KANSAS FARM MANAGEMENT ASSOCIATION

Your Farm - Your Information - Your Decision

N E W S L E T T E R

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POTENTIAL IMPACT OF CREDIT CRISIS ON PRODUCTION AGRICULTURE, PART I

This article is the first part of a three part series that examines the impact of the current credit crisis on production agriculture. This part of the series will discuss why production agriculture is vulnerable to the current macroeconomic environment and will contrast leverage and liquidity today with that in the 1970s, 1980s, and 1990s. The second part of the series will discuss trends in interest rates and loan repayment trends. The third part of the series will update credit quality ratings for KFMA farms (see the August 2008 newsletter for a discussion of average credit ratings for KFMA farms from 1973 to 2007).

Production agriculture has experienced strong financial performance during the last couple of years. However, problems in the general economy and capital markets in the United States and abroad have increased dramatically in the last several months. As evidenced by the drop in grain, fuel, and fertilizer prices during the last few months, the U.S. and Kansas farm sectors are not immune to these events. Factors linking production agriculture and the general economy include exchange rates, foreign and domestic income, rural employment, interest rates, and energy costs (USDA-ERS). The latest issue of *Agricultural Income and Finance Outlook* (USDA-ERS) noted that production agriculture faces several vulnerabilities as it moves into 2009. These include:

1. The relative importance of input price increases on farm profit margins,
2. Farmland value volatility,
3. The overall debt structure and solvency of farm businesses,
4. Access of farm households to credit, and
5. Off-farm income during a national recession.

Given the current macroeconomic environment, it is important to examine long-term trends in financial measures. In 1985, the debt to asset ratio for U.S. farm businesses was 0.222 (USDA-ERS). In contrast, in 2007, the debt to asset ratio for U.S. farm businesses was only 0.096 (USDA-ERS). The average current ratio for U.S. farms was 3.40 in 2007. The USDA-ERS noted that the average current ratio in 2007 was considerably higher than the average current ratio of 2.90 exhibited a decade earlier. The change in the current ratio and the debt to asset ratio is not as dramatic for KFMA farms. Table 1 illustrates trends in the five-year averages of the current ratio, debt to asset ratio, and financial stress from 1973 to 2007. Given variability in weather and prices, it is often useful to examine five-year average financial measures rather than examining the averages for a single year. The five-year average current ratio for KFMA farms for the 2003-2007 period was 2.47 which was the highest average since the 1996-2000 period. Using Table 1, the debt to asset ratio peaked during the 1985-1989 period at 0.330. The average debt to asset ratio

Also in this newsletter:

for the 2003-2007 period, 0.279, was the lowest average since the 1979-1983 period.

Averages often hide the variability in financial measures among farms. Given this artifact, it is useful to examine the number of farms with low net farm income, high debt, or both. The USDA-ERS defines vulnerable farms as those with a negative net farm income and a debt to asset ratio above 0.40. Approximately 3.5 percent of U.S. farms were classified as vulnerable in 2007 (USDA-ERS). Using these criteria to define vulnerability, approximately 6.8 percent of KFMA farms were vulnerable in 2007.

Negative earnings and a debt to asset ratio above 0.70 are used in Table 1 to define financial stress for KFMA farms. Earnings are computed by subtracting unpaid operator and family labor from net farm income. Approximately 45 percent and 11 percent of the farms had negative earnings and a debt to asset ratio above 0.70, respectively, for the 2003-2007 period. Combining these two items, approximately 6.4 percent of the KFMA farms were financially stressed. The level of financial stress is substantially lower than that experienced in the mid 1980s, but is still higher than the averages experienced in the 1970s. The percentage of farms with negative earnings and a debt to asset ratio of 0.70 was 45 percent and 15 percent during the 1985-1989 period, the peak financial stress years.

Farms with negative earnings and/or high debt to asset ratios are more vulnerable to the current credit crisis than farms that have lower debt levels and that have experienced relatively high net incomes in recent years. These farms may find it increasingly difficult to generate a positive cash flow and repay debt. The second part of the series of articles on the current credit crisis will examine trends in interest rates and loan repayment rates.

In summary, the current financial position of U.S. and KFMA farms is relatively strong. However, production agriculture is vulnerable to the current macroeconomic environment in the U.S. and abroad. It is particularly important during uncertain times, to use both internal and external benchmarks of key financial measures to gauge a farm's competitive position. Internal benchmarking involves comparing financial measures for a particular farm over time. This type of benchmarking answers questions such as the following: Is the liquidity of our farm improving or deteriorating over time? External benchmarking involves comparing financial measures with similar farms. An upcoming newsletter will discuss key external benchmarks for the operating profit margin and asset turnover ratio.

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Table 1. Trends in Liquidity, Solvency, and Financial Stress.

Years	Current Ratio	Debt to Asset Ratio	Financial Stress
73-77	2.23	0.217	0.69%
74-78	2.06	0.225	0.01%
75-79	1.97	0.236	1.38%
76-80	2.03	0.237	1.45%
77-81	2.08	0.245	1.83%
78-82	2.08	0.256	2.31%
79-83	2.16	0.265	3.14%
80-84	2.12	0.281	6.73%
81-85	2.06	0.294	7.61%
82-86	2.11	0.304	8.77%
83-87	2.13	0.313	9.49%
84-88	2.17	0.320	10.10%
85-89	2.24	0.330	10.84%
86-90	2.36	0.320	8.51%
87-91	2.51	0.310	8.34%
88-92	2.50	0.306	7.29%
89-93	2.56	0.302	7.21%
90-94	2.56	0.301	8.10%
91-95	2.52	0.304	9.20%
92-96	2.55	0.299	6.87%
93-97	2.58	0.295	6.79%
94-98	2.61	0.291	8.15%
95-99	2.54	0.290	6.98%
96-00	2.51	0.296	7.03%
97-01	2.43	0.301	8.20%
98-02	2.35	0.301	9.67%
99-03	2.31	0.301	9.47%
00-04	2.32	0.302	9.11%
01-05	2.34	0.299	9.89%
02-06	2.36	0.293	8.92%
03-07	2.47	0.279	6.39%

Source: Kansas Farm Management Association 2007 Databank.

PROFIT MAXIMIZATION VS. YIELD MAXIMIZATION IN BROME HAY

When agricultural input prices climb, as they have during the past year, many producers start to ask themselves questions. Often those questions have to do with fertilizer. Can I afford to fertilize this year? Can I afford not too? This article examines nitrogen (N) use as it relates to brome hay production. Specifically, does it make economic sense to cut N application rates in light of recent high nitrogen prices?

That is a difficult question to answer and in order to do so we need to take a look at the concept of profit maximization versus yield maximization. Plant response to an input can be described with a production function. Initially as more of an input is added, the plant responds by increasing production. But, the magnitude of that production increase is smaller with each added unit of input. In other words, as N is increased, the production of brome increases at a decreasing rate, or the benefit realized from the second unit of input is less than the benefit of adding the first unit. Eventually a point is reached where the plant stops responding to inputs. It is at this point that yield is maximized. If inputs are added beyond the point of maximum yield, plants begin to respond negatively.

Figure 1 illustrates a production function for brome hay. This function was developed by KSU Agronomist Dave Mengel using 30 years of brome yield data. This function indicates that with no nitrogen applied there will be a base brome yield of about 1.35 tons/acre. As nitrogen is added, yield increases to the point where yield is maximized at approximately 3.15 ton/acre using 150 lb/acre of applied N. Any additional nitrogen applied above this point will have a negative effect on yield.

Maximizing yield may not make the most economic sense. There is a cost associated with adding each unit of any input. This includes the cost of added fertilizer as well as additional labor and higher per acre harvest cost. If the cost of adding a unit of fertilizer is less than the value of the increased brome production, it makes sense to apply that additional unit of fertilizer. When the cost of one additional unit is equal to the value of the additional production, we have reached the point of profit maximization. If more units are added beyond this point, the cost of each unit of fertilizer is greater than the revenue generated and profit is reduced.

To estimate this point of profit maximization, the Solver function in Excel can be used along with a brome hay production budget. KSU Farm Management Guide MF-2143, Brome Hay Cost-Return Budget in Central and Eastern Kansas was used as a starting budget in this analysis. In order to use this budget, several assumptions were made. First, all other inputs besides nitrogen (rainfall, P, etc.) are assumed to be adequate. Second, rather than a land charge that reflects differences in productivity and therefore land value, a flat rental rate was used. Third, labor hired was assumed to vary with yield.

Finally, the budget assumes that all machinery operations are custom hired. This assumption is based on the idea that custom operators charge a rate that covers all of their costs, including fuel, repairs, labor, and depreciation. Machine hire rates from 2007 were used with a 14.4% adjustment for increases in fuel price. It was also assumed that it would cost the same to swath and rake on a per acre basis no matter what the brome yield was. However, the cost of baling and hauling was assumed to vary with changes in yield.

The budget used in this analysis is displayed in Table 1. Areas highlighted in grey vary with N level or vary with yield. Nitrogen application rate was used to estimate yield. Yield was then used to calculate brome production per acre and labor hours per acre.

Using this budget and the solver function in Excel, maximum profit per acre was estimated for different combinations of brome hay and N prices. The results are summarized in Table 2. Looking at Table 2, each intersection of a particular brome price and N price will give you three numbers. The top row of numbers is an N application rate (lbs/ac) that would be expected to maximize profit given this combination of brome and N price. The second is the expected brome yield using the KSU production function for that N application rate. The third is the expected profit per acre using the budget shown in Table 1.

For example, if brome is selling for $80.00/t and N is $0.60/lb the profit maximizing N application rate is 78 lb/a. Given ideal conditions we would expect a yield of 2.76 tons/ac and a profit of $26.44/ac. However, if brome hay was only selling for $60.00/ton and N stayed at $0.60/lb, the profit maximizing N application rate is only 38 lbs/ac which results in a yield of 2.17 tons/ac. But the best we could hope for at this brome hay and N price combination is a **loss** of $24.23/ac.

When looking at Table 2, keep in mind that determining the amount of profit shown was not the goal of this article. Estimating the point of profit maximization was. If budget items that are fixed on a per acre basis, such as cash rent or miscellaneous costs, increase, profit per acre will decrease. The nitrogen level that maximizes profit, however, will not change.

Cow-calf producers that raise brome to feed to their own cows will probably object to the suggestion that N application be cut dramatically. There is a need for a certain amount of hay to get the herd through the winter and cutting N to levels suggested in Table 2 might decrease total production below that level. In this scenario, finding additional brome acres to make up for decreased production is not likely. Purchasing hay would be the only other alternative. However, this may or may not be an attractive option.

Does it make economic sense to cut N application rates in response to relatively high N prices? The short answer is yes. But how much should rates be cut? The answer will not be the same for all producers. Combining this guide with your own production costs will aid you in your decision making process.

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Figure 1 - Brome Hay Nitrogen Response Curve

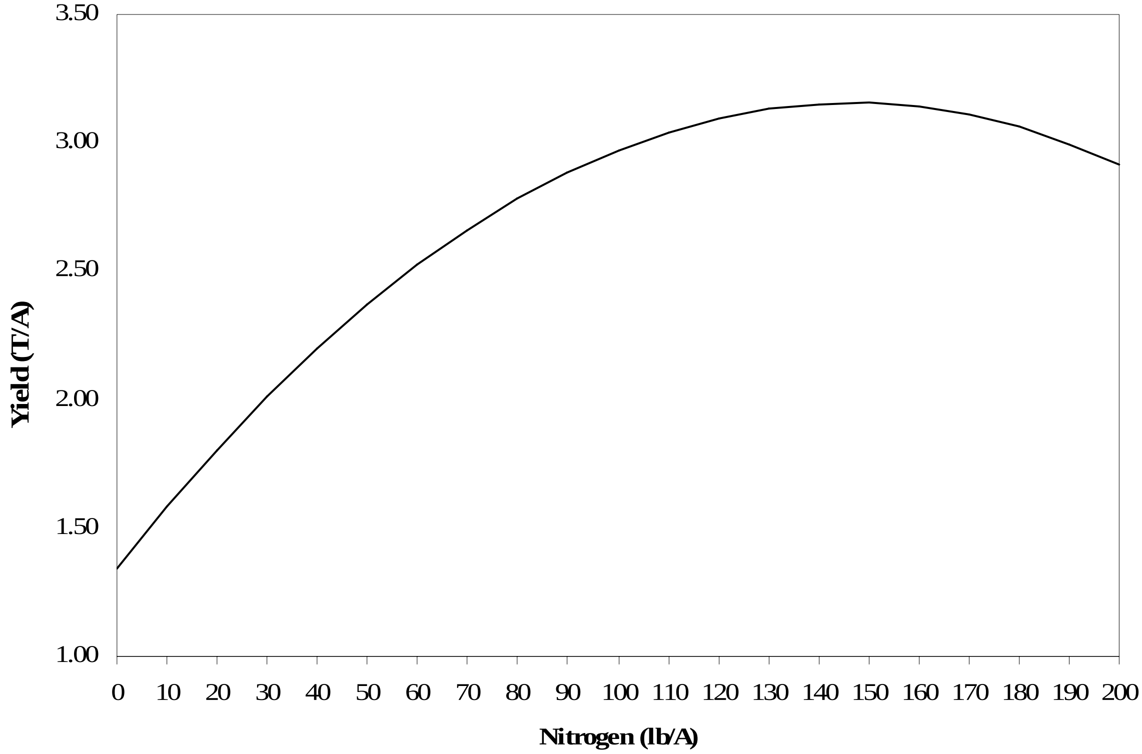

Table 1 - Brome Hay Budget

	Income								
	Brome Sales	2.97	ton/ac	@	$	60.00	/ton	$	178.33
A	**Gross Income**							**$**	**178.33**
	Expenses								
1	Seed*							$	2.50
2	Herbicide							$	5.24
3	Fertilizer	100.0	lb. N/ac	@	$	0.80	/lb. N	$	80.00
4	Miscellaneous							$	6.81
	Machine Hire								
5	Establishment*							$	2.50
6	Swath, Rake							$	25.84
7	Bale, Haul	3.96	bale/ac	@	$	15.74	/bale	$	62.37
8	Labor**	0.89	hr/ac	@	$	12.50	/hr	$	11.15
9	Cash Rent							$	30.00
10	Interest on 1/2 (1+2+3+4+5+6+7+8)							$	7.86
B	**Total Expenses**							**$**	**234.27**
C	**Net Income ($/Ac)**							**$**	**(55.94)**
D	**Total Cost ($/Ton)**							**$**	**78.82**

* Annualized over a 20 year period

** 0.3 hr/ton

Table 2 - Brome Hay Profit Maximization Matrix

Brome Price		Actual N $/lb									
		$ 0.50	$ 0.55	$ 0.60	$ 0.65	$ 0.70	$ 0.75	$ 0.80	$ 0.85	$ 0.90	$ 0.95
$ 60	Actual N (lb/A)	56	47	38	29	20	11	2	0	0	0
	Yield (T/A)	2.47	2.33	2.17	2.00	1.81	1.62	1.40	1.35	1.35	1.35
	Net Income ($/A)	**(19.29)**	**(21.99)**	**(24.23)**	**(25.99)**	**(27.29)**	**(28.12)**	**(28.48)**	**(28.49)**	**(28.49)**	**(28.49)**
$ 70	Actual N (lb/A)	77	70	63	56	49	42	35	28	21	14
	Yield (T/A)	2.75	2.66	2.57	2.46	2.35	2.23	2.11	1.97	1.83	1.68
	Net Income ($/A)	**6.97**	**3.15**	**(0.30)**	**(3.39)**	**(6.11)**	**(8.48)**	**(10.48)**	**(12.12)**	**(13.39)**	**(14.30)**
$ 80	Actual N (lb/A)	90	84	78	73	67	61	56	50	44	38
	Yield (T/A)	2.88	2.83	2.76	2.69	2.62	2.54	2.46	2.37	2.27	2.17
	Net Income ($/A)	**35.18**	**30.66**	**26.44**	**22.51**	**18.89**	**15.55**	**12.51**	**9.77**	**7.33**	**5.18**
$ 90	Actual N (lb/A)	99	94	89	84	79	75	70	65	60	55
	Yield (T/A)	2.96	2.92	2.88	2.83	2.77	2.72	2.66	2.59	2.53	2.45
	Net Income ($/A)	**64.43**	**59.43**	**54.68**	**50.17**	**45.92**	**41.92**	**38.17**	**34.67**	**31.42**	**28.42**
$ 100	Actual N (lb/A)	105	101	97	93	88	84	80	76	72	68
	Yield (T/A)	3.01	2.98	2.95	2.91	2.87	2.83	2.78	2.73	2.68	2.63
	Net Income ($/A)	**94.30**	**88.94**	**83.80**	**78.88**	**74.18**	**69.69**	**65.42**	**61.36**	**57.52**	**53.89**
$ 110	Actual N (lb/A)	110	106	103	99	95	92	88	84	81	77
	Yield (T/A)	3.04	3.02	2.99	2.96	2.93	2.90	2.87	2.83	2.79	2.75
	Net Income ($/A)	**124.57**	**118.94**	**113.51**	**108.27**	**103.21**	**98.35**	**93.68**	**89.20**	**84.91**	**80.81**
$ 120	Actual N (lb/A)	114	111	107	104	101	97	94	91	88	84
	Yield (T/A)	3.06	3.05	3.03	3.00	2.98	2.95	2.92	2.89	2.86	2.83
	Net Income ($/A)	**155.11**	**149.27**	**143.60**	**138.11**	**132.78**	**127.63**	**122.65**	**117.83**	**113.19**	**108.72**

2008-2009 AG PROFITABILITY CONFERENCES

Given the wide fluctuations in prices and recent crop insurance and farm bill changes, it is important to keep abreast of what is going on in production agriculture. With this in mind, KSU Extension and Research is hosting several Ag Profitability Conferences this winter. Specifically, upcoming 2008-2009 Ag Profitability Conferences will be held at the following locations:

January 27	Downs, Kansas
January 29	Lyons, Kansas
February 26	Goodland, Kansas
February 27	Garden City, Kansas

Topics covered will vary by location, but some of common topic themes addressed at these conferences include the following: recent crop insurance changes, 2008 Farm Bill, price and profit outlook, land rental arrangements, and risk management. More detailed program information can be found on the following web site: www.agmanager.info/events/ag_profitability/2009.

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The Kansas Farm Management Association (KFMA) Newsletter is distributed monthly to provide farm management information to farm decision makers. Further farm management information can be found on the KFMA program website: www.agmanager.info/kfma; and, on the Extension Agricultural Economics website: www.agmanager.info. The Newsletter is edited by Michael Langemeier, Professor, Department of Agricultural Economics, Kansas State University.