Food Production and Economics of Fertilizer Use — Tracking the Returns in a Grain Crop

By Tom Jensen

Most grain and oilseed producers are pleased to realize the recent increase in crop prices after many years of relatively low and at times depressed grain and oilseed prices. There is an overall feeling of optimism in crop production. However, the accompanying increases in fertilizer prices have growers questioning whether or not the changes in crop and fertilizer prices relative to one another justify changes in fertilizer application rates.

A few calculations show that optimum rates of fertilizer have changed very little if at all, while the size of fertilizer expenditure has increased. Associated with the larger fertilizer expenditure is more up-front financing and much more valuable potential crop growing in the field. This combines to create an increased need for careful decision making. Growers can manage this increased need by doing the following.

- Have **soil samples taken and analyzed for nutrient availability** and adjust fertilizer rates on each individual field. Soil test laboratories are seeing an increase in fields being soil sampled.
- **Time fertilizer applications to maximize crop utilization** and minimize unwanted losses. Generally this may mean application near the time of planting or in split applications during the growing season for some crops.
- **Place N fertilizers in the soil in bands** to reduce losses compared to broadcast applications.
- Use appropriate **starter fertilizer blends** precision placed near or for some crops in the seed-row when planting.
- Consider using **fertilizer forms or additives** that can result in enhanced efficiency and /or reduced losses of applied nutrients. This may include use of controlled release fertilizers or addition of inhibitors that keep fertilizers in forms less susceptible to losses.
- Seek the advice of **Certified Crop Advisers (CCAs) and crop consultants** in making fertilizer decisions.

Sound advice from an experienced CCA can help a grower determine whether or not there should be changes in fertilizer rates. This is especially important when both grain and

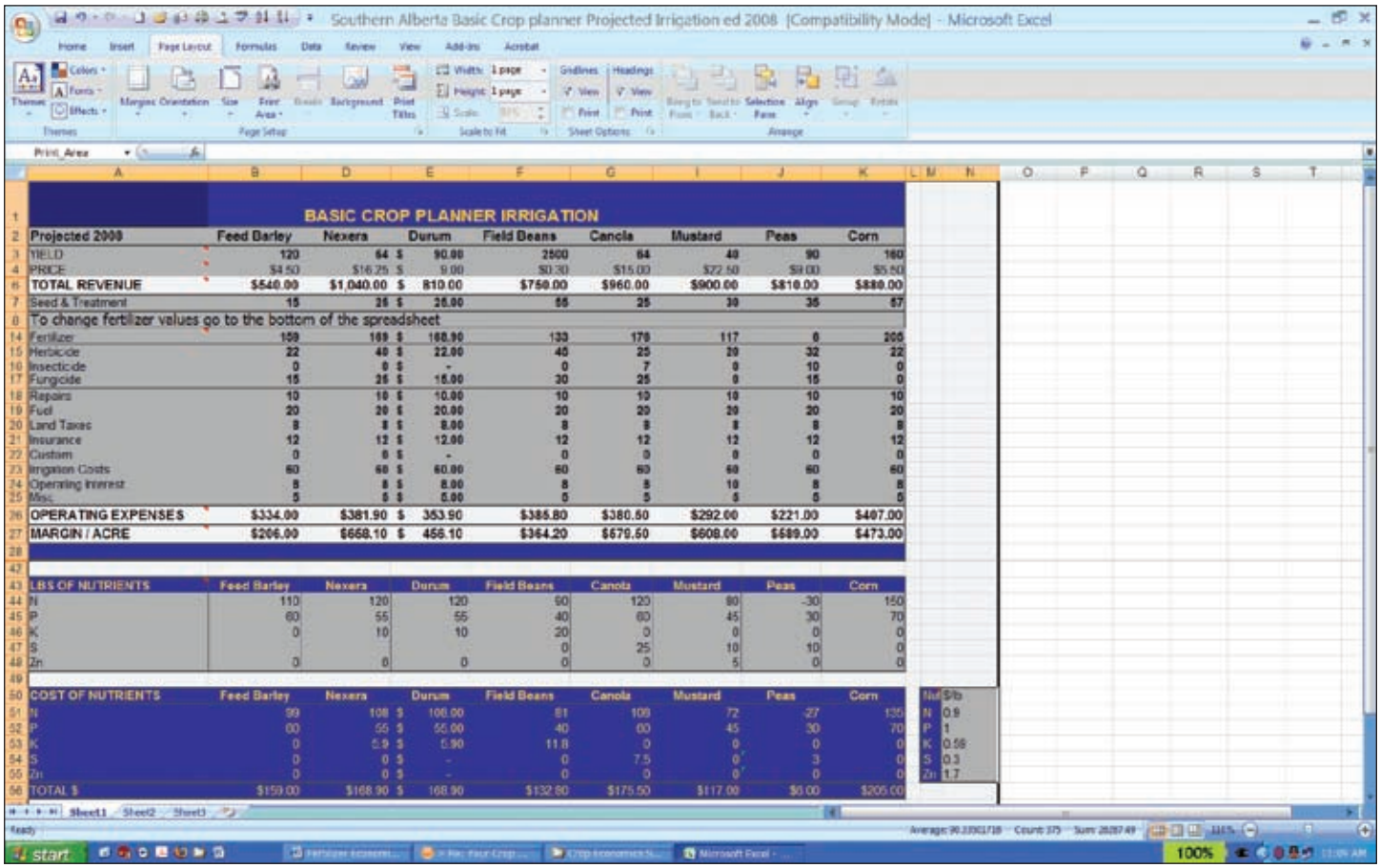

Figure 1. Screen shot of the Crop Planner.

Abbreviations and notes for this article: N = nitrogen.

Table 1. Estimated margins (total revenue minus operating expenses) for years 2005 through 2008 for irrigated durum wheat, southern Alberta.

Crop year	Nutrients: N 120 lb/A	Nutrients: P_2O_5 55 lb/A	Nutrients: K_2O 10 lb/A	Expected yield, bu/A	Market price, $/bu	Gross revenue, $/A	Fertilizer cost, $/A	Operating cost, $/A	Margin, $/A
	Price, $/lb								
2005	0.40	0.30	0.15	90	$4.27	$384.30	$66.00	$229.00	$155.30
2006	0.45	0.38	0.15	90	$4.27	$384.30	$76.40	$233.40	$150.90
2007	0.60	0.70	0.15	90	$6.40	$576.00	$112.00	$300.00	$276.00
2008	0.90	1.00	0.59	90	$9.00	$810.00	$168.90	$353.90	$456.10

fertilizer prices change.

An excellent example of a crop planning tool used with farm customers was developed by Keith Mills, a CCA working for a retail grain and crop input company in Western Canada. He works with farm customers growing crops under both irrigated and rain-fed conditions in southern Alberta. His easy-to-use Basic Crop Planner is a spreadsheet program he uses with customers to estimate potential returns per acre for a number of different crops. His customers often use this tool to help them decide which crops to grow if they are considering changes in their crop rotations. The grower can quickly calculate margins per acre by entering realistic crop yields for their farm along with current area prices for crop inputs, including fertilizers, and prices expected for harvested crops.

Keith Mills emphasizes that the yield and input price estimates entered need to be realistic for the area. The Basic Crop Planner is based on variable crop inputs and expected crop yields and current market prices, and doesn't include fixed costs as this can vary greatly from farm to farm depending on specific land ownership and rental conditions. Mills updates his crop planner each year with average crop prices and input costs for the area where he works. It can be modified by an individual customer especially for expected crop yields depending on specific field conditions, and if an alternate source for crop inputs at different prices is found.

It is interesting to compare information from a number of years for a specific crop and see how changes in crop input prices or operating costs and grain prices affect margin returns per acre. This growing season (2008) some farm customers were considering reducing their rates of fertilizer solely because of increases in fertilizer prices. However, when they saw what the margins were using current fertilizer and crop prices, fertilizer rates have in most cases remained similar to recent years and margins have increased. An example in **Table 1** shows estimated returns over the years 2005, 2006, 2007, and 2008 for irrigated durum wheat.

Operating costs have increased and fertilizer inputs have increased more compared to most other crop inputs, such as herbicides and fuel. The fertilizer costs as a percentage of operating costs are 29%, 33%, 37%, and 48%, respectively for the years 2005, 2006, 2007, and 2008. For example, if the years 2006 and 2008 are compared, fertilizer costs increased 121%, but margins increased 202%. Between the 2 years, every extra $1.00 of investment in fertilizer has been offset by $2.49 in increased margin per acre.

Fertilizer rates have remained similar over the past 4 years even though the portion of the operating costs from fertilizers has increased. Fortunately for growers, the return on fertilizer expenditures remains very positive and optimum economic fertilizer rates have remained similar to rates before the increases in both grain and fertilizer prices. BC

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long-term P management.

In a short-term analysis of P fertilization, it improved net margin at soil Bray P-1 levels below 15 to 20 mg/kg, and return to investment and cost per Mg grain at soil Bray P-1 levels lower or equal to 10 to 15 mg/kg (**Table 3**). The highest grain yields obtained at these experiments were 5.7 Mg/ha, and the rate used provides enough P to replenish the P extracted in wheat crops of up to 6 Mg/ha. Thus, soil testing and adequate P rates provided for high yields, economic profit, and neutral to positive soil P balances. Fertilizer P rates would be increased at lower soil Bray P-1 levels (i.e. less than 10 mg/kg) to improve Bray P-1 status of these soils.

Conclusions

- Balanced fertilization…NPS for this region…results in higher use efficiency of all the resources and inputs implied in grain production.
- Soil testing is a key BMP in defining the right rate of N and P for field crops of the Pampas of Argentina.
- Applying BMPs for fertilizer allows the objectives of productivity, profitability, sustainability, and a healthy environment to be achieved. BC

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