

ANALYZING THE COSTS AND BENEFITS

Prior to investing in an irrigation system, an analysis of the financial factors should be made. In other words, will an investment in an irrigation system provide the desired returns? This chapter provides a method to calculate the potential financial gain (loss) with the purchase and use of an irrigation system. The methodology is to estimate the annual costs and annual returns from the purchase and use of a specific system.

The analysis is completed on an annual basis. The annual cost for equipment that is used for more than one year is determined by spreading its net cost over its expected use period. For example, a pump purchased for \$12,000, expected to be used for five years and then sold for \$2,000, would have a net cost of \$10,000. The annual cost would be \$2,000 (i.e., $\$10,000 \div 5$).

The cost/benefit analysis should be completed on a specific system. Before beginning, you should have a good knowledge of the component and installation costs of the system. In addition, an estimate of operating expenses such as fuel, labour, maintenance, etc. will be required.

On the benefits side, the potential benefits of this irrigation system for crops on your farm will need to be determined.

The actual cost/benefit calculations are completed using five worksheets. The worksheet titles include:

- Worksheet 1: Water and Power Requirements
- Worksheet 2: Annual Ownership, Repair and Maintenance Costs
- Worksheet 3: Annual Operating Expenses
- Worksheet 4: Cost/Benefit Summary
- Worksheet 5: Break-even Calculation

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WORKSHEET 1: WATER AND POWER REQUIREMENTS

This general description worksheet is used to record and determine information required in other worksheets. It calculates the total amount of water required for a season. This is then used to calculate the number of hours the system will operate during the year. For systems using a tractor or engine as a power source, the total fuel needed for one season is determined by the amount of fuel you estimate your power source will use in one hour of operation and the total annual hours of operation.

The pumping rate is the US gallons of water per hour that can be irrigated by the system being evaluated. The pumping rate may need to be adjusted from the rate specified for factors such as water depth and distance to the field.

1) Acres to be irrigated _____

2) Average gross inches per acre applied annually _____

3) Total acre inches applied annually $\frac{\text{_____}}{\text{(line 1)}} \times \frac{\text{_____}}{\text{(line 2)}} \dots\dots\dots = \text{_____}$

4) Pumping rate (US gallons per hour) _____

5) Operating hours per year $\frac{27154^1 \times \text{line 3}}{\text{(line 4)}} \dots\dots\dots = \text{_____}$

6) Energy Requirements

a) Stationary pump or tractor _____ \times _____ = _____
(line 5) **litres of fuel per hour of use**

b) Electric motor _____ \times _____ = _____
(line 5) **kW: hydro/hour**

¹ 27, 154 US gallons (22, 610 Imp gal) are required to put one gross inch of water on one acre of land.

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WORKSHEET 2: ANNUAL OWNERSHIP, REPAIR AND MAINTENANCE COSTS

Worksheet 2 can be used to calculate the average annual cost of purchasing, owning and maintaining the irrigation system.

The purchase price of many components is available from the supplier or can be estimated if the equipment to be purchased is used. The expected use period is the number of years you expect to use that component. If you will keep that item until it's no longer useful, the expected useful life can be estimated using the information on page 116. If you plan to trade or sell the item, the expected use period is the number of years you intend to use it. The salvage value is an estimate of the item's value at the end of its expected use period.

An annual interest expense is charged to reflect the interest cost of owning the irrigation system. It's calculated on the average value of your investment during the expected use period. The interest rate selected should be based on interest on savings, or cost of borrowing, or a combination of both.

Average annual repair and maintenance expenses can be estimated and placed in the last column. These expenses can be estimated based on a percentage of the purchase price (see page 116).

If a tractor is used as the power source, only the percentage of the purchase price of the tractor should be listed on Worksheet 2. For example, the total annual hours of use of a tractor is 1,000 hours. Of the 1,000 hours, 400 will be for irrigation. On Worksheet 2, only 40% of the tractor's purchase price should be listed.

For many irrigation systems, especially drip systems, there are "one-time" installation expenses. Some of these expenses could include: electrical hook-up, burying lines, installing drip hose in orchards, etc. These expenses should be included in the installation section of this worksheet and the expense averaged over the expected use period.

In the "Other" row, space is provided for any components or costs you require that are not listed in the worksheet.

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WORKSHEET 2: ANNUAL OWNERSHIP, REPAIR AND MAINTENANCE COSTS							
System Component	Purchase Price (\$)	Expected Use Period (yrs.)	Salvage Value (\$)	Annual Depreciation ¹ (\$)	Annual Interest ² (\$)	Repair & Maintenance ³ (% purchase price)	Annual R & M ⁴ (\$)
Water Source							
Intake							
Pump							
Pipes & Fittings							
Power Source (electric motor, stationary engine, tractor)							
Sprinkler							
Trailer							
Filtration System							
Installation							
Other: Name _____ Name _____							
TOTALS							

¹ $(\text{Purchase Price} - \text{Salvage Value}) / \text{Expected Use Period (yrs)}$

² $(\text{Purchase Price} + \text{Salvage Value}) / 2 \times \text{Interest Rate}$

³ See table on page 116.

⁴ $\text{Purchase Price} \times \text{Repair \& Maintenance (\% purchase price)}$

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WORKSHEET 3: ANNUAL OPERATING EXPENSES

All costs not included in Worksheet 2 should be included in this worksheet.

To complete this worksheet, the amount of labour per hour required to operate the system is needed. Total labour costs are then calculated based on the labour required per hour and total hours of operation. For example, if it is estimated that 1.2 people are required to operate the system and the system is to be operated 400 hours in a season, the total labour required is 480 hours. If the one person is hired full-time to operate the system, a charge of 400 hours will be calculated for hired labour. If the farm manager provides the one-fifth of an hour, a charge for 80 hours of manager labour is calculated. An additional labour charge should be included for the time spent by the farm manager to manage the irrigation system.

The harvesting and marketing costs are only for additional costs incurred for extra yield attributed to irrigation. The marketing costs would include items such as fuel, containers, labour for extra deliveries, etc. If more than one crop is to be irrigated, these calculations may have to be completed separately for each crop.

Each spring and fall, there may be costs associated with either the setup and/or takedown of the system. An estimate of these costs (including labour) should be included in the setup (takedown) section of Worksheet 3.

The miscellaneous expense should include all other expenses not easily attributed to the irrigation system. Items here could include fuel used in trucks and tractors while operating the system, storage, additional insurance, etc. The cost of extra fertilizer could be included if the irrigation system is used to provide nutrients to the crop.