

Introduction

The value of agricultural production in the Lower Rio Grande Valley (LRGV) region, which includes Cameron, Hidalgo, Starr, and Willacy counties, was approximately \$887 million in 2022 (Table 1). Total crop production accounted for about \$673 million or 75.8% of total agricultural production led by feed crops, cotton, vegetables, miscellaneous crops, and fruits and nuts. Livestock production and agricultural related production were about \$85 and \$129 million, respectively (Robinson, 2023).

Table 1. Estimated Value of Agricultural Production for the LRGV, 2022

LRGV Value of Production for 2022										
	Cameron		Hidalgo		Starr		Willacy	Total LRGV		
	(Thousands of Dollars)									
Total Crops	\$	144,532	\$	333,699	\$	18,118	\$	176,407	\$	672,756
Row Crops	\$	105,145	\$	106,973	\$	10,925	\$	162,739	\$	385,782
Specialty Crops	\$	39,379	\$	225,379	\$	7,193	\$	13,668	\$	285,619
Total Livestock	\$	11,978	\$	43,873	\$	24,539	\$	5,021	\$	85,411
Beef	\$	11,978	\$	42,343	\$	24,440	\$	4,939	\$	83,699
Other Meat Animals	\$	-	\$	1,530	\$	99	\$	82	\$	1,711
Livestock Products	\$	-	\$	-	\$	-	\$	-	\$	-
Ag. Related	\$	104,841	\$	17,375	\$	4,320	\$	2,476	\$	129,012
Total Agriculture	\$	261,351	\$	394,947	\$	46,977	\$	183,904	\$	887,179

Source: Estimated Value of Agricultural Production and Related Items, Texas AgriLife Extension Service, May 2022

Irrigation water is very important to agricultural production in the LRGV region where about half of its crop production acreage is irrigated. Irrigation water shortages in the LRGV have occurred since the mid-1990s (Robinson, 2002; Ribera and McCorkle, 2013; Ribera et al, 2017). 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 673,892 acre-feet as of December 9, 2023 the second largest deficit in the last three decades (IBWC, 2023).

The purpose of this report is to estimate the economic impact of the absence of irrigation water for crop production 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. All row crops and specialty crops are annual crops except for citrus

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and sugarcane. The lifespan of a citrus tree is over 30 years while sugarcane is typically five years. The methodology used in this study is an *ex post* historical crop damage approach where the economic impacts are estimated by measuring the change in farm gate or regional gross value of affected row crops and specialty crops.

Row Crops

To estimate the impact of the lack of irrigation water in row crops, the difference between irrigated and dryland yields are estimated and multiplied by the irrigated acreage for the crop. To account for the year-to-year fluctuations in yields and crop acres, a 5-year average (2018- 2022) of crop yields and acreage is used to project the impacts for 2024. For example, using the estimated corn yield difference between irrigated and dryland production (i.e., 39 bu. per acre), the 5-year average irrigated corn acres, and the 2023 estimated corn price; the loss in farm-gate cotton revenue is estimated at \$9.4 million for 2024 (Table 2). Therefore, with the absence of water, irrigated row crops are assumed to produce dryland yields, causing a reduction in row crop farm-gate values of \$31.3, \$9.4, and \$3.6 million for cotton, corn and sorghum, respectively. Anecdotal evidence suggests that irrigated fields transitioning to dryland tend to produce lower yields compared to their historical dryland counterparts. Therefore, the dryland yields used in the analysis provide a conservative estimate of the potential economic losses. The total farm-gate loss for row crops is estimated at \$44.3 million.

Table 2. Row Crop Losses due to Lack of Irrigation Water in LRGV

	Yield ¹	Yield Loss ¹	Acreage ²	2023 Price ³		Total Farm Gate
	5-year average					
Seed Cotton						
Lint - Irrigated	653	(341)	74,540	\$	0.81	\$ (20,601,138)
Lint - Dryland	312		99,259			
Seed - Irrigated	1,739	(907)	74,540	\$	0.16	\$ (10,738,016)
Seed - Dryland	831		99,259			
Corn						
Irrigated	82	(39)	52,550	\$	4.64	\$ (9,413,207)
Dryland	43		31,328			
Sorghum						
Irrigated	69	(25)	29,359	\$	4.88	\$ (3,562,548)
Dryland	44		179,407			
Total Row Crop Losses					\$	44,314,910

^{1/} USDA ARC/PLC Yield Adjusted Factors for LRGV region, 2018-2022. Cotton yield is measured in lbs/ac, and corn and sorghum yields are given in bu/ac.

^{2/} USDA-FSA annual crop acreage report for LRGV region, 2018-2022

^{3/} CME Group Cotton Lint and Corn December 2023 Prices. USDA Texas Sorghum and Cotton Seed Price December 2023.

Note that seed cotton is composed of cotton lint and cottonseed with Agriculture Risk Coverage (ARC) county yields for the Lower Rio Grande Valley area with the two parts being separated and sold after being picked. The conversion of this seed cotton acreage to the individual parts was assumed to be 27.2975%. For more information on the breakdown of this estimate, refer to the congressional report: [R45143 \(congress.gov\)](https://www.congress.gov/reports/117/143/).

Specialty Crops

To estimate the impact of the lack of irrigation water in specialty crops, these crops were divided between perennial, i.e. citrus, and annual crops, i.e. vegetables and sugarcane. This report assumes that citrus orchards are turned into an annual crop and the estimated cost for removing citrus trees are \$800/acre per Texas Citrus Mutual. This has been an on-going threat for the industry since Hurricane Hanna in 2020, the crippling winter storm Uri during 2021 followed by droughts in 2022 and 2023. The recovering citrus industry has continued while struggling to keep orchards going due to the lack of irrigation water. It is important to note that once citrus orchards are removed the whole industry will be lost permanently.

Therefore, the economic loss of the lack of irrigation water at the farm-level would be the 5-year average value of citrus production in the LRGV region plus the cost to transition orchards, \$268.4 million (Table 3). Vegetables and sugarcane production would be lost as well, as irrigation water is needed for their production. Estimated economic losses at the farm-level would be the 5-year average value of production, \$108.5 and \$98.5 million for vegetable and sugarcane production, respectively (Table 3). The total value of specialty crop production is \$475.5 million.

Table 3. Specialty Crop Acreage and Value of Production Loss

	Acreage ¹		Value of Production ^{2, 3}		Citrus
	5-year average				Transition Cost
Citrus*	27,038	\$	246,791,479	\$	21,630,400
Vegetables	26,090	\$	108,498,775		
Sugarcane	33,474	\$	98,538,195		
Total Specialty Crop Loss					\$ 475,458,849

*Value of Production is years 2015-2019 due to natural events limiting production

^{1/} USDA-FSA annual crop acreage report for LRGV region, 2018-2022, and Texas Citrus Mutual, 2023

^{2/} Estimated Value of Agricultural Production and Related Items, Texas AgriLife Extension Service, May 2023

^{3/} Rio Grande Valley Sugar Growers Inc. Income Statement and Texas Citrus Mutual annual reports

However, it is improbable that the acreage used in specialty crop production would remain out of crop production; instead, they would be converted into dryland crop production, which for the LRGV region would most likely be cotton, corn, or sorghum. The methodology used to redistribute this acreage includes using the 5-year average crop mix in the LRGV region as the crop mix ratio to convert the citrus, vegetable, and sugarcane acreage into row crops (Table 4). Therefore, 37% of the converted specialty crops acreage would go into cotton, 18% into corn, and 45% into sorghum production; accounting for \$24.0 million in production value at the farm-level. This value, \$24.0 million, is subtracted from the total loss of specialty crop production. Therefore, the total crop production loss due to the lack of irrigation water in the LRGV region is estimated at \$495.8 million, which includes row crop losses of \$44.3 million, plus the specialty crops losses of \$475.5 million and the cost to transition land producing citrus to row crops of \$21.6 million, less the value of row crop production of the converted citrus, vegetable, and sugarcane acreage, \$24.0 million.

Table 4. Value of Production of Specialty Crop Acreage Turned into Row Crop Production

	Crop Mix ¹	Acreage Mix	Yield ²	Price ³	Value
	5-year average				
Cotton	37%	32,268			
Lint			312 \$	0.81 \$	8,171,525
Seed			831 \$	0.16 \$	4,259,278
Corn	18%	15,573	43 \$	4.64 \$	3,117,270
Sorghum	45%	38,761	44 \$	4.88 \$	8,402,313
Total Gross Revenue				\$	23,950,386

^{1/} USDA-FSA annual crop acreage report for LRGV region, 2018-2022

^{2/} USDA-NASS Quick Stats for LRGV region, 2018-2022. Cotton yield is measured in lbs/ac, and corn and sorghum yields are given in bu/ac.

^{3/} CME Group Cotton Lint and Corn December 2023 Prices. USDA Texas Sorghum and Cotton Seed Price December 2023.

Total Economic Impact

The IMPLAN input-output model was used to assess the broader economic effects associated with the estimated \$495.8 million crop revenue loss generated by the loss of irrigation water. These effects are measured via three indicators – employment, value added, and economic output. Employment represents both full and part-time jobs, value added is a measure of net business income and employee compensation, and economic output represents gross business activity (spending) associated with the loss of irrigated crop production. Value added also represents a contribution to Texas' Gross Domestic Product (GDP), the most commonly used indicator of the health of the state's economy.

Each of these indicators is measured at three different levels: direct effects represent the farm-level effects; indirect effects represent effects in industries that provide input supplies (fertilizer, fuel, etc.) to farms, and induced effects represent the economic impacts associated with the spending of salaries and wages on household goods. The loss of irrigated crop production in the LRGV region would lead to an estimated \$993.2 million loss in economic output (Table 5). Likewise, the loss of irrigated crop production in the LRGV region would generate a loss of \$554.8 million in value-added (contribution to the state's GDP). In terms of employment, the loss of irrigation would result in an estimated loss of 8,404 jobs (full-and part-time) that depend on the production and sales of these commodities for some portion of their income. It is important to note that value-added and economic output are two distinct indicators, and as such are not to be added together.

This analysis represents the impacts of all economic activities that occur in the production of the described crops, up until the point of sale of the crops at the farm-level. These results are on the conservative side as they do not include the impacts (losses) that occur beyond the farm-level sale of the crops, such as transportation, storage, processing, packaging, and marketing.

Table 5. 2023 Projected Economic Losses Associated with Lack of Irrigation Water in the LRGV

Impact Type	Output	Value Added	Employment
1 - Direct	(\$495,823,372.00)	(\$278,319,316.23)	-5,221.12
2 - Indirect	(\$233,196,608.65)	(\$126,257,482.91)	-1,791.55
3 - Induced	(\$264,226,353.62)	(\$150,178,250.31)	-1,391.71
Total Economic Impact	(\$993,246,334.26)	(\$554,755,049.44)	-8,404.38

Source: IMPLAN Model Estimation

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