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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INDIA

APPRAISAL OF THE AGRICULTURAL MACHINERY PROJECT

September 22, 1949

Loan Department

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INDIA

Appraisal

of the

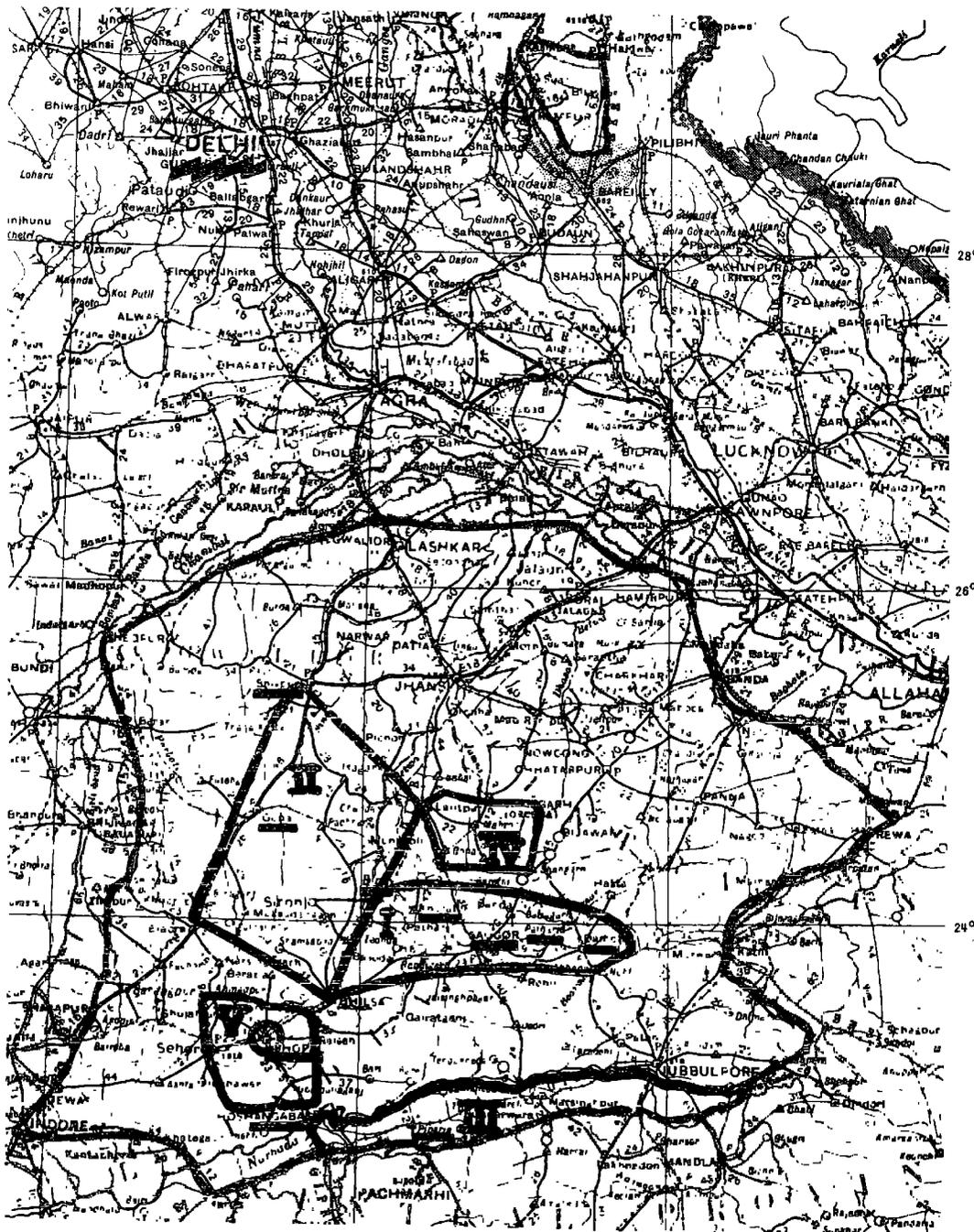
Agricultural Machinery Project

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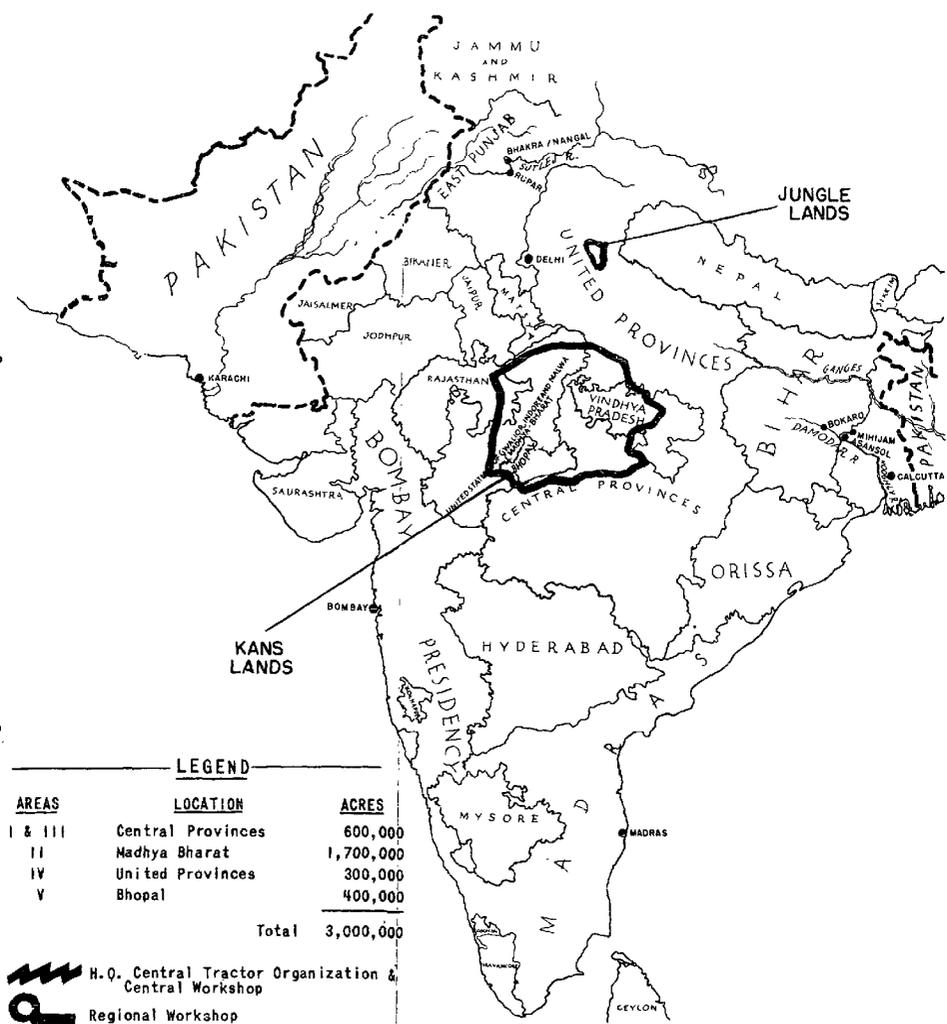
Attached:

Brief Survey of the Food Situation in India
(prepared by the Economic Department)



INDIA

LOCATION OF RECLAMATION PROJECTS



LEGEND

AREAS	LOCATION	ACRES
I & III	Central Provinces	600,000
II	Madhya Bharat	1,700,000
IV	United Provinces	300,000
V	Bhopal	400,000
		Total 3,000,000

IPW H.O. Central Tractor Organization & Central Workshop
 Regional Workshop
 Operational Camp Sites

INDIA

APPRAISAL OF THE AGRICULTURAL MACHINERY PROJECT

INTRODUCTION

1. Cereals are the basic food of the Indians. In the decade preceding World War II, Indian grain imports ranged between one and two million long tons annually. After the war the combined effects of partition, a series of bad monsoons, and an increase in population of approximately 3,500,000 yearly have increased the grain deficit and the Government has had to import annually between 2 and 3 million long tons of grain since 1947.
2. In order to eliminate the need for imports of grain, the Government has devised short, medium and long term programs through which it plans to increase food grain production by about ten million long tons by 1960. With this additional production, domestic crops should satisfy the consumption needs of the population expected in that year.

RECLAMATION OF KANS-INFESTED LANDS

Description of the Project

3. One of the medium term projects involves reclamation of land, the cultivation of which, owing to infestation by a weed known as kans grass (*Saccharum Spontaneum*), has been discontinued or reduced to a low level.
4. Belonging to the same family of grass as the sugarcane, kans grass is found in India up to an elevation of 4,000 feet. It thrives on wet, heavy clay soils and its mass of matted roots make it a difficult weed to eradicate. After an area is infested, the weed grows and spreads rapidly and the land gradually becomes uncultivable with the ordinary means available to the average Indian farmer. Kans flowers appear about the end of August and the seeds are scattered by the winds. Any crop more than 3 feet high acts as a windbreak to intercept the seeds which drop to the root of the windbreak. The soil, climate and moisture being favorable for germination during September, the seeds quickly take root.
5. The total acreage of kans-infested land in India is not known. The Government is surveying for possible reclamation 10,000,000 acres in central India. This area is shown on the accompanying map. Of this area about 3 million acres in the Madhya Bharat Union of States, the Central Provinces, Bhopal, and the United Provinces have already been surveyed and selected for the first phase of reclamation. Madhya Bharat and the United Provinces are normally self-sufficient in grain production, the Central Provinces a surplus area and Bhopal a deficit area. The land is at present owned by farmers who are now cultivating those tracts which are free or partly free of infestation.
6. The main soil in these lands is a heavy clay loam which sets hard during the hot weather after March. The depth of the top soil in kans-infested lands is not less than 24 inches and often it is 36 inches, or more. During the monsoon which lasts from the middle of June until the

end of September, the soil becomes very soggy and sticky and land preparation by either animal or tractor power is impossible.

7. In the area to be reclaimed normally only one crop is raised. Ploughing for cultivation takes place from March through June after which the land lies fallow during the monsoon. Following the monsoon, the usual method of cultivation is by means of a blade harrow which does not penetrate more than two inches into the soil; wheat or legume is sown by a country drill on the wet clay below the top two inches of soil.

8. The normal annual rainfall varies from 35 inches to 50 inches, most of it being received during the monsoon. In the cold weather an average of 2 inches of rainfall is received. The landslope is about 2%; consequently the surface runoff is not more than 50% and much of the rainfall during the monsoon is thus retained by the clay soil. The moisture stored is more than enough to ensure the proper germination and growth of wheat or legume and the rain in December, January, and February is sufficient to ensure the maturing of the crop.

9. The reclamation of kans-infested land has been the object of studies for over twenty years. Methods involving the use of chemicals, long periods of lying fallow, smother crops and other devices have been tried, but they have proved to be either ineffective or uneconomical. After the end of the war the Indian Government acquired some 200 heavy Caterpillar HD-7 tractors from U.S. Army surpluses. At the same time, it acquired a number of machine tools and other essential equipment and also spare parts for the tractors from the same source. A workshop was set up to rehabilitate these tractors. When reclamation work began in 1947, more than a hundred tractors had been repaired and they were put into the operation of reclaiming kans lands. During 1948, about 32,300 acres of waste or kans-infested lands were cleared. Clearing was done with a mould board plough by cutting off the roots of the kans at a depth of about 16 inches and exposing them then to the dessicating effect of the sun during the hot weather. Since most of the kans lands were privately owned, the land was cultivated by the farmers themselves with native cultivation facilities already available.

10. Owing to the hardness of the soil, the deepploughing can be done only with heavy track-laying tractors; it must be completed by May in order that the last furrow turned may be dried by the sun and all kans roots destroyed before the monsoon starts in the middle of June. Ploughing to a depth of 16 inches or more is possible because of the depth of the top soil. A serious limitation of this method is that it is uneconomical unless the lands to be reclaimed lie in blocks of at least 500 acres.

11. The results obtained demonstrated that this method of eradication is the most effective and economical so far known; some kans lands which were reclaimed in 1948 have produced 1,200 lbs. of wheat per acre per annum and more, and the reappearance of kans grass has been insignificant (.1% - 3%) after the deep ploughing. It is contended that the application of mechanical cultivation to those lands where kans grass reappears will eradicate the weed completely.

12. Because of the success obtained from the eradication of kans grass by the deep ploughing method described above, the Government of India decided to apply this method on a large scale. Since its application involves a

substantial dollar investment, the Government applied to the Bank for a medium term loan to finance the cost of heavy tractors and equipment to be purchased in the U.S.A.

13. The project before the Bank involves (a) reclamation over a period of seven years of about 3,000,000 acres located in the areas marked I to V on the accompanying map; (b) mechanical preparation of a fifth of the reclaimed land owing to the expected shortage of draught animals; and (c) reploughing every fourth year of any land where kans grass reappears.

14. Reclamation will be carried out by the Central Tractor Organization, a subordinate organization of Ministry of Agriculture of the Central Government, while mechanical cultivation and reploughing with cultivating tractors will be undertaken by the appropriate agencies of the Provincial Governments.

15. The CTO was formed in 1946. At its head is a chairman who enjoys the administrative and financial powers delegated to all heads of Departments. It is the policy of the Government to operate CTO on a "no-profit no loss" basis.

16. CTO has now 360 trained operators to operate the first 180 heavy tractors which are expected to arrive in India before the end of 1949. Training of other operators is proceeding in accordance with a plan laid down by the CTO. There is also a nucleus of trained mechanics and superintendents, and more are being trained. It is proposed to fill the posts of Chief Engineer and one of the superintending engineers with U.S. or European engineers.

17. After assembly of the tractors in the regional workshop, units of fifteen tractors each with necessary land clearing and ploughing equipment will be allocated to the specific areas scheduled for reclamation. Each unit will have attached to it a mobile workshop to render field service to tractors in operation. Other equipment for each unit will consist of two service trucks, one mobile lubricator, one mobile crane, and two or three trailers.

18. According to the experience gained with reconditioned tractors one new tractor should reclaim one acre of weed-infested land in one hour. The target fixed by CTO for a unit of fifteen tractors is 20,000 acres in a season of 1400 hours.

19. Before the beginning of the reclamation season, the Provincial Governments will map the areas to be reclaimed, and on the basis of special authority conferred upon them by the Kans Eradication Acts, turn over the land to the CTO for reclamation, after marking the boundaries of the individual farms.

20. The reclaimed land will be turned back to the farmers for animal cultivation. Mechanical cultivation will be provided where needed and mechanical reploughing assured at intervals of four years to eradicate any kans reappearing in the reclaimed areas. As the reploughing can be done with cultivating tractors from early in March through May, the use of cultivating tractors for this purpose will not interfere with the normal work of land preparation which extends from October 15 through December 15.

21. The fuels and lubricants to be used by CTO will be procured by the Government out of its own resources. The Government will also assure the supply of fuels and lubricants to the Provincial Governments for cultivation tractors. Their transport has been afforded high priority.

22. The main crop to be produced in the reclaimed area is wheat which will be rotated with a pulse called gram in the proportion of 2:1.

23. The Government proposed to leave to the farmer his present grain production. It will collect annually from the increase in production at the official procurement price the equivalent of the cost of reclamation spread over seven years from the time of reclamation and the annual cost of mechanical cultivation. Furthermore, it will purchase 60% of the balance of the grain increment under compulsory procurement.

24. The grain obtained from the reclaimed lands will be used for distribution mostly in the same or adjoining areas and will replace grain which was formerly imported from other areas. The transport and storage facilities for this grain will be provided by the Governments concerned.

25. There will be sufficient trained operating personnel in 1950 to operate 23 units of 15 tractors. Since each unit of the 23 units of heavy tractors will reclaim 20,000 acres per season, the total land reclaimed annually will be 460,000 acres. As all the tractors will not arrive at the site at the beginning of the first season, it is estimated that only 290,000 acres will be reclaimed in 1950. At this rate, the reclamation of 3,000,000 acres will take seven years. By the end of that period each tractor will have operated for 10,000 hours and its useful life will be ended. The estimated total acreage reclaimed at the end of each of the seven years is shown below:

<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
290,000	750,000	1,210,000	1,670,000	2,130,000	2,590,000	3,050,000

Cost of the Project^{1/}

26. The capital cost of the reclamation phase of the project involves the acquisition by the Central Government of buildings, heavy

1/ Dollar equivalents have been calculated in this appraisal at the following rates:

R1 = \$.21
L1 = \$ 2.80

tractors, ancillary equipment and spare parts at the outset of the project, and of additional spare parts for tractors in the fourth year of operation. The capital cost of mechanical cultivation involves the acquisition by the Provincial and State Governments of buildings, cultivating tractors and ancillary equipment in the course of each of the seven years at a rate corresponding approximately to the acreage reclaimed. The estimated annual capital investment for reclamation and cultivation and the breakdown of this investment by currencies are shown below:

Capital Investment in Dollar Equivalent in Millions

	<u>By years</u>							<u>Totals</u>
	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	
Reclamation	12.2	--	--	1.7	--	--	--	13.9
Cultivation	<u>1.4</u>	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>	<u>11.0</u>
Totals	13.6	1.6	1.6	3.3	1.6	1.6	1.6	24.9

By currencies

	<u>U. S. Dollars</u>	<u>£ Sterling</u>	<u>Rupees</u>	<u>Totals</u>
Reclamation	8.8*	2.3	2.8	13.9
Cultivation	<u>--</u>	<u>9.1</u>	<u>1.9</u>	<u>11.0</u>
Totals	8.8*	11.4	4.7	24.9

* About half of this amount will be spent in 1949.

27. The dollar investment for which a loan of \$8,750,000 is requested from the Bank represents the cost of the 345 heavy tractors (110 H.P. on the drawbar and more), part of the ancillary equipment, spare parts and ocean freight. The sterling expenditures represent a part of the ancillary equipment for reclamation, 2,000 cultivating tractors (between 30 and 40 H.P. on the drawbar), cultivating equipment, spare parts and ocean freight. The rupee expenditures represent the cost of the buildings, vehicles, inland freight in India and the local distributors' commission on the tractors and equipment purchased in the U.S.A. and U.K. The sterling and rupee expenditures will be financed by India.

28. The cost per hour (and per acre) of fuel, lubricants, oil, labor, overhead, insurance on the heavy tractors and interest calculated at $3\frac{1}{2}\%$ per annum are estimated to amount to Rs. 30 (\$ equivalent \$6.30) including a provision for unforeseen expenses. Since the useful life of the tractors and implements will be seven years (that is, 10,000 hours of operation, the

amortization charge per hour (and per acre) of tractors and equipment as well as buildings calculated on a seven-year basis amounts to Rs 22 (₹ equivalent ₹4.62), so that the total operating cost per hour (and per acre) amounts to Rs 52 (₹ equivalent ₹10.92).

29. The annual cost of reclamation will be apportioned and charged by the Central Government to the Provincial Governments. The latter will pay the Central Government at the end of each operating year the cost of reclamation done in that year and will charge the cost to the farmers whose land was reclaimed. The repayment by the farmers will be prorated, over seven years, the first installment becoming due after the sale of the first crop, i.e. in the year following reclamation. The installments will be payable together with and will be subject to the same collection procedures as land taxes. Thus, while each year the Central Government will recover the costs of reclamation performed in that year, the Provincial Governments will recoup such amount over a period of eight years from the date of payment to the Central Government.

30. The table on page 7 shows the operating costs of reclamation and their recovery by the Central Government (CGO) from the Provincial Governments and by the Provincial Governments from the farmers.

31. The cost per acre of fuel, lubricating oil, labor, insurance and over-head on the cultivating tractors, and interest calculated at $3\frac{1}{2}\%$ annually is estimated to amount to Rs 14.4 (₹ equivalent ₹3.02), including a provision for unforeseen expenditures. Total operating cost per acre including amortization of tractors, implements and buildings over a seven-year period is estimated to amount to Rs 27 (₹ equivalent ₹5.67). The costs incurred each year for partial mechanical cultivation including amortization of tractors and equipment will be recouped by the Provincial Governments from the farmers in the year following cultivation and will also be subject to the same collection procedures as land taxes.

32. The cost per acre of reploughing the land with cultivating tractors to eradicate kans grass if it reappears has been estimated at Rs 7 (₹ equivalent ₹1.47) which will be paid by the farmers in the year following reploughing.

33. Thus payments per acre to be made by the farmers will be as follows: Rs 52 (₹ equivalent ₹10.92) for reclamation, Rs 27 (₹ equivalent ₹5.67) for partial mechanical cultivation (if such cultivation is required by the farmer), and Rs 7 (₹ equivalent ₹1.47) for additional reploughing of land where kans grass reappears.

Returns from the Project

34. The yields from those kans lands which are still cultivable are not more than 250 pounds of wheat or gram per acre as compared with an average of about 750 lbs. obtained from the same types of soils elsewhere in India. In 1949 yields of 1,200 to 1,500 lbs. were obtained from lands reclaimed by tractors in the preceding year. As a result of the long period of idleness of the lands, the effect of deep ploughing and the organic fertility provided by the ploughed-up kans grass, yields are expected to remain at an average of 1,000 lbs. per acre over a seven-year period.

35. Under the International Wheat Agreement the average price of wheat landed in Bombay from 1951 through 1953 (when the agreement expires) is \$73.20 or Rs 350 per long ton. This is approximately equivalent to the Government procurement prices paid prior to devaluation for wheat in Central India. It is about Rs 175 less than recent wheat prices in free Indian wholesale markets. As a result of devaluation, it is likely that future Indian grain prices in rupees will tend to move upward rather than downward. Hence, the F.A. prices are taken as a basis for estimating prospective primary market prices for wheat in India during the period of reclamation. After allowing for a spread of Rs 50 between prices at the farm and in primary markets, the expected price to the farmer on this basis would be around Rs 300 per long ton for wheat. Gram prices at the farm have been taken at about Rs 2 less per maund than wheat or at Rs 250 per long ton. On the assumption that the production ratio of wheat to gram will be 2:1 the combined price of grain would, therefore, be Rs 283 or say Rs 285 per long ton.

36. As the costs of animal cultivation and the farmer's labor in India are not readily available, no comparison can be made of the total cost of production with the estimated returns from reclaimed lands. To indicate the size of the returns which the farmer will obtain from this project, estimates have been made on the basis of average cash receipts and cash expenditures of a reclaimed farm (excluding the farmer's own labor, depreciation of implements and buildings, replacement of bullocks, interest on mortgage or rent, etc.). It is to be noted that, at least during the first seven years, it is intended to raise a crop a year on the entire reclaimed land. The table on the following page gives the expected annual return to an average farm of 20 acres. This table shows that, with a yield of 1,000 lbs. of grain per acre, an animal cultivated farm of 20 acres will have (at Rs 285 per long ton of grain) an annual cash income of about Rs 1660 after fixed payments and provision for the farmer's own and his family's food, fodder for his bullocks, and seed. This sum will be available to recompense the farmer for his own and his family's labor and to provide for depreciation of implements and animals, interest on the mortgage, rent, and return on investment. The cash income from a mechanically cultivated farm would be about Rs 1305. Should the yield drop to 500 lbs. per acre and at the same time the price of grain decline to Rs 1 per lb. (Rs 224 or 47 per long ton) an animal cultivated farm would still show some cash income. At this yield and price level a mechanically cultivated farm would be deprived of cash income.

37. Other important benefits to the Indian economy would derive from the increased grain production. The surplus grain from the reclaimed farms which will reach the markets through the government procurement system and through direct sales by farmers (see paragraph 23) will decrease the grain deficit. The table on page 10 gives an estimate of the volume and value of marketable grain excluding existing production on unreclaimed areas.

38. As shown in the table, if the annual yield of 1,000 lbs. per acre is maintained over the seven-year period, the volume of grain available to the markets is estimated to range from 96,000 long tons in the first year of marketing, i.e. 1951, to 1,020,000 long tons in the seventh year, i.e. 1957. One million tons of grain represents about 2% of the average annual grain production in India. On the basis of the above estimate, the value of the grain available to the markets (not the total production) over the seven-year period, i.e. from 1951 through 1957 at Rs 285 per long ton would amount to Rs 1,112 million (equivalent to \$234 million). During the same period

Estimated Receipts, Fixed Payments and Cash Income of an Average Reclaimed Farm

Basic Data and Assumptions

Average farm:	20 acres
Average family:	5 people
Grain consumption per head:	365 lbs. p.a.
Grain for seeds:	82 lbs. per acre p.a.
Grain for fodder:	1,460 lbs. p.a. per pair of bullocks
Annual charge for reclamation:	(Rs 52 ÷ 7) Rs 7.5 per acre
Annual charge for cultivation:	Rs 27 per acre
Charges for reploughing every 4th yr:	Rs 7 per acre
Partially mechanically cultivated area:	4 acres (1/5 of total)
Animal cultivated area:	16 acres (4/5 of total)
Annual tax:	Rs 3 per acre
Average expected yield:	1,000 lbs. per annum per acre
Wheat area:	14 acres
Gram area:	6 acres
Assumed average price of wheat:	Rs 300 per long ton = Rs .134 per lb.
Assumed average price of gram:	Rs 250 per long ton = Rs .112 per lb.
Assumed average combined price of wheat and gram:	Rs 285 per long ton = Rs .127 per lb.

Receipts:

Yield: 1,000 lbs. of grain per acre x 20 acres =		20,000 lbs.
Less: Grain for food: 5 persons x 365 lbs. =	1,825 lbs.	
Fodder, 2 bullocks =	1,460 lbs.	
Seeds: 82 lbs. x 20 acres =	<u>1,640 lbs.</u>	
	4,925 lbs.	
	Say:	<u>5,000 lbs.</u>
Available for Govt procurement and marketing,		15,000 lbs.

A. Total Receipts @ Rs .127 per lb. Rs 1,905

Fixed Payments:

Repayment for reclamation (20 acres x Rs 7.5)	Rs 150
Repayment for reploughing (every 4th year) (20 acres x Rs 7 ÷ 4)	Rs 35
Tax (20 acres x Rs 3)	<u>Rs 60</u>

B. Total Fixed Payments Rs 245

C. Cash Income for an animal cultivated farm Rs 1,660 ^{1/}

Similar calculation for lower yields and prices give the following results:

<u>Yield per acre (lbs)</u>	<u>Price per lb.</u>	<u>A</u>	<u>B</u>	<u>C</u>
750	Rs .127 (2.67¢)	Rs 1,270	Rs 245	Rs 1,025
750	Rs .1 (2¢)	Rs 1,000	Rs 245	Rs 755
500	Rs .127	Rs 635	Rs 245	Rs 390
500	Rs .1	Rs 500	Rs 245	Rs 255

^{1/} For a mechanically cultivated farm, fixed payments will be increased by Rs 540 (20 acres x Rs 27) and receipts by Rs 185 (value of 1,460 lbs. of fodder), leaving a cash income of Rs 1,305.

Estimated Production of Grain and Marketable Surpluses

(In thousands of long tons and millions of Rupees)

<u>1951</u>		<u>1952</u>		<u>1953</u>		<u>1954</u>		<u>1955</u>		<u>1956</u>		<u>1957</u>		<u>Totals in the period 1951-57</u>	
<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>	<u>T</u>	<u>Rs</u>
<u>Estimated Tonnage and Value of Production 1/</u>															
129	37.0	334	95.0	539	154	744	212	949	270	1155	329	1360	388	5210	1485
<u>Estimated Tonnage and Value of Grain Procured by Governments 2/</u>															
64	18	167	48	269	77	372	106	474	135	577	164	680	194	2603	742
<u>Estimated Tonnage and Value of Farmers' Surplus Grain Unprocured by Governments 3/</u>															
32	9	83	24	134	38	186	53	237	68	288	82	340	97	1300	371
<u>Estimated Total Marketable Grain</u>															
96	27	250	71	403	115	558	159	711	203	865	247	1020	291	3903	1112

1/ Grain production per acre: 1,000 lbs per acre at Rs 285 per long ton (composite price for wheat and gram)

2/ Procurement per acre: 500 lbs at Rs 285 per long ton.

3/ Unprocured surplus per acre: 250 lbs at Rs 285 per long ton.

the cost of reclamation, cultivation and reploughing incurred at the Government's initiative to obtain this production (not the total cost of production) is estimated at \$48.6 million (reclamation - \$33.1 million; partial mechanical cultivation - \$13 million; and additional reploughing - \$2.5 million). This comparison illustrates the magnitude of the anticipated benefits to the Indian economy.

39. Even if the yield should drop to 500 lbs. per acre over the entire project, resulting in a decrease of marketable grain to 250 lbs. per acre, and at the same time the average price to Rs 224 (\$47) per long ton, the value of grain marketed during the seven years, Rs 291 million (equivalent to \$61 million) would still exceed the combined cost of reclamation, cultivation and reploughing during the same period.

40. From the balance of payments point of view, in addition to capital investments in machinery and equipment, the Government will import fuel and lubricants. It is estimated that the total cost of fuel and lubricants will amount to \$11.2 million. The total foreign exchange cost of the project over the seven-year period will amount to (in dollar equivalent):

	\$21.9 million for capital investment and interest payable in foreign exchange
	11.2 million for fuel and lubricants
Total	\$33.1 million

At the average IWA wheat price of \$73.20 per long ton, this sum is equal to the cost of about 450,000 long tons of wheat. If the annual yield per acre averages 1,000 lbs., as much as 750,000 tons of grain (wheat and gram) may be made available to the market from the project by the end of 1953. Thus, in the fourth year of the project, the value of the marketable grain may exceed the foreign exchange cost estimated for the seven year period.

Conclusions

41. The method proposed to reclaim kans-infested lands is relatively new. Tests made over a period of two years by expert Indian agronomists have demonstrated that (i) the kans grass eradicated by this method has not reappeared to any significant degree; (ii) the yields from the lands have been almost twice as large as yields from similar kans free soils. It is possible that over a period of more than two years from the time of reclamation kans grass may reappear and the yields may decrease. The proposed application of mechanical preparation of the land and the provision for reploughing of the lands every fourth year where the grass reappears is believed to provide satisfactory means to prevent reinfestation. Through further research, which the Indian Government intends to carry on, better and perhaps less expensive methods to eradicate kans grass may be found. However, since the reduction of food deficits is an urgent problem and the project is remunerative even if the returns fail to reach the estimates by more than a third, and costs increase by about a third, the acceptance of the proposed method is justified.

42. The CTO, a Government department, is headed by an agricultural engineer with long experience in farming who has directed the Government research in the eradication of kans grass through deep ploughing. The available technical personnel and the training program for additional

personnel give sufficient assurance that the project will be carried out with satisfactory efficiency. The tractors and equipment selected for the project and the provision for spare parts are considered by the Bank's experts as appropriate for operating conditions prevailing in India. The detailed plans of operations laid down by CTO are also considered sound and efficient. The Central Government has obtained from the Provincial Governments concerned assurances of cooperation in the production and cultivation phases of the project and the procurement of grain.

43. The cost estimates have been based on the assumptions that labor wages will not increase. The cost of fuel and lubricants has been adjusted to reflect the recent devaluation. The depreciation of tractors and machinery as well as buildings has been calculated on a seven-year basis, i.e. over the duration of the project. Moreover, a small contingency reserve of total operating cost has been included. Since at this time it is not possible to foresee the effects of devaluation on the operating costs of the project, the method of cost calculation used in the appraisal is believed to be the only practical one.

44. The expected average yields of 1000 lbs. per acre for the seven year period are considered to be justified.

45. The price estimates are based on the average International Wheat Agreement prices and recent Government procurement prices. (Recent free wholesale market prices of wheat in the interior of India are about 50% higher than the prices used in the estimated.) Results calculated at considerably lower prices indicate that the project will still leave a satisfactory margin of profit. The profit to the farmers cannot be estimated because of the lack of data. However, estimates of cash profits indicate that the farmers, whose present returns in the kans grass area are negligible, will obtain satisfactory returns. Results calculated at considerably lower prices and yields indicate that the project will still leave a satisfactory margin of profit.

46. The advantages to the economy as a whole will be sizeable. In addition to the improved position of the farmers in the kans-infested area, the markets will receive additional domestic grain, beginning in the second year of the project. The annual marketable grain may amount to as much as one million tons in the seventh year. This would be equal, at the existing rations, to the amount of grain needed to feed about 8 million people. The long term benefits of the project will depend on the success of the proposed method in keeping the lands free from reinfestation. But even if after the seventh year from reclamation the lands again become infested, the benefits of the project obtained during the seven years would justify the investment.

47. The grain deficit in India is a major factor in her balance of payments deficit. It is estimated that the project will increase the domestic production well above its foreign exchange cost and, if the targets of production are reached, its value will be equal in the fourth year to the total foreign exchange cost. Thus, the proposed investment in foreign exchange is also justified.

RECLAMATION OF JUNGLE LANDS

Description of the Project

48. The Indian Government's plans for reclamation are not limited to the eradication of kans grass; they include also the reclamation of scrub jungle lands covering 2.2 million acres where the heavy brush and undergrowth and other factors have made cultivation impossible. From experiments conducted by the CTO on a small scale in the United Provinces with old equipment obtained from U.S. Army surpluses, it has been learned that the time required to reclaim jungle land is about $2\frac{1}{2}$ hours per acre as compared with one hour per acre required for the reclamation of kans lands. In addition, the domestic currency costs involved in the reclamation of jungle lands are high since provision must be made for drainage, malaria control and colonization. In spite of the higher costs involved, the results of the experiments have been sufficiently encouraging to warrant the undertaking of a pilot project. Accordingly, the Government has requested the Bank to finance the dollar component of the capital investment required for a pilot project to be undertaken with modern equipment. Two units of 15 heavy tractors each and ancillary equipment would be sufficient to determine the practicability of large scale reclamation of scrub jungle lands with modern equipment. The initial dollar investment for the heavy tractors, special tools, other equipment, the initial orders of spare parts and freight within the U.S. is estimated at \$1.2 million. The initial sterling investment is estimated at the dollar equivalent of about \$200,000 to cover the cost of additional equipment. The CTO which will carry out the reclamation of the kans infested lands will also undertake this pilot project. The area of about 100,000 acres where the experiment will be conducted is indicated on the accompanying map. It consists mostly of land where two crops can be raised annually. Since it is owned by the Government of the United Provinces, cultivation will be carried out for the first two or three years by that Provincial Government. Full mechanical cultivation will be provided for one-half of the reclaimed land while partial mechanical cultivation will be applied to the other half. It is proposed that, after two or three years, the land will be sold in units of 10 to 20 acres to individual farmers. The cost of the fuel and lubricants which the Government will have to import annually will be provided out of India's own resources. In accordance with the Bank's requirements, the CTO will maintain records and install an appropriate accounting system to show the results achieved under the pilot project.

Cost of the Project

49. The Bank is requested to grant a seven-year loan for this project in the amount of \$1,250,000. Repayment of principal is proposed to start in June, 1952, at the rate of about \$250,000 annually.

Conclusions

50. While the financing of a large scale project of jungle clearance could not be considered at this time owing to high costs, the slow rate of reclamation and complex problems of colonization, the financing of a pilot project is justified. Under a project of this size, no serious problems of internal financing will arise, while the clearing of 100,000 acres of new land on which two crops will be raised annually will contribute towards the reduction of the land shortage and food deficit. In view of the land shortage

the clearing of new lands is an important undertaking. The pilot project will enable the Indian Government to assess the costs and returns of such clearing on a large scale with modern equipment.

BRIEF SURVEY
OF
THE FOOD SITUATION IN INDIA

India has placed the highest priority on increased production and more effective utilization of foodstuffs. The country has organized a nationwide campaign with the immediate objective of food self-sufficiency by 1952 and with the longer range target of a gradual improvement in the dietary standards of the population.

The urgency of the food problem has been emphasized by a combination of recent circumstances. Harvests have been poor since 1946. Food surplus areas were separated from India by Partition. The marketable proportion of domestic crops has been reduced by a larger consumption on the farm as a result of higher rural income. Meanwhile India's requirements have been constantly increasing with the growth in population at the rate of more than 3 million persons per year. Despite this situation the new Indian Government has assumed the obligation to assure the entire population of at least some daily allowance of grain. Pursuit of this policy has meant an increasing dependence on food imports. Foreign food purchases rose consistently from under a million tons in 1945 to 2.8 million tons in 1948. ^{1/} In 1949 they are expected to total over 3 million tons.

It is this situation which bears a major responsibility for India's recent balance of payments difficulties, especially in its hard currency accounts. In 1948, for example, Government food imports represented about 20% of total and hard currency imports. Elimination of food imports would have all but wiped out the current deficit in India's hard currency balance of payments and would have turned the over-all balance of payments deficit on current account into a surplus.

Recent improvements in the food supply position of soft currency areas will now permit India to obtain a larger proportion of food imports outside the hard currency area than has been possible in the past few years. However, the rapid deterioration in India's soft currency balance of payments position since the latter part of 1948 emphasizes the necessity for over-all economies in imports as well as a reduction in those from hard currency countries. Furthermore, to the extent that India remains dependent on consumption goods imports, its ability to purchase foreign equipment for urgent development purposes is curtailed.

Theoretically, the potentialities for increased food production are enormous. Present yields are extremely low even by Asiatic standards. However, the backwardness and ignorance of the typical cultivator and scarcity of the necessities for improved techniques makes the realization of India's agricultural potentialities a most difficult task.

^{1/} Grain imports represented about 6% of the estimated total supply of approximately 45 million tons of cereals and pulses available for consumption in India in 1948.

To cope with this task the Central Government, with the cooperation of Provincial agricultural administrations, has organized a three phase program of agricultural development. It includes:

- (1) Short term measures to improve yields on areas now under cultivation where adequate supplies of moisture are assured. These aim at an increase in annual grain production by 4 million tons over a five year period.
- (2) Medium term measures, extending over two to seven years, including reclamation of weed infested and virgin lands and deep well irrigation. An annual addition of 3 million tons is anticipated from these projects.
- (3) Long range multi-purpose river development projects, irrigation from which is expected to add 4 - 5 million tons annually to the grain supplies by the end of a 10 to 15 year period.

Other phases of the food program include additional attention to high nutritional non-cereal crops, diversion of non-food crop areas to food production, improvement in the handling and storage of foods, emphasis on agricultural experiment projects, and an extension and improvement in controlled grain procurement and distribution.

Special emphasis is placed on the procurement and distribution phase of the program as a means of short run self-sufficiency. Through an extension of compulsory collections of grain production in excess of farm consumption and seed requirements, the Government hopes that by 1952 the system will provide sufficient grain to meet rationing commitments without resort to imports. The Government foresees a subsequent additional expansion in supplies for rationing purposes through its plan to procure at least 60% of the additional grain resulting from measures taken under the program for increased agricultural output.

Realization of the established targets under the food production campaign would add upwards of 10 million tons to India's grain supply over a decade, while the procurement scheme would permit the present population under rationing to be increased by more than 50% at existing ration standards during the same period. This would not only eliminate the necessity for imports but would permit a significant increase in consumption levels.

The extent to which actual results of the food campaign will approach the announced objectives is of course impossible to determine. Judging by past "grow more food" programs it is probable that anticipated gains are unduly optimistic. Nevertheless, the present campaign for food self-sufficiency exceeds anything previously attempted in its scope, priority of importance, and in the energy being devoted to agricultural improvement at all administrative levels.

Self-sufficiency at present consumption standards over the next decade would require additions to India's average annual grain output in normal crop years of the order of about 6 million tons (or little more than half of the objectives of the present campaign). Such an achievement does not seem unreasonable. By conservative estimates at least 3.5 million tons of additional grain per year should be realized from the present reclamation program, the additional fertilizer available from the new ammonium sulphate plant at Sindri, and the various river development projects. It is reasonable to expect that tubewell irrigation and the numerous other measures now being taken by the Provinces to raise the low productivity of existing farms will, at the minimum, add another 2.5 million tons of grain per year within a decade.

In years of adverse weather, crop failures could of course offset these gains and again necessitate supplementary supplies from abroad. However, as irrigation facilities are extended the consequences of unfavorable monsoons will be correspondingly diminished. And the ability to meet consumption needs from given grain supplies will be enhanced as storage and transport facilities are improved, as production and consumption of non-cereal foodstuffs is increased, and as the system of controlled distribution is extended.