Assessment Of Irrigation Rehabilitation Options In The Lower Murray Reclaimed Irrigation Area

Sarah Wheeler[1], Doug Young[1], Stefan Hajkowicz[2], Andrew Manson[3]. and Melissa Bright[1].

1 PIRSA Rural Solutions, 2 Policy and Economics Research Unit, CSIRO Land and Water, 3 PIRSA

A Contributed paper to the 46th Annual Conference

of the Australian Agricultural and Resource Economics Society

Canberra, 13-15 February 2002

[1]

Much of the on and off farm irrigation infrastructure in the LMRIA requires updating and replacement if irrigators are to operate profitability under new water allocations and drainage requirements. A desktop study for assessing a broad range of options for rehabilitating the LMRIA were conducted using both Benefit-Cost Analysis and Multi Criteria Analysis. Other tools used in the assessment included a water trade model developed by DNRE and Input-output Analysis.

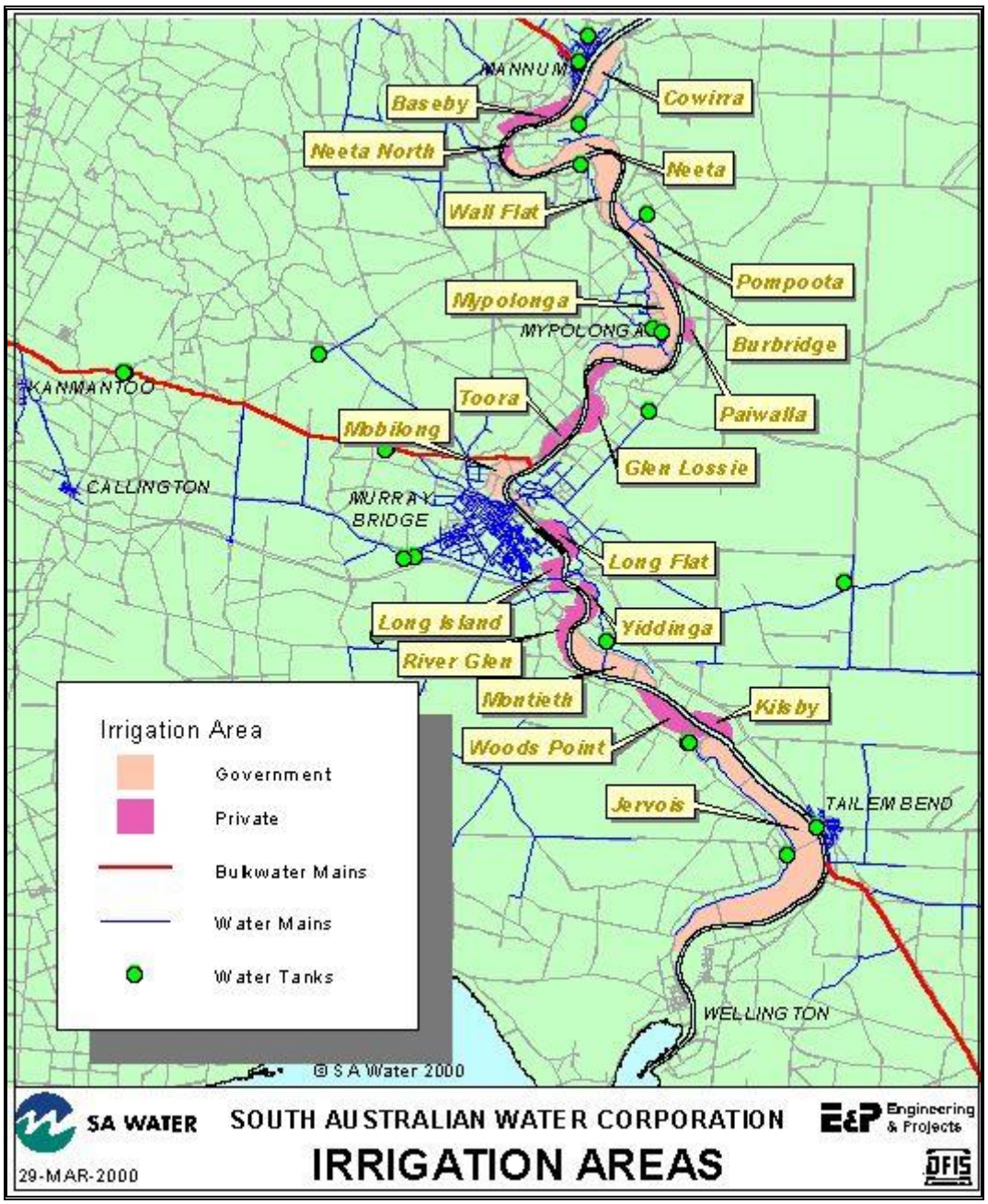
Key words: dairying, rehabilitation, evaluation

[1] Much of this paper is drawn from PIRSA (2001). Contributions from many people were gratefully acknowledged in that report and apply here also.

1. Introduction and background to study

The Lower Murray irrigation areas are former flood plains along the River Murray between Mannum and Wellington (plus one area on Lake Alexandrina at Finniss). Figure 1 below illustrates the area.

Figure 1 LMRIA



Source: SA Water

Most of this land was developed for irrigation between 1880 and 1940, principally in the 1920s. A levee bank was constructed along the River's edge to hold back the water, particularly at times of flooding. Since construction of the barrages at the Murray mouth in 1940, the 22 reclaimed areas ('swamps') have been 1.0m to 1.5m below the water level of the River.

There are about 120 dairy farms, covering an area of approximately 5,200 hectares of swamp and 1,700 hectares of highland. In approximately 2/3 of this area, the land and infrastructure is Government owned and managed, and in the other 1/3, it is privately owned and managed.

Irrigation is used to grow pasture for dairy cattle. The dairy farms in the Lower Murray region produce a significant proportion of the State's milk (15% - 25% depending on the season), with a farm gate value around $32m pa. They make a significant contribution to the regional economy, generating about 200 jobs.

Each swamp is flood irrigated by opening gates in the levee bank, or from a back channel. Irrigators have already laser-graded some of the swamp land to improve the productivity of pastures. Some irrigators also pump water from the River, the back channels or the drainage channels to irrigate highland for pasture or fodder. In many cases the irrigation bays belonging to or managed by specific dairy farmers are spread across the swamp, rather than being located together.

The primary function of the drainage channels is to keep down the water table and to intercept regional ground water, which is highly saline. These channels also capture storm water run off and excess irrigation water. This drainage water is pumped into the River.

The current irrigation system uses large volumes of water due to the poor design and condition of infrastructure, poor management practices and uneven paddocks. This creates a large amount of irrigation run-off that is returned to the River.

It is highly likely that irrigation return waters from dairy farms between Mannum and Tailem Bend are causing observed significant increases in both nutrient and faecal contamination along this stretch of the river. At times the level of microbial contamination at Murray Bridge and Tailem Bend has exceeded recognised recreational use guidelines for swimming. As such, current irrigation drainage management practices in the LMRIA cannot be considered to be ecologically sustainable.

Key objectives of this study included the assessment of:

- the ecological sustainability and economic viability of flood-irrigated dairying in the LMRIA; and
- the advantages and disadvantages of a range of rehabilitation options being considered by Government and irrigators.

2. Analytical approach

To complete this assessment, a desktop study was completed. Data and reports from a variety of sources such as ABARE, ABS, Dairy Authority of SA, Dairy SA and the DRDC were used to both provide an indication of the current status of dairying in the LMRIA and its future directions.

The assessment of the various rehabilitation options employed benefit-cost analysis and multi-criteria analysis. The latter of these two approaches was included because of the difficulty in providing monetary values for the expected changes in the environmental attributes and associated health impacts. As such the multi-criteria analysis was employed to demonstrate that the study had considered the importance that the community ascribes to changes in the values of these environmental attributes and associated health impacts. Data from a regional input-output table was incorporated into the multi-criteria analysis to specifically include the impact of the various options on regional employment.

In conjunction with other policy changes, the clearer definition of rights to irrigation water, and the ability to more widely trade that water is likely to exert adjustment pressures on irrigators in the LMRIA. The study team therefore employed the 'South Australian Dairy and Horticulture Linear Program' model to provide information, at a broad level, on the extent to which dairy farmers would be likely to sell their water allocations and exit dairy farming.

The following options for rehabilitating the on and off farm infrastructure in the LMRIA were assessed.

- Total Rehabilitation of LMRIA with LMIAG design Sprinklers
- Total Rehabilitation of LMRIA with LMIAG design Sprinklers plus evaporation basins
- Total Rehabilitation of LMRIA with DENR design Sprinklers
- Total Rehabilitation of LMRIA with LMIAG design flood irrigation
- Total Rehabilitation of LMRIA with LMIAG design minimal flood upgrade
- Total conversion of LMRIA to other agriculture
- Total conversion of LMRIA to total wetlands
- Total conversion of LMRIA to total abandonment
- Partial rehabilitation and conversion of remainder to other industry
- Partial rehabilitation and conversion of remainder to wetlands
- Partial rehabilitation and abandonment (37 per cent) of remainder
- Partial rehabilitation and abandonment (25 per cent) of remainder
- Partial rehabilitation and abandonment (6.5 per cent) of remainder

3. Results and conclusions

The future ecological sustainability of the region will depend on the effectiveness and choice of rehabilitation options. Clearly, an option that only upgrades the structures will not achieve the desired reductions in faecal or nutrient contamination. The level of future ecological sustainability will also depend on what society (through the EPA) considers is an acceptable level of contamination. The multi-criteria analysis indicates that people ascribe significant weight to the level of contamination of the river. A zero level of contamination would only be met with an option specifying off-site disposal.

Available information suggests that under current practices and prices some, but not all, dairy farms in the LMRIA are financially viable. There is a large difference between the bottom and top 20 per cent of farms in terms of stocking rates, gross margins, operating costs and milk production. For example, there is about 100 per cent difference in operating costs between the best and worst performing farms on the swamps.

Internal and external factors will mean that an increasing number of farms in LMRIA will face financial pressures over the longer term. Over this period, the pressures on dairy farms both within and outside of the LMRIA are likely to increase, generally as milk prices fall and the costs of inputs to production increase. A common response to these pressures in Australia and New Zealand has been an increase in farm size. Based on trends in increasing farm size observed in New Zealand, it is expected that average herd sizes in South Australia and Australia will increase to over 200 head in the medium term. These pressures will also apply to the LMRIA and without significant restructuring it is likely that some swamps in the region will not be financially viable in the future. In addition, the region will also face extra pressures from requirements to reduce the volume of water extracted and to meet higher drainage water standards. The degree of the pressure relating to drainage will depend on the severity of the standards adopted and the share of rehabilitation costs that farmers are expected to pay.

The results of the 'South Australian Dairy and Horticulture Linear Program' model indicated that a significant amount of water may trade out of the region and that there could be a sizeable reduction in the area of swamp irrigated.

The benefit cost analyses and associated sensitivity tests, the @Risk analysis and the multiple criteria analysis, all ranked rehabilitation of parts of LMRIA (at varying levels) using LMIAG design flood extension with abandonment of the remainder as options that consistently ranked highly. In the benefit cost analyses partial rehabilitation (at three varying levels) and abandonment were the options that had the highest NPVs.

Several of the options considered are unlikely to be supported on economic grounds. The results of the sensitivity testing indicated that under the ranges of assumptions made for the values of key variables in the following options, the probability of gaining a NPV greater than zero is less than 80 per cent for;

- Total rehabilitation of LMRIA with LMIAG Design Sprinkler;
- Total rehabilitation of LMRIA with LMIAG Design Sprinkler and Evaporation Basin;
- Total rehabilitation of LMRIA with DNRE Design Sprinkler;
- Total rehabilitation of LMRIA with LMIAG Design Minimal Flood Upgrade; and
- Total conversion of swamps in LMRIA to managed wetlands.

The options likely to be supported on economic grounds i.e. the probability of gaining a NPV greater than 0 was more than 80 per cent are:

- Partial Rehabilitation of LMRIA with abandonment of the remainder (at three varying levels);
- Total rehabilitation of LMRIA with LMIAG Design Flood Extension;
- Total abandonment of dairying on the swamps of LMRIA; and
- Partial rehabilitation of LMRIA with conversion of remainder to managed wetlands.

The ranking of options in the BCAs is sensitive to changes in key variables. Sensitivity testing indicated that if rehabilitation costs and the capital traded price for water were to increase by 50 per cent and 10 per cent respectively, and dairy gross margins were to fall by 20 per cent, then the option in which there is complete abandonment of dairying on the swamps at LMRIA would provide the highest NPV. Apart from this difference there was little difference to the ranking of the partial rehabilitation options. However, the BCA does not include changes to regional employment and the total abandonment option also has the largest negative impact on regional employment. As such, it is unlikely that this option would be supported by the community. This view is supported by the results of the MCA where the panel gave this option a low ranking.

Irrigated forestry was the only alternative industry considered viable for LMRIA. However conversion to irrigated forestry did not rank as highly as the above options. Given the lack of information about the long-term viability of irrigated forestry on the swamps, it was suggested that this option was highly risky and should not be pursued as an option without further research.

The size of the government contribution to the costs of rehabilitation will have a significant impact on the financial viability of farms post rehabilitation. The following analysis relating to the LMIAG Design Flood Extension rehabilitation option provides an example. Based on the financial performance (and associated physical structure) of dairy farms in 1999-200, only the top 20 per cent of farms are likely to be financially viable if they were required to pay all laser levelling and annual operating costs plus 100 per cent of the capital costs of the infrastructure. If dairy farmers were required to pay all laser levelling and annual operating costs plus 50 per cent of the capital costs of the infrastructure, then it is likely that only the bottom 20 per cent of farms would not be viable. It is unlikely that the bottom 20 per cent of farms could afford to pay more than 10 per cent of the capital costs of the infrastructure and all laser levelling and annual operating costs.

The key policy issue is the sequencing of reforms. There would be significant benefits in allowing farms to restructure in response to water trading, deregulation and drainage requirements, prior to rehabilitation. This would provide an exit option for those who do not wish to make the investments needed to succeed in dairying in future. It would also allow poorer swamp areas to be retired, and farms to consolidate, both of which could reduce rehabilitation costs. This would potentially make rehabilitation more affordable to the remaining landholders and reduce the risks to public and private investment in rehabilitation.