Summary of Results from Farm Water Case Studies

This study

Over three years 38 irrigators were interviewed on the costs and benefits of changes made to their farming systems as a result of modernisation of their on-farm irrigation systems in the Goulburn Murray Irrigation District under the Farm Water Program[1]. Case study examples include farms funded by NVIRP (now GMW Connections Program), the Commonwealth's On-Farm Irrigation Efficiency Program plus the contributions made by the farmers themselves.

It is important to note that this is not a program evaluation of the Farm Water Program, it does not consider program administration costs or whether the upgrades would have occurred in the absence of Farm Water; or the timing, cost and scale of future upgrades in the absence of Farm Water. It also does not include any non-farm environmental benefits (such as downstream salinity or nutrient benefits) that can be associated with improved irrigation efficiency.

Instead the purpose of this study is to identify and estimate the relative scale of benefits and costs of irrigation modernisation as they have occurred in the case studies.

Primarily this analysis takes the viewpoint of change in costs and benefits at the farm level from modernisation. It does not discriminate if capital costs have been subsidised by any grants the farmers obtained through the Farm Water Program. Therefore, the grant payments towards capital costs have not been included as a benefit in the analysis, as they are included in the total costs of the farm investment. Similarly all water savings are counted as a benefit even though a % of this was transferred to the Commonwealth. This is because we are interested in the benefit/cost of the investment as a whole, regardless of whether it has received a grant payment and water was transferred.

Method

An analysis of the farm benefits as a result of modernisation, including both the farm upgrade and the off-farm Goulburn Murray Water (GMW) modernised supply was carried out. This is because the farm benefits of each type of modernisation are combined and cannot be easily separated.

The farm benefits are compared with farm costs only. If the GMW modernisation costs were to be included in the analysis the costs would change[2].

This analysis has been undertaken by comparing the same project areas "with the modernisation" versus those "without the modernisation" as experienced before the upgrade. A partial discounted cash flow analysis was undertaken to estimate the cost-benefit of the upgrade. It is important to realise that if the upgrade demonstrates a large economic benefit or cost, this is not a measure of the performance of the whole farm business either before or after the upgrade.

The approach has been to:-

[1] Farm Water refers to a program to modernise farm irrigation in return for a share of the water savings being transferred to the Commonwealth Environmental Water Holder and is managed by a Consortium led by the Goulburn Broken CMA with funding from the Australian Government's On Farm Irrigation Efficiency Program (Rounds 1 and 2) and through Victorian On Farm Irrigation State Priority Project and the Victorian Farm Modernisation Program..

[2] The cost of GMW modernisation would need to be offset by its other benefits and its own water savings and a value put on this saved water.

1. Examine costs and benefits of the 'modernised' system.

2. Examine costs and benefits of the same land if not modernised.

3. Net out costs without modernisation and with modernisation, net out benefits with and without.

4. Determine a NPV over 30 years, at a 7% discount rate. Thirty years was selected to be the effective life of the system with nil residual value and 7% discount rate was selected to reflect the risks of commercial farming. Capital costs were assumed to occur in year zero, whilst benefits and water savings are assumed to occur from year 1 to 30. Water was valued at 7% of the water market price at the time of transfer.

In terms of benefits:

- Production benefits were estimated by determining changes in stocking rates or yields with typical industry benchmarks for gross margins.
- Water savings are the estimated actual change in water use with the current crop mix as a result of the upgrade (this was used to assess the benefit of change in water use).
- The benefit of farm labour savings has been estimated using a standard $25/hour rate[3] with the farmers experience to date on time savings with the new system compared to the old system. This saving may not be cash saving, if the time saving does not reduce labour expenses, but it is a real benefit in terms of lifestyle and/or ability to expand the operation.

Identifying and measuring specific numbers for benefits is difficult. Therefore, estimates of costs and benefits were made and tested with the landholders based on their enterprises and descriptions of the changes they have experienced.

It is important to note the mix of benefits changes when allowing for the **change** in crop type or rotation that is facilitated by some projects (eg. change from annual crops to summer /perennial crops).

Therefore, the analysis has been to test:

1) Change in irrigation system assuming the same as current crop as per Table -1 below; and

2) Change in irrigation system with the change in crop type as per Table 2.

Results

The results show that assuming the same crop mix, the three biggest benefits are the value of saved water, the value of saved labour and the increased productivity. There was also a wide range in individual results.

The tables show that with a change in crop type water savings can be reduced to negative levels as irrigators use their more efficient new systems to irrigate higher water use summer crops and perennial crops, which in some cases were impractical to grow with the old irrigation system; and the productivity gains are increased.

The tables below summarize the case studies results for different years.

[3] This is slightly above farm labour award rates. A high rate has been adopted to reflect the time saved for the business owner doing most of this work. Note FLH 8 as of 14/2/13 was $19.97/hour on https://extranet.deewr.gov.au/ccmsv8/CiLiteKnowledgeDetailsFrameset.htm?KNOWLEDGE_REF=216329&TYPE=X&ID=348700358912184208888991289 4&DOCUMENT_REF=375115&DOCUMENT_TITLE=Pastoral%20Award%202010&DOCUMENT_CODE=MA000035
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Table -1 Comparison of results for different rounds (assuming same crop as current system for both old and new system)- unweighted average values calculated independently

Attribute	**Round 1 values corrected with up to 3 years experience (up to 3 updates)**			**Round 2 Values (1 year of experience)**	**Round 3 values (1 year of experience)**	**Suggested typical values across three rounds (note variation is very large)**
Sample size	19	10	8	10	9	Not applicable (NA)
Water value assumed on savings $/ML at time of transfer	1,800	1,800	1,800	1,500	1,450	NA depends on market price at time of transfer
Capital cost $/ha	5,982	5,557	5,067	5,677	4,951	5,500 (2,000 to 10,000)
Total additional annualised cost per ha of upgrade	523	459	421	624	434	500 (200 to 1,000)
Total additional annualised benefit per ha of upgrade	879	729	635	915	417	700 (200 to 2,000)
NPV per ha	4,420	3,354	2,653	3,509	-217 (increases to >1,000 if 10 ha crop failure ignored	3,000 (-2,000 to +18,000)
Benefit/Cost ratio	1.7	1.6	1.5	2.0	1.1	1.5 (0.6 to 3.5)
Detail on benefits						
Water saving ML per ha	2.0	1.5	1.4	2.6	1.8	1.8 (0.5 to 3.6)
Change in t dry matter/ha	2.1	Not calc	Not calc	2.7	2.3	2.3 (0 to 7)
Change in t DM/ML	0.4	Not calc	Not calc	0.4	0.4	0.4 (0 to 1.1)
Change in gross margin $/ha	382	292	273	346	274	300 (0 to 600)
Labour savings $ per ha (at $25/hr)	143	137	140	188	69	140 (0 to 400)

Table 2 Comparison of results for different rounds (including changed crop with new system)

Attribute	Round 1 values	Round 2 Values	Round 3 values	Suggested typical long term values
Total additional annualised cost per ha of upgrade	523	624	434	500 (200 to 1,000)
Total additional annualised benefit per ha of upgrade	872	729	448	700 (200 to 2,000)
NPV per ha	4,339	1,148	169	2,000 (-2,600 to +19,000)
BCR	1.7	1.2	1.2	1.3 (0.6 to 3.5)
Detail on benefits				
Water saving ML per ha	-0.5	-0.6	0.9	-0.5 (-8 to +3.4)
Change in gross margin $/ha	808	608	274	600 (0 to +2,100)
Labour savings $ per ha (at $25/hr)	95	135	51	90 (0 to 300)

Discussion and conclusions

The results from the case studies generally show a positive return on investment.

However, the benefits estimated will only be achieved if the current irrigated land use continues and has a positive gross margin. For example, if there is a future drought sequence and irrigation does not occur for some seasons, then the benefits, because they are assumed to be every year would be over estimated. However, it would be expected that these more efficient systems would be the last areas to be not irrigated during a water shortage, as less efficient un-modernised irrigation areas are dried off first.

The estimation of benefits is sensitive to the water value, the volume of water savings, value of saved labour and the ability to convert production gains such as feed into income, either through additional milk, reduced feed purchases or sales of feed/crop. There is considerable uncertainty around these values and how these change relative to the base case of no upgrade.

Despite these uncertainties, the case studies do provide a useful picture of the types of change and the relative values of the different benefits that are possible with irrigation upgrades.

Unlike land or water entitlement purchases that a farmer can make, few of the case study farmers believed that their property value would be increased by the same amount as the investment made in the upgrade. This illustrates that expansion by investing in additional land and/or water might be lower risk than in irrigation infrastructure. This is because over the long term land and water assets have tended to appreciate and if needed can be sold. This is unlike the purchase new irrigation systems, which tends to depreciate and cannot be easily sold.

Expansion via investment in additional land assets, water assets or irrigation upgrades will depend upon the individual circumstances and their own appetite for risk. The Farm Water Program by providing incentives for irrigation upgrades in return for a share of the water savings changes the balance in favour of investing in irrigation upgrades that provide environmental and regional productivity gains.