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Donald C. Taylor
South Dakota State University

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Editor: Donald C. Taylor

Economics Department SDSU, Box 504A Brookings, SD 57007 Tele: (605) 688-4141

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by

Donald C. Taylor
Professor of Economics

The prices of farm inputs have increased a great deal during the past two decades. At the national level, for example, the prices paid by farmers for all inputs more than doubled between 1965 and 1977. In the four years since 1977, farm input prices increased an additional 50 percent.

The inputs whose prices have risen most rapidly are "fuels and energy" and interest costs. In South Dakota between 1977 and 1981, for example, the prices of electricity, diesel fuel, and investment capital increased at annual rates of well over 20 percent. Whereas energy price increases have slowed in recent months, few people believe that the upward trend in energy prices over the past decade is now reversed.

In this Newsletter issue, the economic impacts of rising energy prices on crop farmers in Brookings and Turner Counties are examined. First, the current energy-use of the four dominant crops in these two counties--corn, oats, alfalfa, and soybeans--is analyzed. Second, the potential implications of rising energy prices on the economics of crop production in 1990 are projected. Attention is given to each of the four crops under dryland conditions and to corn, alfalfa, and soybeans under irrigation.

Current Energy Use in Crop Production

Both "direct" and "indirect" forms of energy are used in crop production. "Direct" energy, as treated in this study, is embodied in the fuel and lubrication for farm machinery and irrigation systems and the power for grain drying. "Indirect" energy is involved in producing and delivering the inputs in agricultural production. The indirect crop energy treated in this study involves the energy involved in the manufacture of fertilizer and plant protection chemicals, but not the energy embodied in seeds, machinery, transportation, and human labor.

The farm energy bill in 1981 for oats, soybeans, and alfalfa raised under dryland conditions ranges from $14 to $25 per acre (Table 1). Dryland corn, on the other hand, involves more than twice as much energy.

Table 1. Estimated Energy Cost Components in the Production of Selected Dryland Crops, Brookings and Turner Counties, 1981

Crop and county	Energy cost components					Total variable production costs[a]
	Machinery fuel and lubrication	Fertilizer manufacture	Grain drying	Plant prot. chemicals manufacture	Total	
	(dollars per acre)					
Brookings County						
Corn	18	14	10	5	47	97(48)
Oats	14	7	0	1	22	49(45)
Soybeans	15	2	0	2	19	58(33)
Alfalfa	12	1	n/a	1	14	41(34)
Turner County						
Corn	19	17	14	4	54	109(50)
Oats	15	9	0	1	25	55(45)
Soybeans	15	2	0	3	20	61(33)
Alfalfa	18	1	n/a	1	20	59(34)

[a] The numbers in brackets are the total energy costs expressed as percentages of the total variable production costs.

Farm Application: The total energy bill for a typical 350 acre dryland farm under corn production in 1981 would have been over $10,000 more than the energy bill for that same farm with alfalfa and soybeans.

In relative terms, energy accounts for one-third to one-half of the total variable production costs for dryland crops, with the ratios highest for corn and oats and lowest for soybeans and alfalfa.

Of the various energy components in dryland production, "machinery fuel and lubrication" is the largest. It accounts for over one-half the energy bills for all crops except corn. Fertilizer manufacture and grain drying also each involve from one-fifth to one-third of the energy used in corn production.

The energy used for alfalfa and soybeans raised under irrigation amounts to about $35 to $50 per acre (Table 2). For irrigated corn, the energy bill exceeds $100 per acre. Thus, over two times as much energy per acre is used for crops raised with irrigation as under dryland conditions.

Farm Application: The energy bill for a typical quarter section of corn raised under irrigation in 1981 would have been about $7,500 greater than if the corn were raised under dryland conditions.

Energy accounts for over one-half of the total variable costs for irrigated corn, 40 to 46 percent for irrigated alfalfa, and 35 percent for irrigated soybeans.

The largest energy cost component in irrigated corn production, fertilizer manufacture, accounts for well over one-third of corn's total energy cost. The fuel to power irrigation pumps accounts for about 30 percent of total corn energy. For alfalfa and soybeans, on the other hand, well over 60 percent of the total energy expenditure is on irrigation fuel.

Future Impacts of Rising Energy Prices

Three rates of energy price increase were studied:

- "Slow" = Trends throughout the 1970's in energy prices
- "Moderate" = A doubling in the 1981 energy price by 1990
- "Rapid" = A doubling in the 1981 energy price by 1986.

The annual growth rates associated with these rates of increase are 2.8, 8.0, and 14.9 percent, respectively. The prices of other inputs were assumed to grow according to trends throughout the 1970's. Product price projections were based on Chase Econometric forecasts.

The impacts of these three rates of energy price increase on the future economics of crop production are shown in Figure 1. The greater the shortening of the income-bars--from "slow" to "moderate" to "rapid"--for a particular crop, the more severe the impacts of rising energy prices on the profitability of that crop.

Table 2. Estimated Energy Costs Components in the Production of Selected Irrigated Crops, Brookings and Turner Counties, 1981

Crop and County	Energy cost components: Irrigation system power	Machinery fuel and lubrication	Fertilizer manufacture	Grain drying	Plant prot. chemicals manufacture	Total	Total variable production costs[a]
	(dollars per acre)						
Brookings County							
Corn	29	11	35	25	4	104	189(55)
Alfalfa	26	9	1	n/a	0	36	90(40)
Turner County							
Corn	30	12	52	12	4	110	207(53)
Alfalfa	34	17	2	n/a	0	53	115(46)
Soybeans	26	10	1	0	3	40	113(35)

[a] The numbers in brackets are the total energy costs expressed as percentages of the variable production costs.

Under the slow energy price rise assumption and under both irrigated and dryland conditions in Turner county, corn is projected in 1990 to be somewhat more profitable than soybeans. In Brookings County, dryland soybeans have a slight edge over dryland corn. Under both irrigated and dryland conditions in both counties, alfalfa is less profitable than either soybeans or corn. Dryland oats, in turn, are only about one-half as remunerative as dryland alfalfa.

The ranking in the projected relative profitability among crops in 1990 is rather different under the rapid energy price increase assumption from that under the slow energy price rise assumption. The most striking difference is the emergence of soybeans as the most profitable crop under both dryland and irrigated conditions. This results because soybeans require less energy per acre.

Further, under projected dryland conditions in Brookings County, alfalfa has a marked profit advantage over corn as the energy price growth rate increases. In Turner County, dryland alfalfa and corn are about equal in their profitability. Under irrigation, however, corn in both counties continues to be considerably more profitable than alfalfa, even under rapidly rising prices.

The projected 1990 net returns from dryland corn under the rapid energy price increase assumption are over $80 per acre less than under the slow energy price rise assumption. The corresponding reductions in net returns for the other dryland crops range from only $25 to $45 per acre.

> Farm Application: Under the rapid energy price increase assumption, a 350 acre dryland farm under corn production would be roughly $30,000 less profitable in 1990 than under the slow energy price rise assumption. The corresponding reduction in net returns for other crops is from $12,000 to $16,000 per year.

In relative terms, the projected net returns from dryland production under rapidly increasing energy prices are 37 to 50 percent less for corn and oats. The corresponding reductions for alfalfa and soybeans range from about 15 to 25 percent.

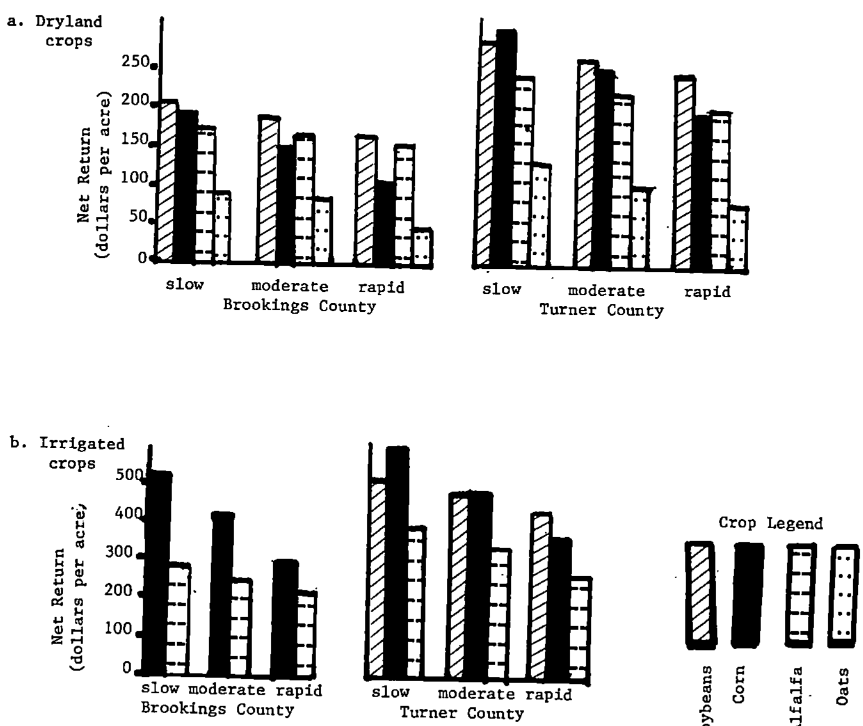

Figure 1. Impact of Slowly, Moderately and Rapidly Rising Energy Prices on the Projected Net Returns in 1990 from Producing Selected Dryland and Irrigated Crops, Brookings and Turner Counties.

The projected 1990 net returns from irrigated corn under the rapid energy price increase assumption are roughly $190 per acre less than with the slow energy price rise assumption. The corresponding reductions in net returns for irrigated soybeans and alfalfa are less than one-half as much as those for corn.

Farm Application: Under the rapid energy price increase assumption, an irrigated quarter section of corn would be about $15,000 less profitable in 1990 than under the slow energy price rise assumption. The corresponding reduction in net returns for alfalfa is about $10,000.

The relative reduction in net returns from rapidly rising energy prices ranges from 16 percent for irrigated soybeans to about 40 percent for irrigated corn.

Conclusion

Currently, energy accounts for about one-third of the variable costs involved in producing dryland soybeans and alfalfa. The corresponding fraction for corn is one-half. With irrigation, the share of energy in variable costs is from five to 10 percent higher than without irrigation.

If current trends in energy and other input prices were to continue through 1990, the profitability of corn and soybeans under both irrigated and dryland conditions would be roughly comparable. If the energy price were to raise more rapidly, however, soybeans would become more profitable than corn and the general profitability of farming would be considerably reduced.

These results demonstrate the potential economic vulnerability of an energy intensive crop like corn to rapidly rising energy prices. Whether the current popularity of corn may diminish during the 1980's, of course, will depend not only on the changes that occur in energy prices, but on changes in relative commodity prices and technology as well.

The full report of research results which underlies the summary presented in this Newsletter is available on request from the author.

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