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Fertilizer Diversification

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Market Report	Yr Ago	4 Wks Ago	12/29/00
Livestock and Products, ***Average Prices for Week Ending***			
Slaughter Steers, Ch. 204, 1100-1300 lb Omaha, cwt	$67.95	$72.78	$77.00
Feeder Steers, Med. Frame, 600-650 lb Dodge City, KS, cwt	*	94.13	*
Feeder Steers, Med. Frame 600-650 lb, Nebraska Auction Wght. Avg	95.38	97.78	103.83
Carcass Price, Ch. 1-3, 550-700 lb Cent. US, Equiv. Index Value, cwt	104.69	111.03	121.23
Hogs, US 1-2, 220-230 lb Sioux Falls, SD, cwt	36.25	38.50	37.75
Feeder Pigs, US 1-2, 40-45 lb Sioux Falls, SD, hd	39.00	*	*
Vacuum Packed Pork Loins, Wholesale, 13-19 lb, 1/4" Trim, Cent. US, cwt	106.50	*	119.13
Slaughter Lambs, Ch. & Pr., 115-125 lb Sioux Falls, SD, cwt	*	67.42	70.00
Carcass Lambs, Ch. & Pr., 1-4, 55-65 lb FOB Midwest, cwt	163.00	149.00	152.00
Crops, ***Cash Truck Prices for Date Shown***			
Wheat, No. 1, H.W. Omaha, bu	2.78	3.22	3.37
Corn, No. 2, Yellow Omaha, bu	1.78	1.93	2.09
Soybeans, No. 1, Yellow Omaha, bu	4.30	4.84	4.82
Grain Sorghum, No. 2, Yellow Kansas City, cwt	2.93	3.48	3.87
Oats, No. 2, Heavy Sioux City, IA , bu	1.19	1.15	1.24
Hay, ***First Day of Week Pile Prices***			
Alfalfa, Sm. Square, RFV 150 or better Platte Valley, ton	*	110.00	110.00
Alfalfa, Lg. Round, Good Northeast Nebraska, ton	35.00	75.00	68.50
Prairie, Sm. Square, Good Northeast Nebraska, ton	*	100.00	97.50

* No market.

Crop diversification is commonly regarded as a risk reducing strategy to moderate the impacts of variable crop prices and yields. The addition of one or more livestock enterprises may lead to still greater income stability for an agricultural producer. Diversification reduces income volatility whenever low returns in one enterprise are associated with relatively moderate or high returns in another enterprise. The reverse phenomenon (moderate or relatively high returns in the first enterprise, occurring during years of low returns for the second enterprise) is also necessary for diversification to be effective. The greater the tendency for enterprise returns from different enterprises to "offset" each other, the greater the effectiveness of enterprise diversification. The disadvantage of diversification lies in the likelihood for reduced average returns across time due to a) the loss of enterprise size efficiency due to engaging in more enterprises, and/or b) if when adding enterprises, the added enterprises have lower returns.

On the other hand, fertilizer diversification (the practice of fertilizing a crop at different levels) is rarely considered as a risk reduction strategy. Rather, precision fertilization is receiving much current attention and offers the potential of increased efficiency. A precision fertilization strategy may result in a range of fertilizer application levels across a farm because of different soils, but this is not the same approach as purposeful fertilization diversification where more than one fertilizer level is applied to a given crop in a given soil.

From a maximum returns standpoint the optimum fertilizer level looking back varies from year to year,

but it cannot be well predicted for a coming year. In dryland production, variable precipitation is the major force leading to this risky choice setting. The conventional approach to maximizing returns under such a risk situation is to consider a "weighted average" of different likely yield-fertilizer responses, and select a level which maximizes returns. This is different from one extreme which is to assume the best conditions will exist and to consistently apply fertilizer based on that assumption. The other extreme is to apply fertilizer based on the assumption that the worst weather conditions will occur leading to a consistently low application level.

From only a profit standpoint, the above described approach (the "weighted average") cannot be exceeded by any other strategy. The only difficulty is that following it may result in more risky returns compared to a diversified approach. In other words, the "offsetting" mechanism previously described for crop diversification may also exist for fertilizer diversification. In such a case a tendency may occur for one fertilizer level with lower returns to be associated with higher returns from another level in a given year and vice versa. Again, even if such is the case and return volatility can be reduced, at what cost in terms of average net returns does this reduction of risk involve?

At this point we need to briefly consider what risk is. Risk can be defined and measured in several ways including a) return volatility, b) the likelihood of disaster returns, and c) the degree which returns fail to reach a target return level. We use the last concept here in analyzing how fertilizer diversification performed over time compared to the maximum return application level.

Data from a 15-year (1984-98) eastern Nebraska dryland cropping experiment were used in examining the risk issue. Continuous cropping systems of corn, grain sorghum and soybeans were analyzed along with rotations of corn-soybeans and grain sorghum-soybeans. All crops were fertilized at three levels. Yields, prices and costs for each year for each system were tabulated. The average net return level and accumulated 15-year return deficits below $100/acre were found for various fertilizer diversification strategies and these were compared to those found for a constant fertilization level. In estimating net returns only operating costs were considered.

While the results require additional analysis, some preliminary findings are interesting. For continuous cropping, diversification was not found to reduce crop return variability. However, for the two rotations, the diversification strategy did result in considerably less risk compared to a constant fertilizer level for each system. This reduction in risk is in addition to the reduced risk resulting from employing the rotation compared to continuous cropping. For continuous corn, 1995 was a particularly poor year, while for continuous grain sorghum, 1987, 1993 and 1995 were troublesome. Low returns were experienced in 1989 and 1995 for continuous soybeans.

The cost resulting from fertilizer diversification in the rotations was approximately $2-$4 per acre per year because, as stated earlier, diversification comes at a cost. The issue of whether fertilizer diversification should be a practiced technique is a complex one. First, the analysis should be studied under more than one location and over a longer time period. In addition, other risk reducing techniques such as crop insurance may accomplish the same objective at a lower cost.

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