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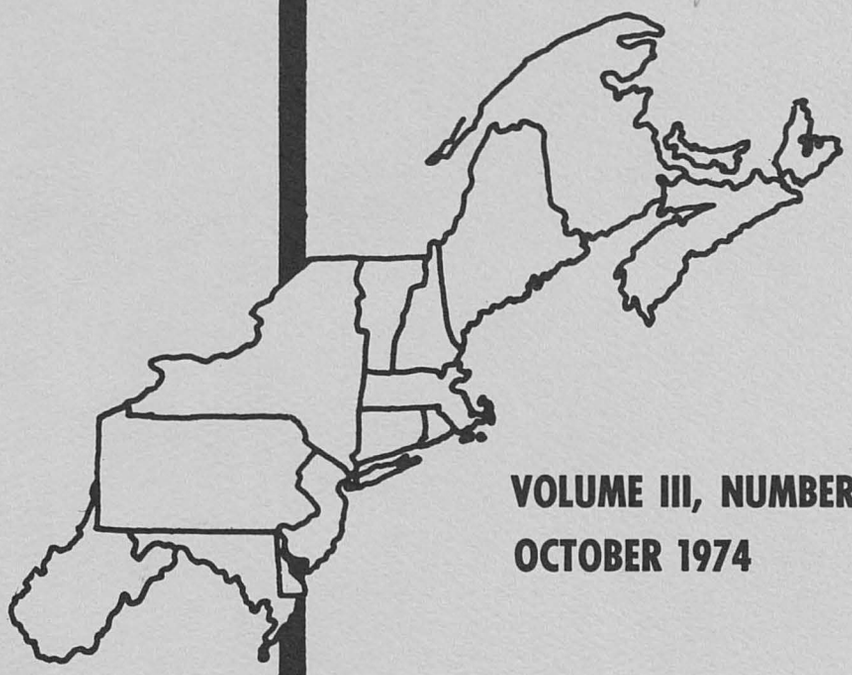

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FUEL AND THE COST OF FOOD

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Already we have felt the crunch of the energy shortage in many ways. However, you and I have not felt that impact equally. Just as we can expect to feel the effects of continued shortages, so, too, can we expect the pressure of that burden to bear unequally upon different segments of our population. It is this unequal impact that is the thrust of this paper.

Without attempting to determine whether there will be adequate supplies of fuel available for food production and marketing let us address ourselves to two other critical questions for the food industry and consumers which spring from our fuel shortage situation. First, what will be the impact on food costs, and second, how will the increased cost be distributed among different foods? There is no simple answer. We admit that neither can the answers be very precise. However, let us not hide behind such an admission to the point that we fail to come to grips with the problem as best we can. Rather, let us apply our present knowledge of the food production and marketing industry so as to gain some insight which might permit us to make more rational adjustments in line with rational expectations. After all, following the period of crises adjustments in which we have participated, we can rest assured that there will be further adjustment--let us hope for the element of rationality and strive for that element.

We have not completed the shakedown cruise of the energy shortage. We are in the process of adjusting to the first round of adjustments and adjusting our expectations for the future.

It is the contention of this paper that when we ask the question "What part of the selling price is represented by fuel cost?" we are understating the significance of changes in fuel cost as a consideration for adjustment. To examine the true significance of rising fuel costs upon producers and consumers, we are assuming that fuel would be available for producing and marketing foodstuffs, and that the physical inputs would remain relatively the same at each level. This enables us to highlight those pressures for adjustment resulting from changes in fuel price.

Farmers and the Cost of Fuel

Farmers, as critical users of fuel, can expect higher production costs as fuel prices rise. But how much more? Will the difference be so great that we might expect farmers to change their input-output decisions, or even to change enterprises?

To be most meaningful, a cost must be considered as part of the total or be compared with something. The relative importance of energy costs may be seen by comparing selected cost and return data as shown in Table 1 for Illinois farms. While there is considerable variation between individual farms in any group and Illinois farms may differ from farms in other states, these farm records provide insights for understanding the differential impact which might be expected by commercial farmers. Fuel costs for four types of Illinois farms represent less than 5 percent of total cash sales and less than 2 percent for beef cattle farms. However, this measure understates the significance of fuel costs and their impact upon returns for farmers. Comparison of fuel costs with cash farm expenses with cash balances 1/, and with labor and management earnings reveals that rising fuel costs would have considerably more effect upon returns than upon total costs.

While fuel costs were only 4.8 percent of cash sales for Illinois dairymen and 3.8 percent of cash sales for the Illinois grain farmers, they were equivalent to almost 40 percent of labor and management earnings for the dairymen and the equivalent of 19 percent of labor and management earnings for the grain producers. If fuel costs doubled, returns to labor and management for Illinois dairymen would be reduced by almost 40 percent, twice the percentage reduction for grain farmers in this essential measure of family well-being. Percentagewise, cash balances would be reduced almost 80 percent more for dairymen than for grain farmers and 40 percent more than for meat producers.

Such marked changes in the relative well-being of producers of different products would likely bring about differential changes in production and in product prices. For example, in response to fuel price increases, and with other things being equal, should we not expect milk production to decline and farm milk prices to rise relatively more than meat and grain at the farm level? This probability is even greater because milk production has already been decreasing during the past two years as resources have withdrawn from dairy.

Let's look at fuel costs in relation to cash expenses for farmers. Cash expenses continue to become more significant to farmers as they purchase increasing proportions of farm inputs. In 1971, Illinois dairy farmers spent about 75 cents of each sales dollar for purchased inputs.

1/ Cash balance, the difference between cash sales and cash expenses, is used as a proxy for value added at the farm level.

Table 1
Relationship of fuel costs to returns for four types of Illinois farms, average per farm, 1971

Item	Unit	Type of farm			
		Dairy	Beef-cattle	Hog	Grain
Farms	No.	322	322	786	2,225
Cash sales of product	Dol.	50,277	143,029	74,642	68,006
Cash expenses	Dol.	37,383	123,206	58,397	43,184
Cash balance (value added) 1/	Dol.	12,894	19,823	16,245	24,822
Labor and management earnings	Dol.	6,094	10,031	8,095	14,071
Gasoline and oil expenses	Dol.	1,579	2,129	1,172	2,162
Electricity as a proportion of gas and oil 2/	Percent	39	20	57	17
Fuel portion of hired transport as proportion of farm gas and oil 3/	Percent	13	9	5	4
Total purchased fuel and energy	Dol.	2,400	2,746	1,899	2,616
Purchased fuel as proportion of:					
Cash sales	Percent	4.8	1.9	2.5	3.8
Cash expenditures	Percent	6.4	2.2	3.3	6.1
Cash balance (value added)	Percent	18.6	13.9	11.7	10.5
Labor and management earnings	Percent	39.4	27.4	23.5	18.6

Source: 1971 Summary of Illinois Farm Business Records.

1/ Cash balance, the difference between cash sales and cash expenses, is considered a proxy for "value added" at the farm level.

2/ Adjustment based upon 1971 farm records for Minnesota and Iowa.

3/ Adjustment for hired transport based upon 1971 farm records for Minnesota and Iowa. Fuel portion of hired transport and freight based upon unpublished ERS summary of records covering 12.4 million truck-miles.

Remember this is the average for the 322 dairymen, in an area where it is the common practice to produce most of the feedstuffs for the herd. Cash expenses may normally constitute 90 percent or more of cash sales for those herds or farms purchasing most feedstuffs in the open market. The impact of an increase in any production cost becomes rather obvious in such an instance, as was witnessed during the past summer with escalating feed prices to the point where cash expenses were constituting well over 100 percent of cash sales. A change in the price of inputs therefore becomes critical in its effect upon the cash balance, labor earnings and standard of living for farmers. Surely we cannot for a moment pretend that since the cost of fuel, or any other input, is not a major portion of the total sales that it will not influence producers decisions when their living standard is being subjected to such radical relative adjustment.

Higher fuel prices would also influence the cost of production for farmers by increasing the cost of inputs other than fuel. While fuel costs for supplying these other farm inputs are not available, an approximation can be made by using the figure for all manufactures of 1.4 percent of value of shipments. This figure is somewhat low in that it does not include fuel for transportation of raw materials or products. An adjustment could have been made to incorporate this and any other additional fuel cost, as well as differentiating fuel cost for the input industries, but was not done in this instance. Even so, we do recognize that farms of different types and location may use quite a different mix of inputs, and that processing and transporting these inputs may have substantially different energy requirements.

Food Industry Fuel Costs

Farm products must be processed and distributed to consumers by firms whose fuel costs are also increasing. Some of the basic comparisons are shown for all manufactures and selected food manufactures in Table 2. Overall, the food industry tends to use less fuel per dollar value added by manufacture than do all manufactures. Dairy processors use more fuel per dollar of value added (or add fewer dollars value per dollar of fuel purchased) than does any other major food industry except grain millers. However, from 1967 to 1971, the dairy products industry increased its total fuel and electrical energy purchases much less than did the other industries. A major part of this was due to the changing structure of the dairy processing industry. Dairy processors, while using more fuel per dollar of value added by manufacture than most other food industries, was the only industry group in the period 1967-71 to have increased the value added per dollar of fuel purchased. Dairy was also the only group increasing value of shipments per dollar of fuel purchased. The increase in dollar value of fuel purchased by the dairy industry was so small that it experienced the next smallest increase in fuel purchased per production worker of all major food industries, despite the fact that this industry also experienced the greatest percentage decline in number of production workers.

Table 2
Selected comparisons of fuel use 1/ by food industries, 1967 and 1971

	Value added per $1 purchased fuel 2/		Value shipments per $1 purchased fuel		Fuel purchased per establishment	Percent change 1967-1971		
	1967	1971	1967	1971	1967	Fuel purchased	Dollar value added	Dollar value of shipments
	Dollars					Percent		
All manufactures	34	30	72	64	24,721	36	20	20
Food and kindred	40	38	127	115	20,346	35	28	23
Meat	39	38	236	199	18,519	44	40	21
Dairy	30	31	110	119	18,859	6	12	14
Butter	11	NA	92	NA	19,259	NA	-16	-7
Cheese	18	NA	139	NA	11,988	NA	86	50
Condensed & evap.	25	NA	83	NA	52,234	NA	17	24
Ice cream and frozen	33	NA	86	NA	14,471	NA	7	10
Fluid	35	NA	118	NA	19,103	NA	6	6
Canned, cured, frozen	42	38	108	97	24,178	46	31	31
Grain mill	33	29	113	94	27,358	35	19	12
Bakery	66	62	122	111	12,073	26	19	14
Beverage	69	60	131	121	15,929	57	36	45
Miscellaneous food	30	30	101	93	21,876	38	37	27

NA = Not available.
1/ Fuel use includes purchased fuel and electrical energy.
2/ Value added by manufacture as defined and reported by Census of Manufactures.
SOURCE OF DATA: Computed from data in census of manufactures publications: "1967 Census of Manufactures"; special publications "Fuel and Electrical Energy Consumed"; "General Summary"; "Annual Survey of Manufactures 1971"; "Value of Product Shipments"; "General Statistics for Industry Groups and Industries 1971".

Classification and allocation problems become more difficult as the industries are broken down into sub-industries. Despite the lower degree of accuracy, the differences in the importance of fuel costs in milk processing do appear significant and illustrate the variation within sectors of an industry. The butter sub-industry was spending the equivalent of almost 10 percent of its value added by manufacture on fuel. Fluid milk processors spend less than one-third this proportion. At the processing level, increasing fuel costs would hit the butter sub-industry the hardest, followed in order by cheese, condensed and evaporated, frozen, and finally by fluid milk products.

Lower returns would affect the relative ability to maintain resources in an independent industry. Such differential impacts could well bring about additional pressures upon an already changing industry structure. Handling surplus milk, admittedly a problem in many areas, could experience even more instability.

Fuel Cost Influence Retail Prices

Once processed, foods must be moved and sold to the consumer. Wholesaling and retailing functions require additional energy. Recognizing the increasing complexity of the joint costs involved, we have attempted to differentiate as to the energy use of three classes of products at the distribution level. It is at this point that we begin to appreciate how marketing practices interact with or upon increased costs at different stages of production and marketing.

According to the recent study of developments in marketing spreads by the Economic Research Service, last year the marketing bill accounted for 55 percent of the consumers food dollar for food consumed at home and 78 percent for food consumed away from home. In addition to the usual margins work, ERS developed detailed information on cost components on selected food items at each level in the marketing system. For all food items studied, retail store margins ranged from 10 to 43 percent of retail selling price, tending to cluster around 20 percent. Using these data, we have computed the combined wholesale and retail margin as a percent of the retail price for dairy products, meat products, and grain mill products. This combined wholesale-retail margin was 25 percent of the retail price for dairy products, 27 percent for meat products, and 54 percent of the retail price for grain mill products.

Initially, the consumer might expect quite a different relative retail price change than that experienced by the producers. The dollar spent for the three groups of food at retail, is divided up quite differently at the processing and farm level. In table 3, the dollar of retail sale is broken down by functional level, starting at the retail level and working backward through processing and farm production to the purchased farm inputs, showing the value of shipments, value added, cost of inputs (materials), and the fuel cost at each stage. Purchased inputs for each stage are considered as the sales from the preceeding stage. This process gives a fair approximation of an impact upon the purchased inputs, although several refinements could be made.

Table 3
Functional breakdown of fuel cost per dollar of retail sales of dairy, meat, and grain mill products, 1971

Item	Unit	Function or stage of production: Wholesale and retail 1/	Processing & distribution 2/	Farm production & shipping 3/	Purchased farm inputs
Dairy products:					
Total sales	Cents	100.00	75.0	57.5	42.8
Cost of inputs	Cents	75.0	57.5	42.8	22.8
Value added	Cents	25.0	17.5	14.7	20.0
Fuel cost	Cents	2.5	.6	2.7	.6
Cumulative fuel	Cents	6.4	3.9	3.3	.6
Cumulative fuel as percent of sales	Percent	6.4	5.2	5.7 5/	1.4
Meat Products:					
Total Sales	Cents	100.0	73.0	54.4	43.6
Cost of inputs	Cents	73.0	54.4	43.6 4/	23.2
Value added	Cents	27.0	18.6	10.8	20.4
Fuel cost	Cents	2.0	.4	1.8	.6
Cumulative fuel	Cents	4.8	2.8	2.4	.6
Cumulative fuel as percent of sales	Percent	5.1	3.8	4.4 5/	1.4
Grain mill products:					
Total sales	Cents	100.0	45.6	21.9	13.9
Cost of inputs	Cents	45.6	21.9	13.9	6.5
Value added	Cents	54.4	23.7	8.0	7.4
Fuel cost	Cents	0.1	.3	0.8	.2
Cumulative fuel	Cents	1.4	1.3	1.0	.2
Cumulative fuel as percent of sales	Percent	1.4	2.9	4.6 5/	1.4

1/ Current estimated fuel cost for food retailing are 0.7% of sales. This comparison includes estimates for wholesaling and fuel portion of transportation for wholesaling and retailing. 2/ Computed from data in the "Annual Survey of Manufactures, 1971". 3/ Farm production costs were calculated from the "1971 Summary of Illinois Farm Business Records" 4/ Adjusted for purchases of feeder livestock. 5/ Average for all manufactures.

This method enables us to see just how each phase contributes to the production of product for which consumers pay one dollar at the retail level. We can then reverse the process, by starting with the initial purchased inputs as defined in Table 3, and move forward through the production marketing complex, observing the sequential impact.

Assuming no change in production processes or in the quantities of fuel used, the total impact which could be expected based upon doubling the price of fuel under the functional breakdown shown in Table 3, is illustrated in Table 4. This breakdown starts with the purchased inputs and works forward through the production-marketing system. Doubling the cost of fuel at each stage of production, processing, and distribution and passing this on as a higher price to the next stage would increase grain mill products about 1½ percent, meat products about 5 percent, and dairy products almost 7 percent.

However, this is only part of this true story. Due to mark-up practices, retail prices would probably increase more than the actual amount of the added fuel cost. If the increased fuel cost is added to the present cost and the existing relationships, or percentage margins, between purchased inputs and sales were maintained at each level, price increases at retail would more than double, shown as alternative B.

This new price represents the expected retail price for the same product which formerly cost the consumer $1. The price, and percentage increase, is the difference in the retail sales prices and the former retail sales price of $1.

The actual cumulative increase in fuel cost at all stages of production and marketing increased by only 1.4 cents to produce and market grain mill products as compared with an increase of 6.4 cents to produce and market the dairy products which formerly sold for $1. However, by the time these increases at each stage were adjusted by the appropriate marketing margin or markup, the percentage increase in retail price for grain mill products would be over 10 percent, the same as that for meat products, and almost 14 percent for dairy products.

The price change of one food relative to others, and of foods relative to other goods, depends on the amount of fuel used by each and the different pricing patterns followed. In 1971, fuel cost in all stages of food production and marketing represented 2 to 6 percent of the retail price of food. With the input-output relationships and pricing practices held constant, every doubling of the fuel cost could increase retail prices of foods up to 13 percent. Dairy products probably would experience a relatively high price increase as dairy producers, processors and refrigerated retail cases are relatively heavy fuel users. Due to the relatively small actual increase in cost because of the small proportion of fuel cost, the price increase would probably not be so great for grain mill products. Following this line of reasoning, we would expect meat products to experience a price increase between dairy and grain mill products.

Table 4
Impact upon price of dairy, meat, and grain mill products at each functional level brought about by doubling the price of fuels

Item	Unit	Purchased farm inputs		Farm production and shipping		Processing and distribution		Wholesale and retail	
		1/ A	1/ B	1/ A	1/ B	1/ A	1/ B	1/ A	1/ B
Dairy products:									
Sales or shipments	Cents	43.4	43.9	60.8	62.6	78.9	82.4	106.9	113.8
Cost of inputs	Cents	23.4	23.4	46.1	46.6	61.4	63.2	81.9	85.4
Value added	Cents	20.0	20.5	14.7	16.0	17.5	19.2	25.0	28.1
Fuel cost	Cents	1.2	1.2	5.4	5.4	1.2	1.2	5.0	5.0
Cumulative fuel cost as a proportion of sales	Percent	2.7	2.7	10.9	10.5	9.9	9.5	12.0	11.2
Meat products:									
Sales or shipments	Cents	44.2	44.7	56.8	58.0	75.8	78.4	104.8	110.1
Cost of inputs	Cents	23.8	23.8	46.0	46.5	57.2	58.4	77.8	80.4
Value added	Cents	20.4	20.9	10.8	11.5	18.6	20.0	27.0	29.7
Fuel cost	Cents	1.2	1.2	3.6	3.6	.8	.8	4.0	4.0
Cumulative fuel cost as a proportion of sales	Percent	2.7	2.7	8.5	8.3	7.4	7.1	9.2	8.7
Grain mill products:									
Sales or shipments	Cents	14.1	14.3	22.9	23.8	46.9	50.2	101.4	110.3
Cost of inputs	Cents	6.7	6.7	14.9	15.1	23.2	24.1	47.0	50.3
Value added	Cents	7.4	7.6	8.0	8.7	23.7	26.1	54.4	60.0
Fuel cost	Cents	0.4	0.4	1.6	1.6	0.6	0.6	0.2	0.2
Cumulative fuel cost as a proportion of sales	Percent	2.8	2.8	8.7	8.4	5.5	5.2	2.8	2.5

1/ Alternative A passes the increased cost through the system while Alternative B adds in the increased cost of fuel and maintains the 1971 percentage relationship between cost of inputs and sales. Computations based upon Table 3. Sales at retail compare with $1 of retail sales in Table 3, the difference representing the price increase.

In summary, I would contend that we have been prone to understate the probable impact upon retail prices of an increase in the price of fuel. Our tendency to err in this direction has come from two sources. First, we have looked at the cost of fuel as a percent of sales rather than as a proportion of value added at each stage. Secondly, we have neglected to acknowledge the markup practices employed by marketing firms at all stages of the food system. Through their interaction, these two factors result in significantly different price changes as reflected at the retail level. There may be enough difference so that we should expect different responses by suppliers and consumers.