FARM Assistance Focus

AgriLIFE EXTENSION
Texas A&M System

Analyzing the Impact of Drought Conditions on Texas High Plains Agriculture

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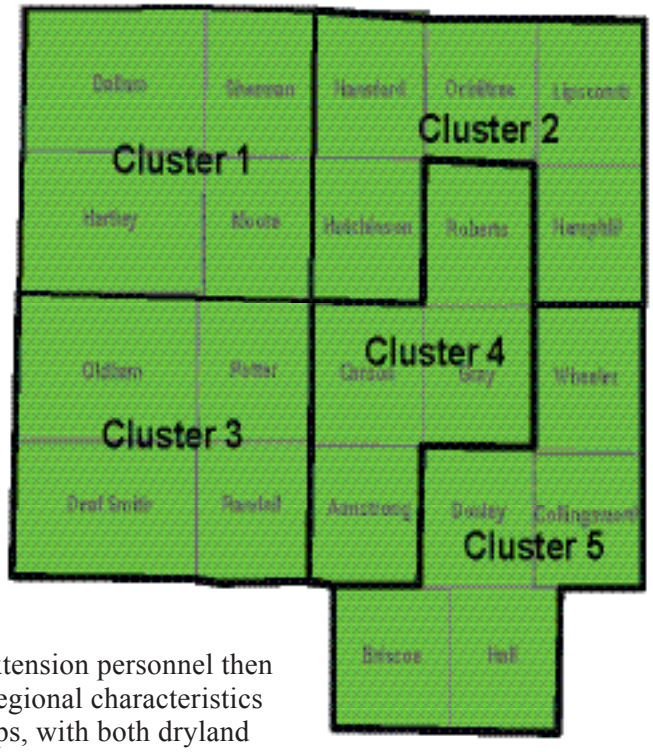
"The Texas High Plains region constitutes a considerable portion of state agricultural production, and was severely impacted by the 2011 drought."

Introduction

Much of the Southern United States experienced drought conditions in 2011. The situation was especially severe in Texas, where agricultural producers faced substantial income losses. While dryland crops and cattle were the most significantly impacted, irrigated farms were also affected. Low rainfall, high temperatures, and strong winds caused many crops to develop water requirements that exceeded pumping capabilities. These shortages combined with elevated fuel costs resulted in irrigated acre abandonment and yield loss. The Texas High Plains region constitutes a considerable portion of state agricultural production. This study evaluated the five-year financial implications of drought conditions on Texas Panhandle operations.

Figure 1. Texas AgriLife Extension Service District 1 - Panhandle



Data and Methods

Model farms were created to illustrate production agriculture in five distinct regions of the Texas High Plains. Twenty-two counties comprise Texas AgriLife Extension District 1. These counties were grouped into five clusters, representing similar cropping and livestock production systems (Figure 1). Extension personnel then conducted focus groups within each cluster to identify common regional characteristics and create model farms. The farms developed included eight crops, with both dryland and irrigated production practices. Many operations also incorporated stockers and/or cow-calf herds. A summary of each cluster farm is detailed below.

Cluster 1. The Northwest Texas Panhandle model consisted of a 2,500 acre crop farm and stocker operation. The farm was 60% owned and 40% share leased. The lease agreement was 1/3 revenue sharing on corn and wheat and 1/4 on cotton. The landlord paid a percentage of fertilizer, chemicals, irrigation, and harvest (irrigated crops only). An emphasis was placed on corn and wheat production, followed by seed sorghum and cotton. All crops were farmer sprayed and harvested. The operation took in 400 head (268 head during 2011) of stockers annually at a lease rate of $0.43 per pound of gain. Stockers grazed for approximately 105 days with an average daily gain of 1.75 lbs.

Table 1. Characteristics of Cluster 1 Model Farm, Northwest

Crops	Acres	Normal Yield	Drought Yield	Price	Stocker	
Irr Corn	1,000	220 bu	173 bu	$5.25/bu	# Head	400 (268 in drought)
Irr Cotton	200	1100 lbs	759 lbs	$0.83/lb	Lease Rate	$0.43
Irr Wheat	500	60 bu	45 bu	$6.48/bu	In Weight	450 lbs
Dry Wheat	500	15 bu	0 bu	$6.48/bu	Out Weight	634 lbs
Irr Seed Sorghum	200	98.21 bu	66.78 bu	$16.00/bu	ADG	1.75 lbs
Dry Sorghum	100	32.14 bu	0 bu	$4.62/bu		
Total Acres	2,500					

"The model farm process attempts to illustrate production agriculture in the Northern Texas Panhandle."

Cluster 2. The Northeast Texas Panhandle model consisted of an approximately 4,000 acre crop farm and stocker operation. The farm was 30% owned and 70% share leased. The lease agreement was 1/4 revenue sharing on irrigated corn and wheat and 1/3 on dryland wheat and sorghum, with the landlord paying a portion of seed (irrigated crops only), fertilizer, chemicals, and irrigation. All crops were custom sprayed and owner harvested. The operation took in 750 head (500 head during 2011) of stockers annually at a lease rate of $0.43 per pound of gain. Stockers grazed for approximately 134 days with an average daily gain of 1.5 lbs.

Table 2. Characteristics of Cluster 2 Model Farm, Northeast

Crops	Acres	Normal Yield	Drought Yield	Price	Stockers	
Irr Corn	820	220 bu	173 bu	$5.25/bu	# Head	750 (500 in drought)
Irr Wheat	820	65 bu	50 bu	$6.48/bu	Lease Rate	$0.43
Dry Wheat	807	25 bu	0 bu	$6.48/bu	In Weight	450 lbs
Dry Sorghum	757	60 bu	0 bu	$4.62/bu	Out Weight	650 lbs
Fallow	757				ADG	1.5 lbs
Total Acres	3,960					

Cluster 3. The Western Texas Panhandle model consisted of a 3,040 acre crop farm and stocker operation. The farm was 66% owned and 34% share leased. The lease agreement was 1/3 revenue sharing on all crops, with the landlord paying a percentage of fertilizer, chemicals, irrigation and harvest. Crops were custom sprayed and harvested. The operation took in 375 head (252 head during 2011) of stockers annually at a lease rate of $0.43 per pound of gain. Stockers grazed for 120 days with an average daily gain of 1.75 lbs.

Table 3. Characteristics of Cluster 3 Model Farm, Western

Crops	Acres	Normal Yield	Drought Yield	Price	Stockers	
Irr Wheat	280	60 bu	46 bu	$6.48/bu	# Head	375 (252 in drought)
Dry Wheat	620	20 bu	0 bu	$6.48/bu	Lease Rate	$0.43
Dry Sorghum	620	39.29 bu	0 bu	$4.62/bu	In Weight	450 lbs
Irr Sorghum	280	98.21 bu	55.98 bu	$4.62/bu	Out Weight	660 lbs
Sorghum Silage	240	25 ton	17 ton	$43.50/ton	ADG	1.75lbs
Native Pasture	1,000					
Total Acres	3,040					

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Cluster 4. The Eastern Texas Panhandle model consisted of a 2,700 acre crop farm and stocker operation. The farm was 40% owned and 60% share leased. The lease agreement was 1/3 revenue sharing on corn, wheat, and sorghum and 1/4 on cotton, with the landlord paying a percentage of fertilizer, chemicals, irrigation, and harvest (cotton only). Grain crops were custom sprayed and cotton was custom harvested. The operation also took in 120 head (80 head during 2011) of stockers annually. Cattle grazed for 128 days with an average daily gain of 1.8 lbs.

Table 4. Characteristics of Cluster 4 Model Farm, Eastern

Crops	Acres	Normal Yield	Drought Yield	Price	Stockers	
Irr Corn	500	180 bu	142 bu	$5.25/bu	# Head	120 (80 in drought)
Irr Cotton	500	1250 lbs	862.5 lbs	$0.83/lbs	Lease Rate	$0.43
Irr Wheat	250	50 bu	39 bu	$6.48/bu	In Weight	450 lbs
Dry Wheat	400	20 bu	0 bu	$6.48/bu	Out Weight	680 lbs
Dry Sorghum	200	35.71 bu	0 bu	$4.62/bu	ADG	1.8 lbs
Irr Sorghum	250	90 bu	51.3 bu	$4.62/bu		
Dry Cotton	200	450 lbs	0 lbs	$0.83/lbs		
Fallow	400					
Total Acres	2,700					

Cluster 5. The Southeast Texas Panhandle model consisted of a 4,000 acre crop farm and cattle operation. The farm was 62% owned and 38% share leased. The lease agreement was 1/4 revenue sharing on all crops, with the landlord paying a percentage of seed (cotton and peanuts only), fertilizer, chemicals, and harvest (cotton only). The wheat was custom sprayed and the cotton custom harvested. The operation also had 50 head of cows with an 86% calving rate. Weaning weight was 450 lbs with an estimated 2011 calf price of $1.20/lb.

Table 5. Characteristics of Cluster 5 Model Farm, Southeast

Crops	Acres	Normal Yield	Drought Yield	Price	Cow Herd	
Irr Cotton	600	1250 lbs	875.5 lbs	$0.83/lb	# Head	50
Dry Cotton	1,500	350 lbs	0 lbs	$0.83/lb	Culling Rate	10%
Irr Peanuts	200	1.75 ton	1.4 ton	$400/ton	Calving Rate	86%
Irr Sorghum	200	100.14 bu	67 bu	4.62/bu	Weaned lbs	450 lbs
Dry Sorghum	500	32.14 bu	0 bu	4.62/bu	Weaned $	$1.20
Native Pasture	1,000					
Total Acres	4,000					

Produced by FARM Assistance, Texas AgriLife Extension Service,
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"Study results show the five-year financial impact of drought conditions on Texas High Plains farming operations."

After each farm was developed, the Financial And Risk Management (FARM) Assistance program generated a five-year economic analysis. FARM Assistance is a computerized decision aid designed for strategic planning. Production information and market prices were calculated based on data from the Texas Agrilife Extension Service, Texas Cattle Feeders Association, the Texas Agricultural Statistics Service (TASS), and focus group estimates.

This study involved two scenarios for each model operation. FARM Assistance first simulated an economic environment from 2011-2015 that assumed average rainfall and crop yields. Another analysis reflected the 2011 drought and 2012 low soil moisture profiles. Conditions were expected to recover under the second scenario by 2013, and remain normal through 2015. Drought impact numbers came from the Texas Agricultural Statistics Service's November 2011 estimates for Region 1N. . FARM Assistance projections were derived through the Texas A&M Food and Agricultural Policy Research Institute.

Results

Table 6. shows Texas Panhandle model farm financial results under average rainfall versus drought conditions.

Table 6. Financial Performance and Position Assuming Average vs. Drought Conditions for 2011

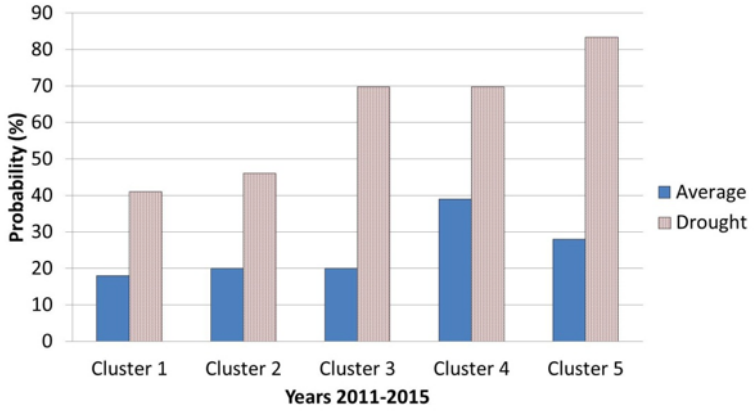
	Cluster 1 Northwest		**Cluster 2** Northeast		**Cluster 3** Western		**Cluster 4** Eastern		**Cluster 5** Southeast	
Average Annual Profitability (2011-15)	Average	Drought	Average	Drought	Average	Drought	Average	Drought	Average	Drought
Net Cash Farm Income	$638,962	$482,726	$567,228	$415,938	$173,726	$95,256	$281,728	$168,264	$233,450	$80,286
Operating Exp / Receipts	61%	67%	60%	68%	69%	80%	76%	83%	82%	93%
Return on Assets	19%	15%	22%	17%	11%	6%	12%	7%	13%	5%
2015 Ending Financial Position										
Working Capital	$950,260	$440,550	$858,130	$379,790	$230,440	($32,730)	$195,980	($197,570)	$181,270	($380,680)
Debt-to-Asset Ratio	19%	23%	17%	23%	24%	31%	28%	38%	15%	44%
Real Net Worth ($)	3,031,800	2,568,880	2,279,330	1,844,890	1,256,430	1,017,420	1,544,170	1,186,750	1,320,330	870,780

Net cash farm income (NCFI) measured profitability. It represented the amount of money available for debt repayment, capital equipment replacement, investment or withdrawal by the owner. All Clusters projected a significant drop in five-year average NCFI under drought versus normal cropping conditions, ranging from 24% to 65%. The resilience of farm profitability was clearly correlated to the percentage of irrigated acres planted. Cluster 1 had 76% irrigated acres and showed the smallest drought impact with a 24% loss in NCFI. Cluster 5 planted 25% irrigated acres, and indicated the least desirable NCFI under drought of $80,290, a 65% decline from average conditions. Profit efficiency (Expense/ Receipts Ratio) and Return on Assets further revealed the lasting impact of 2011's severely low rainfall even through the recovery period.

Liquidity position showed each farms' ability to meet short-term financial obligations without disrupting normal business operations, and was measured by projected annual working capital. Working capital determines (in dollars) the extent to which cash and other short-term, liquid assets exceed current debt obligations. Results varied widely by operation type and county group. Adverse weather conditions and higher costs lead to lower cash balances for all five entities. Model farms projected positive working capital positions in 2011 under normal rainfall conditions, but indicated negative 2011

"A conclusion can be drawn that operations with a higher percentage of irrigated crops and lower debt levels performed more favorably during times of deficient rainfall."

Figure 2. Average Annual Probability of Negative Working Capital



values in the drought scenario. However, by 2015 Clusters 1 and 2 recovered their financial health, showing positive working capital values. These clusters' smaller debt levels and lower operating expenses prior to the drought allowed for a more effective absorption of crop and revenue losses. Cluster 3 almost restored a positive working capital, while Clusters 4 and 5 still carried significant cash shortfalls into 2015.

Figure 2 demonstrates the impact of low rainfall on operational liquidity by calculating the probability of each farm experiencing a negative working capital position. Even the more profitable farms (Clusters 1 & 2) carried an approximately 20% probability of experiencing negative liquidity in normal rainfall conditions. Under the drought scenario their risk more than doubled, while the likelihood of cash shortfalls escalated to 70% or greater on the less profitable operations (Clusters 3, 4, & 5).

Real Net Worth measured equity and represented the dollar amount remaining if assets were sold and debts paid. Each model farm indicated a smaller 2015 equity position in the second (drought) scenario due to lower income values, weaker cash positions, and larger operating loan balances. However, the more profitable farms showed a less severe impact in terms of percentage decline in Real Net Worth and increased debt load.

Summary and Conclusions

Case studies for twenty-two Texas Panhandle counties were developed that provided a five-year financial impact summary of the 2011 drought. Based on focus group characteristics and FARM Assistance analysis, economic stability was strongly correlated with the number of irrigated acres planted, and the ability of farms to effectively control debt levels and operating expenses.

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