Preliminary Staff Summary Report
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Department of Agricultural Economics
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The Ohio State University

Energy From Agriculture - Implications of Brazil's Alcohol Program

Norman Rask and Reinaldo Adams

I. Introduction

This preliminary report summarizes initial results of an ongoing investigation of the Brazilian alcohol program. Early research has focused on the regional competiveness of alcohol production from sugar cane and cassava in four regions of southern Brazil. Emphasis is on food-energy competition at the primary production level with necessary raw product transportation and processing and alcohol transportation linkages to determine regional energy crop price differences. Subsequent analysis will incorporate varying process technologies and processing plant sizes.

II. Issue Statement

An impending world shortage of oil has prompted many to call the energy crisis a liquid fuel problem. An alternative to oil is alcohol produced from biomass. Brazil's bold and imaginative thrust to produce a substantial portion of their liquid fuel requirements in the form of alcohol derived from sugar cane, cassava and other crops presents the world with the first major experiment in the commercial competition between food and energy production.

A substantial portion of Brazil's agricultural resources will be committed to the production of energy crops. The domestic demand for liquid fuels is great and if alcohol produced from biomass is competitive, the farm level shifts in resource use and output can be swift and dramatic. Further, processing plants are being located in both small labor intensive and large mechanized farm regions.

Much of the third world is located in tropical areas and is fossil fuel poor. (Major deposits of coal are found in Russia, China and North America only.) Thus, energy from biomass, and specifically liquid fuel production may be an attractive alternative to costly oil imports for many of these countries. In addition, the implications of Brazil's alcohol plan are generally important for a world short of both food and energy.

This study investigates the farm level adjustments in several regions of Brazil that can be expected as the quantity of alcohol produced and price of energy are increased. Energy price increases are reflected in regional farm level models in several ways including derived farm level prices for energy crops, differential energy inputs to production technologies (mechanized and non-mechanized), uses of specific technologies by farm size, processing costs, and transportation costs of raw products and alcohol to processing plants and distribution centers. Energy price parameterization is conducted for each of a series of processing plant capacities in specific regions with both regional and central demand centers competing for final product. Regional land and labor use, crop competition (sugar cane, cassava and food and feed crops) and technological change (energy intensity) are all studied in relation to energy price changes and volume of energy production.

III. Preliminary Findings

1) At 1976 free market prices, alcohol produced from sugar cane and/or cassava would be competitive with food crops at approximately $.85 to $.90 per gallon wholesale gasoline price. This is roughly double 1976 wholesale gasoline prices. Labor surplus areas, with low cost family labor inputs are competitive at slightly lower price levels.

2) Under the 1976 administered price relationships in Brazil (for gasoline, sugar, alcohol and other crops and inputs) energy crops for alcohol are competitive at the farm level.

3) Regional production areas (as compared to Sao Paulo, a centrally located sugar production area) can be competitive suppliers of alcohol to regional consumption centers.

4) Energy crops are relatively labor intensive. Thus, as energy prices increase, and more energy crops are produced, income to rural areas increases. The increased energy prices are themselves a source of increased cost of production, but the net effect is positive and principally so in non-mechanized production technology areas.

IV. Implications

1) Alcohol from energy crops will be competitive with other alternatives to petroleum.

Competitive alcohol prices at current production technology are within the range of estimates for shale oil, and coal liquefication--two major substitutes for petroleum.

2) There are positive employment and income affects associated with energy crop production.

Increased employment will be dispersed throughout the agricultural sector where energy crops are produced, helping to stem the flow of rural migration to urban centers, a major problem in many developing areas. Associated processing activities and other local industry will add additional employment and income to regional areas.

3) Domestic food supplies and food trade volumes may be adversely affected.

The food-energy interface raises several critical issues including the possibility of higher domestic food prices and less surplus available for international trade. Conversely, energy imports will be reduced. In the case of Brazil, sugar cane and soybeans are two major export crops competing with energy crops for agricultural resources.

4) Alcohol production is potentially more profitable for Brazil than for the United States.

The current emphasis in the United States is on grain-alcohol (corn) where the cost of the raw product alone per gallon of alcohol produced is equivalent to the minimum price of alcohol in Brazil. Conversion of one bushel of corn at $2.25 to 2.6 gallons of ethanol is equal to $.87 per gallon. An additional $.25 for processing costs net of feed by-product credits results in a total cost of $1.12 per gallon with some estimates at even higher levels.