Paper No. 228
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FINANCES AND ECONOMICS OF IRRIGATION PROJECTS

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In British Punjab, area under cultivation was 309.99 lac acres. About 143.8 lac acres was still lying as culturable waste with possibilities of further extension of cultivation. Government canals were irrigating 67% of the total irrigated area. Cost of irrigation by wells is higher than irrigation by canals. The total value of crops matured by Government canals in 1937-38 was estimated as over Rs. 40 crore.

Government has to incur expenditure on the construction of an irrigation project. The cost incurred is later realized from the farmers either by a system for repayment of the capital cost over a number of years or by charging water rate to meet the interest on the capital cost incurred and the annual charges on account of administration and maintenance. However the water charges are not the only cost incurred by the farmer after the introduction of irrigation system. The distribution of water on the farm is developed by him at his own expense. For new lands a certain amount of expenditure has to be incurred by the farmer for the development and preparation of land for cultivation. There are annual costs for maintaining the watercourses and levelling of land. Thus no irrigation project can be financially successful unless the returns both to the financer and the farmer are reasonably adequate.

Canal systems were constructed from borrowed funds as commercial undertakings. In 1867, Government decided that irrigation works

should be constructed by their own agency, and their viability tested as below;

(i) By considering the capital cost of any work to be simply the sum actually spent on its construction

(ii) By debiting the yearly accounts with;

  (a) simple interest on the capital cost of the works at the commencement of the year
  (b) the working expenses of the year

(iii) By crediting the revenue accounts yearly;
  (a) with direct receipts
  (b) with indirect receipts.

It was admitted that irrigation works could not be expected to pay back within 10 years of opening of the canals.

In U.S.A, irrigation projects were financed by individuals, partnerships and corporations. The area financed directly by Government by a revolving fund amounted to 8% of the total development. Generally expansion of irrigation involves an ever increasing expenditure per acre as it can only depend on residual stream flows necessitating relatively greater outlay for storage schemes. Experience in India and in U.S.A led to the same conclusion that large irrigation projects cannot be undertaken by private enterprise. In U.S.A, a standing Land reclamation fund was created. The capital cost without interest is recovered from the farmers in 40 years. A charge per acre is levied on account of annual maintenance and operation. In India, capital required for financing an irrigation project is raised as loan in the open market on Government security. Interest on this capital is met yearly from the revenue budget by debit to the administrative accounts of the project. The farmer pays only a flat rate per acre for water based principally on the value of crop harvested. The cost to the state may be grouped under three heads :

(a) Interest on the capital cost and areas of interest for the construction period
(b) cost of administration

(c) cost of annual repairs and maintenance

In the administrative accounts of the project, the capital cost consists of direct and indirect charges. Direct charges include cost of works, establishment, tools and plant. Indirect charges consist of capitalized abatement of land revenue, Audit and Account Establishment.

Capital cost per acre of earlier projects was less than those of subsequent years, mostly due to increased price of labour and material. For the Haveli Project the actual anticipated outlay is Rs. 36.25 per acre.

The most important single item of expenditure in irrigation is the headworks in the river. The cost of headworks is independent of the area irrigated and depends upon the maximum discharge of the river and the height and type of the gates used. The cost of a storage dam would depend on its locations, its height and its accessibility for tools and plant and branches would depend on the distance of irrigation boundary from the head works, intensity of irrigation and the nature and size of cross drainage works. The cost of construction of distributaries depends on the capacity per thousand acre of the area for which these channels are designed. The cost of distributaries in non perennial areas is higher than in perennial areas. In colony canals water courses are constructed through Government agency and the cost is recovered in instalments on an acreage basis. The drainage works are to be excluded from the capital cost of a project for the purpose of considering its financial prospects. Cost of establishment entirely depends on the number of years taken to complete a project.

In the past there has been a tendency to under estimate the cost of irrigation projects. Inspite of the heavily increased capital cost as compared with original estimates, the Punjab Canals are a financial success. Irrigation receipts constitute more than 40% of the total revenue of the Punjab. In addition to capital outlay and interest on capital, there is expenditure on establishment, maintenance and repair of canals and further improvements in the system. The cost of establishment and maintenance are almost equal. The best criteria for economic feasibility of a project would be when the interest on the capital cost plus the annual charges for operation and maintenance are the least.

In the administrative Account of the Irrigation Department, direct receipts consist of occupier rates, sale of water, receipts from plants and other canal produce, rents, fines under Canal Act, miscellaneous and other receipts. Water rates charged for various crops per acre are uniform. The water rates were changed during 1900 to 1938 on account of increase in area of cash crops and introduction of new canals. It has been suggested that water rates should be based on volumetric basis but it involves an appreciable investment and is not practicable.

Indirect receipts consist of sale proceeds of crown waste land, rent from temporary cultivation & Malkiana from crown waste land. It has always been a question whether income from the enhancement of land revenue from sales proceeds of crown waste lands is correctly creditable to the canal projects or not. The revenue on account of Indirect receipts owes its very existence to the introduction of canal irrigation and should be treated as a credit to the accounts of the project. In the Punjab Canal system the direct receipts have been estimated as Rs. 1.2 per acre.

Initial cost for development of water courses and clearing of jungle is based on flat rate over the entire area of the project. On the Sutlej Valley Project this charge was fixed at Rs.3 per acre. The main annual costs are repayment of capital costs (met by water rate receipts) and the costs on working and maintenance of the system. The return to the farmer from canal irrigation may be due to increase in land value and additional income from farm produce. The land prices have gone up to Rs.200 to Rs.400 per acre. A method should be devised to credit part of this increase to the canal project. Additional income from farm produce may be due to higher percentage of matured crops to sown area, more valuable cash cropping, and higher yield per acre.

The average water rates from canal irrigation are lower and at Rs. 4 per acre whereas the average rate of water from tube wells is Rs. 10.87 per acre. When considering the benefits of canal irrigation it has been calculated that its income is Rs. 21 as compared to Rs.8 from unirrigated area. The price of farm produce varies from year to year whereas farm expenses remain almost uniform. Agricultural products are governed by supply and demand. However agriculture economics is different from industrial economies by virtue of major role played by

natural environments. There are seasonal variations in output of crops. The percentage ratio of the average water rate to the average value of the produce per acre varied from 6% to 15% during 1918 to 1931.

The growing population demands an increase in cultivated area and hence development of irrigation. Irrigation schemes provide vast scope for employment. The only difficulty in development of irrigation is that future schemes may not pay good returns. The standard of basing the test of productivity for 10 years is arbitrary and some of the best canal system failed to come up to this test. Full development of irrigation scheme may take as many as 30 years. It is suggested that the cost of storage schemes for supplementing the existing winter supplies should be pooled with the cost on the original projects for the purpose of financial tests. The financial requirement demands that water rates should be fixed at a level that the cultivators can reasonably afford to pay.

Note :

Paper No. 228 appeared in the Proceedings of Engineering Congress, 1939 Vol. XXVII at pages 191 to 259. It has 7 graphs and 7 other plates. Discussions are recorded at pages 259a to 259y.