

# ENERGY AND AGRICULTURE

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Although increased costs resulting from higher prices for energy-related needs on the farm appear to be the most obvious problem, world marketing complications resulting from the "energy crisis"—not production costs—will also create problems for U. S. agriculture in the next several years.

**E**NERGY REAL PRICES, after declining for about two decades, have increased dramatically during the past year, and these price increases are apparently permanent. Major long-term problems for agriculture will result indirectly from the impact of energy prices on general price levels and economic growth rates—as well as from direct price increases for such energy-based production essentials as electricity, fuel, fertilizer, and chemicals.

## Energy and inflation

Since 1972, world commodity prices have risen at rates unequalled for over a quarter century. These price increases have been led by an almost threefold increase since October 1973 in crude oil prices by the Organization of Petroleum Exporting Countries. Previously, well-head prices in current dollars had risen only modestly for 25 years.

Oil price increases exert both direct and indirect upward pressures on aggregate price levels. Direct effects closely correlate with the reliance of a country on high-priced energy imports. Indirect effects occur as higher energy costs become built into general price structures. Energy price increases are more far-reaching and permanent than, for example, food price increases. Energy-related products accounted for about 29% of wholesale price increases and 18% of retail price rises during 1973, and the first quarter of 1974.

## Domestic demand

Domestic demand for agricultural products will be influenced by increased energy prices as those prices affect economic growth rates, general price levels, and income distribution. A no-growth (and perhaps recessive) economy with "roaring inflation" appears likely for the remainder of 1974 and 1975. As a

result, per capita consumer demand for products with high income elasticities—meat, frozen fruits and vegetables—will probably plateau and perhaps decline. On the other hand, the demand for staple products—wheat and other cereals—will probably increase.

World demand for U. S. agricultural products will be affected through energy price impacts on world inflation, balance of payments, economic growth rates, and relative currency valuations.

In the world market, energy price increases have a large and continuing impact on balance of payments accounts, international financial markets, and trade balances. At present consumption levels, world oil import costs will jump from \$45 billion in 1973 to about \$115 billion in 1974 (about a \$70 billion increase).

In most advanced countries balance of payments and inflationary problems are dampening gross national product (GNP) growth rates. Rapid inflation is eroding real incomes, reducing economic demand for goods and services, and encouraging restrictive government monetary and fiscal policies.

Energy price increases will have varying effects on the world's developing countries. It has been estimated that imports of petroleum, food, and fertilizer will cost the developing countries \$15 billion more in 1974 than in 1973. Of this total, oil import costs are expected to account for \$10 billion, an amount roughly equal to all of the developing nations' increased commodity exports during the past two years.

## Worldwide retardation

Worldwide retardation in economic growth rates is occurring simultaneously with—and in part because of—inflation and balance of payments problems. This has significant implications for U. S. agricultural trade. Because other developed countries (Western Europe, Canada, Japan) purchase about 70% of U. S. food and fiber exports, their economic status has a crucial impact on U. S. export demand.

As in domestic markets, international demand for staple food crops probably will not fall and may even expand as

population growth continues. However, world demand for products with higher income elasticities likely will decline.

Increased oil prices have placed considerable devaluation pressure on the currencies of several Western European countries and Japan, as their foreign exchange reserves diminish. Thus the products of these countries have become relatively cheaper in world markets. The U. S., on the other hand, has lost some of the agricultural export advantages it gained as a result of dollar devaluations in 1971-73.

Given the problems that both developed and developing nations face as a result of increased energy prices, world markets for U. S. farm products are not likely to expand substantially during the next several years.

## Energy and food

Of total U. S. energy use, 12% goes directly or indirectly to the production, processing, transportation, trade and consumption of food. Of this share, 25% goes for farming, 40% for food processing and the remaining 35% for home refrigeration and preparation. Potential adjustments depend on many variables, but greater opportunities exist for conserving energy in the food system off the farm than on the farm.

Production agriculture in the U. S. has become increasingly energy-intensive—up more than threefold in the last three decades. From 1940 to 1972 U. S. farm output increased nearly 90% on essentially the same acreage. Farm labor inputs fell by two-thirds, while fertilizer use increased almost ninefold, and mechanical power and machinery input grew by 237%.

## Energy intensive

U. S. agriculture is energy intensive because U. S. farmers have been economically rational in their use of energy during the past 25 years. The costs of fertilizer, fuel and machinery have increased more slowly than labor and have therefore been substituted for labor in food production. But now that energy prices have jumped dramatically, a rapid shift toward energy-conserving practices should not be expected.

## *economic perspectives*

### **Some of the ways to reduce farm energy use include:**

- Farm machinery could be precisely scaled for particular jobs and properly maintained;
- Water could be monitored more carefully;
- Grain and forage drying systems could be designed for optimal use of solar and artificial heat;
- Minimum tillage practices could reduce energy consumption in some cropping systems; and
- Plant breeding could emphasize resistance and thereby reduce pesticide-energy requirements, and improve plant efficiency in converting fuel energy to food energy.

Patterns of land ownership and tenancy are not generally adaptable to labor-intensive production. Agricultural commodity programs have been capitalized into land prices, imposing constraints on land and making it profitable to freely substitute fertilizer, pesticides, and machinery. Machines would need to be redesigned to reduce energy consumption, and long lead times would be required, even if large energy price increases justified a radical retooling.

This is not a defense of current or past food system practices, but rather an appraisal of agriculture's expected response to changing price relationships. As energy prices increase, marginal adjustments toward energy-saving technologies can be expected, but society should not expect large absolute savings in energy use at the farm level.

The competitive position of a region or country in the production of a particular commodity may change as a result of increased energy costs. Competitive positions are influenced by regional characteristics, including distance to domestic or export markets, available transport alternatives, backhaul possibilities, and seasonality of product movements.

Industrial and institutional factors must also be considered. For example, during the last 30 years, low-cost energy has provided market and public policy incentives that de-emphasized the use of railroads in the U. S. Even an immediate policy decision to improve rail transport facilities and services would require a

lengthy time period for implementation.

Even more important than U. S. inter-regional patterns are government policies and other institutional barriers, such as tariff and non-tariff barriers of the European Economic Community, for example, or legislation requiring that U. S. export commodities be shipped in domestic-built ships. World production and trade patterns for very few commodities are determined by comparative advantage *per se*. Given the impact of energy prices on world inflation and monetary instability, trade protectionism may intensify.

Also, it has been argued that U. S. agricultural production is energy-inefficient relative to more primitive labor-intensive systems and may lose some of its advantages in world markets under higher energy prices. This is not likely. Energy cost is only one input, and comparative advantage involves total production costs. Also, most farmers in labor-intensive systems produce food mainly for family needs, not for world markets.

Current U. S. farm policy must be assessed in the light of recent energy price impacts on the world economy. Although considerable uncertainty now faces demand for U. S. exports, federal farm policy is encouraging increased production in response to previously strong domestic and world markets. If the export demand contraction now occurring for certain specialty crops should become more widespread, depressed farm product prices, combined with cost-push inflation of farm production costs, could substantially reduce net farm incomes.

The movement away from price supports and acreage allotments in the 1973 Agricultural Act could also result in more volatility in agricultural prices and incomes. Target prices do not lend the same degree of stability to the farm sector; indeed, the 1973 act was intended to have more market orientation than previous agricultural legislation. However, the 1973 act does provide for reimposition of acreage allotments if that option becomes economically and politically justifiable. The impact of inflation on farm production costs will also increase target prices under the escalator provision in the 1973 act.

Concern has been expressed that higher energy prices will be detrimental

to environmental improvement. The concern is real. Some recent policy decisions apparently capitalized on public concern about oil shortages during the Arab boycott. Delays in automobile emission-control regulations, resumption of off-shore drilling, and initiation of the Alaskan pipeline project are examples. Yet for every detrimental aspect of the energy-environment situation, complementarities can be cited: the trend toward smaller automobiles, household energy conservation practices, and increased use of mass transit. Examples also occur in agriculture: reduced tillage methods, balanced cultural practices that require less commercial fertilizer and pesticides, and more efficiently-scaled farm machinery.

Also, as the direct and indirect impacts of higher energy prices increase the costs of production inputs, the push toward greater efficiency may result in more utilization and recycling of by-products and wastes. For example, poultry and livestock producers are showing considerable interest in methods of recycling manure for feed and for generating methane gas.

Thus, the emergence of the most recent energy crisis has brought into clearer focus the trade-offs as well as the complementarities of natural resource development and environmental goals. Options between safety and cost, between current consumption and future consumption, and between consumption levels and costs are complex and multidisciplinary. Now that the concepts are more evident, the absence of reliable data and analysis for measurement becomes obvious.

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