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Economics of farm water supplies

by Peter Eckersley,
Rural Economist,
Department of Agriculture

The economics of farm water supplies can be studied in two ways. One is to compare the costs of alternative ways of supplying a specified quantity of water to a farm. Another is to calculate how much a farmer can afford or will pay for a water supply.

I propose to look at these questions from the point of view of an eastern wheatbelt farmer, assuming that he must pay the full costs of any water supply provided for his property. It is also relevant to examine the reasons why Government should bear part of the cost of farm water supplies in a district, since the precedent has been set over a large part of the wheatbelt.

What is water worth?

Like many other commodities, water becomes more valuable to the user as the supply becomes smaller. Drinking water is priceless when little is available.

Wheatbelt farms use water for domestic purposes, fire fighting, crop and stock spraying, and stock watering. Stock watering usually makes up three quarters of the total use.

In the short term water for livestock is worth roughly the net value of income derived from stock after all other variable costs are deducted. As total supply falls from a point of overall sufficiency, the first effect is on the number of sheep that can be carried. Reducing sheep carrying capacity in the eastern wheatbelt affects the farm in five main ways:

- loss of wool and sheep sale proceeds net of direct costs;
- increased fluctuation of annual income;
- increased idle labour time between cropping activities;
- reduced capacity for grazing management for cropping (weed control, organic matter recycling);
- increased seasonality of expenses and income (higher peak operating debt).

Loss of income from wool and sheep sales is the main cost of reduced carrying capacity. It can be calculated as the gross margin per dry sheep equivalent (DSE).

At current prices for wool and inputs, and estimated long term sheep prices, the gross margin per DSE is about $5.00.

At the stocking rates which feed availability permits in the eastern wheatbelt, income from sheep is normally minor in relation to that from cropping. The increased fluctuation of annual income and the increased seasonality of expenses and income therefore do not constitute a large cost.

The annual water requirement of 1 DSE is about 1.0 kilolitre. Farmers can thus afford to pay up to about $5.00 per kilolitre of stock water. At a typical stocking rate of 1.3 DSE per cleared hectare, they can afford to pay out about $6.50 per hectare annually for stock water.

As the water supply falls, sheep numbers eventually fall to the point where none can be carried.

In this situation the net value of stock water is lower since (in the long run) some of the fixed costs of running sheep can be eliminated (for example shearing sheds, internal fences, yards). These costs amount to about $2.00 per DSE annually.

Costs of on-farm water collection and storage

Establishment of dams and roaded catchment would usually cost a total of $2 per DSE for a drought-proof supply. In extreme situations it could cost as much as $5 to $15 per DSE* to give a drought-proof supply. Adding to this the cost of reticulation, then deriving an annual cost, the cost per DSE is never above $3 a year (Table 1). It is typically $1.42 per year.

At the higher water supply cost, a farmer could well ask whether it is worth establishing a sheep enterprise on the property. An alternative is to accept a less than drought-proof supply, at lower cost (say, half the above expenditure on dams and roaded catchment). This

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* See article page 85.
will incur additional costs, such as water carting in some years, or sale of at least some stock in drought periods.

Water carting is not only a tedious, soul destroying task, it is also expensive. With time valued at $3 per hour and truck running at 15 cents per km, carting loads of 7 tonnes (kl) from a supply 30 km distant costs $2 per kl.

Adding the cost of on-farm storage and reticulation, and the cost of the tank for carting, this may total $3 per kl, which is equivalent to $3.00 per DSE per year for a farm relying completely on carted water.

Bores and wells, if successful, can provide water more cheaply, but with a success rate of only 5 per cent (recorded in a survey of the Westonia district in 1973) they are not an attractive alternative.

**Comprehensive Water Supply Scheme**

In 1974 the Public Works Department estimated that extension of the existing Comprehensive Water Supply Scheme to service 576 000 ha east of Merredin would cost about $37.50 per ha. With inflation this probably would have passed $55 per ha by now.

Table 1 shows the calculation of total annual costs for this source of water.

Thus it seems that stock water provided by an extension to the CWS Scheme would cost $6.28 per ha per year, which is about the same as the marginal value of running sheep in the eastern wheatbelt. In other words, there would be no significant surplus to cover over-heads, which include the farmer's living expenses.

Assumptions used in this section are probably conservative on the cost of scheme water.

**Comparing sources of water**

The main criteria for comparing alternative water supply systems are cost, reliability and quality.

Under the cost heading, my calculations in preceding sections have given an annual charge as the basis for comparison. Even in the most difficult areas for dam and roaded catchment construction and sealing, in the eastern wheatbelt, the annual cost of this source is considerably lower than the cost of scheme water.

Reliability is similar for both sources since the dam and catchment combination is designed to cope with drought years. The reliability of scheme water is outside the farmer's own control, whereas he at least has independent control of his own on-farm facilities.

**Who should pay for farm water supplies?**

The cost comparisons above assume the farmer pays in full for his water, whatever the source. The following discussion on the merits

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**Table 1.—Cost of on-farm water supply for 2 000 ha eastern wheatbelt farm**

<table>
<thead>
<tr>
<th>ESTABLISHMENT</th>
<th>Initial cost</th>
<th>Life (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domestic:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>2 x 20 kl tanks plus 1 stand</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>0-6 km pipe</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>mill</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>fittings</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><strong>Farm:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>dams plus rooded catchment—extreme situation</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>typical farm</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>4 mills</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>11 troughs (equipped)</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>12 km pipe including fittings</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>2 x 53 kl concrete tanks</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><em>land used up (50 ha at $120 a ha)</em></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><strong>Total establishment cost maximum</strong></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td><strong>minimum</strong></td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**ANNUAL COSTS**

This example assumes 900 kl (25.7%) of water is used for domestic purposes and 2 600 kl (74.3%) for stock each year.

**Domestic**

*Interest:* 10% of

(i) cost of mill, tanks, stand, pipes etc. around house ... ... ... ... $445

(ii) 25.7% share of dam and catchment costs (typical case) ... ... ... 288

*Depreciation:*

5% of cost of mill, tanks, stand, pipes etc. around house ... ... ... ... 223

*Maintenance:*

25.7% share of catchment spraying (typical case) ... ... ... ... 103

Total for domestic water—Typical ... ... ... ... $1 059

(Extreme case $2 030)

**Stock**

*Interest:* 10% of

(i) cost of mill, tanks, troughs, pipe and fittings ... ... ... ... $1 620

(ii) 74.3% share of dam and catchment costs (typical case) ... ... 832

*Depreciation:*

5% of cost of mills, pipe and fittings ... ... ... ... 500

24% of cost of concrete troughs ... ... ... ... 55

*Maintenance:*

(i) 74.3% share of catchment spraying (typical case) ... ... ... ... 297

(Extreme case $594)

(ii) mills (say 10% of initial cost) ... ... ... ... 400

**Total cost for stock water**

<table>
<thead>
<tr>
<th></th>
<th>per farm</th>
<th>per ha</th>
<th>per DSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical</td>
<td>$3 704</td>
<td>$1.85</td>
<td>$1.42</td>
</tr>
<tr>
<td>Extreme</td>
<td>$6 513</td>
<td>$3.26</td>
<td>$2.51</td>
</tr>
</tbody>
</table>

**Total (domestic and stock) annual water costs per farm.**

Typical ... ... ... ... $4 763

(Extreme ... ... ... ... $8 543)
of Government assistance does not alter the fact that on-farm water supply systems are the cheapest for the community as a whole.

It is relevant here to remember that water is perhaps our scarcest natural resource.

The demand for water in highly populated areas along the coast is expected to rise, which brings in the question of opportunity cost. If other consumers of water from scheme sources are able and willing to pay more for water, then the real cost of supplying Scheme water to the wheatbelt rises. This assumes that other consumers are already paying the real cost of their water.

Rational allocation of Government assistance to community groups and individuals is probably based mainly on the criteria of needs, equity, economic benefits and social benefits.

As far as the law is concerned, the title to a block of land does not carry with it the right to a water supply, unless that water supply occurs naturally on the property.

What value do farmers place on scheme water?

One indication of how farmers value the availability of scheme water over and above existing on-farm supplies is the premium that they will pay for farmland connected to the scheme.

Real estate salesmen subjectively estimate this at commonly between $8 and $12 per hectare, based on market experience. This is roughly equivalent to an annual charge of $1 per hectare, given generous terms of purchase.

However, many of the farms with on-farm supplies do not have drought-proof supplies.

This therefore suggests a farmer would generally be prepared to pay less than $1 per hectare per year for the convenience, real or apparent, of scheme water, whereas the actual cost of this source over and above on-farm sources is usually at least $4.43 per hectare according to figures calculated in Tables 1 and 2.

This means that, given the choice, farmers would not want scheme water if they had to pay the full cost.

**Government assistance for on-farm supplies**

If it were agreed that Government should share the cost of farm water supplies, as is implied by the apparent level of subsidy in existing Schemes, then on equity grounds this is likely to amount to more than is available through the Farm Water Supply Loans Scheme.

On the other hand, if it is not accepted that Government should share the cost, perhaps it is fair to question whether the CWS Scheme should be maintained in existing areas, let alone extended to new areas, especially in view of the much lower cost of on-farm supplies.

**Contributory plan?**

If the indications given by farm sales were wrong about the apparent convenience value of the scheme water, then in the absence of any or sufficient Government finance, farmers would be prepared to contribute to the extension of the Scheme in the same way as they pay for the extension of electricity supplies or telephone lines.

I don't believe farmers could or would pay the full costs of scheme water.

Society in general, and farmers in particular, would be better off with on-farm collection of water for domestic and stock needs.

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**Table 2.—Costs of providing CWS water on 2 000 ha eastern wheatbelt farm**

<table>
<thead>
<tr>
<th>ESTABLISHMENT</th>
<th>Initial cost</th>
<th>Life (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domestic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6 km pipe fittings</td>
<td>1 100</td>
<td>20</td>
</tr>
<tr>
<td>Farm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 troughs (equipped)</td>
<td>3 200</td>
<td>40</td>
</tr>
<tr>
<td>16 km pipe including fittings</td>
<td>8 000</td>
<td>20</td>
</tr>
<tr>
<td>2 x 55 kl concrete tanks</td>
<td>4 000</td>
<td></td>
</tr>
<tr>
<td>Comprehensive Scheme</td>
<td>110 000</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>126 650</td>
<td></td>
</tr>
</tbody>
</table>

**ANNUAL COSTS**

This example assumes 900 kl (25-7%) of water is used for domestic purposes, and 2 600 kl (74-3%) for stock each year.

**Domestic**

Interest: 10% of
(i) cost of pipes and fittings $1 45
(ii) 25-7% share of CWS establishment cost $2 827

Depreciation:
5% of cost of pipes and fittings $73
25-7% share of 2% of CWS establishment cost $565

CWS running costs:
36 million kl cost $10.45 million, thus 900 kl cost $6 28

Total cost of domestic water $3 871

**Stock**

Interest: 10% of
(i) cost of tanks, troughs, pipes and fittings $1 520
(ii) 74-3% share of CWS establishment cost $8 173

Depreciation:
5% of cost of pipes and fittings $400
21% of cost of troughs $80
74-3% share of 2% of CWS establishment cost $1 635

CWS running costs:
36 million kl cost $10.45 million, thus 2 600 kl cost $7 55

Total for stock water per farm $12 563
per ha $6.28
per DSE $4.83

Total (domestic and stock) annual water costs per farm $16 434

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Journal of Agriculture Vol 18 No 3, 1977