

# Water Impact Factor on the Local Economy

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Notes:

*PowerPoint Slides on next page*

# Water Impact Factor on the Local Economy

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# Simple Web Search of Dairy and Water

## Headlines of dairies impact on water aquifers

- Residents say corporate mega-farms are drying up their wells
- A mega-dairy is transforming aquifer and farming lifestyles
- WATER CRISIS CHALLENGES DAIRY
- Cheese in the Desert: Why Mega-Dairies are Piping Water
- Milking the desert: How mega-dairies thrive
- Opinion: legislature has a plan to save water in our desert


### Dairy vs Water vs Economic Impact

Not every rural area (valley) can be a Silicon Valley

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# Fundamental Question

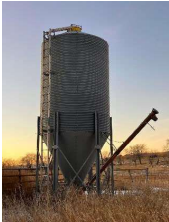
- What is the water usage necessary for a dairy to generate the 1<sup>st</sup> dollar of economic impact in moisture deficit states?
  - Dairies in regions w/ rainfall cropping systems vs irrigated cropping systems
  - Dairying vs crop production water usage in moisture deficit states
  - Potential economic impact of dairying in irrigated regions



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# Disclaimers

- Every dairy does some irrigation due to dewatering lagoons / ponds
- No intent to imply any type of agricultural enterprise is wasting water or not of economic value
- Every day new water conservation practices are adopted within the agricultural sector
- It is recognized that agricultural enterprises have an economic multiplier effect within a local community
- There are exceptions (both positive and negative) to all assumptions made in this analysis
- Some dairies in rain surplus communities may purchase forages or commodities from producers outside the region (i.e. alfalfa hay) or vice versa (i.e. soybean meal)



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## Summary of AZ Study

- 37.5 % of water used in wash pen
- Average water usage was 89.3 gpd/cow
- Avg. water usage w/out W.P. was 58.6 gpd/cow
- Wash pen water usage average 50 gpd/cow
- Water in milk center averaged 11.2 gpd/cow

Zaugg (1989)

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## Fresh Water Pumped per Lactating Cow



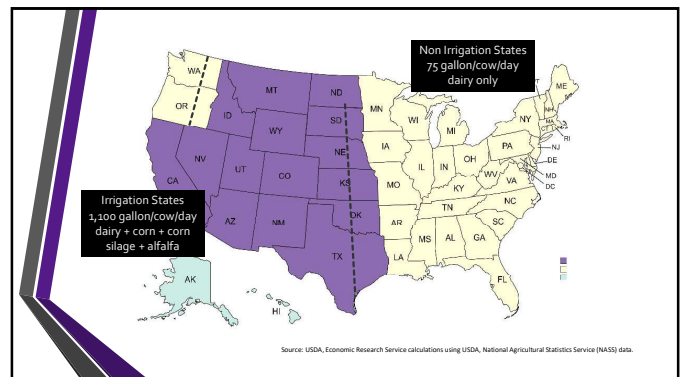
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## Idaho Study (6 dairies)

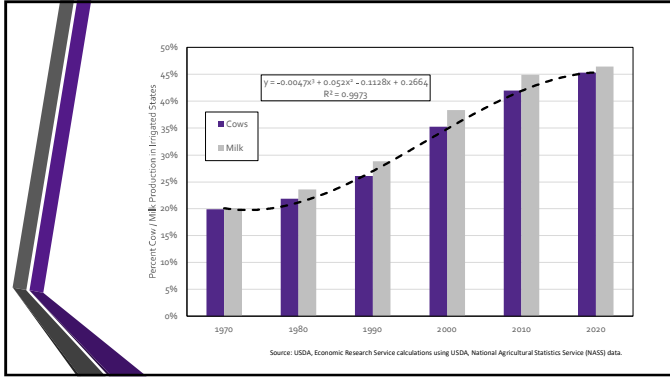
- 660 to 6,400 cows (equivalent cows)
  - No summer heat abatement
- Average 29.1 to 66.1 gpd / eq. cow
- Overall average 50.2 gpd / eq. cow
- Summer usage increased 26.4 gpd / eq. cow
- Waste water – 5.5 to 39.6 gpd / eq. cow
- Average water to milk ratio 6.8 +/- 1.8

Bjorneberg & King (2014)

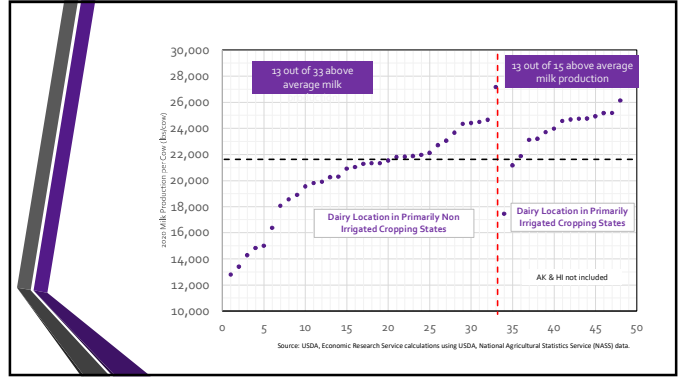
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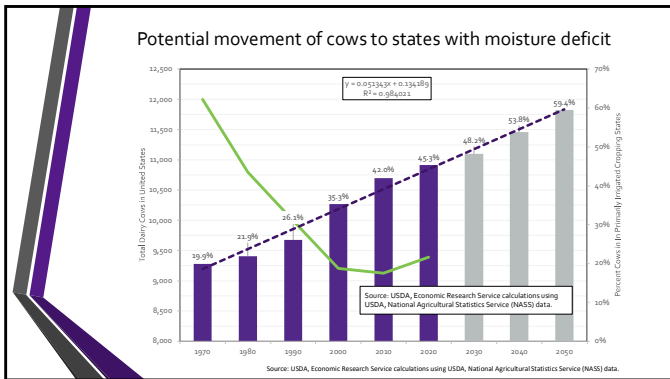
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### Water Impact Factor

- Gallons of water necessary from an agricultural operation to generate the 1<sup>st</sup> gross dollar of economic impact
- Multiplier effect of operations are not considered
- Focus on gross dollars rather than net income or operating cost
- Corn & alfalfa yields & milk production vary by producers

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### Water Impact Factor

*Gallons of water / 1<sup>st</sup> gross dollar to local economy =*  $\frac{\text{Irrigated Water per Unit}}{\$ \text{ per Unit}}$

**Cotton Example**

480 gallons of water to generate \$1 gross to the local economy =  $\frac{325,000 \text{ gal water /acre}}{\$0.75 / \text{lb} \times 900 \text{ lb/acre}}$

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### Water Footprint of Everyday Products

Updated 10/20/2022  
\*The Hidden Water in Everyday Products - Water Footprint Calculator (watercalculator.org)


Everyday Product*	Estimated Water Usage (gallons)	\$/unit	Water Impact Factor (gal/\$)
1 Car	13,737 - 21,296	\$40,00	0.5
1 Smart phone	3,190	\$1,000	3
Cotton jeans	2,866	\$40	72
Cotton Bed Sheet	2,576	\$40	64
Cotton T-shirt	659	\$5	132
Paper (1 piece; A4)	1.3	\$0.017	76

Side note: 53 gallons of water equals 1 latte  
How Many Gallons of Water Does It Take to Make... (treehugger.com)  
\*Water footprint calculator was not verified

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### Corn and Corn Silage Production Assumptions


- Corn
  - 200 bushels per acre
  - 12,15, 18, 21,24 inches water per acre
  - \$4, \$5, \$6, \$7 or \$ 8 per bushel
- Corn Silage
  - 28 ton / acre
    - 7 bu corn = 1 ton of silage
  - 12,15, 18, 21,24 inches water per acre
  - \$40, \$50, \$60, \$70 & \$80 per ton of corn silage
    - Silage cost = 10 x \$/ bu of corn



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### Alfalfa Production Assumptions

- Alfalfa
  - 8 ton per acre
  - 12,15, 18, 21,24 inches water per acre
  - \$200, \$250, \$300, 350 or \$4.00 per ton



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### Milk Production Assumptions

- Milk Production
  - 80 milk / day per cow
  - 12, 18, 24 inches water per acre of crops
  - \$16, \$18, \$20, 22 or \$24 per cwt
- Irrigated Crops in Ration
  - 10 lbs corn
  - 54 lbs silage
  - 10 lbs alfalfa
  - 75 gal/cow per day on dairy



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### Economic Impact of 200 bu Corn Production (gallons of water per 1<sup>st</sup> dollar generated)

Irrigation Water (inches/acre)	Corn Prices (\$/bushel)				
	\$4	\$5	\$6	\$7	\$8
12	407	326	272	233	204
15	509	407	339	291	255
18	611	489	407	349	305
21	713	570	475	407	356
24	815	652	543	465	407

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### Water Impact Factor 28 ton Corn Silage (gallons of water per 1<sup>st</sup> dollar generated)

Irrigation Water (inches/acre)	Corn Silage Prices (\$/ton)				
	\$40	\$50	\$60	\$70	\$80
12	285	228	190	163	143
15	356	285	238	204	178
18	428	342	285	244	214
21	499	399	333	285	249
24	570	456	380	326	285

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### Water Impact Factor for 8 ton Alfalfa (gallons of water per 1<sup>st</sup> dollar generated)

Irrigation Water (inches/acre)	Alfalfa Prices (\$/ton)				
	\$200	\$275	\$350	\$425	\$500
12	204	148	116	96	81
15	255	185	145	120	102
18	305	222	175	144	122
21	356	259	204	168	143
24	407	296	233	192	163

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### Water Impact Factor for 80 lbs Milk Production (gallons of water per 1<sup>st</sup> dollar generated)

Corn & Corn Silage Water (inches/acre)	Alfalfa Water (in/acre)	Crop Irrigation Water per Cow (gal/day)	Milk Price (\$/cwt)		
			\$16	\$20	\$24
12	12	802	65	52	43
18	12	1,102	87	69	58
24	12	1,401	109	87	72
12	24	1,006	79	64	53
18	24	1,306	102	81	68
24	24	1,605	124	99	82
Non-Irrigated Cropping System		75	4.7	3.8	3.1

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### Forgotten Irrigation Water on a Dairy in 48 inch Moisture Deficit Area

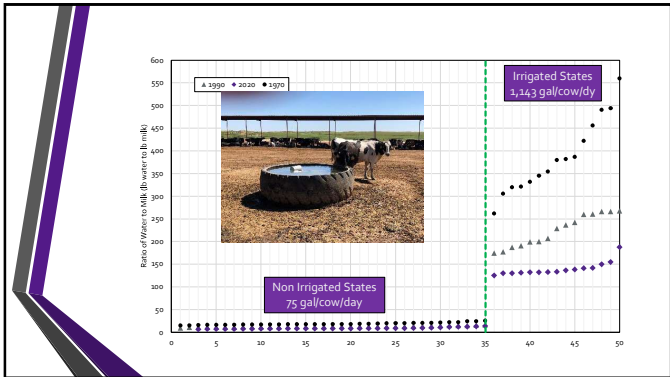
Water Balance on a Dairy	Annual Average Water Usage (gallons/cow/dy)	Percent Allocation
Evaporation from uncovered lagoon & concrete surfaces	19.0	29.3%
Net water in lagoon for future irrigation	26.5	40.8%
Water in milk shipped assuming 13 % solids	8.4	5.1%
Heat abatement water assuming 50 % evaporates	3.3	12.8%
Water in separated manure solids	2.2	8.7%
Unaccounted water	5.7	3.3%
<b>Total water used in a freestall dairy</b>	<b>65.0</b>	<b>100%</b>

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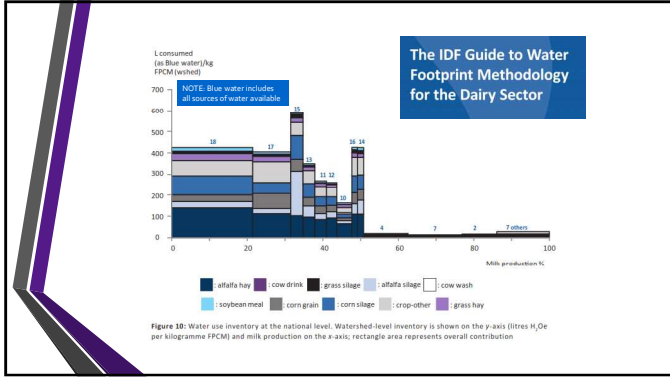
### Water Impact Factor of Ag Enterprises

Agricultural Enterprise	Gallon Water Pumped per 1 <sup>st</sup> Gross \$ Return
Corn Production	200-600
Corn Silage Production	200-500
Alfalfa Production	100-400
Milk + Rainfall Crops	4-6
Milk + Irrigated Crops	60-110
Milk + Irrigated - Lagoon	35-85

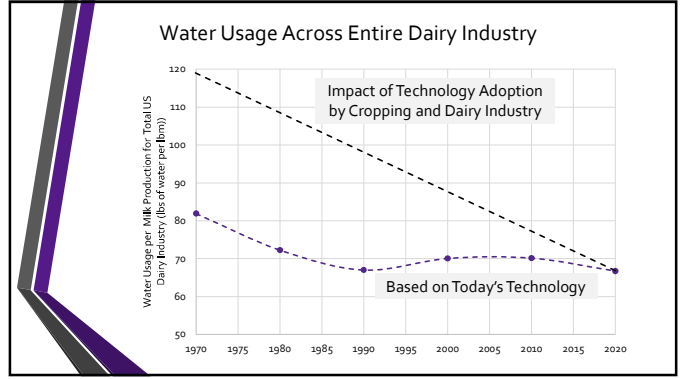
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### Summary of Water Impact Factor

- 1<sup>st</sup> glance it appears dairying in moisture deficit states uses 3-4 times less water than crop production systems to generate the 1<sup>st</sup> dollar of gross return to a region
- Across the entire US dairy industry the pumped water to milk ratio needed for the 1<sup>st</sup> gross dollar generated is estimated to be about 65 when considering water necessary for irrigating crops in some regions. The 5 to 8 lb water to milk ratio reported in research probably does not consider water necessary for irrigated crop production in the vicinity of a dairy.



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