

Water Management Strategies for Reducing Irrigation Demand in Region A

(All 21 Counties)

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RWP 2011 Water Management Strategies

Study Objectives

- Update the effectiveness of agricultural water conservation strategies considered in Regional Water Plan 2006 (RWP 2006)
 - Marginal water savings
 - Baseline
 - Implementation cost (September 2008 dollars)
 - Consider/evaluate new water conservation strategies, as appropriate
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RWP 2011 Water Management Strategies Assumptions

- 2010 used as the baseline for evaluation:
 - Previous strategy implementation rates for 2010 were assumed to have occurred
 - Future implementation rates remained unchanged from RWP 2006 estimates with the exception of irrigation equipment changes
- Marginal water savings by strategies were assumed to be the same as identified in RWP 2006

Results

Possible Water Management Strategies for Reducing Irrigation Demands

Water Management Strategy	Assumed Annual Regional Water Savings acre-feet/ac/yr	Assumed Baseline Use Year 2010	Goal for Adoption 2020	Goal for Adoption 2030	Goal for Adoption 2040	Goal for Adoption 2050	Goal for Adoption 2060
Use of NPET	0.083	20%	27.5%	35%	42.5%	50%	50%
Change in Crop Variety	0.341-corn 0.054-sorghum	40%	70%	70%	70%	70%	70%
Irrigation Equipment Changes	0.525	80%	85%	90%	95%	95%	95%
Change in Crop Type	0.692	20%	40%	40%	40%	40%	40%
Convert Irrigated Land to Dryland	0.892	5%	10%	15%	15%	15%	15%
Implement Conservation Tillage Methods	0.146	60%	70%	70%	70%	70%	70%
Precipitation Enhancement	0.083	0%	100%	100%	100%	100%	100%
Biotechnology Adoption	15 – 30% corn, cotton & soybeans	0%	50%	90%	100%	100%	100%

Results

Estimated Water Savings and Costs Associated with Proposed Water Conservation Strategies in Region A.

Water Management Strategy	Cumulative Water Savings ac-ft	WS/Total Irrigation Demand %	Implementation Cost (IC) \$1,000	IC/WS \$/ac-ft	Direct Regional Impact (DRI) ¹ \$1,000	DRI/WS \$/ac-ft
Use of NPET	1,012,894	1.40	9,000	\$8.89	+	+
Change in Crop Variety	2,265,030	3.14	NA	NA	-	-
Irrigation Equipment Changes	3,966,151	5.49	216,907	\$54.69	+	+
Change in Crop Type	3,312,507	4.59	114,885	\$34.68	-	-
Conservation Tillage Methods	848,437	1.18	-6,956	-\$8.20	+	+
Precipitation Enhancement	2,633,524	3.65	28,994	\$11.01	+	+
Irrigated to Dryland Farming	2,522,546	3.49	75,412	\$29.90	-	-
Biotechnology Adoption	10,635,558	14.73	75,816	\$7.13	+	+

¹ + indicates an anticipated positive impact that was not quantified

Background

- There are substantial irrigation shortages identified in the PWPA region due to limitations of the available supply of the Ogallala Aquifer.
- Water management strategies for reducing irrigation demands in the Ogallala Aquifer for all 21 counties in the PWPG area were examined.
- These strategies focus on the counties in this Region showing water demands that cannot be met with existing supplies:
 - Dallam
 - Hansford
 - Hartley
 - Hutchinson
 - Moore
 - Sherman

Irrigation Shortages Identified in the PWPA

Water User Group	County	Projected Need (acre-feet per year)					
		2010	2020	2030	2040	2050	2060
Irrigation	Dallam	-132,889	-140,984	-148,630	-149,134	-133,737	-117,396
Irrigation	Hansford	0	-856	-1,337	-4,402	-2,933	-1,496
Irrigation	Hartley	-181,732	-180,523	-183,457	-179,983	-161,368	-142,079
Irrigation	Hutchinson	-15,008	-12,175	-11,652	-10,612	-7,534	-5,455
Irrigation	Moore	-52,317	-48,090	-52,425	-54,994	-50,321	-45,420
Irrigation	Sherman	-72,126	-68,962	-79,286	-82,553	-76,718	-68,790

Hutchinson County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	-15,008	-12,175	-11,652	-10,612	-7,534	-5,455
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	1,863	1,863	1,863	1,863	1,863
	Change in Crop Variety	0	1,401	1,401	1,401	1,401	1,401
	Conservation Tillage	0	522	522	522	522	522
	Convert to Dry	0	816	1,631	1,631	1,631	1,631
	Irrigation Equipment	0	938	1,876	2,814	2,814	2,814
	NPET Network	0	222	445	667	890	890
	Precipitation Enhancement	0	1,619	1,619	1,619	1,619	1,619
	Biotechnology Adoption	0	1,752	6,306	7,007	7,007	7,007
	Total Water Savings	0	9,132	15,663	17,524	18,684	18,684
	Water Surplus / Deficit	-15,008	-3,043	4,011	6,912	10,212	12,291

Sherman County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	-72,126	-68,962	-79,286	-82,553	-76,718	-68,790
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	10,580	10,580	10,580	10,580	10,580
	Change in Crop Variety	0	8,020	8,020	8,020	8,020	8,020
	Conservation Tillage	0	2,562	2,562	2,562	2,562	2,562
	Convert to Dry	0	4,261	8,521	8,521	8,521	8,521
	Irrigation Equipment	0	4,607	9,214	13,821	13,821	13,821
	NPET Network	0	1,092	2,185	3,277	4,370	4,370
	Precipitation Enhancement	0	7,953	7,953	7,953	7,953	7,953
	Biotechnology Adoption	0	10,006	36,020	40,022	40,022	40,022
	Total Water Savings	0	49,080	85,055	94,756	100,456	100,456
	Water Surplus / Deficit	-72,126	-19,882	5,769	12,203	19,131	27,059

Hartley County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	-181,732	-180,523	-183,457	-179,983	-161,368	-142,079
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	15,720	15,720	15,720	15,720	15,720
	Change in Crop Variety	0	11,772	11,772	11,772	11,772	11,772
	Conservation Tillage	0	2,859	2,859	2,859	2,859	2,859
	Convert to Dry	0	3,526	7,052	7,052	7,052	7,052
	Irrigation Equipment	0	5,141	10,282	15,423	15,423	15,423
	NPET Network	0	1,219	2,438	3,657	4,876	4,876
	Precipitation Enhancement	0	8,875	8,875	8,875	8,875	8,875
	Biotechnology Adoption	0	13,518	48,663	54,070	54,070	54,070
	Total Water Savings	0	62,630	107,662	119,429	125,789	125,789
	Water Surplus / Deficit	-181,732	-117,893	-75,795	-60,554	-40,720	-21,431

Summary

- Costs and water savings of RWP2006 conservation strategies were updated
- Biotechnology was added and evaluated as a new “potential” conservation strategy
- Minor changes were made to the implementation schedule of Improved irrigation equipment
- Changing conditions affected both cost and effectiveness of conservation strategies

Conclusions

- A combination of conservation strategies would eliminate projected irrigation deficits in Hansford and Hutchinson counties
- Employing all conservation strategies would be required to eliminate projected irrigation deficits in Moore and Sherman counties
- Dallam and Hartley basically have projected shortages regardless of what is done



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Dallam County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	-132,889	-140,984	-148,630	-149,134	-133,737	-117,396
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	17,172	17,172	17,172	17,172	17,172
	Change in Crop Variety	0	12,813	12,813	12,813	12,813	12,813
	Conservation Tillage	0	3,276	3,276	3,276	3,276	3,276
	Convert to Dry	0	4,234	8,468	8,468	8,468	8,468
	Irrigation Equipment	0	5,891	11,782	17,673	17,673	17,673
	NPET Network	0	1,397	2,794	4,191	5,588	5,588
	Precipitation Enhancement	0	10,169	10,169	10,169	10,169	10,169
	Biotechnology Adoption	0	14,492	52,171	57,968	57,968	57,968
	Total Water Savings	0	69,444	118,645	131,730	139,018	139,018
	Water Surplus / Deficit	-132,889	-71,540	-29,985	-17,404	-610	15,731

Hansford County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	0	-856	-1,337	-4,402	-2,933	-1,496
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	5,928	5,928	5,928	5,928	5,928
	Change in Crop Variety	0	4,404	4,404	4,404	4,404	4,404
	Conservation Tillage	0	1,726	1,726	1,726	1,726	1,726
	Convert to Dry	0	3,257	6,514	6,514	6,514	6,514
	Irrigation Equipment	0	3,103	6,206	9,309	9,309	9,309
	NPET Network	0	736	1,472	2,207	2,943	2,943
	Precipitation Enhancement	0	5,357	5,357	5,357	5,357	5,357
	Biotechnology Adoption	0	5,282	19,014	21,127	21,127	21,127
	Total Water Savings	0	29,791	50,620	56,572	60,410	60,410
	Water Surplus / Deficit	0	28,935	49,283	52,170	54,374	55,811

Moore County Projected Annual Irrigation Shortfall and Water Savings by Strategy (acre-ft/year)

		2010	2020	2030	2040	2050	2060
	Projected Shortfall	-52,317	-48,090	-52,425	-54,994	-50,321	-45,420
	Projected Water Savings						
Water Saving Strategies	Change in Crop Type	0	7,852	7,852	7,852	7,852	7,852
	Change in Crop Variety	0	6,151	6,151	6,151	6,151	6,151
	Conservation Tillage	0	1,996	1,996	1,996	1,996	1,996
	Convert to Dry	0	3,488	6,977	6,977	6,977	6,977
	Irrigation Equipment	0	3,589	7,178	10,767	10,767	10,767
	NPET Network	0	851	1,702	2,553	3,404	3,404
	Precipitation Enhancement	0	6,196	6,196	6,196	6,196	6,196
	Biotechnology Adoption	0	7,675	27,629	30,699	30,699	30,699
	Total Water Savings	0	37,798	65,681	73,191	77,631	77,631
	Water Surplus / Deficit	-52,317	-10,292	13,256	18,197	23,721	28,622