REFORMS IN IRRIGATION IN WESTERN AUSTRALIA:

THE SOUTH WEST IRRIGATION SYSTEM

BY

P B McLEOD[1] & E J ROBERTS[2]

Contributed paper presented to the Annual Conference of the Australian Agricultural Economics Society, University of Western Australia in February 1995.

[1] Department of Economics
The University of Western Australia
NEDLANDS WA 6009

[2] Department of Commerce and Trade
170-172 St Georges Terrace
PERTH WA 6000

This paper is based on work carried out when the authors were respectively Chairperson and Executive Officer of the South West Irrigation Review Task Force. The authors wish to acknowledge the contribution of tne other members of the Task Force, Mr Noel Fitzpatrick, Mr David Constable and Dr Maurice Mulcahy. The views expressed in this paper are those of the authors and do not necessarily reflect those of the University of Western Australia, the Department of Commerce and Trade or the Water Authority of Western Australia.

REFORMS IN IRRIGATION IN WESTERN AUSTRALIA: THE SOUTH WEST IRRIGATION SYSTEM

Introduction

The South West Irrigation System represents a very significant investment in agricultural infrastructure by successive Western Australian governments. It is equally a central component of the economic and social structure of the Harvey-Brunswick-Bunbury region. However, over recent years a number of concerns have emerged. There has been a broadly-based criticism of the management of the system by the Western Australian Water Authority (WAWA) from the farming community. There is concern the system has become run down to the point where, at least in part, it may not be able to continue to operate without substantial expenditure on the replacement of many components. There is also criticism of the environmental degradation in parts of the system. The expenditure requirements are expected to increase rapidly over the next ten years.

The South West Irrigation system consists of three irrigation districts - Waroona, Harvey and Collie. The total land area of the properties within the irrigation area is approximately 34,000 hectares with just over 13,000 hectares irrigated. Seventy one per cent of the irrigated area is used for dairy production, the rest for other grazing activities (approximately 25%) and horticulture.

Changing economic and market conditions confronting agricultural enterprises and changes in technology and improved productivity have resulted in significant changes in the area in recent years. This process will continue in the future as new policies relating to the operation of the irrigation service and the management of the environment come into effect, and as continued progress occurs in the application of new technologies to agricultural production and environmental management in the area. In particular, horticulture is capable of establishing an increased presence in the area.

Like many irrigation operations around Australia, the South West Irrigation System was established as a government development initiative. It has subsequently been managed with a high value being given to the social and regional benefits of the system. As a result, successive governments have subsidised the refurbishment and, at times, the maintenance and operation costs. However, the Government is now requiring that government trading enterprises become financially more self-sufficient. This means that in the future the operating, maintenance and asset refurbishment costs will need to be recovered directly from the customer, in this case the irrigator, most likely in the form of higher water prices.

The emerging requirements for water for improved environmental management and for future industrial and human consumption provide alternative competitive uses for the water used for irrigation. There is also some demand for key irrigation land for urban and industrial use. Experience elsewhere in Australia is that where water prices are increased to meet the true cost of supply, there is a demand from farmers to have a dominant role in the management of the supply system.

In recent years WAWA has increased irrigation water prices in the South West and achieved some operating cost savings. Within this framework the combined increase in revenues and cost reductions have generated only a small surplus over operating costs, with the irrigation system still not generating enough revenues to cover depreciation, replacement and interest costs. The net deficit is around $5 million per annum. Full funding of future capital refurbishment and replacement will require a combination of higher water prices and operating cost savings. Although the evidence is that with an appropriate maintenance program the system will be able to perform efficiently in the future, the expenditures required are significant, in the order of $24 million, to extend the effective life by thirty years.

In addition to the financial performance and asset replacement issues, there are nutrient run-off and salinity problems that pose serious environmental threats within the irrigation area and in adjacent areas such as the Peel-Harvey estuary. Future management of the system will require effective management of these environmental issues.

Over time the water used for irrigation will have alternative uses. In particular, water from the northern dams in the irrigation area (Waroona and Harvey) could be used, in part, to supply metropolitan Perth within a 10 to 15 year time-frame. Whether it is used will depend on the economic and social analysis of the impact of a transfer at the time.

The Economics of the South West Irrigation System

The full costs of operating the South West Irrigation System consist of operation and maintenance costs, salaries, interest, depreciation and an allowance for replacement of assets. The statutory dividend that the State Government requires from WAWA must be added to this.

In recent years WAWA has increased prices in the irrigation area and achieved some operating cost savings. Table 2.1 shows the estimated financial position of the South West Irrigation System. It indicates the combined increase in revenues and cost reductions has resulted in the system covering operating costs with an increasing margin, from a deficit of $0.3 million in 1988-89 to a small surplus of $0.4 million in 1990-91. However, the service currently does not generate enough revenues to cover depreciation, replacement and interest. When these are taken into account the net deficit has been just over $5 million for each of the years in the table.

The failure of the South West Irrigation System to contribute to historic cost depreciation, interest on past borrowings[1], or replacement cost provisions and generate a positive rate of return is a critical issue. Attempting to cover these costs directly from irrigators via increased charges would require very significant price increases for irrigation water. These increases in turn would have a significant potential impact on the viability of enterprises and on the future size of the irrigation system.

---

[1] The interest costs are significant. However, that part which pre-dates WAWA may in part be an apportionment of consolidated debt.

There are arguments as to whether the treatment of interest and depreciation as portrayed in the table is appropriate.[2]

Table 2.2 shows the changes in irrigation water prices over recent years. These are the consequence of an effort to lift the financial performance of the South West Irrigation System. The effort appears to have commenced in the late 1970's. Significant real price increases occurred in the early 1980's between 1979-80 and 1983-84. Since that time the real increase has been in the order of 13 per cent[1]. Wages and salaries make up a dominant portion, around 70 per cent, of the operating costs of the irrigation system. The next most significant cost item is maintenance expenditure, especially on open waterways.

In addition to the price increases, the South West Irrigation System has experienced significant adjustments on the cost side in recent years. These include:

- consolidating the operations of the districts and the drainage districts between Pinjarra and Dardanup at Harvey since 1991;

- reducing staff numbers. Total wages staff have fallen from around 70 in 1987 to just under 60 in 1990. Salaried staff in the Harvey office total five, compared with nine in 1988, although these staff also manage town water schemes and sewerage systems for local towns.

Table 2.3 summarises the financial performance of the South West Irrigation System and shows the differential costs of supplying irrigation water across the three districts.

It indicates that drainage is a significant component of operating and maintenance cost for these districts. It varies from 14 per cent in Collie to 27 per cent in Harvey, with Waroona being 20 per cent. These results indicate the cost of water delivery and drainage in terms of operation and maintenance costs is significantly higher in Harvey compared to Waroona and Collie. This difference in costs is exacerbated further if interest and depreciation costs are considered because of the capital intensive piped system in Harvey. In 1991-92 WAWA interest costs were $1.7 million for Harvey, $274,000 for Waroona and $80,000 for Collie. The combined historic cost depreciation and replacement provision was $475,000 for Waroona, $1.1 million for Harvey and $616,000 for Collie. This has implications for future management because WAWA currently uses a uniform pricing system across the districts.

Financial Significance of the South West Irrigation System

---

[2] These issues are the same as those which have been at the centre of irrigation policy debate for some time in Australia. They are considered in general in Industry Commission 1992, *Water Resources and Waste Water Disposal*, Report No 26, AGPS, Canberra. These issues were also to the fore in the recent McDonald Inquiry into rural water management in Victoria. See Gutteridge, Haskins and Davey 1992, *Future Management Review, Rural Water Commission*, Final Report.

[3] Western Australian Farmers Federation, 1993, Preliminary Submission to the South West Irrigation Review Task Force.

The South West Irrigation System currently earns just under $3 million for WAWA. This compares with the total WAWA operating revenue of $465.4 million in 1991-92. Therefore, the irrigation area accounts for less than 1 per cent of WAWA's revenue.

Similarly, the estimated replacement asset value of the irrigation system is around $170 million ($87 million for dams and $81 million for the channel system)[4] compared with the total written down replacement cost of WAWA assets in excess of $5 billion.

Clearly the South West Irrigation System is a very small part of total WAWA activities. WAWA is primarily a provider of metropolitan and country urban water and sewerage services.

This is a very important consideration. The future performance of WAWA under corporatisation will, in the broadest sense, be judged in relation to its metropolitan performance. This is the area where major capital expenditures will be needed, where major efficiencies will be sought and where major pricing initiatives will be required.

Allied to the insignificant global position for the South West Irrigation System is the fact that the culture of the two systems is different in terms of customer orientation and general management. In irrigation, especially in gravity fed systems, the customer is an integral part of the delivery system through ordering and related activities. Therefore, the working relationship between the service provider and the farmer customer needs to be close. To a great extent they are mutually dependent and their interaction has a major influence on the efficiency of the system[5]. The urban system on the other hand leaves the customer at arm's length from the supply and operational aspects.

The Effects of Nutrient Runoff and Salinity

A number of significant environmental problems are now generally recognised as being associated with irrigation activity in the South West. The principal problems are the nutrient load in runoff water from the irrigation area, waterlogging and salinity[6]. These can be divided into off-site and on-site effects.

Off-site effects extend beyond the irrigation area and relate to the quality - in particular the nutrient load - of water discharged from the irrigation area into receiving water bodies such as the Leschenault and Peel-Harvey inlets and into streams downstream from points where drainage water is released. All of the Waroona and 50 per cent of the Harvey District runoff waters drain to the Peel-Harvey estuary. All the Collie district and 35 per cent of the Harvey district runoff water drain into Leschenault Inlet.

---

[4] The South West Irrigation Area Strategy Study, 1990, *Phase 1 Report*, Report No WP95, Water Authority of Western Australia, Perth

[5] This working relationship is emerging as an integral part of new management systems being designed in most irrigation systems based on introducing automation into the functions carried out by water men and in the ordering system

[6] The major nutrient of concern is phosphorus

The critical factor in runoff is the phosphorus load, which leads directly to eutrophication.

Water quality targets for the Peel-Harvey estuarine system, based on annual phosphorus loadings have been defined in the Environmental Protection (Peel-Harvey Estuarine System) Policy 1992. The current catchment management plan has targeted a 50 per cent reduction in nutrient discharge to the estuary.

Managing these environmental issues will be a critical factor in the overall future management of the irrigation system.

Future Water Supply Options for the Perth Metropolitan Region

WAWA in its current planning has identified diversion of water from the irrigation area storages as one of a number of viable future supply options for Perth. Based on current thinking regarding the relative costs of these alternative sources, taking water from the northern storages in the irrigation area (Waroona and Harvey) could become the preferred option for supplying Perth in 10 to 15 years[7]. The potential size of this water transfer is significant.

It appears that the level of water transfer required to make the pipeline to Perth viable is such that WAWA could not rely on using only surplus water. It would need to acquire a significant part of the water currently used for irrigation. This could have a major impact on the size of the irrigation system in the long run. This planning issue has a bearing on the introduction and operation of a transferable water entitlement system for the South West Irrigation System.

The irrigation system would need to be scaled down if water was transferred to the metropolitan system on the scale envisaged from the existing storages. However, planning for future water sources is ongoing and it is important to recognise that other options do exist for supplying Perth. One of these is the option of building a new Harvey dam with capacity to supply irrigation and contribute to metropolitan demands. This option would reduce the pressure to take water away from irrigation uses.

Nevertheless, the desirability of continuously assessing and reassessing the highest and best uses for water and how to achieve them is a critical component of long-term water planning.

In this context, the need to plan for future Perth water supplies creates the only clearly identifiable competing use for South West Irrigation System water in the future. As a consequence, the future strategy for the irrigation system cannot be divorced from the overall water planning task and the potential impact of these planning decisions on competition for irrigation water.

---

[7] Stokes, RA and Stone, RR, 1993, *Planning Issues for Perth's Water Future*, Water Authority of Western Australia, Perth

If the government determines that water for irrigation will be less available in the future, thus requiring a reduction in the size of the irrigation area, this would have a significant impact on the South West Irrigation System.

Efficiency Gains Through Devolving the Management of the Irrigation System

Despite the gains that have been made by WAWA in recent years, in managing the irrigation system there is strong *prima facie* evidence that further major gains in efficiency could be achieved by changing the ownership and management structures of the system to allow more flexible arrangements within a more commercially oriented environment.

In the Eastern States and New Zealand significant changes to the management structures of irrigation systems have taken place or under way. For example, the New South Wales Government has adopted a management structure based on an elected board consisting mainly of irrigators and with formal managerial responsibility for key decisions. This is seen as an interim step to the privatisation of irrigation schemes in that State.

Victoria has also expanded the role of management boards as an interim measure before moving to corporatisation. In contrast, the New Zealand Government has moved directly to privatise all its irrigation schemes.

The Eastern States' experience suggests the key to change is farmer management and not ownership *per se*.

Greater flexibility and more competitive pressures can be introduced by separating the water distribution and drainage from the running of major dams and transferring them to local control and autonomy. The devolution of managerial responsibility would improve the efficiency of the scheme by reducing costs through:

- benchmarking and franchising;
- contracting out of services (eg, contracting out of accounting and billing); and
- inducing a flatter management structure.

At the same time it would allow those responsible for service provision to concentrate on achieving commercial goals and greater customer focus. Contentious and tough decisions in relation to levels of service, pricing and sales of water to competing uses would be made at the regional level with accountability remaining in the region.

Greater ownership of the basic management problems associated with running the service would provide irrigators with a strong incentive to address these problems.

Management Structures for the Irrigation System

Four potential ownership structures would achieve varying degrees of devolution of the management of the irrigation system. These are:

1. *A separate regional division of WAWA with a farmer advisory committee*

Under this structure the irrigation scheme would be managed by WAWA with irrigator input by way of an advisory committee. This option very closely resembles the existing situation.

2. *The WAWA manages the system under the direction of an elected board with a farmer majority*

This management structure goes beyond the status quo by giving an elected board consisting mainly of irrigators formal managerial responsibility for key decisions.

These would include the preparation of an annual business plan for the irrigation scheme which sets out the capital expenditure programs, the maintenance program and the service provided. The board would also monitor progress against the approved plan and approve variations.

Elsewhere in Australia this approach is seen only as an interim step in the devolution of responsibility for irrigation systems.

An advantage of this management structure is that it would maintain ready access to WAWA and its technical back-up. It would also enable farmers to gain first-hand experience of running the irrigation scheme. This would put them in a better position in the future to judge the merits of privatising all or parts of the scheme.

The significant disadvantage of this structure is that it results in limited accountability for the irrigators who have the strongest interest in the decisions taken. It transfers power but does not provide the responsibility and accountability. WAWA would still be acting as a safety net for the irrigation system management.

3. *Ownership by a State Government business enterprise under the direction of an independent board with a farmer majority*

To be successful corporatisation would require:

- autonomy and independence from direct government involvement in decision-making;
- commercial pricing for all services provided to consumers, including other areas of government;
- the relationship with government to be primarily that of a commercial interest, with the new irrigation agency required to set prices on a full cost basis and earn an appropriate target rate of return;

- the establishment of clear objectives separating those objectives which are commercial from those which represent community service obligations;

- strong managerial accountability with increased external financial reporting requirements; and

- rigorous performance monitoring with appropriate rewards and sanctions.

Corporatisation has definite advantages over the other two management structures considered above. These are:

- it will allow the irrigation scheme to develop a much clearer focus and a more predictable operating framework;

- it will allow a greater focus on managing the region's assets in a financially and environmentally sustainable way;

- it will provide the irrigation scheme with greater commercial focus and customer orientation;

- it will provide a level of service directly negotiated with consumers;

- it will allow greater transparency in policy and investment decisions as a safeguard against the abuses of monopoly power; and

- it should achieve a greater reduction in operating costs through increased competitive pressure and market discipline.

At present WAWA pays an annual statutory levy to the State Government. Since the irrigation system is currently a loss-making operation, it would not make a direct contribution to this levy. However, in accordance with current government policy, a corporatised agency could be required to pay such a levy. A corporatised agency would lose direct access to centres of expertise in WAWA. However, it would have the option of contracting out work in specialised areas, including contracting out to WAWA. This would avoid the need to employ a large number of specialised staff.

4. *Full privatisation*

Under this arrangement ownership and management of the irrigation system would be transferred to a co-operative or private firm. Responsibility for the management of the headworks would remain with WAWA.

Most of the advantages and disadvantages associated with corporatisation also apply to full privatisation. In deciding whether the State should retain ownership of the irrigation system in a corporatisation framework or transfer ownership under privatisation, a number of issues need to be addressed, including the following:

- the additional benefits in terms of productivity and efficiency gains that may be obtained through a transfer to private ownership, as distinct from corporatisation;

- the extent of tax liabilities that would be created by the transfer to private ownership. Whereas a corporatised agency would pay only the statutory levy, a private firm would be liable for the full range of taxes, including profits and sales taxes. The only way around this seems to be through specific legislation which exempts the irrigation company from these liabilities;

- the relative magnitudes of the regulatory burdens created by corporatisation and private ownership respectively. Currently, a privatised entity would fall under the ambit of the Prices Surveillance Authority and the Trade Practices Commission, whereas the government-owned corporatised entity would not. However, this would change if the recommendations of the recent Report of the Independent Committee of Inquiry into National Competition Policy were adopted[8]. The Inquiry recommends that all government corporations be made subject to trade practices law; and

- the implications for other major reforms such as the pricing of irrigation water and transferable water entitlements. Specific control over prices is only possible under corporatisation.

In the case of privatisation where a degree of monopoly power exists, the government may need to establish a separate regulatory structure to monitor and regulate the pricing behaviour of the irrigation entity.

Evidence of the impact of ownership on efficiency[9] indicates that market structure and competition are the prime determinants of efficiency. Ownership is considered a second order factor.

Most, if not all, the prospective efficiency gains achievable under privatisation would be obtained from corporatisation. The challenge is to introduce a management structure that will provide the appropriate incentives for on-going efficiency gains.

The evidence available from developments in New South Wales, Victoria and New Zealand suggests that corporatisation would be the most appropriate strategy for the South West Irrigation System. The major gains from privatisation could be achieved through corporatisation while avoiding the added complexities and uncertainties associated with the full privatisation option.

In order to separate the South West Irrigation system from WAWA, a series of important and complex negotiations will need to take place. These include the negotiation of a bulk water licence, the preparation of a Land and Water Management Plan encompassing agreed environmental objectives, a detailed asset register and asset management plan, and the preparation of a business plan.

---

[8] Independent Committee of Inquiry into National Competition Policy, 1993, *National Competition Policy*, AGPS, Canberra

[9] Industries Assistance Commission, 1989, *Government (non-tax) Charges*, Report No 422, Vol 2, AGPS, Canberra

These complex negotiations would be best accomplished through the process of corporatisation rather than privatisation. It would also allow the Government to test a number of procedures and structures that would be necessary for privatisation while still retaining ownership of the assets. Moreover, a move directly to privatisation has some attendant disadvantages. In particular:

- the Government runs the risk that if the private system fails, it will be forced to rescue the system and this could be to the detriment of all parties; and

- full privatisation is contingent upon resolving the issue of long-term security of water for irrigation. If the supply of water available for irrigation contracts in the future due to diversion to alternative uses such as urban consumption or industrial uses, then ownership of the system may not be very attractive to a private firm.

Future Management of the Irrigation System

The water distribution and drainage components of the South West Irrigation System should be separated from WAWA and corporatised as an independent government business agency under an independent board.

The new agency should have a very clear mission to foster a prosperous irrigated agricultural region by providing a high quality, financially sound and environmentally sustainable irrigation service and by participating in initiatives to develop irrigated agriculture and related industries.

The area of operation of the new agency would be the entire irrigation system from the point where the irrigation water is received from the main supply channel to where it enters the main drainage channel. This would entail the assets (all waterway structures) associated with the distribution and drainage of water between the main supply channel and the main drainage channel being transferred from WAWA to the new agency.

Efficient resource use will only be achieved by giving the new agency complete managerial autonomy regarding the setting of strategic and operational objectives, accountability and performance monitoring. This will necessarily cover pricing, employment conditions, asset management, investment planning, future system development and environmental monitoring and management. It is essential to develop a management structure that can carry out these functions.

WAWA should retain responsibility for the operation and maintenance of the headworks. It would supply water to the new agency under a bulk water licence negotiated during the implementation process to establish the new agency. The bulk water licence would provide a comprehensive agreement between WAWA and the irrigation agency covering all significant dimensions of water use, relevant conditions and requirements for compliance.

Currently WAWA is responsible for the removal of drainage water from the South West Irrigation System. This would remain the case and would require the negotiation of a drainage licence between the new agency and WAWA.

In managing the irrigation system assets, a new irrigation agency would have to take responsibility for meeting environmental objectives such as the management of wetlands, parks and recreational areas, monitoring of nutrients in drainage water and flood mitigation.

These tasks are legitimate costs in managing an environmentally sustainable irrigation system and should be paid for by the new irrigation agency.

However, Government agencies are frequently required to carry out a number of non-commercial activities generally aimed at meeting the Government's social objectives. These include subsidies to certain sections of the community such as the aged, and uniform pricing arrangements across large areas that have significantly different costs of supply. These requirements are commonly referred to as community service obligations (CSO's).

Where an agency is required to fund CSO's internally, this has usually been achieved by a cross-subsidy from other users. Cross subsidies of this type are an important source of inefficiency as they break the link between the price of water and individual's consumption of water, thus distorting water use decisions. These CSO's should be directly funded in full by the government. This ensures that the adverse efficiency effects of subsidies are not multiplied by a requirement to fund concessions by over-charging other users. Direct funding also makes the assistance transparent.

Pricing Policy for Efficient and Sustainable Resource Allocation

The pricing of irrigation water and drainage services would be central to any future management strategy for the irrigation system. Correct pricing would provide the financial resources for the system to operate in a financially independent and sustainable way.

Another crucial role of pricing is to provide signals that encourage all individuals and organisations in irrigation to make decisions consistent with efficient resource allocation. For example, by appropriately charging for irrigation drainage services, irrigators would pay the actual cost of removing nutrient loaded water from the irrigation area. With this information they could make informed decisions about the best way to manage their operations in relation to nutrient production and runoff.

The pricing practices in irrigation and drainage in Australia have been criticised for not doing this. As the Industry Commission pointed out, these practices have been largely determined by social and development objectives, rather than by efficiency objectives[10]. The consequence is that most irrigation systems have made little or no financial contribution beyond covering ongoing operating and maintenance costs. They do not contribute to replacement of irrigation assets, interest payments nor to any return on the capital invested in irrigation headworks (dams) and networks.

---

10 Industry Commission, 1992, *Water Resources and Waste Water Disposal*, Report No 26, AGPS, Canberra

There is an increasing recognition that acceptance in the past of routine cost under recovery has resulted in inappropriate investment decisions by both government and the irrigation community.

The increasing pressure on governments to run agencies more efficiently, combined with the difficult financial position of most governments in Australia has meant that pricing and the need to become financially self sustaining is at the centre of much of the debate regarding the future management of irrigation systems in Australia.[11]

The effect of pricing goes beyond simple financial considerations. Cheap water tends to discourage the development of alternative water sources and discourages the adoption of water saving technology and efficient water scheduling techniques.[12]

In addition, to the extent that excess water use results in greater accession to the water table, increased runoff or increased nutrient loads, cheap water works against sound environmental management.

Appropriate pricing is essential to ensure the best use is made of irrigation resources and of associated environmental resources. However, determining the appropriate approach to pricing raises a variety of conceptual and implementation issues that need careful consideration.

Perhaps the most important issue concerns the application of the user pays principle to irrigation services and its relationship to full cost recovery.

The application of the user pays principle, in the sense that irrigators should pay a price for water that reflects the full resource costs of supplying it, has generally been supported in the recent reviews of irrigation systems in Australia. In an ideal world, and certainly for new infrastructure investments (see below), the costs to be covered include:

- operating and maintenance costs;
- overhead or administration costs;
- debt servicing costs;
- depreciation of infrastructure; and
- imputed return on equity.

---

11 See for example, Gutteridge, Haskins and Davey, 1992, *Future Management Review, Rural Water Commission*, Final Report

12 Western Australian Department of Agriculture, 1993, Submission to the South West Irrigation Review Task Force

The complications are not so much with the principle or with what general cost categories are relevant, as with the implementation of the principle. Several important issues have to be resolved including:

- whether past investment which is a sunk cost should be included in the charging base and if so, the method of valuing assets for inclusion;
- the distinction between past and future investments in irrigation infrastructure;
- the treatment of interest on past loans;
- the treatment of interest on accumulated past debts; and
- the interpretation of the return on equity.

Prices Based on a Renewal Accounts System

Increasingly it is being argued that irrigation agencies in Australia should adopt the renewals approach to accounting for infrastructure.[13]

Under this approach, irrigation assets are treated as non-depreciable and the cost of renewals is charges as an operating expense in the year in which it is incurred. The assumption is that renewals expenditure is relatively constant and corresponds to the economic use of capital.

The renewals accounting method has evolved to deal with problems typical of assets in the water industry, in particular:

- the longevity of asset lives, 50 to 100 years;
- the uncertainty of the life of any specific asset;
- the fact that depreciation and maintenance are closely connected;
- the fact that for many water systems it is more appropriate to talk in terms of the system rather than individual assets; and
- deficiencies inherent in conventional depreciation methods when the above conditions exist.

However, renewals expenditure on irrigation assets, especially if headworks items are involved, tends to be lumpy. For example, in the South West Irrigation System, the replacement of automatic flow controls would represent a lumpy renewals expenditure.

---

13 Arthur Andersen and Co, 1991, *Rural Water Commission of Victoria: A Review of Accounting Arrangements*. It was also considered favourably by the Industry Commission (Industry Commission, 1992, *Water Resources and Waste Water Disposal*, Report No 26, AGPS, Canberra)

Where renewals expenditure is lumpy or volatile an averaging procedure is recommended whereby the volatile renewals expenditure profile is reduced to a present value and an equivalent annuity estimated. This renewals annuity then becomes the annual capital charge which, if accumulated as a sinking fund, would be sufficient to finance the planned expenditure program for replacement and refurbishment or for expansion where this has been built into the plan.[14]

In effect, this system is based on an assessment of the stream of expenditure needed in the future to maintain the productive output of the assets.

WAWA has estimated that adopting a renewals approach for the asset replacement charge would improve the bottom line of the South West Irrigation System by about $1 million, as a replacement cost depreciation charge of some $2.6 million would be replaced with a renewals annuity of only $1.6 million.

One attractive feature of renewals accounting has been noted in the Victorian situation[15]. The application of current cost depreciation is frequently associated with claims by irrigator customers that it generates more funds than will actually be required to achieve replacement of the current capacity. If the current cost charge is invested in a sinking fund, the amount with interest may exceed the replacement cost. Under renewals accounting it is easier to identify the charge basis with an actual plan or schedule of renewals covering defined parts of the irrigation system.

The objective of overcoming this type of problem was one of the major reasons why the Review of Accounting Arrangements in the Victorian Rural Water Commission recommended the use of renewals accounting for managerial decision making.[16]

In both New South Wales and Victoria, the establishment of sinking funds is being recommended. The McDonald Inquiry[17] recommends that in conjunction with the adoption of the renewals approach to the capital charge, a sinking fund should be established. The fund would accumulate the excess of the renewals annuity over actual renewals expenditure in those years when the former exceeds the latter and would finance the deficit in years when the renewals expenditure exceeds the renewals annuity.

In the Victorian model, the individual irrigation boards can lend surpluses to those boards in deficit in any given year. This approach works because the various irrigation areas in Victoria are staying within the State Government system while having decision-making power devolved to local management boards.

---

14 Where immediate expenditure is needed there may be a borrowing requirement

15 Langford, J. pers. comm. and Gutteridge, Haskins and Davey, 1992, *Future Management Review, Rural Water Commission*, Final Report

16 Arthur Andersen and Co 1991, *Rural Water Commission of Victoria: A Review of Accounting Arrangements*

17 Gutteridge, Haskins & Davey 1992, *Future Management Review, Rural Water Commission*, Final Report

In the New South Wales case, individual boards must manage their own sinking funds. Currently the various boards are preparing business plans incorporating renewals expenditure plans and associated sinking fund provisions as part of the negotiations relating to privatisation. The lumpiness of the actual renewals expenditure combined with the smooth sinking fund accumulation rate means that in some cases the financial management of the sinking fund could become a major management activity in the future.[18]

The sinking fund approach has been used by the small West Corurgan Private Irrigation District since its inception. At any given time it has substantial cash reserves in the fund.

There is an inherent uncertainty in the annuity approach to the renewals charge. It requires a renewals expenditure plan to be used to calculate the annuity based on the present value of the expected renewals expenditure profile. Expenditure plans can only be estimated with a degree of uncertainty as to both the timing and magnitude of expenditures. Almost certainly there will be some deviation from the underlying plan. However, a concern in most irrigation areas relates to major unforeseen capital expenditure that has not been adequately factored into the plan and therefore has not been accounted for in setting water charges.

In the event of such major unforeseen expenditure deviations, the accumulated reserves in the sinking fund may be deficient. In these circumstances, the sinking fund could be supplemented by a levy imposed on irrigators to cover the expenditure. West Corurgan do exactly this.[19]

Past investments in headworks and irrigation distribution networks are sunk costs and it would not be efficient to seek a return on those assets from current prices if it resulted in an under utilisation of water and the associated infrastructure.

As the Industry Commission has noted, once water infrastructure is in place it does not often have alternative uses. As a consequence it may be more efficient to utilise the infrastructure so long as the associated water charges cover operating costs.[20] In this context operating costs need to be defined to include any environmental damage a. i/or management costs that are attributable to the operation of the system.

In circumstances where an additional charge to obtain some contribution to past capital costs causes infrastructure to remain idle it would be an inefficient outcome.

---

18 For example, in the Murray Irrigation Area financial plan, income from the sinking fund rivals income from water sales at various points in the future, demonstrating the potential importance of the financial management role (Maisey, G. 1993, pers. comm.)

19 This levy arrangement was voted for by the irrigators themselves at West Corurgan as part of their management control of the system. (Wallis, P. 1993, pers. comm.)

20 Industry Commission 1992, *Water Resources and Waste Water Disposal*, Report No 26, AGPS, Canberra.

This view is supported in an Australian Bureau of Agriculture and Resource Economics (ABARE) study of the Murray-Darling Basin, where it is argued that:

"On "user pays" or microeconomic reform grounds there is no case for irrigators paying for the fixed or "sunk" capital of long established water storages. The reason for this is that such payments, which would actually be retrospective charges, would not influence capital allocation in the industry and hence would not increase economic efficiency."[21]

Essentially the same conclusion was reached by the McDonald Inquiry where it was argued that:

"The interest and principal costs incurred in servicing the original investments in storage and distribution are sunk costs in the sense that there is a lack of alternative uses for the infrastructure. The costs associated with these past investments are irrelevant to the decisions regarding their use in the future; the servicing costs will have to be paid irrespective of use. It is then inefficient to include these costs in pricing."[22]

It needs to be recognised that, notwithstanding these arguments, the ongoing costs associated with past infrastructure expenditure do have to be paid. Resolving these "sunk cost" arguments is critical to resolving the future management of irrigation systems. The resolution is likely to involve a direct trade-off. Imposing full interest and replacement cost capital charges against irrigation water prices is likely to render the irrigation service provider financially non-viable and cause specific infrastructure to be under-utilised. On the other hand, adopting these "sunk cost" arguments and absorbing either all or a large part of the sunk interest and principal costs places the financial burden on the general taxpayer.[23]

---

21 Australian Bureau of Agricultural and Resource Economics 1991, *Management of Irrigation Water in the Murray-Darling Basis*, Discussion Paper No 91.6, AGPS, Canberra

22 Gutteridge, Haskins and Davey 1992, *Future Management Review, Rural Water Commission*, Final Report

23 A similar trade-off issue has arisen in New South Wales which the New South Wales irrigation area boards are trying to resolve in conjunction with the Department of Water Resources as part of the process of creating independent irrigation companies. In many irrigation areas the infrastructure is run down and significant capital expenditure is required to upgrade it to an acceptable standard. In addition it carries heavy debt burdens. If irrigation agencies were asked to cover all the principal and interest costs associated with this infrastructure as well as finance and upgrade costs, the resulting water prices would render agriculture and the irrigation companies non-viable in some areas. To avoid this and ensure that the irrigation companies could remain viable would require some form of injection by the New South Wales Government. The trade-off between water price to irrigators and the level of government injections and the implications for viability is currently the subject of a study across all irrigation areas. (Deputy Director-General, New South Wales Department of Water Resources and senior managers and board members in the Murray, Colleambally and Murrumbidgee Irrigation Areas 1993, pers. comm.)

The South West Irrigation System makes a financial loss, earning negative rates of return on assets. However, this loss of just over $5 million includes $2.9 million in interest on past debt and a $2.5 million depreciation charge. Of the $2.9 million in interest charges, $0.5 million relates to debts incurred for irrigation in the South West since the inception of WAWA, the balance of $2.4 million pre-dates this amount. Of the $2.5 million depreciation charge, $1.9 million represents a replacement cost provision.

The interest costs associated with the existing irrigation infrastructure (headworks and distribution networks) are a significant financial cost to the South West Irrigation System. These interest costs are of two kinds: debt on loans for infrastructure and debts to cover past deficits. Both should be treated as sunk costs. However, the interest costs relating to accumulated past deficits represent a charge to current irrigators for subsidies to past irrigators who would have received benefits in the form of higher returns and farm prices. Notwithstanding the sunk cost argument, there is a case for the government to write these off.

Insofar as the interest costs are concerned, these charges represent, at least in part, the consequence of previous investment and pricing decisions that, in the context of current circumstances, were inappropriate.[24] In part they were investment decisions made in the interests of broad agricultural and regional development, and not on purely economic considerations. Therefore it is reasonable to argue that the "community" should bear a substantial part of the costs of these past decisions and the costs of redefining the rules under which the irrigation system will be managed.

In addition to the sunk costs, the costs of rationalisation and closure also need to be considered. If these costs are sufficiently large it may be desirable to continue to run the system even with negative rates of return.[25]

Factoring the interest on past debt into the price of water can seriously jeopardise the long term viability of an irrigation system.

Finding the appropriate price level is largely about making sure that, given the price sensitivity of demand, the revenues earned are sufficient to cover operating, maintenance and capital costs and to earn an appropriate level of surplus. An appropriate structure for prices should ensure those associated with the irrigation system receive the appropriate signals regarding the costs of various services and receive the appropriate incentives for efficient use of resources.

---

24 Water Authority of Western Australia 1993, Submission to the South West Irrigation Review Task Force

25 A cost benefit analysis showed that insofar as the South West Irrigation System is concerned, closure was not a viable option. It produces positive net benefits for the State, although in the Phase 2 estimates, these varied with the size of the system and the pricing and environmental regimes adopted. (The South West Irrigation Area Strategy Study 1992, *Phase 2 Technical Report*, Report No WP171, Water Authority of Western Australia, Perth)

From a pricing theory perspective, the appropriate approach is the use of some form of marginal cost pricing. Under marginal cost pricing, prices reflect the marginal cost of supplying additional units of irrigation water. However, pure marginal cost pricing has some drawbacks in implementation. It involves price fluctuations that reflect the capacity position at any point in time. For example, after increases in storage, prices would inevitably be low and then would rise over time as demand grew and capacity was used.

This attribute of marginal cost pricing has the added disadvantage in that by encouraging high use of water when there is excess capacity in storage, it risks environmental damage through over-use of water, causing water logging and increasing salinity. The implementation of marginal cost pricing is also made difficult because many costs are common across the irrigation system and cannot easily be incorporated into a marginal price. For the above reasons, marginal cost pricing in its purest sense is usually not adopted in irrigation.

The most sensible compromise is two-part pricing where price is composed of a fixed charge and a volumetric charge. This enables cost recovery while at the same time conveying the appropriate signals regarding the marginal cost of later delivery.

Under the approach the fixed charge remains relatively constant while the variable charge changes over time with changes in capacity and with the changes in the cost of delivering water to irrigation.

One complication in using two-part pricing is that most of the costs under the current arrangements are fixed and a balance would have to be achieved between the fixed and variable charge to ensure the variable charge provided the appropriate efficiency incentive.

In addition, determination of the marginal price will need to account for the opportunity costs associated with committing water to irrigators.

Irrigators should be given Water Resource Security as a Water Entitlement

Under present legislation, *the Rights in Water and Irrigation Act, 1914, and the Metropolitan Water Supply Sewerage and Drainage Act, 1909*, vest the right to water in the Crown. WAWA, in consultation with the South West Irrigation Districts Advisory Committee, allocates this water to irrigators in the South West Irrigation System on the basis of rateable land area. Each rateable hectare is given a Basic Allocation of 9.2 ML. The calculation of this allocation was originally based on evaporative need for a normal season.

In addition to the Basis Allocation, a District Allocation is set each year by WAWA on the advice of the South West Irrigation Districts Advisory Committee. In a normal season the District Allocation is set at 14 ML per hectare. The South West Irrigation Districts Advisory Committee has the power to review the District Allocation during the irrigation season. On its advice the Regional Manager of WAWA can vary the allocation.

Under the current arrangement WAWA has an obligation to deliver the prescribed allocation to the irrigator. Any transmission losses incurred from the dam to the bulk off-take or from the off-take to the land holder are borne by WAWA.

Linking water allocation to a particular parcel of land prevents it from being traded freely and channelled into its most valuable use. As such is represents an inefficient restriction on the allocation of water.

A more efficient allocation of water would be achieved by establishing a water entitlement as a legal property right, vested in the individual and negotiable independently of the land. The current water entitlement does not designate ownership of the water; it simply gives the owner the 'right' to use a specific amount of water.

The existing method of allocation based on rateable area should be replaced with one that provides a volumetric entitlement with clearly defined property rights attached to it.

Under this arrangement, the initial allocation of water entitlements should be granted, free of charge, on the basis of the irrigator's water allocation under the existing system. This method of allocation recognises the long-standing *de facto* water right irrigators have had. However, entitlement to additional water supplies should be sold by auction so as not to disadvantage those who do not yet have an entitlement.

Upon making the initial allocations the new agency would supply water to individual irrigators under conditions specified in a legal service contract. It would be accountable to irrigators as customers for the efficiency and quality of water delivery.

It would need to be able to negotiate a level of service contract which is based on a volumetric share of the bulk water entitlement, on an annual basis, delivered to the property boundary through the distribution system.

To be able to properly manage the distribution system, including the water in the channels, the new agency needs to be in control of the water from the off-take point of the bulk water supply to the off-take point at each farm.

WAWA would issue a bulk water licence to the new agency that specifies a contract for the delivery of a bulk water entitlement. This would serve to establish a clear demarcation between WAWA as the bulk water supplier and the new agency.

The bulk water licence would cover the significant aspects of water supply. For example, it would specify all the relevant conditions of supply, the requirements for compliance and the sanctions for non-compliance, by either WAWA or the new agency.

The licence is in effect a performance contract governing the relationship between the two agencies. As such it would deal with:

- maximum daily flow at the off-take; and
- maximum allowable salt and nutrient content.

The licence would also specify the water entitlement parameters including:

- megalitres per annum to be delivered;
- point of supply; and
- reliability of supply parameters.

In the interest of efficiency and equity the aggregate water entitlement to the new agency would be the sum of individual entitlements plus an amount to cover system distribution losses up to the farm off-take point.

An increase or decrease in the bulk entitlement would need to be negotiated with WAWA, subject to appropriate environmental approvals.

It should be possible for irrigators to relocate anywhere within the South West Irrigation System and still be able to obtain irrigation water. This would assist adjustment and facilitate the overall management of the water resource. For example, it should be possible to divert water from the Harvey dam to the Waroona district in the event that water from the Waroona dam was diverted to Perth for domestic use.

Water entitlements should be transferable to allow the movement of water to its most efficient uses. At the farm level a properly functioning market for transferable water entitlements (TWE's) would provide irrigators with a greater choice of responses to changes in market prices and input costs. An effective TWE market would focus irrigators' attention on the real opportunity cost of water. As a result, this is expected to lead to changes in on-farm water use by stimulating the adoption of water saving technologies; by encouraging irrigators to direct water to higher value crops; and by fostering the decreased use of land that is poorly suited to irrigation.

A properly functioning market for TWE's would also play a significant part in the re-allocation of water between competing consumptive uses such as urban use, industrial use and environmental management purposes.

The potential importance of properly functioning TWE markets in water resource management in Australia is well recognised[26]. Their adoption in other states commenced in the early 1980's. South Australia has introduced a variety of schemes since 1982-83, with transfer on either a temporary or permanent basis. New South Wales commenced with annual transfers in 1983, and moved to permanent transfers in some areas in 1989-90. Victoria and Queensland introduced systems of annual transfer in 1987-88, and Tasmania ran a trial of annual transfers in 1989-90.

There are few examples of the transfer of irrigation water in Western Australia. It has been common practice for some time to allow transfers between properties under common ownership. Also, during the 1987-88 irrigation season, when drought caused

---

26 Pigram, J. et al. 1992, *Transferable Water Entitlements in Australia*, Report to the Land and Water Resources Research and Development Corporation.

water to be in short supply, farmers were permitted to transfer water amongst themselves on a temporary basis.

In 1990 Western Australian Water Resources Council Working Group on TWE's[27] recommended that TWE's be introduced, but on a two year trial basis only, in the Collie Irrigation District in the 1990-91 irrigation season. Good winter rains in 1990 meant the supply of irrigation water in the Collie District exceeded demand. Accordingly, the proposed trial was abandoned as there was no significant benefit to be gained from the introduction of TWE's. The failure of this trial to get off the ground suggests that a properly functioning TWE market will only develop if there is a water shortage.

One mechanism for trading entitlements could operate along the following lines. Once entitlements have been distributed, transactions would be conducted between entitlement holders on an individual basis. Buyers and sellers could come together via newspaper advertisements, or through private arrangement. The price would be determined by the individuals concerned.

In Victoria sellers are required by law to place an advertisement in the local newspaper announcing an intention to sell entitlements. This requirement has been found necessary to protect the interests of other parties.[28]

An application for the transfer of water entitlements would be subject to the following conditions:[29]

- the capacity of the supply channels must be sufficient to meet the delivery requirements;
- the transfer must be consistent with the conditions laid down in a Land and Water Management Plan;
- the holder of the mortgage on the transferrer's land must be notified, where applicable; and
- all appropriate fees must be paid.

The new agency would process applications for water transfers and certify that the required conditions, such as those set out above, had been met. In this role it would effectively fulfil functions already well developed and understood in other markets such as settlement agents in the land market.

---

27 Transferable Water Entitlements Working Group 1990, *Transferable Water Entitlements*, Final Report to the Western Australian Water Resources Council, Publication No 5/90, Perth.

28 Saunderson, L, pers. comm.

29 These conditions follow closely those prescribed in Transferable Water Entitlements Committee 1990, *Transferable Water Entitlements in Western Australia*, Report to the Western Australian Water Resources Council, Publication No 8/89, Perth.

Transfer of entitlements could be either a short term or permanent basis, by lease or sale. The Industry Commission[30] believes that under a system of temporary transfers, uncertainty about the availability of water in future seasons will constrain transfer and hence the efficiency gains. Therefore, the Industry Commission argues that while temporary transfers bring some benefits, it is important to have a facility for permanent transfers available as these are likely to deliver much larger gains.

The only clearly identifiable competing use for the South West Irrigation System water in the future is re-direction to Perth for domestic consumption. If a properly functioning TWE market was in place WAWA would have to enter the market and buy water entitlements from irrigators in order for the transfer to take place. In this way the true cost of diverting irrigation water to Perth would be explicitly recognised. WAWA would not buy water entitlements unless it was cheaper than developing alternative sources of water.

This process also provides irrigators some choice in the matter as they would not sell TWE's unless they believed they would be better off through the sale.

Allowing transfers between sectors could also facilitate the use of irrigation water for industrial and environmental purposes. Again, the true cost of water as an input into these alternative uses is explicitly recognised.

For intersectoral transfers, conditions similar to those applying to transfers between individual irrigators within a district would be required to ensure that intersectoral transfers do not have adverse environmental consequences. Intersectoral transfers would be negotiated through the new agency. This is in contrast to transfers of entitlements between individual irrigators within an irrigation district which would be routinely processed subject to checking the specified legal and environmental requirements relating to transfers are met.

Intersectoral transfers represent a transfer of part of the bulk water licence from irrigation to another activity. Individual irrigators negotiating directly with third parties to sell entitlements outside the irrigation sector effectively are selling part of the bulk licence. This reduces the volume of water remaining to be distributed and this in turn, depending on the configuration of the system and the position of the individual farms within it, could have significant effects on the costs of operating the remaining system. Thus the implications for the remainder of the system need to be taken into account in any process of intersectoral transfers. This could occur in a variety of ways. Intersectoral transfers represent a revised allocation of water resources in the South West. This allocation could be subject to the approval of the government through the normal allocation processes with the new agency given an opportunity to have formal input into the decision process, and the opportunity to negotiate the price of transfer.

---

30 Industry Commission 1992, *Water Resources and Waste Water Disposal*, report No 26, AGPS, Canberra.
Gutteridge, Haskins & Davey 1992, *Future Management Review, Rural Water Commission*, Final Report.

Irrigators should be able to sell all their entitlement. This is contrary to a view often put that the sale of total entitlement could seriously disadvantage other irrigators further along the channel.

The sale of water entitlements could enable farmers to move easily out of irrigation into dryland farming, even though the separation of the water right from the land may result in a one-off fall in the value of land. This course of action represents an important adjustment mechanism.

However, irrigators who sell their whole entitlement would continue to pay an access charge unless otherwise agreed by the new agency. Through the access charge they continue to contribute to the upkeep and maintenance of the irrigation system. This would ensure that irrigators further downstream do not experience a deterioration in quality of services as a result of the withdrawal of upstream irrigators.

There may be circumstances where a landholder wishes to forego access to the irrigation system permanently. For example, a landholder wishing to develop land for residential purposes. Landholders in this situation should pay an excision charge. The excision charge would reflect the cost to the irrigation system of removing access to the system.

The new agency, as the agency managing the TWE market, should be able to trade in TWE's including reselling TWE's to WAWA.

Consider, for example, the situation where an irrigator introduces measures that lead to more efficient water use. In a properly functioning TWE market the water entitlement saved in this way could be sold. The new agency should be able to buy TWE's arising from efficiency gains in the situation where a prospective seller is unable to find another buyer. These entitlements could be made available for allocation and sale to new agricultural enterprises. The income generated from such sales could then be used for extending or re-equipping the irrigation system.

The efficient use of land and water resources within the irrigation area is dependent upon establishing well defined resource management and land use planning policies. In particular, the management of the environment must be an integral part of the long term strategy for the South West Irrigation System.

An appropriate way to achieve this is through the development of an integrated Land and Water Management Plan for the irrigation area, in a framework set by appropriate State planning policies and environmental protection policies.

It will therefore be important for the new agency to have appropriate legal powers to intervene formally in the planning and policy development processes which affect the land and water resource base of the irrigation system.

Table 2.1 Financial Performance of the South West Irrigation System

	1988/89 ($ million)	1989/90 ($ million)	1990/91 ($ million)
Operations and Maintenance	1 723	1 632	1 688
Salaries and Administration	0 510	0 557	0 630
Total Operating Costs	2 233	2 189	2 318
Total Revenue	1 929	2 220	2 702
Profit (Loss) Before Interest and Depreciation	(0 304)	0 031	0 384
Depreciation			
Historic Cost	0 522	0 601	0 617
Replacement Provision	1 572	1 753	1 903
Interest on Past Borrowing			
WAWA	0 330	0 510	0 488
Government	2 317	2 341	2 419
Statutory Levy	0 55	0 59	0 67
Net Profit After Interest and Depreciation	(5 170)	(5 232)	(5 112)

Table 2.2 Recent Tariff Rates for the South West Irrigation Area

	1990/91	1991/92	1992/93
Fixed charge per rateable hectare	$73 80	$81 18	$86 [illegible]
Volume charge up to 9 2ML	$17 25/ML	$18 11/ML	$19.40/ML
Volume charge up to District Allocation (14ML)	$19 00/ML	$19 95/ML	$21 35/ML
Volume charge over District Allocation	$34 50/ML	$36 23/ML	$38 75/ML

Table 2.3 Irrigated Areas, Water Consumption and Operating Costs by District, 1989/90

	Waroona	Harvey	Collie	Total
Land Areas (Ha)				
Perennial Irrigation	1,350	4,582	4,200	10,132
Early Germ Pasture	477	1,379	1,499	3 355
Perennial Pasture	2,647	8,689	9,546	20 882
Operating and Maintenance Costs ($)				
Irrigation	132,237	618,154	539,898	
Drainage	33,574	223,457	84,757	
Sub Total	165,811	841,611	624,655	
Water Use				
Total Water Consumption on farm (ML)	11,600	40,800	39,300	
Average Water per ha perennial pasture	8 04	8 33	8 72	
Average Water per ha early germ pasture	1 67	1 74		
Operating and Maintenance Cost per ML	14 3	20 6	15 9	