Cover Your Acres

Winter Conference

January 16 & 17, 2018

Gateway Civic Center
Oberlin, KS

A cooperative effort between:

K·STATE
Research and Extension

Northwest Kansas Crop Residue Alliance

2018 Proceedings, Vol. 15

Table of Contents

To provide a positive experience for presenters and attendees, please silence your wireless device.

Session Summaries

A Historical Look at Climate Variability: With many weather datasets exceeding 100 years on the plains, we have a unique opportunity to look at historical climate variability, changes in climate variability, and how that understanding can help our farm management decisions today.

Making the Right Crop Insurance Choices: With increasing APHs and new options, like trend adjustment and yield exclusion, you may need to rethink your many policy choices. We'll also talk about crop insurance and the issues that will surface in farm bill negotiations.

Maximizing Your Rangeland: Are we maximizing the value of our native range resources? We'll discuss economic thresholds for weed and invasive species management, as well as other factors to consider.

Moisture Probes: Measurement to Management: Soil moisture probes can be a valuable tool in managing irrigation. Learn about different types of probes, their benefits and limitations, and how to incorporate them into your irrigation management.

NWKS Agronomy Research Update: Current extension agronomy research efforts in northwest Kansas involve wheat, corn, peas, and other crops. We'll take a quick look at recent results from a variety of studies and discuss future research needs.

Profitability Opportunities and Pitfalls: Using data from northwest Kansas farms, we take a look at opportunities for profitability and where producers should be alert for possible concerns.

Smart Spending of Your Fertility Dollar: Where are the best places to put your fertilizer dollars to manage cost, while also maximizing return on investment. Discussion will also include how to balance short-term economics with long-term consequences.

Soil Health and Profitability in Dryland Cropping: A recent project collected soils and economic data from dozens of dryland farms across Eastern Colorado. This session will summarize what was learned about farm management and its effects on profitability and soil health.

Surviving and Thriving in Tough Times: Do you work with others in your farm business? Are you all pulling the same direction for your business? This session will discuss to not only how survive these economic challenges, but also positioning it to thrive in the future.

Weed Management Strategies: Tackling resistant and troublesome weeds remains a challenge and is the key threat to no-till farming. This session will be an overview of the latest field trial data for timing, rates, and products.

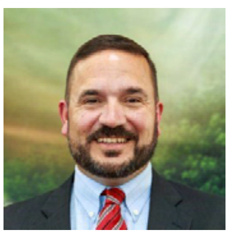
Producer Panel Discussion: An exchange of ideas and experiences on the topic of staying successful with no-till.

Proceedings from prior years of the Cover Your Acres Winter Conference can be found online: www.northwest.ksu.edu/coveryouracres

Presenters

Jonathan Aguilar- Dr. Jonathan Aguilar earned both his bachelor's and master's degrees in agricultural engineering, with focus on land and water resources from the University of the Philippines-Los Baños (UPLB). He worked at UPLB as University Researcher II and handled several water resource related projects with UPLB Foundation Inc., Department of Agriculture and the UN Food and Agriculture Organization. He then came to K-State where he received his doctorate in in 2009. His dissertation focused on the changes of ecologically relevant flow parameters in Kansas' streams. Aguilar then worked as a USDA ARS postdoc agricultural engineer in Sidney, MT from 2009 to 2011 and as postdoc Agricultural Scientist in Mandan, ND from 2011 to 2012. In December 2012, he became an extension water resource engineer with K-State Research and Extension based in the Southwest area office in Garden City, KS.

Art Barnaby- Art Barnaby is a professor in Agricultural Economics at Kansas State University. He provides educational programs on crop insurance, government commodity programs, and risk throughout Kansas. His work emphasizes the development of alternative public policies for crop disaster protection. For example, he developed the Crop Revenue Coverage (CRC), which has been renamed Revenue Protection (RP). RP is currently providing nearly $85 billion of coverage for America's farmers. Other research explores the impact of government commodity programs.



Jeff Basara- Dr Basara's specific research interests are focused on the integration of our understanding across weather, climate, water, and ecosystems. His research activities includes land-atmosphere interactions, the physical processes which impact the development of the planetary boundary layer, droughts, flash floods, the development, validation, and improvement of land surface models used in numerical weather prediction, urban meteorology, severe weather, instrumentation, severe winter weather, and the validation of remotely sensed soil moisture and skin temperature from satellite mounted instruments. Many of these research projects require collaboration with other scientists and interdisciplinary partnerships. Currently, Dr. Basara serves as the Director of the Kessler Atmospheric and Ecological Field Station and works closely with scientists across multiple disciplines to increase the overall understanding of the complex interactions within the environmental column.

Charlie Griffin- Charlie Griffin is a Research Assistant Professor in the School for Family Studies and Human Services, College of Human Ecology, at Kansas State University. He began his career assisting with the impact of the 80's farm crisis and has continued to support agricultural families as they work together, make decisions together, and nurture their families and businesses.

Lucas Haag- Lucas Haag was raised on a diversified dryland farming and ranching operation near Lebanon, Nebraska along the Kansas/Nebraska line. He received his B.S. in Agricultural Technology Management in 2005 and a M.S. in Agronomy (crop ecophysiology) in 2008 from K-State. Lucas completed his Ph.D. in Agronomy in 2013. He is an assistant professor of agronomy and Northwest Area Agronomist stationed at the Northwest Research-Extension Center, Colby, Kansas. He has extension agronomy responsibilities for 26 counties in northwest and north-central Kansas. He conducts research and extension activities in a variety of areas but specializes in precision ag and dryland cropping systems. Lucas remains actively tied to production ag as a partner with his brothers in Haag Land and Cattle Co.

Presenters

Keith Harmoney- Keith Harmoney, Professor of Range Sciences, is stationed at the Kansas State University Agricultural Research Center in Hays, KS. Since arriving at Kansas State University in 1999, he has conducted grazing trials on modified intensive-early stocking strategies and complementary grazing systems for beef cow/calf production or stocker production on rangelands. He also has performed forage evaluations on the growth and persistence of several perennial cool-season grasses for adaptation to the climate of western Kansas. Another major aspect of his research has involved the suppression or control of weedy plant species that have significant impacts on rangelands, particularly honey locust, Japanese brome, and old world bluestems.

Dale Leikam- Dale Leikam is an agronomic consultant that provides technical consulting services and educational programs to fertilizer manufacturers, distributors, dealers and crop advisors. He also serves as President of the Fluid Fertilizer Foundation, an industry supported research and educational foundation. He earned his master's and doctoral degrees in agronomy from Kansas State University. Earlier in his career he was an agronomist for Farmland Industries, Cenex and Agriliance and also served as a Nutrient Management Specialist for Kansas State University Research and Extension.

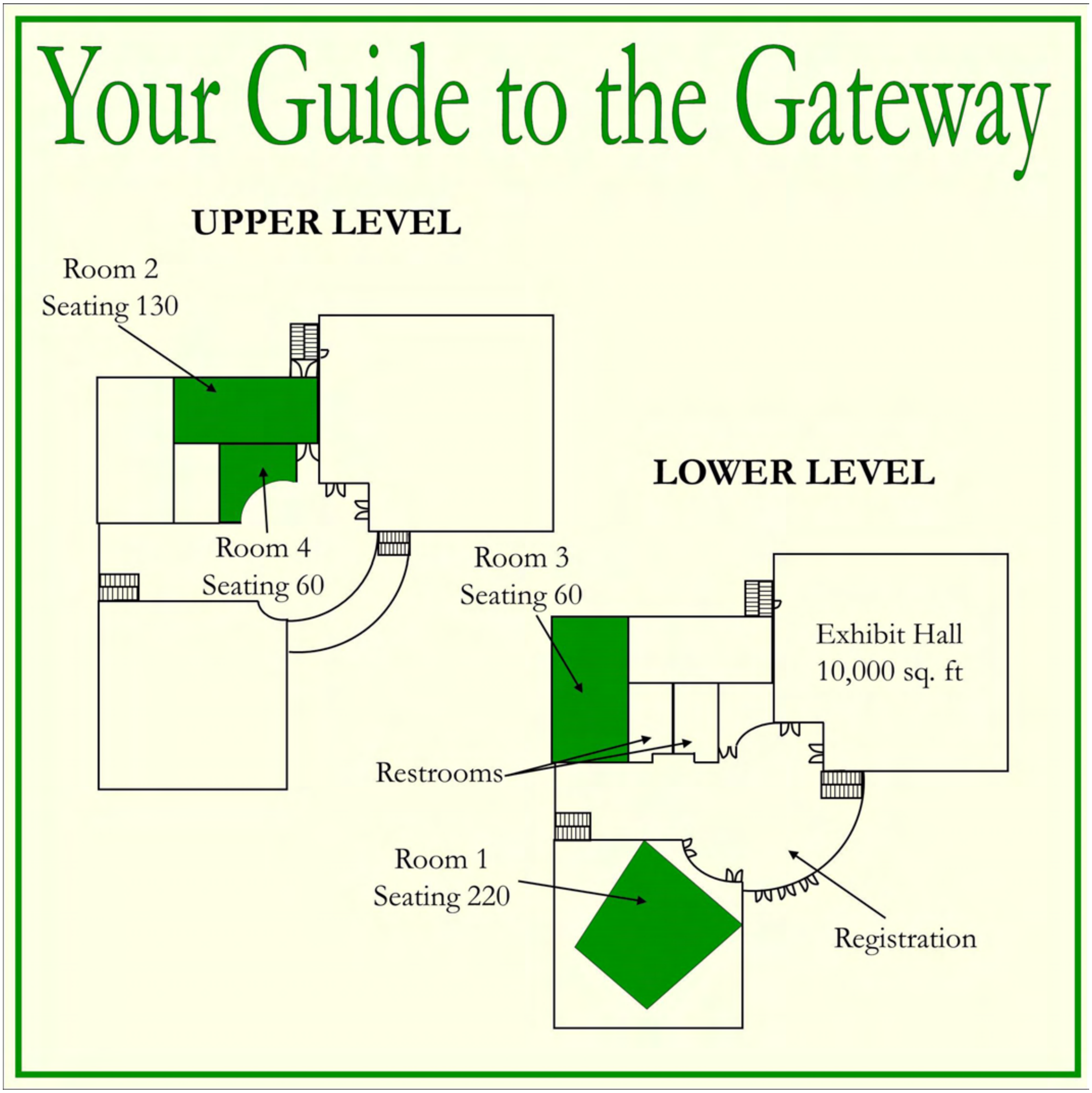
Meagan Schipanski- Meagan Schipanski is an Assistant Professor of agroecology in the Department of Soil and Crop Sciences at Colorado State University. Her research group applies systems-based approaches to improving the sustainability of cropping systems, including topics of crop diversity, soil health, nutrient and water management. Her work spans from on-farm research to greenhouse and modeling studies. Current projects include evaluating grazed cover crop mixtures within dryland cropping systems and integrated approaches to groundwater management with a focus on the Ogallala Aquifer.

Curtis Thompson-Curtis Thompson is a Professor and Extension Weed Science Specialist for Kansas State University, Agronomy. Native of North Dakota, he received his BS and MS and NDSU and a Ph.D. at the University of Idaho. His area of focus includes weed management in field crops emphasizing sorghum, corn, sunflower, and resistant weed management. Thompson continues to focus on glyphosate resistant kochia management in western Kansas and has worked extensively on HPPD resistant Palmer amaranth in the central part of the State. Efforts to manage glyphosate resistant Palmer amaranth are intensifying.

Mark Wood-Mark Wood is an Extension Agricultural Economist with the Farm Management Association in Northwest Kansas. He has been assisting Association member families with record keeping, analysis, management and generational transfer issues in Northwest Kansas for over 28 years. He graduated from North Dakota State University with a Master's degree in Agriculture Economics in 1986 and Kansas State University with a Bachelor's degree in Agricultural Economics in 1982. Mark grew up on a farm near Wakefield, Kansas.

The Gateway Oberlin, Kansas

The Premiere Exhibition, Meeting & Conference Center for the Tri-State Area



#1 Morgan Drive, Oberlin, Kansas 67749
Phone 785.475.2400 FAX 785.475.2925

A Historical Examination of Climate Variability in the Great Plains

Jeffrey B. Basara[1,2], Paul X. Flanagan[1], Jordan I. Christian[1], Xiangming Xiao[3,4], and Jason Furtado[1]

[1]School of Meteorology, University of Oklahoma
[2]Oklahoma Climatological Survey, University of Oklahoma
[3]Department of Microbiology and Plant Biology, University of Oklahoma
[4]Center for Spatial Analysis, University of Oklahoma

The Great Plains (GP) of the United States is a region heavily utilized for agriculture, including crops and grazing. As such, water resources are vitally important to the economy and ecosystem of the region. While irrigation practices are applied across the Plains region, the amount of water received from precipitation remains the most important contributor to water supply for agriculture.

The Great Plains of the United States, spans the region from Southern Texas through North Dakota and eastern Montana, and is located in a transition zone between the dry west and the wetter east (Fig. 1). Because of the nature of the transition zone, the amount of precipitation that is received at any location within the Great Plains can change drastically from year to year. In other words, the region has large seasonal to interannual precipitation variability. This natural phenomenon whereby there are shifts between the opposite ends of the precipitation spectrum is the main reason for the two different water extremes in the Great Plains: droughts and pluvials. Drought is represented by drier than average conditions which can be extremely detrimental to the ecosystem and economy of the region. Pluvials, on the other hand, are represented by greater than average rainfall over the region. This may appear to be beneficial in many aspects but may also be associated with an increased number of flooding events and changes in landscape and environment through enhanced erosion. One aspect is certain, precipitation variability on a seasonal to annual to interannual scales affects the daily lives of everyone in the Great Plains through impacts to local environment, ecosystem, economy, transportation patterns, food availability and water resources.

Recent analyses have examined the overall variability of the climate system in the Southern Great Plains using historical observations along with studies focused on the frequency and intensity of both drought and pluvial events. Recent results have shown that precipitation variability within the Great Plains, and especially in the Southern Great Plains from Texas through Kansas, is increasing (Weaver et al. 2016; Fig. 2). Thus, it is becoming more likely that the region will see wetter than average years and drier than average years compared to what was previously occurring. In addition, the transition between extreme events including drought and pluvial periods have been accelerating (Christian et al. 2015). In other words, one type of precipitation extreme followed by another in the next year, is becoming more common in the region (Fig. 3).

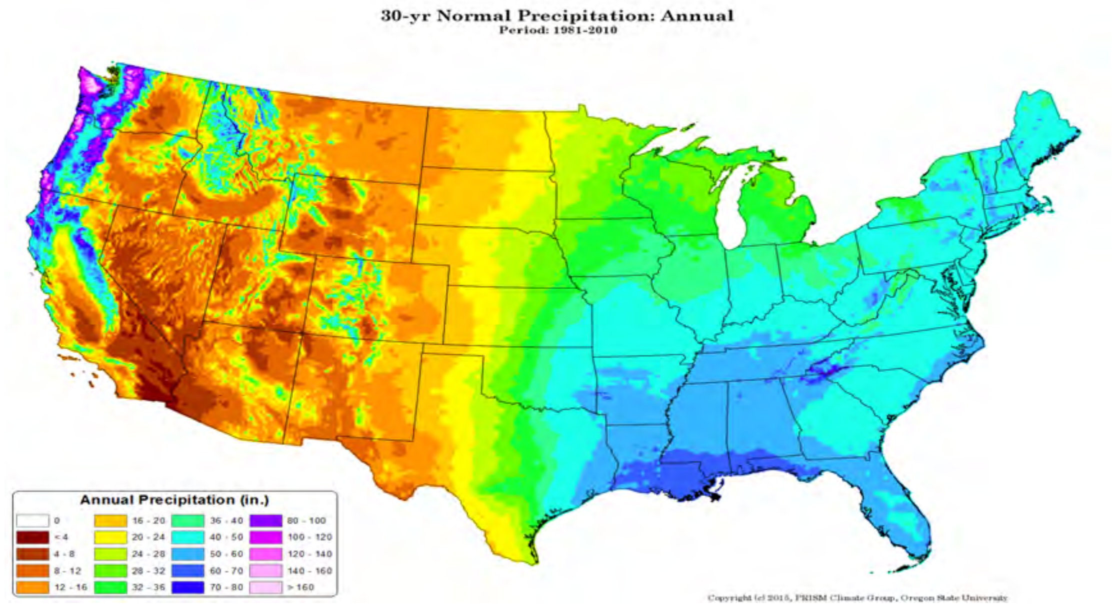


Figure 1: Climatology (1981-2010) of Annual Precipitation Amount across the United States of America from PRISM precipitation observations (Image taken from http://www.prism.oregonstate.edu/normals/).

So, how does this impact the Southern Great Plains? For starters, incurring rapid changes in the precipitation regime could impact total water resources, water quality, agriculture, industry, and wildfires. For the latter, wetter than average years yield large increases in plant biomass across the region as the ecosystem flourishes throughout the year. However, when the region experiences drought, this increased biomass dries causing an increase in the amount of fuel available to wildfires, which could be devastating. For water resources, drought conditions severely decrease the water needed for competing natural and human systems. A practical example is shown regarding a large pond in central Oklahoma during late 2014 which dried significantly following a period of extended drought (Figure 4a). However, excessive rainfall during May 2015 (over 24 inches in some locations) associated with pluvial conditions rapidly recharged the pond beyond normal capacity (Figure 4b). However, close inspection of the water quality shows significant sedimentation due to erosion from the heavy rainfall.

Another aspect of the precipitation variability is not only how much falls, but when it falls. This is of critical importance to agricultural producers as there is an offset between the climatological period of greatest precipitation in the southern Great Plains (May-June) and the peak temperatures (July-August). An additional study by Flanagan et al. (2017) noted that not only are the total magnitudes of precipitation becoming more variable, the period in between the peak in precipitation and temperature is also becoming more variable. Thus, the critical timing related to crops, precipitation, and temperature is becoming more variable, and as such, more difficult to adequately plan for.

Finally, as noted previously, drought is a critical concern for agriculture-related activities in the Great Plains given the historical frequency through they occur and overall devastating impacts (Basara et al. 2013). Typically, drought is defined by precipitation

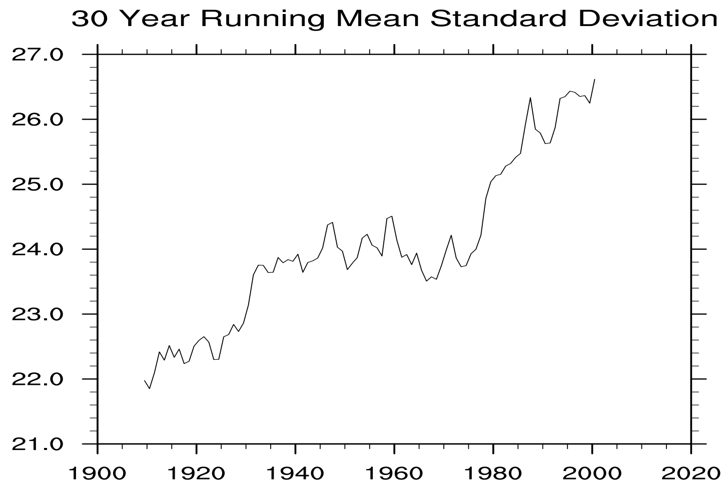


Figure 2. The 30 year running standard deviation of annual precipitation in the Southern Great Plains from PRISM precipitation observations. Units are in mm month^{-1}. Value is calculated by averaging the standard deviation of the previous 15 years along with the current and next 14 years for each value.

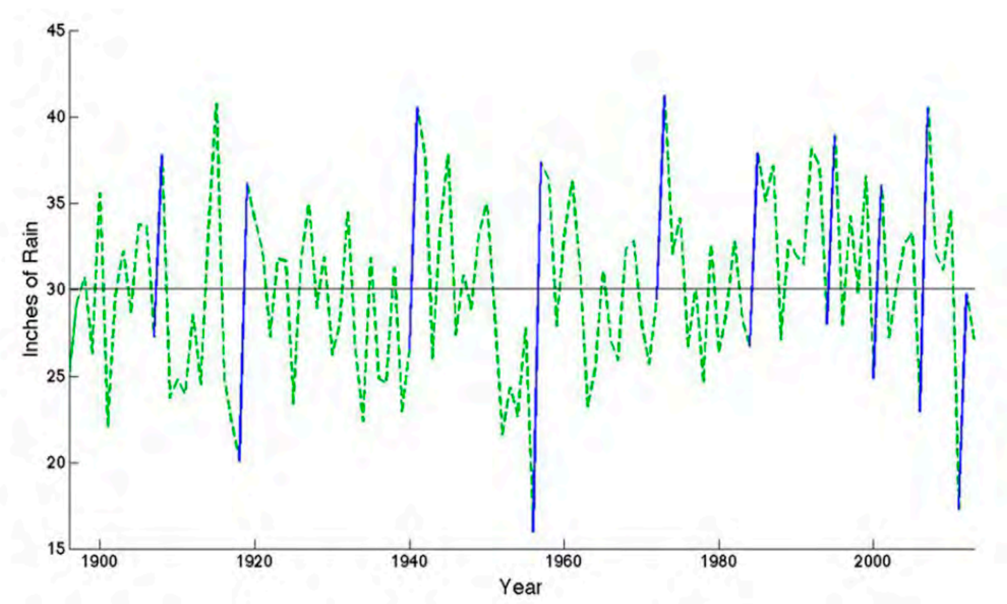


Figure 3. Annual rainfall for the SGP (green line) in inches of rain per year. The solid blue lines represent one standard deviation or above dipoles in precipitation from year to year. Image is from Christian et al. (2015).

deficits (meteorological drought) leading to soil moisture deficits (agricultural drought). More recent analyses have focused on the rapid intensification of drought during the growing season, or “flash drought” which can develop in 2-3 weeks (Otkin et al. 2013; Otkin et al. 2018). Historical data via the North American Regional Reanalysis (NARR) and a methodology relating both total evapotranspiration and atmospheric demand was utilized to examine the climatology of flash drought occurrence in the United States. The preliminary results shown in Figure 5 demonstrate that the Great Plains is a flash drought “hot spot” whereby it is a region that yields a high propensity of flash drought occurrences. Depending on the timing of such events, the impact on agriculture can lead to dramatic decreases in yield and forage.

a

b

Figure 4. A large pond in Washington, OK in (a) October 2014 and (b) in May 2015.

All in all, the recent research demonstrates that we are seeing a shift in the precipitation regime across the Southern Great Plains as precipitation variability increases. A key question is whether this increased variability is beneficial to the region. In some years more abundant precipitation may occur during the warm season leading to potential positive benefits to agriculture and total water storage along with potential negative impacts from flooding and erosion. Conversely, the increased variability may lead to more frequent and more intense drought periods with large negative consequences across all natural and socioeconomic sectors. From a planning standpoint, this places an additional burden on those dependent on precipitation. Further, one aspect is certain: the overall nature of the climate system in the Southern Great Plains has been dynamic and with increasing precipitation variability these dynamic trends will continue into the foreseeable future.

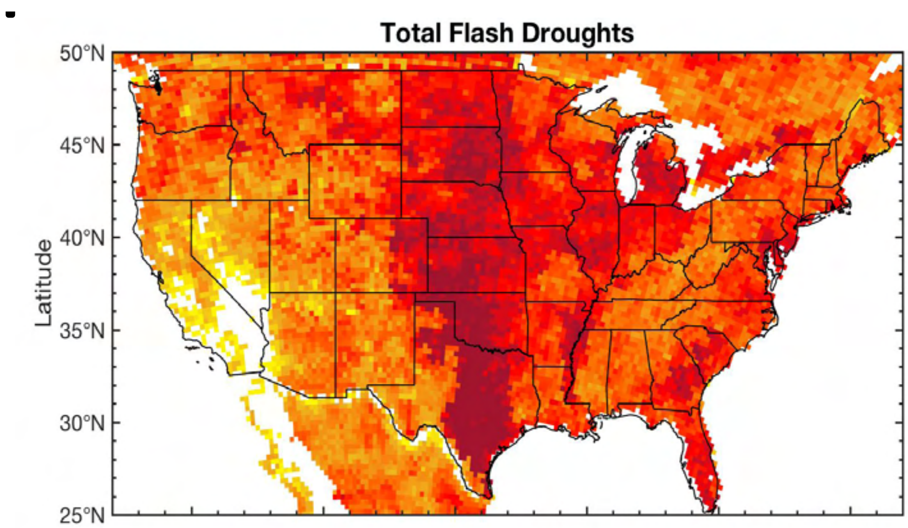


Figure 5. Annual rainfall for the SGP (green line) in inches of rain per year. The solid blue lines represent one standard deviation or above dipoles in precipitation from year to year. Image is from Christian et al. (2015).

References:

Basara, J. B., J. N. Maybourn, C. M. Peirano, J. E. Tate, P. J. Brown, J. D. Hoey, and B. R. Smith, 2013: Drought and associated impacts in the Great Plains of the United States – A review. *International Journal of Geosciences*, 4, 72-81.

Christian J, K. Christian, J. B. Basara, 2015: Drought and pluvial dipole events within the great plains of the United States. J. Appl. Meteorol. Climatol., 54, 1886–1898, doi: http://dx.doi.org/10.1175/JAMC-D-15-0002.1.

Flanagan, P. X., J. B. Basara, and X. Xiao, 2017: Long-term analysis of the asynchronicity between temperature and precipitation maxima in the United States Great Plains. Int. J. Climatol. doi:10.1002/joc.4966.

Otkin, J. A., M. C. Anderson, C. Hain, I. E. Mladenova, J. B. Basara, and M. Svoboda, 2013: Examining Rapid Onset Drought Development Using the Thermal Infrared-Based Evaporative Stress Index. *Journal of Hydrometeorology*, **14,** 1057-1074.

Otkin, J.A., M. Svoboda, E.D. Hunt, T.W. Ford, M.C. Anderson, C. Hain, and J.B. Basara, 2018: Flash Droughts: A Review and Assessment of the Challenges Imposed by Rapid Onset Droughts in the United States. *Bulletin of the American Meteorological Society*, doi.org/10.1175/BAMS-D-17-0149.1.

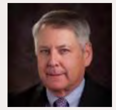
Weaver S, S. Baxter, K. Harnos, 2016: Regional Changes in the Interannual Variability of Warm Season Precipitation. J. Climate., 29, 5157–5173 doi:10.1175/JCLI-D-14-00803.1.

A full set of color slides will be distributed during Dr. Barnaby's presentation

Please attend the session or ask the registration desk for a copy.

The slides here are provided for reference and those unable to attend

Making the Right Crop Insurance Choices
2018 Cover Your Acres Conference



Dr. G.A. (Art) Barnaby
Kansas State University
January 16 & 17, 2018, Oberlin, KS

Dr. Art Barnaby was raised on a diversified farm, located in Elk County, Kansas. Art received his B.S. degree from Fort Hays State University, M.S. from New Mexico State University and a Ph.D. in Agricultural Economics from Texas A&M University. Art joined the Agricultural Economics faculty in 1979. He currently holds the rank of Professor. Art conducts national extension education programs on market risk, government commodity programs, crop insurance and public policy. He has authored several research projects on crop insurance issues and their impacts on farmers. His research work with the private sector was the basis for the first revenue insurance contract.

Email: barnaby@ksu.edu Phone: 785-532-1515

Check out our WEB page at http://www.AgManager.info

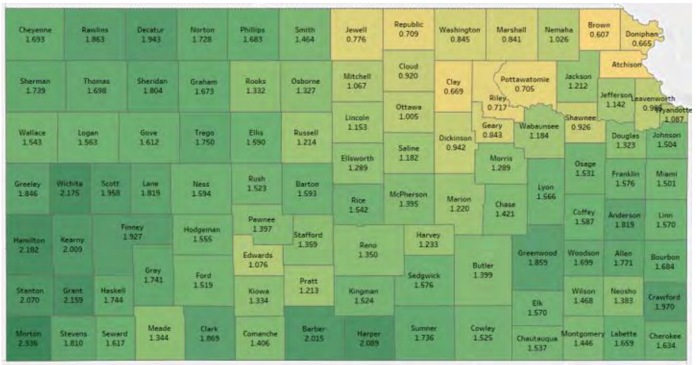
Kansas Crop Insurance History, Dryland Corn

Obs	YR[1]	Net Acres	Liab-ility	Total Prem-ium	Sub-sidy	Farmer Paid Prem-ium	Indem-nity	Loss/ Gain	Units Inde-mni-fied	% Seve-rity of loss[2]	Loss Rat-io	Farm Paid % Of Prem-ium	Farm-er Paid Loss Ratio	Avg $ Cov-erage per AC	Farm-er Paid R/L <1	Avg Rate	Farm Avg Rate
		(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)									
1	2002	1.364	188	20.8	11.9	8.8	97.9	(77.1)		52%	4.71	42%	11.09	$138		11.03%	4.69%
2	2003	1.215	182	23.1	13.1	10.0	66.3	(43.2)		36%	2.87	43%	6.63	$150		12.69%	5.49%
3	2004	1.467	245	38.7	22.0	16.7	37.9	0.8		15%	0.98	43%	2.27	$167		15.81%	6.81%
4	2005	1.864	250	42.3	24.5	17.8	27.8	14.5		11%	0.66	42%	1.56	$134		16.91%	7.12%
5	2006	1.739	263	47.9	27.4	20.5	69.8	(21.9)		26%	1.46	43%	3.40	$151		18.17%	7.78%
6	2007	2.003	463	89.2	51.7	37.6	24.0	65.3		5%	0.27	42%	0.64	$231	1	19.27%	8.11%
7	2008	3.958	1,237	244.9	142.6	102.2	145.2	99.6		12%	0.59	42%	1.42	$313		19.79%	8.27%
8	2009	2.203	549	116.3	71.5	44.7	13.7	102.6		2%	0.12	38%	0.31	$249	1	21.16%	8.14%
9	2010	2.812	671	113.2	70.2	43.0	31.5	81.7		5%	0.28	38%	0.73	$239	1	16.87%	6.41%
10	2011	2.846	1,076	167.3	105.0	62.3	333.6	(166.2)		31%	1.99	37%	5.35	$378		15.55%	5.79%
11	2012	2.815	1,067	143.1	89.9	53.2	626.9	(483.9)		59%	4.38	37%	11.79	$379		13.41%	4.98%
12	2013	2.597	1,006	145.7	89.9	55.7	206.4	(60.8)		21%	1.42	38%	3.70	$388		14.47%	5.54%
13	2014	2.419	788	115.8	71.6	44.1	50.1	65.7		6%	0.43	38%	1.14	$326		14.70%	5.60%
14	2015	2.512	759	127.3	80.9	46.4	28.6	98.6		4%	0.22	36%	0.62	$302	1	16.76%	6.11%
15	2016	3.220	897	149.3	95.1	54.2	12.5	136.8		1%	0.08	36%	0.23	$278	1	16.65%	6.05%
Totals 1997-2016 (20 yr. performance)																	
		35	9,643	1,585	967	617	1,772	(188)			1.12	39%	2.87		5		

Kansas Crop Insurance History, Irrigated Corn

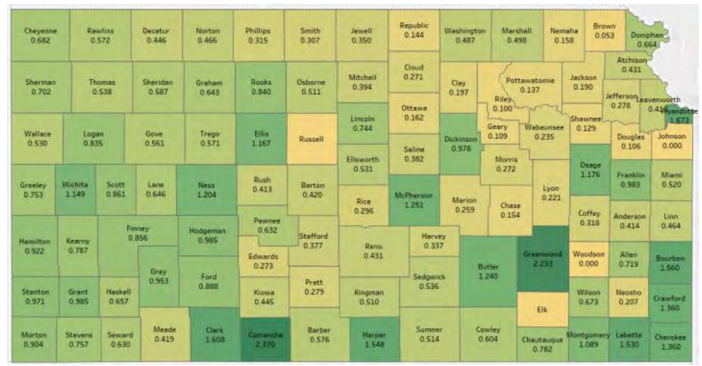
Ob s	YR[1]	Net Acres	Liab-ility	Total Prem-ium	Sub-sidy	Farmer Paid Prem-ium	Indem-nity	Loss/ Gain	% Units Inde-mni-fied	% Seve-rity of loss[2]	Loss Rat-io	Farm Paid % Of Prem-ium	Farm-er Paid Loss Ratio	Avg $ Cov-erage per AC	Farm-er Paid R/L <1	Avg Rate	Farm Avg Rate
		(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)									
1	2002	1.281	319	18.9	10.6	8.4	39.4	(20.5)		12%	2.09	44%	4.72	$249		5.94%	2.62%
2	2003	1.146	311	20.2	11.3	8.9	11.3	8.9		4%	0.56	44%	1.27	$272		6.47%	2.85%
3	2004	1.147	368	27.5	15.7	11.8	12.6	14.9		3%	0.46	43%	1.07	$321		7.49%	3.22%
4	2005	1.227	331	26.1	15.1	11.0	9.9	16.2		3%	0.38	42%	0.91	$269	1	7.89%	3.32%
5	2006	1.152	343	30.4	17.3	13.1	13.7	16.7		4%	0.45	43%	1.04	$298		8.85%	3.83%
6	2007	1.365	651	61.5	35.2	26.3	8.1	53.4		1%	0.13	43%	0.31	$477	1	9.44%	4.03%
7	2008	2.671	1,705	172.9	100.0	72.9	100.1	72.8		6%	0.58	42%	1.37	$638		10.14%	4.28%
8	2009	1.392	698	77.2	45.5	31.7	23.6	53.6		3%	0.31	41%	0.75	$501	1	11.06%	4.54%
9	2010	1.441	714	63.1	37.4	25.7	10.5	52.6		1%	0.17	41%	0.41	$495	1	8.84%	3.59%
10	2011	1.462	1,117	98.4	58.7	39.6	118.6	(20.3)		11%	1.21	40%	2.99	$764		8.81%	3.55%
11	2012	1.419	1,061	80.7	47.3	33.4	106.6	(25.9)		10%	1.32	41%	3.19	$748		7.61%	3.15%
12	2013	1.393	1,054	76.9	44.3	32.6	46.3	30.6		4%	0.60	42%	1.42	$756		7.30%	3.09%
13	2014	1.357	846	55.3	31.8	23.5	37.3	18.0		4%	0.68	42%	1.59	$624		6.53%	2.78%
14	2015	1.359	761	50.6	29.7	20.9	10.2	40.4		1%	0.20	41%	0.49	$560	1	6.65%	2.75%
15	2016	1.477	780	48.2	28.5	19.7	11.3	36.9		1%	0.23	41%	0.57	$528	1	6.18%	2.53%
Totals 1997-2016 (20 yr. performance)																	
		21	11,058	908	528	379	560	348			0.62	42%	1.47		6		

20 Year Kansas Crop Insurance County Farmer Paid Loss Ratios, All Crops



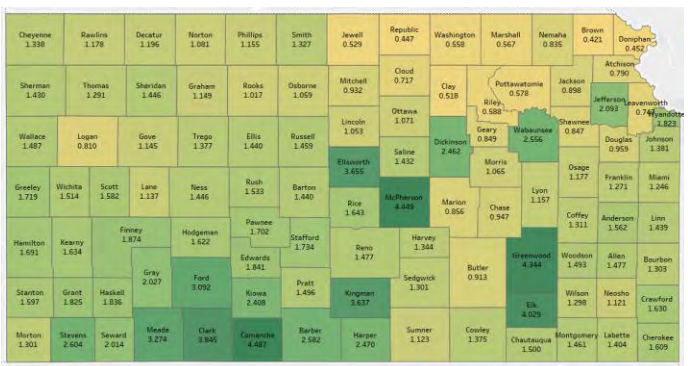
1/8/2018 4B Ag Consultants & Kansas State University, 5

15-Year Kansas Irrigated Corn Insurance County Farmer Paid Loss Ratios



1/8/2018 4B Ag Consultants & Kansas State University, 6

15-Year Kansas Non-irrigated Corn Insurance County Farmer Paid Loss Ratios



1/8/2018 4B Ag Consultants & Kansas State University, 7

Illinois Crop Insurance History, Corn

Obs	YR[1]	Pol-icy No.	Net Acres	Liab-ility	Total Prem-ium	Sub-sidy	Farm Paid Prem-ium	Indem-nity	Loss/ Gain	% Units Inde-mni-fied	% of Liab-ility Paid[2]	Loss Rat-io	Farm Paid % Of Prem-ium	Farm-er Paid Loss Ratio	Avg $ Cove-rage per AC	Farm-er Paid R/L <1	Avg Rate	Farm Avg Rate
		(000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)									
1	1997	57.0	6.5	1,111	53.8	22.7	31.1	14.1	40	5%	1%	0.26	58%	0.45	$171	1	4.85%	2.80%
2	1998	54.9	6.3	1,227	61.1	24.0	37.1	31.2	30	17%	3%	0.51	61%	0.84	$194	1	4.98%	3.02%
3	1999	57.3	6.9	1,303	79.8	39.1	40.7	33.9	46	14%	3%	0.43	51%	0.83	$188	1	6.12%	3.12%
4	2000	60.8	7.5	1,629	103.8	41.4	62.4	28.3	76	9%	2%	0.27	60%	0.45	$216	1	6.37%	3.83%
5	2001	57.2	7.3	1,653	113.2	60.3	52.9	30.0	83	8%	2%	0.27	47%	0.57	$225	1	6.85%	3.20%
6	2002	55.1	7.5	1,750	115.4	60.5	54.9	99.8	16	26%	6%	0.86	48%	1.82	$232		6.60%	3.14%
7	2003	54.8	7.8	1,960	137.0	71.6	65.3	40.2	97	11%	2%	0.29	48%	0.62	$250	1	6.99%	3.33%
8	2004	53.3	8.1	2,432	173.0	92.5	80.5	60.5	113	11%	2%	0.35	47%	0.75	$299	1	7.12%	3.31%
9	2005	53.1	8.6	2,375	169.0	90.1	78.8	191.3	(22)	30%	8%	1.13	47%	2.43	$276		7.11%	3.32%
10	2006	54.9	8.9	3,535	277.2	147.8	129.4	26.4	251	8%	1%	0.10	47%	0.20	$395	1	7.84%	3.66%
11	2007	54.8	10.2	5,961	487.2	258.3	228.9	47.4	440	8%	1%	0.10	47%	0.21	$582	1	8.17%	3.84%
12	2008	52.4	9.4	6,717	547.4	274.5	273.0	325.8	222	31%	5%	0.60	50%	1.19	$713		8.15%	4.06%
13	2009	53.0	9.7	5,351	465.0	250.0	215.0	135.3	330	21%	3%	0.29	46%	0.63	$553	1	8.69%	4.02%
14	2010	52.9	9.9	5,495	376.8	207.4	169.4	239.4	137	21%	4%	0.64	45%	1.41	$554		6.86%	3.08%
15	2011	53.7	10.2	8,591	631.0	347.5	283.6	264.2	367	24%	3%	0.42	45%	0.93	$842	1	7.35%	3.30%
16	2012	54.9	10.3	8,402	522.2	293.4	228.8	3,208.5	(2,686)	76%	38%	6.14	44%	14.02	$814		6.22%	2.72%
17	2013	60.1	10.5	8,671	530.5	286.6	243.9	572.9	(42)	46%	7%	1.08	46%	2.35	$826		6.12%	2.81%
18	2014	60.1	10.4	6,855	450.4	243.1	207.3	192.2	258	20%	3%	0.43	46%	0.93	$661	1	6.57%	3.02%
19	2015	59.3	10.2	6,319	482.8	267.3	215.6	320.7	162	28%	5%	0.66	45%	1.49	$617		7.64%	3.41%
20	2016	58.1	10.1	5,964	439.9	245.2	194.7	65.5	374	12%	1%	0.15	44%	0.34	$588	1	7.38%	3.27%
Totals 1997-2016 (20 yr. performance)																		
		1,117.7	177	87,302	6,217	3,323	2,893	5,928	289			0.95	47%	2.05		13		

1/8/2018 4B Ag Consultants & Kansas State University, 8

Indiana Crop Insurance History, Corn

Obs	YR[1]	Policy No.	Net Acres	Liability	Total Premium	Subsidy	Farm Paid Premium	Indemnity	Loss/ Gain	% Units Indemnified	% of Liability Paid[2]	Loss Ratio	Farm Paid % Of Premium	Farmer Paid Loss Ratio	Avg $ Coverage per AC	Farmer Paid R/L <1	Avg Rate	Farm Avg Rate
		(000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)	(000 000)									
1	1997	17.5	2.6	484	24.6	8.9	15.7	21.1	4	15%	4%	0.86	64%	1.35	$186		5.09%	3.24%
2	1998	17.4	2.6	575	29.9	10.0	19.9	27.1	3	18%	5%	0.91	67%	1.36	$220		5.20%	3.47%
3	1999	18.6	3.0	627	40.6	18.9	21.8	32.4	8	20%	5%	0.80	54%	1.49	$211		6.48%	3.47%
4	2000	20.7	3.4	818	57.8	21.6	36.2	20.1	38	11%	2%	0.35	63%	0.56	$240	1	7.06%	4.42%
5	2001	19.8	3.4	842	61.17	31.91	29.26	10.24	50.93	0.07	0.01	0.17	0.48	0.35	$251	1	0.07	0.03
6	2002	19.1	3.3	835	58.3	30.2	28.1	96.3	(38)	39%	12%	1.65	48%	3.43	$250		6.98%	3.36%
7	2003	19.8	3.6	986	72.8	37.8	35.0	48.8	24	23%	5%	0.67	48%	1.40	$272		7.38%	3.55%
8	2004	19.6	3.7	1,161	94.3	49.8	44.4	61.9	32	21%	5%	0.66	47%	1.39	$316		8.12%	3.83%
9	2005	19.5	3.8	1,097	90.2	48.0	42.2	29.5	61	19%	3%	0.33	47%	0.70	$286	1	8.22%	3.84%
10	2006	18.8	3.7	1,279	109.5	58.1	51.4	21.5	88	19%	2%	0.20	47%	0.42	$341	1	8.56%	4.02%
11	2007	19.7	4.5	2,405	217.5	115.6	101.9	65.8	152	16%	3%	0.30	47%	0.65	$537	1	9.04%	4.24%
12	2008	18.6	3.9	2,637	242.2	123.3	118.8	269.0	(27)	45%	10%	1.11	49%	2.26	$674		9.18%	4.51%
13	2009	19.0	4.1	2,183	218.6	117.2	101.4	65.3	153	19%	3%	0.30	46%	0.64	$535	1	10.02%	4.65%
14	2010	19.1	4.2	2,218	177.7	97.9	79.7	58.9	119	19%	3%	0.33	45%	0.74	$529	1	8.01%	3.59%
15	2011	19.7	4.4	3,525	304.8	166.9	138.0	175.2	130	32%	5%	0.57	45%	1.27	$801		8.65%	3.91%
16	2012	20.5	4.6	3,607	261.0	146.0	115.0	1,272.9	(1,012)	74%	35%	4.88	44%	11.07	$781		7.24%	3.19%
17	2013	22.5	4.8	3,865	273.1	147.7	125.4	146.6	126	30%	4%	0.54	46%	1.17	$797		7.07%	3.24%
18	2014	22.1	4.7	2,948	223.7	121.3	102.5	98.3	125	25%	3%	0.44	46%	0.96	$630	1	7.59%	3.48%
19	2015	21.4	4.6	2,697	229.5	127.3	102.2	317.9	(88)	40%	12%	1.39	45%	3.11	$587		8.51%	3.79%
20	2016	21.0	4.6	2,553	212.7	118.0	94.7	61.0	152	24%	2%	0.29	45%	0.64	$557	1	8.33%	3.71%
Totals 1997-2016 (20 yr. performance)		394.4	78	37,344	3,000	1,597	1,403	2,900	100			0.97	47%	2.07		9		

Buy Highest Coverage to Maximize Subsidy

2018 Great Plains, CORN, RP, NON IRR, GSG, OU, $3.84/100%,
Volatility: 0.17, Acres: 100, Yield: 80, Rate Yield: 80

	70%	75%	80%	85%
Price Election	$3.84	$3.84	$3.84	$3.84
Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
Gross Premium - $/Acre	$47.36	$54.18	$61.56	$73.05
Net Premium - $/Acre	$19.42	$24.38	$32.01	$45.29
Subsidy (OU)	$27.94	$29.80	$29.55	$27.76
Subsidy (EU)	**$25.18**	**$28.65**	**$30.80**	**$28.27**

Maximizing Subsidy

1. Highest coverage provides the largest subsidy, so why don't more farmers buy the highest coverage?
2. This argument assumes the rate is correct for your farm.
3. In low frequency of claim market, individual farmers may not get enough draws to maximize the subsidy.
4. The marginal rate for insurance becomes expensive for that last dollar of coverage.

Marginal Premium rate

2018 Great Plains, CORN, RP, NON IRR, GSG, EU,
$3.84/100%, Volatility: 0.17, Acres: 100, Yield: 80, Rate

	70%	75%	80%	85%
Price Election	$3.84	$3.84	$3.84	$3.84
Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
Gross Premium - $/Acre	$31.47	$37.21	$45.29	$53.34
Net Premium - $/Acre	$6.29	$8.56	$14.49	$25.07
Farmer Rate	2.9%	3.7%	5.9%	9.6%
Increase Coverage 5%				
Added $ Coverage	$15.36	$15.36	$15.36	$15.36
Added $ Net Premium	$1.00	$2.27	$5.93	$10.58
Marginal Rate	6.5%	14.8%	38.6%	68.9%

Calculate Premium Rate & Marginal Rate

	85%	
Premium	Coverage	Rate
$25.07 /	$261.12	9.6%

85%	$261.12
80%	$245.76
Added Coverage	$15.36
85%	$25.07
80%	$14.49
Added Premium	$10.58

	Added	
Added Premium /	Coverage	Rate
$10.58 /	$15.36	68.9%

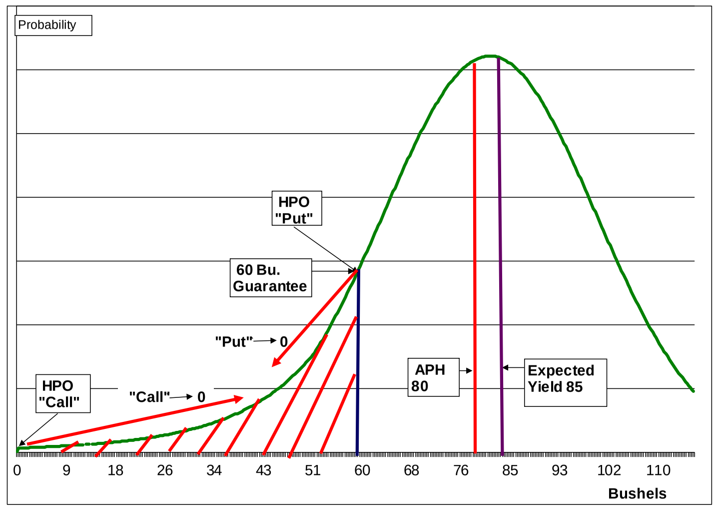
Margin farmer paid rate may exceed 100%

2018 Western Kansas, CORN, RP, NON IRR, GSG, OU, $3.84/100%,
Volatility: 0.19, Acres: 100, Yield: 57, Rate Yield: 57

	65%	70%	75%	80%	85%
Price Election	$3.84	$3.84	$3.84	$3.84	$3.84
Coverage - $/Acre	$142.46	$153.22	$164.35	$175.10	$186.24
Gross Premium - $/Acre	$41.31	$46.61	$52.50	$58.58	$68.62
Net Premium - $/Acre	$16.94	$19.11	$23.62	$30.46	$42.54
Farmer Rate	11.9%	12.5%	14.4%	17.4%	22.8%
Added $ Coverage	$11.13	$10.76	$11.13	$10.75	$11.14
Added $ Gross Premium					$10.04
Added $ Net Premium	$3.89	$2.17	$4.51	$6.84	$12.08
Marginal Rate	35.0%	20.2%	40.5%	63.6%	108.4%

All Farmer Marketing Plans Assume Bushels

1. Hedging, HTA, forward contracts, puts, window/fence, synthetic put, livestock feed, dairy cow feed, sell out of storage after harvest, sell cash grain off of the combine, etc.
2. If production doesn't matter, why farm? Anyone can trade the market.
3. Only RP guarantees bushels!
4. Critics argue RP over pays the loss and the harvest price was originally provided by the private sector. True?



2012 Great Plains Example

	Loss Calculated in Bu. YP	Loss Calculated in Bu. RP	Loss Calculated in Dollars[1] YP	RP	RP-hpe
1 APH yield[2]	80	80	80	80	80
2 Coverage level	75%	75%	75%	75%	75%
3 Bushel guarantee	60	60			
4 Deducted bushels	20	20			
5 Bushels per acre produced	40	40	40	40	40
6 Cash Price (30 under)	$7.20	$7.20	$7.20	$7.20	$7.20
7 Cash Sales	$288.00	$288.00	$288.00	$288.00	$288.00
8 Projected price	$5.68	$5.68	$5.68	$5.68	$5.68
9 Insurance guarantee	$340.80	$340.80	$340.80	$340.80	$340.80
10 Indemnity-Harvest Price[3]	$5.68	$7.50	$5.68	$7.50	$7.50
11 Bushels lost below Expected	40	40	40	40	40
12 Bushels Indemnified	20	20			
13 Gross indemnity	$113.60	$150.00			
14 Insurance guarantee			$340.80	$450.00	$340.80
15 Value of production[4]			$227.20	$300.00	$300.00
16 Gross indemnity			$113.60	$150.00	$40.80
17 Farmer Paid Premium[5]	$21.14	$24.38	$21.14	$24.38	$21.50
18 Net Indemnity Payment	$92.46	$125.62	$92.46	$125.62	$19.30
19 # Replaced Lost Bu. (cash)	12.8	17.4	12.8	17.4	2.7
MVP = Indemnity Bu. X Price Change Insurance guarantee					
20 Price Change (harvest - proj. P)	$36.40		$36.40		$36.40
21 MVP Premium[6]	$4.80		$4.80		$4.80
22 Net MVP Indemnity Payment	$31.60		$31.60		$31.60
23 # Replaced Bu. Of 40 Bu. Lost	17.2	17.4	17.2	17.4	7.1

Corn example for 2012
- Corn price @ harvest=$7.50
- Drought cut yield in half
- Coverage under RP with HPO is highest
- Coverage under RP with HPO excluded is lowest
- PLC not likely to have paid
- ARC not likely to have paid (yield low, but price high)

[1]Risk Management Agency Kansas Corn Fact Sheet 2017 Crop Year, Topeka Regional Office-Topeka, KS: Revised February 2017, RMA Website link:`https://www.rma.usda.gov/fields/ks_rso/2017/kscorn.pdf
[2]RMA's website summary of business reported the average APH for Osborne County, Kansas sorghum farmers buying 75% Revenue Protection was 80.4 bushels in 2012. The APH will change some from year to year and those farmers that buy higher coverages tend to have higher APH's.
[3]The Indemnity Price for Yield Protection is the projected price set at signup. The Indemnity Price for Revenue Protection is the harvest price set at harvest. Prices used in the example are for Kansas Sorghum in 2012.
[4]Critics often cite RMA published examples of payment calculations where RMA values the bushels produced at the harvest time futures price. In the "real world" a crop that has drought or other weather damage will have dockage at the elevator in addition to a negative price basis in most markets.
[5]Rates used are typical for this State at this APH level
[6]MVP premium is an estimate based on option premiums assuming 2012 volatility levels.
*Prepared by G. A. (Art) Barnaby, Jr., Professor, Department of Agricultural Economics, K-State Research and Extension, Kansas State University, Manhattan, KS 66506, January 2, 2018

2012 Great Plains Example

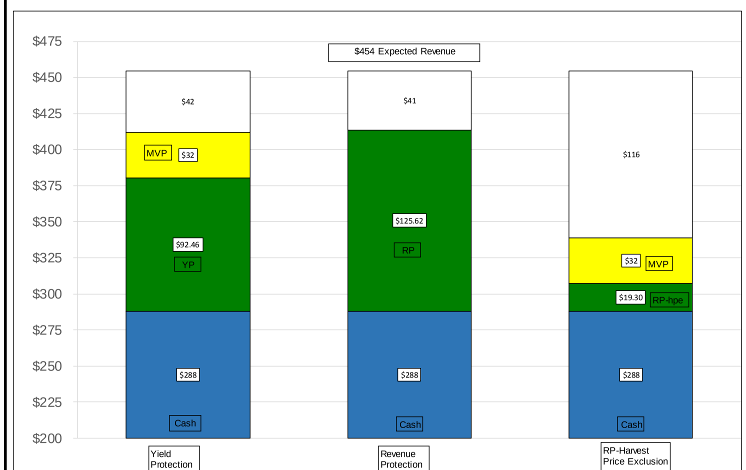
	Loss Calculated in Dollars[1] YP	RP	RP-hpe
1 APH yield[2]	80	80	80
2 Coverage level	75%	75%	75%
5 Bushels per acre produced	40	40	40
6 Cash Price (30 under)	$7.20	$7.20	$7.20
7 Cash Sales	$288.00	$288.00	$288.00
8 Projected price	$5.68	$5.68	$5.68
9 Insurance guarantee	$340.80	$340.80	$340.80
10 Indemnity-Harvest Price[3]	$5.68	$7.50	$7.50
11 Bushels lost below Expected	40	40	40
14 Insurance guarantee	$340.80	$450.00	$340.80
15 Value of production[4]	$227.20	$300.00	$300.00
16 Gross indemnity	$113.60	$150.00	$40.80
17 Farmer Paid Premium[5]	$21.14	$24.38	$21.50
18 Net Indemnity Payment	$92.46	$125.62	$19.30
19 # Replaced Lost Bu. (cash)	12.8	17.4	2.7
MVP = Indemnity Bu. X Price Change Insurance guarantee			
20 Price Change (harvest - projected	$36.40		$36.40
21 MVP Premium[6]	$4.80		$4.80
22 Net MVP Indemnity Payment	$31.60		$31.60
23 # Replaced Bu. Of 40 Bu. Lost	17.2	17.4	7.1

Compare YP vs. RP in 2012
- Corn price @ harvest=$7.50
- Drought cut yield in half
- Coverage under RP vs. YP & RP-hpe
- ARC not likely to have paid (yield low, but price high)

2012 Corn Belt Example

	Loss Calculated in Bu. YP	RP
1 APH yield[2]	80	80
2 Coverage level	75%	75%
3 Bushel guarantee	60	60
4 Deducted bushels	20	20
5 Bushels per acre produced	40	40
6 Cash Price (30 under)	$7.20	$7.20
7 Cash Sales	$288.00	$288.00
8 Projected price	$5.68	$5.68
9 Insurance guarantee	$340.80	$340.80
10 Indemnity-Harvest Price[3]	$5.68	$7.50
11 Bushels lost below Expected	40	40
12 Bushels Indemnified	20	20
13 Gross indemnity	$113.60	$150.00
17 Farmer Paid Premium[5]	$21.14	$24.38
18 Net Indemnity Payment	$92.46	$125.62
19 # Replaced Lost Bu. (cash)	12.8	17.4
MVP = Indemnity Bu. X Price Change Insurance guarantee		
20 Price Change (harvest - proj. P)	$36.40	
21 MVP Premium[6]	$4.80	
22 Net MVP Indemnity Payment	$31.60	
23 # Replaced Bu. Of 40 Bu. Lost	17.2	17.4

Compare YP vs. RP in 2012
- Corn price @ harvest=$7.50
- Drought cut yield in half
- Coverage under RP vs. YP
- ARC not likely to have paid (yield low, but price high)



Compare premiums for Enterprise Units vs. Optional Units

% Coverage	70%	75%	80%	85%
Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
YP-OU Net Premium	$16.83	$21.14	$27.74	$39.46
YP-EU Net Premium	$5.57	$7.45	$11.97	$20.76
RP-hpe-OU Net Premium	$17.46	$21.90	$28.71	$40.78
RP-hpe-EU Net Premium	$5.54	$7.52	$12.76	$22.08
RP-OU Net Premium	$19.42	$24.38	$32.01	$45.29
RP-EU Net Premium	$6.29	$8.56	$14.49	$25.07

Change to EU and buy up a coverage level

% Coverage	70%	75%	80%	85%
Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
	75%	80%	85%	
	$230.40	$245.76	$261.12	
YP-OU Net Premium	$16.83	$21.14	$27.74	$39.46
YP-EU Net Premium	$7.45	$11.97	$20.76	
RP-hpe-OU Net Premium	$17.46	$21.90	$28.71	$40.78
RP-hpe-EU Net Premium	$7.52	$12.76	$22.08	
RP-OU Net Premium	$19.42	$24.38	$32.01	$45.29
RP-EU Net Premium	$8.56	$14.49	$25.07	

Effective "put" strike in RP

2018 Great Plains, CORN, RP, NON IRR, GSG, EU, $3.84/100%, Volatility: 0.17, Acres: 100, Yield: 80, Rate Yield:

1 % Coverage	70%	75%	80%	85%
2 Price Election	$3.84	$3.84	$3.84	$3.84
3 Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
5 Net Premium - $/Acre	$6.29	$8.56	$14.49	$25.07
7 Effective Put Strike	$2.69	$2.88	$3.07	$3.26
8 % Price Decline	(30.0%)	(25.0%)	(20.0%)	(15.0%)

85% X $3.84 = $3.26

Crop Insurance Price Change, Past 26 Years

	Mar 15 Corn				Mar 15 Soybeans				Sep 30 KC Wheat			
Year	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]
2017	3.96	3.49	0.19	(11.9%)	10.19		0.16		4.59		0.18	
2016	3.86	3.49	0.17	(9.6%)	8.85	9.75	0.12	10.2%	5.20	4.50	0.22	(13.5%)
2015	4.15	3.83	0.21	(7.7%)	9.73	8.91	0.16	(8.4%)	6.30	5.31	0.17	(15.7%)
2014	4.62	3.49	0.19	(24.5%)	11.36	9.65	0.13	(15.1%)	7.02	7.17	0.19	2.1%
2013	5.65	4.39	0.20	(22.3%)	12.87	12.87	0.17	0.0%	8.78	7.22	0.24	(17.8%)
2012	5.68	7.50	0.22	32.0%	12.55	15.39	0.18	22.6%	8.62	6.75	0.26	(21.7%)
2011	6.01	6.32	0.29	5.2%	13.49	12.14	0.23	(10.0%)	7.14	8.18	0.33	14.6%
2010	3.99	5.46	0.28	36.8%	9.23	11.63	0.20	26.0%	5.42	4.79	0.33	(11.6%)
2009	4.04	3.72	0.37	(7.9%)	8.80	9.66	0.31	9.8%	8.77	6.35	0.27	(27.6%)
2008	5.40	4.13	0.30	(23.5%)	13.36	9.22	0.31	(31.0%)	5.88	7.88	0.33	34.0%
2007	4.06	3.58	0.26	(11.8%)	8.09	9.75	0.19	20.5%	4.52	5.62	0.30	24.3%
2006	2.59	3.03	0.23	17.0%	6.18	5.93	0.21	(4.0%)	3.52	4.81	0.20	36.6%

Crop Insurance Price Change, Past 26 Years (continued)

	Mar 15 Corn				Mar 15 Soybeans				Sep 30 KC Wheat			
Year	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]	RP Plant Price[2]	RP Harv. Price[3]	Volatility[4]	% Price Change[5]
2005	2.32	2.02	0.21	(12.9%)	5.53	5.75	0.21	4.0%	3.56	3.28	0.18	(7.9%)
2004	2.83	2.05	0.21	(27.6%)	6.72	5.26	0.21	(21.7%)	3.40	3.77	0.19	10.9%
2003	2.42	2.26	0.20	(6.6%)	5.26	7.32	0.18	39.2%	3.73	3.14	0.19	(15.8%)
2002	2.32	2.52	0.18	8.6%	4.50	5.45	0.16	21.1%	3.34	3.09	0.22	(7.5%)
2001	2.46	2.08	0.20	(15.3%)	4.67	4.37	0.16	(6.4%)	3.31	3.07	0.18	(7.3%)
2000	2.51	2.04	0.21	(18.7%)	5.32	4.72	0.20	(11.2%)	3.34	3.02	0.20	(9.6%)
1999[6]	2.40	2.01	0.14	(16.1%)	5.11	4.85	0.17	(5.1%)	3.16	2.84	0.21	(10.1%)
1998	2.84	2.19	0.20	(23.0%)	6.64	5.46	0.18	(17.7%)	3.95	3.04		(23.1%)
1997	2.73	2.81	0.18	3.1%	6.97	6.82	0.17	(2.1%)	4.13	3.64		(11.7%)
1996	3.08	2.84	0.19	(7.9%)	7.23	7.07	0.16	(2.2%)	3.91	5.76		47.4%
1995	2.57	3.23	0.15	25.7%	5.85	6.56	0.15	12.2%	3.52	4.24		20.4%
1994	2.68	2.16	0.16	(19.5%)	6.48	5.41	0.14	(16.5%)	3.00	3.37		12.0%
1993	2.40	2.49	0.15	3.7%	5.86	6.15	0.15	4.9%	3.20	2.87		(10.3%)
1992	2.70	2.09		(22.7%)	6.06	5.37		(11.4%)	3.05	3.59		17.9%

15% or More Price Change, Past 25 Years

Year	Loss Ratio	Volatility	% Price Decrease	Year	Loss Ratio	Volatility	% Price Increase
2014	1.05	0.19	(24.5%)	2012	2.74	0.22	32.0%
2013	1.25	0.20	(22.3%)	2010	0.60	0.28	36.8%
2008	0.81	0.30	(23.5%)	2006	0.52	0.23	17.0%
2004	0.58	0.21	(27.6%)	1995	0.94	0.15	25.7%
2001	0.65	0.20	(15.3%)				
2000	0.54	0.21	(18.7%)				
1999	0.60	0.14	(16.1%)				
1998	0.67	0.20	(23.0%)				
1994	0.19	0.16	(19.5%)				
1992	0.81		(22.7%)				

Cost of RP option derivatives vs. CME traded options

2018 Great Plains, CORN, RP, NON IRR, GSG, EU, $3.84/100%, Volatility: 0.17, Acres: 100, Yield: 80, Rate Yield: 80

1 % Coverage	70%	75%	80%	85%
2 Price Election	$3.84	$3.84	$3.84	$3.84
3 Coverage - $/Acre	$215.04	$230.40	$245.76	$261.12
4 YP Prem cents bu.	$0.10	$0.12	$0.19	$0.31
5 RP-hpe Prem cents bu.	$0.10	$0.13	$0.20	$0.32
6 RP Prem cents bu.	$0.11	$0.14	$0.23	$0.37
Asian Yield Adjust "Option" premiums in cents per guaranteed bu.				
7 Cost/ bu. "Put"	(0.001)	0.001	0.012	0.019
8 Cost/ bu. "Call"	0.013	0.017	0.027	0.044
9 Cost of out of Money Put Options			$0.010	$0.026

RP Yield Adjusted Asian Options vs. CME traded Options

1. RP strike price is based on a monthly average price. CME trade multiple strike prices.
2. RP premiums are based on the last 5 trading days prior to the 15 days before RP sales closing. CME option premiums are continuously traded.
3. RP options have no exercise rights. CME options can be exercised.
4. RP options have intrinsic value only, no time value. CME options will have intrinsic plus time value based on the days to expiration and volatility.

Compare Spring Wheat RMA February adjusted volatility with July volatility and at the money option Premiums

Strike Date	Futures	$5.60 Call	$5.60 Put	Volatility	RMA Adj. Volatility
RP Price	565.0000				0.1300
02/22/17	564.5000	32.1250	27.6250	18.7	0.1295
02/23/17	565.5000	32.5000	27.0000	18.7	0.1291
02/24/17	564.7500	31.0000	26.2500	18.2	0.1253
02/27/17	560.7500	28.3750	27.6250	18.0	0.1228
02/28/17	560.7500	29.2500	28.5000	18.5	0.1259
Strike		$7.80 Call	$7.80 Put		
07/03/17	816.0000	77.1250		49.7	
07/05/17	819.7500	78.6250		49.3	
07/06/17	769.0000	49.5000	60.5000	47.3	
07/07/17	766.7500	47.5000	60.7500	47.0	
07/10/17	797.5000	62.0000	44.5000	48.3	
07/11/17	796.7500	60.6250	43.8750	48.0	
07/12/17	782.7500	51.3750	48.6250	46.4	
07/13/17	749.5000	30.5000	61.0000	40.2	
07/14/17	758.0000	33.7500	55.7500	41.0	
07/17/17	767.2500	35.5000	48.2500	40.5	
07/18/17	780.5000	42.6250	42.1250	42.2	
07/19/17	775.5000	39.1250	43.6250	41.5	
07/20/17	778.0000	39.0000	41.0000	41.0	

RP Yield Adjusted Asian Options vs. CME traded Options

5. RP options are settled on the harvest monthly average price and pay intrinsic value only. CME options are spot settled.
6. RP "put" can take on negative values.
7. RP settlement values are adjusted for yield. CME options are settled based on price only.

Use TA or YE to increase APH From 160 to 170 bu.

2018 Great Plains, CORN, RP, NON IRR, GSG, EU, $3.84/100%, Volatility: 0.17, Acres: 100, Yield: 80, Rate Yield: 80

1 % Converge	65%	70%	75%	80%	85%
2 Coverage - $/Acre	$199.68	$215.04	$230.40	$245.76	$261.12
3 Gross Premium - $/Acre	$26.44	$31.47	$37.21	$45.29 →	$53.34
4 Net Premium - $/Acre	$5.29	$6.29	$8.56	$14.49	$25.07
TA OR YE increase APH FROM 80 BU. TO 85 BU.					
5 % Coverage	60%	65%	70%	75%	80%
6 Coverage - $/Acre	$195.84	$212.35	$228.48	$244.99	$261.12
7 Gross Premium - $/Acre	$23.86	$28.12	$33.44	$39.57 →	$48.12
8 Net Premium - $/Acre	$4.77	$5.62	$6.69	$9.10	$15.40
9 Change in Coverage	($3.84)	($2.69)	($1.92)	($0.77)	$0.00
10 Premium Change	($0.52)	($0.67)	($1.87)	($5.39)	($9.67)

Use TA & YE to increase APH From 80 to 92 bu.

2018 Great Plains, CORN, RP, NON IRR, GSG, EU, $3.84/100%, Volatility: 0.17, Acres: 100, Yield: 80, Rate Yield: 80

1 % Converge	65%	70%	75%	80%	85%
2 Coverage - $/Acre	$199.68	$215.04	$230.40	$245.76	$261.12
3 Gross Premium - $/Acre	$26.44	$31.47	$37.21	$45.29 →	$53.34
4 Net Premium - $/Acre	$5.29	$6.29	$8.56	$14.49	$25.07
TA OR YE increase APH FROM 80 BU. TO 92 BU.					
5 % Converge	60%	65%	70%	75%	80%
6 Coverage - $/Acre	$211.97	$229.63	$247.30	$264.96	$282.62
7 Gross Premium - $/Acre	$30.44	$37.09	$46.54	$54.96 →	$64.30
8 Net Premium - $/Acre	$6.09	$7.42	$9.31	$12.64	$20.58
9 Change in Coverage	$12.29	$14.59	$16.90	$19.20	$21.50
10 Premium Change	$0.80	$1.13	$0.75	($1.85)	($4.49)
11 75% Coverage vs. 85% Coverage				$3.84	
12 Premium Savings				($12.43)	

Percent Subsidy Rate by Unit Structure

Percent Level	50%	55%	60%	65%	70%	75%	80%	85%
Unit								
BU	67%	64%	64%	59%	59%	55%	48%	38%
OU	67%	64%	64%	59%	59%	55%	48%	38%
EU	80%	80%	80%	80%	80%	77%	68%	53%
WU	80%	80%	80%	80%	80%	80%	71%	56%

High volatility increases RP premiums

2018 Great Plains, CORN, RP, NON IRR, GSG, EU, $3.84/100%, Volatility: 0.30, Acres: 100, Yield: 80, Rate Yield: 80

1 % Coverage	65%	70%	75%	80%	85%
2 Coverage - $/Acre	$199.68	$215.04	$230.40	$245.76	$261.12
3 RP EU Net Premium	$5.29	$6.29	$8.56	$14.49	$25.07
4 RP EU Net Premium 30% Volatility	$6.28	$7.47	$10.16	$17.08	$29.36
5 Premium Change	$0.99	$1.18	$1.60	$2.59	$4.29

What Did We Learn Today

1. RP options are adjusted for yield and can't be cashed in early.
2. HPO replaces indemnity bushels at current market value.
3. Replacement bushel coverage provides a back stop to any marketing plan including cash sales off of the combine.
4. Use YE and/or TA and increase APH by 7% or more, will allow farmers to reduce their premium without a cut to their coverage.
5. High volatility creates the possible for selling insurance covered options.

Maximizing Your Rangeland

Keith Harmoney, KSU Ag Research Center, Hays, Kansas
(785) 625-3425 x221, kharmone@ksu.edu

Rangeland and pasture productivity is highly regulated by precipitation and capturing that precipitation as available soil moisture. Of course, the location of a pasture determines how much precipitation a pasture is expected to receive, with more precipitation and more productivity expected as one travels eastward through the state. The overall weather pattern and amount of precipitation received on any given pasture is largely out of the hands of land managers. Even though managers have no control over the weather, managers have direct control over the animals and the vegetation in their pasture systems. At any location with a specific amount of expected precipitation, decisions about animal management and vegetation management also affect the total amount of potential forage growth that is actually produced. That forage growth, particularly the leaves, is the main mechanism in efficiently capturing the sun's energy. Even a greater number of management decisions determines how efficiently that forage is converted into animal products and subsequent net returns.

More than any other decision, selecting a stocking rate for your rangeland or pasture system will affect forage yield, animal production, and net returns. Past research at the KSU Ag Research Center at Hays has shown that forage yields are greater the next growing season when light (37% utilization) or moderate (47% utilization) stocking rates are used the prior season compared to heavy stocking rates (over 60% utilization). Along with increased forage production, individual animal gains are also greatest during a growing season with moderate or light stocking rates compared to heavy stocking rates. Individual gains are equal with moderate or light stocking, so animal gains per acre are greater with moderate stocking compared to light stocking because more animals per acre are stocked while gaining the same amount of individual weight (Fig. 1). Total animal gain per acre is greatest with heavy stocking rates, up to point, and then total animal gains per acre will decline with the addition of more animals. As individual animal performance declines with heavier stocking rates, the total net return per animal and per acre will decline even though gain per acre slowly increases before also declining rapidly. Although stocking rate is the most important decision that a land manager makes regarding a pasture, other decisions, such as the stocking system used and weed control measures, also impact the productivity and net returns of a pasture system.

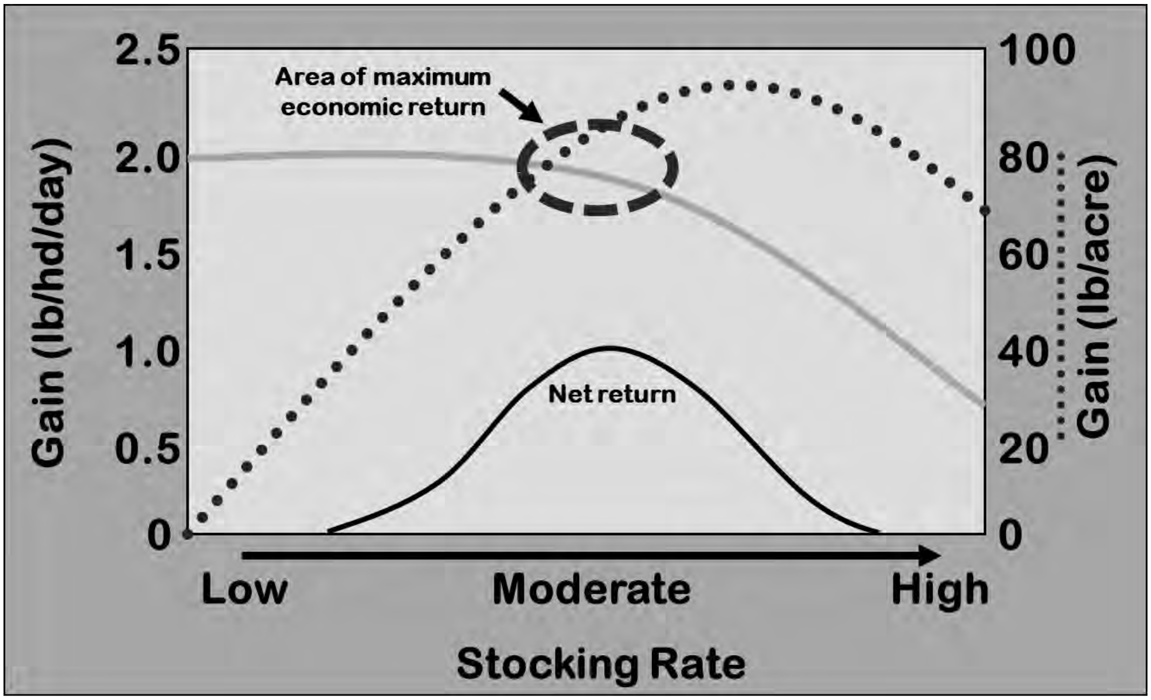


Fig. 1. Relationship of individual animal gain, gain per acre, net returns, and pasture stocking rate.

Perennial pasture acreage continues to shrink each year due to fragmentation of housing or urban development and tillage for row crop systems. In order to maintain a similar level of total production and net returns from fewer perennial grassland acres, often managers need to be more efficient with the perennial acres they manage or to lessen input costs. The time of stocking and the stocking system used has some influence on maximizing rangeland production potential. Pasture vegetation is the only way that energy from the sun is converted into energy that grazing animals consume. In order to be most efficient, a high grass and forb leaf area is needed to cover the soil surface to intercept the suns energy. Leaf area and growth results in leaf photosynthesis, energy capture, root growth, energy storage, and continued leaf growth. Removing too much vegetation through grazing results in pastures that do not have adequate leaf material to efficiently convert as much of the sun's energy into more forage and carbohydrate storage. This is why stocking rate is highly important to animal production and future vegetative production. Pastures composed of less productive species or pastures that are not as productive and vigorous as they once were have three basic remedies to improve production. First, stocking rate could be lessened so that less vegetation and leaf material is removed to allow more energy capture and storage to occur of desirable vegetation. Second, a rest period during the growing season could be used to make sure that all vegetation was allowed to grow adequate leaf material for energy capture and storage. Third, a combination of lessening stocking rate and allowing a rest period during the growing season could be used. Most all management systems to improve degraded or over-utilized pasture employs one of these three strategies.

Another way to improve or maximize potential is to match the stocking system to the livestock being grazed. For example, young stocker animals have high gain potential and a need for high quality forage compared to typical cow/calf systems. Rangeland forage quality is greatest during the spring and early summer, so stocking systems that utilize and take advantage of high quality, early season grazing, such as intensive early double stocking or modified intensive early stocking, are well suited to stocker production. The use of prescribed burning in this system can produce an additional 10-15% gain in animal production. Rotational stocking systems that defer grazing a pasture for the first time until midway or late into the season can result in a decline in animal gains because forage quality will be significantly lower in deferred pastures. Therefore, stocker grazing usually occurs with intensive early season stocking or season-long stocking. With cow/calf systems, the most important factor in production efficiency is the ability of the cow to conceive and raise a live calf. Production systems that are able to maintain or increase a cow's body condition prior to and during the breeding season typically result in the greatest reproductive performance. Stocking and animal systems that provide ample quality and quality of forage prior to and during the breeding season, and match the nutrient requirements of the cow/calf system with nutrient availability of the pasture, will help to maximize production efficiency. The main overall goal is to balance accumulated daily dry matter requirements of the cow with dry matter availability from the pasture system. The majority of animal gain in cow/calf systems is experienced by the calf rather than the cow. Gains from cow/calf systems also generally follow the aforementioned principles of stocking rate. Pasture management that increases total carrying capacity and allows for higher stocking rates to attain 50% utilization will increase total production. However, management that defers grazing of some pastures until late in the season may also lessen individual calf gains for the season.

Rangeland vegetation is a mixture of grass, forbs, and shrubs. Rangeland animals have preferences for which type of vegetation they want to graze or browse. Cattle tend to prefer grasses, but a significant portion of their diet, up to 25%, is often composed of forbs. Because of this, many of the broadleaf plants in rangelands that are considered to be weeds are actually nutritious and high quality complements to the more prevalent and common grass species. Some forb and brush species found in pasture do have invasive or weedy characteristics that make them undesirable and may reduce preferred forage production. Specifically, most Kansas noxious weeds (musk thistle, sericea lespedeza, i.e.) found in pasture can reduce preferred forage yield and should be controlled. Other species that producers often view as undesirable weedy species, such as western ragweed, goldenrods, and many species of sunflowers, are typically utilized when young and immature by grazing animals. These species may go through population cycles of varying high and low densities that correspond to precipitation cycles. Western ragweed populations in grazing studies at Hays have been as high as 15-20% before crashing to nearly 0% following droughty periods. Further studies at Hays have shown that western ragweed populations do not reduce grass yield or grass production until the vegetative population consists of approximately 40% ragweed. At that point, grass productivity will begin to decline significantly. High ragweed populations may decline naturally during the next drought period, or alternatively pasture areas with high ragweed populations could be spot treated with herbicide to reduce the density and allow more grass growth. Broadcast whole pasture spraying is typically not recommended as beneficial forbs to a beef animal's diet may also be controlled, and pasture productivity may not be increased enough to cover the cost of treatment if undesirable plant density is not high. Research at Oklahoma St. University has shown that individual animal daily gain and total beef production per acre are usually similar between broadcast sprayed and unsprayed pasture. Application and herbicide costs are typically greater than $10/acre. For stocker steers stocked at 3-4 acres/head, breakeven per head increases by $30-40 even though individual animal performance is often not affected by herbicide application. For cow/calf operations stocked at 10-12 acres/pair during the growing season, broadcast spraying would add $100-120 to the annual cost of producing a single calf. Therefore, whole pasture spraying should be evaluated to monitor if costs of treatment of non-noxious species can be offset by increased carrying capacity and animal production potential.

Other plant species may reduce grass production at much lower populations because of the size the plants may obtain, particularly eastern red cedar and small soapweed (otherwise known as yucca). Both of these plants are able to reduce desirable forage yield because of the large footprint of the plants themselves. Mature yuccas may reach over 3 ft in diameter, while eastern red cedar trees may have a drip line canopy that reaches over 20 ft in diameter, thus shading all grasses under the canopy and intercepting and using precipitation that would otherwise be used by the grass. In eastern Kansas, a pasture may be converted from a complete grassland stand to a forested red cedar canopy within 40 years if no control measures of cutting or prescribed burning are practiced. A density of 250 trees/acre can reduce forage production by 50% when trees reach 6 ft in height. In central to eastern portions of the state, one 6 ft tall tree can reduce forage yield by 6 lb/acre. Trees less than 6 ft tall are easily controlled with prescribed fire, but more costly measures are typically required when trees are allowed to grow beyond that point. By cutting the tree below the lowest branch, small clippers, shears, or hand saws are also capable of controlling red cedar when small, but often chain saws, skid loader shears and tree saws are required when trees are allowed to grow taller and the trunk increases in size substantially.

Yuccas are also a species that can use soil moisture that would otherwise be utilized by neighboring grasses and forbs. Yuccas at a density of 1000 plants/acre or greater can significantly reduce soil moisture and subsequent forage production. The vast root system and large root structures of yucca are able to absorb and hold a large quantity of soil water. However, not all yucca populations are detrimental, even if populations appear to be rather high. Yuccas are often found on slopes and shallow soils, and play a major role in stabilizing these sites and preventing soil and wind erosion. Yuccas found on sandy soil sites also serve the same function. These locations are areas in which grasses and forbs may not establish and persist as well, and therefore the yucca population stops water movement down the slopes and helps to prevent blowouts and wind movement of soil. Yucca found at these ecological sites may actually be beneficial to the overall pasture system. Yucca populations found on deep soils and fertile sites that are fully capable of greater grass and forb production are locations in which yucca control may be beneficial to overall forage production with less risk of soil exposure and erosion potential. Prescribed fire may reduce the overall biomass of yucca on a site, but fire typically will not reduce yucca populations because growing points and buds may be well below the soil surface and are well protected from fire. Yucca is typically controlled by mechanical removal by popping root and stem structures deep below the soil surface, by winter grazing of livestock, and by herbicides. The greatest herbicide control is attained by selectively treating individual plants with soil applications or applications directly into the growing point and whorl. Some herbicides containing metsulfuron methyl are labeled for a foliar application to yucca when combined with 2,4-D ester. These herbicides allow for spot broadcast treatments to heavy yucca populations and are most effective when yucca is bolting and getting ready to flower. A recent KSU study showed that these foliar applications controlled 60-70% of yucca plants when monitored one year after application (Fig. 2). Because of the time and labor involved with individual plant treatments, the foliar treatments with metsulfuron methyl and 2,4-D ester may be more cost effective per acre on moderate to heavy infestations even though yucca mortality may not be as great. One negative aspect of these foliar treatments is that they may also injure other desirable forbs in the plant population.

Fig. 2. Yucca control with broadcast foliar or an individual plant herbicide application in the whorl, applied in June and evaluated 1 year after treatment.

Treatment	Rate/acre	Control %
Chaparral + 2,4-D LVE	3.3 oz + 2 pt	63.3
Escort + Weedmaster + 2,4-D LVE	0.5 oz + 2 pt + 2 pt	71.5
Escort	0.5 oz	36.0
Escort + Weedmaster	0.5 oz + 2 pt	26.0
Chaparral + Remedy	3.3 oz + 1 pt	58.0
Cimarron Plus + 2,4-D LVE	1 oz + 2 pt	65.9
Remedy (in whorl)	2 % in diesel	77.0
Untreated	---	9.9

In summary, management decisions that enable an increase in forage production and pasture carrying capacity or an increase in animal performance have potential to increase overall pasture production efficiency. The most important step to try to achieve efficient pasture productivity is to match the forage demands of the grazing animals and forage availability of the pasture system with a moderate stocking rate to utilize 50% of the available forage. Fine tuning production with different stocking systems over time, season of stocking, and control of unwanted species may also help to increase production efficiency, but also need to be evaluated to determine if increased value can offset costs of these practices long term.

Moisture Probes: Measurement to Management*

Jonathan Aguilar, Extension Irrigation Engineer
Southwest Research-Extension Center, Garden City, KS
Phone: (620) 275-9164, Email: jaguilar@ksu.edu, Twitter: @ksirrigation

Danny Rogers, Extension Irrigation Engineer
Dept. of Biological and Agricultural Engineering, Manhattan, KS
Phone: (785) 532-2933, Email: drogers@ksu.edu

Summary
Irrigation scheduling is crucial to effectively manage water resources and optimize profitability of an irrigated operation. Tools that can be customized to a field's characteristics can greatly facilitate irrigation scheduling decisions. Soil moisture probes are just one of the three groups of tools (Fig. 1) that could be implemented on an irrigated farm. Couching on the precepts that the more information you have, the better is your decision. The same is true with irrigation scheduling. With the recent advances in electronics, soil moisture probes measures and log considerable amount of data. Interpreting, integrating and applying these data to your management decisions are sometimes challenging. Moreover, knowing its limitations and caveats or its advantages and uniqueness adds confidence to your decisions.

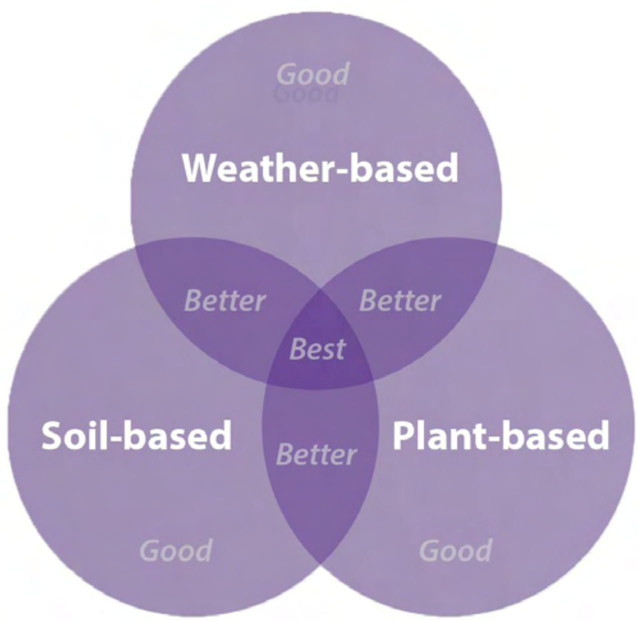


Figure 1. Soil water sensing is just one of the three groups of tools to schedule irrigation. Using two or more of these independent tools gives you greater confidence in your decision.

*This paper presented for the 2018 Cover Your Acres Conference was adapted from: Aguilar, J., Rogers, D. and Kisekka, I., 2015. Irrigation Scheduling Based on Soil Moisture Sensors and Evapotranspiration. *Kansas Agricultural Experiment Station Research Reports*, *1*(5), p.20

Southwest Research-Extension Center has been involved with the use of soil moisture sensors in both in research plots and producer's fields. We corroborate with other research studies the importance of soil moisture sensors being installed as early as possible in a representative location with good soil-sensor contact The soil moisture sensors, at the least, help in determining whether the soil is becoming wetter or dries over time which can be related to when irrigation water should be applied or scheduled. Furthermore, in implementing an irrigation schedule, the irrigation manager should consider the irrigation system capacity, the amount that can be efficiently applied, the soil intake rate, and other relevant factors.

Introduction

Faced with weather uncertainty and water supply limitations, irrigation scheduling becomes extremely crucial in effective water management and profitability optimization in an irrigated farm.

Irrigation scheduling involves determining when and how much water to apply to meet specific management goals – generally to prevent yield-limiting crop water stress. Effective irrigation scheduling helps optimize profit while minimizing inputs such as irrigation water energy cost. The factors that affect irrigation scheduling include the type of crop, stage of development, soil properties, soil-water relationships, availability of water supply, and weather conditions (temperature, wind, rainfall, and others) (Younker, 2012).

As the medium where water can be stored for the crop extraction, soil provides a crucial interplay between the crop and water. The upper limit of root-zone soil water, after gravity drainage, is determined by the soil's texture — which, for irrigation water management purposes, is known as field capacity. The lower limit of soil water storage, based on the ability of crops being able to extract soil water is known as the permanent wilting point. The difference between these two values is the plant available soil water. The desired lower limit for optimal crop growth can be a more variable value depending on the crop, the stage of growth, and management goal. Often it is referred to as the managed allowable depletion or MAD. A common MAD is 50 percent of the total plant available soil water-holding capacity. The normal goal of the irrigation scheduling procedure is to help the irrigation manager track the amount of water in reserve above a minimum soil water balance level to prevent water stress to the growing crop (Rogers, 2012).

Evapotranspiration (ET), or crop water use, is a measure of the rate water is extracted from the soil. The term combines two processes of water loss from the system, evaporation — the loss of water from the soil and plant surface, and transpiration — the beneficial use of water by the crop. This method of estimation is based on weather parameters (e.g. solar radiation, temperature, humidity, wind speed) and crop growth stage.

The ET information can be used for irrigation scheduling by accounting for the water balance in the soil profile. It is often described as being similar to a checkbook accounting procedure — except in this case, root zone soil water content, rather than money, is the account balance. Deposits to the account would be effective rainfall and irrigation, and withdrawal is the crop water use. Unlike a checkbook, if the account balance becomes too large, additional deposits are lost to surface water runoff or deep percolation. If the balance is too low, optimal crop growth might not be achieved (Rogers 2012).

Knowing the amount of water in the soil at any time is the key to effective irrigation scheduling. Soil water content could be measured directly, using manual gravimetric sampling, and indirectly, using sensors such as neutron probe (NP), capacitance probe and time domain reflectometry (TDR) (Chavez, 2012). For all practical purposes, soil moisture sensors that indirectly measure water content operate based on surrogate properties (i.e. soil dielectric permittivity, electrical resistance, and soil water potential, among others). They are generally used for irrigation scheduling at the farmer's field. Most of these sensors have the advantage of being near real-time, automatic data logging, nondestructive, and telemetry-compatible, as compared to gravimetric sampling. Commercially available soil moisture sensors differ from each other mainly in operating frequency, sensing materials and design, and multiple-sensing capabilities.

Soil Moisture Sensor-Based Scheduling

With advances in microcomputer and communication technology, the variety of soil moisture sensors is increasing in the suite of irrigation tools. The main selling point for this technology is telemetry and therefore the continuous near real-time measurements delivered to the irrigation manager through a computer or other hand-held communication devices. With the advancement in design and electronic components, some soil moisture sensors have a smaller footprint in the field using an array of sensors in one location at multiple depths. However, to be useful for management, soil water sensors must be accurate around 0.02 to 0.04 inch/inch (Evett, et al. 2014). Since soil water sensors typically are sensitive only to the soil immediately around them — and since most sensors are small — it is prudent to have two or more sensors installed at different depths. This not only reduces uncertainty but also promotes understanding of soil water content changes in response to irrigation and crop water uptake. Depths of 6 and 18 inches or 6 and 24 inches are common. In general, irrigation events should be scheduled above the MAD of 50% water content for the specific soil or 50% of the relative water used.

ET-Based Scheduling

In the early 1990s, K-State Research and Extension introduced an Excel spreadsheet program to help facilitate ET-based irrigation scheduling. The program eventually evolved into KanSched. The features of KanSched have been shown to be useful to a variety of climatic conditions and irrigation capacities.

KanSched is a free, user-friendly computer program that can be easily used to develop an irrigation schedule (access KanSched at www.bae.ksu.edu/mobileirrigationlab). KanSched has several versions (Excel – KanSched1, standalone program – KanSched2, and web-based – KanSched3) to suit the needs and platforms of users. The KanSched3 program is currently available as a beta version and requires users to set up individual accounts and identities. However, once done, KanSched3 appears very similar to the KanSched2 standalone version (Rogers and Alam, 2007).

KanSched uses daily and field inputs to calculate ET. The field inputs can be tailored to the individual field's soil characteristics, emergence, maximum rooting depth, crop characteristics, and crop coefficients, among others. The daily inputs are typically reference ET and rainfall, along with measured soil moisture content (i.e. gravimetric method or from the probe readings). KanSched allow the irrigation manager to manage the soil water content to the desired MAD.

Plant Based Scheduling

An emerging option, that would be complimentary ET and/or soil based scheduling would be the use of plant-based or plant health indicators. Canopy, temperature, color or other light frequency indicators can be used to determine stress levels in the crop. For example, techniques that to determine the water stress level in a crop, based on relationships between air temperature and canopy temperature, can be used to indicate the soil water availability. The use of aerial platforms to “scout” a field is becoming an available option and may be useful to determine other issues, such as irrigation system uniformity, fertilizer distribution issues, weed or disease pressures.

Researchers have shown that crop canopy temperature (expressed as Crop Water Stress Index or CWSI) responds well to the availability of water in the soil profile. Chavez (2015) was able to detect this relationship in corn canopy temperature and develop a new soil water stress index (SWSI). For example, a corn CWSI of about 0.20-0.23 corresponds to SWSI of 0.43 in sandy clay loam soils.

Tips for Use of Soil Moisture Probes

Focusing on the installation of soil moisture sensors, K-State Research and Extension installed three types of moisture sensors, specifically Decagon 10HS, Watermark, and Campbell Scientific’s CS655 at 1-, 2-, and 3-ft depths (Fig. 2), along the corn rows of the research plots and in some producer’s field. The following are the summarized results of the study:

- Soil water sensors should be installed in the field as early as possible to achieve adequate soil settling around the sensors.
- While good soil-sensor contact is important, some sensors are difficult to properly install without disturbing the soil profile.
- The learning curve for some sensors is relatively steep, and establishing confidence in the measured values takes time.
- After-sales support is vital in product selection.
- Soil sensor costs are associated with three components: equipment, installation, and telemetry/service subscription.
- Cables must be protected from possible rodent damage by adequately burying them or enclosing them in conduits.
- A good representative location should also consider equipment size and traffic as well as subsequent seasonal field operations.
- It was evident that — among the different sensors — proper installation (i.e. good soil contact and location at the right time) was the key to the optimum sensor performance.

Conclusion

Irrigation scheduling tools that can be customized to a field’s characteristics can greatly facilitate the irrigation scheduling decision process. While soil moisture probes offer more data from a point in the field, the availability of separate independent data is better than relying on just one type of feedback. In implementing an irrigation schedule, the irrigation manager also considers the system capacity, the amount that can be efficiently applied, the soil intake rate, and other factors.

Figure 2. Three different soil moisture sensors (Watermark, CS655, and Decagon 10HS) installed at different depths (1, 2, and 3 feet) at the SWREC plot and a farmer's field.

References

Aguilar, J.P., D.H. Rogers, I. Kisekka, and K. Shaw. 2014. In-field Demonstration and Evaluation of Telemetric Soil Moisture Sensors. Poster Presentation. Ogallala Aquifer Program Annual Meeting. Manhattan, Kansas, March 12–13, 2015.

Chavez, J.L. 2015. Using Canopy Temperature as an Indicator of Plant Stress. Proceedings of the 26th Annual Central Plains Irrigation Conference, Colby, Kansas, February 17-18, 2015.

Chavez, J.L. and S.R. Evett. 2012. Using Soil Water Sensors to Improve Irrigation Management. Proceedings of the 24th Annual Central Plains Irrigation Conference, Colby, Kansas, February 21–22, 2012.

Evett, S.R., P.D. Colaizzi, R.C. Schwartz, and S.A. O'Shaughnessy. 2014. Soil Water Sensing–Focus on Variable Rate Irrigation. Proceedings of the 26th Annual Central Plains Irrigation Conference, Burlington, Colorado, February 25–26, 2014.

Rogers, D.H. 2012. Introducing the Web-based version of KanSched: An ET-based Irrigation Scheduling Tool. Proceedings of the 24th Annual Central Plains Irrigation Conference, Colby, Kansas, February 21–22, 2012.

Younker, B.J. 2012. Irrigation Scheduling: Crucial During a Drought. 2012 Press Release. Natural Resources Conservation Service. Accessed at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/newsroom/?cid=nrcs142p2_033543.

K-State Northwest Area Agronomy
Research Project Update

Lucas Haag, Ph.D., Assistant Professor and Northwest Area Agronomist
Northwest Research-Extension Center, Colby, KS
Email: lhaag@ksu.edu Phone: (785) 462-6281 Twitter: @LucasAHaag
www.northwest.ksu.edu/agronomy

Overview

The Northwest Area Agronomist is responsible for supporting county/district agents and working with producers and industry personnel in 29 counties of northwest and north-central Kansas. An applied research program is part of this effort with the goal of generating data to answer questions relevant to producers in the region as resources allow.

The research program currently focuses primarily on the crops of wheat, corn, and peas, with some work in sorghum and other experimental crops. The research program has also supported various cover cropping experiments led by other investigators. The research program to date has been funded 100% by industry through agreements with cooperating businesses on specific projects, participants in the field pea performance testing program, and also, to a smaller extent, through revenue generated by the Cover Your Acres Winter Conference. In addition to supporting the research program, industry funds also subsidize the extension operating expenses of the area agronomist.

Selected Current Projects: Evaluation of Solid-Stem Wheat Varieties for Northwest Kansas

Justification
The wheat stem sawfly has been an issue affecting the Northern Plains and Canadian Prairie Provinces for decades. In recent years however the range of the insect has expanded into Nebraska Panhandle (2007) and northeast Colorado (2010). The most damaging result of wheat stem sawfly is severe lodging of the crop immediately prior to harvest. In some cases lodging has been 100% with yield losses approaching 50%. Control of the wheat stem sawfly with insecticides is not practical or economical. Other control options including burning and heavy tillage of wheat residue, which would have significant negative impacts on the cropping systems of northwest Kansas. The most reasonable control option is the use of solid-stemmed wheats, which due to their thicker stem wall, prevent the wheat stem sawfly from laying its eggs in growing wheat. Solid stem winter wheats currently available have all been developed for the Northern Plains.

Objective

Determine the yield potential of northern plains solid-stemmed wheats when planted in Northwest Kansas and the feasibility of using them as a stop-gap measure to combat wheat stem sawfly until locally developed varieties become available

Procedure

Beginning in the fall of 2013, multiple locally adapted hard red winter wheat varieties (Table 1) and solid-stem wheat varieties from the Northern Plains were planted in replicated trials across northwest Kansas. Trials were conducted in the context of a wheat-sorghum or corn-fallow rotation, and most site-years were under no-till management.

Table 1. Locally adapted and Northern Plains solid-stem varieties evaluated across Northwest Kansas locations, 2014-2018.

Variety	Source	Type	2014		2015			2016			2017		2018		
			Colby	Tribune	Herndon	Colby	Tribune	Herndon	Colby	Tribune	Colby	Tribune	Herndon	Colby	Tribune
Denali	CSU	Local	X	X	X	X	X	X	X	X	X	X	X	X	X
Langin	CSU	Local									X	X	X	X	X
LCS Chrome	LimaGrain	Local											X	X	X
TAM111	TAMU	Local	X	X	X	X	X	X	X	X					
TAM112	TAMU	Local	X	X	X	X	X	X	X	X					
TAM114	TAMU	Local			X						X	X	X	X	X
Tatanka	KSU	Local									X	X	X	X	X
Winterhawk	Westbred	Local	X		X	X	X	X	X	X	X	X	X	X	X
KS14H180-4-6	KSU	Local Experimental											X	X	X
CO15SFD061	CSU	Local Solid-Stem Experimental											X	X	X
CO15SFD092	CSU	Local Solid-Stem Experimental											X	X	X
CO15SFD095	CSU	Local Solid-Stem Experimental											X	X	X
CO15SFD107	CSU	Local Solid-Stem Experimental											X	X	X
Bearpaw	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X
Bynum	MSU	Solid-Stem	X	X	X	X	X	X	X	X					
Genou	MSU	Solid-Stem	X	X	X	X	X	X	X	X					
Judee	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X
Loma	MSU	Solid-Stem									X	X	X	X	X
Rampart	MSU	Solid-Stem	X	X	X	X	X	X	X	X					
Spur	MSU/Wyoming	Solid-Stem									X	X	X	X	X
Warhorse	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X
WB-4483	Westbred	Solid-Stem						X	X	X	X	X	X	X	X
WB-Quake	Westbred	Solid-Stem	X		X	X	X	X	X	X	X	X	X	X	X
MTS1588	MSU	Solid-Stem Experimental											X	X	X
Norris	MSU	Montana Hollow-Stem	X	X		X	X								

Results

Across 10 site-years of trials, solid-stemmed varieties, on average have yielded 81% of the locally adapted varieties (Table 2). This has ranged from as high as 99% at Colby in 2015 and as low as 56% at Tribune in 2017, which was largely due to several of the solid-stemmed varieties being highly susceptible to wheat-streak mosaic virus, and several of the local varieties in use having some moderate resistance. In general, the northern wheats have yielded better than anticipated, especially in the face of heat stress at grain fill. The spread in heading date from the earliest locally adapted wheat (TAM112) to the latest solid-stem (Warhorse or WB-Quake) has ranged from 8 to 13 days at Tribune. The solid-stem wheats tend to all be later maturing than the locally adapted varieties, with the exception of Bynum which tends to be similar in heading date to Denali.

Table 2 - Yield performance summary of locally adapted and solid-stem varieties

Year	Location	Mean Yield of Local Varities	Mean Yield of Solid-Stemmed Varities	%
2014	Tribune	59.7	39.7	66%
	Colby	74.3	66.0	89%
2015	Tribune	60.0	53.4	89%
	Colby	37.3	36.7	99%
	Herndon	27.4	24.7	90%
2016	Tribune	84.3	70.3	83%
	Colby	85.5	72.6	85%
	Herndon	73.5	65.6	89%
2017	Tribune	55.8	31.4	56%
	Colby	89.6	59.6	67%
			Max	99%
			Min	56%
			Average	81%

Conclusion

Solid-stem wheats from the Northern Plains can be consistently grown in northwest Kansas. However, producers should expect a reduction in yield relative to locally adapted varieties. In the event that wheat stem sawfly advances rapidly into Kansas before locally adapted varieties are available, solid stem wheats from the Northern Plains offer a viable alternative for producers desiring to keep wheat, and the critical residue it produces, in their cropping system.

The 2018 season brings some exciting developments as we are evaluating four experimental lines from the CSU breeding program. These lines have Byrd, a proven locally adapted wheat, in their pedigree.

Funding

Support labor for this project is being funded in part with proceeds from the Cover Your Acres Winter Conference.

Evaluation of Enhanced Efficiency Nitrogen Fertilizers for In-Furrow Application at Wheat Seeding

Justification:

Seed-placement of urea nitrogen would allow seeding and fertilizer application to be made in a single operation. This would reduce costs, time requirements, soil disturbance and residue destruction, while providing readily available N for early season growth and development. Sub-surface band placement prevents volatilization losses of nitrogen from urea compared to surface broadcast, thus improving the environmental and economic sustainability of wheat production systems.

Current guidelines suggest a maximum nitrogen application rate of between 20-30 lbs. N/acre (in a 7.5 to 10 in row-spacing). However, it is recommended that no urea-containing fertilizers be used in-furrow due to potential toxicity and significant stand reduction. Nevertheless, starter nitrogen can be particularly beneficial for winter wheat, and many producers consider adding some nitrogen in the form of a urea product. This can be done easily when planting with modern air seeders commonly used in Kansas, however there is significant risk for crop injury. Safe upper limit values for seed-placed urea and enhanced efficiency nitrogen fertilizers in winter wheat need to be evaluated for soils in Kansas. New nitrogen fertilizer technologies for enhanced efficiency may also have improved safety when placed with the seed over straight urea.

Objectives:

1. Evaluate the contribution of seed-applied nitrogen fertilizer to wheat yield and the potential effect on stand reduction under different soil types and different combinations of urea and Enhanced Efficiency Fertilizers (EEF).
2. Estimate safe upper limits for seed-placed urea, and EEF (NBPT-Agrotain, and ESN-polymer coated urea) on winter wheat using modern no-till drill openers.
3. Compare seedling emergence, grain yield, protein content, and nitrogen concentration in the plant with different nitrogen sources and rates.
4. Evaluate the use of seed-applied fertilizers as the primary application method for nutrients in wheat.

Related Information:

Information on this topic doesn't directly exist for the state of Kansas. However, work in the Northern Plains has shown in their environment that rates of up to 20 lb./Ac of conventional urea can be safely utilized (Sask. Agriculture, 2015). Recent work in North Dakota has shown that when 100% of the nitrogen placed in furrow is ESN treated, no reduction in final yield was observed (Silahi-Sebess, 2015). Montana recommendations stress the importance of soil moisture and texture, but in general state that polymer coated urea's (such as ESN) and NBPT-urea fertilizers are effective at reducing seedling damage, with the ESN having the advantage

(Olson-Rutz, 2011). They reported that rates up to 100 lb. N/ac could be safely placed with the seed compared to only 27 lb. N/ac for conventional urea. Preliminary field data collected at Colby and greenhouse studies in Manhattan would suggest the opportunity exists to use enhanced efficiency fertilizers such as ESN and NBPT to allow safe in-furrow use of urea.

Procedures

Field studies are being conducted at multiple locations with different soil types. Nitrogen fertilizer sources will include (1) urea, (2) polymer coated urea (ESN), and (3) urea treated with the urease inhibitor NBPT (Agrotain). Nitrogen application were 15, 30, 60, and 90 lbs N/acre for each fertilizer source for a total of 12 treatment combinations plus one control with no nitrogen. An additional treatment was 10 lbs. N/acre applied as 11-52-0 at a rate of 91 lbs./ac. Studies were seeded with a no-till drill using the variety Byrd seeded at a rate of 1 million seeds/acre. Fall stand counts were taken soon after emergence, spring stand counts were taken at green up, and head counts were taken immediately prior to harvest. All plots received additional N applied as top-dress to ensure Nitrogen was not yield limiting and that stand injury was the observed factor. Plots were machine harvested using a plot combine equipped with a stripper head.

Results

Numerical reductions in fall plant stand were apparent when any form or amount of urea was placed in-furrow (Figure 1).

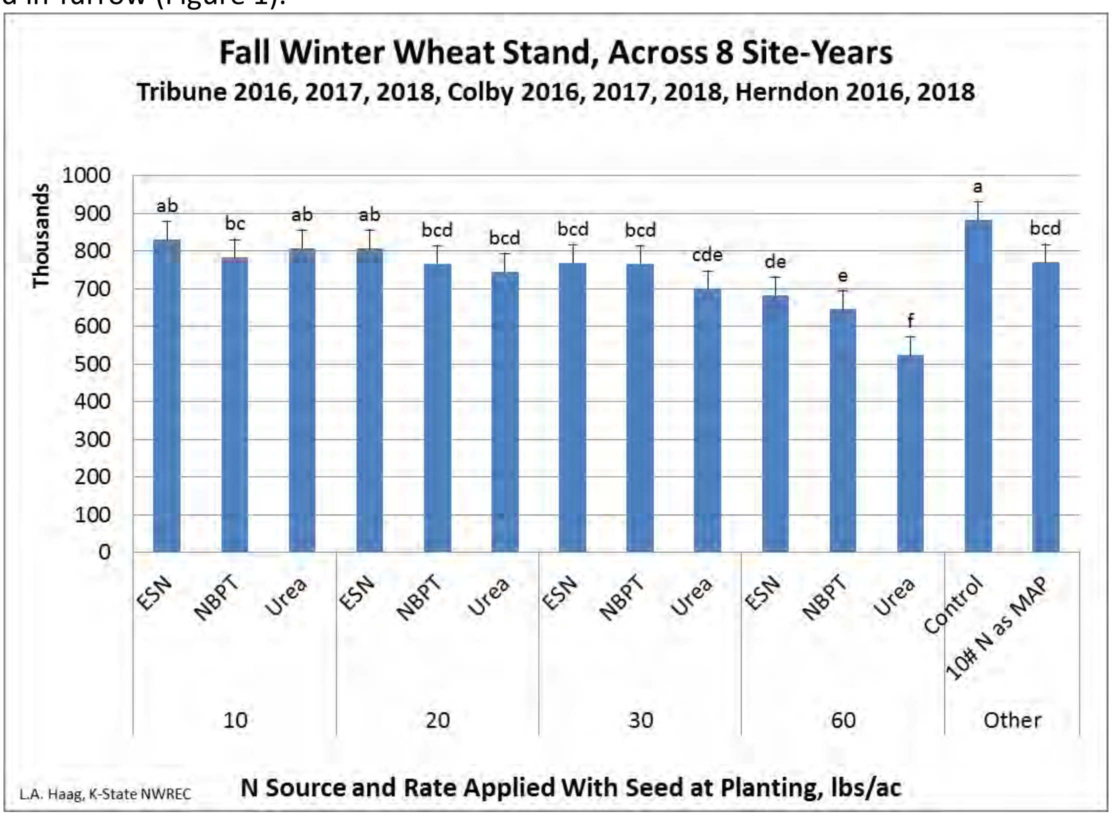


Figure 1 - Fall winter wheat stands as affected by seed placed Nitrogen rates and sources.

Stands were reduced compared to the control for NBPT at the 10 lb. N/ac rate, NBPT and urea at the 20 lb. N/ac rate, and all sources at the 30 and 60 lb. N/ac rates. Within each nitrogen rate, no significant differences were observed among N sources except at the 60 lb. N/ac rate, where urea resulted in reduced fall plant stand compared to ESN or NBPT treated urea.

A numerical yield response was observed to placing 10 lb. N/ac with the seed as MAP. In general these plots were conducted on soils that would be considered at or above threshold values for soil test phosphorus. Reductions in fall stands did result in corresponding reductions in grain yield for some treatments. Urea at the 30 lb. N/ac rate and NBTP and urea at the 60 lb. N/ac rates both resulted in less grain yield than the control.

It is important to note that site-year to site-year variability is considerable in this study. One of the challenges to understanding the risk of seedling injury is that the magnitude of injury varies by field conditions and years. In some years very little reduction may be evident, even at higher rates of N, while in other years, stand reductions (and their associated impact on yield) is very evident. As an example, at Tribune in 2017, yields were reduced 28% when 20 lb. N/ac was placed as urea. Grain yields were reduced 50% when that rate was increased to 60 lb. N/ac.

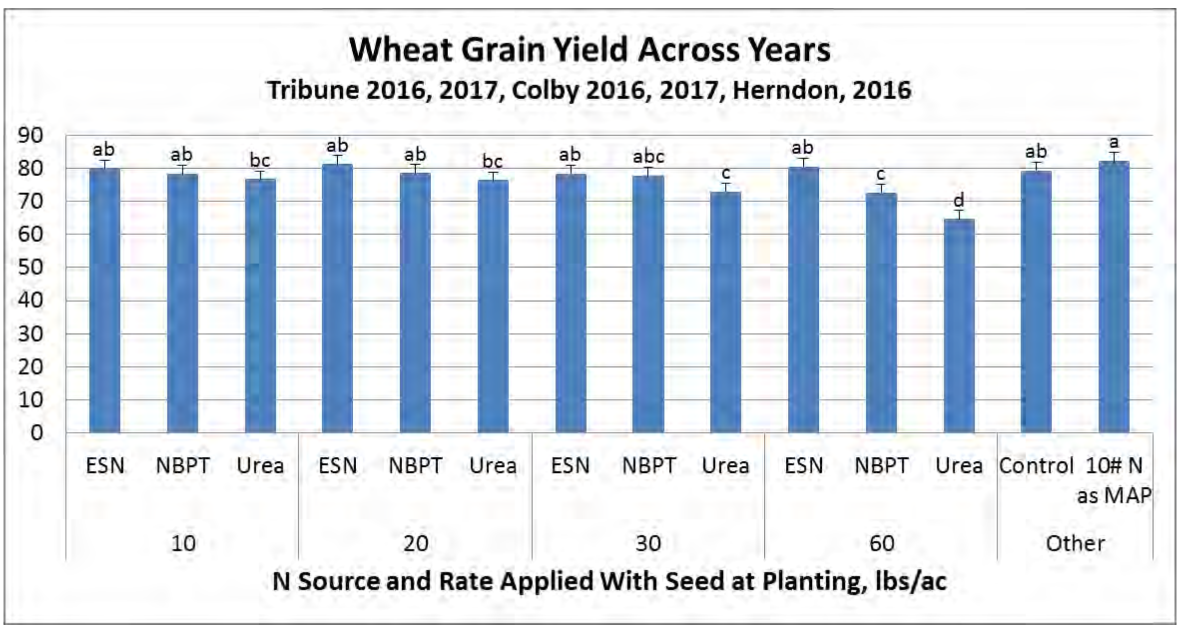


Figure 2 - Winter wheat grain yields as affected by seed placed Nitrogen rates and sources.

Funding

Fertilizer was provided by Crop Production Services in Colby and McCook. Support labor for this project is being funded in part with proceeds from the Cover Your Acres Winter Conference.

Summaries of current research in corn, peas, and other crops can be found at: www.northwest.ksu.edu/agronomy

Developing Financial Stress of KFMA Farms in Northwest Kansas

Mark A Wood, Agricultural Economist
Kansas Farm Management Association, Northwest
Email: mawood@ksu.edu, Office (785) 462-6664

The past ten years have been a roller coaster ride financially for KFMA, Northwest (NW) farms. This short article will highlight the estimated cash flow, net non-farm income (non-farm income minus family living and taxes), and the resulting liquidity drain on Working Capital as a percent of total cash expenses that has been reported by quartile of Net Farm Income in the ProfitLink Analysis from 2004 through 2016. Quartile averages are derived from grouping individual KFMA member data included in the analysis by the Net Farm Income. Individual analysis can move from one quartile to another as their Net Farm Income changes in relation to other farms in a given year. For example, an individual farm analysis could be in the High 25% group in 2012 and due to hail or marketing that same farm could be ranked in the Low 25% in 2013.

First let's review the estimated net cash flow generated by KFMA, NW farms when displayed by Net Farm Income Quartiles. Estimated cash flow is calculated by starting with Net Farm Income (NFI) plus Non-Farm Income and depreciation (a non-cash expense); then subtract non-farm expenditures and debt payments. Debt payments were estimated by dividing the average current debt by 7 years to pay off and dividing term debt (greater than one-year debt instruments) by 15 years to pay off. Average KFMA, NW Non-Farm Expense (Family Living and Income Taxes) were used for years 2004 through 2013. In years 2014 through 2016 the average Non-Farm Expenses by quartile were used.

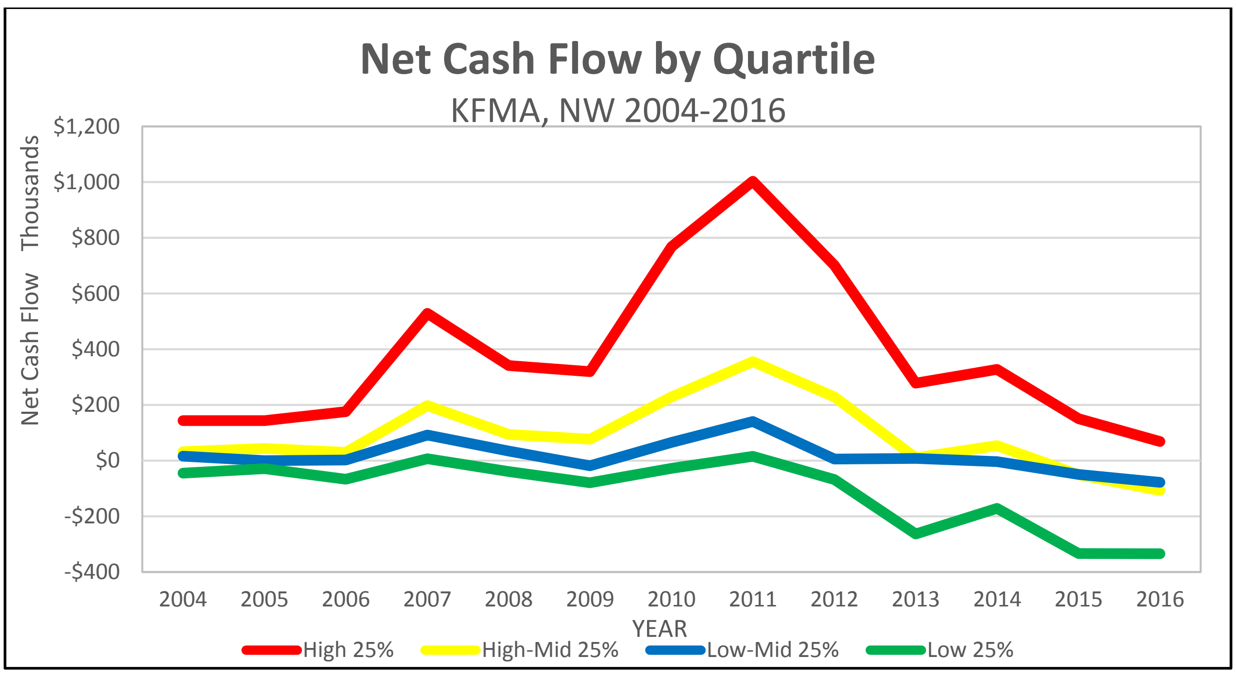


Figure 1

Figure 1 shows the High 25% Quartile as red line with two peaks, one in 2004 at $528,997 and a second in 2011 at $1,003,108. This level of net cash flow was the driver for more than tripling of land values in Northwest Kansas and a volume of machinery purchases unseen since the 1970's. It is important to note that there was only one substantial peak of income realized in 1973 whereas this most recent agricultural boom cycle had four excellent years (2007, 2010, 2011 and 2012…three in a row!) out of six from 2007 through 2012 for the High 25% and High-Mid 25% Quartiles. The bust cycle for all Quartiles of Net Farm Income began in 2013 and continues through 2016. It is possible that the High 25% will experience some improvement in 2017, and the KFMA, NW average should improve a bit over 2016, but the Low 25% and Low-Mid 25% will continue to struggle with negative net cash flow.

It is important to note that the High 25% farms continue to show a positive cash flow of $68,564 in the 2016 analysis, where the High-Mid 25% and Low-Mid 25% are reporting two consecutive years of negative cash flow. The Low 25% has experienced negative cash flow for five of the most recent years of the 13 years displayed, accumulating losses of -$1,169,74. These are the farms experiencing severe financial stress and as we will see later, are not necessarily the smaller farms.

Value of Farm Production (VFP) is a measure of accrual revenue generated for a farm. Those KFMA, NW farms included in the analysis from 2004 through 2016 are summarized by quartile of Net Farm Income and displayed in Figure 2. The dashed line running near the High-Mid 25% is the average for each of the years displayed. The High 25% farms have experienced the steepest nominal decline in VFP from a peak of $2,538,23 in 2011 to $1,247845 in 2016, a 50% reduction. High-Mid 25% farms have declined the most by percentage, losing 56% from $1,067,974 in 2011 to $460,371 in 2016. The most curious aspect of Figure 2 is the substantial increase in VFP in the Low 25% quartile. Low 25% quartile farms averaged a VFP of $331,962 in 2012, which is only 29% of the KFMA, NW average for that year. Compare 2016, where the Low 25% quartile is reporting VFP of $964,086 which is second only to the High 25% quartile. What is going on? It has been observed over the past three years a steady increase in the number of large operations that shifted from the High 25% to the Low 25% quartile. Anecdotal contributors to this shift is stubborn, storage delayed marketing of crops into consecutively lower price levels as we wind down commodity prices. In other words, no risk management strategy. Also some of these farms were cattle feeding operations without risk management strategies and the losses in 2014 – 2015 were disastrous.

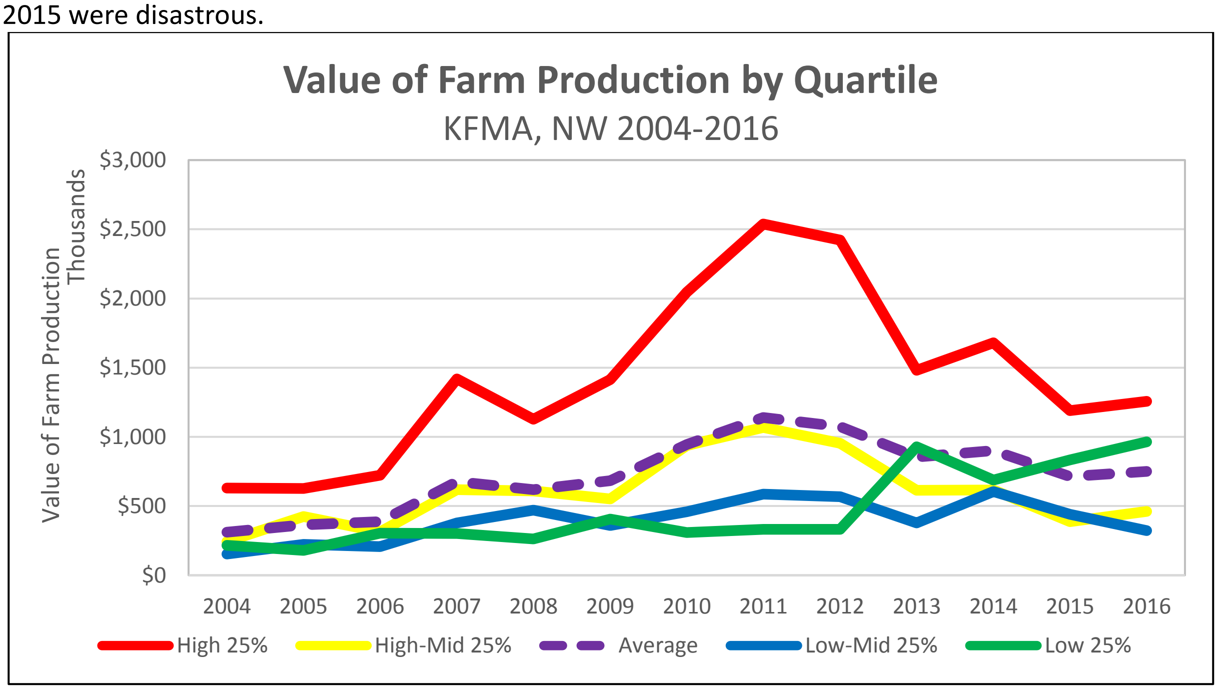


Figure 2

Total cash farm expenses are displayed by quartile in Figure 3. Note how the High 25% and High-Mid 25% operations have reduced their cash expenses. Cash expenses for High 25% operations climbed to $1,507,900 in 2012 and declined to $944,113 in 2016, a 37% reduction in 5 years. Compare that to the Low 25% quartile. The Low 25% quartile increased from an average total cash expense of $306,832 in 2012 to $1,000,232 in 2013 and continued to increase to $1,038,708 in 2016. Note the shift in 2013 between High 25% operations where total cash expense dropped from $1,507,900 to $1,016,424 with the increase in total cash expense experienced by Low 25% farms. This shift from High 25% to Low 25% quartiles reflects the initial phase of the farm economy bust cycle among KFMA, NW farms. What is very concerning is that these same Low 25% farms continue to spend more on total cash expense through 2016. All other quartiles of farms in KFMA, NW have worked with varying degrees of success at reducing their cash expenses. These Low 25% farms are prime candidates for three consecutive years of debt restructuring. Will the bank examiners allow a fourth year?

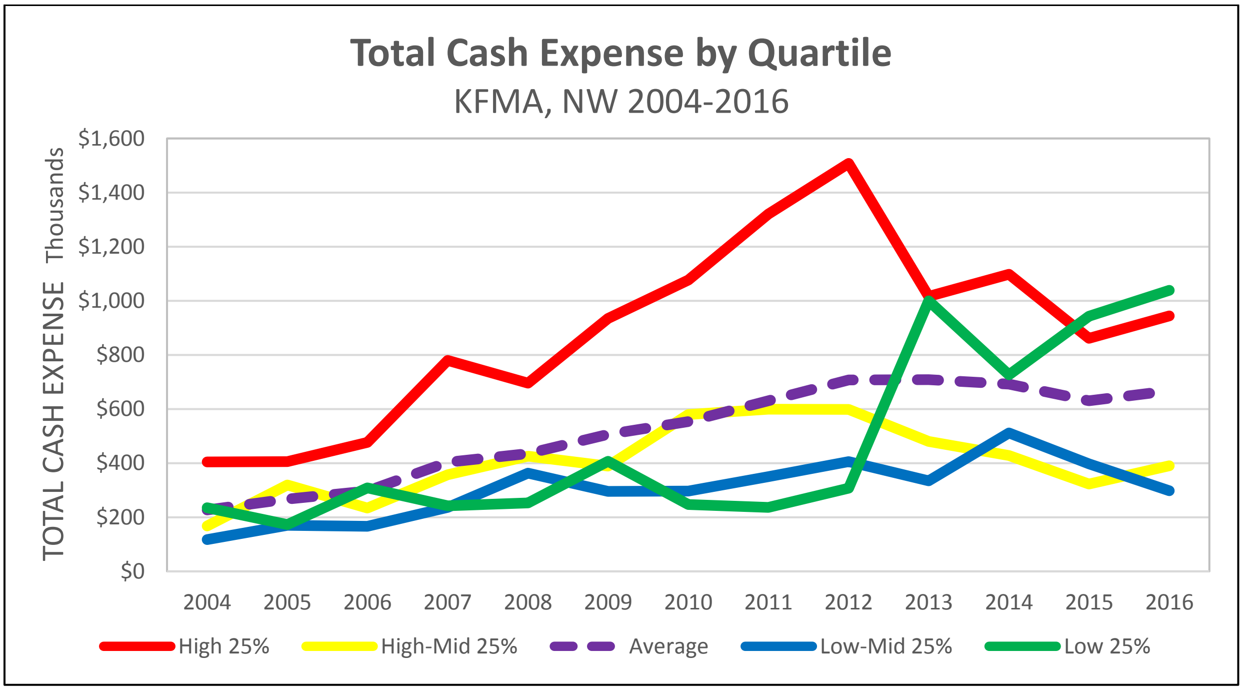


Figure 3

How well do KFMA, NW farms manage their finances outside the farm? Net Non-Farm Income is simply non-farm income such as wages, rent, interest and dividends, retirement funds, and other non-farm income sources minus family living, income and social security taxes, and non-farm investments. Net Non-Farm Income is typically a negative value since the non-farm income sources rarely exceed the family living and income taxes. The resulting shortfall is compensated from Net Farm Income in the form of withdraws from the farm account. Historically, KFMA, NW has displayed the Non-Farm income and expenses as an average for the Association. Net Non-Farm Income for 2014 – 2016 is shown by quartile of Net Farm Income in Figure 4. Note that the High 25% farms household increased their draw from Net Farm Income each year from $101,577 in 2014 to $138,925 in 2016, a 37% increase. The concern here is that High 25% farms might be working to reduce their cash farm expense, but they are not as successful at lowering their household expenditures. The same is true of the Low 25% farms. The household draw from Net Farm Income increased from $40,347 in 2014 to $71,440, which is a 77% increase. The High-Mid 25%, Average, and Low-Mid 25% bars in the chart show a decrease in household draws of -55%, -4%, and -55% respectively. These net changes can come from increasing Non-Farm income by taking a job off the farm for additional income or to increase income (add wages) along with reducing the cash outflow for health insurance premiums (employer sponsored health insurance). In many households, health insurance premiums have moved to the largest single category of family living expense, surpassing income and self-employment taxes which has been historically the largest item of non-farm expense.

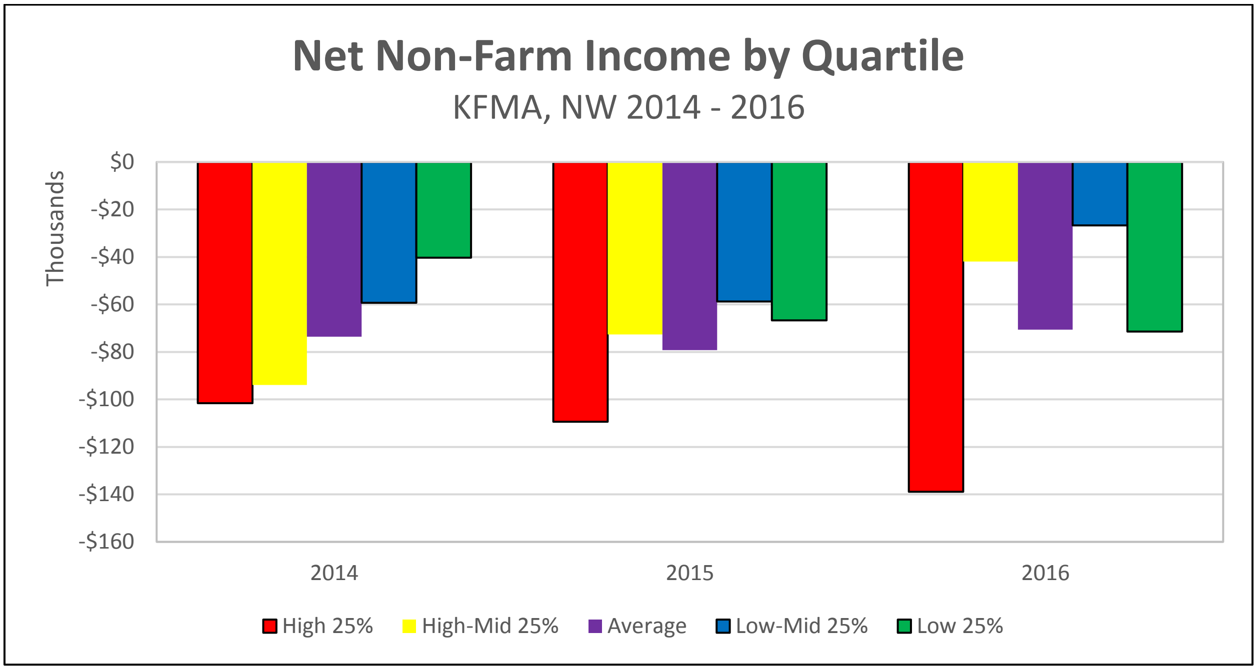


Figure 4

All the aspects of the current farm economy down turn discussed in this article influence the resulting decline in financial stability and stamina on KFMA, NW farms. Working capital as a % of Farm Cash Expense are charted for the years 2004 – 2016 in Figure 5. All quartiles have experienced declines, but none as steep as the High-Mid 25% farms. The High-Mid 25% farms enjoyed a Working Capital as % of Cash Farm Expense of 108% in 2014, or about 13 months of cash expense reserves to only 20% in 2016, which is only enough Working Capital to make it almost to St Patrick's day or 2.4 months. The High 25% farms enjoyed Working Capital in excess of one year's cash expenses from 2011 through 2015, peaking at 121% or 14.5 months, only to drop to 88% or 10.5 months in 2016. If these declines in liquidity continue, debt restructure will begin to erode the equity base of KFMA, NW farms. If the erosion of liquidity continues in the High 25% farms, the cash that has been sitting on the sidelines to support land values will disappear and land value declines could accelerate.

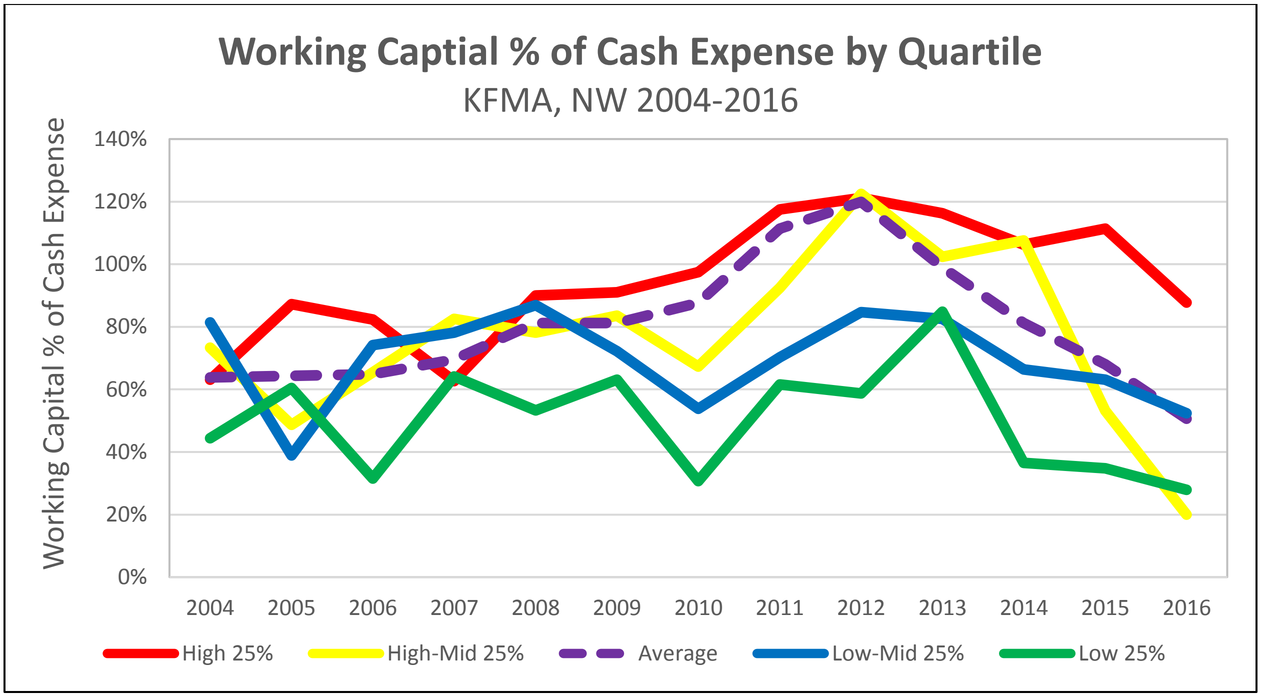


Figure 5

Take Home Points from where we have been:

- KFMA, NW farms that are the most profitable since 2013 have focused on cost containment first. This is not to say they sacrifice productivity; it is cost per unit of production cost containment that counts.
- Marketing opportunities over the past three years have been infrequent and seldom realized. The persistent wide basis for staple crops of wheat and corn have been the primary contributor to reduced farm revenue generation (VFP) for KFMA, NW farms. Cow-Calf operations were spanked in 2016 with lower calf prices in response to the draconian losses in the feedlots in 2014 – 2015.
- Household expenditures and lifestyle choices are difficult to pull back after such good "boom" years within recent memory. Larger operations seem to have a more difficult time lowering expectations on lifestyle.

The present: Prospects in 2017 are improved slightly.

- Cost containment continues to improve efficiency.
- Record fall crop production, especially corn, is going to provide breathing room for lower cost per unit farms.
- Basis up to the time of writing this article has not been as oppressive as 2015 and 2016. This is a positive for most of KFMA, NW farms since it indicates that we have found a way to export our surplus instead of depending on regional feedlot and ethanol consumption exclusively.
- Cow-calf and feedlot operations have enjoyed more balanced and potentially profitable market prices in 2017. Beef export demand has been strong and with some continued success in exports, could contribute to improved producer profits. Feedlot operations need to be very

careful of bidding all their *potential* profits back into replacement calves. But that can turn into a bonus for Cow-Calf producers.

- Inputs for seed and fertilizer have finally started to back down. Herbicides are a challenge because the effectiveness has deteriorated due to resistant weeds and grasses. Some producers have decided to return to tillage methods of summer fallow. This is the result of landlord refusal to share the cost of a key yield increasing input of no-till, herbicides.

Concerns going forward:

All these improved prospects will only buy us time to survive another year in some cases. What has this KFMA Economist worried, and several bankers I interact with, is the likelihood of returning to "normal" (meaning dry weather) and yields that will be ½ of 2017 levels. When this happens (not if, but when) and if prices continue at sub $3.50 corn and $4.00 wheat, the financial stress will go from a bad cold to pneumonia in Northwest Kansas. Keep doing the right things:

- Know your cost of production by enterprise. Using planning budgeting and then follow up with measuring actuals to determine follow-through in cost management. Adequate records that can help you measure your costs and benchmark them against other farms similar to yours can be critical. Consider participating in your regional Kansas Farm Management Association to assist you in providing this important management tool.
- Producers will have to continue to push for cost per unit improvements. Several producers I work with are attempting to renegotiate their cash and share lease arrangements. Getting landlords to pay an appropriate share of the herbicide costs is critical if you are going to continue with no-till. If that doesn't work, consider working the landlord share down to a level that you, the tenant, can afford to cover all the input costs yourself. That could move share rents from 1/3 – 2/3 to 1/5 – 4/5 for some dry land arrangements in Northwest Kansas….
- Continuing to negotiate for lower seed, fertilizer, and herbicide cost with crop input sources. Don't be afraid to travel to get inputs. Find the competition if your locals are not competitive…
- Equipment maintenance will need to move to the farm whenever possible, by extending the life of your equipment without replacement, or looking for "bargain" used equipment will be the successful strategy for moderate to larger sized farms. Remember those nice shops we built during the boom years and the bonus depreciation that we used? Now is the time to get some return on that investment. Very large acreage farms may be trapped into continuing steady equipment replacement strategies due to their critical time constraints in season and the extreme complexity of their high technology equipment. Your dealers will thank you….

To sum it all up, we are in a very traditional, and predictable farm economic cycle. Booms, the big ones, run on approximately 30 year cycles: World War 1, World War 2, 1970's and 2010's. All of these boom cycles were followed by bust cycles and then nearly 20 years of treading water. We are in the bust cycle and we will wash out another crop of inefficient farms. The larger efficient farms will get larger, the moderate will hold on, and the smaller ones will subsidize their lifestyle with Non-Farm Income and frugal living. This is very predictable historically, but every generation seems to need to re-discover this phenomenon for themselves.

A Few Fertility Management Issues/Opinions

Dale Leikam, Leikam AgroMax

The cornerstone of any well designed fertility program is a sound soil testing program. Soil testing is essential for making wise fertility program decisions. Without soil test information for each field, or portions of a field, the development of an efficient fertility program is severely hampered. A key to developing the greatest value of soil testing is to recognize that a single soil sample/test from a field has only limited value since soil test values may vary year-to-year. The real value is the development of a soil test history so that trends can be evaluated and acted upon. Unfortunately, large crop acreages have little, if any, soil test history. And providing a fertility history is really what soil testing does best.

The final product of soil testing is not a specific prescription for the amount of fertilizer to apply to a specific field. The product of soil testing is an additional piece of important information to use when developing a farmer/field/situation specific fertility program. Recommendations should include more than just a suggested application rate – application method and timing are equally important. There are several steps involved in developing a fertility program for a specific farmer/field utilizing soil testing:

1. Collecting a good sample (person sampling should be a trained professional)
2. Proper care of the sample after collection (contamination, microbial activity, etc.)
3. Laboratory chemical analysis (appropriate tests, quality control, service)
4. Interpretation of analytical result relative to historical research base
5. Integrating interpretation to fit specific farmer/field goals/objectives (fertility program)

Following the actual soil test analysis by the laboratory, the results must be interpreted to be of any value. For nutrients such as P, K and/or Zn, soil testing generally provides an index of the relative ability of a soil to supply a nutrient to the crop – not the amount of available nutrient present in the soil. For these nutrients, what soil testing does best is provide an estimation of the probability of obtaining an economical response if that specific nutrient is applied to the crop. Secondly, it offers a long-term approximation of the percent of maximum yield that will be realized if the nutrient in question is not applied. And while it is widely believed that soil testing accurately predicts the specific rate of a nutrient (e.g. P, K, Zn) to be applied for optimum crop production in a specific situation - it really doesn't.

For N, S and Cl in the Great Plains, the soil test does estimate the actual amount of plant available nutrient in the sample depth submitted to the laboratory. These nutrients (nitrate-N, chloride-Cl and sulfate-S) are present as anions in the soil solution and are mobile with soil water. As a result, it is important to sample deeper in the soil profile than for other nutrients that are generally immobile in the soil (e.g. P, K, and Zn). Samples submitted to the laboratory for these mobile nutrients should represent the top two feet of soil at a minimum.

Sound fertility programs depend on a comprehensive soil testing program, accurate and appropriate procedures, reliable guidelines based on long-term research and knowledge of how to refine guidelines into efficient and profitable fertility programs.

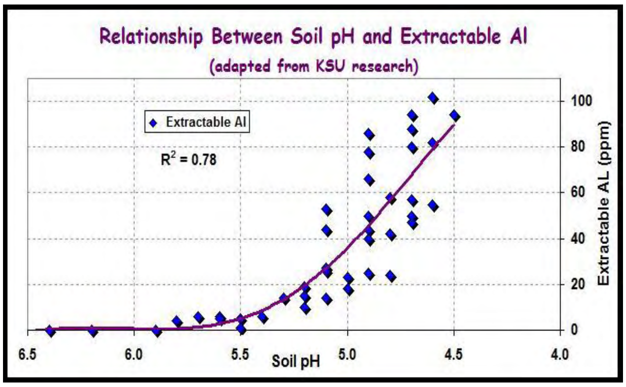
Soil Acidity (pH) Management

Low soil pH can severely reduce plant growth and correcting soil acidity problems may have the highest priority. For much of the Great Plains soil acidity has not historically been much of a concern since soil pH values were originally higher than in areas further east. Over the past several decades, however, change has occurred in certain important hard red winter wheat areas. In the 1970’s and 1980’s, extreme soil acidity developed in parts of southern Kansas and northern Oklahoma and drastic yield reductions occurred. Soil acidity was generally thought to be of no real concern in this area and soil pH was not adequately monitored. More recently, low soil pH values have become more common in other areas of the Great Plains, even the western areas of the Great Plains.

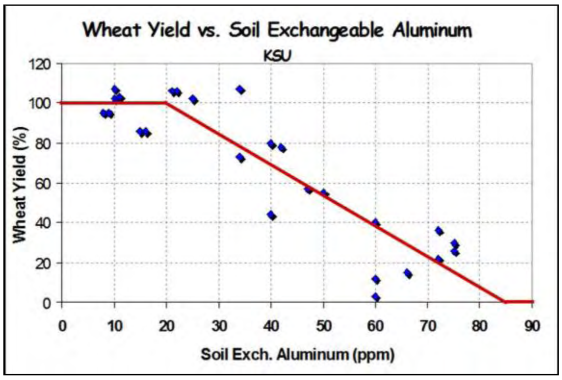
The application of nitrogen fertilizers along with N from soil organic matter, manure and plant residues results in residual soil acidity. When ammonium N is converted to nitrate N by soil microbes, the formation of residual soil acidity results. Anhydrous ammonia has been blamed for much of this soil acidity, but all N fertilizers — including urea, ammonium nitrate and UAN solution — result in the same amount of residual acidity at equivalent N application rates. Ammonium sulfate is more residually acidic per pound of N applied as other N sources. Also, as long-term no-till systems continue to be adopted; monitoring soil pH in the surface 2-3 inches will become more and more critical since the residual acidity of broadcast N applications accumulates in the surface 1-3 inches of long-term no-till systems.

The yield damaging effect of low soil pH on crop growth and development is generally from aluminum toxicity. As the soil pH falls below 5.5, the potential for aluminum containing soil minerals beginning to dissolve into soil solution in some parts of the field increases. And as soil pH falls below 5.0, soil solution aluminum levels increases dramatically. The Figures below summarizes KSU research and illustrates how soil pH influenced soil water Al concentration and potential wheat grain yield.

Soil pH Effect On Wheat Yield



Soil Aluminum Effect On Wheat Yield



Soil acidity is easily corrected with liming. However, lime application rates needed to correct the soil pH (increase pH to 6.5-6.8) are often very high. Also, economical sources of lime are often not available in the most of the Great Plains. As a general rule, if the soil pH is less than 5.5 and 25% of the lime required to bring the pH up to 6.8 is applied (most generally the normal lab recommendation), the resulting soil pH should increase to about 5.5 and little yield loss will occur. Keep in mind, however, at reduced rates lime will need to be applied more frequently. Lime applied at 25% of the recommended rate should keep the soil pH high enough to alleviate aluminum toxicity for a couple of years, but fields should be carefully monitored to prevent yield loss. Applying about 50% of the lime required to increase soil pH to 6.8 should result in a soil pH of about 6.0.

Another practice proven to be helpful in managing soil aluminum toxicity problems are drill-row applications of 30-40 pounds of $P_2 0_5$ with wheat seed. When phosphate fertilizer is placed with the seed, relatively insoluble aluminum phosphates form which takes the soluble Al out of soil solution in the area of the developing seedling. The seedling root system can then develop normally. Keep in mind that soil acidity has not been neutralized and lime or P fertilizer application will be necessary for the next crop.

Nitrogen Fertility Management

Nitrogen is the nutrient with the highest potential for limiting profitable crop production. Since N is a constituent of chlorophyll, the green pigment allowing plants to convert the energy in sunlight into carbohydrates, a shortage of available N has wide ranging effects on crop growth and development. Nitrogen is also an essential constituent of proteins, nucleic acids and many other plant components and processes.

For wheat, deficiency symptoms of N include reduced root growth, slowed development, smaller leaf size and reduced tillering. During the reproductive development stages, N deficiencies in wheat adversely affect spikelet formation, floret formation, kernel fill and result in reduced grain protein. Adequate N must be available to the growing wheat plant during all phases of plant development. The most obvious visual indication of N deficiency is the lack of dark green color, especially the lower leaves. In small plants, the whole plant will have a light green color while in older plants the lower leaves will turn yellow and die from the tips back. Another indication of N deficiency is low grain protein.

In addition to potential discounts when marketing the crop, wheat grain protein below about 11.5% likely indicates that adequate N was not provided for optimum grain yield. Hard red winter wheat with a protein content of 12.0% will require a total of about 2.4 pounds of available N per bushel of production. Keep in mind that these N requirements need to be met by both soil and fertilizer N sources. This includes residual profile N, N mineralized from soil organic matter, credits from previous manure application, and N from previous legume crops. A suggested N rate recommendation for Hard Red Winter wheat is:

N Rec (lbs. N/A) = (Yield Goal x 2.4) - (2 ft. Nitrate-N) - (10 x % OM) – (Other N Credits)

For winter wheat, much of the root system develops in the fall — a time when a relatively small amount of vegetative dry matter accumulates. Fall root system development may be greatly reduced if the amount of available N in the fall is inadequate. Well developed, vigorous and deep root systems reduce the potential for winter injury and increase water use efficiency. The adoption of no-till systems has resulted in increased need for a portion of the N fertility program (30-40 lbs. N/A) to be applied at or before planting. This is also true for row crops in reduced/no-till systems.

Typically, winter wheat recommendations call for topdress N to be applied by jointing, but there are sound reasons to not wait this long. If topdress applications are made late, near or after jointing, and sufficient precipitation is not received to move the applied N into the root zone, the applied N will be positionally unavailable and yields will suffer. On the other hand, waiting until jointing to make top-dress applications also exposes producers to the risk of not getting the required N on until well after jointing in the event of a wet spell — or possibly not getting it applied at all. Further, equipment traffic in wheat fields causes minimum damage if applications are made early. After jointing, the stem below the joint may be broken by application equipment resulting in tracks that remain through harvest and increased susceptibility to disease.

At a minimum topdress N applications should be in the root zone by jointing. While topdress N applications are sometimes referred to as "foliar" applications, topdress applied N is not taken up through the leaves, it is moved into the root zone with precipitation and taken up through the roots. The key point for topdress N applications is to get it on early. All too often, topdress applications are made too late, and production efficiency and profitability suffers.

For corn, more recent research has shown that modern hybrids require more N later in the season than older genetics. In fact, it is suggested that delaying a significant portion of the total N program until brown silk may is beneficial for high yield potential situations. This is contrary to what was thought twenty years ago. Keep in mind that these late applications will only be effective if they are moved into the root zone with rainfall or irrigation.

.

Phosphorus Fertility Management

Wheat and corn are very responsive to fertilizer P applications on soils that do not provide adequate amounts of this essential nutrient. Phosphorus is second only to nitrogen as the nutrient that most commonly limits crop growth and development. Across the Great Plains region, there are large acreages of crops that do not receive adequate fertilizer P, and consequently, profitability is sharply reduced. For some fields, applying adequate fertilizer P is more important than fertilizer nitrogen. About 0.5 pounds of P_20_5 is removed with each bushel of wheat grain and about 0.34 pounds of P_20_5 with each bushel of corn grain.

Phosphorus is generally considered immobile in soils and stays where it is placed — it does not move with water to any great extent. In areas/situations with deeper tillage and/or higher P soil test index values, broadcast applications have performed well in the past and will continue to do so. These applications should be made prior to the deepest tillage operation. However, if a producer is contemplating a move to shallower and/or less frequent tillage, some thoughts should be given to some form of band application. There has been much research documenting the generally improved effectiveness of band P applications as compared to broadcast. Even in areas of higher P soil test index values and/or deeper tillage, if there is a difference between application methods, it will tend to favor band applications.

For no-till systems it has generally been suggested that all P applications be band applied since broadcast applications would not be expected to move into the root zone. As a result, fertilizer P applications have necessarily been made at or before planting. Unfortunately, this has sometimes resulted in fairly low rates of fertilizer P being applied because of logistical/equipment issues as compared to past broadcast P applications. As a result, P soil test values often fall into the low range which may reduce yield potential in the longer-term. However, for long-term no-till systems, it is possible that surface broadcast applications will be much more effective than in traditional production systems that included tillage –

especially in irrigated situations. Because of a change in soil moisture content and root development near the soil surface immediately below the residue, crop root uptake of shallow P would likely be better. Band P applications are still desirable if possible, but broadcast P applications would seem to be a potential complement to band P applications systems.

Maximum Seed Placed Fertilizer

Suggested Maximum Rates of Fertilizer to be Applied Directly With Seed

(Corn and Small Grains)

	Pounds N $+K_2O$* (No urea or UAN)	
Row Spacing in Inches	Medium to Fine Textured Soils	Sandy or Dry Soils
40	6	4
30	8	6
20	12	8
15	16	11
12	20	14
10	24	17
6-8	30	21

Reduce salt rates 30% for grain sorghum.

No seed-placed fertilizer is recommended for soybeans, sunflowers, field beans, or sugar beets.

Should P application rates be reduced if the needed nutrients are band applied? In my opinion, the answer is 'No'. The P fertility program should include long-term P application rates that build or maintain P soil test values at or above the critical value. And while band applications are generally desirable in areas with shallow/minimal tillage, including broadcast P applications will work well if the fertilizer P is thoroughly incorporated and possibly for long-term no-till systems. While P application rates should not be reduced simply because band P applications are used – if low P application rates must be used, the P should be applied in as efficient manner as possible. Band P applications should be adopted not to save money, but to make money. In general

What about starter fertilizer applications? In general, if starter attachments are available on planting/seeding equipment, I suggest a starter fertilizer be included in the fertility program – regardless of soil test values.

Should I Be Using Fertilizer Enhancement Products?

Over the past 15 years or so, there have been a number of products that have been marketed as ways of improving nutrient use efficiency – mainly nitrogen and phosphorus additives. While there is little research information on some of these products, there are many that have an extensive research base in the Plains. Products with the largest research base include Agrotain (urea, NBPT w/wo DCD), Nutrisphere-N (urea, polymer), ESN (urea, controlled release coating), and Avail (phosphates, polymer). There are also other products being introduced that contain NBPT and certain humic additives that may have research base in other areas.

All of these products have been shown to have beneficial effects on crop yield and/or nutrient use efficiency IF conditions conducive to nutrient loss or reduced nutrient efficiency are present. However, conditions conducive to positive responses are not always present. And none of these products will provide a beneficial response all of the time. Also, keep in mind that there are other cultural/management practices that can be employed to manage potential nutrient losses or inefficiencies. In my opinion, these products are NOT a replacement for management or a way of reducing nutrient application rates. Instead, they should be viewed as insurance for possible inefficiencies that might come up.

Continuous and Diverse No-till Crop Rotations Maximize Soil Health and Profitability

Steven Rosenzweig[1,2] and Meagan Schipanski[1]
[1]Department of Soil and Crop Sciences, Colorado State University
[2] General Mills, Brookings, South Dakota
Contacts: Meagan.Schipanski@colostate.edu
steven.t.rosenzweig@gmail.com

Abstract
Cropping system intensification (reducing the frequency of summer fallow years in crop rotations) has implications for soil health and the profitability of dryland agriculture. The goals of this study were to quantify the effects of intensification on crop yields, fertilizer and herbicide use, profitability, and soil health on working farms and in long-term cropping system experiments. We took soil and plant samples, and gathered 6-year yield and input use histories, from dryland no-till fields from southeastern Colorado to northwestern Nebraska representing every level of cropping system intensity including wheat-fallow, mid-intensity rotations (summer fallow once every 3 or 4 years), and continuous rotations that have eliminated summer fallow through diverse 3 or 4 year rotations. We found that cropping system intensification was positively associated with soil organic carbon, aggregate stability, and fungal biomass, and these effects were robust amidst variability in environmental and management factors. Continuous rotations had 17% and 12% higher soil organic carbon (SOC) concentrations than wheat-fallow in 0-10 cm and 0-20 cm depths, respectively. Aggregate stability in continuous rotations was about twice that in wheat-fallow rotations, and fungal biomass was three times greater in continuous rotations than wheat-fallow, but was not significantly different from mid-intensity rotations. Fungal biomass was positively correlated with aggregate stability. We also found that total and potentially mineralizable nitrogen (N) were 12% and 30% greater in continuous rotations relative to wheat-fallow, respectively, suggesting that internal N cycling was stimulated in continuous systems. Additionally, mid-intensity and continuous rotations had roughly 2 and 3 times more arbuscular mycorrhizal fungal (AMF) colonization than wheat-fallow, respectively, and AMF colonization was positively correlated with plant phosphorus (P) concentration. These results suggest that cropping intensity enhances internal cycling of N and phosphorus (P). Continuous dryland farmers also achieved 60% greater annualized crop production using a similar amount of fertilizer compared to wheat-fallow farmers. Overall, we conclude that cropping system intensification, and continuous cropping in particular, represents an opportunity to achieve more grain production while managing nutrients and weeds with fewer inputs.

Introduction

Wheat-fallow (WF) is one of the dominant dryland cropping systems in the semi-arid Great Plains. No-till farmers in this region often reduce summer fallow frequency from one out of two years (WF), to one out of three or four years (mid-intensity; MID), by rotating winter wheat with crops like corn, sorghum, proso millet, peas, or sunflowers. They may also eliminate summer fallow altogether via continuous cropping (CON).

Are intensified crop rotations more profitable? How do they impact soil health, crop production, and input use? We examined these questions on dryland, no-till farms and long-term cropping system experiments in eastern Colorado and western Nebraska.

Materials and methods

Soil and plant sampling was conducted in 2015 and 2016 on 96 dryland, no-till fields in eastern Colorado and western Nebraska, representing 54 fields from working farms and 42 fields from long-term experiment stations (Fig. 1). Each of three levels of cropping intensity – WF (n=27), MID (n=37) and CON (n=26) – was represented along a potential evapotranspiration (PET) gradient that increased from 1368 mm yr^{-1} in northwestern Nebraska to 1975 mm yr^{-1} in southeastern Colorado. Additionally, two 30-year old Conservation Reserve Program perennial grass plots (30-yr CRP) at the three long-term experiment stations in Colorado were sampled as a reference for comparison with the cropping systems (n=6). Five-year field histories were collected for each field. We collected nitrogen (N) and phosphorus (P) fertilizer use data from working farms for the years 2010-2014 to calculate annualized fertilizer use. All fields were under tilled WF management for several decades prior to implementation of no-till and the current crop rotation. Every field was planted to winter wheat in the fall of 2015.

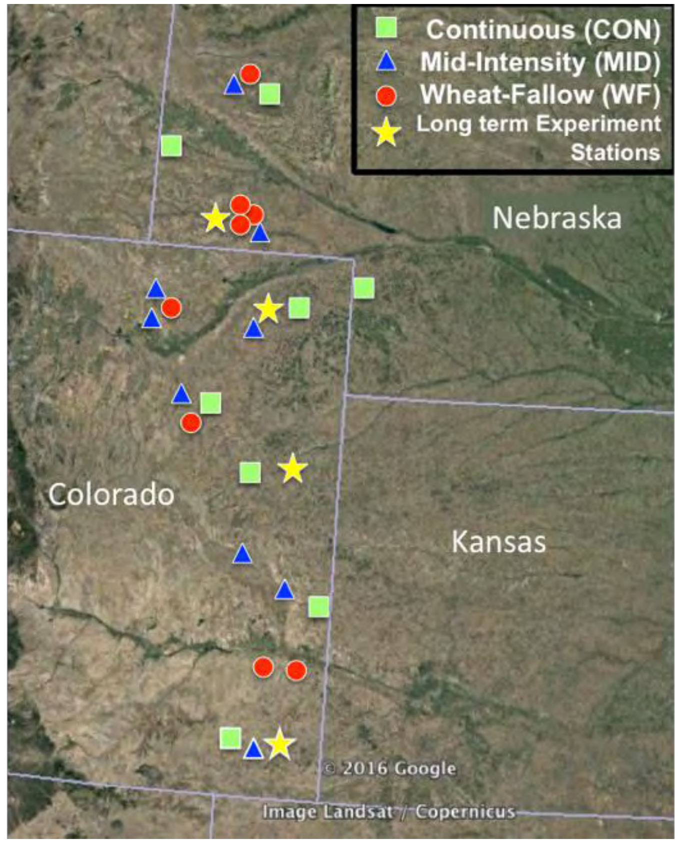


Figure 1. Study locations color-coded by cropping system intensity. Multiple fields per location were sampled, and all three levels of cropping system intensity were present at each of the experiment stations.

In the fall of 2015, soil samples from the 0-20 cm depth were taken using a corer (2 cm dia.) at 4 locations within each field that represented corners of a 10 x 10 m square on each field and geo-referenced for later samplings. At the three long-term experiment stations in Colorado, samples were taken from both a summit and toeslope position in each field to examine if the differences in water availability at upland and lowland positions influenced SOC. Samples on all other fields were taken from a flat topographical position and labeled as a summit.

Additionally, soil and plant samples were taken in spring of 2016 at the same locations as the fall sampling. The spring sampling was to a shallower 0-10 cm depth because the surface soil layers are more likely to be influenced by management practices, and surface soil physical properties, such as aggregation, can confer important functionality on water infiltration and storage. A 5.5 cm slide-hammer corer was used to take one 0-10 cm depth soil sample per sampling location (4 cores per field) to assess water-stable aggregation, bulk density, SOC, total N, potentially mineralizable N (PMN), and phospholipid fatty acids (PLFA). Toeslope positions at the long-term experiment stations were excluded in the spring sampling. Plant samples (taken to coincide with wheat heading) were analyzed for arbuscular mycorrhizal fungal (AMF) colonization of wheat roots, and wheat P concentration.

For each working farm field whose operator was willing to report data (n=42), we collected yearly data from 2010-2014 on N and P fertilizer use, and yields for each crop from 2010 to 2015. No field received compost or manure, and amounts of nutrients applied other than N and P were negligible. The net operating income for each cropping system was calculated using partial enterprise budgets. Fertilizer prices for each year from the National Agricultural Statistics Service were converted to USD/ha of N and P and multiplied by the amount of N and P applied each year in kg/ha to obtain fertilizer expenditures in USD/ha. Amounts of herbicide were converted to acid equivalents (AE)/ha, and multiplied by the 2017 cost of each herbicide in USD/AE calculated from University of Nebraska to obtain herbicide expenditures in USD/ha. Additional expenditures included planting and seed costs, herbicide and fertilizer application costs, and harvest costs, estimated for each crop in each year using custom rates as reported by Colorado State University. Based on results of interviews with the farmers in this study, we assumed that each summer fallow period required 4 separate applications of herbicide. Annualized grain production was calculated by dividing the total amount of grain production from 2010 to 2015 by 6. To calculate revenues generated from crop production, yields were multiplied by crop prices for each crop in each year. Net farm operating income was calculated as revenues minus expenses for each year, excluding fixed costs, and then divided by 5 to calculate annualized net operating income in USD/ha/yr. Additionally, to assess the wheat yield penalty of continuous cropping relative to summer fallowing, we collected wheat yield data from a broader set of fields (5 to 10 fields per farmer) from 2012 to 2015, and recorded whether the preceding year was summer fallow or cropped.

The relationships between cropping system intensity and SOC at 10 cm and 20 cm, aggregate MWD, total N, PMN, AMF colonization, input use, crop yields, and microbial PLFA were tested using multiple linear regression. Models were selected using backwards selection with cropping system intensity as a categorical variable, and all management factors (# years in no-till, # years in rotation, and fertilizer use) and environmental factors (PET, % clay, pH, and slope) until all remaining terms were significant (a=0.05). To account for environmental and management factors as covariates, least-squared means for each level of cropping system intensity were generated and tested for significant pairwise comparisons. P-values less than 0.05 were considered significant. The relationships between % AMF colonization and plant P, and between % AMF colonization and PET, were tested using linear regressions.

Results

Overall, intensified cropping systems had higher SOC, aggregation, and fungal and total microbial biomass, and these trends were robust amidst variability in environmental and management conditions. Additionally, continuous cropping enhanced the N and P supply capacity of soil by increasing total N and PMN, and fostered AMF colonization, which correlated with enhanced wheat P uptake. Farmers practicing continuous cropping achieved greater annualized grain production despite applying similar total amounts of fertilizer and much less herbicide, resulting in higher profitability than WF farmers.

Soil Health

We observed greater SOC concentrations in CON relative to MID and WF rotations at both the 0-10 and 0-20 cm depths (Figure 2). After accounting for PET, % clay, and slope as covariates, SOC concentrations in WF, MID, and CON averaged 1.09%, 1.15%, and 1.28% at 0-10 cm, and 0.92%, 0.89%, and 1.03% at 0-20 cm, respectively. SOC levels were 17% higher in CON rotations than WF at the 0-10 cm depth, but CON was not significantly different from MID. However, SOC concentrations in CON rotations were 16% greater than MID, and 12% greater than WF to a depth of 20 cm. SOC concentrations in CON and the less intensified rotations were about 80% and 70% of those in the 30-yr old CRP at both depths, respectively. SOC concentrations in MID rotations were similar to that of WF at both 0-10 cm and 0-20 cm depths. There were no significant cropping intensity effects on bulk density.

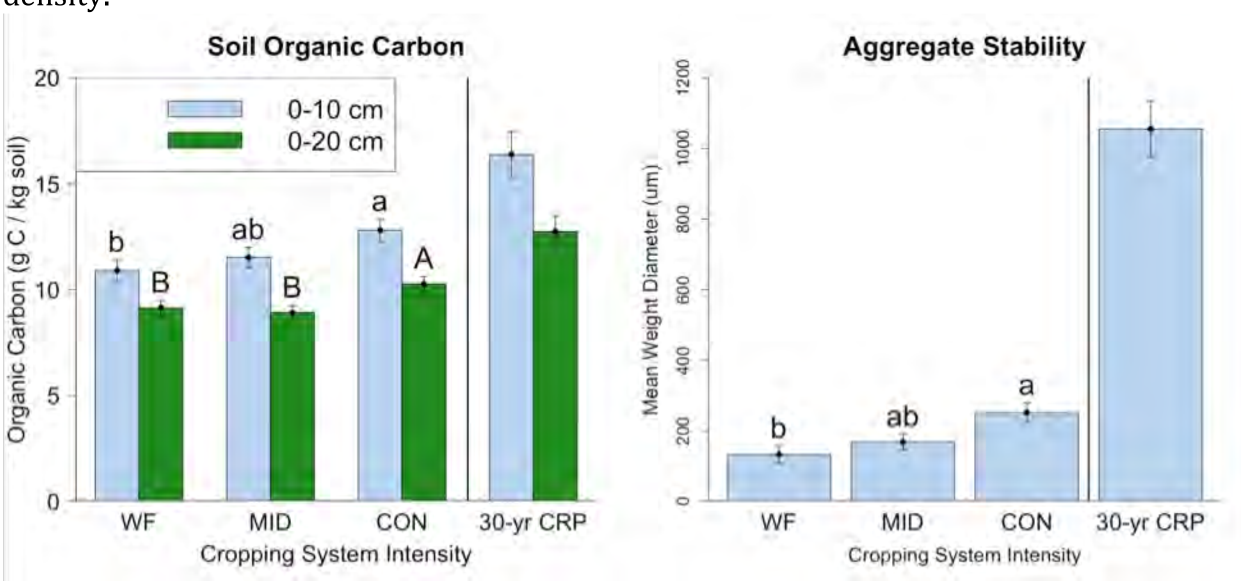


Figure 2. Cropping system intensity effects on SOC concentration in the bulk soil (left) and water-stable aggregation assessed via mean weight diameter in surface soils (right; 0-10 cm depth). Bar heights and error bars represent model generated least-squared means ± standard error. Lower case letters represent significant differences between treatments at the 0-10 cm depth ($p<0.05$), and upper case letters represent significant differences between treatments at the 0-20 cm depth ($p<0.05$). WF=wheat-fallow; MID=rotations with fallow every 3 or 4 years; CON=continuous rotations; 30-yr CRP=Conservation Reserve Program shortgrass prairie strips restored 30 years ago.

Aggregate MWD increased with cropping system intensity (Figure 2). After accounting for PET and % clay, aggregate MWD in CON rotations was about twice as large as those in WF, and aggregate MWD in MID rotations was intermediate of the two. Aggregate MWD in the 30-yr CRP was 4 times greater than CON rotations, and 8 times greater than WF.

Total PLFA concentration (a proxy for microbial biomass), the fungi:bacteria ratio, and total fungal PLFA concentration increased with cropping system intensity. There was no relationship between cropping system intensity and bacterial PLFA concentration. Total PLFA in CON rotations was 35% greater than that of WF, and MID rotations were intermediate between the two. Total PLFA in 30-yr CRP was 1.5, 1.8, and 2.1 times greater than CON, MID, and WF rotations, respectively. CON rotations had three times higher fungi:bacteria ratios than WF and MID rotations were intermediate of the two. Total fungal PLFA was 3 times greater in CON rotations compared to WF, but was not significantly different from MID rotations.

We observed positive effects of cropping system intensity on total soil N and PMN at a depth of 0-10 cm. After accounting for PET, % clay, and slope, total N stocks were 12% higher in CON rotations than WF (p=0.04), but CON was not different from MID. After accounting for % clay and the intensity-by-clay interaction, PMN was 30% higher in CON rotations than WF (p=0.06), but CON was not significantly different from MID.

AMF colonization increased with cropping system intensity, and was negatively impacted by PET. After accounting for PET and the intensity-by-PET interaction as covariates, MID and CON rotations had roughly 2 and 3 times more colonization than WF (p=0.02, p<0.001), respectively. Additionally, CON rotations had 54% more AMF colonization than MID rotations (p=0.01). Wheat aboveground biomass P concentrations positively increased with AMF colonization (R^2=0.16, p=0.03).

Fertilizer and Herbicide Use

Annualized fertilizer use from 2010 to 2014 was similar between cropping system intensities, as a result of smaller amounts of fertilizer applied per crop in CON rotations. Cropping system intensity (p=0.002) and PET (p<0.001) explained 55% of the variability in annualized N fertilizer use. MID rotations applied about 59% more N fertilizer per year (18 kg N/ha/yr) than both CON and WF rotations (p=0.007). In CON rotations, N applied per crop was about 22 and 34 kg N/ha less than WF (p=0.05) and MID rotations (p<0.001), respectively. Annualized P fertilizer use and P applied per crop did not differ by cropping system intensity.

Glyphosate, 2,4-D, and dicamba use from 2010 to 2014 decreased substantially with cropping system intensity (Figure 3). CON rotations used 50% the amount of glyphosate (p=0.07), 20% the amount of 2,4-D (p<0.001), and 32% the amount of dicamba (p=0.03) applied in WF rotations. Additionally, MID rotations used 57% (p<0.01) and 82% (p=0.049) the amount of 2,4-D and dicamba as WF rotations, respectively.

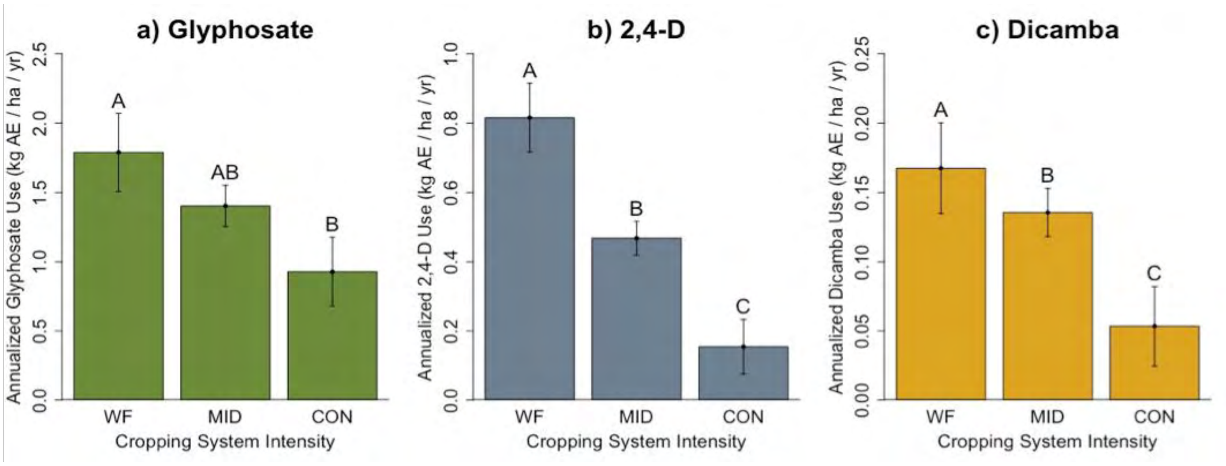


Figure 3. Cropping system intensity effects on acid equivalents (AE) of a) glyphosate, b) 2,4-D, and c) dicamba applied from 2010 to 2014. Bar heights and error bars represent model generated least-squared means ± standard error. Letters represent significant differences between treatments ($p<0.1$). WF=wheat-fallow; MID=rotations with summer fallow every 3 or 4 years; CON=continuous rotations.

Grain Yield and Profitability

Annualized grain yields from 2010 to 2015 increased with cropping system intensity (Figure 4A), despite a wheat yield reduction associated with the elimination of summer fallow (Figure 4B). After accounting for N fertilizer and PET as covariates, MID and CON rotations produced 46% and 60% ($p<0.01$) more grain per year than WF, respectively. We

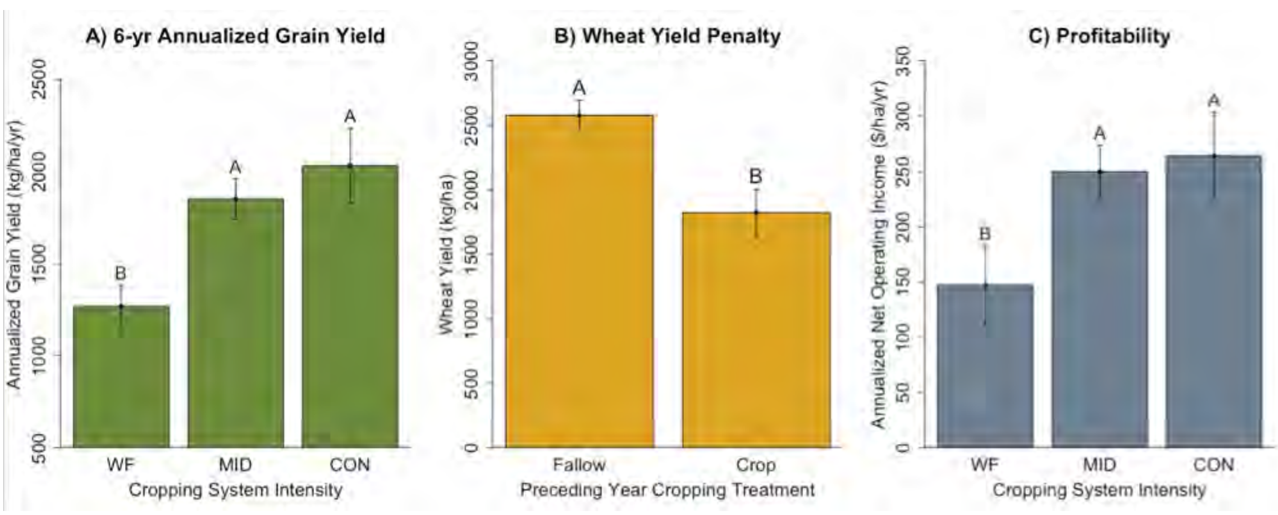


Figure 4. Cropping system intensity effects on A) annualized grain yield from 2010 to 2015, B) continuous cropping effects on wheat yields relative to summer fallow from 2012 to 2015, and C) annualized net operating income in USD from 2010 to 2014. Annualized grain yield was calculated as the total amount of grain production from 2010 to 2015 divided by 6. Annualized net operating income was calculated as the net operating income over the 5-year period divided by 5. Bar heights and error bars represent model generated least-squared means ± standard error. Letters represent significant differences between treatments ($p<0.1$). WF=wheat-fallow; MID=rotations with summer fallow every 3 or 4 years; CON=continuous rotations.

separated all wheat yields into two cropping treatments based on whether wheat was preceded by summer fallow or continuous cropped. After accounting for PET as a covariate, on average across 2012 to 2015, wheat that followed a crop yielded 29% less than summer fallowed wheat (29 vs. 41 bushels on average, respectively; $p<0.001$).

We observed positive effects of cropping system intensity on annualized net farm operating income from 2010 to 2014 (Figure 4C). Cropping system intensity ($p=0.04$) and PET ($p<0.001$) explained 61% of variability in net farm operating income. After accounting for PET, net profits of CON rotations were an estimated 47 USD/ha/yr (80%) more than WF ($p=0.06$), and MID rotations made 42 USD/ha/yr (70%) more than WF ($p=0.08$). There was no difference in net operating income between CON and MID rotations.

Discussion and Conclusions

While WF remains the one of the most common cropping systems in the semi-arid High Plains, this and other semi-arid regions around the world are undergoing a profound transition to intensified dryland cropping systems, and thus it is critical to understand the implications of this transformation. We found different levels of SOC, aggregation, and fungal biomass between different levels of cropping system intensity. Overall, our results suggest that cropping system intensity, increases SOC both directly, through greater C inputs to soil, and indirectly, through effects on microbial communities and aggregation. We observed these relationships to be robust across a wide climatic gradient, and amidst variability in soil texture and management history. These results corroborate others who have found greater aggregation and SOC in more intensely cropped systems, but also shed new light on the central role that fungi may play in C storage in dryland agroecosystems.

Additionally, we found that continuous cropping in the High Plains can increase N retention and cycling and P uptake by plants, mediated by increased associations with AMF. We also found that cropping system intensification enables farmers to use much less herbicide, with continuous farmers using less than half the total amount of herbicide compared to WF. This enhanced capacity to supply nutrients and control weeds in continuously cropped soils enabled continuous dryland farmers to achieve more grain production using the same amount of fertilizers and much less herbicide compared to those practicing wheat-fallow.

Overall, we conclude that cropping system intensification represents an opportunity to achieve more grain production while managing nutrients and weeds with fewer external inputs. Together, these results suggest that the elimination of summer fallow in semi-arid cropping systems has the potential to achieve higher profits, greater crop production, and soil health improvements that will contribute to the long-term success of dryland agriculture.

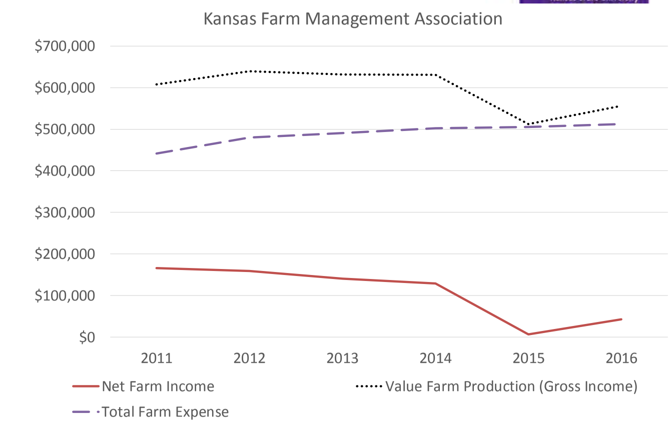
Acknowledgements
This material is based upon work that is supported by the National Institute of Food and Agriculture, USDA, under award number GW16-020 through the Western Sustainable Agriculture Research and Education program #130676020-281 and by USDA NRCS Conservation Innovation Grant #69-3A75-16-002.

Surviving and Thriving in Tough Times

Charlie Griffin, M.S.
School of Family Studies and Human Services
Kansas State University

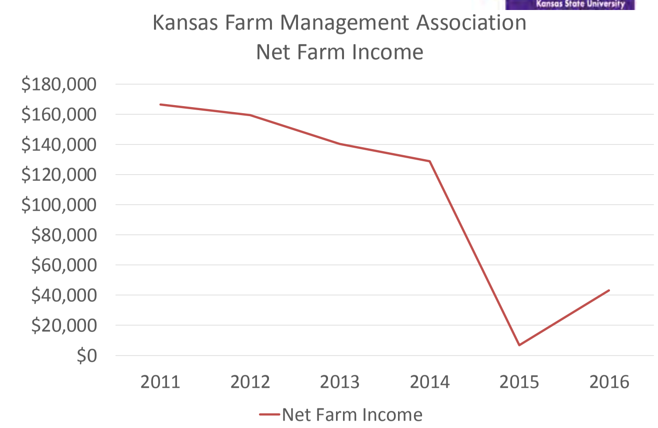
Cover Your Acres Winter Conference
Oberlin, KS

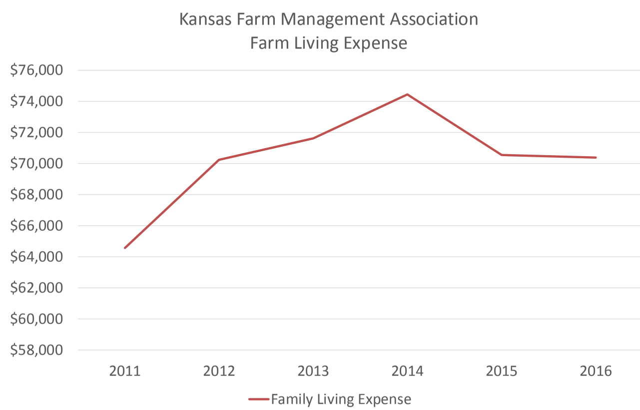
January 16 - 17, 2018

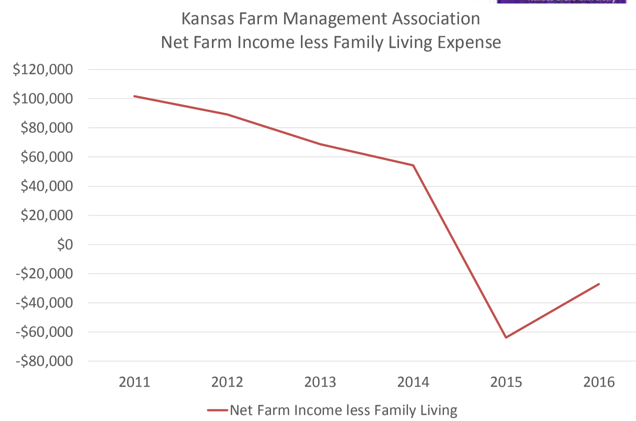


Net Farm Income 2011-2016

Year	Net Farm Income
2011	$166,375
2012	$159,352
2013	$140,356
2014	$128,731
2015	$6,744
2016	$43,161





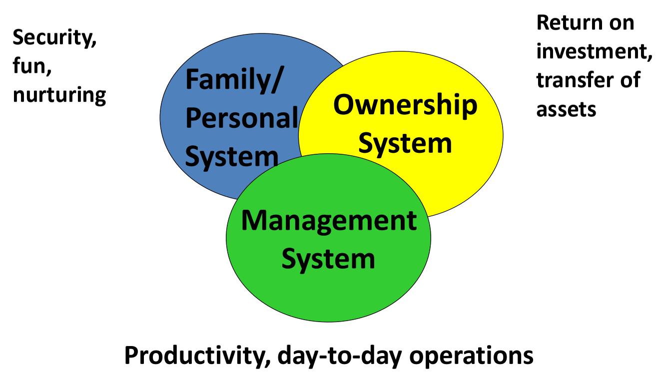


Whatever hits the fan

will not be

evenly distributed.

COMPLEXITY OF FAMILY BUSINESS



The (New???) Farm Crisis is……?

- Individual crisis and transition
  - Both personal and business
- Family crisis and transition
- Community crisis and transition
- Normal life in agriculture??? (High stress)

Elements of Crisis/Disaster

- In general, Crises are:
  - Sudden
  - Short in duration
  - Not prepared for
  - Potentially dangerous
- Responses depend on:
  - The Type of crisis (predictable?, normative?)
  - The Duration of the crisis
  - The person's Prior Experience with crisis
  - The person's Expectations of the crisis situation
  - The person's Resources, Life situation, and Support systems
  - The person's Preparedness (warning? General resilience?)
  - The level of Support the person receives
  - The Behavior of others

Oh, yea, then there's the normal stuff!

CHALLENGES TO FAMILY BUSINESSES

- The separation of authority from ownership and management.
- Issues of unfairness in the successor generation.
- Absence of a shared sense of purpose.
- Communication problems.
- Lack of formal structures and processes that manage decision-making.
- Neglect of individual, family and organizational development.

Common Sources of Farm Family Conflict

- Control
- Transfer of property/ownership
- Division of income…fairness?
- Obligations, debts, and risks
- In-law relations and competing loyalties
- Coping differences
- Decision making

Understanding the Business Life Cycle

- Much more than estate planning!
- Weaving of Family Life Cycle with Business Life Cycle
- Combines: Career Development Plan
  Professional Development
  Retirement Plan

"Hey! C'mon! Hold it! Hold it! . . . Or someone's going to get hurt."

If it weren't for the

STRESS

I'd have no energy at all.

What Help is Needed During Change?

- Information
- Understanding
- Emotional Support
- Financial / Legal / Career / Family Needs
- Problem Solving / Future Planning

- All interrelated and happening simultaneously

Sources of Effective Helping

Who do we turn to in hard times?

- Family
- Friends/Neighbors
- Family Physicians / Ministers
- Business contacts (elevator / banker, etc)
- Bartenders/Hairdressers
- Professional Helpers (Helpers of Last Resort)

Effective Coping Responses

- Open Discussion
- Valuing of Family
- Participation in Professional Organizations
- Use of Outside Experts / Consultants
- Humor
- Faith

Effective Communication

- Who's on the Board of Directors?
- Roles and Responsibilities?
  - Who makes which decisions?
- Meetings/Regular Information Sharing
- Conflict Management
- Rewards and Perks (Positive nurturance)
- Career Development plan?
- Retirement plan?

Valuing of Family

- Vision and Mission Statement?
- What is our purpose?
- What is our most important product?
- Family and business both have high value

Faith

- Optimism and Hope—
- What's your source?

Getting What You Want From Your Family Farm Life

- What is most important about having a farm?
- What do you value about family life?
- What issues do you have with other family members? What conflicts are unresolved?
- What do you want to be different in your relations with other family members?
- What do you want to stand for and preserve as a family?
- What issues does the farm business need to address in the next year, five years, ten years that will significantly impact the family and you?

CONTACT INFORMATION

Charlie Griffin, M.S., Research Assistant Professor
School of Family Studies and Human Services
Programs for Workplace Solutions, A211 Edwards Hall
Phone: 785-532-5510 Email: cgriffin@k-state.edu

Kansas State University
Manhattan, KS 66506

Weed Management Strategies Research Data plus My Philosophy.

Curtis Thompson
KSU Agronomy
(785) 532-5776

Herbicide resistance in KS!

Kochia

- ALS inhibitors
- Triazines
- Glyphosate
- Dicamba
- ALS+Triazine+Glyp+Dica

Palmer amaranth

- ALS inhibitors
- Triazines
- Glyphosate
- HPPD+Triazine+ALS
- HPPD+Triazine+ALS+ Glyphosate????

Controlling kochia and Palmer amaranth.

- ➢Same strategy holds for both weed species.

Controlling kochia and Palmer amaranth.

- ➢Same strategy holds for both weed species.
- ➢If we can keep the weed from ever emerging, we can manage/control them!
- ➢**HOW?**

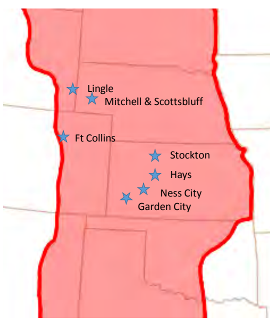
Controlling kochia and Palmer amaranth.

- ➢Same strategy holds for both weed species.
- ➢If we can keep the weed from ever emerging, we can manage/control them!
- ➢**HOW?**
- ➢Soil active herbicide must be in place (incorporated in the soil) when the weed seed germinates
- ➢POST applications should be to small weeds. Smaller the better?

Controlling kochia and Palmer amaranth.

- Same strategy holds for both weed species.
- If we can keep the weed from ever emerging, we can manage/control them!
- **HOW?**
- Soil active herbicide must be in place (incorporated in the soil) when the weed seed germinates
- POST applications should be to small weeds.
- **We need to understand the emergence patterns of both species.**

Kochia emergence experiment, Dille etal.

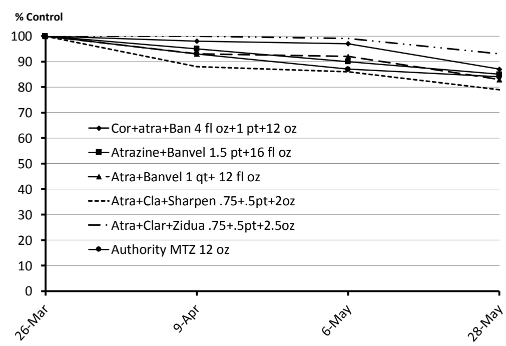


Location	Site
Garden City, KS	crop
Hays, KS	crop & non-crop
Ness City, KS	non-crop
Stockton, KS	non-crop
Ft. Collins, CO	crop dryland & irrigated
Mitchell, NE	non-crop
Scottsbluff, NE	non-crop
Lingle, WY	non-crop

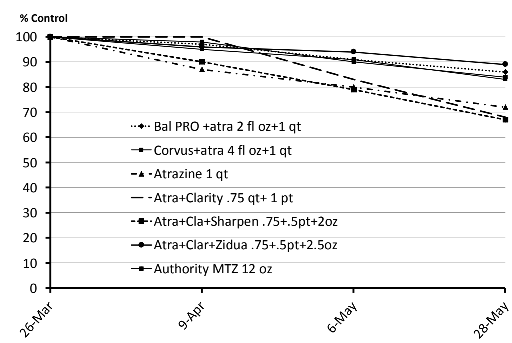
Kochia emergence experiment, Dille etal.

Location & site	Site	GDD to 10% E	Date	GDD to 90% E	Date	GDD Duration 10% to 90% E
Lingle, WY	NC	76	3/21	191	4/10	115
Mitchell, NE	NC	84	3/17	456	5/7	372
Scottsbluff, NE	NC	69	3/15	415	4/29	346
Hays, KS	Crop	238	3/18	365	3/24	127
Hays, KS	NC	137	3/31	173	4/10	36
Ness City, KS	NC	114	3/11	475	4/18	361
Garden City, KS	Crop	283	3/31	1056	5/26	773

Fall herbicides applied Feb 3, 2015 for kochia control, Tribune, KS.

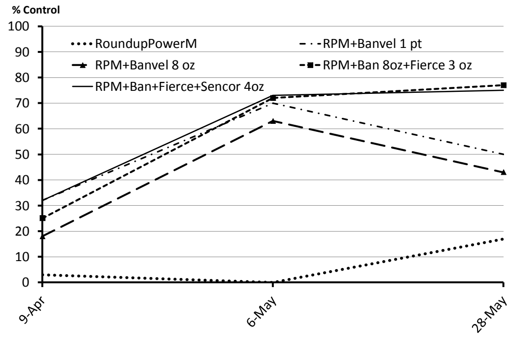


Fall herbicides applied Dec 7, 2014 for kochia control, Tribune, KS.

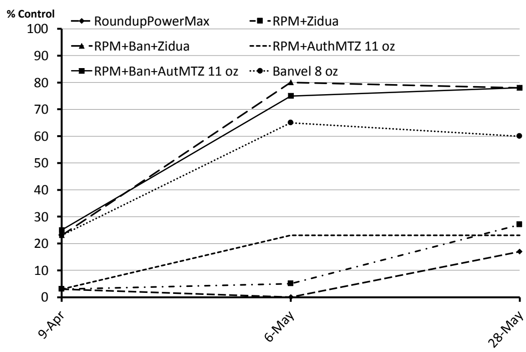


2015 applications made on March 10

EPP/POST herbicides applied March 10,2015 for kochia control, Tribune, KS. Kochia at cotyledon stage

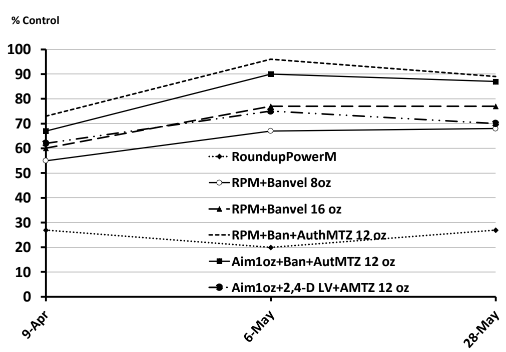


EPP/POST herbicides applied March 10,2015 for kochia control, Tribune, KS. Kochia at cotyledon stage. Value of dicamba!!

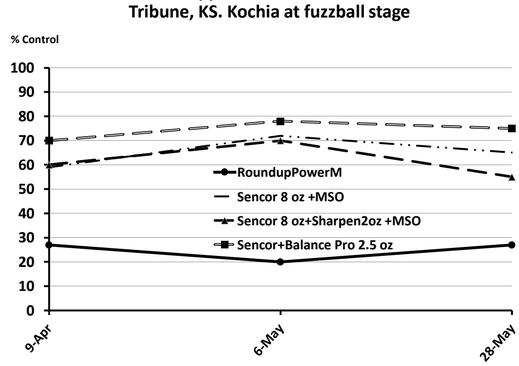


2015 applications made on March 20

EPP/POST herbicides applied March 20,2015 for kochia control, Tribune, KS. Kochia at fuzzball stage



EPP/POST herbicides applied March 20,2015 for kochia control, Tribune, KS. Kochia at fuzzball stage



PRE herbicides for kochia control

- Corn and Sorghum
  - Atrazine (5), *mesotrione (27),* Lexar/Lumax (5, 27, 15), Sharpen (14), Verdict (14, 15)
- Corn
  - Corvus (2, 27), Balance Flexx (27), Acuron (5, 27, 27, 15), Resicore (4, 15, 27), Harness Max (15, 27), Zidua (15), Anthem Maxx (15, 14), Anthem Flex (15, 14)
- Soybeans
  - Authority (14) based products, ie. Authority MTZ (15, 5), Spartan (14)
  - Zidua (15), Zidua PRO (15, 14, 2), Anthem (15, 14) products
  - Metribuzin (5)
- Sunflower
  - Spartan (14) based products

Mesotrione (27) for PRE and POST in corn or PRE to sorghum

- Mesotrione is the active in Callisto and is off patent.
- Generics and Callisto currently are all 4 lb ai/gallon.
- Callisto was > $5 / fl oz
- Current price of mesotrione generics < $2 / fl oz
- Incinerate, BL4, Explorer, Tenacity, Bridle, Willowood Mesotrione and many others!
- $8 to $12 / acre (4 to 6 fl oz) of mesotrione added to a chloroacetamide+atrazine will provide much improved control of broadleaf weeds compared to the chloroacetamide+atrazine alone. Will enhance control of pigweeds, velvetleaf, kochia, and others

Weed control in wheat and wheat stubble following harvest, SWREC Tribune 2017.

Thompson, Schlegel, and Peterson. 1701whtTR

Treatment	Rate		Kochia in crop		Kochia in fallow	
		Appl.	May 9	PreHarv	13 DAT	33 DAT
	Lb / acre	Time	(% control)			
Clarity + 2,4-D/ Clarity+2,4-D+NIS	0.125+0.375/ 0.5+0.5+0.125%	PreJnt Fallow	91	89	88	85
Clarity+Zidua/ Clarity+2,4-D+NIS	0.125+0.106/ 0.5+0.5+0.125%	PreJnt Fallow	93	89	91	89
Clarity+Prowl H2O/ Clarity+2,4-D+NIS	0.125+1.12/ 0.5+0.5+0.125%v/v	PreJnt Fallow	94	96	95	96
Clarity+Huskie+NIS+AMS/ Atrazine+Sharpen+MSO+UAN	0.125+0.23+0.25%v/v+1lb/ 1.0+.045+1%+2.5%v/v	PreJnt Fallow	99	95	100	100
Clarity+Huskie+Zidua+NIS+AMS/ Atrazine+Sharpen+MSO+UAN	0.125+.23+.106+0.25%+1lb/ 1.0+.045+1%+2.5%v/v	PreJnt Fallow	99	97	99	100
Rave+NIS/ Atrazine+Sharpen+MSO+UAN	0.147+0.5% v/v 1.0+.045+1%+2.5%v/v	PreJnt Fallow	95	89	97	97
Rave+Zidua+NIS/ Atrazine+Sharpen+MSO+UAN	0.147+0.106+0.5%/ 1.0+.045+1%+2.5%v/v	Fall Fallow	96	88	92	93
Widematch/ Atrazine+Sharpen+MSO+UAN	0.25/ 1.0+.045+1%+2.5%v/v	FlagLf Fallow	80	89	100	100
LSD (0.05)			4	3	8	5

Fall = Nov 15, 2016; PreJnt = April 12; FlagLf= May 9; Fallow = June 15

Kochia control in wheat stubble with no in wheat crop treatment, SWREC Tribune 2017.

Thompson, Schlegel, and Peterson. 1701whtTR

Treatment	Rate	Appl.	Kochia in fallow	
		time	13 DAT	33 DAT
	Lb / acre			
Clarity+Sharpen+Linex+MSO+UAN	0.5+0.045+0.75+1%+2.5% v/v	Fallow	84	87
Clarity+Atrazine+COC	0.5+1.0+0.5%	Fallow	59	78
Clarity+atra+Sharpen+MSO+UAN	0.5+1.0+.045+1%+2.5% v/v	Fallow	82	87
Gramoxone SL+NIS	0.75+0.5% v/v	Fallow	91	88
Gramoxone SL+atra+COC	0.75+0.25+1%	Fallow	94	91
Clarity+2,4-D+NIS	0.5+0.5+0.125%	Fallow	70	82
LSD (0.05)			8	5

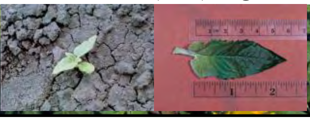
Zidua registration for sunflower, BASF

Zidua registration for sunflower, BASF

- Pyroxasulfone (15) 85% WDG

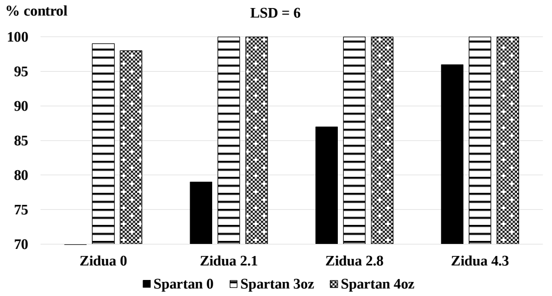
- Rate/texture	Coarse	Medium	Fine
PPlt Surf	1 to 1.5	1.5 to 3	3 to 4
Preemerge	1 to 1.5	1.5 to 3	3 to 4
E.PostV2 to V8	1 to 1.5	1 to 2	1 to 2

- NOTE label says V1 to V8, it's V2 – when first true leaves are 1.5 inches (4 cm) long. Come out in pairs.



Zidua + Spartan for Palmer Amaranth control in Sunflower

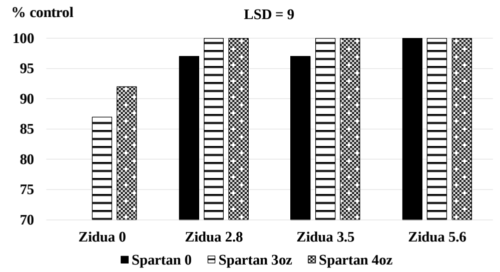
SWREC-Tribune 2008, Thompson and Schlegel



Maximum labeled rate for Zidua on this soil 3 oz

Zidua + Spartan for Palmer Amaranth control in Sunflower

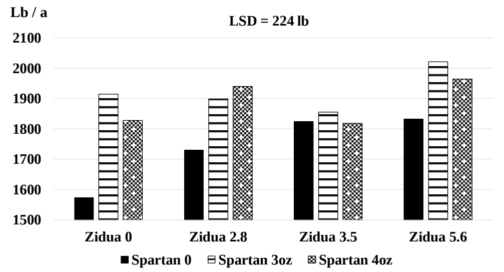
Manhattan 2008, Thompson and Peterson.



Maximum labeled rate for Zidua on this soil 4 oz

Effect of Zidua + Spartan on Sunflower Yield

2008, Colby, Hays, Manhattan, Minot ND, and Highmore SD.



Maximum labeled rate for Zidua on these soils is 3 to 4 oz

Palmer amaranth management and why is Palmer such a problem??

Using the same approached of PRE herbicides for control, when does Palmer amaranth emerge?

- **March?**
- **April?**
- **May, June, July, August, September**
- **NOT DOCUMENTED??**
- **Heat unit driven!**
  - **Emergence and growth rate will be different in April than in June.**

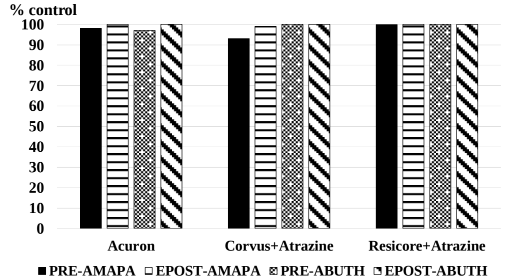
PRE herbicides for Palmer amaranth control

- **Corn and Sorghum**
  - **Atrazine (5), *mesotrione (27),* Lexar/Lumax (5, 27, 15), Sharpen (14), Verdict (14, 15), Chloroacetamide+atrazine (15, 5), Dual II Mag type (15), Degree type (15), Outlook type (15)**
- **Corn only**
  - **Corvus (2, 27), Balance Flexx (27), Acuron (5, 27, 27, 15), Resicore (4, 15, 27), Harness Max (15, 27), Zidua (15), Anthem Maxx (15, 14), Anthem Flex (15, 14)**
- **Soybeans**
  - **Prefix (14), Valor (14) or Authority (14) based products, ie., Spartan (14), Fierce (14, 15), pendimethalin (3)**
  - **Zidua (15), Zidua PRO (15, 14, 2), Anthem (15, 14) products, S-metolachor/metolachlor (15), Warrant (15), dimethenamide (15)**
  - **Metribuzin (5)**
- **Sunflower**
  - **Spartan (14) based products, S-metolachor/metolachlor and Zidua(15), BroadAxe (14, 15) pendimethalin, trifluralin, and Sonalan (3)**

Overlapping residuals to extend control of later emerging Palmer.

- A soil active herbicide is added to an effective postemergence herbicide program.
- A soil active PRE herbicide program is delayed to Early Post to extend residual control BUT must be effective to control the emerged weeds. Risk/reward.
- Sometimes a PRE treatment is not able to be made because of wind, rainfall, or other and the crop emerges.

Effect of PRE and EPOST applied herbicides on weed control 7 weeks after POST treatments were applied (1714corn Thompson/Peterson).



Weed Management in V2 Corn with DiFlexx and Status Tankmixes, 2017

1719corn, Thompson and Peterson.

Treatment	Rate	Palmer	Vele	MoGy	Sunf	ShCn
	Prod. / acre	% control 5 wks after application				
Corvus + Atrazine	4.5 fl oz+ 1 pt	99	100	98	100	100
Corvus + Atrazine + DiFlexx	4.5 fl oz+ 1 pt + 8 fl oz	100	99	99	100	100
Corvus + Atrazine + Status	4.5 fl oz+ 1 pt + 3 oz	100	100	98	100	100
Acuron	2 qt	99	100	98	100	100
Acuron + DiFlexx	2 qt + 8 fl oz	99	100	99	100	100
Acuron + Status	Q qt + 3 oz	100	100	99	100	100
Capreno+Atra+RPM+AMS	3floz+1pt+32oz+8.5lb	98	100	97	100	100
Capreno+Atra+RPM+DiFlexx +AMS	3floz+1pt+32oz++8floz +8.5lb	98	100	97	100	100
Capreno+Atra+RPM+Status +AMS	3floz +1pt + 32 oz + 3oz +8.5lb	97	100	96	100	100
Halex GT+atrazine	3.6 pt + 1 pt	99	99	98	100	100
Halex GT+atrazine+DiFlexx	3.6 pt + 1 pt + 8 fl oz	100	100	99	100	100
Halex GT+atrazine+Status	3.6 pt + 1 pt + 3 oz	99	100	97	100	100
LSD 0.05		1	NS	3	NS	NS

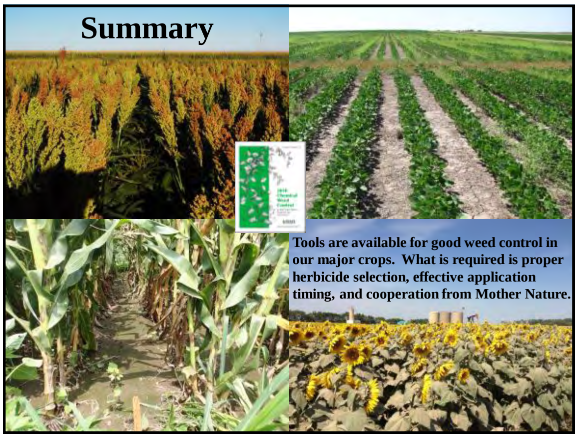
Treatments applied on May 15 to cotyledon-1” Palmer and Coty-2lf Vele

Weed Control in Corn with Harness Max and Comparisons, 2017

1720corn, Manhattan. Thompson and Peterson

Treatment	Rate	Application	Palmer	Vele	MoGy	ShCn
	Prod. / acre		% control 52/14 days after PRE/EPost			
Degree Xtra	3 qt	PRE	100	43	50	63
TripleFLEX	1 qt	PRE	100	60	57	85
Harness Max	2 qt	PRE	100	97	82	93
Acuron	3 qt	PRE	100	100	89	94
Corvus	5.6 fl oz	PRE	95	93	88	100
Resicore	2.25 qt	PRE	100	100	82	97
TripleFLEX + atra + RPM+AMS	1qt+1qt+27oz+8.5	EPost	100	100	95	100
HarnessMax+atra+RPM+AMS	40oz+1qt+27+8.5	Epost	100	100	100	100
Halex GT+atrazine+AMS	3.6pt+1qt+8.5	EPost	99	100	97	100
Resicore+atra+Durango+AMS	1.25qt+1qt+30+8.5	EPost	100	100	100	100
Roundup PowerMax	32 fl oz	EPost	90	95	83	100
LSD (0.05)			3	10	10	24

PRE’s applied on April 25 and Epost May 18 to V3 corn, Coty to 3” Palmer, 1-3” Vele



AGRICULTURE

Visitors to the Monsanto Learning Center see first hand how Monsanto works with farmers to help them grow more with less. The Learning Center uses field based demonstrations to teach systems based agriculture—a combination of genetics, biotech traits and agronomics.

These demonstrations and other research are key drivers to help farmers increase their yields while using less inputs—per unit of output—such as water and fertilizer.

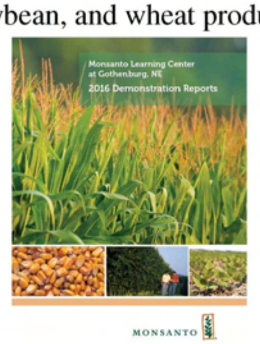
Call To Schedule A Tour.

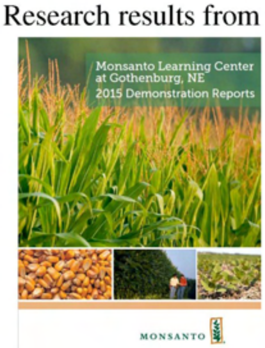
MONSANTO

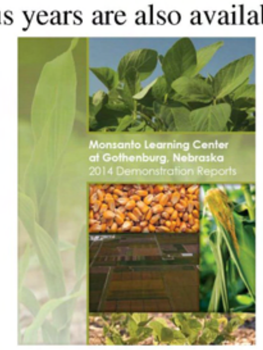
Gothenburg
Water Utilization
LEARNING CENTER

76268 Hwy 47 • Gothenburg • 308-537-4500 • Fax 308-537-2028

The research results from 2017 can be seen in the latest Monsanto Learning Center Demonstration Report Book. Please ask your local Monsanto seed salesman for a copy as there is a helpful information on corn, soybean, and wheat production. Research results from previous years are also available.








Talk is Cheap
Inventing the future of application technology takes work
20 years of relentless innovation insure our systems solve the challenges application professionals face.
Our patented technology offers capabilities that are impossible with any other system.
THE RESULT:
The best application technology on the planet. Period.
OUR PRODUCTS: SharpShooter PinPoint
CASE IH INCORPORATING OUR PRODUCTS:
Aim Command* Aim Command Pro* *Trademarks of CNH America LLC
CapstanAG
1-855-628-7722
www.capstanag.com


ROW BY ROW
ACRE BY ACRE
SEASON AFTER SEASON
WITH YOU
FROM THE WORD
GO
PIONEER
PIONEER
SOYBEAN SEED
PIONEER
SEED CORN
UNMATCHED SERVICE AND SUPPORT
LOCAL KNOWLEDGE
MANAGEMENT INSIGHTS
Pioneer.com
TruChoice
Science with Service Delivering Success®


HORTON SEED SERVICES
Leoti, KS
RICK: 620-874-0331 KEN: 620-214-1460
MATT: 620-214-1070 ALEC: 620-214-2417
HORTONSEEDSERVICES.COM HORTONSEEDSERVICES@GMAIL.COM
NEW:
LANGIN
LCS YETI
SY RUGGED
EASTWOOD
WB-GRAINFIELD
WB-CEDAR
WB4303
T-158
KWA JOE
SEED TREATMENT
WITH REVIZE IMIDA ST and VIBRANCE EXTREME
YOU MAY PURCHASE SEED ALREADY TREATED, OR WE CAN TREAT YOUR WHEAT USING THE LPX 2000 USC AUTOMATED PORTABLE TREATER.


We've Got You Covered...From Start To Finish
We're Your No-Till Farming Headquarters!
Colby Ag Center, L.C.
785-462-6132
www.colbyag.com
Hoxie Implement Co., Inc.
785-675-3201
www.hoxieimplement.com
Oakley Ag Center, LLC
785-671-3264
www.oakleyag.com
SPRAYERS.......Self-Propelled and Pull-Type
• Case IH Patriot 2240, 3340 & 4440 Self-Propelled with Exclusive AIM Command Pro System
Case IH Tractors.....Get The Job Done!!
• Farmall 90 HP-120 HP
• Puma's 125 HP-205 HP
• Magnums's 180 HP-380 HP
• Steiger 4WD 370 HP-620 HP
No-Till Planters & Drills
for uniform stands & the best yields
Case IH—Kinze—Sunflower
Great Plains—Crustbuster
Precision Fertilizer Placement
In No-Till Fields
DMI - Orthman - Yetter - Ag Synergy
And The Most Important Step...
Harvest every bushel with a Case IH Axial Flow Combine and leave your field ready for next year with a Shelbourne Stripper Header
Financing Available on All Equipment–Attractive Rates and Options!

With the **High Plains Sunflower Committee**

Enhancing sunflower production through education, research and promotion

Please take a moment and assess the financial advantages sunflowers can provide your farming operation this next growing summer. Whether it be oils or confections, outstanding opportunities are available for sunflowers this next year. To view the latest information on yield trials, revenue assurance, market prices, elevators taking sunflowers, chemical options, and other important topics, please view the National Sunflower association web site: http://www.sunflowersnsa.com/

Gold Sponsors

SIMPSON
FARM ENTERPRISES, INC.

Ransom	Hays	Great Bend	Beloit	Grand Island
800.235.5359	888.228.3611	866.379.1426	888.232.8558	866.218.5422

SIMS
FERTILIZER & CHEMICAL

1006 Industrial Park Ave
Osborne, KS 67473

(785) 346-5681

www.simsfarm.com

Gold Sponsors

Breakfast Sponsor

MNB

McCook National Bank

(800) 595-9286—www.mnb1.com

American Agricultural Laboratory
Christine Grooms
christine@amaglab.com
308-345-3670

Arrow Seed Co, Inc
Rich Russell
deb@arrowseed.com
308-872-6826

Bayer
Ty Gerlits
ty.gerlits@bayer.com
620-617-3187

Channel
Matthew Stevenson
matthew.stevenson@channel.com
785-202-0145

Chipperfield Ag Erectors
Calvin Chipperfield
chipag.melba@gmail.com
308-344-9700

CHS
Lloyd Cersovsky
lloyd.cersovsky@chsinc.com
785-299-0272

CHS
Lloyd Cersovsky
lloyd.cersovsky@chsinc.com
785-299-0272

Decatur Coop Association
RD Wait
rdwait@decaturcoop.net
785-475-2233

Dow AgroSciences & DuPont Crop Protection
Justin Herman
justin.c.herman@dupont.com
970-571-4111

Farm Implement and Supply
Chadd Copeland
Colby (785) 462-2411
Plainville (785) 434-4824

Golden Acres Genetics
Rusty Klitzke
rklitzke@goldenacres.com
785-731-6847

Heartland Ag
Tyson Shelley
tysons@heartlandag.com
308-380-2462

Heartland Genetics
Justin Comer
comerseedsolutions@yahoo.com
785-443-3336

JD Skiles
Justin Marintzer
justin@jdskiles.com
785-626-9338

Kansas Ag Mediation Service
Forrest Buhler
fbuhler@ksu.edu
785-532-6958

Kansas Corn
Erin Rios
erios@ksgrains.com
785-448-6922

Kansas Grain Sorghum
Jesse McCurry
jesse@ksgrainsorghum.org

Kansas Soybean Commission
Dennis Hupe
hupe@kansassoybeans.org

Mycogen Seeds
Bruce Keiser
bakeiser@dow.com
785-443-1303

NuTech Seed LLC
Troy Westadt
troy.westadt@nutechseed.com
308-340-9768

Oberlin CPS
Patti Richards
patti.richards@cpsagu.com

Polansky Seed Inc
Pat Baxa
pat@polanskyseed.com
785-527-2271

Premier Tillage Inc
Bronc Barrows
rscott@premiertillage.com

Producers Hybrids
Cody Graham
betsy.larson@producershybrids.com
888-675-3190

Red Willow Chemical
Mark Vlasin
mvlasin@hotmail.com
308-345-3635

Renk Seed
Logan Stephens
lstephens@renkseed.com

Schaffert Mfg Inc
Paul Schaffert
sherri@schaffert.com
308-364-2607

Select Seeds/Axis Seed
Rod Spencer
selectseeds@gpcom.net
308-278-2160

Sharp Bros. Seed Company
Jeff Allen
jeff.allen@sharpseed.com
620-398-2231

Sorghum Partners
Larry Heier
lheier@chromatininc.com
785-673-9491

Star Seed Inc
Devon Walter
devon@gostarseed.com
800-782-7311

Stine Seed Company
holmes1331@hotmail.com
785-533-1335

Tweed Agency LLC
Ben Hoeting
bhoeting@st-tel.net
785-462-7366

Ward Laboratories, Inc
Chelsie Michalewicz
chelsie@wardlab.com
308-234-2418

Woofter Construction & Irrigation Inc
Blake Arnberger
amberb@woofter.com
785-462-7441

Websites

Weather:

National Weather Service-Goodland	www.crh.noaa.gov/gld
CoCoRahs	www.cocorahs.org
Drought Monitor	www.droughtmonitor.unl.edu

K-State:

Northwest Area Agronomy	www.northwest.ksu.edu/agronomy
Cover Your Acres Conference	www.northwest.ksu.edu/coveryouracres
K-State Research and Extension	www.ksre.ksu.edu
K-State Department of Agronomy	www.agronomy.ksu.edu
K-State Ag Economics Extension	www.agmanager.info
K-State Department of Entomology	www.entomology.ksu.edu
K-State Department of Plant Pathology	www.plantpath.ksu.edu
K-State Department of Bio and Ag Engineering	www.bae.ksu.edu
K-State Mobile Irrigation Lab	www.mobileirrigationlab.com
K-State Western Kansas Ag Research Centers	www.wkarc.org

Herbicide Labels:

Greenbook	www.greenbook.net
CDMS	www.cdms.net

The plan for the day...

	Room 1	Room 2	Room 3	Room 4
7:45 8:15	Registration			
8:15 8:20	Welcome			
8:30 9:20	Profitability Opportunities and Pitfalls [1] (*M. Wood*)	A Historical Look at Climate Variability [1] (*J. Basara*)	Moisture Probes: Measurement to Management [1] (*J. Aguilar*)	*Encirca Services: Analytical Services for Growers (DuPont Pioneer) (I)*
9:30 10:20	Surviving & Thriving in Tough Times [1] (*C.Griffin*)	Weed Management Strategies [1,2] (*C.Thompson*)	NWKS Agronomy Research Updates [1] (*L.Haag*)	*Technology Update (Monsanto) (I)*
10:20 10:50	View Exhibits			
10:50 11:40	Soil Health & Profitability in Dryland Cropping [1] (*M. Schipanski*)	Making the Right Crop Insurance Choices [1] (*A. Barnaby*)	Maximizing Your Rangeland [1] (*K. Harmoney*)	*Sunflower Update (National Sunflower Assoc.) (I)*
11:50 12:40	Smart Spending of Fertility Dollars [1] (*D. Leikam*)	Moisture Probes: Measurement to Management [1] (*J. Aguilar*)	Lunch	
12:50 1:40	Making the Right Crop Insurance Choices [1] (*A. Barnaby*)	NWKS Agronomy Research Updates [1] (*L.Haag*)		
1:50 2:40	A Historical Look at Climate Variability [1] (*J. Basara*)	Soil Health & Profitability in Dryland Cropping [1] (*M. Schipanski*)	Smart Spending of Fertility Dollars [1] (*D. Leikam*)	*Is Wheat Worth It? (Horton Seed Services) (I)*
2:40 3:10	View Exhibits			
3:10 4:00	Producer Panel: Staying Successful with No-Till	Maximizing Your Rangeland [1] (*K. Harmoney*)	Surviving & Thriving in Tough Times [1] (*C.Griffin*)	*Lower Inputs, Raise Yields (Sims Fertilizer & Chemical) (I)*
4:10 5:00	Weed Management Strategies [1,2] (*C.Thompson*)	Profitability Opportunities and Pitfalls [1] (*M. Wood*)	*The Importance of Adjuvants (EGE Products)*	*Finding a More Effective Application for Starter Fertilizer (CapstanAG) (I)*

(I) indicate industry sessions.

[1] Indicate Certified Crop Advisor CEUs applied for.

[2] Indicate Commercial Applicator CEUs applied for.

This conference is organized by a committee of producers and K-State Research & Extension personnel. Lucas Haag, K-State Northwest Area Agronomist is the conference coordinator and proceedings editor. Please send your feedback to lhaag@ksu.edu

Find us on: facebook www.facebook.com/NWKSAgronomy

#CYA18

www.northwest.ksu.edu/CoverYourAcres