18	74.00+
Madhya Pradesh	Gurmatia	58.23	64.80	73.13	71.00+
Madras	Kattaisamba	64.45	70.01	70.01	69.50+
Maharashtra	Coarse	65.40	69.40	68.50	68.50
Mysore	Coarse (raw)	60.70	67.00	67.00 to 70.00	67.00+
Orissa	Common	59.50	64.00	74.15 (hand pounded)	71.00+
Punjab	Begmi	60.00	60.00	69.50	71.00+
Uttar Pradesh	Grade III	60.00 to 63.00	66.50 to 68.00	69.50	71.00
West Bengal	Common	61.62 to 64.30	64.30 to 66.00	72.00 to 93.75	74.00

*Prices relate to the marketing year which is November through October. In some cases, a spread of prices is given.

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Table 15

TRENDS IN PROCUREMENT PRICES* - WHEAT

(Rs. per quintal)

State	Variety	1965-66	1966-67	1967-68	1968-69
Bihar	Common white	52.00	54.00	95.00	76.00
	Superior				81.00
Gujarat	Red	55.00			
	Common white	60.00			76.00
	Superior	65.00			81.00
Haryana	Mexican			88.60	76.00
	Common white	52.00	59.50	94.45	76.00
	Superior	56.00	63.50	96.85	81.00
Madhya Pradesh	Mexican			65-75	76.00
	I	52.00	53-55	55-65	
	II	57.00	56-59	59-70	
	III	61.00	59-63	63-75	
	IV	65.00	61-65	65-77	
Punjab	Mexican			72-77	76.00
	Common white	52.00	59.50	76.00	76.00
	Superior	56.00	63.50	81.00	81.00
Rajasthan	Mexican			69.50-79.50	76.00
	Red	46-48		67-77	
	Common white	50.50-52		71-81	
	Superior	54-56		75-85	81.00
Rajasthan	Mexican			85.00	76.00
	Red	60.00		80.00	
	Common white	65.00		85.00	76.00

*Prices relate to the marketing year which is May to April.

These Ludhiana yields are at the upper end of Indian wheat performance. However, the example does illustrate the potential incentive role of the procurement cum support prices which the GOI is financing. Additional discussion of the uses made of the increased incomes will be in Section V.

If Mission supply and demand projections are accurate,[5] the price support cum procurement operations will assume increasing importance in FY 1969 and 1970.

The Mission has not calculated estimates of reasonable support and procurement prices for 1968-69. The 1967-68 procurement prices (approximately Rs.76 per quintal for Mexican wheat and Rs.71 per quintal for rice) convert to $2.76 per bushel for wheat and $94.70 per ton for rice. The world price for wheat is approximately $1.44 per bushel (December 1967 spot contract in Chicago), well below Indian procurement levels.[6] On the other hand, the world rice price is in the $150-210 per ton range, which is well above 1967-68 rice procurement prices and above private market prices of $115-160 per ton (Rs.85-120 per quintal).[7] The domestic price of wheat appears to be high relative to rice as judged by international prices. Since India is basically a "closed" economy for foodgrains, this is not necessarily surprising. The GOI is aware of these relationships and reports of the Agricultural Prices Commission draw repeated attention to the problem.[8]

5/ These aggregate supply and demand projections are developed in Section III of this Annex.

6/ The landed price of imported wheat in Bombay would be close to $2.00 per bushel.

7/ Caution should be used in interpretting these international price comparisons, particularly with regard to rice. Rice is a heterogeneous commodity; superior qualities command premium prices. The international market is thin (approximately six to seven million tons annually) and prices change frequently.

8/ For example, Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1967-68 Season, GOI, September 1967, pages 10-11.

GOI price policy must balance off the desire to provide incentive prices against the need to hold down inflation and conserve government finances. Information on the supply response to price of Indian foodgrain production on which to base these calculations is scarce.

3. Distribution prices 9/

Government foodgrains are distributed through roller flour mills, institutions and military, and most importantly, through Fair Price Shops.

Under the scheme of subsidy prevailing through 1967, the issue prices were so low relative to market prices that there was pressure on the public distribution system even in good crop years. During 1967, the cost of subsidy was Rs.1300 million and would have reached Rs.1900 million in 1968 if the issue prices remained unchanged.

In order to correct this situation, two changes were made:

a. From January 1, 1968, issue prices were fixed at:

i. Rs.67/quintal - imported wheat
ii. Rs.48/quintal - milo
iii. Rs.96/quintal - coarse rice

A sizeable element of subsidy still remains in imported rice and milo.

b. From June 17, 1968, as a result of the successful procurement program, the large quantities of indigenous wheats were pooled with the imported wheats and sold at the following prices: 10/

i. Rs.70/quintal - imported red and indigenous Mexican
ii. Rs.90/quintal - imported white and indigenous common white
iii. Rs.96/quintal - indigenous superior

9/ This information is taken in large part from Review of the Food Situation in India, Ministry of Food, Agriculture, Community Development, and Cooperation, July 1968, pages 10-11.

10/ The issue prices can be compared with the wheat procurement prices given in Table 15.

Due both to the higher prices of publically issued foodgrains and to the greater availability of indigenous supplies, offtake from the Fair Price Shops declined during 1968. The changes in distribution prices are a positive step in implementing the buffer operation.

C. Procurement

Procurement policy is important for three reasons:

1. It is a primary means of building up the buffer stock. As PL 480 imports decrease, domestic procurement will thereby increase in importance;

2. If market prices fall below procurement price levels (as for wheat in 1968-69), this policy is the means of carrying out price support; and

3. If market prices are above procurement prices, as has been true for kharif cereals through 1967-68, and procurement is carried out through compulsory levies on producers and mills, then it is a form of agricultural taxation.

The Food Corporation of India (FCI), the body organized to carry out Center procurement operations, has operated in most States (Maharashtra being the most notable exeeption). However, in many cases, FCI activity has followed time consuming ad hoc negotiations. The FCI's role has varied from one extreme of direct procurement through traders to the other extreme of merely underwriting State activities.

The target of procurement for 1967-68 suggested by the Agricultural Prices Commission was 8 million tons, consisting of 7 million kharif (summer and 1 million rabi (winter) cereals. The consensus at the Chief Minister's Conference was that a more "realistic" target for kharif grains would be between 5.5 and 6 million tons.

As of the middle of July, three million tons of rice (as compared to the Agricultural Prices Commission recommendation of 5.1 million ton

target)[11] and approximately 0.8 million tons of coarse grains (as compared to the APC recommended target of 1.9 million tons) had been procured. Only Punjab, Haryana, and Jammu and Kashmir had reached recommended target. There is some expectation that another 200,000 tons of rice may be forthcoming.

Various explanations have been offered for the shortcomings:

1. In Madras, there was the mix-up between the cooperatives and FCI with the latter generally being ineffective.

2. Political uncertainty dominated the West Bengal, U.P. and Bihar scenes.

3. In both Andhra and Orissa, the states claimed that production was over-estimated, the crop was late, etc.

4. In Maharashtra, the supposedly effective cooperative systems did not come through (which primarily affected jowar procurement rather than rice).

It should be emphasized that the market prices for rice and other kharif cereals have been well above procurement prices (Table 16). Therefore, there was no "price support" problem for kharif foodgrains in 1967-68. Almost all the procured rice has been accumulated by compulsory levies on producers and mills.[12]

This compulsory levy at "below-market" prices introduces a form of agricultural taxation which has had strong appeal to most policy makers.[13] Historical studies of economic development have

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11/ In a normal year the 'guestimated' marketable surplus (31.4 per cent of the Mission estimate of 41 million tons production) for 1967-68 would be about 12.9 million tons of rice. However, 1967-68 followed on two successive drought years. More than normal amounts of production would be expected to build up private stocks, thereby reducing actual marketed surplus. Therefore, the APC procurement target of 5.1 million tons of rice represented an ambitious 40-50 per cent of marketed surplus. The APC recommendations are made to the GOI which in turn must negotiate their implementation by the individual states.

12/ The fact that a compulsory levy had to be used in order to procure rice at below-market prices is the main economic reason that procurement fell short of targets. This difficulty will persist even after the institutional problems are solved.

13/ For example, this method was recommended in the Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1967-68 Season, GOI, September 1967.

Table16

Prices (for rice or paddy converted to rice equivalents)

	Procurement Price		Appropriate Market Prices		
	APC rec.	State	10-11-67	1-12-68	5-11-68
Andhra	68.00	72.69	120	90	85
Madras	69.50	72.80	100	100	95
W. Bengal	74.00	93.75	240	175	180
Orissa	71.00	69.25	90	90	115
M.P.	71.00	85.00	-	-	95
U.P.	71.00	90.00	150	125	120
Bihar	74.00	95.25	160	130	130
Mysore	67.00	n.a.	115	120	125
Haryana	71.00	86.00	95	95	95
Kerala	74.00	102.50	-	-	200
Assam	74.00	n.a.	180	160	145
Gujarat	72.00	n.a.	200	150	130

Source: GOI data furnished by the office of the Agricultural Attache, American Embassy, New Delhi

shown a net transfer of resources from agriculture to industry as development proceeds. However, in India, agricultural income is untaxed and land taxes are very low. Therefore, by "purchasing" rice at prices below market there is a transfer of income from cultivator to state.

A potential problem is that this form of indirect taxation, by lowering output prices and reducing the rewards from the higher yields, may inhibit incentives to adopt the new technology and to use inputs up to recommended rates. On the other hand, the lower output prices may "force" cultivators to adopt new technology in order to maintain income levels. Such debate is carried out on the basis of very incomplete information. The Mission favors the "carrot" philosophy of price policy, particularly as applying to the higher risk crops such as rice. It should be kept in mind that if the HYV do catch on and the growth rate does rise to five per cent annually, compulsory levies will not be necessary as a policy tool.

In contrast to kharif performance, the procurement effort for wheat involved the first major price support effort which India has had to carry out. The 1967-68 wheat harvest was estimated at 17 million tons 14/ compared to the previous high of 12.3 million tons in 1964-65. A large portion of this output was in high-yielding Mexican varieties which are red in color and less preferred for consumption.

The overall procurement activities for wheat were quite successful, although again performance varied from state to state. In the Punjab, the FCI and Cooperatives purchased all Mexican wheats delivered to market at the procurement price. This program was carried out successfully in spite of the fact that arrivals were coming in at volumes two to five times greater than the previous year. As a result, by the 15th of June, the first month and a half of marketing, 978,000 tons out of 1,089,000 tons of market arrivals had been procured in Punjab and Haryana. The initial target of one million ton was raised to two million tons and that will be overfilled. 15/

14/ The GOI final estimate of wheat production was 16.6 million tons.

15/ As of the middle of July, wheat procurement totaled 2.1 million tons.

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In Haryana, the state government purchased wheat on account for FCI. In the first month, market prices fell approximately Rs.5 below announced procurement prices. Market prices firmed up by June. A reported cause of the lower prices was the presence of black spot on the kernels caused by rain just before harvest. In U.P. where FCI operations were restricted, market prices were Rs.10-15 below procurement rates during May. These prices also began to firm up by June when the FCI eventually entered selected markets.

In summary, overall procurement progress was encouraging (Table 17). Since this (1967-68) was the first year of serious price support and procurement operations after two successive drought years, some of the ad hoc problems were inevitable. Some valuable lessons were learned.

D. Foodgrain zones

Throughout most of 1967-68, private trade in the major foodgrains was restricted to intra-state movement; only government stocks were legally moved inter-state. With the easier foodgrain outlook in 1967-68, a more liberal policy promises to emerge.16/

The justifications of zones are primarily on two fronts:

1. Zones make it easier for the government to procure foodgrains to move from surplus to deficit areas, and

2. Zones protect the poorer rural groups from the higher buying power of the cities.

16/ In March 1968 movement restrictions were relaxed. Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, and Delhi were joined in an enlarged wheat zone. All restrictions on private inter-state movement of gram and barley were removed. Movement restrictions in respect of sorghum (jowar), corn (maize), and spiked millets (bajra) were lifted from the producing states of Punjab, Haryana, and Rajasthan. Statutory rationing was also lifted in several of the major Indian cities. No further relaxation of zonal restrictions apparently will be considered until after the prospects of the 1968-69 kharif season are clearly known.

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Table 17

PRODUCTION AND PROCUREMENT

(000 tons)

		Riced	Jowar	Other Kharif	Total Kharif	Wheat
1964-65	Production	39,034	9,749	12,962	61,745	12,290
	Procurement	3,280	374	70	3,724	437
	Per cent	8.4	3.8	0.5	6.0	3.6
1965-66	Production	30,623	7,527	11,192	49,342	10,424
	Procurement	2,963	486	136	3,585	183
	Per cent	9.7	6.5	1.2	7.2	1.8
1966-67	Production	30,438	9,224	12,481	52,143	11,393
	Procurement	2,222	632	48	2,902	815
	Per cent	7.3	6.8	0.4	5.6	7.2
1967-68	Production a/	37,858	10,107	15,351	63,316	16,567
	Procurement*	3,000	400	400	3,800	2,100
	Per cent	7.9	4.0	2.6	6.0	12.7

a/ Officially reported GOI "final" estimates of production

* Procurement through mid July 1968

Careful examination casts serious doubt on the validity of either of these arguments in support of zones. More importantly, critical analysis suggests that continuation of zones will impede the attainment of "self-sufficiency".

In the first place, it is not clear that the government can procure and move greater volumes of foodgrains from surplus to deficit areas than can the private trade, operating in response to price difference.17/ Government procurement did increase substantially during 1964-67 compared to previous years (but commitments increased even more). However, the degree to which zones themselves were responsible for increased procurement as compared to other causes (for example, great government commitment) is not clear. Furthermore, the amounts procured have not been large. During the Second and Third Plan, only three to six per cent of marketed production was procured. The procured proportion of production did not increase much above this level in either 1965-66 or 1966-67 when food was short and zones were strictly enforced.18/ Imported wheats have accounted for 75 to 90 per cent of wheat moved inter-state by government.19/

A "conventional wisdom" pervades the whole question of foodgrain distribution, namely that private traders are parasites without a basic productive function - opportunists who hoard stocks to bid up prices to weaker members of society during times of scarcity. Although there may be specific cases of "anti-social" speculators, the charge on any general basis has not stood up to serious enquiry. On the contrary, our limited evidence suggests that during normal times, the private foodgrain trade does an effective job of allocating foodgrains over time and space making only a normal profit in the process. The private trade is not able to carry out the entire job of distribution during times of shortages when private stocks are not available to move in response to price difference. However,

17/This argument is developed in more detail in Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1965-66 Season, GOI, May-July 1965, pages 37-46 "Rice Zone Policy: A Note of Dissent by Dr. Raj Krishna."

18/See Table 17.

19/In 1966, of the approximately 14 million tons of foodgrains distributed by the Central and State Governments, more than 10 million tons consisted of imported foodgrains. These same proportions continued in 1967.

there is no evidence to show that monopoly government distribution is a superior alternative. The most desirable government intervention - and this principle applies to each of the policy areas discussed - would be to supplement and reinforce the private market rather than to circumvent or replace it.

Secondly, zones are not necessary for procurement. In fact, states which are using a levy at the producer or trader level (i.e., in most states) or which are procuring through purchase at market prices (i.e., Punjab for wheat) may not be aided in actual procurement by the zones, as such. The zone does serve to depress prices in the surplus areas thereby appearing to make the cost lower for the government. However, while zones may minimize cost per unit procured, they also may inhibit the volume arriving in the market for several reasons - i.e., if either the cultivators substitute sales of (for example) gram for wheat (consuming the latter on the farms) or anticipate that zones may be lifted and higher prices will follow <u>or</u> sell to the black market. Any policy which discourages market sales increases foodgrain waste since storage conditions are probably poorer on farms than with traders.20/

Thirdly, the charge that the high per capita purchasing power of the cities "sucks" the grain from the rural areas is based more on one or two specific historical instances, which may not bear close relationship to the present situation, rather than on any systematic research.

Finally, any price-depressing result may work to the cost rather than to the benefit of the non-producing poor. Cultivators in the surplus states receive lower prices, hence lower incomes. They can afford to spend less money to hire rural labor. Other expenditures which might result in income for landless are also limited. If these poorer rural groups could be identified, they could still be supplied food from the Fair Price Shops through extended coverage. The higher prices for indigenous foodgrains generated by the urban consumers should be treated as what they are - the value these wealthier consumers place on a particular type of food. Basically, the imported and indigenous wheats have comparable food values. If

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20/ This is another area that badly needs empirical investigation. The lack of reliable information on the marketing behavior of cultivators (especially including storage at the producer level) poses a major unknown for policy determination.

welfare (i.e., food value) is an objective of policy, the non-producing poor can be fed from government stocks without disrupting the private market and introducing the attendant inefficiencies.

The primary implication of the zones for agricultural development is that it creates a patchwork of disconnected markets which can be implemented and disassembled at will. The overall production advantages which potentially result from regional specialization on the basis of comparative advantage are seriously interrupted. Wheat prices are raised in a normally low-productivity state such as U.P. and depressed in a high-productivity state such as Punjab compared to what might be expected if there were no zones. This appears to reward inefficiency to the penalty of progress.21/ Furthermore, when zones apply only to selected crops, the prices of unrestricted crops are raised (in surplus zones) relative to the zoned foodgrains resulting in acreage being diverted to the temporarily more profitable crop. Black market operations, whether carried out or not, are certainly encouraged. Finally, because zones have been used only during times of shortage, there is expectation that they will be lifted or altered eventually. Government policy becomes an additional element of uncertainty which benefits neither cultivators, trader, or consumer in planning decisions.

The zones have not accomplished what they were intended to accomplish regarding procurement and distribution. When harvests are good, zones will be a more obvious liability with regard to accelerating agricultural productivity. The costs of this system in terms of budget, of economic inefficiency, and of government time and effort are very great. Free private inter-state movement reinforced, rather than replaced, by government distribution is a more promising alternative. In the interests of both inter-state harmony as well as sound long-term agricultural development, zones should be lifted.22/ The buffer stock would then become the primary policy focus to promote agricultural production and distribution.

21/At the level of foodgrain prices prevailing in 1966-67 this probably is not serious. For example, the market prices for wheat appear to be amply high to provide incentives even in the Punjab. However, these inter-state price discrepancies would be serious at less favorable all-India levels.

22/The problems brought on by zones are recognized by the Government. Both the Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1967-68 Season and the statements of the Union Food and Agriculture Minister, Jagjivan Ram, at the meeting of Chief Ministers Conference of Food (September 26-27, 1967) acknowledged arguments for the desirability for change.

V. IS THERE A GREEN REVOLUTION

Something fundamental and dynamic, with likely far-reaching consequences, has been introduced into the Indian scene since 1965. However, there have been previous periods, such as at the end of the First Five Year Plan, when optimism was similarly widespread. Are there grounds for believing that something new and permanent has become active in the rural economy? We believe a case can be made to indicate this is so.

This section is an attempt to analyze the strengths and weaknesses of this "Green Revolution." It is a preliminary attempt; this topic will occupy the significant portion of our efforts during the current year.

A. The New Strategy

1. Background

Food self-sufficiency has been the official objective of India since the First Plan. During the early period, the approach was to achieve increases by emphasizing institutions (i.e., Community Development) and extensive agricultural practices (more acres tilled, more under canal command areas). Good rains led to increased production which gave planners the hope that the right approach had been followed. The Second Plan directed more attention to the industrial sector while continuing to emphasize extensive agricultural practices. This policy continued into the Third Plan period. Finally, the drought of 1965-66 preceded by four years (1960-61 through 1963-64) of relatively stable production focused attention on the lack of success of this approach.

The "New Strategy of Agricultural Development," as enunciated in the Fourth Plan draft (original) in 1965, marked a departure from these previous efforts. Some productive parts of the program had been building. The New Strategy attempted to put these separate activity areas into an integrated, comprehensive program.

The New Strategy focused on combining high yielding varieties of seeds with a "package" of complementary inputs on selected water assured acreages.

The development of high yielding varieties of seeds was the critical new element.

The fundamental policy change was to concentrate inputs on highest productivity areas.

In addition, there were commitments to:

... make required inputs, particularly chemical fertilizers, available; assigning priority to scarce foreign exchange when necessary;

... actively encourage domestic and foreign investment in fertilizer and other input areas;

... implement an economic policy which was "producer oriented;"

... reorganize agricultural research into a coordinated program;

... refocus extension activities; and

... support a system of state agricultural universities which would make scientific activity directed toward practical application a permanent part of the Indian scene.

2. Coverage by area and crops

The strategy seeks to increase each season the number of acres under high yielding varieties. By 1973-74 it is proposed to have 60 million acres under these varieties. The pattern of planning is flexible allowing changes to be made from season to season as experience provides additional guidelines with regard to the responsiveness of local cultivators and the adaptability of varieties to regional conditions. Table 18 shows the tentative targets through 1973-74 with the corresponding accomplishments through kharif 1967-68.

Progress has varied by crop. Wheat provides the clearest example of success. Mexican varieties have produced double the yields of local varieties. These varieties respond to management techniques quite similar to those practised by Indian farmers. Research has already provided new varieties with higher yields and better grain qualities of color and taste than the original varieties. Some potential

Table 18

HYV Program - Targets and Achievements (000 acres)

Crop	1966-67 Target	1966-67 Coverage	1967-68 Target	1967-68 Coverage	1968-69 Target	1970-71 Target	1973-74 Target
Rice	3,254	2,142	6,158	5,735	9,000	12,500	25,000
Maize	910	513	1,616	833	2,150	4,000	5,000
Jowar	927	243	2,560	1,723	3,200	4,000	8,000
Bajra	375	145	1,151	1,084	1,750	4,000	7,000
Wheat	1,593	1,278	4,562	6,681	6,500	8,000	15,000
	7,080	4,321	16,233	16,056	22,600	32,500	60,000

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danger to these varieties may lie in the homogeniety of germplasm and the potential vulnerability of the crop to attack by new strains of rust. However, by and large during the early warning surveilance carried out during 1967-68, the Mexican varieties demonstrated higher resistance to rust than the local varieties.

Less spectacular, yet encouraging, progress has been made with rice. Rice requires more complex management than other crops, particularly with regard to water. ADT-27, a lower yielding but short-duration dwarf variety developed in India, is more easily managed than most new rice varieties and has had wide acceptability in Madras state.

Some problems have appeared. TN-1, a dry season crop in most of southeast Asia was given to farmers during the wet (kharif) season which left it vulnerable to attack by bacterial leaf blight.1/ The solution to sow TN-1 during the winter and IR-8, a higher yielding variety, during the summer should correct this problem. The new rice varieties are generally more susceptible to gallfly and to stem-borer than local varieties.

In sum, agronomic practices have lagged behind the plant breeding work with rice. Even acknowledging this, average yields are much higher than for local-varieties and the problems are correctable with continued research and experience. Such research is well along. Promising crosses of dwarf materials with disease resistance, better grain qualities, and higher yield potential should be available for release in the next two to three years.

Generally success also has followed the introduction of high yielding varieties of the other important cereal crops - bajra, jowar, and maize. Hybrid bajra and jowar, which are normally grown on poorer

in increasing acreage in the north. Maize is a newer crop in the hilly areas of south and is becoming rapidly popular because it requires less water than rice and has much higher yields than bajra and jowar.

In sum, the potential is quite favorable and the problems are identifiable. Expansion of coverage up to the limits of irrigated and rain-assured acreages at a fairly rapid rate appears to be assured.

B. Inputs

The agricultural supply industry has grown rapidly (Table 19).

1. Fertilizer

Perhaps the most important of these inputs to the Green Revolution at the present time is fertilizer.

Since 1965 the government has encouraged investment in domestic production and supplemented domestic production with imports adequate to cover demand. Imports both of raw material for fertilizer production and of the finished product have been given a high priority. Availability of foreign exchange appears to be the major question with regard to the adequate aggregate supply of these materials. Annex E, Fertilizer Requirements and Production, develops these aggregate supply aspects in detail.

Distribution is the critical variable which will determine whether the cultivators get the nutrients at the time and place required. Problems exist at all levels of distribution: unloading of ships, shortages of rail wagons, bottlenecks at inter-gauge transit points, storage, etc.

However, even if these problems are solved, weakness in management at all levels of distribution is likely to remain a constraint upon the efficiency of fertilizer movement for some time. For example, in north-west India only 16% of the cooperative retail outlets have full-time staff.[3] Few persons at any level in

3/ A fuller description of the fertilizer distribution system is to be found in the market analysis report prepared for the Kandla cooperative fertilizer project, 1968.

Table 19

Production of Inputs for Agriculture

Item		1950-51	1955-56	1960-61	1967-68
Fertilizers					
N	(000 tons)	9	79	153	381
P_2O_5	(000 tons)	9	12		206
Agricultural Inputs					
Power driven pumps	(000)	34	37	105	140
Diesel engines	(000)	5.5	10	43.2	78
Tractors	(000)	-	-	-	11.4
Irrigation					
Tubewells (Number)		3,500	-	17,700	43,136
Insecticides (000 tons)		-		6.7	27.4
*Electricity (mil KWH)		203	-	832	1,730*
*Fuel Oil (value in crores)		4.5	-	14.6	27.7*

Source: Planning Commission, Third Five Year Plan and Fourth Five Year Plan: A Draft Outline for 1950-51 through 1960-61 data, 1967-68 data are Mission estimates.

*Production of electricity and crude oil is only for that share of total output used in farming. Data in last column refer to 1965-66.

the cooperative distribution system are trained in sales, retailing, or marketing. Moreover cooperatives do not provide sales incentives to their retail personnel either in the form of commission or recognition. Although the cooperative system is coping with the volumes it is moving at present, very great difficulties may be encountered when twice or three times the present volume moves through.

One important reform that is being carried out is to consolidate the cooperatives into units which are large enough to be economically viable and afford full-time, trained staffs.

The GOI has also taken steps to 'commercialize' fertilizer marketing, by allowing producers to sell some fertilizer directly to whatever outlets are available at a negotiated price. This arrangement will allow producers to sell a large portion of their production outside the public sector for a guaranteed period of seven years. The states, however, have the exclusive right to license retailers. In practice some states have refused to issue these licenses (Punjab, Gujarat, Orissa and Rajasthan), maintaining the fertilizer retail monopoly held by the cooperatives. In Uttar Pradesh, Madras, Andhra Pradesh, Mysore, Kerala, West Bengal and Assam licenses have been issued liberally. This experience underscores the limited power the GOI has in agricultural policy; it can encourage policies but the final decision is up to the state.

2. Irrigation

While the Government of India has constructed irrigation facilities for approximately 30,000,000 acres of land since Independence, for the long-term it is realized that the amount of water that economically can be developed will be insufficient to provide all the irrigation needed for full development of India's land resource. Therefore, the GOI presently is emphasizing the increased utilization of the supply which is being made available by these new systems, is making more efficient use of the irrigation water that presently is available, and actively is seeking new sources of supply.

The interaction of water with the other factors of production is extremely important in making efficient use of other inputs recommended for high yields. Modern water management takes into account the proper relationship between the water supply system, the kind of crops, the soil type, methods of cropping, drainage

requirements, farm machinery, disease and pest control, fertilizer, climate, and related influences on food and fiber production.

Perhaps one of the clearest indications of the changing priorities is the increased attention to minor irrigation. The government has encouraged the private sector to produce pumpsets (diesel and electric). It is providing drilling units to punch down new wells. It is encouraging commercial banks to move into long-term rural loan activities necessary to help finance tubewell construction. Most important, it is fostering a very ambitious rural electrification program.4/

These efforts are showing results. By 1969 it is estimated that 640,000 diesel and nearly a million electric powered pumpsets will be in operation. This new availability of water will act to help farmers increase their use of fertilizer, double crop (as well as combat water-logging and salinization), and greatly widens the scope for better water management. Moreover, such sources of water will lessen the farmers dependence upon the monsoon and act to cushion its effects, moderating the swing effect on output which has hitherto so afflicted Indian agriculture.

A cadre of skilled scientists and technologists, trained in several disciplines, must work as a team in diagnosing land and water problems and prescribing corrective measures. Good planning and application of programs require adequate information on the resources available, research facilities to support the technical program, and the development of trained organizations in the States and Center to assist the cultivators in applying the improved methods. Effective program administration requires a coordinated effort by all Center and State agencies dealing with problems of agricultural water.

3. Plant Protection

As increasing production changes the varieties under cultivation, the ecological balance (in the short-run at least) will shift as to provide ideal conditions for the growth of pests and diseases. The

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4/ In 1951 only 1.5% of Indian villages had electric connections. By 1966-67 10% (61,000 out of 570,000) had been electrified. The target for 1971 is 110,000 villages (about 20%). In one state, Madras, over half the villages have electric power supplies. With this availability the electrification of pumpsets is now proceeding at an estimated rate of about 140,000 annually. A measure of their demand is that applications for electric connections are backlogged six months.

FAO reports that with the HYV now in use in South East Asia and the Far East (IR-8, TN-1, etc.), pesticides have replaced or rival fertilizers as the major input in value terms. This experience suggests that plant protection may become a priority input second only to irrigation as the acreage under HYV increases.

The government appears to recognize the need for a plant protection program and is making an effort to offset the threat to the new crops by obtaining large quantities of protection materials. The area treated with these materials has increased greatly, from 16 million acres in 1961 to 124 million acres in 1967-68. By 1971, it is hoped to be able to treat over 200 million acres annually. It is organizing spraying units, developing an aerial spray potential, encouraging the manufacture of hand applicators, and training personnel in methods of application. An early warning surveilance system has been set to spot attacks of pests and plant diseases.

4. Mechanization

Farmers are moving towards multiple cropping by taking advantage of the opportunities offered to them by the new technology. Timely and efficient tillage, culture and harvesting operations will require larger energy inputs.

Recognizing lack of adequate energy on the farm as a constraint, the GOI in the Fourth Plan, is taking steps to rapidly increase the pace of farm mechanization. Manufacturers are responding to the widening market for power equipment and they are requesting assistance to cope with the opportunities.

The demand for tractors is rising faster than supply. Tractor production has risen from 1600 units in 1962 to about 11500 expected in 1968. Demand for such equipment is reflected by the estimated backlog of 20-30,000 orders. Tractors are not subsidized and their production is left to the private sector (although a public sector plant is under consideration). Government has actively encouraged production levels to increase and is promoting mechanization where farmers are prepared to pay for it.5/

5/ This represents a reversal from former policy which favored bullock implements.

The production of diesel engines and electric motors have each increased at the rate of approximately 20% per year since 1960. Current annual production of irrigation pumps is estimated at 250,000 sets. Production of spray-motors for plant protection equipment have increased to about 30,000 annually from none in 1964. In the intensive wheat growing areas, more than 50% of the wheat is threshed by machines. An estimated 10,000 threshers have been produced and sold from the workshops in Ludhiana district (Punjab). The increased demand for agricultural machinery throughout India is stimulating investment and expansion of producing units.

As production of tractors, pump engines, implements and spraying equipment increases, the need to improve sales and service facilities as well as organize production facilities, and train management becomes increasingly important.

5. Seeds

Sufficient supplies of hybrid seeds will be available to meet HYV program targets if past trends continue. Seeds are being produced by private firms and the National Seeds Corporation through contracts with private growers. In 1967 kharif season there were 7,595 hybrid seed growers in 16 states and the Union Territory of Delhi. The area of certified hybrid seeds (corn, sorghum and pearl millets) grew from 1,618 acres in 1963-64 to 71,600 acres in 1967-68. Hybrid seed production for kharif 1968 has been set at 101,921.70 acres, adequate for HYV targets.

The supply of hybrid seed does not appear to be a problem, but certification, processing, storage, and distribution may become bottlenecks. The lack of trained personnel, inadequate processing equipment and storage facilities and limited marketing arrangements for increasing quantities of seed may collectively thwart the timely distribution of certified seed to producers. The states, hampered by the lack of personnel and facilities and enabling legislation, are responsible for seed production to achieve state targets and for local enforcement of standards and quality controls. Performance of the states has been variable; shortfalls and inadequacies to date have been covered generally by close, effective support of the National Seeds Corporation; however, current and future production requirements are likely to strain the NSC's capabilities. Much of the seed will be distributed through the cooperative system where the same problems will be encountered as for fertilizer.

Research is proceeding aggressively on the development of high-yielding synthetic varieties (of which the cultivator can grow his own seed) in order to take the building pressure off the hybrid seed producers.

C. Outputs

The huge wheat arrivals from the 1967-68 harvest highlighted marketing problems which will become more serious in the north unless remedial action is taken. Some markets were overrun with wheat and business was actually delayed or postponed until congestion was cleared up. Labor was very short at this peak period of activity. Strikes, as much over work conditions as over wages, were a constant threat. The daily pay for common laborers in some busy markets reached Rs.15-25. Transportation and storage shortages were great problems with the result that large amounts of bagged wheat were left uncovered awaiting removal. Even though the probability of rain is low in May and June, the potential danger was great.

A different type of problem developed in Tanjore district in the South. An intensive effort was made to increase the double-cropped acreage by growing an extra crop of ADT-27, a short-duration dwarf rice. ADT-27 has no dormancy period; it matured during the height of the winter monsoon. In order to dry the paddy to a suitable moisture level before spoilage set in, 30 modern drying units had to be erected.

Substantial progress is being made in marketing. Almost 1500 markets are regulated by government. Approximately 750 markets are covered by full-time reporters. Approximately 5.5 million tons of foodgrain storage capacity (hired plus leased space) exists in the public sector and a much larger volume is owned by the private trade. Rodent control is receiving much greater attention in an effort to reduce storage losses.

Output marketing is not a serious problem at present. However, under the projected rates of production growth, it could impose serious problems in the next five years and thereafter. An eventual system of bulk handling and all-India grading is inevitable. The challenging questions are (a) when will a modernization of the present system of bag handling and trader-grading become absolutely necessary and (b) what will be the transition path for the change. The Mission will carry out research in this area during the coming year.

D. Release of Land for other Purposes

Several trends in the reallocation of land can be anticipated.

First, the intensity of multiple cropping is likely to increase. This trend will follow from the spread of minor irrigation, the improvement of water management practices, and the provision of other inputs, including the development of more short duration crops.

Second, the cropping pattern itself may be expected to change. Foodgrains, at the present time, are about 75% of the sown area. Yields of cereals are rising leading to increases in total supply and falling per unit costs of production. However, the relative income elasticity of demand for cereal foods is generally lower than for other foods (as might be expected for a staple) being approximately 0.4 as compared to edible oils (.89), sugar (.9), eggs (1.5) and milk (1.60). At probable rates of income change (discussed in Section III), we can expect to see more grain being fed to animals, and land previously sown to grain, now shifting to oilseeds, sugarcane, cotton, fruits, and vegetables (which are short-duration and can be double-cropped) and export crops.

Third, new crops such as sugar beets in the north and soybeans will become increasingly important. Plant breeding and production research is already underway in these crops. Development of processing in these two areas is a foreseeable bottleneck.

Lastly, the extent of use of land for fodder crops will depend on which force moves faster - the demand for power or the transition to mechanization.

With a five per cent growth in foodgrain production, these land-use changes will occur gradually. With a faster growth rate the changes will be forced more rapidly.

E. Higher Investment Costs - Higher Profits

One of the effects of the green revolution will be the progressive commercialization of the farm sector, requiring farmers to purchase quantities of costly inputs to be able to capture the benefits of the HYV. Cost of production of the HYV is approximately double that of local varieties with the increased expenditures going primarily for fertilizer, plant protection, water, and seeds. Investments in

assured water supply, in leveled, well-shaped land, and in mechanization or adequate draft power will all have high payoffs.

Where the high yielding varieties have been successful, the profits have been high. The example cited in Section IV of Ludhiana wheat returning Rs.1000 net per acre per season is the clearest example. Hybrid bajra and jowar are generally profitable even under poor management conditions.

The question may be raised, given the predominance of small farmers in India, which groups of farmers are being most benefited or most able to benefit from the opportunities afforded by the new inputs? Two general points can be made in answer to this question. First, there is nothing inherent in the new technology which biases it to larger holdings. Availability of water is a pre-requisite to make full use of the new technology. Larger farms, especially in Punjab, probably already have tubewells. However, the return on water is probably high enough to justify a tubewell (or pumpset) on smaller farms as well.6/ Furthermore, the large part of irrigated land in India is served by tanks, dug wells, and canals which are generally available to smaller holdings.

Second, even if larger holders do take first advantage of the new technology, the smaller holders will follow quickly after they have seen the profitability. This is the basic question of whether innovation and size-holding are correlated. The evidence is mixed; but the period of experience is still very brief. In Punjab, it appears to be the larger farmers who are moving most quickly to use new inputs; whereas in Tanjore district (Madras), IADP studies suggest that size of holding is not a significant factor explaining rate of acceptance. In practice, the intensive district agricultural programs are making conscious efforts to make the new technology available to small-holders.

On the whole, all farmers using the new technology are probably better off in terms of absolute income than before. How this increase is distributed is not known. Larger farmers, because of

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6/ The usual size for a private tubewell in Punjab is 0.5 cusecs to a depth of about 100 ft. which can water 15 acres. The investment costs are approximately Rs.4000-6000 per well plus land shaping. Very rough guesses gives a pay-off period of two to three years. There is an opportunity to custom water to farmers who have no private supply of water, an additional source of income.

their influence in cooperatives, may have more opportunities to obtain and use the necessary inputs than do smaller farmers.

A question might be raised regarding agricultural laborers. Agricultural wages are rising but probably not as much as the incomes of the land-owners. Laborers went on strike before the harvest in Tanjore and West Bengal; this has happened in previous years.

It would be premature to generalize too greatly from these events, but it seems safe to say that as incomes rise for some, dissatisfaction will be stimulated in others. The technical revolution presently underway which enables the earning capacity of the agricultural sector to increase (though not necessarily equitably, inter-personally or inter-regionally) may well also exacerbate and sharpen social differences which now exist. The implications of these widening income differences - whether they will unlease constructive or destructive forces - is difficult to predict. Certainly India has had a history of sharply defined and wide income and social differences from its beginning.

There is also little firm evidence as to what is being done with the increased incomes by farmers. Incomes have been depressed for the past two years. It would be reasonable to assume that there will be some move by consumers towards replenishment of basic necessities, clothing, farm equipment repaired, outstanding debts serviced. Some income will likely go to ceremonial activities. It seems plausible to expect food consumption and especially for superior foods - pulses, edible oils, dairy products - to increase. No doubt part of the income (but an unknown portion) will be put back into the farm. Demand for such inputs as tubewells, fertilizers, HYV seeds, machinery (including tractors) is very strong. Part of [illegible]

the potential of the new technology and of the increasing evidence of the economic responsiveness of agriculturists. Several steps remain to be taken toward assuring the maintenance of a suitable economic environment to encourage positive activity by farmers. The GOI is moving in these directions on its own initiative.

1. Center-State relations, a very basic problem, remains a source of difficulties to an effective all-India agricultural program.

2. The buffer stock, which promises to be the cornerstone of future economic policy regarding agriculture, must be viewed as an inter-related program of price supports, procurement, and distribution with the objective of bringing forth price stability and supporting a nutritional minimum by increasing production and consumption.

3. There is a clear and present need for an appreciation of the role of support prices (announced in advance of sowing) in the production process and for development of a systematic methodology for calculation of these prices which is directly related to that production role.

4. Greater flexibility in the method of procurement, is needed, particularly a greater use of open market purchases and reduction of compulsory mill and producer levies.

5. There should be a clear mandate of procurement objectives for the Food Corporation of India (FCI), and a strengthening of the organization to enable it ot carry out these objectives. Two things give promise that this organization will be improved:

   a. The production potential over the next few years make the problems of not carrying out an effective price support cum procurement program obvious, and the better supply-demand balance alone ought to be made to make the operations easier to carry out.

   b. The GOI has given repeated assurances that it places a high priority on this program.

6. Planning for investment in storage and transportation facilities to enable buffer stock operations to be carried out is necessary.

7. Foodgrain zones should be eventually eliminated.

Recent changes in economic policy are one of the most hopeful signs in believing that confidence in the performance of the Green Revolution is well-founded.

G. Research, Education and Extension

1. Research

With the exception of ADT-27, the major rice (TN-1, IR-8, Tainan-3) and wheat (Lerma Rojo, S-63, S-64) varieties initially introduced which have been the technical basis of the Green Revolution, have been developed abroad. This rapid infusion of technology has been a boon to Indian agriculture and has brought with it many new opportunities for research.

An important step to improve India's indigenous research capacity was taken in 1965 when all central research institutes and commodity institutes were placed under the direction of the Indian Council of Agricultural Research (ICAR). The objective of the reorganization was to reduce the duplication of effort between research institutes and to make it easier to focus research toward specific priority targets. As a consequence the ICAR has assumed the role of coordinator which finances and influences agricultural research all over India. The ICAR has direct coordination of the all-India crop improvement schemes which represent the main indigenous research thrust supporting the Green Revolution.

The all-India coordinated crop projects are selected to obtain improvements in yields which will have a rapid impact on production.[8/] Such programs, managed under an ICAR-appointed coordinator, greatly accelerate the pace of research work. Twenty-one coordinated projects in crop improvement in addition to 31 more in agronomy, soil science, agricultural engineering and animal sciences are proposed or underway. Experimental work is carried out in all India states. All-India coordinated yield trials are conducted throughout the major crop areas.

The strengths and weaknesses of the high yielding varieties were discussed in the initial pages of this section. An impressive, though young, research program is developing. One of the keys to the success

8/ One of the great advantages of the centralized research effort has been the ability to gather quickly a rich germ plasm from all over the world which can be distributed by the ICAR on all-India basis.

of the Green Revolution in India is the development of continuous feedback and interaction among research planning (based on both national goals and the known needs of farmers), ongoing research, training of researchers and extension to the farmers of the fruits of research. This type of relationship is growing in India although much needs to be done to link the elements (government-research-extension-the farmers) together so that information flows smoothly both ways.

2. The Role of the Agricultural Universities

A growing proportion of the research effort is being assumed by the developing agricultural universities of which eight are presently functioning. A ninth (in Maharashtra) is being organized and the Education Committee (1966) has recommended that every state have such an institute.

Agricultural universities represent an attempt to introduce the land-grant philosophy into Indian education providing linkage between teaching, research and extension with appropriate influence on public policy. By recruiting many of their students from farm communities, they hope to be able to build a continuing relationship with farmers. Their program is new but already solid achievements are being made. Some 7300 graduates came out of agricultural and veterinary colleges in 1967-68. Of these almost two-thirds are taking jobs in agricultural universities, in agricultural research stations, with government agricultural offices or with the extension service. By the end of the Fourth Plan (1974) nearly 25,000 students will graduate annually representing a growing infusion of human capital to the sector.

The agricultural universities participate in the all-India crop development projects and in addition undertake research of their own directed toward more specific local problems. Both Punjab and U.P. universities have become very active research centers. The M.P. university (Jabalpur), for example, has done important work into multiple cropping of paddy. As yet only two schools - U.P. and Punjab - have been able to work out a direct relationship with the extension service. Such a relationship must be fostered so that a continuing two-way flow of information can operate between farmer, research and extension.

3. Extension

Until the coming of the Green Revolution the extension agents did not have much technology to extend. Now this limitation has been removed.

The magnitude of the challenge facing the Indian extension service is an awesome one. A single village level worker may have to cover up to ten villages and up to 5000 farmers. He is expected to simultaneously engage in community development projects and schemes to increase farm production.

The Intensive Agricultural Districts Program (IADP) was set up in 1960, assisted by the Ford Foundation, to induce cultivators to adopt a package of improved agricultural practices in order to bring about a significant increase in yields per acre. This concept has been adopted in extending the extension program into assured rainfall areas under the High Yielding Varieties Program.

To make the extension service more effective its 60,000 block level workers and nearly 50,000 other staff members need to be retrained in the new technology. Not only the quality but the size of the service will have to be upgraded to allow individual workers to become more effective. The service is hoping to recruit increasingly among the agricultural university graduates. Training in the future will stress production and technical skills (mechanization, irrigation, cropping patterns).

The major thrust of the extension program, during the Fourth Plan period, is to be through farmer training and education programs which will rely to an increasing extent on field demonstrations, audio-visual aids, farm radio programs, and farmer training courses. The agricultural universities will play an increasingly important role in the transition, first through extension training and eventually by taking a more active role, if not overall direction in the extension activity.

H. Credit

As the agricultural revolution achieves momentum, farmers' demand for credit will increase for two reasons. First, more inputs will be needed. Second, these inputs are costly and must be purchased with cash. There is a marked increase in cost of production per acre of

HYV over traditional variety crops accruing primarily from the much larger use of fertilizer and plant protection materials. The extra cost of production of HYV maize over local varieties was found to be Rs.138 in one studied district. In two districts growing paddy the incremental cost of production per acre was Rs.213 in one and Rs.139 in another. The same pattern was found in the case of bajra where the increased cost was found to be Rs.81 per acre.9/

Farmers find credit from several sources: non-institutional (family, money-lenders, etc. 65%), credit cooperatives; which are the most important institutional rural credit source (30%) and from commercial banks and taccavi (5%). States where short-term credit has been a problem are those states where the cooperatives are weak (notably Assam, West Bengal, Bihar and Rajasthan). In several states smaller farmers and tenants have been unable to obtain cooperative credit.10/ Cooperative credit (which has a rather low maximum loan level per farmer) has been generally inadequate for the larger farmers. Until recently the alternative institutional source, the commercial banks, have been reluctant or disinterested in entering the rural credit market (which has been viewed officially as the special perserve of the rural cooperatives).

Commercial banks have begun to extend long-term loans to finance tube-well construction. Now government is encouraging them to establish branches in rural areas and widen the scope of their activities. The banks are responding and have begun to study the opportunities and needs involved.11/

As the demand for credit mounts, great pressures will be placed on the cooperative credit system to distribute credit. The system will have to re-examine its efforts to extend cooperative membership (and take steps to expand this). The ceiling on credit for individual farmers will either have to be raised or alternative sources developed.

9/Report on the High Yielding Varieties Programme, Directorate of Economics and Statistics, New Delhi, June 1967, page 50-51.

10/This reflects one of the problems which exist at the village level cooperative structure. Only cooperatives members can get cooperative credit. Yet many farmers do not join the institution. The reason is not well understood but appears to involve social (though not necessarily caste) and political cleavages within the village society such that one group does not or cannot join a body dominated by another group. This is one reason why plural credit sources are needed.

11/Formerly the state governments provided farm loans (taccavi) through the Block Development Officer but this program is being curtailed and will likely soon disappear.

Commercial banks have stressed rather rigid collateral qualifications for credit. These need to be reviewed, and efforts made to introduce new ideas of credit worthiness (the crop loan idea is a step in this direction). The need for larger and more effective credit institutions is foreseen. If this is not built-up, credit management could become a real bottleneck to the Green Revolution.

I. Is There a Green Revolution?

It is the sum of this public and private commitment - the obvious strengths and the programs to overcome recognized weaknesses - that is the Green Revolution in India.

To a very considerable degree the process seems irreversible. Changes are occurring at the farm site, with farmers themselves opting in increasing number for the new inputs. The industrial capacity to produce inputs is being rapidly built-up. Great public and rural expectations have been generated which will fortify the government's commitment to continue the needed economic policies for the foreseeable future. External pressures such as weather and foreign exchange availability, which cannot be guessed at here, will also play a role. There is little doubt but what many claims will be made upon GOI resources from many quarters. The question: how strong is the commitment and how long shall that commitment continue?

It is the opinion of the Mission that the government, with the experience of the drought still fresh, and encouraged by the substantial productive response to its efforts, will continue its efforts to make the revolution a permanent one.

For all these reasons we feel the Green Revolution represents a fundamental and permanent change justifying optimism. This process and the adjustments necessary to bring it about will occupy a large portion of Mission research and evaluation during the coming year.

VI. U.S. ASSISTANCE

In the preceding sections we have demonstrated that a 5 per cent growth rate for foodgrains over the next several years could bring India to foodgrain "self-sufficiency" by 1972-73. Moreover, such a rate of growth is an achievable goal. The requirements, in terms of supplies of high yielding, disease-resistance variety seeds; fertilizers; pesticides; insecticides; irrigation and associated machinery and equipment for efficient application and use of these various inputs have been indicated. We have also suggested the kinds of government policies and programs necessary to provide an environment in which India's farmers can and will make the needed adjustments in production. In this section we will discuss the types of assistance USAID is now giving or might provide to help India meet these growth goals.

USAID grant and loan programs should aim to: improve supply and distribution of essential production inputs; help develop institutions for agricultural research and education needed to generate and diffuse advances in technology; and strengthen organizations and mechanisms for implementing programs for stabilizing foodgrain prices and supplies.

P.L. 480 will remain an important instrument of aid in the next few years; first, to help meet the continuing average annual gaps between consuption requirements and production and, secondly, to help the GOI to build buffer stocks, which are crucial to implementation of policies for stabilizing foodgrain prices and supplies. The GOI will be under considerable political pressure to terminate these imports as quickly as possible and may find it extremely difficult to continue these imports in years of normal or better weather and production. Certainly the U.S. will want to insure that such imports do not complicate the difficulties of maintaining agricultural prices at adequate incentive levels.

A. The Inputs Problems

The important production inputs relevant to a growth rate of 5 per cent have been outlined above. There are problems unique to each of these input areas and the nature of the U.S. assistance differs sufficiently to make it useful to discuss each separately.

1. Fertilizers

We need to continue encouragement of a rapid build up of production capacity for nitrogen and phosphatic fertilizers. Even with reasonably good progress in this effort, the gap between needs and domestic production of nitrogen will be more than one million tons per year for at least the next three years. The gap for phosphatic fertilizers will continue to widen and will probably be more than 500,000 tons by 1970-71. There are now no prospects on the horizon for the development of indigenous production of potash. Foreign exchange requirement for fertilizer imports will continue at a high level for the next several years. Loans, on concessional terms, will be of major importance in helping the GOI meet fertilizer requirements.

Existing organizations and facilities are generally inadequate for distributing efficiently the rapidly expanding amounts of fertilizer used. The Mission is now providing technical assistance to the fertilizer industry in developing more effective promotion and distribution arrangements. This program should be continued, emphasizing development of capacity within the Fertilizer Association of India and the Fertilizer Corporation of India to assist their member units in meeting farmers needs more efficiently. The Mission should pursue its proposal for assistance to a refinance and loan guarantee fund designed to help finance the distribution of fertilizer and other inputs.

2. Plant Protection

The pesticide and insecticide industry is developing rapidly. Internal production capacity is expanding quickly but basic materials must still be imported on a large scale for local compounding. The Mission should encourage and assist in further investment for internal production capacity but meanwhile be prepared to help finance substantial imports.

Aside from any stimulus USAID can give to expansion of supplies of plant protection materials, the Mission can be of considerable help in improving the distribution and use of these materials. The Mission plans to provide a technical advisor to strengthen the program at a national center for plant protection training. This will emphasize organization of surveillance and warning systems to improve ability to respond quickly to plant disease outbreaks. USAID is also providing plant protection specialists on the Agricultural Production teams

assigned to several States. These specialists will help develop more effective arrangements for detecting and solving the plant disease problems encountered with the new high yield varieties programs. The Mission will also give technical assistance in developing effective rodent control programs to diminish losses to crops in the field as well as in storage. The Mission has proposed a program for accelerating development of storage facilities and practices to reduce losses in storage from rodents and other pests.

3. Seeds

High yielding seed varieties are basic to the strategy of expanding foodgrain production through intensification. The seed industry needs assistance at the development, production and distribution levels. First, the capability of scientific talent and research institutions to carry out an intensive coordinated crop improvement program needs to be strengthened. The new seed varieties, which have formed the backbone of the intensive production programs, have depended heavily on foreign development. While high yielding varieties of maize, bajra, and jowar have been developed by Indian plant breeders in cooperation with scientists from the Rockefeller Foundation, the wheat and rice varieties were largely imported. Considerable work is now underway for selection and breeding of wheat and rice varieties better adapted to local conditions and with greater disease resistance. These crop development programs need to be strengthened and accelerated to provide a steady, dependable flow of new plant materials that will sustain high yield potentials.

USAID's program for development of Agricultural Universities is one major effort through which the essential research institutions for advanced practical varietal improvement work will be fostered. This program will be discussed more fully below. The Mission will give special support to three major crops; rice, the pulses and soybeans.

The Indian Council of Agricultural Research has only recently organized a coordinated all-India project for rice improvement to which USAID, through a contract with the International Rice Research Institute, and in cooperation with the Rockefeller Foundation, will give substantial technical and financial support. This support will include the advisory services of four full-time international rice experts, several short-term consultants, and a participant training program for India staff at the outstanding research and development institutions of the region.

The pulse crops, which utilize about one-fifth of the acreage devoted to foodgrains and are an important source of protein in the Indian diet, have until recently, been very much neglected. AID/W, through a PASA with USDA/ARS, has initiated a major research effort to develop the pulse crops. This is now being supported by an all-India coordinated pulse research project. This work should lead to development of pulse varieties and cultivation practices that will substantially enhance the yield and profitability of these crops.

Soybean acreage in India is now very small but this crop offers tremendous opportunities for increasing the supply of edible oils and high quality vegetable protein. There is now considerable interest in soybean in India. Commercial firms are pressing for expansion of supplies, particularly the antibiotics industry and more recently firms interested in development of high nutrition foods. To meet these expanding demands, the GOI imported 40 tons of seed for multiplication this year and is encouraging further research to develop improved varieties adapted for different areas of India. The University of Illinois has developed a comprehensive program of research on soybean in collaboration with the two Agricultural Universities it assists under the Agricultural Universities Development Project. This work has already identified well adapted varieties suitable for introduction and determined suitable cultivation and fertility practices for this crop at locations in Madhya Pradesh and Uttar Pradesh. ICAR has now set up a coordinated All-India development program for soybean to which this activity is closely linked.

The production and distribution phases of the seed industry also need considerable strengthening. The National Seeds Corporation established in 1964 is the principal GOI agency for promoting a reliable seed production and distribution system and works closely with State Governments and the private seed trade in developing facilities for production, processing and distribution of quality seeds. The National Seeds Act enacted in 1967 provides the necessary legislation for seed certification and quality control. The National Seeds Corporation is working with the States in developing the necessary State administration machinery for implementation of this Act. USAID has been invited to assist the National Seeds Corporation in carrying out its functions. A team of six seeds specialists are being provided under a contract with Mississippi State University for this purpose. We expect this team to assist the NSC in encouraging greater participation on a responsible basis by the private sector in seed production and distribution.

The Mission has encouraged major American seed producers to invest in the Indian seed industry. Upto now the results have not been impressive but several American producers are now indicating interest in collaboration and one firm is now engaged in a fairly large hybrid seed production enterprise with Cooley loan assistance. The Mission feels that expanded investment and participation by American seed producers could make a very important contribution to development of a healthy, reliable seed industry in India. The proposed USAID assistance to a refinance and guarantee fund for input producers and distributors will be of great importance to the seed industry.

4. Farm Machinery Power and Equipment

Mechanization is an important element in intensification of Indian agriculture. There are high pay-offs to timeliness and precision in many operations that require new types of implements and often additional power. There is need not only for additional power supplies but for new designs of equipment and machinery for use with conventional power units as well as adapting to the requirements of intensive production systems.

The Mission will assist the GOI in studying power and machinery requirements, testing and evaluating various types of equipment available and adapting equipment to particular crops and field conditions. Specialists assigned to the Agricultural Production teams are becoming engaged in this process in connection with the high yield varieties programs in the States in which they work. One specialist assigned to Delhi meanwhile, working closely with the Farm Mechanization Unit in the Ministry of Food and Agriculture, is providing advice on power and machinery imports and manufacture and provides guidance to prospective foreign manufacturers interested in investing in this industry. He is also helping to develop effective and viable arrangements for joint use or custom hiring of certain types of farm equipment in order to make their use on small farms economical.

5. Water

The strategy for increasing foodgrain production concentrates on irrigated land or land with an assured water supply. It emphasizes efficient use of irrigation facilities and expansion of irrigation primarily through short-gestation, minor irrigation systems. USAID

is providing technical assistance in developing better organization at the Center for investigating and evaluating land and water resources and planning for optimal development use. The Mission is also assisting selected States in planning and implementing, on a pilot basis, improved land and water management techniques and organization appropriate for major areas having particular types of water management problems. These pilot demonstration areas also serve as facilities for training large number of Indian technicians at all levels. This program, which is being carried out through a PASA with USDA, aims at helping to develop Indian agencies competent to plan and carry out programs for efficient development and utilization of soil and water resources. A joint Indo-USAID study is being organized with the Ministry of Food and Agriculture, the Ministry of Irrigation and Power, and the Planning Commission cooperating. The objective of this study is to strengthen the factual and analytical basis for policy and operational decisions for more efficient use of land and water resources in Agricultural Production.

USAID is helping to establish pilot rural cooperative electricity distribution systems as a means for accelerating the development of electric power facilities in rural areas, particularly those having high potential for pump irrigation. Technical assistance will be provided through a contract with the National Rural Electric Cooperative Association of the U.S. The Mission has proposed use of U.S. Uses Rupees as a contribution to a Central GOI fund for financing the rural electric cooperatives.

B. Agricultural Credit

The sharp increase in use of all agricultural inputs will greatly increase the need for agricultural credit. Cooperatives which are now the major source of institutional credit for agriculture provide about 30 per cent of the credit. While efforts are being made to strengthen the cooperatives credit system, much of the increase in credit will need to come through commercial banks and other credit institutions. USAID is responding to recent initiatives by the commercial banks to develop rural credit programs. The Mission is helping to sponsor a seminar for commercial bankers on the subject and will provide short-term consultants to assist the commercial banks in this undertaking. The Mission has proposed, and the GOI accepted in principle, using U.S. Uses Rupees to help fund four important credit activities, including a refinance and guarantee fund for fertilizers, seeds and other inputs, district

agricultural development corporations, a rural electric cooperative fund, and assistance to the Land Development Banks Union for additional funding for long-term credit.

C. Agricultural Education, Research and Extension

To sustain a high rate of growth in agriculture India will need to expand its supply of manpower trained in agricultural sciences and develop further its institutions for agricultural research and extension education. The agricultural universities are the most promising institutions for providing quality education to the large numbers of technical people needed for agricultural research, development, and administration. These institutions also can be looked to for undertaking the research needed for evolving better adapted, high-yielding varieties resistant to diseases and improved associated cultural and fertility practices and production materials needed for continued improvement in production practices. These agricultural universities are also expected to develop and carry out programs for extending knowledge about improved agricultural practices to farmers. This activity should extend beyond plant breeding and production practices to encompass the multitude of socio-economic problems associated with expanding agricultural production such as marketing and related distribution, credit, and income problems.

USAID is now supporting agricultural universities in eight Indian States through contracts with six American state universities. These programs need to be continued and expanded into other States. In some cases considerable change in the nature of the assistance will be appropriate. Each State needs a strong state-wide agricultural university effectively integrating agricultural education and research, focused on the problems of adapting and introducing modern technology in these areas. Assistance should include technical advisors to help develop various aspects of a comprehensive program of teaching, research and extension and participant training to provide advanced degrees to selected staff members.

At some of these institutions, future programs should emphasize development of "Centers of Excellence" in one or more special fields, providing India with staff and facilities for the high quality advanced training heretofore available only by going abroad. The Mission has recently arranged for a team from the University of California to explore the possibilities of developing such a center at one or more of the agricultural universities for advanced training and research in soil and water management.

Over the past 15 years India has built up a sizeable agricultural extension apparatus, including a hierarchy of staffs directed by a department of agriculture at the State level supporting and supervising field staffs at the district, block and village levels. A major weakness has been the inadequate backstopping of the field staff by competent research institutions and lack of communication of field problems to research agencies. Varieties and practices have been recommended on a generalized basis, taking inadequate account of soil, water, and other environment variations.

In 1966-67 the Mission began its Agricultural Production Program designed to develop and strengthen links between State research institutions and the agricultural field staff responsible for agricultural production programs. Under this program, specialists in major disciplines involved in crop production are working closely with counterparts in the agricultural universities or research institutions and in the Departments of Agriculture, helping to identify problems encountered in introducing intensive production programs and helping to find solutions and get these incorporated immediately into field extension programs. In the process, these teams are helping to institutionalize a pattern of cooperation among the research and development agencies involved that will serve the needs of the State more effectively. This process needs to continue and to be extended into additional States.

D. Production Incentives and Price Stability

The experiences of recent years give evidence that income incentives are important in inducing farmer adoption of improved technology. The GOI has established the basic institutions for implementing a food price policy with twin objectives of stabilizing food supplies and prices for consumers and providing a minimum incentive price for producers. USAID has provided technical assistance through a PASA with USDA to the Food Corporation of India (FCI), which has the major technical responsibility for implementing policy laid down by the Ministry of Food and Agriculture. The FCI does not yet have the capability to manage food supplies to meet the policy objectives. Technical assistance should be provided to help develop appropriate market intelligence systems and control procedures. Buffer stocks will be an important element in stabilizing food grain prices and supplies. U.S. supplies of grain under P.L. 480 will be of great assistance to the GOI in building up such stocks in the next few years.

The rate of growth in different States and in different districts within each State show a great amount of variability. The Mission is carrying out a joint program of research with the Director of Economics and Statistics in the Ministry of Food and Agriculture which draws on a wealth of existing data on agricultural production to get a better understanding of the factors contributing to or hindering growth in productivity. This activity, aside from providing the Mission and the GOI insights into the causes of differential rates of growth, is helping to develop competency within the Ministry to make better use of available data in analysis that are useful for making policies and planning development.

E. Concluding Comments

The foregoing describes what appear now to be appropriate types of assistance for the next two or three years. The Mission is undertaking a study of the long-term prospects in Indian agriculture to give a more solid basis for proposing new lines of activity. In the last few years our program has focused quite narrowly on increasing foodgrain production. Very tentative projections suggest that in the future there will be a need to give more emphasis to other aspects of agriculture. With more ample supplies of foodgrain, greater attention should probably be given to improving the nutritional balances by emphasizing high protein crops, protective foods, and livestock products.

High income elasticities for milk, eggs, fruits and vegetables suggest that these products will take on much greater importance in the Indian diet. This may lead to important shifts in production, with implications regarding the requirements for marketing, processing, preserving, and distributing much larger quantities of these products. There are likely to be important problems emerging out of the inter-personnel and inter-regional income disparities accompanying agricultural growth. Perhaps some of these problems will alter our priorities in designing assistance program for later years. We hope that the studies being carried out this year, projecting the likely changes in Indian agriculture, will provide a firm basis for moving into new types of activities.

ANNEX E - FERTILIZER REQUIREMENTS & PRODUCTION

I. Introduction

India's most urgent and immediate need is to grow more food. There is still a substantial gap between domestic production and consumption of foodgrains, which comprise the bulk of food for most of the population. The Government of India (GOI) is trying to close the gap. In 1965 it adopted a dynamic new strategy for agriculture: to bring about a rapid increase in foodgrain production by combining the use of high-yielding and fast-growing varities of crops with greatly intensified use of other agricultural inputs, particularly fertilizer.

The Mission estimates that by the application of the high-yielding varities program in suitable areas and continued gradual improvement of farm practices and inputs in other areas planted to foodgrains, production will increase at an annual rate of at least 5 percent beginning in 1968. The 1967-68 crop substantially exceeded a base estimate of 93 million tons, and a growth rate of 5 percent per year would mean total foodgrain production of about 108 million tons in 1970-71. Although domestic output at this level would not eliminate foodgrain import requirements, it would reduce them substantially; and a sustained growth rate of 5 percent per year would accomplish the objective of self-sufficiency in foodgrains by the mid-1970s.

A rapid increase in the use of fertilizers will be needed to obtain optimum results from the high-yielding varieties program, increase the yield from traditional crop varieties and raise the output of cash crops.[1/] The use of large quantities of fertilizer, even if much of it must be imported, is essential if India is to reduce its present dependence on imported foodgrains. The application of one additional ton of fertilizer nutrient will yield at least 9 tons of additional foodgrains from traditional seeds or irrigated or rain-assured lands, and an average of over 13 tons from the high-yielding varieties of seed.[2/] Imports of $100 worth of fertilizer in the form of urea (45 percent nitrogen, c.i.f. cost $90 per ton) will provide 0.50 tons of nitrogen nutrient. The additional yield from this fertilizer will be about 4.5 tons of foodgrains, which will save $360 of foodgrain imports at $80 c.i.f. per ton. The foodgrain grown from this ton of urea will be sufficient to feed about 27 people for a year.

1/ It is expected that of the total available supply of fertilizer 75 percent will be applied to foodgrains and 25 percent to cash crops.

2/ See the Food Production Annex to this Program Memorandum.

The foreign exchange required to pay for imported fertilizer must be diverted from other urgent needs of the Indian economy. Fertilizer manufactured in India in large-scale plants based on modern technology, such as the Trombay expansion, will be competitive with imports from plants constructed elsewhere in the world,[1] and domestic production of fertilizer to replace imports offers significant opportunities to save foreign exchange.

The GOI is trying to increase domestic production of fertilizer by construction of public sector plants and by grants of special concessions to investors in private sector plants. It has seven major government-owned plants in operation, five under construction and two in the planning stage. Private sector plants now in operation include two large units - Coromandel and Gujarat State Fertilizer and a large number (30 - 40) of small units. In addition, as a result of major policy changes made by the GOI to encourage private foreign investment in fertilizer projects, two foreign companies (one U.S. and one British) are participating in the ownership and management of large fertilizer plants now under construction, and six other foreign firms are involved in fertilizer projects which have been issued letters of intent.

While India is building up its domestic fertilizer production, it is also giving top priority in its foreign exchange allocations to import of sufficient fertilizer to meet its ambitious demand targets. AID non-project loans are financing a major part of these fertilizer imports.

Attachment I-1 provides a tabular summary of the overall Indian fertilizer program, giving requirements, estimated fertilizer production, and import targets (in both tons and dollars), for the three major types of fertilizer nutrients.

1/ For example, Trombay projects the sales price of urea from the expanded plant at $77.33 per ton. The FOB prive of urea in the U.S. is about $75 per ton and freight charges would add approximately $20.00 per ton to the cost of urea shipped from the U.S. to India.

II. Production

Production during IFY 1967/68 and the 1st quarter of 1968/69.

Production of fertilizer in India during the past fiscal year was disappointing. Last year's PM projected manufacture of 581,000 MT of N: actual production was 366,000 MT.* By plant, only Nangal, Rourkela and Baroda reached or exceeded expectations.

Major problems were raw material shortages (Alwaye - sulfur; Sindri - gypsum), strikes (Sindri, Rourkela and Neyveli), mechanical difficulties (everywhere and by far the biggest problem), unreliable power (Alwaye and Vizag) and unexpected developments (Alwaye - salinity in the Periyer River). The government -- all but two of the plants are public sector -- made strenuous efforts to eliminate the difficulties. It dispatched technical evaluation teams to each plant encountering serious mechanical problems; it alleges (and Mission knowledge of behavior at Trombay confirms) that the companies reacted expeditiously to technical recommendations; and it made foreign exchange available immediately in each instance in which it was required.

The record of the first quarter of the current year is more encouraging. All plants except Sindri produced more fertilizer than in the equivalent quarter of the previous year: N production increased by 38,000 MT (55%). Nevertheless, extrapolation of the quarter's production to a yearly basis**indicates manufacture of only 431,000 MT of N while the Mission has estimated production of 590,000 MT and the GOI projects 650,000 MT.*** However, the elimination of major constraints at several plants (a new power source for Coromandel, sulphuric acid to replace poor quality gypsum at Sindri, solutions to most running-in problems at Neyveli) plus two additional units due on stream in the middle of the year (Namrup and gasification capacity at Rourkela) make production in the range of the Mission estimate possible.****

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* A minor part of the difference is due to Mission overestimate of realizable plant capacity, especially in the case of Sindri.

** Dangerous because many plants conducted major annual overhauls in April.

*** Mission estimates of N production are close to IBRD projections (IND 68-13, Table 3). The Bank projects 580,000 MT for this year, is 2% below the Mission for 1969/70 and marginally above for the three years following.

**** This discussion and that which follows has concentrated on N. The 1967-68 P_2O_5 record is similar: production of 181,000 MT where 266,000 MT was predicted (a 32% shortfall). Indigenous production of phosphatic fertilizer is not nearly as important to India since adequate, even more than adequate, stocks are on hand and the foreign exchange savings in manufacturing such fertilizers within the country tend to be marginal. See section 7.21 of the Trombay loan paper.

Construction of new plants

Twleve new or expanded plants are under construction. The construction record is excellent. With the possible exception of Madras and Barauni, all major plants are on or ahead of schedule. The DCM plant at Kota expects to start-up in October 1968, months ahead of original expectations: its construction time of 19 months would be good in the U.S. Delay occasioned by the controversy over Madras' boiler may not significantly delay plant commissioning for alternate, temporary (and expensive) sources of steam may be available.

Long-term prospects

Attachment II-1 estimates Indian fertilizer production through 1974-75 from plants in operation, under construction or sanctioned by the government. Comparison of such estimates to consumption targets is of limited value beyond 1971-72. Consumption estimates more than three years in advance based on such a high compound growth rate are problematic and an important proportion of production after that date may come from plants not yet licensed by the government and not included in the Mission projections.* In the interim, N production is expected to fall short of requirements by significantly more than 1/2 million MT each year.

The government's attempts to create significant private sector N production will have an important effect by 1970-71 during which the private sector should produce 508,000 MT of N or 39% of the country's total production. Those private sector plants will then possess 47% of Indian N producing capacity: 31% is now in the private sector.

During the past year the government's private sector efforts have had mixed results. Two projects have been dropped. Phillips withdrew from Haldia either because of dissatisfaction with government behavior at their jointly owned Cochin refinery or because better opportunities became available outside of India. Rohm and Haas and the Modis relinquished the Delhi site predominantly because of the disadvantages of an inland location and a short supply of management in their organizations. Early expansion of Coromandel appeared a possibility and then receded as a consequence of unfortunate production levels caused by frequent power fluctuations.**

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* E.G., Burmah-Shell's 1000 MT/D ammonia plant and Occidental's proposed production of 300,000 MT of N per year by early 1973. Moreover, the projections do not include any public sector plants in the planning stage except Trombay and the Sindri rationalization scheme.

** Cured, Coromandel hopes. June was the first month the plant operated at better than its cash breakeven point.

The Tata-Allied proposal, first made to the government in mid-1967, has unfortunately become a cause celebre. After the government persuaded Allied to reduce the price of ammonia it would supply to the plant, the project was approved by the Secretaries' Committee in January 1968. Since then it has run a gamut of Cabinet and Planning Commission reservations about its foreign exchange costs, location, technology, phasing and financing. Much of the delay has been caused by the conjunction of the projects varied and staggered scope with Planning Commission consideration of the constituents of the Fourth Plan. The Mission shares at least one of the government's major concerns: that the high foreign exchange savings portions of the project are unreasonably postponed while the Tata's gradually break into the fertilizer business with products manufactured from intermediate materials. In any event, the government appears willing to approve the project if the sponsors will agree to curtail the period of ammonia imports, permit greater government equity participation via the IDB or IFC, put more equity in themselves and will accept public, rather than privately developed, port facilities at Okha. Such adjustments are probably acceptable to Tata-Allied.

Evaluation of Indian efforts to attract private investors and responses to those efforts indicate two conclusions. First, the context -- the combination of government attitudes and procedures, site locations, market potential, local partners, available financing and the opportunity to use fertilizer projects as entrees to attractive crude, ammonia and phosphoric acid supply contracts -- is attractive enough to interest a reasonable number of prospective investors -- seven collaborations involving major Western fertilizer producers have sought industrial licenses since January 1, 1967 and four had received licenses prior to that date. The Indian situation is also attractive enough to maintain the commitment of a high proportion of those investors once they have decided to apply for a license. Of the eleven propositions, nine continue active: one is in operation, two are under construction, three are completing engineering or financial arrangements and three are still negotiating with the government.

At the same time, it is now apparent that prior estimates of the time which it is reasonable to expect will be consumed between application to the government and beginning of construction, even if conservative, have not been conservative enough. Different factors obviously affect different projects. To varying degrees, however, implementation of most projects is conditioned by two sets of difficult considerations: Indian economic and political sensitivities on the one hand and, on the other, the wide range of project raw materials, processes, products and locations which the private investor must sort through before committing itself to the $60-100 million investment required by a modern, Indian fertilizer plant.

The Government of India has a legitimate interest in most dimensions of most fertilizer projects. It must provide the foreign exchange to service loans, pay profits and procure raw materials and spare parts. It must locate and time-phase new refineries and public sector plants.

It must administer systems designed to insure that plant equipment which can be procured in India will be procured in India. It must be in a position to take maximum advantage of bilateral trading agreements. It must worry about the fiscal consequences of financing plans and the economic consequences of private size and process decisions. It must worry about the concentration of private economic power and its own relationship to the states. And it must do all of this in a manner which in its concept will make it least vulnerable to political accountability, in and outside of parliament.

The Government of India is frequently faulted for producing unconscionable delays in project implementation while it pursues optimum solutions at the expense of production lost and foreign exchange squandered. Critics say that Allied and Burmah-Shell, if authorized to go ahead with their (to the Indians) imperfect projects when first they applied, would have more than paid for their imperfections by the time sliced from argumentation and negotiation. But it is probably unrealistic to expect a popularly elected, dogmatically divided, parliamentarily responsible, far from secure federal government to act other than it does on issues in a planned economy which are as "hot politics"* as fertilizer is in India.**

This intergovernmental haggling takes time. The Secretaries' Committee was organized to save some of that time. And it has done so in run of the mine cases. Any reputable applicant which wishes to build a naphtha based, 600 TP/D ammonia plant and appropriate urea facilities at an appropriate seaport,has a middle-sized Indian business house as a partner and asks for no unusual government concessions, will be cleared by the Secretaries without Cabinet reference and in short order. But where project proposals have economic or political consequences beyond their own immediate dimensions, the Secretaries will not act for the Planning Commission nor as Ministers or Cabinet. And at those levels decisions take time -- everywhere.

These factors from the Indian side become interlocked, and exacerbated, by the wide range of alternatives open to, even forced on, serious prospective private investors. The Kaiser-Birla situation is an example. Hindalco, of which they are the major shareholders, requested and received a letter of intent for a standard-size ammonia/urea complex at Mirzapur, near the aluminum plant. Presumably the site was chosen to conserve management and because it was on the Barauni pipeline and near a relatively unexploited market in U.P. and Bihar. The process and size were the same as the Birla's Goa proposal. Then Kaiser prepared a feasibility study which concludes that market development with urea alone would be a mistake, that ammonia can be imported to India on terms at least as economic as its manufacture in the country and that transport considerations militate

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* A. Mehta to J. Lewis.

** Footnote classified.

in favor of very high analysis fertilizers in the 36:36:0 range. From a simple naphtha-ammonia-urea project Kaiser's plans now incorporate two seaport plants converting ammonia and phosphoric and superphosphoric acid into DAP (18:46:0) and ammonium polyphosphate (15:60:0), shipping it to plants at either end of the Gangetic plain where it will be converted with purchased urea into 28:28:0 and 36:36:0 and sold from the Punjab to West Bengal. Sometime later, the requisite urea will be produced at the inland locations rather than purchased. This plan may make excellent sense. It is certainly bold for UAP of the concentration proposed is nowhere, and has never been, commercially produced. But the first point is that it took Kaiser a long time after receipt of the letter of intent to come up with the proposal. And the second point is that the complexity of the proposal, coupled with its high and continuing foreign exchange costs, will invoke the kind of government consideration to which Allied-Tata has been subjected and by which it has been delayed.

Consideration of such projects will, almost inevitably, improve. Much of the ground covered by the government in Allied-Tata will not necessarily be restudied or reargued in consideration of Kaiser-Birla. Some of the economics may become less obscure. But the lesson to be learned is that AID, as well as GOI, planning should provide healthy margins between fertilizer plant proposals and fertilizer plants.

III. Imports

A. Terms of Reference

Analysis of data on the Indian fertilizer situation can be extremely confusing. A word like "demand" can be used to mean several different things. Similarly the year 1968/69 can mean a number of different things, depending on context and on who is using the term. In analysis of fertilizer demand, production and imports, the Mission has found it convenient to use the following definitions:

1. Time Periods:

For purposes of fertilizer imports, the year 1968/69 can mean a number of different time periods, depending on whether one is talking about a tendering year, an ordering year, an arrivals year, a distribution year, etc. All of these different "1968/69s" are tied together by the central principle that, at least in theory, they refer to fertilizer to be used during the crop year 1968/69, which extends from July 1968 to June 1969, and represent the time periods required to undertake the steps, such as tendering, etc., to get the fertilizer to the farmer for use during the crop year. Attachment III-1 is a chart which shows the time periods involved in the various steps in the procurement of fertilizer from the U.S.

As Attachment III-3 shows, it is usual to allow about a three month lag between production or import of fertilizer and its actual use (consumption). However, in fact roughly two-thirds of total fertilizer requirements for a crop year must be available to the farmer by the time the rains begin in July, the first month of the crop year. Thus, if one is trying to estimate actual consumption of fertilizer (for purposes of estimating the resulting agricultural production), then it is more useful to count only that fertilizer produced or imported (landed) in the twelve months ending in October as available for the crop year beginning the preceding June. This would give an eight month lead time rather than three months between availability and consumption.

2. Definitions and Relationships:

a. Consumption Crop year 68/69 = Distribution from factory or port in IFY 68/69, adjusted for changes in inventory in the distribution system.

Distribution, which can be measured reasonably accurately and consistently over time, is used as a substitute for consumption, since no reliable data are available on actual consumption. However, distribution is not the same as consumption for purposes of the technologically based estimates of fertilizer requirements given in the agriculture section of this Program Memorandum. For that purpose, to attain a consumption target of

about 2 million tons of all types of fertilizer nutrients in 1968/69, actual distribution would have to be a few hundred thousand tons over 2 million to allow for the time lag losses between distribution and consumption and for increased inventory requirements in the distribution system (since some states do not have good data on inventories at the retail level and thus include such inventories in their distribution estimates).

b. Imports 1968/69 = Orders placed in ordering year 1968/69.

For purposes of convenience and consistency, the Mission and the GOI use the term, "Imports 1968/69," to mean actual or planned orders for crop year 1968/69 (see Attachment III-1), since by this method we can get fairly precise readings on imports in 1968/69 fairly soon after the beginning of IFY 1968/69. Use of the orders placed concept also focuses attention on the area where the GOI and the Mission can do the most to affect imports. For example, the GOI ordered 963,000 metric tons of nitrogen in the ordering year 1967/68, but due to lack of availability of ships from the U.S. actual arrivals of fertilizer in India in IFY 1967/68 were only 859,000 MT. From the point of view of evaluating GOI performance, the 963,000 MT figure is probably more relevant than 859,000 MT. (Actual arrivals in the 12 months ending with April 1968 were 961,000 MT).

c. Distribution IFY 1968/69 = Import Arrivals IFY 68/69 + Production IFY 68/69 + Inventory March 31, 68 - Inventory March 31, 69.

Distribution, which we use as a substitute for consumption, is computed by taking actual import arrivals during IFY 1968/69 (which will be a slightly different number from arrivals resulting from orders placed in ordering year 1968/69; actually, either number could be used so long as it was used consistently from year to year), adding domestic production during the IFY and then adjusting for the change in inventories at all levels during the IFY. This gives the best available estimate of fertilizer actually delivered to the farmer.

d. Additional Availability 1968/69 = Imports 1968/69 + Production IFY 1968/69

The additional supply of fertilizer for distribution in IFY 1968/69 and use in crop year 1968/69 is defined as orders placed for imports in ordering year 1968/69, plus production during the IFY. However, it should be remembered that for purposes of estimating actual farmer consumption in a given crop year, equation "d" overstates the supply available to the farmer, since it is based on a three month lead time between availability and consumption, rather than a more realistic eight months. While we would not want to confuse an already confusing situation

further by changing the definitions which the fertilizer industry and the GOI have been using, application of an eight month lead time between availability and consumption would change equation "d" as follows:

$$\text{Additional Availability (For consumption in Crop Year 1968/69)} = \frac{2}{3}\,(\text{Imports})_{1968/69} + \frac{1}{3}\,(\text{Imports})_{1967/68} + \frac{7}{12}\,(\text{Production})_{\text{IFY } 1968/69} + \frac{5}{12}\,(\text{Production})_{\text{IFY } 1967/68}$$

e. $\text{AID/GOI Demand Target}_{1968/69} = \text{Additional Availability Target}_{1968/69}$

When the GOI or the Mission talk about a demand target for 1968/69, what we mean is additional fertilizer (as defined in the unrevised version of equation "d" above) which is required to be imported or produced for use in crop year 1968/69.

f. $$\text{Imports}_{1968/69} = \text{Demand Target}_{1968/69} - \text{Production}_{\text{IFY } 68/69} - \text{Inventory}_{\text{March 31, 1968}} + \text{Required Inventory}_{\text{March 31, 1969}}$$

Combining equations "b", "d", and "e", we see that the amount of fertilizer that the GOI should order for use in crop year 1968/69 (in fact, the GOI has almost completed ordering for 1968/69) can be computed by subtracting from the Demand Target for 1968/69 the sum of estimated production in IFY 68/69 and of excess inventories at the end of IFY 67/68. Excess inventories can result either from a shortfall in demand in previous year, from late arrivals of imports, or from other problems, such as imperfections in the distribution system. For example, the GOI determined that there was an excess inventory of P_2O_5 of about 200,000 MT at the end of FY 1967/68, due to a combination of the above factors and, therefore, reduced their planned imports for 1968/69 from 330,000 MT to 136,000 MT. Determination of whether inventories at a particular time of year are excess is in part a matter of judgment. In that case, the GOI had been under strong pressure from manufacturers of superphosphates, who were having difficulty in selling their production, and from state distribution organizations, who reported that DAP was not moving as fast as had been planned. Equation "f" forms the basis for the Mission's import projections shown in Attachment A. For future years, we make the implicit assumption that targets will be met and that excess inventories will be zero.

B. Demand

1. Progress to Date

Data on past fertilizer distribution show that even before the widescale use of High Yielding Varieties India has maintained a high rate of growth in the use of fertilizers over the past fifteen years, with an increase in the rate of growth in recent years. Of course, earlier growth was on a very small base, and India's fertilizer consumption, in terms of nutrient units per acre of farmland, is still only a small fraction of use in countries with highly developed agriculture sectors, but India is making progress. Progress up to 1966/67 is shown in Attachment III-2, which gives distribution figures for the three major nutrients from 1952/53; and in Attachment III-3, which summarizes the growth rates derived from these distribution figures. Past data on fertilizer distribution has tended to be somewhat unreliable and has not been available rapidly enough to assist in making short-term import decisions. The Mission is now discussing with the GOI the development of an improved system of collection and analysis of distribution data. The GOI response to the Mission's initial proposal was negative, but the Mission will continue to work with the GOI on this problem.

Initial estimates of distribution for IFY 1967/68 are as follows:

	Distribution (Metric Tons of Nutrients)	% Increase Over 1966/67
Nitrogen	1,071,000	28
P_2O_5	335,000	35
K_2O	170,000	47
Total	1,575,000	31

2. Consumption Targets

Attachment I.1 uses the demand targets for the period 1968/69 to 1970/71 set out by the Sivaraman Committee (1965) and reconfirmed by the GOI Fourth Plan Working Group on Fertilizer (1968).

The Mission has been very encouraged by reports of excellent response rates from wide-scale tests of application of fertilizer to High Yielding Varieties. The reports from these tests are discussed in the Food Production Annex to this Program Memorandum. These responses suggest that if the GOI can attain its very ambitious targets of acreage planted to High Yielding Varieties, and if prices for High Yielding Varieities of foodgrains can be maintained at a level sufficiently high to discourage

diversion of water-assured acreage to other crops, then the GOI could attain an overall response rate on High Yielding Varieties of about 13.5 to one (compared to previous estimates of about 10 to 1). If another year's data on response rates supports the conclusion that less fertilizer may be required to support a 5% growth rate in Agriculture, it may then be desirable to discuss with the GOI the possibility of reducing import targets for fertilizer. This question has bureaucratic as well as economic implications, since the GOI Food and Agriculture Ministry has a legitimate interest in inflating its demand targets to the extent that they expect a shortfall in the Petroleum and Chemicals Ministry's domestic production targets. For the next few years, however, the lags between availability (import plus production) and consumption mean that the Mission's model and the GOI's targets are not inconsistent with each other. The Mission realizes that it is easy to get overoptimistic on the basis of initial returns and that it is certainly not yet time to say that since the foodgrains problem is solved the GOI should attempt to hold back demand for inputs. However, it is encouraging to note that if things go well, these high response rates might mean that otherwise staggering import requirements (roughly speaking, over $450 million in 1972/73) can be brought down to more manageable levels.

If there is more fertilizer available at a given time than the farmers are willing to buy, then the GOI has lost for a few months the use of the funds used to procure the excess fertilizer. Also, there will be both costs and benefits from the competition of imports with local production, primarily in the case of P_2O_5. If there is too little fertilizer available to meet the farmers' requirements, however, then the loss of foodgrain production will be about four times the value of the cost of the fertilizer. Fertilizer is useful only when the farmer is willing and able to buy and apply it. Only the fertilizer in place at the retail outlet is truly inventory. The remainder is pipeline stock. To assure an adequate supply for all farmers each retail point must have enough to meet the maximum possible demand. Since the demand will vary according to local weather, the actual requirement may vary substantially from year to year. To get full production the current year's actual requirement for a given area, not the average requirement for that area, must be met. Whenever local conditions fall below the optimum "excess" inventory will accumulate. Such variations will occur over rather large regions as unpredictably as monsoon weather. Therefore, rapid movement of excesses from one area to another is not practical.

The desirable year-end inventory is determined not by the use during the year but by the requirements for the coming year. If we assume that two-thirds of the fertilizer is used for the monsoon crop and that this fertilizer should be in place by July 1, one-third of the succeeding year's requirements should be on hand by the close of the IFY on March 31. Allowing for the short-term growth targets of about 40 percent per year, this requires that over 40 percent of the current year's supply be retained as closing inventory.

Not all of the significance of inventories is technical. The whole system of economic and trade controls within the fertilizer industry came out of and was reinforced by a shortage. Liberalization of both production and distribution is only possible when no charge of

profiteering from shortage can be taken seriously. Adequate inventories must be maintained if there is to be any hope of developing an independent non-government system of distribution. An extension of the seeding program (which diverted a portion of the fertilizer imported on government account to fertilizer plants under construction) to private traders who would develop or expand a retail sales organization would be desirable. The GOI and State governments would consider such a proposal only if the aid outlook were such that it appeared that adequate supplies of imported fertilizer could be made available over a period of several years.

Aside from questions of optimal targets, the outlook for growth in consumption of fertilizer is excellent, as the following indications show:

--- use of fertilizer-responsive, high-yielding varieties is increasing rapidly;

--- farmers have more money to spend on fertilizer from their good crops in 1967/68;

--- the returns to the farmer from investment in fertilizer are excellent (about 4 rupees' worth of grains for every rupee invested in fertilizer), and would remain excellent even with a moderate decline in current foodgrain prices;

--- domestic producers are learning how to go out and sell fertilizer (To meet competition from imported fertilizer, they are setting up and improving sales organizations and distribution systems. In the past, the fertilizer industry had been almost completely production oriented, and had not paid proper attention to marketing and distribution.);

--- the fertilizer distribution system, despite its inadequacies, has shown an ability to adjust to rapid increases in fertilizer requirements.

C. AID Financing

1. Requirements

AID is playing a major role in providing financing for India's fertilizer imports. In the past five years the percentage of AID non-project funds used for fertilizer has gone from less than 10 percent of total funds to about 50 percent. Expenditure for fertilizer in IFY 1967/68 was about $150 million, and expenditure in IFY 1968/69 is expected to be $140 million. In general, the GOI obtains as much fertilizer from other donors as the other donors will allow, since US freight (particularly US-flag freight) makes US fertilizer non-competitive in price. AID financing takes up the balance of import requirements. This has two main consequences: First, all the uncertainties and fluctuations

in demand which India experiences as it tries to rapidly increase fertilizer consumption will be reflected changes in AID-financed procurement. This means both that AID must expect occasional last-minute changes in fertilizer procurement plans if distribution does not go as well as expected and that the GOI should do its best to improve its reporting system on fertilizer distribution so that such changes can be kept to a minimum. Second, as import requirements rise and if the volume of new commitments (net of debt relief) from other donors remains the same or declines, AID will be asked to finance a rising percentage of India's fertilizer imports. For example, in 1967/68 the AID financed about 60 percent (in terms of dollar cost) of India's fertilizer imports. For 1969/70 AID financing is expected to account for over 70 percent of fertilizer imports, after taking account of both increasing quantities to be procured from the US and rising payments for US freight.

On the basis of detailed procurement plans through 1969/70 and of Mission estimates for 1970/71, the requirement for AID financing for fertilizer for the period 1968/69 to 1970/71 is expected to be as follows (millions of dollars; Indian FY's):

1968/69	1969/70	1970/71*
$140	$240	$233

* At 2/3 of total requirements.

2. Procurement Trends

In the past U.S. fertilizer prices have tended to be well above world market prices. However, recent trends in U.S. prices of urea, diammonium phosphate (DAP), and ammonium sulphate (AS), the three major(nitrogenous and phosphatic) fertilizers the GOI imports, combined with a revised fertilizer procurement strategy, have resulted in major reductions in the cost of AID-financed fertilizer. In 1967/68 AID/W suggested that the GOI revise its fertilizer procurement strategy by breaking up its AID-financed import requirements into a number of moderate-sized tenders, rather than a small number of very large tenders. It appears that the tenders for huge quantities (such as the $75 to $100 million tender of October 1967) tended to discourage competition, since each of the bidders thought that the GOI would buy virtually all they could get at any price. Evidence from recent tenders has shown that smaller tenders can encourage a degree of competition that can result in significant savings to the GOI and the AID program.

In June 1968, a GOI fertilizer procurement team visited the U.S. to consult with AID/W and industry officials on the GOI's continuing AID-financed fertilizer import program. AID/W stressed to the team the importance of giving adequate notice to U.S. manufacturers so that they can adjust their production and bagging schedules to reduce their costs and their prices. There are still some differences between

AID/W and the GOI on timing of tenders. AID/W is concerned that tenders maximize the lead time for US manufacturers. The GOI recognizes that AID/W has a valid point. However, there are several factors on the other side of this question. The GOI is faced with a number of uncertainties about fertilizer imports -- uncertainties about how much foreign assistance will be available several months hence to finance industrial imports as well as fertilizer, uncertainties about whether ambitious demand targets will be met or whether inventories will become too large, uncertainties about whether domestic fertilizer production targets will be met. Faced with these uncertainties, the GOI is hesitant to finalize its fertilizer commitments too far in advance. In addition, as funds for industrial imports become very tight, there would be strong arguments against reserving funds for Letters of Credit for deliveries six months or more in advance. There is clearly a need for the tendering schedule for AID-financed fertilizer procurement to take account of these two legitimate points of view. Since the return of the GOI fertilizer team from the US, the GOI has been placing increased emphasis on tendering far enough in advance to allow adequate lead times for delivery. For the future, the Mission is working with the GOI to assure that fertilizer procurement plans are drawn up as far as possible in advance.

3. Shipping Costs

The Mission is concerned that increasing availability of U.S.-flag vessels will absorb very large amounts for extra freight and reduce the amount of AID non-project loans to India available for badly needed fertilizer and industrial commodities. Current freight rates are about $18 per ton for foreign flag vessels, compared to U.S. flag rates of about $50. U.S. rates are somewhat lower for bulk cargoes carried in larger vessels, but Indian ports are able to handle only a limited number of these larger vessels.

Typical magnitudes of excess costs involved (dollars per metric ton) are as follows: for ammonium sulphate, the recent FOB cost was $20. Landed cost via foreign flag vessels would be $38, landed cost via U.S. flag vessels would be $70, or almost twice as much as by foreign flag. The excess freight cost alone approximately equals the total C&F cost using foreign flag vessels. Similarly, for urea, the most recent FOB cost was about $74. Landed cost via foreign flag would be $92, landed cost via U.S. flag would be over $124. The excess freight cost equals almost half the FOB cost, and about a third of the total foreign flag C&F cost.

If half of AID-financed fertilizer in FY 1968/69 were to go on U.S. bottoms (per STATE 166534), the cost in excess freight charges (at $32 per ton over foreign flag cost) would be about $38 million, compared to $123 million total FOB cost of the fertilizer, or $151 million c.i.f. foreign flag. Even if only one-third goes on U.S. bottoms, excess freight charges would be about $25 million. In contrast, total expenditures under AID commodity code 9501, which would include chartering costs, was only $3 million for 1966/67. We do not yet have the comparable figure for 1967/68.

We recognize that this problem is not new in principle, but the very large prospective drain on limited non-project loan funds is of special practical concern at this time because of the critical shortage of non-project aid. The high priority accorded to fertilizer would probably result in further constrictions of funds available to finance needed raw materials and spares, and in combination with the reduced overall level of foreign assistance would reduce the GOI's ability to maintain import liberalization. Alternatively, the $25 to $38 million dollar excess cost could result in a shortfall of fertilizer availability of about 125,000 to 170,000 tons of nitrogen, the equivalent of over one million tons of foodgrains.

ATTACHMENT I-1

Fertilizer Projections - 1967-68 thru 1973-74

Demand, Production & Imports, and cost of imports (finished fertilizer and fertilizer raw materials)

	Unit of Measurement	1967-68	1968-69	1969-70	1970-71
N					
Demand b/	Thousand Tons	1,350	1,700	2,000	2,400
Production a/	Thousand Tons	365	590	905	1,302
Imports	Thousand Tons	963f/	1,050f/	1,095g/	1,098
Unit value of imports c/	$/Ton C&F	205	220	210	200
Value of imports	$ Million	197.4	231.0	230.0	219.6
P_2O_5					
Demand b/	Thousand Tons	500	650	800	1,000
Production a/	Thousand Tons	181	337	402	445
Imports	Thousand Tons	418f/	136f/	398g/	554
Unit value of imports c/	$/Ton C&F	140	145	145	145
Value of imports	$ Million	58.5	19.7	57.7	80.3
K_2O					
Demand b/	Thousand Tons	300	450	550	700
Imports a/	Thousand Tons	296f/	214	550	700
Unit value of imports	$/Ton C&F	80	80	75	75
Value of imports	$ Million	23.7	17.1	41.3	52.5
Total Value of Fertilizer Imports	$ Million	279.6	267.8	329.0	352.4
Raw Materials					
1. Nitrogenous - Ammonia e/					
Imports d/ h/	Thousand Tons	-	-	-	28
Unit value of imports	$/Ton C&F	-	-	-	40
Value of imports	$ Million	-	-	-	1.1
2. Phosphatic - Rock Phosphate, Sulfur, Phosphoric Acid					
Production h/	Thousand Tons	272	370	434	539
Unit value of imports	$/Ton (C&F) of Production	130	130	130	130
Value of imports	$ Million	35.4	48.1	56.4	70.1
Total Value of Fertilizer Raw Materials	$ Million	35.4	48.1	56.4	71.2
Total Value of Finished Fertilizers and Fertilizer Raw Materials	$ Million	315.0	315.9	385.4	423.6

Note: a/ Production: Mission estimates of 8/1/68. Potash production assumed to be zero.
b/ Demand: Targets are those recommended by the 4th Plan Working Group and concurred in by the Mission's Fertilizer Committee. Demand is defined as incremental requirement for distribution.
c/ Prices: Mission estimate. Increase in cost between 1967/68 and 1968/69 due to increased use of US-flag vessels from U.S. P_2O_5 finished product prices are meaningful only in conjunction with the N (unit value of imports) price for the same year.
d/ Ammonia Imports: 1.25 x Nitrogen output of Okha and Bombay area projects.
e/ The cost of Naptha for nitrogen production is assumed to be included in petroleum import estimates.
f/ 1967-68 imports are actual orders placed. 1968-69 import targets for P_2O_5 and K_2O have been reduced due to excess inventories.
g/ In 1969-70 GOI currently plans to import 1,024,000 tons of N and 420,000 tons of P_2O_5 based on their production estimates of 976,000 tons N and 380,000 tons P_2O_5. Actual imports will be based on latest available production estimates.
h/ Assumes six month inventories of raw materials. Therefore production figures used to calculate raw materials import requirements are two year moving average.

DP/IR:8/6/68

Schedule of Completion and Projected Production by Plants
(In Thousands of Metric Tons - Indian Fiscal Years)

	CAPACITY Nitrogen (N)	CAPACITY Phosphate (P_2O_5)	Completion Year	1967-68 N	1967-68 P_2O_5	1968-69 N	1968-69 P_2O_5	1969-70 N	1969-70 P_2O_5	1970-71 N	1970-71 P_2O_5	1971-72 N	1971-72 P_2O_5	1972-73 N	1972-73 P_2O_5	1973-74 N	1973-74 P_2O_5	1974-75 N	1974-75 P_2O_5
IN OPERATION:																			
Miscellaneous	48	230	-	12	144	45	195	45	195	45	195	45	195	45	195	45	195	45	195
Alwaye	62	30	-	26	11	53	26	53	26	53	26	53	26	53	26	53	26	53	26
Sindri	95	-	-	74	-	81	-	81	-	81	-	81	-	81	-	81	-	81	-
Nangal	80	-	-	78	-	68	-	68	-	68	-	68	-	68	-	68	-	68	-
Rourkela	40	-	-	39	-	34	-	34	-	34	-	34	-	34	-	34	-	34	-
Trombay	77	45	1966-67	44	11	65	38	65	38	65	38	65	38	65	38	65	38	65	38
Neyveli	70	-	1966-67	34	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-
Baroda	100	55	1967-68	40	13	60	33	95	52	95	52	95	52	95	52	95	52	95	52
Vizag	85	75	1967-68	7	2	51	45	81	71	81	71	81	71	81	71	81	71	81	71
Gorakhpur	80		1967-68	1	-	48	-	68	-	68	-	68	-	68	-	68	-	68	-
	737	435		365	181	565	337	650	382	650	382	650	382	650	382	650	382	650	382
UNDER CONSTRUCTION																			
Rourkela (Gassifier)	80	-	1968-69	-	-	16	-	68	-	68	-	68	-	68	-	68	-	68	-
Namrup	45	-	1968-69	-	-	9	-	27	-	38	-	38	-	38	-	38	-	38	-
Alwaye (Expansion)	30	15	1969-70	-	-	-	-	6	3	26	13	26	13	26	13	26	13	26	13
Kota	120	-	1969-70	-	-	-	-	24	-	72	-	114	-	114	-	114	-	114	-
Baroda (Expansion)	130	-	1969-70	-	-	-	-	26	-	78	-	124	-	124	-	124	-	124	-
Cochin	152	-	1969-70	-	-	-	-	30	-	91	-	129	-	129	-	129	-	129	-
Durgapur	152	-	1969-70	-	-	-	-	30	-	91	-	129	-	129	-	129	-	129	-
Madras	200	85	1969-70	-	-	-	-	40	17	120	51	190	81	190	81	190	81	190	81
Sindri (Expansion)	20	-	1969-70	-	-	-	-	4	-	17	-	17	-	17	-	17	-	17	-
Kanpur	200	-	1970-71	-	-	-	-	-	-	40	-	120	-	190	-	190	-	190	-
Barauni	152	-	1971-72	-	-	-	-	-	-	-	-	30	-	91	-	129	-	129	-
Namrup (Expansion)	152	-	1971-72	-	-	-	-	-	-	-	-	30	-	91	-	129	-	129	-
	1,433	100		-	-	25	-	255	20	641	64	1,015	94	1,207	94	1,283	94	1,283	94
PLANNED																			
PROJECTS WITH NO KNOWN CRITICAL PROBLEMS																			
Trombay (Gassifier)	13	-	1970-71	-	-	-	-	-	-	11	-	11	-	11	-	11	-	11	-
Bombay Area	90	230	1971-72	-	-	-	-	-	-	-	-	18	46	54	138	86	219	86	219
Sindri (Rationalization)	-	156	1971-72	-	-	-	-	-	-	-	-	-	31	-	94	-	133	-	133
Trombay (Expansion)	256	124	1971-72	-	-	-	-	-	-	-	-	51	25	154	74	218	105	218	105
Goa	160	-	1971-72	-	-	-	-	-	-	-	-	32	-	96	-	152	-	152	-
Kota (Expansion)	-	30	1971-72	-	-	-	-	-	-	-	-	-	6	-	29	-	29	-	29
Kandla	260	130	1972-73	-	-	-	-	-	-	-	-	-	-	52	26	156	78	247	124
										11		112	108	367	361	623	564	714	610
PROJECTS WITH CRITICAL PROBLEMS																			
Mirzapur	160	-	1972-73	-	-	-	-	-	-	-	-	-	-	32	-	96	-	152	-
Okha	130	140	1971-72	-	-	-	-	-	-	-	-	26	28	78	84	124	133	124	133
Vizag (Expansion)	150	50	1972-73	-	-	-	-	-	-	-	-	-	-	30	11	90	32	143	50
												26	28	140	95	310	165	419	183
PROJECTS WHERE BASIC STRUCTURE IN PROCESS OF CHANGE:																			
Mangalore	240	124	1973-74	-	-	-	-	-	-	-	-	-	-	-	-	48	25	144	74
	1,459	984																	
	3,629	1,519																	
TOTAL PRODUCTION	-	-		365	181	590	337	905	402	1,302	446	1,803	612	2,364	932	2,914	1,230	3,210	1,343

Production Projections

1. Production estimates for new projects or major expansions of existing plants have been phased as follows:

   20 percent in the first year of operation;
   60 percent in the second year of operation;
   85 percent in the third and succeeding years of operation for the public sector; and
   95 percent in the third and succeeding years of operation for the private sector.

2. Only private projects which have received a letter of intent or a license, and in the case of public sector plants, Ministry approval, have been included with the exception of the Tata/Allied plant located at Okha, Gujarat which has been cleared by the Secretaries' Committee.

3. Planned projects have been segregated into three categories; (1) projects with no known critical problems; (2) projects with critical problems; and (3) projects where the basic structure is in process of change. Under category (1) a completion year is set which assumes expeditious project progress. For category (2) the expected completion date is extended by one year. For category (3) the expected completion date is extended for two years.

Availability Targets - GOI Fourth Plan Working Group on Fertilizer.

Notes

1. Production figures for 1967-68 are actuals.

2. In the case of the plants at Alwaye, Rourkela, Sindri and Trombay, rated capacity is reduced from the design capacity because each of the units must make a substantial investment in additional or replacement equipment to achieve the design capacity. The additional investments in these plants are listed as expansion and "phased in" in a shorter period than a major expansion.

3. Major changes in production projections from the last previous Mission estimate, April 9, 1968 are:

   (a) N capacity at Baroda was reduced to 100,000 MT/Y from 120,000 MT/Y to eliminate from production estimates N which is intended to be sold as ammonia or urea for

(3)

industrial uses. For similar reasons, capacity at Cochin, Durgapur, Barauni and Namrup (expansion) was reduced by 8,000 MT/Y each.

(b) Miscellaneous N capacity was reduced by 12,000 MT/Y and Miscellaneous P_2O_5 capacity increased by 40,000 MT/Y based on the most recent IBRD (IND 68-13, May 9, 1968) and GOI (March 1, 1968) reports.

(c) The Delhi plant was eliminated; Goa was removed from the critical problem list, but Mirzapur was added to it, and estimated completion of the Kandla plant has been extended for one year.

APPROXIMATE TIMETABLE FOR FERTILIZER PROCUREMENT FROM THE U.S.

Calendar Year	1967					1968												1969					
U.S. Govt. Fiscal Year	1967-68											1968-69											
Govt. of India Fiscal Year	1967-68								1968-69												1969-70		
STEP	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1 Tendering	■	■	■	■	■	■	■	■	■	■	■	■											
2 Orders Placed			■	■	■	■	■	■	■	■	■	■	■	■									
3 Delivery = Shipment from the U.S. which approximately equals payment and loan disbursement						■	■	■	■	■	■	■	■	■	■	■	■						
4 Arrival in India								■	■	■	■	■	■	■	■	■	■	■	■				
5 Production year for fertilizer = distribution year for domestic and imported fertilizer									■	■	■	■	■	■	■	■	■	■	■	■			
6 Use on the field in India (Crop Year 1968/69)												■	■	■	■	■	■	■	■	■	■	■	■

IN THEORY FERTILIZER IMPORTED FROM MARCH TO FEBRUARY OR PRODUCED FROM APRIL 1968 TO JUNE 1969 IS USED IN THE CROP YEAR 1969 BEGINNING JULY 1969. IN FACT, SINCE 2/3 OF TOTAL FERTILIZER REQUIRED MUST BE AVAILABLE BY THE JUNE RAINS, FERTILIZER IMPORTED OR PRODUCED AFTER OCTOBER 1968 IS CONSUMED IN THE CROP YEAR BEGINNING JULY 1969.

DP/IR 8/10/68

Attachment III 2

Distribution of Fertilizers
1952/53 - 1966/67

(Metric Tonnes)

Year	Nitrogen (N)	Phosphoric Acid (P_2O_5)	Potash (K_2O)
1952-53	57,822	4,552	3,311
1953-54	89,287	80,261	7,490
1954-55	94,810	15,027	11,097
1955-56	107,494	13,018	10,265
1956-57	123,054	15,874	14,791
1957-58	149,019	21,922	12,786
1958-59	171,988	29,490	22,366
1959-60	229,326	53,930	21,342
1960-61	211,685	53,134	29,052
1961-62	291,536	69,932	27,982
1962-63	360,033	81,385	36,503
1963-64	406,976	116,674	50,570
1964-65	434,473	147,652	70,440
1965-66	547,363	132,178	77,746
1966-67	838,736	248,602	115,710

Attachment III 3

Compound Growth Rates of Fertilizer Distribution

Type of Fertilizer	Growth Rate* Best Estimate	Likely Range of Future growth Rates**
1953-67		
N	18%	17% - 20%
P_2O_5	28%	24% - 32%
K_2O	23%	20% - 27%
1961-67		
N	22%	16% - 29%
P_2O_5	27%	18% - 36%
K_2O	28%	21% - 35%

* Distribution = a $(\text{Growth Rate})^{\text{Time}}$

** Growth Rate ± (Standard error) (t factor for 95% confidence level)

Source of distribution data: Fertilizer Statistics 1966-67; FAI, New Delhi, 1967

PL-480

TITLE II ANNEX G

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ANNEX G

PL-480 - TITLE II

PART I - DESCRIPTION OF PROGRAM

A. Targets - Food for Whom?

The India Title II program is aimed at children. Children 14 and below account for 92% of the recipients programmed in FY 1969. Twenty five per cent of these are pre-schoolers. Food for work projects account for 7% of FY 1969 programmed recipients while the remaining 1% consists of refugees and institutions.

The voluntary agencies began to focus almost exclusively on child feeding and work projects in 1965 following passage of the new Food for Peace legislation. Dole programs - refugees, family feeding and institutions -- had accounted for 10-12% of their beneficiaries in the previous five years. Future programs are expected to concentrate increasingly on pre-school children. The volagencies -- with Mission support -- expect pre-school feeding to rise from 25% of total child feeding in FY 1969 to about 43% in FY 1971. (See Table 1 for breakdown of program by types of recipients.)

The rationale for concentrating on child feeding and work projects has several bases. Malnutrition affects children, particularly those from weaning to six years old, more than any other group. Research has yielded the now well-known evidence that malnutrition in children can lead to physical and mental retardation with deleterious effects on the productive capacities of a nation's human resources. Conversely, children benefit more from a given quantity of supplemental food than other age groups. Agriculture food for work projects can contribute significantly to the economic life of specific localities and provide minor support for India's national agriculture programs. Work projects circumvent the demoralizing effects of direct relief doles and thus are a positive means for the volagencies to provide relief to low income groups.

As defined by the legislation, Title II is intended as assistance to needy persons and as a means for promoting economic and community development. By concentrating on work projects and child feeding, the volagencies bring significant benefits to needy groups and localities and at the same time maximize the development returns from the program. Such returns as: benefits to children which may strengthen India's human resource inventory in the long-term; and small gains in agricultural productivity in the short-term.

B. Growth of the Program:

The table below shows the growth of beneficiaries by volagency from 1964 to 1971:

(000's)

FY	1964 Actual	1965 Actual	1966 Actual	1967 Actual	1968 Actual	1969 Proposed	1970 Proposed	1971 Proposed
CARE	4,843	5,433	6,978	13,170	13,250	14,697	18,815	21,530
CRS	1,407	1,511	1,573	2,740	2,008	1,816	1,984	2,096
CWS/ LWR	418	512	1,075	1,488	1,454	1,228	1,394	1,530
UNICEF	1,781	1,680	442	403	422	535	-	-
Total	8,449	9,136	10,068	17,801	17,134	18,276	22,193	25,156

The large increase between FY 1966 and FY 1967 consists primarily of children fed under famine relief programs in Bihar, Orissa, and West Bengal. Emergency child feeding programs, conducted by CARE, continued in FY 1968, and in FY 1969 most of the children fed under the emergency feeding program were absorbed into CARE's regular school feeding program. This point bears underlining because it apparently has not been effectively communicated in previous messages to Washington. If one compares programmed beneficiaries with actual beneficiaries between FY 1964 and FY 1971, different pictures of program growth emerge.

Progmd. Beneficiaries	FY 1964 Progmd.	FY 1965 Progmd.	FY 1966 Progmd.	FY 1967 Progmd.	FY 1968 Progmd.	FY 1969 Proposed	FY 1970 Proposed	FY 1971 Proposed
CARE	6,286	7,009	9,308	10,797	9,670	14,697	18,815	21,530
CRS	1,406	1,853	1,739	2,102	1,781	1,816	1,984	2,096
CWS/LWR	406	492	1,036	1,080	1,187	1,228	1,394	1,530
UNICEF	1,781	1,689	719	579	539	535	0	0
Total Progmd.	9,879	11,043	12,802	14,558	13,177	18,276	22,193	25,156
Actual Beneficiaries	8,449	9,136	10,070	17,802	17,134	-	-	-

The growth of programmed beneficiaries gives the impression that a large increase in the program is taking place between FY 1968 and FY 1969. In fact, the programmed increase in FY 1969 results from absorbing into the regular program children in the drought areas who were actually fed by CARE in FY 1967 and 1968 under the special emergency program. As shown by the actual recipients, CARE's workload has increased little since FY 1967. (Tables 2 provides a detailed breakdown of program growth by volagency.)

C. The Different Volagency Programs:

CARE runs pre-school and school feeding programs in 15 of 17 Indian states and the Bombay and Calcutta municipal districts. (No program in Assam or Kashmir). These are government schools and the state departments of education administer the programs and provide the budget. CARE has no food for work projects and plans none.

CARE opened its school feeding program in FY 1962/63 at the request of four southern States: Madras, Kerala, Andhra Pradesh and Mysore. It took over programs in five states from UNICEF in FY 1965; its most recent addition was West Bengal in FY 1967. CARE believes it has reached the limit of its geographical expansion. Programs in Assam and Kashmir are not contemplated, the first because of its remoteness and the second because of the political situation.

In three states, Madras, Kerala and Mysore, the CARE program now covers every block in the state. CARE covers about 65% of all blocks in Bihar and Orissa. CARE's coverage is most extensive in those states where the program is oldest or where feeding began on a large scale during the drought. (Table 3 provides a state by state breakdown of the CARE program.)

CRS and CWS/LWR divide their programs about equally between school feeding and food for work projects. The schools are private schools, many of them church sponsored. Projects of both agencies are found in all parts of the country although CRS is concentrated in Madras, Maharashtra, Gujerat, and Bihar and CWS in West Bengal, Andhra, Maharashtra and Gujerat.

The growth of the volagencies' program has not proceeded from some grand strategy -- a determination as to which state or areas are neediest and a decision to begin there. For CARE, the state by state growth of the program has hinged mainly on financial and administrative considerations -- whether a state will provide a budget for the program and whether it has the necessary administrative skill to run it. Within a state, CARE has selected the districts which will be fed first on the basis of several considerations: which districts are neediest, which have good facilities and offer prospects for sound administration; which districts the state government -- for political or other reasons -- wants fed first. Within a school, CARE has usually begun by feeding the youngest children first.

For the sectarian agencies, the size and geographical spread of the program has depended largely on the availability and location of volunteers to manage the program. In CRS, the initiative for beginning a work project or school feeding program rests with the diocese. Each of the 72 diocesan bishops is responsible for developing the social welfare program in his diocese and usually appoints a priest on his staff to supervise welfare activity. The shape of CRS's program in any one year, therefore, has depended initially on the initiatives of the diocesan representatives and more basically on the number of interested priests and laymen he has below him to carry out projects. Where groups of socially concerned missionaries and laymen are found, the program will bulk large in these areas.

The CWS situation is basically similar although CWS/LWR headquarters -- unlike CRS -- does take initiatives to plan projects, help local missionaries develop them and supervise their implementation. However, CWS's capacity to begin a program depends fundamentally on the availability of interested and competent volunteers at the local level. This, as with CRS, is the ultimate determinent of program size and concentration.

D. Relation of Title II program and US Development program:

Food for work projects provide minor support for the Mission's agriculture goals. Child feeding offers more substantial support for Mission efforts to improve nutrition. Besides the direct benefits to the recipients, the program stimulates community awareness of the importance of nutrition and can alter diet habits, thus increasing the acceptability of

non-traditional, nutritious foods. However, because these programs are consistent with US goals does not necessarily mean that -- had it the choice -- the Mission would endorse either child feeding or food for work as the best means of achieving its goals. If Title II were fungible form of dollar assistance under Mission control, the $86 million slated for investment in feeding programs in FY 1969 would probably be programmed very differently. But Title II is a separate program whose aims are primarily social welfare and social development; it is fueled from a separate appropriation and managed by agencies independent of the Mission. Thus while the India Title II program supports and is compatible with the Mission's development strategy, it is not an integral part of it.

E. GOI Contribution to the Program:

The contributions of each party supporting the CRS and CWS/LWR programs are fixed. The US supplies food and ocean freight. The GOI, under the terms of the Indo-American agreement, pays port storage and transportation to the distribution point. The voluntary agencies assume the costs of distributing food to the recipients. This cost is largely met by volunteer labor contributed by missionaries and others. Table 4 compares GOI contributions and the contributions of the sectarian agencies with US contributions to the Title II program from FY 1964 through FY 1968. Although the percentages shift each year, the implication that there has been a change in the contribution of any one participant is misleading because, in fact, the services provided by each have remained exactly the same each year. The percentage differences can reflect only price changes in the different inputs.

There is no expectation that the relative burden born by these three parties will shift in the future. As a secular government, the GOI is not expected to contribute to foreign based sectarian agencies. The prospects that the volagencies will supply food to replace US food is also remote. Faced with cutbacks of US foods, the volagency tendency has been to reduce food programs -- which are expensive -- in favor of other forms of social assistance. As long as Title II programs exist, the contributions of the GOI, sectarian agencies, and the US are expected to remain in the same proportion.

CARE is different. For CARE, the state government pays for transportation, storage, administration, food processing, and some-

times for land on which to grow supplementary foods. The government assumes -- in other words -- the administrative costs which for the sectarian agencies are born by volunteers. Part of the cost is met directly from the state education budget and part -- the cost of supplementary food and fuels -- is met through cash or in kind contributions of the local panchayats. The states are partially reimbursed by the center for the program. In most areas, the state assumes 60% of the cost and the center 40% although in some localities the center will pay more. It is reimbursing Bihar for the full cost of its FY 1969 program.

Each CARE contract with a state stipulates that the state will ultimately assume the full cost of the program. This is an expression of intent not a firm plan on a firm timetable. Analysis shows that to date CARE has not made strong progress in converting this intent to reality. Three tables below tell the story.

Table A shows that the average GOI budget contribution per recipient per year has not altered markedly since FY 1964.

CARE - Average Annual Expenditure/Beneficiary

TABLE A

FY	Programmed Recipients (000)	State Budgets* (Rs. 000)	Cost/Recipient Rs.
1964	6,200	30,544	4.9
1965	7,000	39,290	5.6
1966	9,300	41,693	4.5
1967	10,800	56,930	5.3
1968 (actual)	13,250	80,265	6.1
1969 (est.)	14,697	82,232	5.8

*State budgets only; excludes contribution of panchayats

Table B shows that the GOI budget for school feeding, while registering an absolute increase from 1964 to FY 1969, has not grown as a percentage of the U.S. Contribution.

CARE - Relative U.S. and GOI Contributions to School Feeding Programs

TABLE B

FY	(a) U.S. Inputs ($ mill.)	(b) Budget Contributions ($ mill.)	(c) (b) as % of (a)	(d) Other local Govt. Contributions ($ million)	(e) Total ($ mill.)	(f) (e) as % of (a)
1964	26.9	4.1	15.2%	1.5	5.6	20.0%
1965	20.4	5.2	25.5%	1.6	6.8	33.3%
1966	38.1	5.6	14.7%	1.8	7.4	19.4%
1967	29.0	7.5	25.8%	2.3	9.8	33.6%
1968*	64.0	10.4	14.2%	2.5	12.9	20.1%
1969(est)	47.9	11.3	23.5%	4.7	16.0	33.4%

* includes drought package

And Table C indicates that only in Bombay, Calcutta and Madras has the state budget contribution risen above the average of 4-5 rupees per beneficiary. Bombay supplies bottled milk, biscuits and processed and packaged peanuts for its program; Calcutta provides funds to bottle milk and prepare biscuits. In Madras the government supplies locally purchased food for two out of every five feeding days. Madras plans to increase the share of food procured by it and CARE estimates that the program will use only local foods by the mid 1970's.

CARE PROGRAM - FY 1968

TABLE C

(a)	(b) Govt. Budget (Rs. 000)	(c) Budgeted Recipients (000)	(d) State Budget Beneficiaries (Rs.)	(e) Local Contributions (Rs. 000)	(f) Total: Budget & Local Contribution (Rs. 000)	(g) Total Cost Beneficiaries (Rs.)
Bombay and Maharashtra	13,450	350	38.4	-	13,450	38.4
Madras	24,000	1,600	15.0	3,200	27,200	17.0
Calcutta	891	70	12.7	-	891	12.7
Andhra	2,682	520	5.1	1,040	3,722	7.1
Madhya Pradesh	1,600	320	5.0	640	2,240	2.0

(Contd.)

(a)	(b) Govt. Budget (Rs. 000)	(c) Budgeted Recipients (000)	(d) State Budget Beneficiaries (Rs.)	(e) Local Contributions (Rs. 000)	(f) Total: Budget & Local Contribution (Rs. 000)	(g) Total Cost Beneficiaries (Rs.)
Gujarat	1,500	300	5.0	600	2,100	7.0
West Bengal	1,842	400	4.6	800	2,642	6.6
Mysore	4,800	1,200	4.0	2,400	7,200	6.0
Kerala	5,000	1,320	3.8	2,640	7,640	5.8
Orissa	3,600	950	3.8	1,900	5,500	5.8
U.P.	2,000	300	3.6	600	2,600	8.6
Bihar (Actual Recipient)	17,300	4,900	3.5	3,000	20,300	4.1
Rajasthan	1,000	420	2.3	840	1,840	4.3
Punjab	600	420	1.4	840	1,440	3.4

The question of USAID's role in pressing for further increases in the GOI contribution will be taken up in Part II below.

F. Plans for the Future - Food for How Many?

The Feeding Program mounted during the drought convinced many of the merits of school feeding. In the Fall of 1967, the Prime Minister issued a statement endorsing expansion of school feeding. Earlier in the year, the Ministry of Food and Agriculture developed a plan to increase school and pre-school feeding to 25 million children by 1972. The plan was based on the production of Bal Ahar (child's food) a nutritious food supplement made from wheat, ground nut meal, milk and vitamins. Large scale production of Bal Ahar was to begin in 1968. According to the original proposal, the US was to supply all ingredients for Bal Ahar in the first year of the program. Local commodities, purchased by the GOI, were to be substituted for Title II at a rate of 20% a year for the ensuing five years so that when the 25 million mark was reached, US Title II food would be withdrawn.

This plan has not been adopted partly because technical difficulties -- problems of taste, storage life and ease of preparation,

have limited the production of Bal Ahar. The Food Ministry is now in the process of thoroughly remodelling Bal Ahar. Different combinations of ingredients are being tested. The possibility that the product should be pre-cooked to increase storage life, digestability, and acceptability is being examined.

The GOI is also taking a fresh look at child feeding proposals. A newly-formed Nutrition Policy Coordinating Committee, consisting of officials of concerned ministries and chaired by two members of the Planning Commission, has been charged with developing a child feeding program for the fourth five year plan. The proposal will not be completed before September 1968, but we anticipate that it will:

-- call for expansion of child feeding to 25 million by the end of the fourth plan; fifteen million of these are to be school children and ten million pre-schoolers.

-- Request CARE's assistance in developing and supervising the program.

-- divide responsibility for school and pre-school feeding between the Ministry of Education and the Ministry of Health. The Ministry of Health will be responsible for conducting the pre-school program through primary health centers, district and sub-division hospitals, and community centers. (The Education Ministry is concerned that expanded feeding of pre-schoolers at school kitchens will disrupt academic programs.)

The Committee's recommendations on phase-out of US inputs are not known. There are reasons to suspect that it is no longer considering a reduction of US inputs at a rate of 20% a year for the next five years. When the plan is completed, it will be submitted to the Finance Ministry for review.

The selection of 25 million -- rather than 20 million or 30 million -- as the target to be fed is not -- as far as we know -- based on criteria of need. It rests largely on financial and administrative considerations. The government believes that increasing the program to 25 million by 1973 is a reasonable rate of expansion given present state financial and administrative capacities. Twenty-five million represents

about 10.6% of the estimated 234 million children who will be in the 0-14 age group by 1973. Given estimates that two-thirds of all children suffer from malnutrition, the target represents only 16% of those who can be considered eligible for supplemental feeding.

The center government reportedly does plan to take a hand in selecting the areas in which school feeding will be expanded. The committee is attempting to develop criteria of need to use in selecting those states and districts which most deserve an increase in child feeding. To enforce its selections, the center presumably will offer greater child feeding subsidies to states deemed to be neediest and curtail subsidies to the more affluent. USAID supports this initiative and, if an expanded program is approved, plans to press for establishment of standards to guide food resources to the neediest areas. The first question of policy facing the Mission, however, is not which 25 million to choose, but whether to choose 25 million. And this breaks down into several questions:

-- Does CARE have the managerial capacity to supervise the expansion?

-- What are the implications of the expansion for USAID's development program and management load?

-- What is the justification for the expansion in light of the prospects for foodgrain self-sufficiency? To what extent should we supply Title II? What policy should we adopt toward the phase-out of U.S. resources?

The ensuing section of the annex addresses these questions.

PART II - THE EXPANSION QUESTION

A. Management Capability:

The question of the volagencies' ability to manage an increase in the program is relevant only for CARE. The sectarian agencies do not expect to increase their programs significantly in the next few years. While the Mission believes the sectarian agencies are generally in control of their programs, they have about reached the administrative limits of their present network of priests, missionaries, social workers and volunteers. The Mission does not intend to approve an expansion in the sectarian agencies

programs unless there is a commensurate expansion of their managerial resources. These paragraphs, then, deal only with the CARE management.

Responsibility for the CARE program flows through the normal administrative structure of the state departments of education. At the top, the department of education appoints a Special Officer for Mid-Day Meals to supervise the state-wide program. At the district level, the district education officer is responsible for the program, and at the block the local school inspector. Within the school, responsibility is vested with the headmaster who usually appoints one or more teachers to assume day to day responsibility. CARE maintains an office in each state headed by an American representative who has a formal counterpart relationship with the Special Officer for Mid-Day Meals. The American representative and his staff help plan the program and monitor its implementation. They work with the state government to set up an effective logistics system for moving food to the schools. They train teachers to prepare the food. They work to see that the required records -- daily stock registers and monthly issues and receipts reports -- are maintained accurately. The CARE staff follows a regular procedure for spot checking individual school programs, and, in the port cities, it monitors the unloading, storage and transport of commodities. CARE's basic job in a state is two-fold: (1) help the state administer the program; and (2) sell the program -- convince a broad audience of the importance of the program so that contributions from local panchayats will rise and a commitment to continue and expand the program will take root. To the latter end, CARE representatives seek to instruct teachers, panchayat committees and others in the rudiments of nutrition, and supply schools with materials on nutrition.

CARE's present and past personnel inventory is as follows:

	U.S. Staff	Local Personnel	Full-time State Employees	Part-time State Employees
1968	27	211	28	100,000
1967	27	191	-	-
1966	16	113	-	-
1965	14	69	-	-
1964	10	59	-	-

In 1968, 21 of the US staff and 177 of the local staff are posted in the states.

The Mission believes CARE's management of its program is sound. Periodic visits by the Food for Peace Office indicate that CARE has, in most states, been able to develop a functioning logistical and administrative system. This impression is corroborated by audit reports. Two audits of CARE's overall operations in March 1964 and November 1967 found generally satisfactory performance and noted successive improvements in management capability. The audits did flag several procedural irregularities and recommended that CARE augment its field surveillance staff. All recommendations have been met. The auditors have cited CARE as "the best organized, administered, and controlled (feeding operation) in India" and are satisfied that CARE's prescribed procedures for headquarters and state operations are sound. CARE's port operations have been declared satisfactory. There has been no significant diversion of commodities and losses and damage have been minimal.

In this context, the Mission has no doubt as to CARE's ability to manage the proposed FY 1969 school feeding program. As noted previously, there has been a less than 10% increase in the actual number of beneficiaries fed by CARE since FY 1967. CARE's program jumped steeply between FY 1966 and FY 1967 and the personnel table above indicates that CARE increased its staff sharply at that time. CARE has successfully managed a program for 13-14 million recipients for the past two years and there is no reason to believe that it cannot do so for another year.

For the future, the Mission has decided to augment its audit surveillance of the volagency program (which pinpoints deficiencies but does not give a complete picture of management capability) with a comprehensive management study. It has commissioned an Indian firm of management consultants, Kirloskar Consultants Limited, to conduct a four month review of volagencies' management capabilities including management of the logistics system, record keeping, financial accounting, and effectiveness of supervisory control over program. This study will be completed in early November and will form the basis for Mission decisions to permit further expansion of the school feeding program in FY 1970.

The possibility that pre-school feeding may become a Ministry of Health responsibility is a source of some concern to the Mission. We would be hesitant about approving any procedure which may affect adversely the ability of health departments, particularly in rural areas, to carry out their family planning responsibilities. If the GOI makes this proposal, the Mission intends to review it carefully.

B. Expansion and USAID's Development Program:

As stated above, the Mission believes that by concentrating on work projects and child feeding, the volagencies both fulfill effectively the social welfare purposes of Title II and maximize the development returns from these programs. Given present limits on the use of these resources, the Mission sees no means of harnessing them more effectively to its development program. As long as the limits remain and as long as Title II dollars remain unfungible with other assistance funds, USAID does not believe that expanding Title II donations can conflict with or compromise the Mission's ability to carry out its program.

In terms of management, the Mission has four authorized positions in its Food for Peace Branch, three of which are assigned to supervision of the feeding programs. Two of the three positions are now filled. In addition, the Mission audit branch is responsible for checking volagency compliance with U.S. regulations. We do not believe additional Food for Peace or audit positions will be needed if the program expands.

C. Expansion and Indian Food Grain Self-Sufficiency:

Scrubbing foodgrains from India's import list will not, unfortunately, be the same as wiping its nutrition slate clean. Crossing the self-sufficiency line is expected to bring a rise in per capita foodgrain availability, but not an adequate diet. The level of per capita foodgrain which India is expected to achieve in 1972-73 (17 oz per day) will be nutritionally sufficient only if all the other ingredients necessary for a balanced diet also increase. There is, however, little reason to expect that per capita production of vegetables, fruits, meat or dairy products will increase to the levels needed for a proper diet by 1972-73. Without this increase, per capita foodgrain availability must expand markedly to make up for the lower per capita availability of other essentials.

Even if in the late 1970's or early 1980's all foodstuffs required for a balanced diet become available, inequalities in income

distribution would still leave large groups vulnerable to malnutrition. In short, the Mission finds no reason to expect that malnutrition will not endure in India well beyond achievement of foodgrain self-sufficiency.

That the need for child feeding programs will continue does not, of course, mean that it should be met with U.S. rather than Indian resources. The policy question facing the Mission is:when can or should the GOI assume the costs of the program? Is achievement of foodgrain self-sufficiency the signal which triggers the withdrawal of Title II as well as Title I imports? 1/

D. The Cost of Expansion and Phase-out:

The present school feeding pattern in which the US supplies all food and the GOI pays for administration, storage and transport costs the GOI about Rs. 5.0 per beneficiary per year. At this rate, the total cost of a program for 25 million children would be Rs.125,000,000 and would rise above present expenditure approximately as follows:

FY	Programmed Beneficiary (000)	GOI Financial* Cost (Rs. 000)	Cost/Recipient
1966	9,300	41,693	4.5 (Actual)
1967	10,800	56,930	5.3 (Actual)
1968	13,250	80,265	6.1 (Actual)
1969	14,697	82,232	5.8 (Estimated)
1970	18,815	94,075	5.0 (Estimated)
1971	21,530	107,650	5.0 (Estimated)
1972	25,000	125,000	5.0 (Estimated)

* State budget only; excludes contribution of panchayats.

1/ This question assumes that the technical problems now plaguing Bal Ahar will be overcome. The present US contribution to the child feeding program consists mainly of CSM - a blend of corn, soybeans, and milk. Bal Ahar is a comparable blend of wheat, groundnut and milk, but so far a suitable combination of these has not been found. The question is not one of substituting Indian wheat for US wheat, but of developing an Indian product based on wheat for a US product based on corn.

In calculating the cost of a child feeding program funded solely by the GOI, it is assumed that the GOI will substitute Bal Ahar for Title II. The estimated cost of a Bal Ahar program -- made solely from local ingredients including the costs of production, transportation, and administration -- is estimated at Rs. 33.5/year per recipient. (See Table 6 for breakdown of Bal Ahar Costs.) At this rate, the total cost of a 25 million recipient program would be:

FY	Beneficiary (000's)	GOI Financial Cost (Rs. 000)	Cost/Recipient
1973	25,000	Rs. 837.500	Rs. 33.5

If GOI assumed the full cost of the present program for 14.6 million children, its costs would be:

FY	Beneficiary (000's)	GOI Financial Cost (Rs. 000)	Cost/Beneficiary
1973	14,697	Rs. 492,349	Rs. 33.5

For the GOI to take over the full costs of the present program in 1973 would require an increase of Rs. 410 million over the FY 1969 budget. To take over and expand the program to 25 million children would involve an increase of Rs. 712.5 million.

The Mission believes that either of these alternatives represents an untenable financial burden for the GOI. There are three ways in which the costs could be met: (a) an increase in taxes; (b) a diversion of expanditure from other programs; (c) an increase in the budgetary deficit. A simple order of magnitude comparison can help place the relative burden of a feeding program funded solely by the GOI in perspective.

The possibility of additional taxes seems slight. The government's ability to mobilize more resources through taxation will be under strain in the next few years as PL 480 funds phase out and other net foreign aid resources remain stable or decline. At the meeting in May 1968 of the National Development Council, which considered guidelines for the new Fourth Five Year Plan, the choice was posed of a 6 percent national growth rate over a 5 per cent rate, with additional resource mobilization through

taxation and other sources of Rs. 2,500 to 3,000 millions per year required for the higher growth rate. The reaction of the NDC was not favorable to the possibility of raising this amount of additional resources. An additional requirement of Rs. 712.5 million rupees for a feeding program would be roughly 25 per cent of the total taxation needed for the higher growth rate and does not seem likely to be forthcoming.

The possibility for decreasing other expenditures also seems slight. Rs. 712.5 million is almost enough to finance the entire annual rupee expenditures for the fertilizer production expansion program -- an additional quantity of 400,000 tons of nitrogen per year, or two 200,000 ton plants costing about Rs. 675 million each, of which Rs. 375 million is rupee expanditure and the rest foreign exchange (assumed to be financed through foreign aid or private foreign investment). Even if the plants are constructed in the private sector the drain on government resources would be large, since most private companies rely heavily on government financial institutions for funds.

The prospects for financing the program through the budget deficit also appear remote. Rs. 712.5 millions would be an addition of 25 percent to the current year's deficit for central government expanditures of roughly Rs. 3,000 millions. The deficit is considered higher than normal since an expansionary policy is desirable to stimulate recovery from the recession of the last few years, and there will be pressure to reduce the deficit in future years as the economy returns to more normal conditions.

Another consideration which militates against a recommendation that the GOI use its scarce resources for the program is that the economic benefits of child feeding have never been measured. Studies undertaken by the University of Baroda and the Sri Avinashilingam Home Science College in Coimbatore have shown that the school lunch program significantly increased the quantity and quality of the overall diets of the recipients. Their caloric intake increased, as did their intake of protein, vitamin A, riboflavin and calcium. The children who were fed were both taller and heavier at the end of the study period than control groups which received no food. The tests also revealed over-all improvement in their biochemical status. However, no attempt has been made to measure the meaning of these improvements in terms of increased mental acuity, better classroom performance, disease prevention and reduction of burden on public health facilities etc. The GOI knows the costs of the program but has no precise measure of its economic benefits.

E. To Phase Down or Not to Phase Down:

These cost figures alter the policy question facing the Mission. It now is: should the US continue to commit Title II Foods for the present or an expanded program -- a commitment which will probably run well past 1972/73; or should the program be pared to a level which is sustainable with Indian resources? Phrased differently, the question is, what is more important: that the GOI -- consistent with normal practice in programming foreign assistance -- learn to manage and assume responsibility for the program in the near term and not depend on US handouts; or that significant numbers of malnourished children continue to be fed? The Mission opts for the latter alternative. For the following reasons:

Title II is not technical assistance. The ambitions which animate our technical assistance program -- namely, the creation of self-sufficient institutions capable of making a continuing contribution to a country's development -- are not the central concerns of the Title II program. Title II, as noted before, is primarily an instrument of social welfare and social development. It reflects the concern of the Congress that American surplus agriculture resources be used -- in the words of the legislation -- "to meet famine or other urgent relief requirements and combat malnutrition especially in children." In recent years the stipulation has been added that, insofar as practical, "assistance to needy persons shall be directed to self help activities designed to alleviate the need for such assistance", but this does not change Title II's essential character as "assistance to needy persons." The requirement that these funds be channelled through voluntary agencies insofar as possible is also a manifestation of US intent that these resources should serve other than strictly development purposes. They are intended to capitalize on and reinforce the American people's concern for the welfare of less developed countries.

Institution building is admittedly an important component of school lunch programs and the ultimate aim is that host country competence and commitment will grow to the extent that it will continue the program. But to allow our concern for institution building to dominate, with the consequence that our short-term aim becomes creation of a small program managed and funded by the GOI, would, we believe, be an inversion of priorities and a serious mistake. India's present and future needs for supplemental child feeding are too great to justify this approach.

A decision to phase down would also appear to be inconsistent with present Congressional and Executive branch intentions toward Title II. Admittedly Washington does not speak with one voice, but the dominant tone from Washington does not support early curtailment of child feeding. The guidelines for the FY 1969 Title II program state that: "emphasis is being placed on greater use of American agricultural productivity to combat hunger and malnutrition in developing countries." The guidelines repeat the evidence that malnutrition may cause mental retardation in children and its entire emphasis is on broader use of Title II resources to dampen malnutrition problems. This emphasis is reinforced -- by inference at least -- by the Title II legislation which contains none of the phase-out language or termination provisions of Title I.

The above paragraphs are not an argument that the U.S. should continue to supply Title II food indefinitely without any increase in the GOI contribution. We believe, as implied above, that it is not valid to ask or expect the GOI to assume a significant portion of either the present or expanded program in the near future. Such a step would be a diversion of funds from more pressing development priorities and could compromise the effectiveness of U.S. dollar assistance and the achievement of Mission goals. We believe, however, that, as the program expands, a gradual increase in the relative contributions of the center and/or state governments to the program (as well as an increase from the local governments) should be sought. The Mission plans to discuss means for doing so with CARE and the GOI during FY 1969 and intends to condition approval for the FY 1970 program on development of such an understanding.

PART III - THE MISSION STANCE ... CONCLUSIONS & RECOMMENDATIONS

The Mission believes that:

-- malnutrition with its pernicious implications for the health and productive capacity of India's human resources will endure in India well into the 1970's and perhaps the 1980's. Expanding child feeding from the present 14 million to 25 million is clearly justified in terms of need.

-- CARE appears to have the managerial ability for a program of 25 million children. It certainly has the ability to administer the FY 1969 program which is only slightly larger than its program for the last two years. To obtain

a more precise assessment of CARE's management resources, the Mission has commissioned a management study which should pinpoint any improvements needed for 1970 and beyond.

-- The US should neither expect nor require the GOI to assume a significant portion of the costs of the child feeding program during the fourth five year plan. The U.S. should, however, develop with CARE and the GOI a plan under which the GOI will gradually increase its relative contribution to the program. The U.S. should also work with CARE and the GOI on development of criterion for establishing need and procedures for directing the additional food to needy areas and children.

-- Assuming above conditions are met, the U.S. should provide Title II food to support expansion of the pre-school and school feeding program to about 25 million by the end of the fourth five year plan.

-- The U.S. -- in conjunction with CARE and the GOI -- should seek to mount a study to measure the nutritional impact of school feeding, the physical and mental benefits for the recipients and the cost/benefits in terms of improved classroom performance, disease prevention and the diminished burden on health facilities etc.

The Mission recommends, therefore, that AID/W: (1) approve the FY 1969 AER as submitted and (2) endorse plans for expansion of school feeding subject to the above conditions and the continued availability of Title II resources.

TABLE 1

PL 480 TITLE II PROGRAMMED BENEFICIARIES
ALL VOLUNTARY AGENCIES

Note: These are programmed not actual recipients

Category	U.S. Fiscal Year							
	64	65	66	67	68	69	70	71
MCH	789,172	910,864	751,826	945,752	2,050,050	4,074,000	5,583,350	7,111,695
SCHOOL	8,106,293	8,248,714	8,041,327	9,783,886	9,629,600	12,731,200	15,009,820	16,372,522
INSTITUTION	235,477	229,235	218,884	237,736	46,300	52,400	60,277	34,700
FAMILY	600,191	704,523	754,388	763,325	-	-	-	-
REFUGEE	50,587	55,970	66,365	51,284	27,600	24,800	-	-
HEALTH	63,345	58,991	56,804	50,076	82,500	73,200	85,094	38,500
FEEDING CENTERS	34,334	35,203	37,850	48,120	-	-	-	-
ECON. DEV.	-	-	-	-	1,324,900	1,304,700	1,435,170	1,578,687
EUC. DEV.	-	-	-	-	7,100	10,100	11,200	12,300
OTHER	-	-	-	-	9,300	5,700	8,400	8,400
EMERGENCY	-	800,000	2,876,461	2,678,401	-	-	-	-
TOTAL	9,879,399	11,043,500	12,803,905	14,558,580	13,177,350	18,276,100	22,193,311	25,156,804

TABLE 1-a

AGENCY - CARE

PL 480 TITLE II PROGRAMMED BENEFICIARIES

Note: These are programmed recipients not actual recipients

CATEGORY	U.S. FISCAL YEAR							
	64	65	66	67	68	69	70	71
MCH	6,286,000	6,577,000	716,000	275,000	1,100,000	3,177,000	5,180,000	6,670,000
SCHOOL				8,780,000	8,570,000	11,520,000	13,635,000	14,860,000
INSTITUTION								
FAMILY								
REFUGEE								
HEALTH								
FEEDING CENTERS								
ECON. DEV.								
EDUC. DEV.								
OTHER								
EMERGENCY		432,203	2,148,733	1,742,300				
TOTAL	6,286,000	7,009,203	2,864,733	10,797,300	9,670,000	14,697,000	18,815,000	21,530,000

TABLE 1-b

AGENCY - CRS

PL 480 TITLE II PROGRAMMES BENEFICIARIES

Note: These are programmed recipients not actual recipients

CATEGORY	U.S. FISCAL YEAR							
	64	65	66	67	68	69	70	71
MCH	26,462	32,716	20,711	12,351	451,200	309,500	340,450	374,495
SCHOOL	578,588	589,364	602,527	717,927	547,900	684,400	745,520	820,622
INSTITUTION	137,445	122,635	133,584	140,779	17,200	23,700	28,677	
FAMILY	589,705	697,073	751,258	736,585				
REFUGEE	19,800	20,970	20,715	21,550	19,400	12,000		
HEALTH	51,381	44,191	38,704	33,442	68,500	41,400	50,094	
FEEDING CENTERS	3,167	4,333	8,250	14,655				
ECON. DEV.					676,900	744,700	819,170	901,087
EDUC. DEV.								
OTHER								
EMERGENCY		341,915	163,777	424,001				
TOTAL	1,406,548	1,853,197	1,739,526	2,101,290	1,781,100	1,815,700	1,983,911	2,096,204

TABLE 1-c

AGENCY - CWS/LWR

PL 480 TITLE II PROGRAMMED BENEFICIARIES

Note: These are programmed recipients not actual recipients

CATEGORY	U.S. FISCAL YEAR							
	64	65	66	67	68	69	70	71
MCH	8,710	11,050	11,300	90,090	144,200	57,200	62,900	67,200
SCHOOL	214,705	260,650	278,800	274,534	314,000	521,800	629,300	691,900
INSTITUTION	98,032	106,600	85,300	96,957	29,100	28,700	31,600	34,700
FAMILY	10,486	7,450	3,130	26,740				
REFUGEE	30,787	35,000	45,650	29,734	21,000	12,800		
HEALTH	11,964	14,800	18,100	16,634	14,000	31,800	35,000	38,500
FEEDING CENTERS	31,167	30,870	29,600	33,465				
ECON. DEV.					648,000	560,000	616,000	677,600
EDUC. DEV.					7,100	10,100	11,200	12,300
OTHER					9,300	5,700	8,400	8,400
EMERGENCY		25,882	563,951	512,100				
TOTAL	405,851	492,302	1,035,831	1,080,254	1,186,700	1,228,100	1,394,400	1,530,600

TABLE 1-d

AGENCY - UNICEF

PL 480 TITLE II PROGRAMMED BENEFICIARIES

Note: These are programmed recipients not actual recipients

CATEGORY	U.S. FISCAL YEAR							
	64	65	66	67	68	69	70	71
MCH	754,000	867,098	719,815	568,311	529,150	530,300		
SCHOOL	1,027,000	821,700		11,425	10,400	5,000		
INSTITUTION								
FAMILY								
REFUGEE								
HEALTH								
FEEDING CENTERS								
ECON. DEV.								
EDUC. DEV.								
OTHER								
EMERGENCY								
TOTAL	1,781,000	1,688,798	719,815	579,736	539,550	535,300		

PL 480 Title II Programmed Beneficiaries

The attached Table indicates the growth in beneficiaries from 1964 to 1971. In accordance with the Food for Freedom priorities, child feeding has risen rapidly and Food-for-Work projects started in 1968 show some slight increase. Institutional feeding has rapidly declined and family feeding was eliminated altogether in 1967. The refugee case-load has been gradually diminishing. Feeding centers were also eliminated in 1967. Educational development programs requiring food support are expected to rise because of the increase in feeding programs for vocational school students. Health programs will reach the peak in 1970 and decline rapidly. The refugee program is concerned with Tibetan Refugees who are a hard-core residual responsibility.

The Tables of individual agency programmed beneficiaries indicate that they have followed the trend in present guidelines for Food for Peace programs. CRS has significantly decreased or eliminated its dole type of programs. Family feeding and feeding centers were eliminated entirely in 1967. Institutional feeding dropped drastically between 1967 and 1968 and is levelling off. Food-for-Work programs started in 1968 probably contain many people who may have been on family feeding previously but now are able to perform work for their rations. Pre-school feeding programs which declined in 1967, increased dramatically in 1968 and is expected to level off at a slightly lower figure. School feeding has increased at a steady pace after a decline between 1967 and 1968. In 1967 all categories of CRS were re-examined in accordance with the new guidelines. It was found that many beneficiaries in the family category were actually pre-school children and 1968 reflected that fact. The decline in school children between 1967 and 1968 was based on actual experience. CRS expected to undertake certain municipal programs which did not materialize. Hence the decline in 1968.

CWS also re-examined its categories in 1967 and the 1968 program reflected a new alignment. Family feeding was eliminated and children in that category received food under child feeding in 1968. Feeding centers were eliminated in 1967 and the Food-for-Work program became the major focus in the agency.

Examination of the CARE program for 1967, 68 and 69 indicates that CARE has been operating at about the same level for the past three years. The FY 69 program reflects absorption of the 1968 emergency beneficiaries in the regular FY 69 program.

At the end of 1965 UNICEF eliminated its school feeding program and reduced its MCH program. After a lapse of one year it inaugurated a feeding program for pre-vocational students which declined rapidly. Since it is UNICEF's global policy to withdraw from feeding programs, this agency will phase out its activities by the end of 1969.

TABLE 2

PL 480 TITLE II BENEFICIARIES PROGRAMMED/ACTUAL
FY 64 THRU 71

Fiscal Year	VOLAG	TOTAL		REGULAR		EMERGENCY	
		Programmed	Actual	Programmed	Actual	Programmed	Actual
64	CARE	6,286,000	4,843,000	6,286,000	4,843,000	0	0
	CRS	1,406,548	1,407,813	1,406,548	1,407,813	0	0
	CWS/LWR	405,851	418,120	405,851	418,120	0	0
	UNICEF	1,781,000	1,781,000	1,781,000	1,781,000	0	0
	TOTAL	9,879,399	8,449,933	9,879,399	8,449,933	0	0
65	CARE	7,009,203	5,433,000	6,577,000	5,055,000	432,203	378,000-
	CRS	1,853,197	1,511,282	1,511,282	1,511,282	341,915	0-
	CWS/LWR	492,302	512,400	466,420	454,927	25,822	57,473
	UNICEF	1,688,798	1,680,232	1,688,798	1,680,232	0	0
	TOTAL	11,043,500	9,136,914	10,243,500	8,701,441	799,940	435,473
66	CARE	9,308,733	6,978,550	7,160,000	5,741,000	2,148,733	1,237,550
	CRS	1,739,526	1,573,814	1,575,749	1,573,814	163,777	0
	CWS/LWR	1,035,831	1,075,835	471,880	688,895	563,951	386,940
	UNICEF	719,815	442,735	719,815	442,735	0	0
	TOTAL	12,803,905	10,070,934	9,927,444	8,446,444	2,876,461	1,624,490
67	CARE	10,797,300	13,170,000	9,055,000	6,410,000	1,742,300	6,760,000
	CRS	2,101,290	2,740,800	1,677,289	2,063,500	424,001	677,300
	CWS/LWR	1,080,254	1,488,100	568,154	1,261,400	512,100	226,700
	UNICEF	579,736	403,790	579,736	403,790	0	0
	TOTAL	14,558,580	17,802,690	11,880,179	10,138,690	2,678,401	7,664,000

PL 480 TITLE II BENEFICIARIES PROGRAMMED/ACTUAL - FY 64 THRU 71

Fiscal Year	VOLAG	TOTAL		REGULAR		EMERGENCY	
		Programmed	Actual	Programmed	Actual	Programmed	Actual
68	CARE	9,670,000	13,250,000	9,670,000	8,750,000	0	4,500,000
	CRS	1,781,100	2,008,000	1,781,100	1,612,900	0	395,100
	CWS/LWR	1,186,700	1,454,500	1,186,700	1,222,500	0	232,000
	UNICEF	539,550	422,000	539,550	422,000	0	0
	TOTAL	13,177,350	17,134,500	13,177,350	12,007,400	0	5,127,100
69	CARE	14,697,000		14,697,000			
	CRS	1,815,700		1,815,700			
	CWS/LWR	1,228,100		1,228,100			
	UNICEF	535,300		535,300			
	TOTAL	18,276,100		18,276,100			
70	CARE	18,815,000		18,815,000			
	CRS	1,983,911		1,983,911			
	CWS/LWR	1,394,400		1,394,400			
	UNICEF	0		0			
	TOTAL	22,193,311		22,193,311			
71	CARE	21,530,000		21,530,000			
	CRS	2,096,204		2,096,204			
	CWS/LWR	1,530,600		1,530,600			
	UNICEF	0		0			
	TOTAL	25,156,804		25,156,804			

Title II beneficiaries program in actual FY 64 thru FY 71 by Voluntary Agencies

This Table indicates the number of beneficiaries actually fed by each volagency during the period FY 64 thru FY 68 and the program proposed figures for FY 69 thru FY 71.

For CARE, it should be noted that the beneficiaries actually served were about the same for both FY 67 and FY 68 and the proposed figures for FY 69 only involves a slight increase.

Beneficiaries actually served by CRS were reduced in 1968 from the 1967 figures and the proposal for 1969 is a further reduction.

The same situation is true for CWS. The increase in FY 69, 70 and 71 on the part of all agencies result from further concentration on the child feeding and food-for-work programs.

It should be noted that fewer persons were fed in 1968 than 1967 and the program proposal for 1969 is based on GOI plans for increased child feeding for pre-schoolers.

TABLE 3

- CARE PROGRAM -

ACTUAL PL 480 TITLE II BENEFICIARIES REGULAR AND EMERGENCY - FY 67, 68, 69

(Figures in 000s)

	Program FY 69	Actual FY 68			Actual FY 67		
		Total	Regular	Emergency	Total	Regular	Emergency
Bihar	3,000	4,900	1,400	3,500	4,000	-	4,000
West Bengal	2,060	1,400	700	700	560	60	500
Kerala	1,900	1,400	1,400	-	1,600	1,600	-
Madras	1,700	1,400	1,400	-	1,500	1,500	-
Mysore	1,200	1,100	1,100	-	1,000	500	500
Madhya Pradesh	675	430	330	100	700	300	400
Maharashtra	675	350	350	-	360	350	10
Uttar Pradesh	650	550	350	200	1,000	200	800
Andhra Pradesh	605	400	400	-	500	500	-
Orissa	597	600	600	-	900	400	500
Rajasthan	400	300	300	-	400	400	-
Punjab	375	300	300	-	400	400	-
Gujarat	335	120	120	-	250	200	-50
Harayana	325	-	-	-	-	-	-
Himachal Pradesh	200	-	-	-	-	-	-
Total	14,697	13,250	(8,750)	(4,500)	13,170	(6,410)	(6,760)

TABLE 4

U.S. TITLE II CONTRIBUTIONS - FY 64 - FY 71
COMPARISON WITH GOI AND VOLAGENCY CONTRIBUTION

Agency	Year	U.S. Inputs	% of total program	GOI Inputs	% of total program	Other Inputs (Cooperating sponsor inputs	% of total program
CARE	1964	26964.0	82.58	5669.0*	17.36	20.0	.06
	1965	20441.5	74.82	6853.0	25.09	24.0	.09
	1966	38174.1	83.67	7400.0	16.22	49.0	.11
	1967	29030.7	74.29	9818.0	25.13	226.0	.58
	1968	64053.2	82.97	12900.0	16.72	239.0	.31
	1969	47909.5	74.44	16050.0	24.93	400.0	.63
	1970	71980.0	73.90	24920.0	25.59	500.0	.51
	1971	80622.0	68.70	36325.0	30.96	400.0	.34
CRS	1964	5170.0	29.05	332.316	1.9	11972.0	68.60
	1965	11279.6	42.87	702.842	2.67	14324.0	54.46
	1966	12209.6	42.89	936.737	3.29	15316.0	53.82
	1967	13757.9	41.59	927.474	2.81	18396.0	55.60
	1968	17658.3	47.05	1369.789	3.65	18500.0	49.30
	1969	22955.4	52.78	1646.526	3.79	18890.0	43.43
	1970	25948.0	53.73	1743.789	3.61	20590.0	42.64
	1971	28542.0	53.97	1918.632	3.63	22419.0	42.40

* includes contribution of local panchayats

Note: Other inputs for the Sectarian agencies consist of the imputed dollar value for the administrative services provided by priests and volunteers. Each sectarian agency has different means of calculating the value of the services, and USAID believes they are somewhat overstated. For CARE, the other inputs consist of cash donations and grants of food from special sources. They do not include the imputed value of the part-time services of teachers and others involved in preparing the food.

TABLE 4 (Contd.)

Agency	Year	U.S. Inputs	% of total program	GOI Inputs	% of total program	Other Inputs (Cooperating sponsor inputs)	% of total program
CWS/LWR	1964	2934.1	38.11	91.474	1.19	4675.0	60.70
	1965	5938.9	50.10	214.211	1.81	5700.0	48.09
	1966	6693.3	40.85	430.737	2.63	9260.0	56.52
	1967	8661.3	35.72	559.263	2.31	15025.0	61.97
	1968	13676.9	42.21	1046.737	3.23	17673.0	54.56
	1969	13049.0	40.89	727.158	2.28	18130.0	56.83
	1970	16648.0	44.21	957.579	2.54	20500.0	53.25
	1971	18312.0	44.41	1052.526	2.55	21870.0	53.04
UNICEF	1964	1568.2	17.39	5874.0	65.13	1576.0	17.48
	1965	2532.5	25.57	5640.0	56.81	1756.0	17.68
	1966	63.0	1.10	4242.0	74.08	1421.0	24.82
	1967	1812.3	23.14	4601.0	58.74	1420.0	18.12
	1968	798.1	6.73	8342.0	70.30	2726.0	22.97
	1969	2181.5	15.12	9315.0	64.55	2933.0	20.33
	1970	-	-	-	-	-	-
	1971	-	-	-	-	-	-

TABLE 4-a

COMPARISON OF TOTALS

(In $ 000s)

Fiscal year	U.S. Inputs	%	GOI Inputs	%	Cooperating Sponsorships	%
1964	36,636.3	54.8	11,966.8	17.9	18,243.0	27.3
1965	40,192.5	53.3	13,410.1	17.8	21,804.0	28.9
1966	57,140.0	59.4	13,009.5	13.5	26,046.0	27.1
1967	53,262.2	51.1	15,905.8	15.3	35,067.0	33.6
1968	96,186.4 *	60.5	23,658.5	14.9	39,138.0	24.6
1969	86,095.4 *	55.8	27,738.7	18.0	40,353.0	26.2
1970	114,576.0 **	62.5	27,621.4 **	15.1	41,140.0 **	22.4
1971	127,476.0 **	60.3	39,296.2 **	18.6	44,689.0 **	21.1

* Includes emergency package program for $24,786,000

** UNICEF has not prepared a program for these years.

TABLE 5

ADJUSTED REQUIREMENTS, RECEIPTS, DISTRIBUTION, STOCK ON HAND

	FY 64 (000's)		FY 65 (000's)		FY 66 (000's)		FY 67 (000's)	
	MT	$	MT	$	MT	$	MT	$
AID/W Approved								
Adjusted Requirements	119.4	30,414.3	152.6	31,996.5	246.6	43,071.2	254.7	41,169.3
Ocean Freight	0	6,222.0	0	8,195.8	0	14,068.8	0	12,092.9
Total	0	36,636.3	0	40,192.3	0	57,140.0	0	53,262.2
Opening Balance	27.5	0	52.1	0	35.9	0	62.0	0
Actual Receipts	101.9	0	116.6	0	187.0	0	293.2	0
Actual Distribution	77.3	0	132.7	0	160.9	0	228.6	0
Transfers Out*	0	0	0	0	0	0	0	0
Closing Balance	52.1	0	35.9	0	62.0	0	126.6	0
% stock-on-hand programmed amount (not adjusted)	36.6	0	20.4	0	24.5	0	39.9	0

TABLE 5 (Contd.)

	FY 68 (000's)		FY 69 (000's)		FY 70 (000's)		FY 71 (000's)	
	MT	$	MT	$	MT	$	MT	$
AID/W Approved								
Adjusted Requirements	561.5	71,581.0	410.8	65,609.6	543.6	85,136	602	94,893
Ocean Freight	0	24,605.4	0	20,485.8	0	29,446	0	32,583
Total	0	96,186.4	0	86,095.4	0	114,576	0	127,476
Opening Balance	126.6	0	0	0	0	0	0	0
Actual Receipts	437.3	0	0	0	0	0	0	0
Actual Distribution	326.8	0	0	0	0	0	0	0
Transfers Out *	44.5*	0	0	0	0	0	0	0
Closing Balance	192.6	0	0	0	0	0	0	0
% stock-on-hand programmed amount (not adjusted)	34.3**	0	0	0	0	0	0	0

MT	LBS (000)
	2,330 flour to Wallace Mills
	22,046 milo to WFP
	18,739 milo to GOI-repay
	9,677 milo for Bal Ahar
	45,354 wheat to GOI-repay
44,518	98,146

*Includes:

Regular Program:	$53,040.00 commodities	
	18,360.40 ocean freight	
Drought Program:	$18,541.00 commodities	
	$ 6,245.00 ocean freight	
Total	$96,186.40	

TABLE 6

COST - BAL AHAR PROGRAM

I. Bal Ahar

Local Wheat 700 Kg	Rs. 462.00
Groundnut meal: 250 Kg	Rs. 225.00
Milk (local): 50 Kg	Rs. 154.00
Vitamins and	Rs. 101.80
	Rs. 942.80
Manufacturing and flavoring	Rs. 245.00
Cost/MT	Rs.1187.80
Cost/Kg	Rs. 1.18

II. Feeding Program: Cost per beneficiary

Bal Ahar - Rs.1.18/kg x 25 kg/ beneficiary/year	Rs. 29.50
Administration, Transportation & Storage/per beneficiary/year	4.0
Cost/beneficiary/year =	Rs. 33.5

TABLE 7

RELATIONSHIP OF INPUTS OF PL-480 AND WORLD FOOD PROGRAM [d]

FY YEAR	Commodities in Metric Tons			Total of Column 2, 3 & 4	Percentage Relationship		
	W.F.P. (approved)	Title II (Actual Receipt)	Title I (Actual Receipt)		W.F.P.	Title II	Title I
1	2	3	4	5	6	7	8
1964	16,650	101,900	4,479,381	4,597,931	.4	2.2	97.4
1965	31,169	116,800	6,248,225	6,396,194	.5	1.8	97.7
1966	149,798	190,800	7,689,243	8,029,841	1.9	2.4	95.7
1967	71,793	300,800	6,811,387	7,183,980	1.0	4.2	94.8
1968	64,910	393,000	4,547,854[b]	5,005,764	1.3	7.9	90.8
1969	-	410,810[a]	5,900,000[c]	6,310,810			

NOTE: (a) The Title II figures for 1969 shows proposed quantity.

(b) The Title I figures show actual arrivals upto April 68 for wheat and sorghum and upto March 68 for corn, and for the balance of FY year the projected quantity.

(c) The Title I figures show programmed quantity for FY 69.

(d) World Food Program donations are used to carry out self-help projects in agriculture and related fields. USAID reviews all WFP project proposals to ensure that they will not duplicate or overlap volagency food for work projects.