Estimating the Value of Irrigation Water for Agriculture in the Lower Rio Grande Valley

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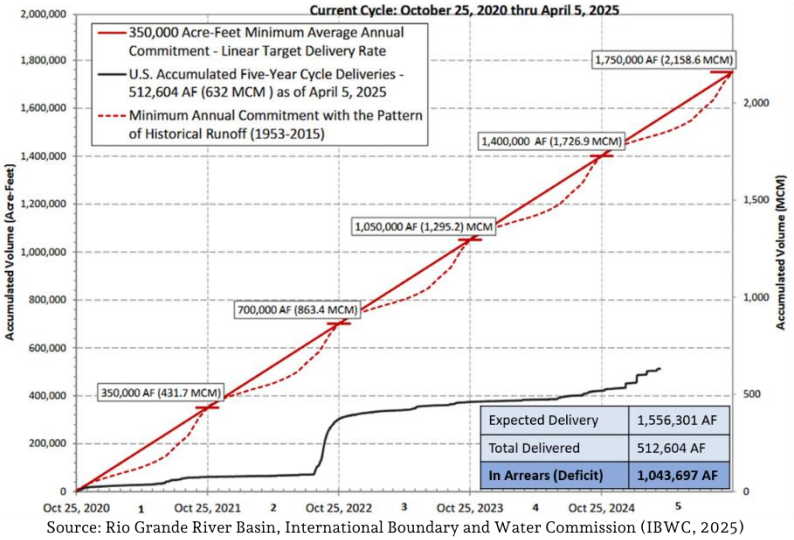
Introduction

Irrigation water is important to agricultural production in the Lower Rio Grande Valley (LRGV), which includes Cameron, Hidalgo, Starr, and Willacy counties; about half of the region's crop production acreage is irrigated. Shortages of irrigation water in the LRGV have occurred since the mid-1990s (Robinson, 2002; Ribera and McCorkle, 2013; Ribera et al, 2017; Ribera et al, 2023). These shortages were exacerbated in 1992, when Mexico began undersupplying the average minimum annual amount of 350,000 acre-feet of water into the Rio Grande, which continues today. The treaty of 1944 requires Mexico to deliver 350,000 minimum average annual acre-feet annually over the defined five-year cycles. The water deficit for the current five-year cycle that started on October 25, 2020 is 1.043 million acre-feet as of April 5th of 2025 with the five-year cycle ending in October 2025 (IBWC, 2025). This is the largest deficit to accrued since 2002.

Figure 1: Estimated Volumes Allotted to the United States by Mexico under the 1944 Water Treaty



Source: Rio Grande River Basin, International Boundary and Water Commission (IBWC, 2025)

The estimated economic impact from losing irrigation water in the LRGV region published in December of 2023 was $495.8 million of direct impact and 5,221 jobs in the region (Ribera et al, 2023). When expanding this to also include both indirect and induced sources this impact rose to $993.2 million and 8,404 jobs. This report estimated the potential losses due to having no irrigation water for agricultural production; therefore, it provides an upper bound of potential losses.

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The purpose of this report is to estimate the value of water for irrigation in the LRGV region. Crops affected by irrigation water shortages are row crops (mainly sorghum, cotton, and corn) and specialty crops (mainly vegetables, citrus and sugarcane). Row crops can be grown in either irrigated or dryland production systems while specialty crops can only be grown under irrigation.

Direct Revenue Loss Without Irrigation

In the Ribera et al 2023 report, the losses to row crops were estimated by finding the yield difference for irrigated versus dry-land crops in the LRGV and subtracting the revenue if irrigated land was transitioned.

Table 1: Row Crop Losses due to Lack of Irrigation Water in LRGV

Seed Cotton			
	Lint	$	(31,258,192)
	Seed	$	(16,292,836)
Corn		$	(18,041,274)
Sorghum		$	(5,949,148)
Total		$	(71,541,449)

Source: Estimated Economic Impacts of Irrigation Water Shortages on Lower Rio Grande Valley Agriculture, CNAS, December 2023

The calculation for specialty crops loss in the Ribera et al 2023 report was done by estimating the value of production for the different specialty industries and subtracting that from the estimated production value of that land distributed among dry-land row crops. It was assumed that the land would be converted with the same distribution that the row crops had previously.

One change that was made from the Ribera et al 2023 report was removing the citrus transition cost since removing the trees would be a one-time occurrence. This brings losses for LRGV specialty crops from $407.2 million, that was initially reported to $385.6 million which will be incurred annually.

Table 2: Specialty Crop Losses due to Lack of Irrigation Water in LRGV

Value of Specialty Crop Production			
	Citrus	$	(246,791,479)
	Vegetables	$	(108,498,775)
	Sugarcane	$	(98,538,195)
Value as Non-Irrigated Row Crops			
Seed Cotton			
	Lint	$	25,228,088
	Seed	$	13,149,740
Corn		$	9,985,786
Sorghum		$	19,856,845
Total		$	(385,607,990)

Source: Estimated Economic Impacts of Irrigation Water Shortages on Lower Rio Grande Valley Agriculture, CNAS, December 2023

The impact of converting all specialty crops and irrigated row crops to dry-land row crops is a loss of $457.1 million annually, this includes 4,814 jobs that were supported directly by the production lost. When expanding past the direct impact the value grows to $915.8 million and 7,749 jobs supported by this lost production.

Unfortunately, due to the lack of irrigation water in early 2024 the only sugarcane mill in Texas closed. It is assumed that the value of the sugarcane industry will not return to LRGV region. The $98.5 million the industry provided will not count towards the value loss from specialty crop production, the acreage that was in production meanwhile is assumed to stay in production of dry-land row crops.

Table 3: Specialty Crop Losses due to Lack of Irrigation Water, Loss of Sugarcane Industry

Value of Specialty Crop Production			
	Citrus	$	(246,791,479)
	Vegetables	$	(108,498,775)
Value as Non-Irrigated Row Crops			
Seed Cotton			
	Lint	$	25,228,088
	Seed	$	13,149,740
Corn		$	9,985,786
Sorghum		$	19,856,845
Total		$	(287,069,795)

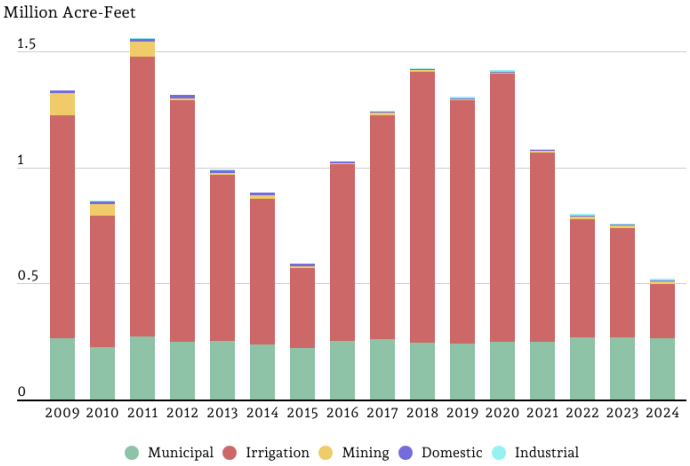
Source: Estimated Economic Impacts of Irrigation Water Shortages on Lower Rio Grande Valley Agriculture, CNAS, December 2023

Based on this new estimate for specialty crop losses, converting all irrigated agricultural land in the LRGV region to dry-land row crops decrease agricultural production for the area by $358.6 million annually. This is an estimated total impact of $718.4 million and 6,079 jobs, with 3,776 jobs directly related to production of these crops.

Irrigation Water Used in LRGV Agriculture

The leading use for water in the LRGV area most years is agricultural irrigation, and the need for this water is largely dependent on rainfall for a given year. An irrigation district manager in the LRGV explained that recent years have seen both extremes in terms of water needs. During the drought in 2011, the region received only twelve inches of rain and used 1.2 million acre-feet of water for irrigation. Meanwhile in 2015, the area received an estimated forty inches of rain and irrigation totaled only 346 thousand acre-feet. It was expressed that a typical year for irrigation water usage in the LRGV region would be similar to 2019 where irrigation values totaled 1.046 million acre-feet.

Figure 2: LRGV Water Usage, 2009-2024



Source: Texas Water Development Board, Region M Planning Group

Using the Ribera et.al 2023 report along with the need for irrigation water on a normal year, the value per acre-foot of water can be calculated by dividing the potential loss of agricultural production by the usage of irrigation water. Therefore, before the loss of the entire sugarcane industry, due to lack of irrigation water, the direct value per acre-foot of water is $436.99 while the total value per acre-foot of water is $875.38. After the loss of the sugarcane industry, the direct value of irrigation water is $342.79 and the total value is $686.69 per acre-foot.

Table 4: Economic Impact from Loss of Irrigation Water to the Lower Rio Grande Valley

	With Sugarcane	Without Sugarcane
Loss of Revenue Converting Row Crops	$ (71,541,449)	$ (71,541,449)
Value of Specialty Crop Production	$ (453,828,449)	$ (355,290,254)
Converting to Dry-Land, Row Crop	$ 68,220,459	$ 68,220,459
Total Loss/Direct Impact	$ (457,149,439)	$ (358,611,244)
Total Impact	$ (915,773,701)	$ (718,379,413)
Direct Employment	(4,814)	(3,776)
Total Employment	(7,749)	(6,079)
Direct Value of Irrigation Water	$ 436.99	$ 342.79
Total Value of Irrigation Water	$ 875.38	$ 686.69

Source: Ribera et al, 2023; IMPLAN Model Estimation

The Treaty of 1944 established that Mexico is required to deliver 1.75 million acre-feet of water every five years, or 350,000 acre-feet of deliveries annually. To illustrate, Table 5 shows the potential direct and total losses to the LRGV from one year without irrigation water being supplied under such treaty.

Table 5: Economic Impact of Annual Rio Grande Water Deliveries Under Treaty of 1944

Annual Water Delivery, Acre-Feet 350,000

	With Sugarcane		Without Sugarcane	
Direct Value of Irriation Water	$	436.99	$	342.79
Total Value of Irrigation Water	$	875.38	$	686.69
Direct Value of Water Deliveries	$	152,944,818	$	119,977,685
Total Value of Water Deliveries	$	306,383,056	$	240,342,433

Source: Ribera et al, 2023; IMPLAN Model Estimation

References

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