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TEXAS TECH UNIVERSITY SYSTEM



Economic Evaluation of Integrating Legume and Beef Production on Low-Water-Input Systems

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RESEARCH MOTIVATION



- The imminent decline of the Ogallala Aquifer
- Crude protein(CP) is the limiting factor in improving performance of grazing beef
- Forage-livestock systems may be a viable option for the future of the Southern High Plains(SHP) agriculture

CONTENTS



- Background information
- Economic evaluation
- Comparison of the systems
- Conclusion

BACKGROUND INFORMATION



Ogallala Aquifer and the Southern High Plains(SHP)



Ogallala Aquifer supports ~30% of U.S. crop and livestock production.

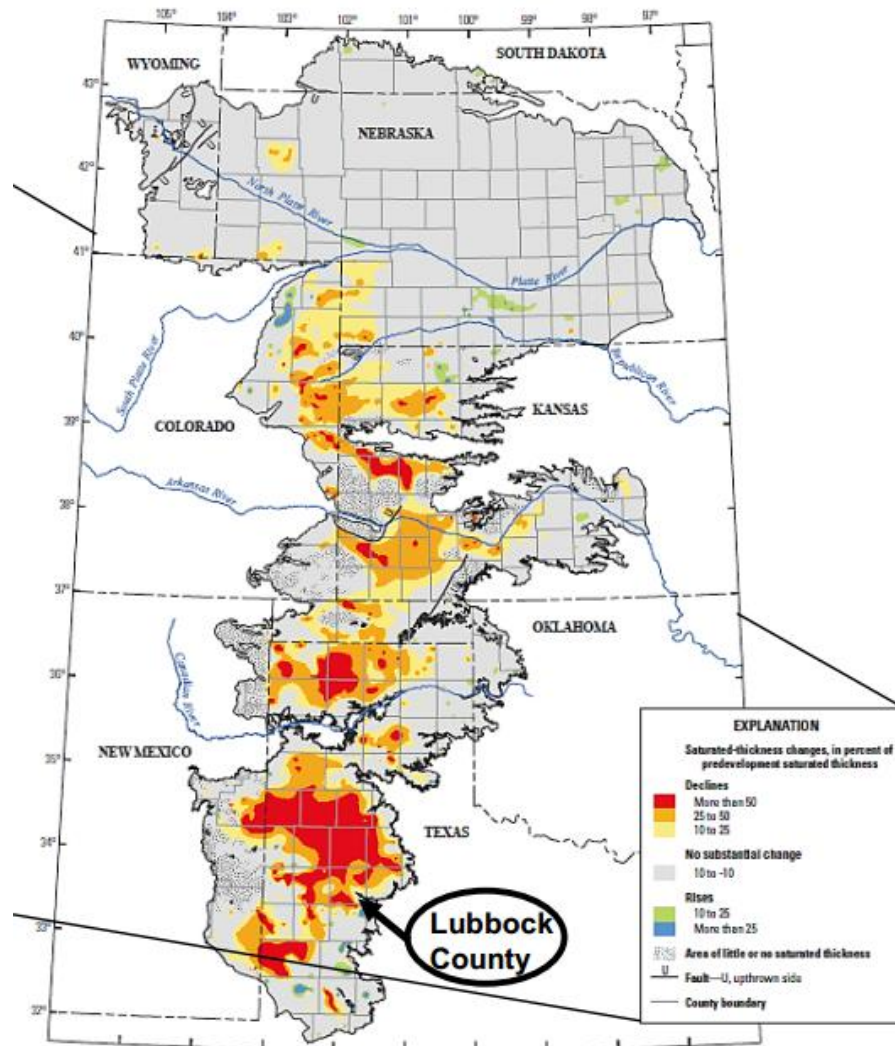


The SHP is largely treeless, cropping system on the SHP rely on supplemental irrigation from the Ogallala Aquifer.

BACKGROUND INFORMATION



Hotspots of groundwater depletion



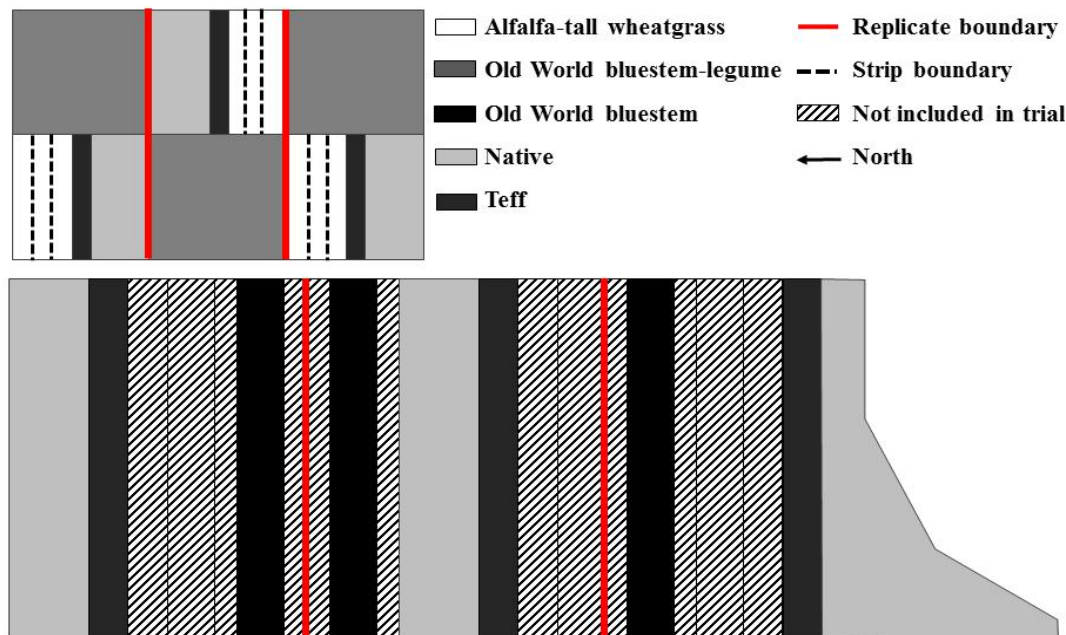
BACKGROUND INFORMATION



Research location and project description

Research was conducted at the Texas Tech Forage-Livestock Research Laboratory located in northeast Lubbock County (33045' N, 101047' W; 993 m elevation).

Overview of experimental area



BACKGROUND INFORMATION



Pastures design

Grass-only system (total 8.33 ha)

1.74 ha of teff

4.53 ha of a native grass mixture

2.06 ha of 'WW-B,Dahl' old world bluestem (OWB).

Grass-legume system (total 4.21 ha)

2.1 ha of OWB mixed with alfalfa and yellow sweetclover

0.93 ha of a native grass mixture

0.93 ha of alfalfa mixed with tall wheatgrass

0.24 ha of teff

ECONOMIC EVALUATION



Summary of selected outprices and input costs from 2014 to 2016

parameter	2014	2015	2016	Mean
<u>Output price</u>				
Value of steer gain, US\$ kg^{-1}	4.22	6.47	5.11	5.27
<u>Input costs</u>				
Irrigation cost, US\$ per 100 m^3	8.75	8.75	8.75	8.75
Herbicide, US\$ $acre^{-1}$	24	21.47	21.12	22.20
Fertilizer N, US\$ kg^{-1}	1.07	1.33	1	1.13
Fertilizer S, US\$ kg^{-1}	0.49	0.49	0.49	0.49

Data resource: summer stocker calf budget from Texas A&M Agrilife Extension

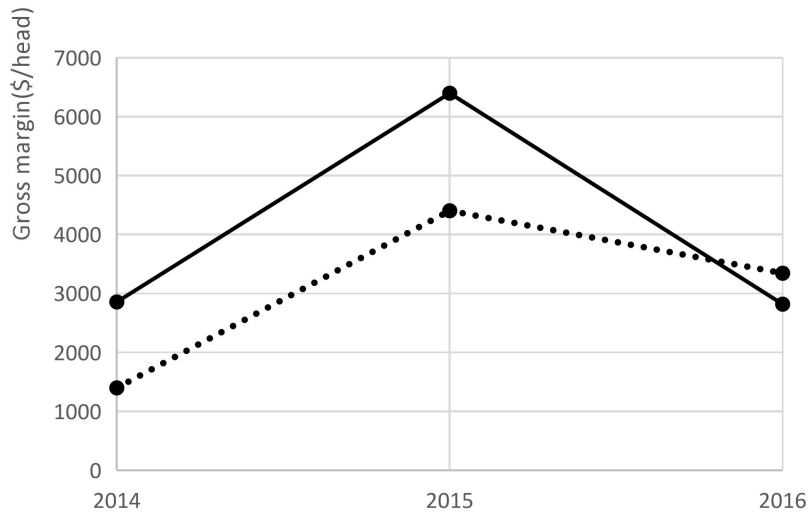
ECONOMIC EVALUATION



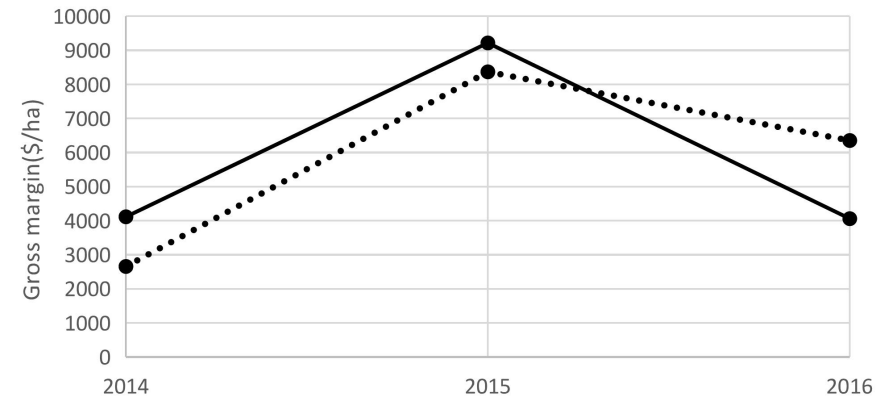
Gain, cost, and value of gain stocker steers for grass only system and grass-legume system

Parameter	Grass only				Grass legume			
	2014	2015	2016	mean	2014	2015	2016	mean
In weight, kg	227	235	268	243.3	227	235	268	243.3
Out weight, kg	922	1221	817	986.7	576	894	908	792.7
In price, US\$ kg^{-1}	3.69	5.11	4.07	4.29	3.69	5.11	4.07	4.3
Out price, US\$ kg^{-1}	4.22	6.47	5.11	5.3	4.22	6.47	5.11	5.3
	<u>Per head</u>				<u>Per head</u>			
Gain, kg $head^{-1}$	695	986	549	743.3	349	659	640	549.3
Value of gain, US\$ $head^{-1}$	3053.1	6699	3084.1	4278.8	1593.1	4583.3	3549.1	3241.8
Operating expense, US\$ $head^{-1}$	196.3	301.2	365.3	254.3	194.2	179.6	205.4	193.1
Gross margin, US\$ $head^{-1}$	2856.9	6397.8	2818.8	4024.5	1398.9	4403.7	3343.7	3048.8
	<u>Per hectare</u>				<u>Per hectare</u>			
Head per system ha	1.4	1.4	1.4	1.4	1.9	1.9	1.9	1.9
Gain, kg ha^{-2}	1001.2	1420.4	790.9	1070.8	663.2	1252.3	1216.2	1043.8
Value of gain, US\$ ha^{-1}	4398.4	9650.5	4442.9	6163.9	3027.2	8709.4	6744.2	6160.3
Operating expense, US\$ ha^{-1}	282.8	433.9	382.2	366.3	369.1	341.2	390.4	366.9
Gross Margin, US\$ ha^{-1}	4115.6	9216.5	4060.7	5797.6	2658.1	8368.2	6353.8	5793.4

ECONOMIC EVALUATION



Gross margin for the grass-only system and the grass-legume system per head

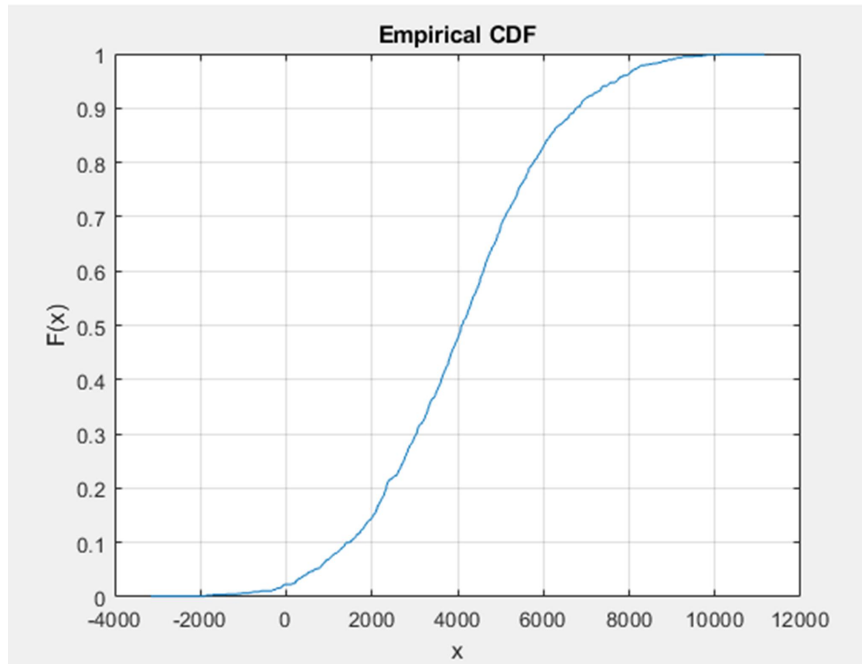


Gross margin for the grass-only system and the grass-legume system per hectare

COMPARISON OF THE SYSTEMS



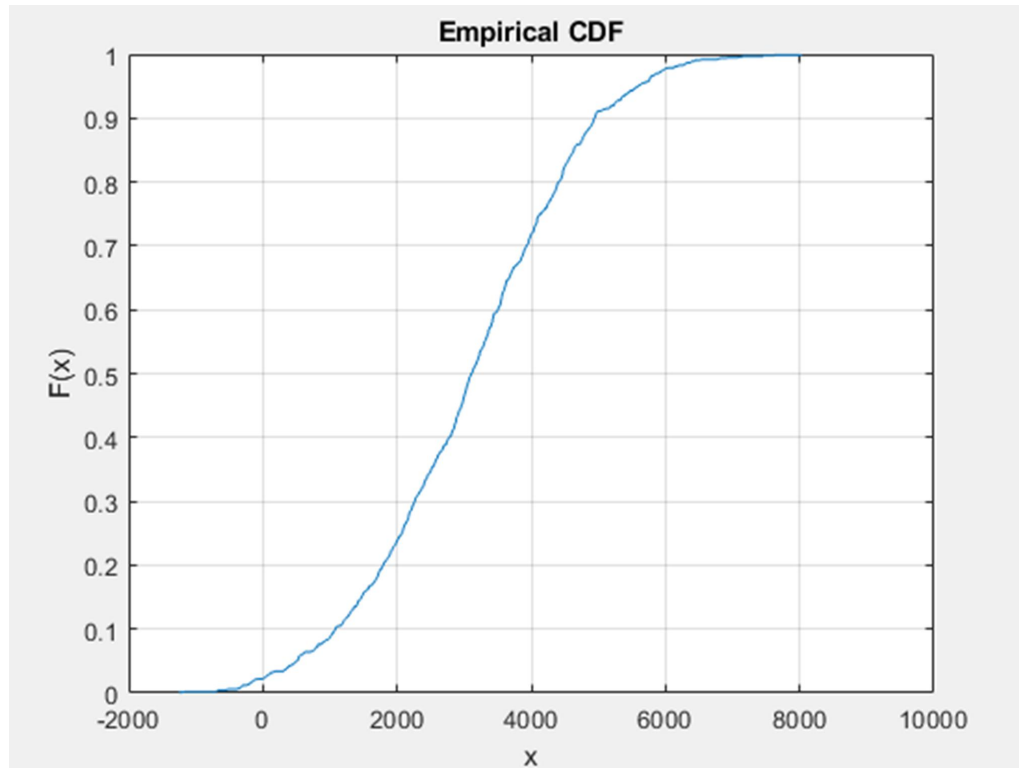
Cumulative distribution functions (CDF) show the estimated probability of realizing a given outcome.



If the 3-yr mean input and output prices are considered to be expected prices, results indicates that the grass-only system has a ~20% probability of achieving a gross margin > US\$6000/head

CDF for gross margin(US\$/head) for grass-only system

COMPARISON OF THE SYSTEMS



The grass-legume system has a ~3% probability to achieve a gross margin > US\$6000/head

CDF for gross margin(USD/head) for grass-legume system

CONCLUSION



- When increasing the duration of the grazing season, the grass-legume system has higher profitability than the grass-only system.
- Integrated agricultural production system is a viable option for West Texas where water resources are declining.

Thank you for your attention!

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