Pasture / Forage Irrigation Options & Economic

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- then hit the Irrigation button
Irrigation- can I do it?/can I afford it?

- Do you have water available?
- Is there equipment that fits your farm?
- Is labor available?
- Will it pay for it’s self?
Inches of Water

Corn Water Use

Normal Rainfall

Needed Irrigation 5.5”

Normal rainfall 34.6

Crop need 15.6” total

Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec
Estimated rainfall recharge

U.S. Department of the Interior
U.S. Geological Survey
Bedrock option

Site specific review

Ave. Irr withdrawal = 700 gpm

Wells may cut impact by 75%

Note: Bedrock aquifers are present in some areas of the State - however some do not support large capacity wells. More detailed data can be found at gwmapp.rsgis.msu.edu
From Minnesota Extension bulletin “Irrigation Scheduling”, assuming temperature 80-89
Quantity Needed

- Maximum water use for most crops is .27 - .32 in./day
- 3 gal/minute/acre pump capacity = 1”/week
- 5 gal/minute/acre pump capacity = .25 in./day
- 7 gal/minute/acre pump capacity = .33 in./day, 1” every 3 days
- 500 gal/minute pump can provide 1” every 4 days on 100 acres
Groundwater Sources

Deep wells

Shallow wells

Shallow suction wells

Horizontal suction wells
Surface Water Sources

- Lakes
- Rivers
- Streams
- Drainage ditches
- Private ponds

Surface pump creates vacuum to lift water to the pump, issues:

- Plugged inlet- screens, rotary screens and wash systems, aquatic weed control
- Loss of vacuum, creates a vortex, maintain > 3’ of water over inlet, water guides/flow diverters

Solid pump base needed < 8’ from water surface for standard pump
Irrigation Equipment Options

Side Role
Drip and Trickle
Hand Move
Solid Set
Linear Move
Big Gun Travelers
Center Pivots

MWPS -30 $20
Side Role
or
Hand Roll

-Crop heights up to 30”
-Low cost compared to pivots
-Not common east of Mississippi
Reverse Drainage Irrigation

- Stand pipe or ditch dam is used to build water level in dry season.
- Environmental benefit to limiting the times year drainage is functioning.
- Commonly drained heavy soils are slow to respond.
Solid set

- Allow almost immediate and continuous coverage
- Require medium to high psi
- High operating cost

- High initial investment per acre on small plots
- To keep uniform applications run time needs to increase as pressure decreases
- Flexible irrigation of subsets of field
Hand move

- Low start up cost for small scale field irrigation.
- Full and partial circle options
- Advantage of solid set with option to move field between seasons
- High energy cost, low uniformity
Multiple sprinklers and drag hose

- Advantage of solid set with option to move for multiple set within a field.

- Flexible layout allow use in any shape field.

- Moderate to High energy cost, low uniformity, labor intensive.
Solid set

• Excels at truck crop irrigation.
• Flexible irrigation of subsets of field.

• High initial investment per acre on small plots.
• To keep uniform applications run time needs to increase as pressure decreases.
Big Gun Travelers

- Fairly standard design
- Flexible for future use in other fields
- Lots of used equipment available
- Limited hose life – replacement hose cost are often higher than used equipment cost

- High pressure needed
- High energy and labor cost
- Typical field layout is 300’ x 1320’ providing about 10 irrigated acres
Center Pivots

Over 80% of the irrigated acres are covered by center pivot irrigation

- Size and shape dependent
- Least labor and operating cost
- Most uniform and rain like coverage
- Economics are size dependent
Tow-able Center Pivots

- Allow greater coverage by the same distribution equipment
- Exactly matching circle and tow pattern must be planned. End tow system allow use in partial circles
- Total pump time and down time for towing the system need to be planned for
Ownership Cost Example - Two Circle Towable System

Depreciation: (original cost - salvage value)/years of use
(pivot cost + installation cost - salvage value)/10 years =
($43,000 - 10,000)/10 = $3,300
(well cost - salvage value)/20 years =
($30,000 - 10,000)/20 = $1,000

Interest: interest rate * average investment value
6.5% * (original cost + salvage value)/2 =
6.5% * ($73,000 + $20,000)/2 = $46,500
6.5% * $46,500 = $3,023

Repair: estimated to between 2 to 5% of original cost
pivot cost * 4% =
$43,000 * 4% = $1,720
well cost * 2% =
$30,000 * 2% = $600

Taxes: no personal property tax in Michigan
the addition irrigation equipment should not increase property taxes

Insurance: estimated at 0.5% * average investment value
0.5% * (original cost + salvage value)/2 =
0.5% * ($73,000 + $20,000)/2 = $46,500
0.5% * ($40,500) = $233

Total Ownership Cost = $4,300 + $3,023 + $2,320 + $233 = $9,876
$9,876 / 70 acres = $141.09 / irrigated acre/year
Operating Cost (per acre) or total actual annual cost
These costs are best handled annually calculated using actual costs at the end of season.

**Power:** use actual fuel or power bill is recommended estimated power cost:
$3.50/acre in. * 6 in.* 70 acres = $1,470 annually
$3 to $5.50/acre in. range

**Labor cost:** recommend use of actual labor bills
Range of $1 to $3.50/acre in.
$2 * 6 acre in. * 70 acres = $840 annually

**Total Operating cost annually** = $2,310
$2,310 / 70 acres = $33.00

**Grand Total Estimated Annual Cost** = $9,876+ $2,310 = $12,186
$12,186 / 70 acres = $174.09/acre at 6"
Estimated irrigation cost at 6”
All system designed to meet an E.T. Rate of 0.25”/day or more

<table>
<thead>
<tr>
<th>System type</th>
<th>Acres</th>
<th>Water requirement</th>
<th>Annual Ownership cost / irr acre / year</th>
<th>Annual Operating Cost (per acre / year)</th>
<th>Total Estimated Annual Cost</th>
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</thead>
<tbody>
<tr>
<td>Traveler</td>
<td>80</td>
<td>500 gpm</td>
<td>$82.58</td>
<td>$ 51.00</td>
<td>$133.58</td>
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<td>Single tower tow pivot</td>
<td>51</td>
<td>300 gpm</td>
<td>$119.20</td>
<td>$25.51</td>
<td>$ 144.71</td>
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<td>160 A center Pivot</td>
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<td>750 gpm (7”)</td>
<td>$93.26</td>
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<td>160 acre Pod Drag</td>
<td>160</td>
<td>800 gpm</td>
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<td>$25.13</td>
<td>$163.03</td>
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<td>40 acre Center Pivot</td>
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<td>Two Circle 40 Towable</td>
<td>70</td>
<td>450 gpm</td>
<td>$141.09</td>
<td>$33.00</td>
<td>$174.09</td>
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</tbody>
</table>

Irrigation will cost nearly $150 per year. Will it pay?
Other additional expenses

• Labor, Phosphorus and Potassium requirement should be no higher than dry land in a pasture situation
• Irrigated Nitrogen expense may be higher
• Additional 40 lb. N cost about $20 to $25
  • Ammonium Sulfate $275 ton / 420 Lb. N = $0.65/lb. x 40 = $26
  • Urea $450 ton /920 lb. N / = $0.49/lb. x 40 = $20
$150 of additional income

- $3/4 ton hay equivalent at $200/ton
- 1 ton hay equivalent at $150/ton
- 1½ ton hay equivalent at $100/ton
- 2 ton hay equivalent at $75/ton

• What is hay worth?

• Wet year
• Average year
• Dry Year
# Additional income

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*single farm example - actual sold hay*

**St. Joseph County Irrigated vs. Dry land forage yields**

<table>
<thead>
<tr>
<th>year</th>
<th># cuts</th>
<th>Irrigated Tons/acre</th>
<th>Tons over 3.40</th>
<th>Value at $100/Ton</th>
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<tbody>
<tr>
<td>2003</td>
<td>4</td>
<td>3.91</td>
<td>0.51</td>
<td>$51</td>
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<tr>
<td>2004</td>
<td>3</td>
<td>5.35</td>
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<td>2005</td>
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<td>2006</td>
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<td>2007</td>
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<td>5.14</td>
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<tr>
<td>2008</td>
<td>4</td>
<td>4.56</td>
<td>1.16</td>
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<td>2009</td>
<td>3</td>
<td>3.89</td>
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<td>$49</td>
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<td><strong>Average</strong></td>
<td><strong>3.6</strong></td>
<td><strong>4.90</strong></td>
<td><strong>1.35</strong></td>
<td><strong>$135</strong></td>
</tr>
</tbody>
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*St. Joseph County average dry land hay yield 3.40 ton/acre*