CENTRE FOR DEVELOPMENT STUDIES

115381

Working Paper No.71

ECONOMIC EVALUATION OF A LAND DEVELOPMENT PROJECT IN A WATER LOGGED AREA

K.P. Kannan

Centre for Development Studies
Ulloor, Trivandrum 695011

July 1978

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I

In the selection of development projects, economic evaluation, understood in the sense of detailed social cost-benefit analysis, is being increasingly advocated by not only national planning authorities but also domestic as well as international financing agencies. The purpose is to assess the net worth of a project not merely from the point of view of the groups directly involved but also from the broader social angle. The latter alone would provide a total framework to judge a project's overall impact. In practice, however, very few projects are subjected to an economic evaluation in the above sense, in a systematic fasion. The problems encountered are not merely one of methodology like, for example, the question of shadow pricing of inputs and outputs and the availability of national parameters; they are often much more basic in character. Some of them relate to the total absence of technical alternatives being considered at the stage of design, the tendency to rely on ad hoc methods of estimating costs and benefits - often inflating both or underestimating the former and overestimating the latter - and a clear lack of interaction of persons from different disciplines which is particularly crucial in agricultural projects. It is, however, not contended here that these aspects of micro-level planning are the only important considerations; the intention is only to point out that they constitute the foundation for a sound project analysis.

The project under examination is a land development project in a water-logged area in central Kerala known as the Trichur Kole Land Development Project recently undertaken for implementation by the State Governmat with financial assistance from the Agricultural Refinance and Development Corporation. The Project, as it was conceived by the authorities, is not an exception to the limitations mentioned earlier. However, our exercise is an attempt to demonstrate how best one can go ahead with the economic evaluation of a project of this kind. More often than not, both the project sponsors and financial institutions are satisfied with the evaluation which takes into account their respective costs and returns. The role of different groups involved and their respective net gains and how they affect the considerations of social profitability are hardly tackled. Particular emphasis has been given here to such aspects.

For our analysis, we had to rely in a number of places on independent sources of data and our informed judgements. On this basis, four alternative variants of the Project were considered and their relative worth examined. Methodologically, the general principles of project evaluation have been applied although no attempt was made to straight-jacket the analysis to any standard methodology of project evaluation in its entirety. The scope of our evaluation could have been expanded to take into account such aspects of "externalities" as the impact on the ecology of the area and objectives like income distributional effects since the benefits accrue to different sections consisting of farmers from various size-groups and agricultural labourers. Omission of these aspects, especially the former, is due mainly to the non-availability of reliable data at a sufficiently disaggregated level.

A brief description of the Project could be given as follows. The low-lying area extending from the banks of the Chalakudy river in Trichur district upto Ponnani in the north of Kerala is known as Kole lands. These lands covering an area of about 180 sq. kms. being below mean sea level (ranging between 0.5 M and 2.2 M below MSL) remain water-logged for a major part, about seven months, of the year. Earlier they must have comprised of shallow lagoons which got silted up, over time, by floods. Another similar land-depressed area in the State is the Kuttanad region covering an area of about 874 sq. kms.

Though the Kole land area is very fertile because of the silt and other waste materials deposited during floods, the scope for regular cultivation of paddy is confined largely to a single crop (known as Punja) during summer, i.e. between January and May. When the North-East monsoon fades off by the end of November the fields are dewatered by pumping water out into the canals. To start with, the water requirements of this crop were being met from water stored in the channels and depressions but from 1957 onwards they are met mainly from the Peechi reservoir. The total area in the Kole lands under the summer crop is about 11,000 hectares.

A winter crop (known as Mundakan) was first raised in the Kole lands in 1966 and has gradually been extended to an area of 3,500 hectares. The major hazard this crop faces is of flooding during the North-East monsoon. The winter crop is raised by dewatering the fields immediately after the cessation of South-West monsoon in August. Temporary bunds are then constructed to prevent flooding during the North-East Monsoon in October-November. The crop is of a shorter duration and the risks involved in raising this crop are considerably greater thanthe summer crop. Table 1 summarises the present cropping pattern in the Kole lands.

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Table 1: Present Cropping Pattern in the Kole Land

	Summer Crop	Winter Crop
Duration of crop	January-April	Sept. - Dec.
Variety of paddy grown	C-28 (HYV)	IR-8 (HYV)
Water requirement (MM^3)	100.63	43.69
Source of irrigation	(i) Peechi reservoir	(i) Rainfall
	(ii) Water stored in canals & depressions	(ii) Water stored in canals & depressions
Total cultivated area (hectares)	11,000	3,500
Average yield per hectare (quintals)	27.3	19.0
Total output (tons)	30,000	6,650
Major problems in cultivation	Shortage of water	Floods during N-E monsoon

As part of the State Government's programme of increasing the production of paddy in the State through intensive cultivation measures - the scope for extensive cultivation is limited in Kerala because of the near-full utilisation of cultivable area - it was thought that the Kole land area be taken up for development so that an additional crop could be raised.[1] Accordingly, a feasibility study conducted in 1969 suggested that permanent bunding of the Kole fields and improving and widening of the Kole canals for preventing water-logging of the area during the cropping season.

Based on this report but incorporating certain additional proposals a Project Report was prepared in 1971 by the State Public Works Department. This proposal envisaged (i) the construction of two storage reservoirs at the Chimoni and the Mupli tributaries of the Karuvannur river for purposes of irrigating a net area of about 20,200 hectares, (ii) the construction of two regulators for preventing the intrusion of salt water from the sea; and (iii) the development of 11,000 hectares of Kole and adjoining lands for raising an additional crop together with the construction of flood outlet to the sea at Kuttamangalam.

In 1973, the State Planning and Economic Affairs Department updated the above project and submitted it as the Chimoni-Mupli-Kole Project to the World Bank for financial assistance. The project did not pass muster because (a) the benefits were overestimated in that the feasibility of raising an additional third crop was not clearly established and (b) the cost estimates were found to be on the high side. The Project now under consideration, i.e. the Trichur Kole Land Development Project now under consideration

can be said to be a scaled down, modest version of the 1973 Project.

The Project seeks

1) to construct permanent earthen bunds around the paddy fields in the Kole lands to prevent flooding during the North-East Monsoon thus enabling the cultivators to raise Mundakan (Winter) paddy crop in an additional area of about 7,100 hectares (i.e. 11,000 minus 3,500 hectares already under Mundakan cultivation minus 400 hectares to be submerged in the course of widening and improving existing water courses);

ii) to widen and improve the existing water courses for diverting the flood waters through new cuts into the lake and improving the existing flood banks and levees; and

iii) to construct a dam across the Chimoni river for irrigating not only 11,000 hectares of Kole lands but also 2,000 hectares of peripheral land for the first i.e. Punja (summer) paddy crop. (The Project Report itself does not claim the extension of irrigation to periphery land).

While the first two items come under the land development scheme to be implemented by the Kerala Land Development Corporation, the construction of the dam will be the responsibility of the Public Works Department.

It is important to bring out straight away that the water requirements of the Kole lands (i.e. the entire 11,000 hectares) for the summer crop are at present being met from (a) the Peechi Reservoir which was completed in 1957 and (b) water stored in the channels and depressions. The Chimoni dam is supposed to replace the Peechi Reservoir as a source of irrigation for the Kole lands.

The cost estimates for the (1) development of Kole lands and (2) construction of Chimoni Reservoir are summarised in Table 2.

Table 2: Estimated Cost of Land Development and Construction of Dam

Nature of work	Estimated Cost (Rs. in lakhs)
I Kole Land Development	
(1) Land acquisition	137.05
(2) Earth work	331.37
(3) Bridges and Regulators	162.69
(4) Miscellaneous	110.40
Total:	741.51
II Construction of Chimoni Dam	
(1) Works	576.68
(2) Establishment Charges	46.13
(3) Tools and Plant	5.77
Less: Resale value of Temporary Buildings	1.62
Add: Audit and Account charges etc.	5.76
Total:	632.72
Grand Total (I+II)	1,374.23

IV

Though the Project, as formulated, does not make explicit the various technical alternatives which might have been considered for the purpose of this evaluation exercise, it is assumed that there still are at least two alternative ways of developing the same area. One alternative is to undertake both the construction of Chimoni Dam and development of Kole lands, both works to be completed within a period of four years, as provided for in the Project Report itself. The other, we believe, can be to undertake only the development of Kole lands but to omit altogether the construction of the Chimoni Dam.

The proposal for the construction of the Chimoni Dam assumes that (a) the water now made available from Peechi reservoir for irrigating the summer crop in the Kole lands is not adequate and (b) that the substitute water made available to the Kole lands during summer from the Chimoni Dam will be much more adequate and therefore stabilising. In short, both the construction of a dam across the Chimoni river and diversion of water from the Peechi reservoir are considered essential.

Though the assumption regarding the inadequacy of the existing supply of water to Kole lands for the summer crop is extremely crucial to the proposal for constructing the Chimoni Dam, it has not been elaborated upon in depth with supporting data in the Project Report. To examine the viability of this assumption, estimates of yield for the three taluks comprehending the Kole area were collected by us. The yield per hectare of 27.3 quintals (average for the 5 years period 1969-74) and 29.4 quintals (average for the three year period from 1971-74) is one of the highest for the State (See Tables A-3 and A-4). Since the yield figures, as mentioned above, refer to the 3 taluks and not to Kole area

proper, it is very likely that the Kole area itself being more fertile than other lands, had even higher yields. That being so, it is difficult to accept the proposition that Kole lands are, at present, suffering from shortage of water during summer.

As for the winter crop, the question of shortage of water does not arise. Then, the problem is one of flooding.

Further, information on the incidence of crop failure in the area was sought from the State Department of Agriculture. The information furnished (see Table A-1 in the Annexure) showed that for the last five years the area adversely affected by shortage of water was only 5 per cent. In the circumstances, it appears that the second alternative of developing only the Kole land proper through the construction of permanent bunds and widening and improving water courses without the construction of Chimoni Dam is quite feasible and worthwhile examining. Whatever little shortage of water exists at present could be overcome by deepening the channels and depressions in the area, an alternative which finds no place in the Project Report. In fact, the main source of water for irrigating the summer crop in the Kole lands before the commissioning of the Peechi reservoir in 1957 was the channels and depressions.

The two alternatives mentioned above have been evaluated first with a phasing period of 4 years and then with an 8-year phasing. Thus, this exercise can be said to consider four alternatives (see Table 3).

III

As a first step in this evaluation exercise, it was necessary to scrutinize the estimates of costs and benefits in terms of resource flows of the Project over its life time. For the purpose of this exercise, ev-

Table 3: Costs and Benefits under Different Project Alternatives

Costs	Benefits	Area Benefitted (hectares)	Phasing
Alternative - I			
Capital Investment			
1. Land Development (Construction of bunds, etc.)	1. Additional Winter (Mundakan) Crop in Kole lands	7,100	
2. Construction of Chimoni Dam	2. Stabilization of existing Winter (Mundakan) Crop in Kole lands	3,500	4 years
Annual Costs			
3. Cultivation of Paddy (Winter and Summer Crops)	3. Additional Summer (Punja) Crop in the Periphery lands	2,000	
4. Cultivation of Coconut	4. Stabilization of existing Winter (Mundakan) Crop in the periphery lands	2,000	
	5. Additional yield from Coconut cultivation		
Alternative - II			
Capital Investment			
1. Land Development (Construction of bunds, etc.)	1. Additional Winter (Mundakan) Crop in Kole lands	7,100	
Annual Costs			
2. Cultivation of Paddy. (Winter crop)	2. Stabilization of existing Winter (Mundakan) crop in Kole lands	3,500	4 years
3. Cultivation of Coconut	3. Additional yield from Coconut cultivation		
Alternative-III	As in Alternative-I		8 years
Alternative-IV	As in Alternative - II		8 years

luation has been attempted separately assuming life-spans of 20 and 30 years. However, it is felt that for a project of this type with a long physical life, evaluation on the basis of a somewhat longer life-span than is usually allowed for by financial institutions would be more reasonable.

Costs are divided into two major categories: capital costs and operating costs. Capital costs cover the costs of land development including construction of permanent bunds and construction of the Chimoni dam. The information given in the Project Report was subsequently supplemented by the Project formulators by a break-down of these costs in terms of their material and labour (skilled and unskilled) components. Neither the engineering details of these estimates nor the technical choices considered in various items of work have been scrutinised by us for the purpose of this exercise. Neverthless, it should be borne in mind that the technical choices implicit in such estimates do have certain cost implications. The costs may be higher or lower depending on the materials used and designs adopted.

Operating costs include not only the maintenance of the capital assets but also the costs of cultivation of paddy and coconut in the Project area. Though the Project Report does not envisage planting coconut trees along permanent bunds, costs as well as benefits of planting coconuts have been incorporated in this exercise because it would add, marginally though to the net benefit of the project. For this purpose, reasonable estimate of the cost of coconut cultivation was relatively easy to make on the basis of the cost data collected by the Central Plantation Crops Research Institute, Kasargod. Estimates, however, of costs of cultivation of paddy cultivation incorporated in the Project Report were found to be at great variance with the data used in the Engineering Report on the Chimoni Dam. Further both these sets of data were not found to comprehend the existing cultivation

practices. They appear to have been worked out on the basis of some normative judgement of optimal system of cultivation. It was felt however that valuation on the basis of such estimates would be quite unrealistic.

Fortunately, data on cost of cultivation of paddy in Kerala State has been regularly collected under a research programme of the Ministry of Agriculture, Government of India. These data were collected on the basis accepted methods of sampling and data collection and hence carry a better scientific basis than other sources. The data on cost of cultivation for a representative area in the Kole lands are given in the Annexure (Table A-2) for the winter and summer crops. Comparison of these costs with the estimates given in the Project Report shows that the latter are overstated to the extent of 16 per cent (for summer crop) and 22 per cent (for winter crop). For the purpose of this evaluation exercise, the former cost estimates have been adopted.

On the benefit side, the most important benefit of the Project would be the yield from raising the second, i.e. winter, crop. To estimate the yield, a five-year, 1972-76, average for the three taluks in which the Kole lands fall, has been taken as the basis (see Tables A-3 and A-4). It ought to be stated, however, that only 3,500 hectares of a total of 11,000 hectares of cultivable Kole land has so far been under winter crop. To the extent that land already brought under winter crop was of better quality and therefore had better yield the adoption of a five-year average yield could be said to result in overestimating the benefit of this Project. At the same time, it cannot be overlooked that the entire Kole lands are likely to benefit during winter from the fact that permanent bunds will reduce the incidence of flooding. So there is scope for improvement in yield for the entire area. However, this is an aspect considered separately. The major benefit of the Project is claimed in terms of improvement in yield from the land

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already under cultivation for one or two crops. It is not quite clear what the basis is for expecting improvement in the yield from summer crop. As was noted above, the average yield is high. It could be argued that since the same land will hereafter be used to raise two crops, the yield from the crop will decline though the overall yield per hectare from the two crops taken together is very much higher than before. Therefore, in this exercise no credit has been taken for improvement in yield per hectare, as far as summer crop is concerned. Credit has been taken however at 20% of the existing average yield of winter crop as likely to accrue from improvement on account of better protection afforded to this crop against flooding. This improvement in yield per hectare, it is assumed, be brought under winter crop as a result of this Project. No additional cost has been provided for in this evaluation so that the improvement in yield allowed for in the estimates of yield of winter crop raises the net benefit from the Project by the full amount.

Thus, for the purpose of this exercise, the paddy output is projected at the rate of 27.3 quintals per hectare for the summer crop and 23 quintals per hectare for the winter crop as against the estimate of 30 and 37.5 quintals respectively given in the Project Report.

It must be added however that to project output per hectare on the assumption of existing cultivation practices which is implicit in the adoption of a five-year average yield ignores that yield could be much higher than what it actually is, if and when (a) better water management practices are followed like supply of adequate water at critical periods during summer crop and (b) still better protection is available from floods to the winter crop. It could lead to the increased use of inputs like fertilizers, pesticides, etc. which would raise the cost of cultivation but simultaneously would also result in higher yields. On this basis it is

possible to talk of "expected benefits" at a higher level of technology of cultivation. However, to estimate uch "expected benefits" is difficu in the absence of data from studies on comparable land with similar agro-climatic conditions.

The pricing of paddy is the next important problem to tackle in order to evaluate the benefits of the project. For rice/paddy, dual pric obtains in Kerala State where some 40 per cent of the rice consumed is distributed through Fair Price Shops and the balance is sold in the open market at a clearing price much above the fair price. While the adoption of the fair price would under-estimate the benefit of the project, to adopt the market clearing price would everestimate the benefit. In a situation like Kerala's, where the paddy/rice is regularly purchased in large quantities from outside the State, the price paid for such paddy/ri could be reckoned as the relevant opportunity cost of paddy/rice produced additionally within the State. Fortunately, the data on the quantities a prices of rice purchased from other States by the Kerala State Civil Supplies Corporation was possible to obtain for the past five years. The weighted average price of rice thus purchased comes to Rs.2,171 per ton.

Table A-5 gives the details of rice purchased by the Kerala State Civ Supplies Corporation from other States. Since the additional output of paddy due to the Project is only marginal compared to the State's annual demand for additional quantities of paddy/rice from outside the State, it is not likely to affect the price of rice procurred from other States. Therefore the valuation of the additional output of paddy in the Kole lands on account of the Project on the basis of the price paid to rice purchased from outside the State appeared to be the most reasonable course to adopt. The paddy-to-rice conversion ratio has been taken at 3:2.

Table 4: Summary of Flow of Benefits and Costs (. in Lakhs)

Sl. No.	Item	0	1	2	3	4	5-7	8	9	10-30
A.	BENEFITS									
1.	Additional Winter Crop in Kole Land	-	-	25.0	87.6	250.3	250.3	250.3	250.3	250.3
2.	Stabilisation of existing Winter Crop in Kole Lands	-	-	2.1	7.5	21.5	21.5	21.5	21.5	21.5
3.	Additional Summer Crop in Periphery Lands	-	-	8.3	29.3	83.7	83.7	83.7	83.7	83.7
4.	Stabilization of existing Winter Crop in Pheriphery lands	-	-	1.2	4.3	12.3	12.3	12.3	12.3	12.3
5.	Coconut Cultivation	-	-	-	-	-	-	0.6	2.0	5.7
B.	COSTS									
6.	Land Development	49.2	85.7	111.8	68.2	-	-	-	-	-
(a)	Materials	19.6	29.8	39.1	22.7	-	-	-	-	-
(b)	Skilled labour	9.1	17.4	24.3	15.0	-	-	-	-	-
(c)	Unskilled labour	20.5	38.5	48.4	30.5	-	-	-	-	-
7.	Maintenance	-	-	-	-	7.9	7.9	7.9	7.9	7.9
(a)	Materials	-	-	-	-	2.4	2.4	2.4	2.4	2.4
(b)	Skilled labour	-	-	-	-	2.4	2.4	2.4	2.4	2.4
(c)	Unskilled labour	-	-	-	-	3.1	3.1	3.1	3.1	3.1
8.	Chimoni Dam	36.7	136.4	223.7	223.7	-	-	-	-	-
(a)	Materials (including other charges)	27.6	55.8	78.6	78.6	-	-	-	-	-
(b)	Skilled labour	2.5	24.2	44.1	44.1	-	-	-	-	-
(c)	Unskilled labour	6.6	56.4	101.0	101.0	-	-	-	-	-

(Table 4 Continued)

Sl.No.	Item	0	1	2	3	4	5-7	8	9	10-30
9.	Maintenance	-	-	-	-	5.21	5.21	5.21	5.21	5.21
(a)	Materials	-	-	-	-	1.56	1.56	1.56	1.56	1.56
(b)	Skilled labour	-	-	-	-	1.56	1.56	1.56	1.56	1.56
(c)	Unskilled labour	-	-	-	-	2.09	2.09	2.09	2.09	2.09
10.	Coconut Cultivation	-	-	0.2	0.6	1.8	2.0	2.1	2.4	3.2
(a)	Materials	-	-	0.1	0.4	1.2	1.5	1.6	1.7	2.1
(b)	L Labour	-	-	0.1	0.2	0.6	0.5	0.5	0.7	1.1
11.	Cultivation of Paddy (Winter Crop)	-	-	17.9	62.6	178.9	178.9	178.9	178.9	178.9
(a)	Materials	-	-	11.1	38.8	111.0	111.0	110.0	111.0	111.0
(b)	Labour	-	-	6.8	23.8	67.9	67.9	67.9	67.9	67.9
12.	Cultivation of Paddy (Summer Crop)	-	-	6.1	21.4	61.0	61.0	61.0	61.0	61.0
(a)	M Materials	-	-	3.7	13.1	37.4	37.4	37.4	37.4	37.4
(b)	Labour	-	-	2.4	8.3	23.6	23.6	23.6	23.6	23.6
13.	Saving in annual repairs to bunds	-	-	0.3	0.9	2.7	2.7	2.7	2.7	2.7
C.	TRANSFER PAYMENTS									
14.	Repayment of Loan*	-	-	-	-	13.9	13.9	13.9	13.9	13.9
15.	Land Acquisition (Land Development)	69.02	68.03	-	-	-	-	-	-	-
16.	Land Acquisition (Chimoni Dam)	6.50	6.50	-	-	-	-	-	-	-

*@ Rs.1310/hectare of equal instalments for 11 years

The benefit in terms of coconut output has been estimated on the basis of (a) the yield data for Trichur District and (b) the average farm price for the 5-year period, 1970-71 to 1974-75 (see table A-6).

A flow chart of costs and benefits for Alternatives I and II of the Project, i.e. the alternatives with 4-year time phasing for the completion of capital construction, was prepared after making the adjustments and corrections on the above lines. The detailed breakdown of items in terms of resources, skilled and unskilled labour and their time phasing have been done on the basis of whatever information is given in the Project Report and subsequent discussions with the concerned officials. A summary of the detailed flow chart is presented in Table 4.

The items classified as transfer payments refer to cash transfers from one group to another which are not resource costs to the Project. When viewed from the point of respective groups they constitute as costs benefits to the group concerned. But they get cancelled when viewed from the point of view of the society as a whole.

It will be noted that the costs and benefits given in Table-4, though considerably modified and adjusted, are still at market prices. Though the market prices may not necessarily reflect the social opportunity cost of resources, it is always useful to start with an evaluation by using market prices. After all, the project costs are incurred largely through the market and also its benefits usually accrue in terms of marketed, or at least markatable, goods and services.

Itmay be recalled that the life-span of the Project is taken to be 20 and 30 years. In a sense, an agricultural development project of this nature may be considered permanent but for purposes of evaluation a life-span of more than 30 years is unlikely to make any perceptible influence on

the net worth of the Project, even on the basis of a very moderate rate of time discount. Since no single cut-off rate of discount has been stipulate for projects of this nature, three alternative discount rates were applied and the flow chart reduced to present values as given in Table 5.

The net present value of the Project at market prices NPV(M), indicates its networth in terms of the discounted surplus it is expected to generate after allowing for its various costs, capital and recurring, during its expected life-span. At market prices, the net benefits of Alternative I can be worked out as under from Table 5.

$$NPV(M) = \left[(1)+(2)+(3)+(4)+(5)+(13)\right] - \left[(6)+(7)+(8)+(9)+(10)+(11)+(12)\right]$$

Items (14) to (16) are not included since they are merely transfer payments

The results, given below for the above equation shows that the Alternative I of the Project is not viable at 10 and 12 per cent rates of discount with a 20 year life-span. If the life-span is taken at 30 years the net returns are positive at 8 and 10 per cent rates of discount. However, even with a larger life span of 30 years the Project is not viable at market prices at 12 per cent rate of discount.

NPV (M)	20 years			30 years		
(Rs. in lakhs)	8%	10%	12%	8%	10%	12%
	+105	-20	-116	+281	+91	-42

V

For the purpose of social benefit-cost evaluation, the major item that calls for correction is the cost of labour, that too unskilled labour.

In a state like Kerala with chronic problems of unemployment it is hardly necessary to emphasize the importance of examining the employment

Table 5: Present Values of Costs, Benefits and Transfer Payments
(Rs. in lakhs)

Sl. No.	Item	20 years			30 years		
		Discount Rate			Discount Rate		
		8%	10%	12%	8%	10%	12%
A	BENEFITS						
1.	Additional Winter Crop in Kole Lands	1903.6	1959.7	1351.6	2263.8	1824.3	1496.5
2.	Stabilization of Winter Crop in Kole Lands	163.4	137.0	116.0	194.4	156.6	128.7
3.	Additional Summer Crop in Periphery Lands	636.5	531.3	451.9	757.0	607.0	501.1
4.	Stabilization of Winter Crop in Periphery Lands	93.5	78.4	66.4	111.2	89.6	69.6
5.	Coconut Cultivation	21.7	16.8	13.2	29.9	22.1	16.5
B.	COSTS						
6.	Land Development	278.5	270.6	263.3	278.5	270.6	263.3
(a)	Materials	98.7	96.0	93.5	98.7	96.0	93.5
(b)	Skilled labour	57.9	56.2	54.6	57.9	56.2	54.6
(c)	Unskilled labour	121.9	118.4	115.2	121.9	118.4	115.2
7.	Maintenance	57.3	47.7	40.1	68.5	54.9	44.7
(a)	Materials	17.4	14.5	12.2	20.8	16.7	13.6
(b)	Skilled Labour	17.4	14.5	12.2	20.8	16.7	13.6
(c)	Unskilled Labour	22.5	18.7	15.7	26.9	21.5	17.5
8.	Chimoni Dam Construction	523.3	513.6	496.1	523.3	513.6	496.1
(a)	Materials	209.0	202.3	196.0	209.0	202.3	196.0
(b)	Skilled Labour	97.7	94.1	90.7	97.7	94.1	90.7
(c)	Unskilled Labour	225.6	217.2	209.4	225.6	217.2	209.4

Table 5 (Continued)

Sl. No.	Item	20 years			30 years		
		Discount Rate			Discount Rate		
		8%	10%	12%	8%	10%	12%
9.	Maintenance	37.7	31.4	26.4	45.1	36.1	29.4
(a)	Materials	11.3	9.4	7.9	13.5	10.8	8.8
(b)	Skilled Labour	11.3	9.4	7.9	13.5	10.8	8.8
(c)	Unskilled Labour	15.1	12.6	10.6	18.1	14.5	11.8
10.	Coconut Cultivation	21.2	17.6	14.8	25.8	20.5	16.6
(a)	Materials	14.2	11.8	9.9	17.2	13.7	11.1
(b)	Labour	7.0	5.8	4.9	8.6	6.8	5.5
11.	Cultivation of Paddy (Winter Crop)	1479.6	1240.3	1050.4	1759.5	1417.8	1164.6
(a)	Materials	776.0	650.5	550.9	922.8	743.6	610.8
(b)	Labour	703.6	589.8	499.5	836.7	674.2	553.8
12.	Cultivation of Paddy (Summer Crop)	327.9	274.9	233.2	390.0	314.3	258.2
(a)	Materials	158.5	132.9	117.9	188.5	151.9	124.8
(b)	Labour	169.4	142.0	120.3	201.5	162.4	133.4
13.	Saving in annual repairs to bunds	20.5	17.2	14.6	24.4	19.7	16.2
C	TRANSFER PAYMENTS						
14.	Repayment of loan	78.8	67.9	58.8	78.8	67.9	58.8
15.	Land Acquisition (Land Development)	132.9	131.8	130.7	132.9	131.8	130.7
16.	Land Acquisition (Chimoni Dam)	12.5	12.4	12.3	12.5	12.4	12.3

potential of new development projects. Due to the predominance of tree crops in Kerala's agriculture, whatever additional employment has to be generated within agriculture will have to be connected largely with rice cultivation and allied activities.

The employment potential of a project could be examined in terms of its own technical alternatives and also between similar projects. The scope for such an analysis is rather limited in this exercise. However an attempt to quantify the employment potential of the Project is worthwhile.

For land development including the construction of permanent bunds, the manpower requirements have been estimated at 55 lakh mandays of unskilled labour and 17 lakh mandays of skilled labour, both direct and indirect. For the construction of the dam, the manpower requirements are nearly 38 lakh mandays of unskilled and 9 lakh mandays of skilled labour. This employment will be spread over a period of four years.

Also, there will be a step-up in recurring employment due mainly to the additional winter crop in an area of 7,100 hectares and additional summer crop in 2,000 hetares. When the project is completed the additional employment thus generated will be 15 lakh mandays of unskilled labour per annum.

Having got the estimate of labour input of the project, recurring and non-recurring, the most important question for purposes of assessing its social profitability is whether wages actually paid to unskilled workers can be taken as reflecting the social opportunity cost of labour. The agricultural labourers in the Project area, as in the rest of rural Kerala, do not have continuous employment throughout the year. Further, these agricultural labourers who belong to the landless category and hence are

unable to utilise their family labour for any other land-based occupation. Alternative employment opportunities are also very little as there is hardly any industry worth mentioning which could absorb the surplus labour in agriculture. In the project area, the whole problem of unemployment is acute in view of the fact that only one crop a year is raised in more than two thirds of the Kole lands.

In order to determine the social cost of labour involved in the Project, we need to have some idea of the magnitude of unemployment in the Project area. As the data of the latest Sample Survey on employment and unemployment in Kerala conducted by the State Bureau of Economics and Statistics is yet to be processed, we have depended on two earlier surveys of 1965 and 1970, for the estimates of unemployment in Trichur district as a whole and also the Project area(covering three taluks). It can be seen from Table 6 that in the Project area, which is spread over three taluks in Trichur district, the available man-days of the unemployed comes to well over 150 lakhs and that of the underemployed over 200 lakhs per annum. As against that, as can be seen from Table 7, the requirement of unskilled labour for capital construction and annual additional paddy cultivation under Alternatives I and II of the Project does not exceed 23.25 lakh in any single year.

While the availability of unemployed man-days is much higher than the maximum requirement of labour in capital construction under Alternative I, it need not necessarily follow that the social cost of labour can be assumed to be zero. In any one normal year, January to April is the work period for the summer crop and September to December is the work period for winter crop. The latter is raised at present only in part of the Project area. Naturally therefore, the peak agricultural demand for

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Table 6: Estimates of Unemployed Man-days Available in Trichur District and Kole Area (in lakhs)

Item	Trichur (5 Taluks)	Project Area (3 Taluks)
(1) Total population (1971 Census)	21.29	16.12
(2) Total rural population (1971)	18.79	14.02
(3) Annual growth of population	2.61%	2.61%
(4) Total Rural population in 1975	21.36	15.94
(5) Total workers (rural)	6.19	4.62
Estimate of unemployment based on 1965 survey		
(6) Unemployed persons: 12% of workers	0.74	0.55
(7) Underemployed persons: 29% of workers	1.79	1.34
(8) Man-days available of the unemployed @ 300 days per annum	222.00	165.00
(9) Man-days available of the underemployed @ 150 days per annum	268.50	201.00
(10) Total = (8) + (9)	490.50	366.00
Estimate of rural unemployment based on NSS, 12th round, Kerala, 1970		
(11) Unemployed persons: 3.2% of rural population	0.68	0.51
(12) Underemployed persons: 30% of workers	1.86	1.39
(13) Man-days available of the unemployed @ 300 days per annum	204.00	153.00
(14) Man-days available of the underemployed @ 150 days per annum	279.00	208.50
(15) Total = (13) + (14)	483.00	361.50

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Table 7: Availability of Unemployed man-days in relation to the requirement of the Project

Item	3 Taluks in which the Project area falls	Project Catchment Area	Annual requirement of the Project (in lakh man-days)			
			Alternative-I		Alternative-II	
			Capital Construction	Paddy Cultivation	Capital Construction	Paddy Cultivation
Area in km^2	2,258	200				
Area in hectares	2,25,800	20,000				
Population (in lakhs)	16.12	1.43 *				
Man-days availabe of the unemployed(in lakhs)			23.25+	15.00	13.75+	12.00
1965 Survey	165.00	14.30**				
1970 Survey	153.00	13.57**				

*Worked out on the basis of the density of population in 3 taluks at 7.14 persons per hectare

**Percentage share of the unemployed man-days in the 3 taluks

+There will be an additional requirement of labour to the extent of 10 per cent and 35 per cent of that required for paddy cultivation in the third and fourth years respectively as a result of the extension of winter crop cultivation/areas where the construction of bunds has been completed.

to

labour occurs during January to April when practically everyone classified as underemployed[3] finds work. Secondly, our estimates of the unemployed include persons both in the agricultural and non-agricultural sectors and even here all those unemployed may not be actively seeking work. Thirdly, most capital construction of the type envisaged in the Project is such that it is bound to slow down during monsoon time because of floods. Therefore, much of it will have to take place within the remaining seven months or so. Once, however, capital construction is started it has to go on at a certain pace.

The crucial factor in determining the social cost of unskilled labour is still the number of unemployed within the Project area who can be utilised without any direct or indirect social cost. For those unskilled labour outside the vicinity of the Project area, their employment would involve an element of additional cost in terms of transportation to the Project site from different parts of the three taluks in which the Project is spread over. Assuming that the Project catchment area is 20.000 hectares, we have attempted an estimate of the unemployed man-days in this area. The assumptions underlying our estimate are spelled out in Table 7. It may be noted that the availability of unemployed man-days in the Project catchment area comes to a little over half the average annual requirement of unskilled labour days for capital construction under Alternative I. If we allow for the additional man-power requirements for the extension of winter crop cultivation in the third and fourth years, the available unemployed man-days for the four-year construction period as a whole would work out to half the number required. Therefore, for unskilled labour required for capital construction under Alternative I the social cost has been placed at half the wage cost at market prices. Hence, a premium of (-) 0.50 has been applied.

The estimated regression is:

$$Y = 116.26^{**} + 0.031^{*} x_1 - 1.94\, x_2 - 10.57\, x_3 - 267.46^{*} x_4 \quad R^2 = 0.$$

'T' Values (2.985) (2.104) (1.441) (0.467) (-2.258)

where y = BID/ha, x_1 = output/ha, x_2 = BID/ha; x_3 = cost of human relative to animal labour and x_4 = horsepower/ha.

33. The selected explanatory variables, however, explain no more th 40 per cent of the observed variations in human labour input. Apart from the fact that our specification of the relationship and the measur of the input variables may be too crude (this is discussed more fully later in this section), it seems possible that differences in crop patt could be an additional factor. This is because the human labour input per hectare varies a great deal between crops: The available crop-wise labour input data from FMS for the selected districts (Table 7) suggest that, on the average, paddy and sugar cane use significantly more human per hectare than other crops.

Table 7 : Frequency distribution of Intensity of Human Labour input per hectare for different crops

	Number of mandays per hectare				
	Less than 50	50-75	75-100	100-150	150
Paddy	-	3	6	17	2
Wheat	2	5	3	2	-
Coarse grains	13	4	5	5	1
Pulses	7	6	-	-	-
Groundnut	-	1	1	1	1
Cotton	-	2	1	1	1
Sugarcane	-	-	1	4	5

Source: Compiled from data relating to individual crops given in the F reports for selected districts. Since the choice of crops was based with any idea of getting a representative sample for the as a whole, and since no distinction is made between irrigated unirrigated crops, this distribution is only indicative.

skills required for construction work is unlikely to be readily available even when the Project area has a surplus of skilled labour as a whole. Thus no correction has been made in the costing of skilled labour.

Thus, for purposes of social evaluation of the Project, there will be considerable reduction on the cost side and therefore increase in net benefit from the Project. While no direct weightage has been given to employment, the objective of employment generation can be said to have indirectly been incorporated in this evaluation exercise by costing labour at its social price.

It may be recalled that major corrections and adjustments such as the pricing of paddy and coconut were incorporated in the evaluation of the Project at market prices ((NPV(M)) itself. The only further correction introduced for purpose of social, as distinct from market, evaluation of the Project related to the pricing of unskilled labour. Unskilled labour accounts for 42 per cent of the cost of construction of dam and 43 per cent of the cost of land development and between 48 and 51 per cent of the cost of cultivation of paddy. The cost of materials and skilled labour has been taken at market prices on the assumption that social values thereof are not very different, an assumption, though arguable, is unlikely to affect materially the conclusions of the evaluation.

For reasons explained above, while the social cost of unskilled labour in capital construction (items 6-c and 8-c of Table 4) has been taken at half the market wage rate, that of the unskilled labour employed in cultivation and allied year to year operations (items 7-c, 9-c, 10-b, 11-b and 12-b of Table 4) has been taken at zero wage.

Table X

Average Rate of Growth (1964-67 to 1973-75) of Selected Variables of 25 Firms Classified Product-wise

Product Category	No. of Firms	Rate of Growth of Gross fixed Assets	Rate of Growth of Net fixed Assets	Rate of growth of Net Sales	Rate of gro of gross Prof
Cotton yarn ≤ 40s	(4)	5.45 (2.99)	2.13 (6.85)	9.42 (4.92)	8.30 (10.05)
Cotton yarn > 40s	(5)	7.25 (2.96)	6.78 (3.41)	10.44 (1.86)	8.79 (3.05)
Cotton and Staple fibre yarn & Processing	(9)	7.37 (2.64)	5.75 (6.13)	13.12 (3.67)	12.46 (5.24)
Spinning, Weaving & Allied activities & wholly new avenues	(7)	10.24 (2.85)	11.36 (3.88)	13.12 (5.95)	11.89 (6.68)
Spinning, Weaving & Allied activities & wholly new avenues	(5)	11.15 (2.56)	13.24 (1.74)	15.12 (5.67)	14.84 (6.25)

Note: (i) Figures in brackets indicate standard deviations around the weighted mean.

(ii) Average calculated by weighting the rates of growth of the different variables for each firm by the actual value of the variable in the base period.

(iii) Row (5) in the table is obtained by omitting 2 firms from those in row (4) which have diversified either into weaving or wholly new lines of production. The two firms omitted are Janakiram Mills Limited, and Raghuvanshi Mills Ltd. both of which though diversified are obviously not in the profitable lines of production. For example, though Janakiram Mills has diversified into weaving from spinning, it spins only yarn of counts 20s - 40s and weaves only grey cloth.

The net benefits of farmers, given below, reflects, the time pattern of costs and benefits of this group. Farmers do gain substantially from this project.

NPV(F) Rs.in lakhs	20 years			30 years		
	8%	10%	12%	8%	10%	12%
	+1020	+872	+754	+1204	+988	+831

Unskilled labourers: It will be recalled that the social gain of generating additional employment of unskilled labour NPV(L), was arrived at by taking half the unskilled wage component of capital costs (under Alternative I) plus the entire wage component of recurring costs.

NPV(S) = NPV(M) + NPV(L)

NPV(S) Rs.in lakhs	20 years			30 years		
	8%	10%	12%	8%	10%	12%
	+1176	+900	+683	+1522	+1119	+826

The implications of the social valuation thus arrived at are worth while stating. Clearly, net social benefits of a Project (NPV(S)) can be positive even if the net benefit of that Project at market values (NPV(M)) is zero or negative. But the social justification of the Project is then wholly dependent on the additional employment of unskilled labour it generates. It means also that one or more parties involved in the Project will be incurring a net cash loss. The latter comes out when the net benefits of the Project are disaggregated in terms of the principal groups involved therein.

VI

Three principal groups have been identified with respect to this Project: (i) the farmers, (ii) the agricultural labourers (unskilled labour) and, (iii) the project authority (ie. the State Government). The third group is taken to include all public agencies like the Land Development

insignificant in the remaining two . The divergent pattern of relation as between the inter-district and intra-district analysis, as well as between different district groups are puzzling and cannot be easily explained.

A	Y =	-109.6 + 0.183$^{**}x_1$ (-3.254) (3.269)	+ 3.53$^{**}x_2$ (2.380)	+ 83.59$^{**}x_3$ (2.823)	R^2 =
B	Y =	221.13 + 0.134$^{**}x_1$ (4.059) (4.836)	- 3.99$^{**}x_2$ (-2.503)	- 98.56$^{**}x_3$ (-2.350)	R^2 =
C	Y =	15.50 - 0.005x_1 (.141) (-0.238)	+ 3.65$^{**}x_2$ (3.412)	+ 4.52 x_3 (0.025)	R^2 =
D	Y =	6.30 - 0.002x_1 (.379) (-.078)	+ 2.89$^{**}x_2$ (7.166)	+ 49.6$^{**}x_3$ (4.418)	R^2 =
E	Y =	104.15 + 0.079$^{**}x_1$ (3.581) (4.89)	+ 6.12$^{**}x_2$ (3.07)	- 616.2$^{**}x_3$ (-3.51)	R^2 =
F	Y =	21.28 - 0.029 x_1 (.77) (-.13)	+ 2.70x_2 (1.38)	- 16.43$^{**}x_3$ (-.70)	R^2 = 0

Relation between Human and Bullock Labour

38. That high levels of human labour use generally tend to go with larger inputs of animal labour has been interpreted as evidence of complementarity between the two sources of energy. But as pointed out above, the positive correlation between the two is neither universal nor always significant; in any case it certainly does not imply that they are used in fixed proportions. The ratio of human to bullock labour in fact varies very much across districts and within districts (See table 1). The significance of these variations and the factors responsible for them have, however, received hardly any attention in the literature.

Project Authority: As already stated, the expression "government" has been used to include all public agencies connected with this project, directly or indirectly. The costs to be taken into account in this context are the costs of construction of the dam and its maintenance (items 8 and 9) development of land (item 6) and compensation for acquisition of land (items 15 and 16). The returns of this group comprise only of repayment of loan by the farmers (item 14). Thus the net gain from the project authority's view point would be:

$$NPV(G) = (14 - [(16) + (8) + (9) + (15) + (16)])$$

As can be seen from the results of NPV(G) given below, because the authority has to incur certain costs (like dam construction and its maintenance) without recoupment and also bear the initial investment on land development the returns have turned out to be in the negative for all the three rates of discount even with a longer life-span of 30 years.

NPV(G) Rs. in lakhs	20 years			30 years		
	8%	10%	12 %	8%	10%	12%
	-915	-892	-870	-923	-897	-873

The sum of the net benefits of the above three groups valued at social prices should give the net social benefits of the Project referred to in Section V.

VII

In sections IV and VI, evaluation results were given for Alternative-I. Under Alternative - II, costs on construction of the dam and its maintenance (items 8 and 9), cultivation of summer crop (item 12) and compensation for

land acquisition for constructing the dam (item 16) will not be incurred. Correspondingly, some of the benefits (items 3 and 4) will also not accrue Therefore, the net benefits of the Project under the different equations wi be as follows:

$$NPV\ (M) = \left[(1)+(2)+(5)+(13)\right] - \left[(6)+(7)+(10)+(11)\right]$$

$$NPV\ (F) = \left[(1)+(2)+(5)+(13)+(15)\right] - \left[(7)+(10)+(11)+(14)\right]$$

$$NPV\ (L) = -\lambda\left[(6-c)\right] - \phi\left[(7-c)+(10-b)+11-b)\right] - (13)$$

Where $\lambda = -0.75$ and $\phi = -1.00$

so that

$$= 0.75\left[(6-c)\right] + \left[(7-c) + (10-b) + (11-b)\right] - (13)$$

$$NPV(G) = (14) - \left[(6) + (15)\right]$$

$$NPV(S) = NPV(M) + NPV(L)$$

$$= NPV(F)+NPV(L)+NPV(G)$$

	20 years			30 years		
	8%	10%	12%	8%	10%	12%
NPV (M)	+ 273	+ 191	+ 127	+ 380	+ 259	+ 171
NPV (F)	+ 605	+ 525	+ 462	+ 713	+ 593	+ 506
NPV (L)	+ 804	+ 686	+ 592	+ 940	+ 772	+ 705
NPV (G)	- 332	- 334	- 335	- 333	- 334	- 335
NPV (S)	+1077	+ 877	+ 719	+1320	+1031	+ 876

The results of Alternative II, presented above, bring out that the project becomes economically viable even at market prices for all the three rates of discount for both 20 and 30 years. At the same time, it ha

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also helped to reduce the Project Authority's (denoted as Government) loss to a considerable extent. Compared to Alternative I both at market and social prices, Alternative II comes out better even though one of the parties involved in the Project, i.e. the Government, will still face a net drain of a little over Rs. 3 crores. The reason for Alternative II emerging as a better variant is that the reported shortage of water, for which the construction of the dam is proposed is not reflected in the yield rates of the paddy crop in the Kole Lands.

VIII

Every project has a regional or local dimension to it. What is attempted in this section is only a measure of the direct impact of the project on the region. This could be done by identifying the outflows and inflows and then calculating the net inflow to the region.

Under Alternative I, the net benefit to the region would be given by

$$RD(T) = \left[(1)+(2)+(3)+(4)+(5)+(6-c)+(8-c)+(9-c)+(15)+(16)\right] - \left[(7-a)+(7-b)+(10-a)+(11-a)(12-a)+(14)\right]$$

Under Alternative II, this would be:

$$RD(T) = \left[(1)+(2)+(5)+(6-c)+(15)\right] - \left[(7-a)+(7-b)+(10-a)+(11-a)+(14)\right]$$

Apart from the direct impact, there could be some indirect impact as a result of spending some part of the direct income generated by the Project. But the indirect impact can be measured if it was sufficiently known to what extent the additional income generated locally tended to be spent on goods and services produced within the region. Since this is an unknown, no attempt has been made in this exercise at measuring the indirect impact of the Project on the region.

IX

Given a choice between projects, or different variants of the same project, it is worthwhile examining how the benefits are distributed between the various income groups of beneficiaries. This could be done first by assessing the net benefits accruing to the weaker sections and thereby assigning such benefits a higher weight than that to benefits accruing to other beneficiaries. In practice, the difficulty is one of assigning the right weights because they are seldom laid down at the national (or regional) planning level. However, one may still assess the impact of a Project on the sections which are broadly identified as poor.

Two groups which could safely be identified as poor are the small farmers and the agricultural labourers. Small farmers have been defined as those with a land-holding of less than 2 hectares. It must be conceded straight away that the "poverty" of a small farmer is not the same as that of the "poverty" of an agricultural labourer and that the clubbing together of the two groups is not, in any way, intended to equate poverty of the two groups. In fact, if agricultural labourers alone were to be identified as poor, the net benefits accruing to them are already given by R(L).

From the point of view of redistribution, it will be still relevant to ask what proportion of the benefit accruing to the farmers as a whole goes to small farmers. In the absence of data on the distribution of land separately for the Kole lands, information on land distribution in Trichur District has been used on the assumption that the pattern of land distribution will not be significantly different in the Kole lands from that of the district as a whole of which these (the Kole lands) are a part. Table 8 gives the pattern of land distribution for the Trichur District.

Table 8: Pattern of Land-holding in Trichur District

Size (Hectares)	No. of holdings '000	%	Total area '000 hectares	%	
Less than 1 hectare	139.1	75.4	33.1	19.7	33.4
Between 1 & 2 hectares	22.0	11.9	31.3	18.7	
Between 2 & 4 hectares	15.3	8.3	40.9	24.4	
Between 4 & 6 hectares	3.6	2.0	16.2	9.7	
Between 6 & 8 hectares	1.7	0.9	11.5	6.9	
Between 8 & 10 hectares	1.5	0.8	14.0	8.3	
Above 10 hectares	1.2	0.7	20.7	12.3	
	184.4	100.0	167.7	100.0	

It may be noted that the distribution of land in the district is highly skewed, with 87 per cent of the cultivators having holdings below two hectares accounting for only 38 per cent of the area. On the other hand, 13 per cent of the cultivators with a holding of 2 hectares and above account for 62 per cent of the area. Hence, the net benefits accruing to the small-farmers in the Project area is taken to be 38 per cent of the benefits accruing to the farmers as a whole.

Under Alternative I, this will be

$$R(SF) = 0.38 \left[(1)+(2)+(3)+(4)+(5)+(13)+(15)+(16)\right] - \left[(7)+(10)+(11)+(12)+(1\right.$$

$$= 0.38 \left[NPV(F)\right]$$

Under Alternative - II, this will be

$$R(SF) = 0.38 \left[(1)+(2)+(3)+(5)+(13)+(15)\right] - \left[(7)+(10)+(11)+(14)\right]$$

$$= 0.38 \left[NPV(F)\right]$$

The net benefits of the poorer sections as a whole would be given by

$$R(PS) = R(SF) + R(L).$$

X

The results in terms of net present values of benefits of Alternatives I and II are summarised in Tables 9 and 10. With a 20 years life-s Alternative I is viable in terms of market prices, of course as adjusted in this exercise, at a rate of discount of 8 per cent. Alternative II is viable even when the rate of discount is higher. With a 30 year life-span, Alternative I becomes viable in terms of market prices ever at 10 per cent rate of discount. However, in terms of social valuation, Alternative I can be seen to show a higher net present value for rates of discount of 8 and 10 per cent and almost as much net present value for the rate of discount of 12 per cent when compared to the correspondin

Table 9: Net Present Values of Benefits of the Kole Land Development Project under Alternatives I & II with a Life-Span of 20 years

(Rs. in lakhs)

Sl. No.	Item	Alternative-I			Alternative II		
		Discount Rate			Discount Rate		
		8%	10%	12%	8%	10%	12%
1.	Benefits at Market Prices NPV (M)	+114	-20	-116	+273	+191	+127
2.	Benefits of Farmers NPV(F)	+1020	+872	+754	+605	+525	+462
3.	Benefits of Labourers NPV(L)	+1071	+920	+799	+804	+686	+592
4.	Benefits of Government NPV(G)	-915	-892	-870	-332	-334	-335
5.	Benefits in terms of social values NPV(S)	+1185	+900	+663	+1077	+877	+719
6.	Regional Development NPV (T)	+2264	+1960	+1715	+1440	+1241	+1063
7.	Benefits of Small Farmers NPV(SF)	+388	+331	+287	+230	+200	+162
8.	Benefits of Labourers NPV (L)	+1245	+1080	+961	+834	+715	+621
9.	Benefits of Poorer Sections NPV (PS)	+1633	+1419	+1246	+1064	+915	+793

Table 10: Net Present Values of Benefits of the Kole Land Development Project Under Alternatives I and II with a Life-Span of 30 years (Rs. in lakhs)

Sl. No.	Item	Alternative I			Alternative II		
		8%	10%	12%	8%	10%	12
1.	Benefits at Market Prices NPV(M)	+281	+91	-42	+380	+259	+17
2.	Benefits of Farmers NPV(F)	+1204	+983	+831	+713	+593	+50
3.	Benefits of Labourers NPV (L)	+1241	+1028	+868	+940	+801	+73
4.	Benefits of Government NPV(G)	-923	-897	-873	-333	-334	-33
5.	Benefits in terms of Social Values NPV(S)	+1522	+1119	+826	+1320	+1031	+87
6.	Regional Development RD(T)	+2618	+2183	+1861	+1683	+1395	+118
7.	Benefits of Small Farmers R(SF)	+457	+375	+316	+271	+251	+19
8.	Benefits of Labourers R(L)	+1415	+1196	+1030	+970	+801	+73
9.	Benefits of Poorer Sections R(PS)	+1872	+1591	+1346	+1241	+1052	+92

net present value of Alternative II. It will be misleading however to infer from this that in terms of social valuation, Alternative I is at least as good, if not better than, Alternative II. Here, it is relevant to relate the net present value to the capital cost for each alternative. Table 11, gives the ratios of net benefits at market and social values to corresponding capital costs. It can be seen that the ratios for Alternative II are between two and a half to three times higher than the corresponding ratios for Alternative I. Thus the net benefit, social as well as market, likely to be realised per unit of capital investment is higher for Alternative II than Alternative I.

It will be recalled that for both Alternatives I and II it is assumed that construction will be completed in the first four years. How realistic is it to make this assumption? There could be dout on this score, particularly in the light of recent experience within Kerala with respect to agricultural projects in general and a project of similar type, namely Kuttanad Development Project, in particular. To what extent the factors which were responsible for the delay in the completion of the earlier scheme have been provided for in the formulation of the Project now evaluated is not clear • In case, however the completion of the Project is likely to take much longer than originally expected, evalnation results are bound to be adversely affected. This can be seen from the results summarized for Alternative III and IV (see Tables 12 and 13). Alternative III includes all the costs and benefits in Alternative I but with a phasing of the construction work over 8 years. Similarly Alternative IV is an 8 year phasing of Alternative II. It must be added that in the absence of details about the time phasing, in physical terms, of the various items of capital construction it is difficult to say whether or not the time phasing of financial expenditure is realistic.

Table 11: Net Benefit-Cost Ratios of Kole Land Development Project Under Alternatives I and II

	Alternative-I(20 Years)			Alternative-II (20 Years)		
	8%	10%	12%	8%	10%	12%
At Market Prices	+0.14	-0.02	-0.15	+0.98	+0.70	+0.48
At Social Prices	+1.50	+1.14	+0.89	+3.86	+3.24	+2.73
	30 years			30 years		
At Market Prices	+0.35	+ .11	-0.05	+1.36	+0.96	+0.65
At Social Prices	+1.89	+1.42	+1.08	+4.73	+3.80	+3.33

Note: Net Benefit Cost ratio is defined as the amount of net benefits generated per unit of capital investment. That is,

$$\text{Net Benefit Cost Ratio} = \frac{\text{Present Value of Net Benefits}}{\text{Present Value of Capital Costs}}$$

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Table 12: Net Present Values of Benefits of Kole Land Development Project under Alternatives III and IV (Rs. in lakhs)

Item	Alternative-III (20 years)			Alternative-IV (20 years)		
	Discount Rate			Discount Rate		
	8%	10%	12%	8%	10%	12%
Benefits at Market Prices NPV(M)	+26	-61	-105	+283	+196	+149
Benefits in terms of Social Prices NPV(S)	+732	+531	+397	+771	+604	+493
	30 years			30 years		
Benefits at Market Prices NPV(M)	+199	+99	-35	+413	+329	+201
Benefits in terms of Social Prices NPV(S)	+1042	+728	+522	+1001	+751	+586

Table 13: Net Benefit-Cost Ratios of Kole Land Development Project under Alternatives III and IV

	Alternative III (20 years)			Alternative-IV (20 year		
	8%	10%	12%	8%	10%	1
At Market Prices	+0.04	-0.10	-0.18	+1.19	+0.87	+0.1
At Social Prices	+1.05	+0.64	+0.37	+3.24	+2.68	+2.1
	30 years			30 years		
At Market Prices	+0.29	+0.16	-0.06	+1.73	+1.47	+0.
At Social Prices	+1.53	+1.15	+0.86	+4.21	+3.34	+2.

Table 14: Capital Cost (Undiscounted) of Land Development In Kuttanad and Trichur Kole Lands

Region	Rs. per hectare		Area benefitted (hectares)
	Including Cost of land acquisition	Excluding Cost of land acquisition	
Including Infrastructure Works*			
Kuttanad	4,673	4,557	52,000
Trichur Kole	11,803	9,872	12,400
Excluding Infrastructure Works*			
Kuttanad	3,846	3,730	52,000
Trichur Kole	7,130	5,812	10,400

*Infrastructure works for the Kuttanad Development Project consists of improvements to the channel to the Thottappally Spillway, protective works to the bunds affected by the spillway and diversion of Idukki tail race water from the Muvattupuzha basin with a total outlay of Rs.430 lakhs. The infrastructure works in Kole Land Development Project is that of the construction of the Chimoni dam with a total outlay of Rs.632.7 lakhs.

The reduction in net benefits at market and social valuation on account of delays in construction can be seen to be quite considerable. Thus the smaller the delay in completion, the larger will be the net benefits of the Project. At the same time the ratios of the net benefits to corresponding capital costs are considerably higher for Alternative IV a Alternative III.

Thus on the basis of this evaluation exercise, the choice clearly seems to be for undertaking the Project without the Chimoni Dam. It must be added however that, as can be seen from Table 12, the capital cost per hectare of land even without the Chimoni Dam works out to be nearly one and a half times as high as the corresponding figure under the Kuttanad Development Project.

Concluding Observations

The exercise is rather limited in scope in the absence of both the kind of detailed data necessary for a much more thorough socio-economic evaluation and also the specification of other technical variants of the Project. The Project, as conceived envisages princip the construction of permanent bunds to prevent flooding during winter in the Project area and construction of a dam across the Chimoni river for supplying adequate water during summer. The construction programm would, it is assumed, be completed in a period of four years. The two alternatives to it considered for the purpose of this evaluation a strictly speaking, not technical variants. One possible varaint coul have been the deepening and extension of channels and depressions whic used to serve as the principal source of water for irrigation prior to

construction of Peechi Reservoir but are naturally out of use now. Could these not be developed at a much lower cost and in shorter period than the proposed Chimoni dam to overcome whatever little shortage of water exists at present? Evidently, the present thinking in official circles is not well disposed to consideration of such not-too-imposing variants.

Also though for the purpose of this exercise, some corrections were made to cost and benefit estimates, as for example to the costs of cultivation of paddy and to the likely additional output of paddy and its price, the capital cost estimates have been left virtually unt uched. Only for the social evaluation is the price of unskilled labour assumed to be considerably below the market wage. The intention is both to incorporate thereby the employment objective into our evaluation and to treat at least a part of the wage paid as "benefits" because it accrues to people whose employment and income levels need to be raised. However, the underlying assumption needs being highlighted, namely that labour is mobilised largely in such a way that it coincides with the period of maximum unemployment in the area. Drawing labour for the Project during periods when agricultural operations require the available local labour does not obviously constitute a social benefit.

The exercise has also demonstrated that delay in implementing the Project will result in considerable reduction of net benefits accruing to all parties concerned. Even the assumption of prolongation by four years may, in the light of experience in implementing similar projects in the State, seem to be on the conservative side. Construction of many irrigation and other projects started as far back as 12 years in the State are nowhere near completion.

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It is important to note that even with a modest version of the Project, namely Alternative II the capital cost of land development pe hectare turns out to be one-and-a-half times the cost of a similar project under taken for the Kuttanad region. Interestingly the cost estimates of this Project were further revised upwards (when the presen exercise was completed) by another 35 per cent which would double the co per hectare of this Project compared to the one in Kuttanad.

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[I owe more than the usual word of thanks to I.S.Gulati for his guidance in finalising this study. A number of comments and suggestions that he offered for improvement and subsequent changes made at various stages of this study have made it a joint product. But he thought it fit to give me the privilege of the sole responsibility for the paper so that any errors and omissions that might have escapted his notice should solely be mine!]

Notes and References

1/ A similar programme of land development taken up by the State in 1974 was the Kuttanad Development Project covering an area of 52,000 hectares. Kuttanad region is also a low-lying area, 0.5 to 2.0 metres below mean sea level where an additional crop will be raised once the construction of bunds is completed. For an evaluation see, K.P. Kannan, "Kuttanad Development Project: An Economic Evaluation", Indian Journal of Agricultural Economics, October-December, 1975, Vol.XXX, No.4.

2/ See Report of the Survey on Unemployment, 1965, Bureau of Economics and Statistics, Trivandrum and National Sample Survey, 12th Round. Employment and Unemployment in Rural Areas, Kerala, 1970.

3/ As per the 1965 Survey, a person was treated as underemployed if he worked less than 42 hours in a week; the percentage of such persons came to 54.7% of the employed. However, in our calculations, we have taken only those who are severely underemployed, i.e. those who worked less than 28 hours in a week. They formed 29% of the employed. In the NSS of 1970, a person was treated as underemployed if he worked less than or equal to 4 days in a week.

4/ Item 13 represents the saving effected as a result of reduction in the annual cost (on unskilled labour currently being employed) on repairs to temporary bunds. Thus the net addition to employment on account of the Project will be less to that extent. Therefore in working out the social benefit due to employment this saving in wage cost has been deducted.

ANNEXURES

Table A-1: Incidence of Summer Crop Failure in Kole Lands due to Water Shortage: 1972-73 to 1976-77

Sl. No.	Name of locality	Area affected in Hectares (Partial damage only)				
		1972-73	1973-74	1974-75	1975-76	1976-77
1.	Pullazhi	292	250	-	-	No crop failure due to shortage of water
2.	Arimpur	83	-	-	-	
3.	Anthikad	333	333	-	-	
4.	North Konchira	125	104	138	-	
5.	South Konchira	83	75	83	-	
6.	Kannoth Padavu	42	38	-	-	
7.	Ponnomatha	125	-	75	75	
8.	Jayanthi padam	104	-	-	-	
9.	Allappad Pullu	208	-	-	-	
10.	Parappur Society	-	-	250	-	
	Total	1395	800	546	75	nil
As % of Kole area		13	7	5	1	
Average area affected for the 5 year period: 563 hectares As % of Kole area : 5						

Source: Computed from Information furnished by the Department of Agriculture, Government of Kerala, Trivandrum.

Table A-2: Cost of Cultivation of Paddy for Winter and Summer Crops

Sl.No.	Item	Winter (Rs.)	Summer (Rs.)
1.	Human Labour*	1303	1114
2.	Animal Labour	148	68
3.	Machine Charges	272	129
4.	Seed	251	353
5.	Organic Manure	172	220
6.	Fertilizer	509	173
7.	Insecticides	85**	84
8.	Other Charges	-	13
	Total	2740	2156

*The human labour hours used were 1676 and 1004 respectively.

**The cost of insecticides in years with widespread attack of pests was as high as Rs.375/- per hectare.

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Table A-3: Average Yield of Paddy per hectare for Summer (Punja) Crop in the Kole Area, Trichur District & Kerala State: 1960-61 to 1973-74

Year	Kole area*	Trichur District (quintals per hectare)	Kerala (quintals/hectare)
1960-61	22.33	12.76	15.77
1961-62	21.51	15.72	16.30
1962-63	24.05	16.72	15.12
1963-64	24.69	16.16	15.40
1964-65	26.27	12.74	15.21
1965-66	21.80	12.73	11.22
1966-67	22.04	13.19	14.87
1967-68	20.25	17.11	15.96
1968-69	23.86	13.52	16.10
1969-70	21.52	12.22	18.19
1970-71	28.60	18.08	19.60
1971-72	30.69	16.65	23.16
1972-73	27.02	18.77	19.17
1973-74	28.53	12.10	14.24
Average for 1969-70 to 1973-74	27.3		

Source: Government of Kerala, Bureau of Economics and Statistics, Agricultural Statistics in Kerala: 1975, Kerala

* Refers to the three taluks of Trichur, Mukundapuram and Chavakad where the Kole lands are located.

Table A-4: Average Yield of Paddy for the Mundakan Crop

(Quintals per hectares) : 1972 - 1976.

Year	Trichur	Mukundapuram	Chowghat	Average for the 3 taluks
1972	20.99	24.48	13.27	19.58
1973	21.27	23.61	24.41	23.10
1974	13.65	17.38	10.50	13.84
1975	23.06	17.43	22.46	20.98
1976	23.16	16.77	11.65	17.19
Average for the 5 years				19.00

Source: Information furnished by the Department of Agriculture, Government of Kerala, Trivandrum.

Table A-5: Details of Rice purchased by the Kerala State Civil Supplies Corporation from other States

Sl. No.	Year	Month of Purchase	Source of Purchase	Qty. of rice purchased (in qntl.)	Price per Quintal (Rs.)	Railway Freight per qntl. (Rs.)	Handling & transport charges per qntl. (Rs.)	Total cost (Rs. in lakhs)	Weighted Average Price per Quintal (Rs.)
1	2	3	4	5	6	7	8	9	10
1	1975	July-Aug.	Nepal	50,060	287.00	12.39	4.00	151.88	
2	1975-76	Oct-March	A.P.	1,42,840	230.00	6.67	4.00	343.77	
3	1976	July-Sept.	F C I	2,49,800	207.05	Nil	4.00	527.20	
4	1976	July	A.P.	1,68,090	197.18	6.96	4.00	349.86	217.06
5	1976-77	Nov.-June	Karnataka	1,67,050	185.00	Nil	4.00	315.72	
		Total		7,77,840	-	-	-	1,688.43	

Source: The Kerala State Civil Supplies Corporation, Cochin.

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Table A-6: Yield of Coconut trees and Farm Price of Coconuts in Trichur District 1960-61 to 1974-1975

Sl. No.	Year	Yield per hectare (Nos) (1 ha. = 175 trees)	Farm Price (Rs. per thousand)
1.	1960-61	6421	208
2.	1961-62	6429	233
3.	1962-63	6143	244
4.	1963-64	5972	233
5.	1964-65	6027	351
6.	1965-66	6311	368
7.	1966-67	6324	423
8.	1967-68	6319	424
9.	1968-69	6317	421
10.	1969-70	6323	587
11.	1970-71	6325	474
12.	1971-72	6316	430
13.	1972-73	6084	707
14.	1973-74	5891	932
15.	1974-75	-	723
Average yield of nuts: 1969-70 - 1973-74 (per hectare)		6188	
" per tree		35	
Average Farm Price for 1970-71 to 1974-75		-	653

Source: 1. Bureau of Economics and Statistics and State Planning Board, Statistics of Agriculture, 1975, Government of Kerala, Trivandrum.

2. State Planning Board, Economic Review, 1976, Government of Kerala, Trivandrum.

Table A-7: Cost of Cultivation of Coconuts

Year	A. Planting @ Rs.7/tree		B. Cultivation of non bearing trees @ Rs.8/tree		C. Cultivation of bearing trees @ Rs.13/- tree	
	No. of trees	Cost (Rs. in '000s)	No. of trees	Cost (Rs. in '000s)	No. of trees	Cost (Rs. in '000s)
0-1	-	-	-	-	-	-
2	2,496	17.47	-	-	-	-
3	6,240	43.68	2,496	19.97	-	-
4	16,224	113.57	8,736	69.89		
5	-	-	24,960	199.68		
6	-	-	24,960	199.68		
7	-	-	24,960	199.68		
8	-	-	22,464	179.71	2,496	32.45
9	-	-	16,224	129.79	8,736	113.57
10	-	-	-	-	24,960	324.48

Table A-8: Pattern of Flow of Costs and Benefits under Alternatives I & II

Item	Year: 0	1	2	3	4
Dam Construction					
Masonry and Earth Dams	-	20%	40%	40%	-
Buildings, Communications and Land acquisition	50%	50%	-	-	-
Miscellaneous items	25%	25%	25%	25%	-
Land Development					
Land acquisition and buildings	50%	50%	-	-	-
Preliminary Works	70%	30%	-	-	-
Regulators and Bridges	10%	20%	45%	25%	-
Earth Work	10%	20%	40%	30%	-
Miscellaneous items	10%	30%	35%	25%	-
Flow of Benefits	-	-	10%	35%	10

Table A-9: Flow of Benefits from Additional Cultivation of Paddy

Item	Year	0-1	2	3	4-30
1. Additional area under Summer Crop in the periphery lands (hectares)		-	200.0	700.0	2,000.0
Yield of paddy @ 27.3 qntls. per hectare (tons)		-	546.0	1911.0	5,460.0
*Value @ Rs.2171 per ton of rice (Rs.in lakhs)		-	7.8	27.4	78.2
**Value of straw @ Rs.100 per ton (Rs.in lakhs)		-	0.5	1.9	5.5
2. Additional area under winter crop (hectares)		-	710.0	2485.0	7,100.0
Yield of paddy @ 23 qntls. per hectare (existing 19 qntls. +20% for stabilization) (tons)		-	1,633.0	5716.0	16,330.0
Value @ Rs.2171/ton of rice (Rs.in lakhs)		-	23.4	81.9	234.0
Value of straw @ Rs.100/ton (Rs. in lakhs)			1.6	5.7	16.3
3. Stabilization of winter crop in Kole lands (hectares)		-	350.0	1225.0	3,500.0
Additional yield of paddy @ 4 qntls. hectare (tons)		-	140.0	490.0	1,400.0
Value @ Rs.2171					
Value @ Rs.2171/ton of rice (Rs. in lakhs)		-	2.0	7.0	20.1
Value of straw @ Rs.100/ton (Rs. in lakhs)		-	0.1	0.5	1.4
4. Stabilization of winter crop in periphery lands (hectares)		-	200.0	700.0	2,000.0
Additional yield @ 3.4 qtls/hectare (tons)		-	80.0	280.0	800.0
Value @ Rs.2171/ton of rice (Rs.in lakhs)		-	1.1	4.0	11.5
Value of straw @ Rs.100/ton (Rs.in lakhs)		-	0.1	0.3	0.8

* Rice equivalent of paddy is taken at 66% of paddy output
** Yield of straw is taken as the same as that of paddy.

Table A-10: Flow of Benefits from Coconut Cultivation

Year	No. of bearing trees	Nuts @ 35 per tree	Value @ Rs.653 per thousand (Rs. in lakhs)
0-7	-	-	-
8	2496	87,360	0.57
9	8736	305,760	2.00
10	24960	873,600	5.70

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