ENERGY POLICY ALTERNATIVES AND FOOD COSTS

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Less public attention is being paid to energy problems than at the time of the OPEC oil embargo. Not that the problems have been solved. U.S. oil imports continue to mount, and natural gas shortages provoke increasingly restrictive control measures. Only the happenstance of two mild winters in a row has prevented a far more serious natural gas supply problem.

Domestic oil production has declined from the 1970 peak, and will continue to do so. Oil production from oil shale appears less economically viable than three years ago. Most companies have reduced their efforts in this technology.

Four pilot plants for coal conversion to high energy gas are now in operation, but it may be 10 years or more before any substantial production can be expected, and only then at prices triple or quadruple present natural gas prices.

Solar, wind, and other alternative energy sources have their enthusiastic supporters (including this author) but, like other new technologies, only small portions of our needs can be supplied from these sources in the next decade. Even expansion of coal production—for the industries that can use it and for electric power plants—will require a long time. There is no clear policy for strip mining regulation, and permits and railroad capacity will not support shipping a much expanded coal production.

The costs of nuclear power have been escalating, too. An electric industry survey for 1975 showed nuclear generated electricity to be the most expensive way to generate electricity, except for the use of imported oil.

These cost increases were not predicted by the utility industry and the causes are still the subject of considerable debate. The only agreement is that the costs are likely to continue to rise.

ENERGY USE IN THE INTEGRATED FOOD SYSTEM

Food is often discussed in terms of agricultural policy and prices. This is misleading because hardly any food is consumed directly as produced by the farmer. We have a food system in the

United States that is not only integrated, but highly interdependent.

Farm production depends on the agricultural chemical business, the farm implement business, and indirectly the primary metals industry. It depends especially on transportation to and from the farm, mostly by truck. In turn, the food processing industry, fourth largest energy consumer among the major industrial groups, depends on farm production practices, machinery, fuel supply and, of course, transportation.

The entire system is dependent upon consumers' facilities for refrigerating food and holding frozen food. If eating and food preparation habits change as they may now be doing, or if prices of energy or other commodities force such changes, the effect will be felt throughout the food system. This will happen not only on the farm but also in the food processing industry and the transportation links that connect it all together.

Much is made of increased farm productivity due to the application of chemicals and the use of improved technologies, as well as the introduction of crop varieties with higher yields. But a good deal of our increased productivity has been the result of regional specialization in food growing. Although certain specialized crops were grown in specific areas as long ago as the 1870s, as recently as the 1940s much of the food supply was regional and subjected to relatively little food processing.

At present, most crops are highly specialized and, without a rapid transportation system and food processing, dramatic changes in the crop mix grown in almost all regions would occur.

There are at least two effects involved: (1) for many crops certain areas have the appropriate soils and weather to produce higher yields. Corn yields are better in Iowa than in Massachusetts. (2) Losses are reduced through processing, preservation and rapid transportation. A good example is seen in the drying of milk which has been the buffer against milk shortages and excess supply.

The conventional view of the U.S. Department of Agriculture has been that energy use in agriculture is only about 2% to 3% of the U.S. energy total. Therefore the impact of increased energy prices on agricultural commodities is not likely to be large. But it is the impact of a changed energy situation on the entire food system that will affect food prices for the consumer and agricultural prices for the farmer.

Several independent studies a year or two ago estimated total

energy use in the U.S. food system at about 12% or 13% of the U.S. total energy use. While this general agreement was encouraging, the individual studies covered somewhat different items and suggested that all were too conservative.

A recent study by Booz-Allen Associates for the Federal Energy Administration summarized these studies to include all categories and concludes that energy use in the food system is at least 16% or 17% of the U.S. total energy use. Of this energy use 2% or 3% goes to direct fuel use on the farm (not including transportation), 4% to the food processing industry, less than 1% each to wholesale and retail food activities, 3% to food system transportation, and about 6% for food consumption energy use by consumers.

Increases in fuel and energy costs anywhere in this system will produce food price increases for the consumer or the export customer which can be expected to change demand patterns and affect the economic picture generally. Unfortunately for the farmer, he is the one link in the food system least able to pass along these cost increases.

Weather may also cause additional fuel requirements. The period between 1940 and 1970 now appears to be, as one author described it, "the most favorable growing weather in a thousand years." Although changing weather patterns are still the subject of much controversy among meteorologists and climatologists, there is at least no dispute that the record of weather for the past 150 years shows the 30 years from 1940 to 1970 to be among the most favorable ever seen.

Especially on the farm, unforeseen bad weather usually escalates energy use per unit of output. This past season, drought caused hay crops to be so poor that it was necessary to truck hay to dairy herds in central and northern Wisconsin. This use of fuel to truck low value crops escalates both their cost and total energy use.

Similar effects were felt by the farmer whose response to drouth-damaged corn crops was to place them in silage. The energy investment was far too high for silage though it might have been justified for direct corn grain yields. These real increases in energy costs mean increased food prices.

THE PRICE OF ENERGY AND THE PRICE OF FOOD

Food prices have indeed risen to about double the 1969 levels. Meantime, retail prices of gasoline have doubled and fuel oil prices have more than doubled. For many people, including the department of agriculture, that would seem to be an end to it. But there is good evidence to suggest that the increased energy prices

are passed through the system rather slowly and that more energy price increases are yet to come.

Throughout this period, domestic oil, whose price has been controlled, has constituted one-half to two-thirds of all our supplies of petroleum products. Natural gas prices, also controlled for interstate sales, have been maintained at a level only about one-third the intrastate prices in Texas and Louisiana.

This past summer the Federal Power Commission took the first step to permit natural gas prices to rise. Domestic natural gas production has been declining at least since 1973. Most experts now agree that it will continue to decline in the future.

Natural gas can be imported only at much higher prices and synthetic gas from coal will be available only at much higher prices than the current controlled price of natural gas.

Some fuel price increases appear at the retail level rather soon after change in supply price. For example, prices began to rise for gasoline shortly after the increased OPEC prices were announced. But for most energy and fuel prices there is some considerable delay in reflecting increased supply prices.

First there is the matter of inventories. Whether the inventories are of energy-intensive fertilizers, fuels themselves, or of materials manufactured at lower energy costs, delays of a few months to a year are common before the increased energy costs are reflected in the final prices. Electricity price changes must be processed through the government regulatory process where delays after the initial request may range from a few months to more than a year.

Direct controls were placed on prices for domestic oil as well as natural gas and only recently have plans been laid for phasing out these controls. Natural gas prices are to be increased only for newly-found gas supplies.

Much longer delays are occasioned by replacement of capital equipment manufactured at low energy costs with replacements manufactured at much higher energy costs. Tractors in the United States have an average lifetime of 14 years. Thus, it will take that long for all of the tractors manufactured at low energy prices to be replaced with ones manufactured at higher energy prices.

On a larger scale, power plants for the generation of electricity must be replaced by power plants manufactured under the conditions of much higher energy prices, which are reflected in the costs of steel, cement, and all of the materials required in erecting an electric generating plant.

Thus we have so far experienced the effects of only a fraction of the price increases that have already occurred. By the first half of 1976 approximately half of the energy and fuel price increases that have already occurred had been reflected in the final price of food and agricultural products.

If increased energy costs were the sole cause of price changes in food we might then expect another doubling of food prices when the increased energy costs are fully reflected in the final prices. That picture is, of course, far too simple. Many other factors contribute to changes in food prices.

For natural gas, the constriction of supply has already provided spot shortages and in the event of a severe winter more serious shortages can be expected. Natural gas prices in uncontrolled areas in Texas and Louisiana are now about three times the natural gas prices in the remainder of the country. This difference cannot be expected to continue and we have before us an increase in natural gas prices of about a factor of three to take effect over the next three to ten years.

New natural gas supplies from Alaska will help some, but they will probably only offset the diminished supplies to be expected from Canada as a result of their national policy. The Canadian national policy began to reduce oil exports to the United States in January 1976. By 1980 no oil supplies will be obtained from Canada, and our reliance on OPEC nations will be almost complete.

The world price of oil is presently about twice the average price of oil sold in the United States, and OPEC meetings this fall may bring further price increases. This discrepancy also cannot be expected to continue. Thus we have about a factor of two in increased oil prices yet before us.

If any substantial fraction of our oil is to be supplied from shale oil or from coal conversion, price estimates between $14 and $25 a barrel will provide further price increases for consumers of these products. Electricity costs have been rising ever since 1967, reversing a declining trend in real electricity prices that had persisted from 1910 to 1967.

Some of these increases are related to fuel price increases, but many have other origins. For example, nuclear cost increases have outstripped estimates by two or three times, due to rising costs of nuclear power plant construction. Plants constructed in the mid 1960's at $150 per kilowatt of installed capacity now cost more than $1,000 per kilowatt of installed capacity.

Uranium fuel prices for nuclear power plants which were contracted for long term contracts at $8 per pound have long since proven unsatisfactory; one major supplier is being sued by some major utilities for attempting to terminate the contracts. Spot prices for uranium now frequently exceed $50 a pound.

Coal prices have also escalated and further price increases are to be expected when final decisions are reached as to air and water pollution standards and those for strip mining and reclamation in the West. Most estimates suggest a conservative doubling of electricity prices in the next decade. More pessimistic estimates suggest that they will double in the next five years.

The impact on food prices of the delayed and future increases in fuel and energy costs depends to some degree on the mix of fuels required by the food system. Petroleum provides a highly visible portion of the energy use in the food system through transportation and direct on-farm fuel use, but the extent to which the fuel system depends upon natural gas is less well known.

Natural gas provides both raw material and process energy for the manufacture of fertilizer and other agricultural chemicals and for crop drying. Much of the irrigation in the Southwest and parts of the food processing sector also depends heavily on natural gas. The baking industry is over 95% dependent on natural gas.

Similarly, meat packing, milk drying, and container manufacturing are heavy users of natural gas. Since most of the natural gas price increases still lie in the future, resulting food price increases will surely follow.

Electricity provides the other main source of energy, most of it derived from coal-fired electric power plants. Heavy users include ultimate consumers through their appliances, as well as wholesalers, retailers, and increasingly on-farm usage, especially for dairying.

Actual energy cost increases have come more slowly in the cases of electricity and natural gas than in petroleum products. Overall we should expect energy costs to the food system to at least double and perhaps triple in the next decade.

Making allowance for general economic conditions and other factors such as the export of food, it appears that the multiplier for price increases in fuel to ultimate price increases for food is larger than one. Recent historical evidence suggests that this multiplier is between 1.1 and 1.3, and must ultimately be somewhat higher because of the lags for price increases that have not yet filtered through the system.

The only other estimate I know of is for England—a price multiplier of 1.5. It can soon be checked, for it implies an increase in food prices of nearly 50% within the next two years. Such a price increase is highly undesirable for several reasons.

First, real increases in the price of food are regressive. They tend to cancel social benefits that might otherwise assist low income families. Second, if the fraction of disposable income required for food should increase substantially, money diverted into food purchases will be unavailable for purchase of other goods and services and will thus contribute to general recessionary pressures.

ALTERNATIVE POSSIBILITIES AND SOME RECENT TRENDS

Increases in real food costs already have provoked some changes in trends of long duration. Meat consumption, which had continually increased since World War II, has turned down in the past three years. It appears that people are willing to eat less meat to save money.

Home gardening has undergone an expansion reminiscent of World War II times. According to recent figures, 50% of the households in the United States attempted to grow some food in the summer of 1976, as compared to about 20% in 1971. This trend has been indicated for several years from spot evidence of seed shortages by suppliers to home gardeners and by shortages of canning jars and lids for both 1974 and 1975.

Only at the very last stages of the recent energy bill did congress delete incentives for home gardening. Perhaps they should have been left in. Home gardening need not be a trivial activity. In Wisconsin during World War II, all vegetable crops consumed by the residents of Wisconsin were grown in backyard gardens. Casual gardeners seem to be able to grow 5% to 10% of their vegetable requirements, and serious gardeners 50% or more of their annual vegetable crop requirements.

An interesting side benefit of home gardening is that recreational energy use is ordinarily diminished since the time from gardening is subtracted from other kinds of recreational activities, many of which involve trips in the family automobile.

In another trend, direct marketing, either through farmers' markets or such organized arrangements as that of the National Farmers Organization, has expanded enormously. States such as West Virginia take an active official hand in promoting such activities.

These trends run counter to the centralization of food supply and diminish some of the energy use by middlemen in the food

system. Other current efforts toward full time subsistance farming by a few (usually dismissed as romantics) and more extensive attempts at lower energy agriculture on the part of some farmers may represent a trend which should be encouraged.

Recent studies by St. Louis University of paired farms, one using low energy and the other high energy techniques, suggests that yields decline slightly, but income actually increases for the farmer using low energy methods.

The flexibility provided by lower energy dependence may be the best protection a farmer can have against the future conditions discussed above. A number of measures could be undertaken to lower energy dependence on the farm: minimum tillage, lowered fertilizer application, solar drying either through solar capture or field drying, and more careful planning of equipment size and use.

Policies to reduce energy requirements for the food system should include tax incentives for the above. The best policies encourage people to do something they seem inclined to do anyhow. Educational efforts to encourage dietary shifts that both improve nutrition and diminish energy requirements for food could be helpful.

As containers and packaging have become a competitive issue between food processors and distributors, it may be necessary for government standards to discourage excessive packaging without placing individual firms at a competitive disadvantage.

A more difficult question arises with respect to transport where the result of a 30 year period of evolution has reduced dramatically the use of transportation in the food system other than by truck, a high energy using transport mode. We provide massive subsidies to highways and truckers which no longer appear to be in the public interest.

Since more than half the trucks on the road are hauling food and agricultural products (according to the American Trucking Association) we should seek ways of using the more energy efficient trains and waterways to transport some of our food.

Reversing the long-time trend toward trucking as the primary food transportation mode will not be easy. It should be undertaken gradually by reducing public subsidies and at the same time providing for more regional food supplies than at present. This measure will not be without its cost since some reduction in productivity can be expected. But the gains in diminished energy costs would appear to exceed the losses.

Efforts to expand the consumer's opportunities to cope with energy supply problems should include improved appliance standards and the encouragement of more energy efficient appliances. Public property also could be made available for community gardens to those without backyard gardens, or even to a new national homestead act for those who wish to engage in subsistence farming.

For the longer term we should consider seriously substituting solar and wind applications on farms wherever that can be done without economic penalty. We might also consider decentralizing and diversifying our food supply. These measures will become profitable as energy prices rise.

It probably will be advantageous to increase the use of labor, again reversing a trend of several generations. As this increased labor use occurs, it will not be and should not be in the direction of a return to backbreaking manual labor. For example, an "as needed-where needed" application of herbicides and pesticides can diminish both the pesticides requirements and the energy requirements necessary to supply them through the use of wheeled or vehicle-mounted sprayers without instituting backbreaking labor.

SOME INTERNATIONAL IMPLICATIONS

It is highly desirable not to expand energy use in the food system any further but to seek to diminish it in an effort to hold the real price of food down. However, this effort should not be undertaken as we are presently doing it, at the expense of farmers alone.

It is commonly overlooked that U.S. food is already expensive by world standards. For example, if we wished to purchase the diet of an average Indian at U.S. market prices, his annual diet (admittedly deficient) would cost about $200, which should be compared with our average food expenditures in the United State of nearly $700 in 1974. But the per capita income of this same average Indian is only about $90.

If we wish to help with world hunger problems and are not prepared to give away whatever agricultural surpluses we may be able to generate, we must find ways to produce food more cheaply by world standards in order that hungry people who need it may be able to purchase it.

On the other hand, we cannot simply give the food surpluses away at the same time we are importing $25 billion worth of oil from OPEC nations. The dilemma is not a pleasant one, with morality on one side and economics on the other, but if we can diminish energy use correspondingly the dilemma will be reduced.