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Oilseed Economics

by

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Oilseed Economics

The 1990 U.S. Farm Bill provided producers an opportunity for production of alternative crops and oilseeds on portions of program crop acres. This change in policy created an interest by producers in canola (a genetic alteration of rapeseed) and oil-type sunflowers. In addition, soybeans were also eligible to be grown on these "flex acres."

A common question of program participants is "Which crop should I grow?" The answer generally given is that depending on the tillage, crop rotation, climate and a handful of other factors, farmers should choose the "flex acres crop" that produces the highest net income per acre. Ordinarily, an analysis of which crop to grow, could be done on a gross margin basis with best guesses for crop price. The method used in this paper takes advantage of the interelated prices of the three crops.

This paper looks at the question of "Which of the three major oilseeds to produce?" based on an economic analysis of the joint products, and some basic biological crop characteristics. The analysis in this paper does not consider government payments and subsidies, since the future of farm programs and payment levels are uncertain. If the strategy of growing the most profitable crop continues to hold for program participants, then the analysis that follows is suitable for oilseeds whether a producer is in or out of the program.

The Challengers and Their Characteristics

All three crops are "competing" for row crop acreage, as cash crops. While it may be possible to ensile a crop, most producers harvest the grain and sell it, to be processed into oil and high protein meal, for livestock feed supplements.

The attraction of these three oilseeds is that their oils are low in saturated fats and since they are derived from plant tissue, they have no cholesterol. These characteristics are important to consumers and will likely remain important for some time to come.

When an oilseed is processed, it is dehulled, crushed, the oil is extracted with a hexane solvent (then refined), and the remaining cake and hulls are toasted or dried and ground for animal feeds. Rapeseed (canola) is an exception, where prior to this process, some oil is directly pressed or extruded out of the seed. The principles in processing are the same for all three major oilseed crops, but some subprocesses may differ.

Table 1. Crop Characteristics

Characteristics	Canola	Soybeans	Sunflowers
a. Test weight (lbs./bushel)	50	60	25
b. Oil (% of seed by weight)	40	20	40
c, Saturated fats (% in oil)	6	15	11
d. Meal (% of seed by weight)	57	77	57
e. Protein (% of meal)	37	44	37
f. Seeds/lb. (in thousands)	150	2.8	7.7
Line d. adjusted for crush margin.			

Flax, cottonseed, safflower, and peanuts are alternative oilseeds, for central and northern U.S. The adaptability (and economics) of these alternative oilseeds to the central and northern states is limited, as well as the oportunities to market them, compared to other parts of the United States and the world.

Soybeans

Soybeans can be grown in nearly every fertile area of the world. Production in the U.S. has increased more than seven fold since the early 1950s, due to genetic improvements, increasing acreage, improved management, and technology. Markets, processing, grades and standards are well established.

In 1990, U.S. exports for all oilseed and products (most of which were soybeans and soy-products) was 6.098 billion dollars or more than 1/7 of all U.S. agricultural product exports. They ranked second in all agricultural product exports (only feedgrains were higher) in monetary terms.

As a legume, soybeans fix their own nitrogen, making their fertility costs lower than sunflowers or canola. State Agricultural Experiment Stations and Extension Services in most U.S. states publish variety trials, have established breeding programs, and often distribute production research reports to help farmers produce soybeans in the most cost effective manner for the region.

Each 60 pound bushel of No. 2 yellow soybeans yields roughly 11 pounds of vegetable oil and 47.5 pounds of (44%) protein meal.

Sunflowers

Specialty markets for confectionery and bird-seed sunflowers account for only 10% of all sunflower production, while the remaining (oil-type) sunflowers are processed for oil and meal. The main difference between the speciality and the oil-type are plant population and perhaps where you deliver the crop. Lower population gives larger seed, whereas higher population reduces seed size, but increases total yield for oil and meal.

Best management practices and varieties vary by production area. Markets and standards are not as well established as they are for soybeans, so you need to identify possible delivery locations and potential contracts, before planting. Some sunflower processors offer premiums for oil content above 40%, but others might not. While it might be possible to use a conventional corn head for harvesting, special combine heads for sunflowers are manufactured to reduce losses and grain damage. It may be possible to buy a used sunflower head or rent a head from another farmer. Another alternative is to swap heads or combines so that the neighbor works on another crop while you harvest your sunflowers (and vice versa).

In some areas birds can be a pest in sunflowers. Pest and disease resistance in sunflowers is improving, but not to the extent of soybeans. Thick hulls on sunflower seeds give a low test weight and a bulkier crop at harvest time, compared to soybeans and canola. Drying sunflowers on the farm requires experience and close monitoring. Chaff and grain are flammable and too much heat can reduce grain quality. State extension crop storage specialists (in Ag. Engineering) as well as processors are good sources of experience and information if you are considering on-farm storage of any oilseed.

Canola

Canola is a member of the mustard (Brassica) family. There are two types of canola. One type is fall planted and undergoes a vernalization process before maturing the following summer. The other type is spring planted and harvested later, the same summer. Spring canola is a cool season crop suitable for most of Canada and extreme northern U.S. Fall seeded canola requires adequate snowcover and/or moderate winter temperatures to prevent winterkill. Those areas where winter wheat are grown are candidates for the winter variety of canola (there is a state specific section later in this paper).

Rapeseed oil contains acids that help the oil adhere to machinery and gears, but make the oil unusable for human consumption. Canola is derived from rapeseed through genetic engineering. The result is an oil highly desirable for human consumption, and a meal that is palatable for food and feed.

Canola seed is very small as indicated by Table 1. Table 1 also shows that sunflower and canola crush have similar yields of oil and meal content. The protein content of canola meal and dehulled sunflower meal are very comparable. The balance of amino acids in all three protein meals vary. It is recommended that livestock producers test for amino acid content before balancing rations.

In some areas canola is cut and swathed to dry, but it may be possible to harvest the crop using a small grain head. Shattering of seeds from the plant is a problem, as are immature (green) seeds. Grades and standards are not as well structured for canola. Processors may offer premiums for high oil content.

With time and breeding improvements the future for canola should be very bright. University and private breeding programs will expand, the number of processors is likely to increase, and variety trials and refined management practices will become more available.

MARKETING AND ECONOMICS

Contracts to market sunflowers and canola are usually offered by processors, but contract terms will vary. At least one company offers 4 opportunities to price a percentage of production, with no direct marketing fees. With this system the producer can market any percentage (1 to 100%) of an uncertain yield, prior to harvest. This is more flexible than a contract of a specific number of bushels or pounds.

If a contract guarantees a specific price for a specific number of bushels (pounds), the event of a local drought might require producers to make delivery or pay for any contract shortfalls. In some cases the contract may protect the processor more than the producer.

Oilseed producers will want to consider Multiple Peril Crop Insurance (if available), especially if they are inexperienced in growing the crop, or if contracts do not include clauses for drought and/or crop failure.

Oilseeds and contracts are priced off their joint products (value of the oil and meal). In the world market the oils compete with a host of vegetable oils as well as lard, butter and tallow. Most vegetable oils are traded (cross-hedged) via the Chicago Board of Trade (CBOT) soybean oil contract. The value of the protein meal is commonly hedged on the CBOT soybean meal futures contract. At one time the Minneapolis Grain exchange offered futures contracts for sunflowers. Currently they offer a cash market in sunflowers.

The major soybean futures market is the CBOT. CBOT traders and soybean processors ensure that futures price of soybeans stay in line with the value of its joint products (futures prices in oil and meal).

Yields for all three crops are likely to be closely related in a given year, since all three grow during the same time period, and are harvested from late August to early November. Sunflowers are probably the most drought tolerant of the three, followed by soybeans. Many producers will be able to achieve higher yields with soybeans than with sunflowers or canola on a pound per acre basis. With continued plant breeding in the other oilseeds, this may not be the case in the future. There are also areas where neither winter or spring planted canola can be recommended, due to winter kill and low yields.

Crop Production Costs

Table 2 shows a breakdown of expenses for each of the three oilseeds for yields of 2100 lbs per acre. For soybeans, this is a yield of 35 bushels per acre. Yields for canola and sunflower are usually quoted in pounds. The numbers used in Table 2 should be considered example values and are not intended to be an average for farms or typical for a producer. Farmers are encouraged to adjust yields and expenses according to their own records and costs.

Table 2. Oilseed Production Costs

Expenses	Soy-bean	Sun-flower	Canola	Your Costs
Seed	12.00	9.00	9.00	
Fertilizer	16.00	27.00	24.00	
Chemicals	26.00	27.00	26.00	
Fuel	8.00	9.00	8.00	
Repair & Maintenance	19.00	21.00	22.00	
Interest on above	4.00	4.00	4.00	
Land rent	82.00	82.00	82.00	
Allocated Fixed Costs	36.00	36.00	36.00	
Other Misc.	2.00	0.00	4.00	
Total Costs per Acre	205.00	215.00	215.00	

Some of the costs in Table 2 need a brief explanation. Variable costs like seed, chemicals and fuel are self-explanatory. Interest on variable expenses (until harvest) are the interest you might pay on a production loan, or what you could have earned in some alternative investment if you use your own capital, to finance planting. Land rent is a short way to cover land related expenses (ie. taxes and interest costs on land). Like interest costs, even if you own the land you farm, you could have rented it out, and should expect that the oilseed crop be able to cover land costs as well as variable costs. Allocated Fixed Costs are depriciation and costs of capital items like grain bins, equipment and buildings used in crop

production and allocated over all acres. This value will be highly variable from one farm to another, but will probably be constant across all crops.

If each crop yields 2100 pounds per acre, then Table 3 shows important breakeven calculations. At present, this is a somewhat optimistic canola yield, a reasonable sunflower yield, and a conservative soybean yield for many North Central U.S. producers. Use reasonable and comparable yields for your area in your analysis. The notation at the bottom of the table is similar to many electronic spreadsheets, where the column is designated by a letter and the row (or line) by a number. The "*" (asterisk) is multiplication and "/" (back slash) division. In the formula for B6 there is a factor of B5/A5. This factor adjusts for the difference in protein content between soymeal and canola or sunflower meal.

Table 3. Breakeven Worksheet

Quantity (watch units)	Soybean Column A	Sunflower/ Canola (B)	Your A Values	Your B Values
1. Yield (lbs/ac)	2100	2100		
2. Oil in seed (%)	20	40		
3. Oil (lbs/ac)	420	840		
4. Meal in seed (%)	77	57		
5. Protein in Meal(%)	44	37		
6. SBMeal (tons/ac)	.8085	.6799		
7. Table 2 costs	205.00	215.00		
8. Oil BE if Meal=$0	$.49/lb	$.26/lb		
9. Meal BE if Oil=$0	$253.55/ton	$316.22/ton		
A3=A1*A2*0.01, B3=B1*B2*0.01, A6=A1*A4*0.01/2000, B6=(B1*B4*0.01*B5/A5)/2000, A8=A7/A3, B8=B7/B3, A9=A7/A6, B9=B7/B6				

Table 3 values in rows 8 and 9 are plotted on each of the axis, as done in Figure 1. The lines between the values on each axis are break-even lines. If prices rise (up or to the right), profits will increase. If prices fall far enough both crops will lose money.

Imagine there are lines perpendicular to each of the break-even lines. The further a price combination point is from a breakeven line (where distance is measured in the perpendicular direction), the farther from break-even the profits will be.

In Figure 1 soybean profits were lower but positive in 1990 and 1989 according to the costs used in this analysis. Prices used in Figures 1 and 2 are average annual crude oil, and 44% protein SBM prices F.O.B. Decatur, IL. The local basis for oil and meal, will be a relatively equal factor for all three crops, and has been excluded in the calculations. Figure 2 is for you to plot your own break-even lines.

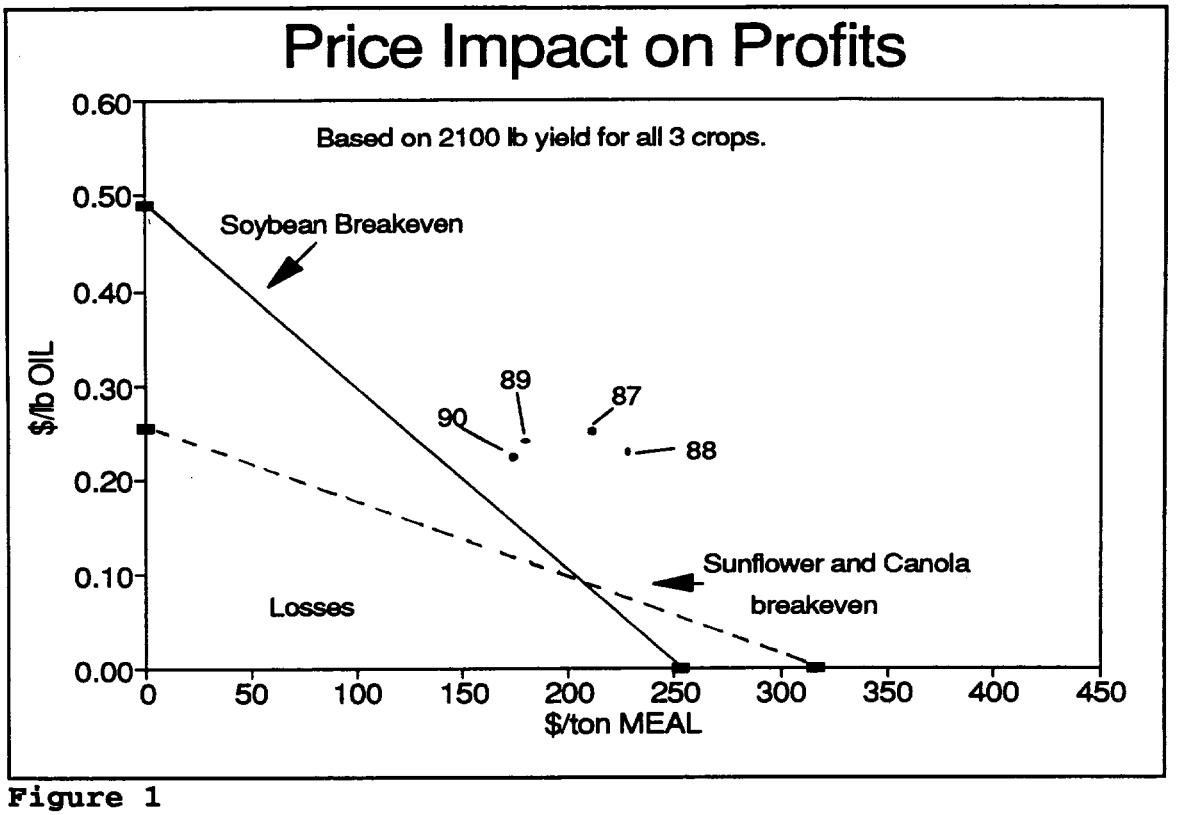

Figure 1

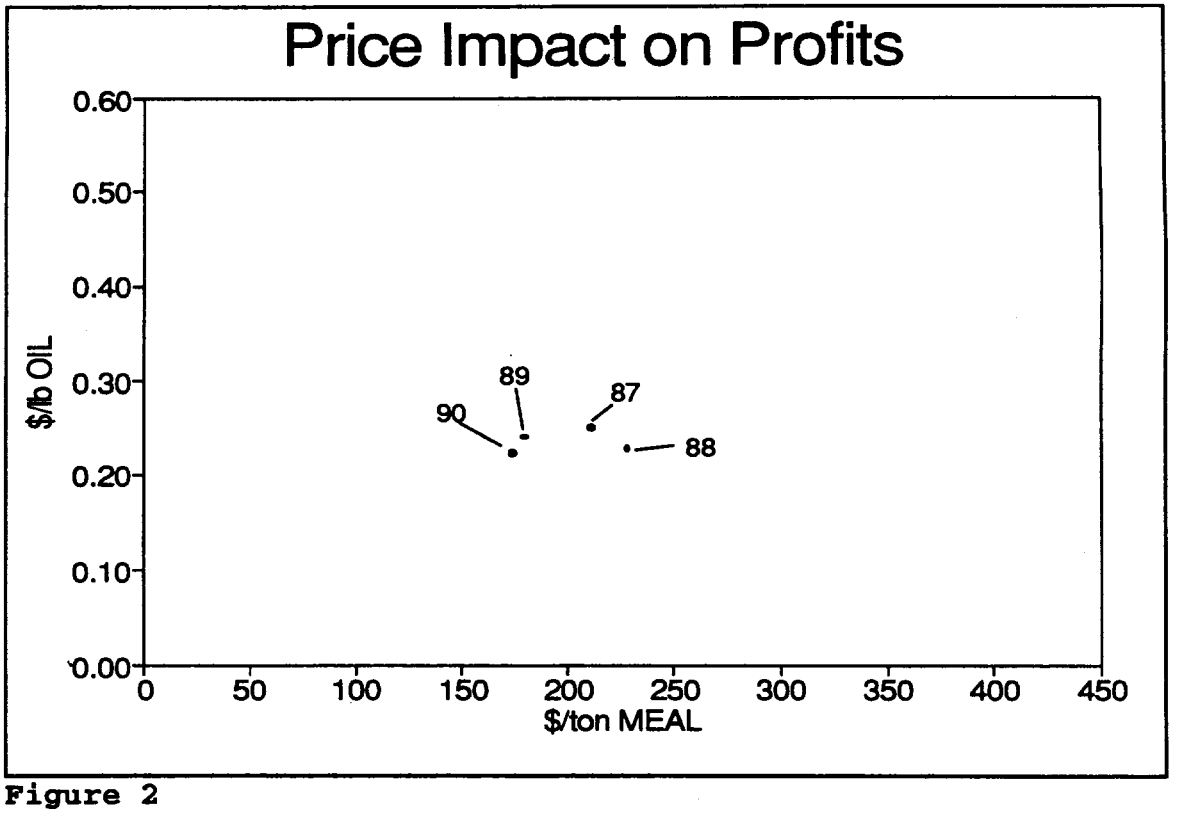

Figure 2

If this analysis useful, it would be rather simple to transfer the calculations into an electronic spreadsheet. If you have difficulty graphing in your computer, you may find it faster to use graph paper and a pencil.

The authors hope you find this analysis useful in your crop decision-making. Naturally, rotations, residual herbicides, pests, diseases, tillage, and equipment changes have not been incorporated in the analysis, but might weigh heavily on the decision.

IN MINNESOTA

To date, yield trials would suggest that soybeans are a superior oilseed in southern and central Minnesota. In northwestern Minnesota soybean yields (and protein) are low and the other two crops are excellent alternatives.

Diseases and pests could be a factor in production and rotations in Minnesota. Soybean Cyst Nematode (SCN) does not affect sunflower or canola. If SCN develops, inserting a non-legume like canola or sunflower into the rotation should reduce nematode survival. On the other hand, canola and sunflowers are more suseptable to a number of diseases, that once established would eliminate dry beans, soybeans, canola and sunflowers from the rotation for at least three or four years.

Variety trials for spring canola at Crookston, Morris and Roseau averaged 1624, 2624 and 2258 lbs./ac. respectively in 1990 and 1091, 1307, 2271 in 1991. (Top five varieties over the two year period.) Check Minnesota Varietal Trials Report for updated trial results on soybeans and canola.

What is Ahead?

Biotechnology and plant breeding programs both public and private will make significant strides in cold hardiness and disease resistance for many crops in as few as five or six years. Recent developments in tissue culture allow scientists to examine millions of plant cells on a single petri dish. The bottom line to improvements in plant breeding is that with increased disease resistance and cold hardiness, farmers will have fewer rotational headaches, more crops to choose from, and hopefully less risk in production.

Crop breeding improvements to oilseeds may include changes in the oil or meal content. Such changes in the "crush" content of oil or meal can still be computed using the methods presented earlier, as long as the oil and meal from each of the oilseeds are being used for many of the same purposes. If the properties (quality) of oil or meal from one of the competing crops were trading at a premium to all other oils, adjustements in calculations would be necessary. This could be done by keeping soybean crush and product quality as a base, and reflecting quality differences in the crush yield of the other crops.

Suppose canola oil becomes 50 percent of seed by weight and that it is more valuable than soybeans by a factor of 1.3 times the price of soy oil. This means the oil yield for canola would be "crop yield" times .5 (50%) times 1.3 for the quality factor. The same could be done for protein meal quality.

Farmers can watch for new varieties by keeping current on yield trial results from State Experiment Station variety trials in their area. Change in variety characteristics will be coming and with the new plant breeding methods, occuring at an increased rate. Support for these crop improvement efforts comes from federal research grants, land grant universities, state and local commodity groups, state appropriations and the private sector.