

Irrigation Development Planning: Aspects of Pakistan Experience by I. D. Carruthers. Department of Economics, Wye College (University of London), Ashford, Kent, December 1968.

In this little book, the second in a series of Agrarian Development Studies, issued by the Economics Department of Wye College, the author draws upon four years' experience with the consultants to the Water and Power Development Authority in West Pakistan to review the main technical and economic factors to be considered in planning irrigation development.

The first chapter describes, in general terms, some of the basic relationships between crop growth and water and drainage conditions. The author warns that in arid areas water tends to be regarded as a unique resource. Assigning supreme priorities to single resources can be very damaging to economic development since mere technical feasibility is regarded as justifying irrigation projects, regardless of whether they are economically justified.

The following chapter presents a brief description of the main features of the Indus Basin Irrigation System and outlines alternative investment opportunities. The author points out that recent technological advances, notably high-yielding grain varieties and fertilizer use, have shifted the balance of advantage strongly towards investment at the intensive margin. Nevertheless, he is somewhat reluctant to generalize about the economics of allocating additional water to existing irrigation areas, as compared with extending canal supplies to new areas, pointing to the existence of areas with high watertables which would require relatively heavy investment in drainage before they could profitably employ additional water. The fact that it is possible to find already irrigated areas, which would offer even less returns to additional water than new commands, does not, of course, justify the author's noncommittal position on this basic issue. He has elsewhere in the book drawn attention to the problems emerging from Pakistan's emphasis hitherto on low-intensity irrigation over a larger land area.

The next three chapters contain the main discussion of the application of economic principles to planning and appraisal of irrigation projects. Chapter 4 brings together a number of technical relationships of importance in project design. It illustrates the effect of the discounting rate selected upon decisions concerning the mining of groundwater, design of tubewells, lining of canals, and the like. It also shows the application of simple economic reasoning to such questions as whether stored water should be released in winter or held over for use in early summer, what are the optimal tubewell capacity and pumping schedules in an area to be covered by a public programme for supplementary irrigation and watertable control, and so on. It discusses the decisions open to farmers in using water and explains, in terms of the underlying crop-water

production functions, the economic rationality of the widespread underwatering observed in the Lower Indus region.

Chapter 5, *inter alia*, sets out the comparative costs of providing irrigation water in various ways. A long-run marginal cost curve is presented showing, in ascending order of costs, river diversion, canal remodelling, surface storage (running from about 15.00 rupees to 20.00 rupees per acrefoot) and finally tubewells (20.00 rupees per acrefoot and upwards). This order will be challenged by those who recall that costs per acrefoot of water from the dam being constructed at Tarbela were estimated at around 100.00 rupees per acrefoot even before the heavy social costs, arising from paralysis of other developmental programmes by this commitment, became apparent. If it is true that water supplies could be augmented by surface storage for less than 20.00 rupees per acrefoot, the wisdom of the World Bank's decision to finance the Tarbela Dam becomes even more dubious.

Chapter 5 also discusses the valuation of output for purposes of project appraisal. Somewhat surprisingly, shadow pricing, while accepted as necessary in the case of costs, is considered to be impossible in practice for benefits. PL-480 imports of agricultural commodities are said by the author to involve little or no foreign-exchange expenditure and this is apparently held to rule out the use of other than domestic-product prices on the benefit side.

Chapter 6 gives several rather revealing glimpses of the author's views regarding the scope and role of economic analysis in irrigation planning. In the introductory paragraph he suggests that economic evaluation is but one of the three tests to be used in project appraisal. The other two tests are said to be, first, a comparison of the forecast physical output with the targets the project is designed to meet and, secondly, the assessment of the distributional aspects, especially the percentage of benefits realizable for reinvestment in subsequent projects. The author's concern with mobilizing resources for development seems to lead him into a preference for public, as compared with private investment. He advocates, for example, that "reinvestment potential over time be assessed in terms of the return to government from the direct beneficiaries" (p.57). This smacks somewhat of the fallacious belief, popular amongst administrators and engineers in colonial times and still remarkably hard to eradicate, that the additional tax revenues accruing to government from project output should be counted as one of the main benefits.

Another questionable proposition advanced is that, providing their benefit-cost ratios are greater than unity (discounting at the interest rate at which capital can be borrowed from international agencies), large-scale projects should be preferred as contributing to a faster rise in output. Bias towards large-scale public projects also occurs when the author argues that, if the present net worth of a large-scale project is greater than that of a small-scale private

project with higher benefit-cost ratio, it should be preferred provided the opportunity cost is less than the anticipated marginal return. This criterion, coupled with the erroneous interpretation of opportunity costs as the interest rate on borrowed capital rather than as the returns to capital in alternative uses, could clearly be used to rationalise relatively unproductive large-scale public projects.

The final chapter deals with agricultural taxation and water pricing. The author again refers to his belief that the movement towards using benefit-cost ratios has gone too far since it leads to the selection of projects oriented towards increased consumption rather than to reinvestment. His discussion of water rates is predictably concerned largely with the possibility of using them to mobilize greater resources for development from the agricultural sector. He does not think volumetric charges for irrigation water are practicable in Pakistan at present and suggests a system of charges combining a betterment levy to recoup capital costs of irrigation projects with a charge per acre of commanded area to cover operating costs of the irrigation system.

The present structure of rates gives charges per acrefoot equivalent varying widely between crops. This is considered bound to distort cropping patterns since farmers in Pakistan have been shown to be price responsive. Under the present institutional arrangements for water distribution, however, water is not rationed by price and present charges are so low in relation to use value that they almost certainly have only minor effects upon decisions how available water should be allocated between crops.

The concluding sentences of the book suggest that small farmers be assisted not by cheap water but by subsidised farm supplies and services. Rebates in this form are asserted to be less likely to be diverted to consumption. No explanation is given why money saved on purchase of water is more likely to be diverted to consumption than the same amount saved on purchases of fertilizer or machinery services.

What the author himself in the introduction terms the lack of a strong central theme running through the book could perhaps be less charitably described as poor organisation and disjointed presentation of material. Despite such weaknesses, the book conveniently brings together many of the basic physical and economic relationships involved in irrigation planning and gives many useful examples of the application of economic analysis to help decision-making on water and drainage development projects. Many readers, however, may find unacceptable the author's views on criteria for project appraisal and selection and especially his advocacy of additional criteria outside the "economic evaluation". Technical consulting groups are often predisposed to favour large public-development projects. An economist working with such groups is

subject to strong pressures to modify the economy principles and criteria he uses in his work or to concede that economic considerations are not all important. This book, perhaps, reflects a little of these erosive influences when it suggests that in some mysterious way a rupee of benefits from a public project is worth more than a rupee of benefits from a private investment undertaking.

J. N. Lewis
Harvard Advisory Group
Lahore (Pakistan)
