THE IMPACT OF CHANGING FUEL PRICES ON ALFALFA PRODUCT COSTS

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The recent drop in oil prices has resulted in lower energy costs in the U.S. The impact on agriculture has been significant. About 5% or $7 billion of total production expenses in agriculture went for fuels and oils in 1985. It is expected that 1986 prices of refined petroleum prices will average between 20 and 30 percent below 1985 prices. If farmers buy the same amount of fuel in 1986 as in 1985 this would equal from a $1.5 to $2 billion decrease in expenses or about a 1 to 1.5 percent drop.

Fuel prices have been fairly constant over the past three years (Figure 1). The marked drop came between January and April of 1986 when the average U.S. price of diesel fuel went

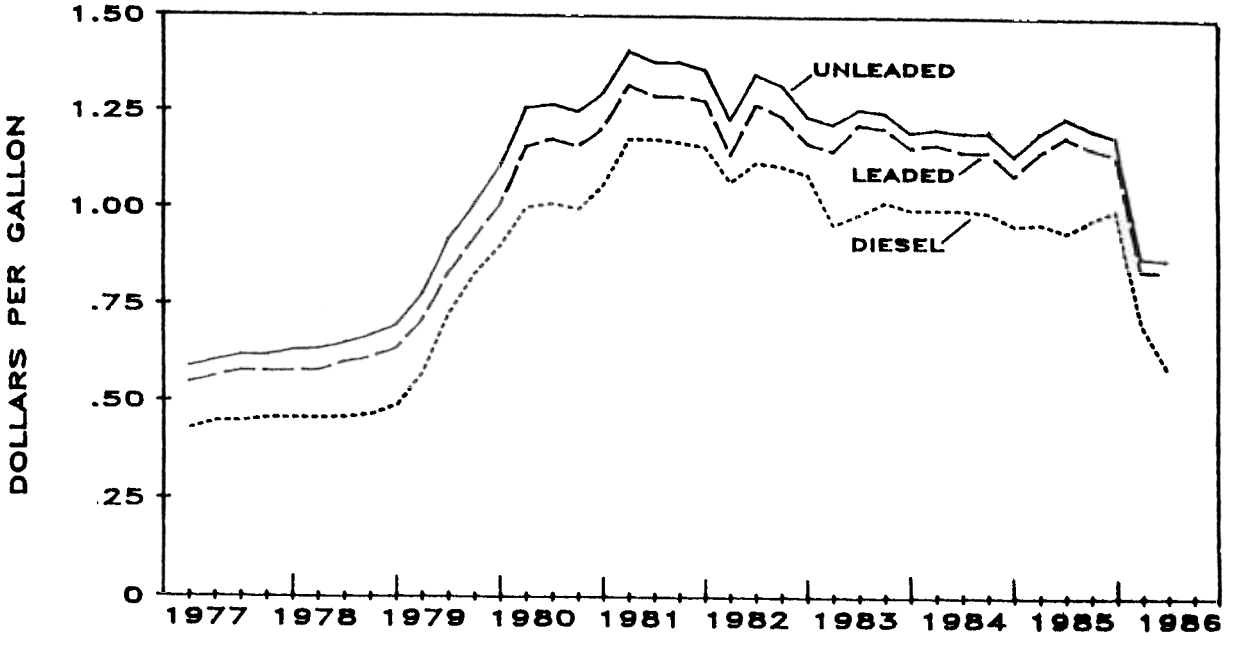

Figure 1. Fuel Prices, January 1977-July 1986
Source: "Agricultural Prices", U.S. Agricultural Statistics Board, NASS, USDA, July, 1986.

from $1.00 per gallon to $.63 per gallon (Table). The price fel further to $.59 per gallon in July.

Prices in California have been slightly below average U.S. prices (Table 1). The prices in 1986 have been between three and seven cents per gallon lower in California than U.S. average.

Table 1. Prices Paid By Farmers for Diesel Fuel*

	1984 JAN	1985 JAN	1986 JAN	1986 APRIL	1986 JULY
	$ per gallon				
California	.97	.94	.97	.63	.54
U.S.	1.00	.96	1.00	.70	.59

*Includes state and local per gallon, but excludes state road taxes.

Estimating Fuel Requirements for Crop Production

Energy use rates for farming operations are often measured in PTO horsepower-hours (PTO hp-hrs). This is found by multiplying the rated maximum PTO hp (power take-off horsepower) by the number of hours of the operation. For example, a disking operation using a diesel tractor rated at 100 maximum PTO hp operating at full load and used continuously for 5 hours would deliver 500 hp-hrs of energy.

Diesel tractors will deliver an average of 11.2 PTO hp-hrs per gallon of fuel. Gasoline engines will deliver an average of 8.4 PTO hp-hrs per gallon.

A diesel tractor rated at 100 maximum PTO hp operating at ful load would use 8.9 gallons of fuel per hour.

$$\frac{100 \text{ hp}}{11.2 \text{ hp-hrs/gal}} = 8.9 \text{ gal/hr.}$$

Tractors will operate at between 55% and 75% of their maximum horsepower on a year round basis. Returning to our example, if the same tractor were operating at 75% of capacity, the fuel use per gallon would be 7.0 gallons per hour.

$$\frac{100 \text{ hp} \times .75}{11.2 \text{ hp-hrs/gal}} = 7.0 \text{ gal/hr.}$$

Average fuel use per rated PTO hp at various field efficiencies are given in Table 2

Table 2. Average Fuel Consumption per Rated PTO hp

Engine Fuel Type	load factor .60	.65	.70	.75
	gallons/hr			
Diesel	.054	.058	.063	.067
Gasoline	.071	.077	.083	.089

Fuel use for various size tractors are given in Table 3. Average horsepower use is always less than the maximum power rating to extend engine life. Also, tractors are often used for operations such as fertilizer spreading, seeding, and cultivation, which do not require maximum horsepower.

Table 3. Fuel Use for Diesel Tractors

Maximum PTO Horsepower	Percent of Maximum Capacity .55	.6	.65	.7	.75
	gallons per hour				
30	1.47	1.61	1.74	1.88	2.01
50	2.46	2.68	2.90	3.13	3.35
80	3.93	4.29	4.64	5.00	5.36
100	4.91	5.36	5.80	6.25	6.70
130	6.38	6.96	7.54	8.13	8.71
150	7.37	8.04	8.71	9.38	10.04
250	12.28	13.39	14.51	15.63	16.74

Fuel Use in Alfalfa Establishment

Fuel use for establishment of an alfalfa stand is primarily for land preparation. Practices vary widely depending on the soil type, other operations and the crop preceeding the alfalfa. Variation in fuel requirements may be plus or minus 25%, depending on soil type.

An example of fuel use for alfalfa establishment is given in Table 4. Two tractors are used, 130HP and 80HP. The large tractor is assumed to be operating at 65% capacity. The smaller tractor is operating at 55% capacity.

The fuel use for each operation is found by multiplying the hours per acre by the fuel use per hour. The total fuel use is about 17 gallons of diesel fuel per acre.

It should be pointed out that the fuel use might not vary significantly if smaller equipment was used. Fuel use per hour would be lower for a smaller tractor, but the hours per acre would be higher for a smaller implement.

Fuel Use in Alfalfa Harvest

An example of fuel use in harvesting alfalfa hay is given in Table 5. The costs are for a single cutting of 1.2 tons of hay. Of course, baling and bankout costs per acre will vary with stand density.

The fuel use for swathing and raking are calculated by dividing the fuel use per hour by the acres per hour.

Swather: $\frac{2.5 \text{ gal/hr}}{6 \text{ acres/hr}}$ .42 gal/acre

Rake: $\frac{3.9 \text{ gal/hr}}{10 \text{ acres/hr}}$ .39 gal/acre

For baling and roadsiding the fuel use per acre depends on the yield per cutting. A yield of 1.2 tons was used for the calculations in Table 5.

For the baler the fuel use for one acre is .4 gallons per cutting. It is calculated as follows:

$$\frac{1.2 \text{ tons/acre}}{12 \text{ tons/hr}} \times 4.0 \text{ gal/hr.} = .42 \text{ gal/acre}$$

For the balewagon:

$$\frac{1.2 \text{ tons/acre}}{15 \text{ tons/hr}} \times 4.0 \text{ gal/hr.} \quad .32 \text{ gal/acre}$$

The total fuel use per cutting is .53 gallons per acre.

Fuel Costs at Varying Prices

The costs per acre for establishment and harvest at various fuel prices are given in Table 6. Harvest costs are for a single cutting.

Using the price history given in Table 1, fuel costs for establishment were $16.47 per acre in January 1986, $10.70 using April prices, and $9.17 using July prices. This is a decrease of 44% from January prices to July prices. For a 500 acre stand this is a savings of $3,650 in fuel costs.

For harvesting, the cost dropped from $1.48 for fuel for each acre cut to $.82. For a six cut system and 500 acres this is a savings of $1,980.

Discussion

While lower oil prices are encouraging because of savings in expenses, the indirect effects on the alfalfa industry are not clear. The two highest fuel use crops are rice and cotton. As fuel prices drop these crops may start to look more attractive and take pressure off expanding alfalfa acreage. Cheaper oil will also reduce oil-exporting countries' ability to pay for imports from U.S. farmers. This will also affect planting patterns. The recent dramatic changes in oil prices and uncertainty over future prices will make enterprise planning even more difficult this coming year.

Table 4. Sample Fuel Use for Alfalfa Establishment

Operation	Tractor Size	Hours Per Acre	Acres Per 10Hr Day	Fuel Use Per Hour	Fuel Use Per Acre
Chisel	130HP	.8	13	7.5	6.00
Disk	80	.5	20	3.9	1.95
Land plane	80	.4	25	7.5	3.75
Border prep	80	.25	40	3.9	.98
Float checks	80	.10	100	3.9	.39
Re-shape borders	80	.10	100	3.9	.39
Fertilize	80	.3	33	3.9	1.17
Seedbed prep.	80	.25	40	3.9	.98
Plant	80	.25	40	3.9	.98
Cover seed	80	.10	100	3.9	.39
TOTAL		3.05			16.98

Table 5. Sample Fuel Use for Alfalfa Harvest

Operation	Performance	Fuel Use Per Hour	Fuel Use Per Acre*
Swather	6 acres/hr	2.5	.42
Rake	10 acres/hr	3.9	.39
Baler	12 tons/hr	4.0	.40
Balewagon	15 tons/hr	4.0	.32
TOTAL			1.53

*Single cutting of 1.2 tons

Table 6. Sample Costs Per Acre for Alfalfa Establishment and Harvest at Various Fuel Prices

	Dollars Per Gallon of Diesel						
	.40	.50	.60	.70	.80	.90	1.00
	Dollars Per Acre						
Establishment*	6.80	8.49	10.19	11.89	13.58	15.28	16.98
Harvest**	.61	.77	.92	1.07	1.22	1.38	1.53

* Refer to Table 4 for detail of operations.
** One cutting of 1.2 tons. Refer to Table 5 for detai of operations.

References

"Agricultural Outlook", May 1986. Economic Research Service, USDA, Washington, D.C.

"Agricultural Prices", various issues. US Ag Statistics Board, National Ag Statistics Service, USDA, Washington, D.C.

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