BUSINESS ANALYSIS OF CROPPING SYSTEMS

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1.0 Introduction

Traditional low input cropping systems tend to be "soil users" but the newer high production high input cropping systems tend to be "soil savers" over the long term. This paper is focused on some of the relevant cost/yield relationships which have been demonstrated in recent years using these two very different approaches to cropping configurations.

The work for this paper was carried out as part of the ENERDEMO project, which is funded by Energy, Mines and Resources Canada in conjunction with Saskatchewan Agriculture. This is a farm program which is studying energy use and conservation on more than 50 prairie farms. A research team from the Saskatchewan Research Council in heading up the project with input from several independent consultants.

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2.0 Low Input vs. Soil Saver Cropping Systems

The farm business analysis done by Farmwest under the F.E.M.P. and ENERDEMO programs has been focused on the cost/yield (input/output) relationships for cropping systems which have an impact on long term soil productivity.

At one end of the continuum are extensive rotations with high tillage, up to 1/2 summerfallow and a minimum of fertilzer. These systems can be loosely described as Low Input Soil User Systems.

At the other end are intensive systems which minimize tillage and summerfallow, and which call for high fertilizer inputs. For this paper, these are referred to as High Input Soil Saver Systems.

2.1 Yield

Benchmark cost/yield relationships have been developed for spring wheat in 3 soil zones. The yield targets have been demonstrated as achievable by research and some successful farmers.

Research has demonstrated that conservation cropping systems can achieve 60-70 kg/hec/cm (or about 2.5 bu/acre/inch) of water used.

The water efficiency assumptions on which the targets in Table 1 are based can be summarized as follows:

	Continuous Crop Yields bu/ac	Water Used cm/year
Black	32	30
D. Brown	26	26
Brown	21	22

Table 1. Benchmark Wheat Yields

	Low Input	Soil Saver	
	bu/ac	bu/ac	% of low input
Black	40	32	80%
D. Brown	35	26	74%
Brown	30	21	70%

2.2 Cost/Yield Relationships

2.2.1 High Energy Inputs

The price of major inputs like fertilizers and fuel will continue to be closely linked to trends in energy costs, and these costs are therefore of great interest.

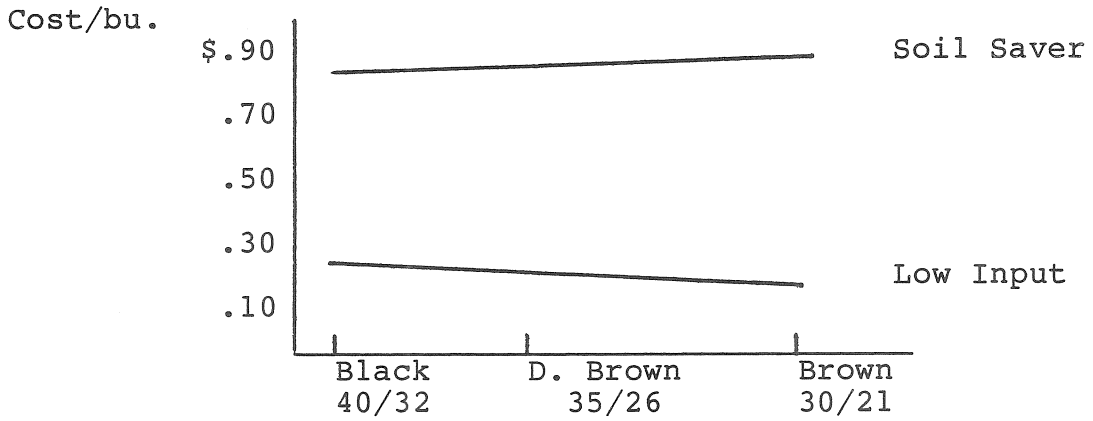
Based on the available data, we can expect fertilizer use to compare as outlined in Table 2 and Figure 1.

Table 2. Fertilizer Used*

	Low Input per acre crop	Soil Saver per acre crop
Black	$7	$24
D. Brown	5	20
Brown	4	18

* Assume $.26/lb. for NO3 and P2O5

Figure 1. Fertilizer Cost/Yield*



* Based on Tables 1 and 2

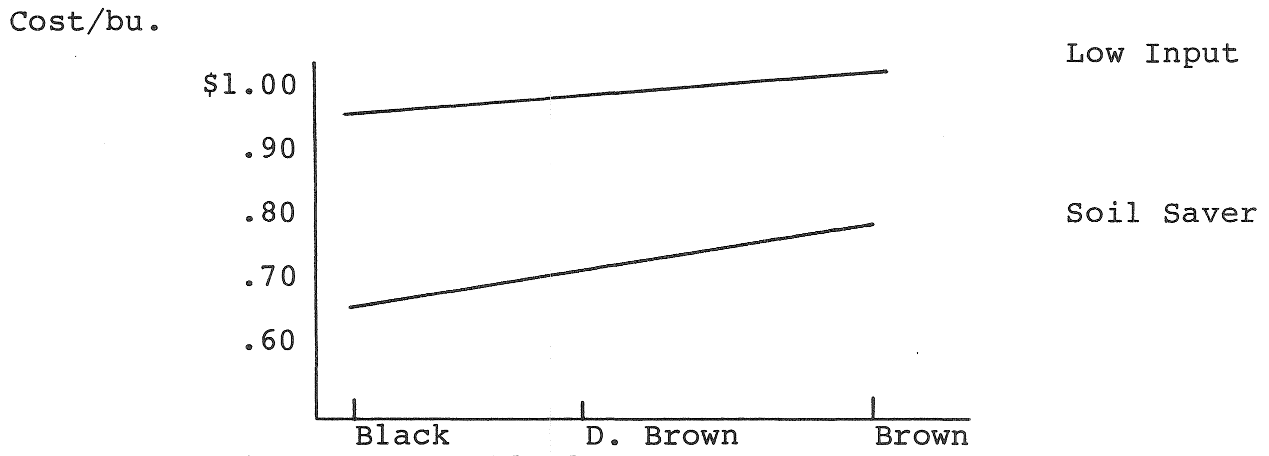
Based on available data, we can expect fuel and repairs to compare as outlined in Table 3 and Figure 2. Fuel use includes grain hauling and about 2/3 of 1/2 ton fuel. See Table 3 and Figure 2.

Table 3. Fuel and Repairs*

	Low Input per acre crop	Soil Saver per acre crop
Black	$38	$20
D. Brown	34	18
Brown	30	16

* Fuel at 55%, repairs 45%

Figure 2. Fuel and Repairs Cost/Yield*



* Based on Table 1 and 3

2.2.2 Other Operating Costs

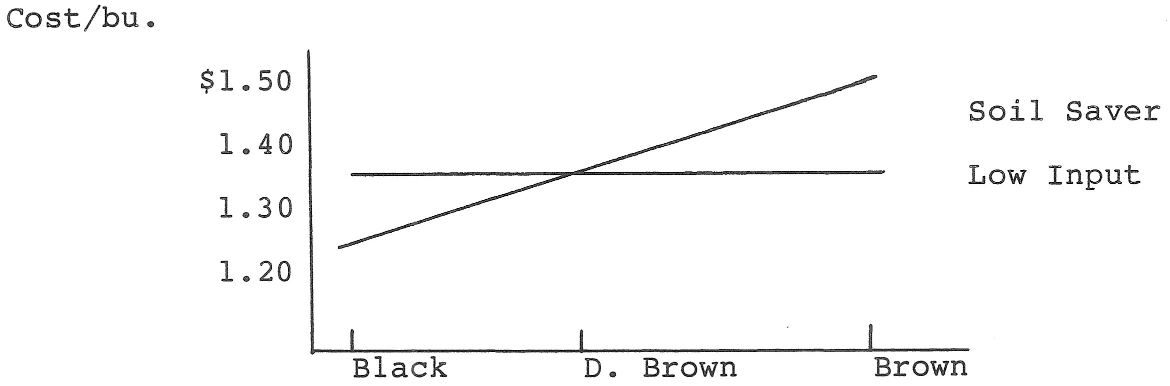
Based on available data, expectations for other operating costs including herbicides, insurance, hired labor, custom work, operating interest etc. are given in Table 4 and Figure 3.

Table 4. Other Operating Costs*

	Low Input per acre crop	Soil Saver per acre crop
Black	$54	$40
D. Brown	47	35
Brown	41	30

* Does not include principal and interest on term debt, depreciation, municipal tax, family living or income tax.

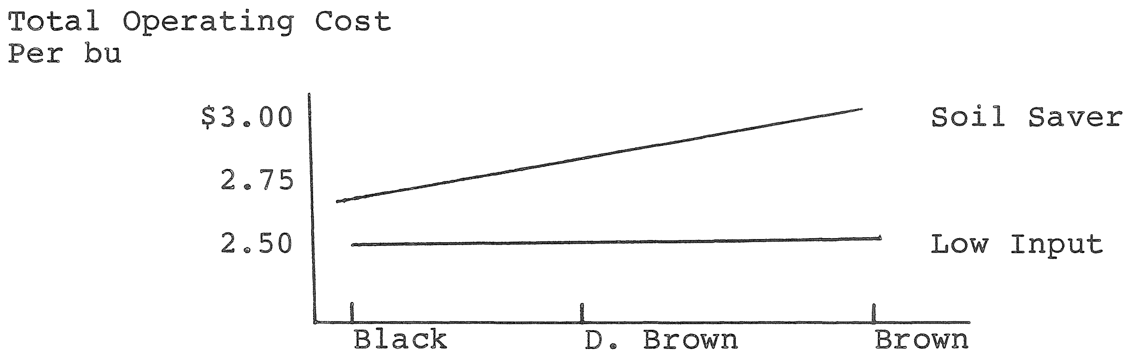
Figure 3. Other Operating Cost/Yield



2.2.3 <u>Total Operating Costs</u>

A summation is given is Figure 4. Note that total operating costs (called variable costs) include the costs that would be avoided if there was no production.

Figure 4. Total Operating Cost/Yield*



* Based on summation of Figure 1,2, and 3.

Reference to Figure 4 shows that based on operating costs "break-even prices" required under the two very different systems is quite similar for the Black Soil Zone. For the Brown

Soil Zone, the "break-even price" is about $.55 per bu. higher for the Soil Saver System.

2.3 Farm Size Implications

Different costs and yields means that farm size requirements will vary by cropping system and by soil zone.

To translate cost/yield data into farm size requirements requires an analysis of total cost, that is, variable cost plus fixed cost.

For a simple analysis assume a fixed cost level of $50,000 as a standard for all farms regardless of location or crop system. See Table 5.

Table 5. Size of Farm Required to Cover Total Cost at $4 wheat*

	Low Input cult. ac	Soil Saver cult. ac
Black	1,640	1,140
D. Brown	1,880	1,620
Brown	2,200	2,500

* Total costs include operating costs as in Figure 4, and fixed cost of $50,000 for each farm to include principal and interest on term loan, municipal tax, family living, income tax and other non business expenses.

In the short term, the decision to maintain a high production cropping system depends on whether or not operating costs are being covered. For the low input systems, this can usually be achieved at somewhere around $2.50/bu. for all soil zones. For soil saver systems, the requirement is much higher. For each 1,000 cult. acres, the comparisons are given in Table 6.

Table 6. Annual Operating Capital Requirement Per 1000 Cult ac.*

	Low Input $/1000 ac	Soil Saver $/1000 ac
Black	50,000	84,000
D. Brown	43,000	73,000
Brown	37,000	64,000

* Based on 500 ac of summerfallow crop on Low Input System and 1000 acres of stubble crop on a Soil Saver System.

For wheat prices in the range of $2.50 per bu., even the low input system farms cannot get from one year to another without using up savings, defaulting on loans and/or increasing new debt. The problem of "capital rationing" is even more severe for the high input Soil Saver Systems at these low prices. The problem then becomes one of just financing the production.

Although it can be argued (Figure 4) that costs per bushel can be similar for intensive and extensive systems in the Black Soil Zone, the operating capital requirements are still much higher because of all the extra production. Therefore, even in the Black Soil Zone, there will be massive pressures for a move back toward lower input systems with prices in the $2.50/bu. range simply because of the need to use available cash to cover fixed costs.

3.0 MACRO IMPLICATIONS

Price is the ultimate allocator of resources in any market. Prices dictate what technology and what production systems can be used on individual farms.

Low prices will always result in a decrease in supply, although there is a time lag expected in this response.

A problem for grain producers worldwide, is that the government policies and Agronomic research and recommendations of the 1970´s and 1980´s have encouraged high production systems which lock producers into situations where it is more difficult to respond to lower prices by decreasing production. The recovery time for prices is thereby increased because supply is slower to adjust to market requirements. The economic losses suffered by farmers are therefore greater because of the "chronic" nature of oversupply conditions.

So here we have another example of the conflict between micro and macro level results of policies and recommendations aimed either directly or indirectly at increasing production on individual farms.

Once again, Professionals serving Agriculture have proceeded carelessly without considering the price implications associated with policies and recommendations which serve to increase aggregate supplies in the market.

Now, as before, it is individual farm families which have to bear the burden of adjusting to insufficient cash flow. The adjustment required on many farms in Western Canada is to shift back to more traditional low input cropping systems. For farms on Brown and Dark Brown Soils, this can result in lower operating costs per bushel. For farms in the Black Soil Zone, the main advantage to shifting back will be to decrease the need for operating funds to keep the farm alive.