

Introduction

The value of agricultural production in the Lower Rio Grande Valley (LRGV) region, which includes Cameron, Hidalgo, Starr and Willacy counties, was approximately \$668 million in 2016 (Table 1). Total crop production accounted for about \$493 million or 81.2 % of total agricultural production led by feed crops, cotton, vegetables, miscellaneous crops, and fruits and nuts. Livestock production and agricultural related production were about \$39 and \$ 136 million, respectively (Johnstone and Robinson, 2017).

Table 1. Estimated Value of Agricultural Production for the LRGV, 2016

LRGV Value of Production for 2016					
	Cameron	Hidalgo	Starr	Willacy	Total LRGV
	(Thousands of Dollars)				
Feed Crops	\$46,852	\$50,399	\$5,564	\$35,343	\$138,158
Cotton	\$52,816	\$38,916	\$1,115	\$25,097	\$117,944
Oil Crops	\$0	\$1,125	\$0	\$1,009	\$2,134
Vegetable Crops	\$6,905	\$64,270	\$3,996	\$6,512	\$81,683
Fruits & Nuts	\$15,360	\$70,105	\$0	\$106	\$85,571
Sugar Cane	\$6,226	\$9,857	\$0	\$1,319	\$17,402
Misc. Crops	\$18,000	\$32,409	\$0	\$32	\$50,441
Beef	\$1,670	\$14,850	\$10,430	\$6,551	\$33,501
Other Meat Animals	\$0	\$5,200	\$66	\$44	\$5,310
Livestock Products	\$0	\$0	\$0	\$0	\$0
Ag. Related	\$100,044	\$30,200	\$3,348	\$2,166	\$135,758
Total Crops	\$146,159	\$267,081	\$10,675	\$69,417	\$493,332
Total Livestock	\$1,670	\$20,050	\$10,496	\$6,595	\$38,811
Ag. Related	\$100,044	\$30,200	\$3,348	\$2,166	\$135,758
Total Agriculture	\$247,873	\$317,331	\$24,519	\$78,178	\$667,901

Source: Estimated Value of Agricultural Production and Related Items, Texas AgriLife Extension Service, May 2017.

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

¹ Prepared by Luis A. Ribera, Samuel Zapata, Nishita Sinha, Dean McCorkle, and Daniel Hanselka, and is a collaborative effort of Center for North American Studies and Texas A&M AgriLife Extension Service, Department of Agricultural Economics, Texas A&M AgriLife Research/Texas A&M AgriLife Extension Service. For additional information, please contact lribera@tamu.edu or call 979-845-3070. <http://cnas.tamu.edu>. Twitter: @cnastamu1

have occurred since the mid-1990s (Robinson, 2002; Ribera and McCorkle, 2013). These shortages followed the point in 1992, when Mexico began undersupplying the average minimum annual amount of 350,000 acre-feet of water into the Rio Grande and continue nowadays. The treaty of 1944 requires Mexico to deliver the 350,000 minimum average annual acre-feet over the defined five-year cycles. The water deficit for the current five-year cycle that started on October 25, 2015 is 234,221 acre-feet as of May 27, 2017 (TCEQ, 2017).

The purpose of this report is to estimate the economic impact of the absence of irrigation water for crop production in the LRGV region. The crops affected by the absence of irrigation water 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 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 (2012-2016) of crop yields and acreage is used to project the impacts for 2017. For example, using the estimated cotton yield difference between irrigated and dryland production (i.e., 573 lbs. per acre), the 5-year average irrigated cotton acres, and the 2017 estimated cotton price; the loss in farm-gate cotton revenue is estimated at \$21.2 million for 2017 (Table 2). Therefore, with the absence of water, irrigated row crops will produce dryland yields, causing a reduction in row crop farm-gate values of \$21.2, \$3.5 and \$5 million for cotton, corn and sorghum, respectively. The total farm-gate loss for row crops is estimated at \$29.7 million.

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

	Yield ¹	Yield Loss ¹	Acreage ²	2017 Price ³	Total Farm Gate
	5-year average				
Cotton					
Irrigated	1,181	-573	46,787	\$0.79	\$21,186,667
Dryland	608		50,238		
Corn					
Irrigated	98	-24	38,752	\$3.72	\$3,513,090
Dryland	74		12,285		
Sorghum					
Irrigated	78	-21	64,831	\$3.62	\$4,961,279
Dryland	57		256,994		
Total Row Crop Loss					\$29,661,036

^{1/} USDA-NASS Quick Stats for LRGV region, 2012-2016. 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, 2012-2016.

^{3/} CME Group Cotton, Corn and Sorghum July 2017 Prices.

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. Citrus production would be close to zero, but in general, trees would survive a season without irrigation water. It is assumed that citrus orchards would not be turned into an annual crop since replacing mature trees is very expensive. 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, \$45.8 million (Table 3). Vegetables and sugarcane production would be lost as well as irrigation water is needed for their production. Estimated economic loss at the farm-level would be the 5-year average value of production, \$101.4 and \$44 million for vegetable and sugarcane production, respectively (Table 3). The total value of specialty crop production is \$191.1 million.

Table 3. Specialty Crop Acreage and Value of Production Loss

	Acreage¹	Value of Production²
	5-year average	
Citrus	27,038	\$45,822,200
Vegetables	26,090	\$101,356,600
Sugarcane	37,680	\$43,961,720
Total Specialty Crop Loss		\$191,140,520

^{1/} USDA-FSA annual crop acreage report for LRGV region, 2012-2016, and Texas Citrus Mutual, 2017.

^{2/} Estimated Value of Agricultural Production and Related Items, Texas AgriLife Extension Service, May 2017.

However, it is improbable that the acreage used in vegetable and sugarcane 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 vegetable and sugarcane acreage into row crops (Table 4). Therefore, 21% of the converted acreage would go into cotton, 11% into corn and 68% into sorghum production; accounting for \$17.2 million in production value at the farm-level. This value, \$17.2 million, is subtracted from the total loss of specialty crop

Table 4. Value of Production of Vegetables and Sugarcane Acreage Turned Into Row Crop Production

	Crop Mix¹	Acreage Mix	Yield²	Price³	Value
	5-year average		Dryland		
Cotton	21%	13,168	608	\$0.79	\$6,322,608
Corn	11%	6,926	74	\$3.72	\$1,904,093
Sorghum	68%	43,676	57	\$3.62	\$9,021,545
Total Gross Revenue					\$17,248,247

^{1/} USDA-FSA annual crop acreage report for LRGV region, 2012-2016.

^{2/} USDA-NASS Quick Stats for LRGV region, 2012-2016. Cotton yield is measured in lbs/ac, and corn and sorghum yields are given in bu/ac.

^{3/} CME Group Cotton, Corn and Sorghum July 2013 Prices.

production. Therefore, the total crop production loss due to the lack of irrigation water in the LRGV region is estimated at \$203.5 million, which includes row crop losses of \$29.7 million, plus the specialty crops losses of \$191.1 million, less the value of row crop production of the converted vegetable and sugarcane acreage, \$17.2 million.

Total Economic Impact

The IMPLAN input-output model was used to assess the broader economic effects associated with the estimated \$203.5 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 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 \$343.5 million loss in economic output (Table 5). Likewise, the loss of irrigated crop production in the LRGV region would generate a loss of \$209.3 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 3,172 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. 2017 Projected Economic Losses Associated with Lack of Irrigation Water in the LRGV

Impact Type	Employment	Total Value Added	Output
Direct Effect	1,822.0	\$132,213,599	\$203,459,580
Indirect Effect	556.7	\$31,027,212	\$52,268,973
Induced Effect	793.1	\$46,036,721	\$87,828,927
Total Effect	3,171.8	\$209,277,532	\$343,557,480

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