

Management of irrigation areas

*Irrigation Management
in the Red River Delta
of Vietnam*

Vietnam's future food security depends on the country's ability to expand agricultural production, and this in turn will rely heavily on the increased efficiency of irrigation systems associated with the Red River Delta in the country's north and the Mekong Delta in the south. This Research Note describes the work undertaken to deliver more integrated water management in pumped irrigation systems of the Red River Delta.



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AGRICULTURAL production in Vietnam must increase markedly in the coming decades to keep pace with projected food security demands. Most food production in Vietnam takes place under irrigation in the Red River Delta in the north and in the Mekong Delta in the south. While some future modest expansion of irrigated area is forecast, improved productivity from existing irrigated lands is essential to meet the bulk of this increased demand for food.

The average area cultivated in the Red River Delta (RRD) between 1988 and 1998 has been approximately 480 000 ha. Rice is the principal crop but only one crop can be grown each year without irrigation. The spring and summer rice crops plus additional winter crops in the RRD average 360 000 ha. Up to 40% of the gross cultivable area is planted to vegetable, tuber and other non-rice crops in the winter season. Low efficiencies for water delivery and water use are major impediments to increasing productivity. In addition, irrigation and drainage in the RRD requires high usage of electricity (averaging about 300 kilowatt-hours per hectare) and the irrigation and drainage hydraulic infrastructure is generally in poor condition.

Vietnamese and Australian scientists have designed and tested a package of operational, management and institutional improvements that is vital to improving the performance of irrigation schemes in the RRD. This package was piloted on the La Khe Irrigation Scheme in Ha Tay Province. New measures include changes in the operational rules of the irrigation supply system to better meet crop water

demands and improve water use efficiency based on more accurate hydrologic parameters and operation modelling. The measures also encompass a comprehensive framework and strategy to improve the sustainability of the hydraulic infrastructure and to change the institutional arrangements between the Irrigation Management Companies (service providers) and farmers.

Computer-assisted operation

Poor water supply service to farmers usually stems from inadequate operational rules, inadequate hydraulic control infrastructure and inappropriate institutional arrangement between the water supplier and users. Typically, the problem manifests itself by untimely water deliveries, inadequate amount of water or unreliability of water supply (Figure 1). Project scientists developed a model, the Irrigation Main System Operation model (IMSOP), then fully adapted and tested it for application in irrigation schemes in the Red River Delta and other river basins. Operation monitoring before and after the implementation of the computer model showed significant improvements in the uniformity of supply throughout the irrigation system. The use of computer assisted operation requires:

- Diagnostic analysis of the current operational practices
- Modelling of the irrigation system
- Development and trial of improved operational rules
- Implementation of improved operational rules



Supply:demand, spring 1997

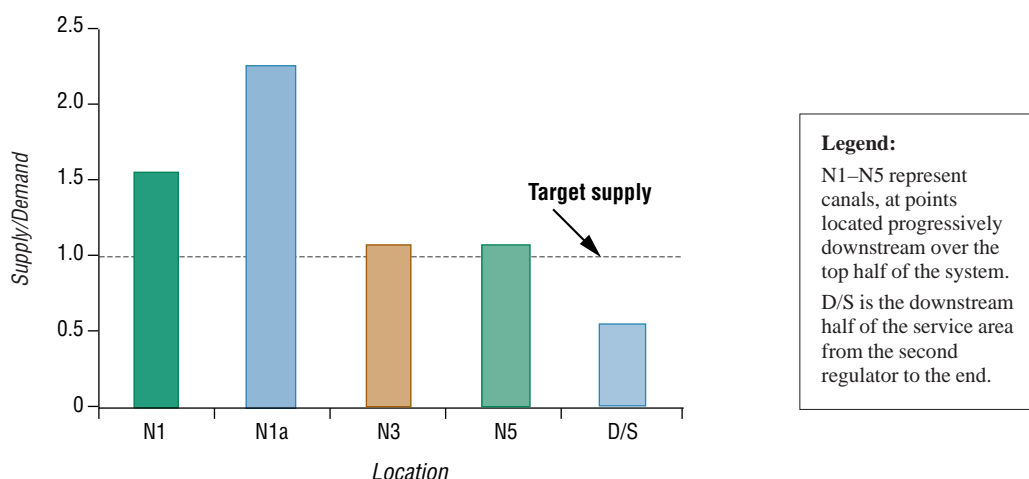


Figure 1. Poor operation of the irrigation delivery system leads to large differences between crop water demand and actual water supply.

The implementation of the IMSOP model to assist in the operation of irrigation schemes in the RRD requires reliable data on crop water requirements and rainfall. This information is also essential to enable farmers to improve irrigation water management at the farm level. Comprehensive micro-lysimeter trials were conducted in the RRD to determine evapotranspiration rates and crop coefficients for rice and a range of upland crops. This information can be generalised for the entire RRD by use of the FAO Penman-Montieth evapotranspiration model.

Infrastructure management

The condition and adequacy of the hydraulic infrastructure are central to the ability of the irrigation system to deliver the intended water supply service. The main deficiencies of the present irrigation schemes in the RRD arise from the dilapidated condition of a large proportion of the infrastructure and inappropriate design criteria. The poor condition of these systems is primarily the result of insufficient maintenance expenditure that can in turn be ascribed to insufficient revenues collected from the provision of water services.

The project scientists designed and trialed a framework for developing and implementing an asset management program for the La Khe Irrigation Scheme. This includes:

- A financial strategy for maintenance, rehabilitation and modernisation of the irrigation and drainage infrastructure
- A financial model to determine the actual system cost to ensure sustainability of the hydraulic infrastructure (Figure 2)
- Economic analysis model to determine cost of service provision and volumetric water pricing applicable to irrigation schemes in general.

The financial analysis showed that current revenues from water charges fall short of the current cost by US\$11.00/ha/annum to ensure proper maintenance and replacement of assets (Figure 3).

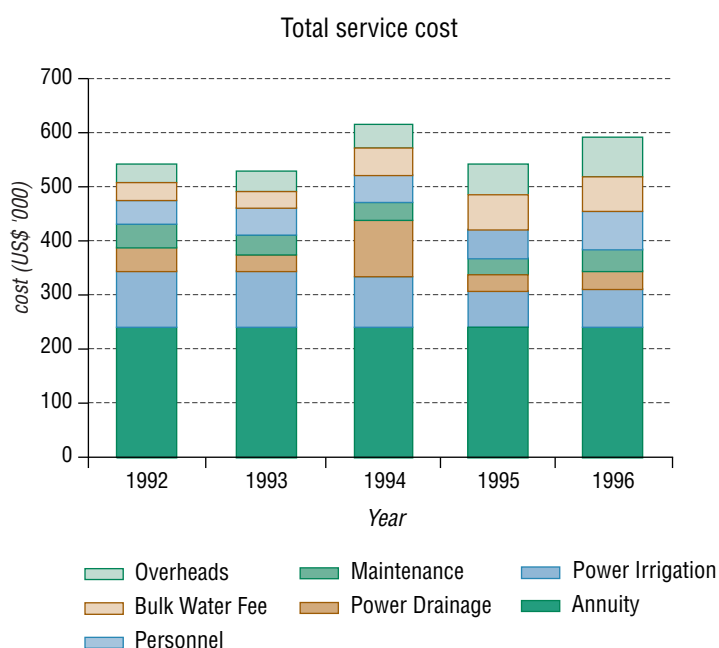


Figure 2. Proper identification of operation costs is essential to determine the actual cost of providing water supply and drainage service.

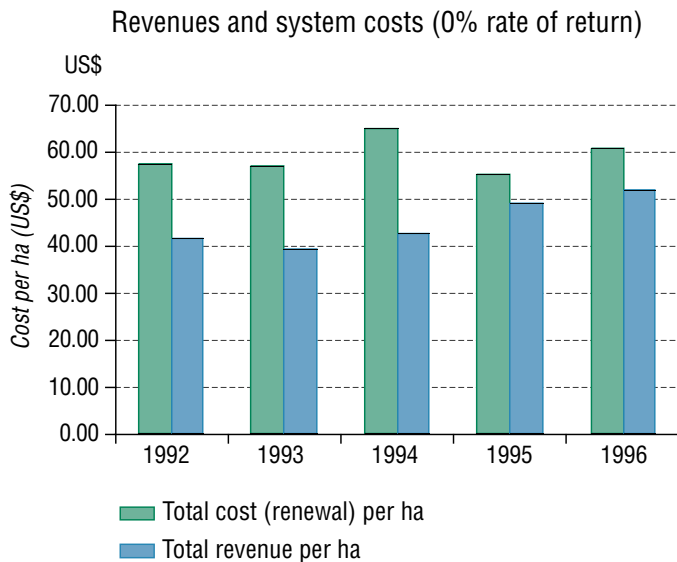


Figure 3. A shortfall in revenue from water services leads to insufficient investment in maintenance and renewal of irrigation and drainage assets.



Institutional and management arrangements

Satisfactory institutional arrangements between the irrigation management companies and the farmers are crucial to improve the performance of irrigation. The prevailing institutional arrangements in RRD irrigation and drainage districts are still largely based on commune administrative boundaries rather than canal-hydraulic lines. In addition, costing and pricing of water service need to be adequate, to ensure maintenance and management of the irrigation and drainage infrastructure and to provide an incentive for users to improve efficiency

of water use and electricity. The successful implementation of operational and management improvements must rely on the following basic institutional elements:

- Conversion of commune-based water management groups to canal-based water users groups by use of an appropriate institutional model. The model developed is applicable to irrigation schemes in the Red River Delta and other river basins in Vietnam.
- Implementation of a user-operator service arrangement of general application to irrigation schemes in Vietnam.
- Economic model from which to determine cost of service provision and volumetric water pricing, to promote more efficient use of water and electricity.

The information in this Research Note was gathered in conjunction with ACIAR Project 1994/004: Integrated water management in pumped irrigation systems in the Red River Delta of Vietnam (University of Melbourne, CSIRO Division of Building, Construction and Engineering, Vietnam Institute for Water Resources Research and Hanoi Agricultural University).

Further information on this and other ACIAR projects is available from:

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