INTERRELATIONSHIPS OF AGRICULTURAL PESTICIDE RESTRICTIONS, ENVIRONMENTAL QUALITY, AND COST TO SOCIETY[1]

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Using an econometric model, projected estimates of farm output and expenditure for food and fiber were made assuming agricultural pesticides are restricted to 5% of the average quantities used in 1965-1969 base period. At the end of a two-year adjustment period, farm output will decrease 41 percent and the cost of food will increase 14.3 percent over the 1965-69 base. At the end of the seven year intermediate run period, farm output will be 14 percent less and costs will be 8 percent more than the 1965-69 base. Society also should recognize the possibilities of reducing the quality of the environment if pesticides are restricted.

The Environmental Protection Agency (EPA) recently banned nearly all uses of DDT after December 31, 1972. Agriculture is being accused of polluting the environment because of its use of pesticides. Environmentalists attack pesticides because of the adverse effects due to drift during application, run-off into streams, and persistence in the environment. EPA currently is considering cancellation of registration for mirex, 2,4,5,-T, aldrin and dieldrin (1).

Emotionalism appears to be guiding many of the environmental groups in their fight against pesticides. Before all agricultural pesticides are restricted, both beneficial and adverse effects of such restrictions on society need to be considered. The research reported herein considered the cost to society of restricting pesticides. Specifically, the objective was to estimate the increased cost to society for food and fiber if pesticide use were restricted to 5% of the average quantity used in 1965-1969.

METHOD

To estimate the cost to society two functions are specified: an aggregate agricultural production function and an aggregate demand function for farm output. The production function estimates farm output with a pesticide restriction by assuming durable inputs are fixed in the short run, except that about 40 million acres of land currently in government diversion programs could be brought back into production in the second year of the short run. In the intermediate run (years three through seven) estimated output would increase as more land is cleared, irrigated or drained. It is assumed cropland would increase by an additional 50 million acres by the end of the intermediate run.

The aggregate demand function is used to estimate the market price of farm output. The price of output times output plus the marketing costs provides the estimate of consumers' expenditures for farm output (food and fiber). Assuming marketing costs are constant, an increase in the expenditure for food is taken to be the cost to society of pesticide restrictions. The cost to society is calculated for the short run and the intermediate run.

RESULTS AND DISCUSSION

The average adjusted output in 1965-1969 was $30.635 billion (2; 3, p. 472). The estimated output for the first year after pesticides were restricted would be $22.096 billion (Table 1). The average annual consumers' expenditure for farm output in 1965-1969 was $86.353 billion (2; 3, p. 472). Consumers' expenditures for the first year after pesticides were restricted is estimated at $98.769 billion. The increased cost of farm output ($12.416 billion) would be the cost to society to restrict pesticides the first year (Table 1). The second year after restricting pesticides farm output is estimated to be $18.040 billion and the cost to society, therefore, would be $14.271 billion.

The reduction in farm output in the short run would cause prices received by farmers to increase. The estimated 25% increase in prices received affected farm out

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TABLE 1. *Farm output, consumers' expenditures for farm output, and the cost to society to restrict pesticides.*

Production period	Adjusted farm output[a]	Consumer expenditure	Cost to society
1965-1969 average[b]	30.635	86.353	0
Pesticides restricted			
	Short Run		
Year 1	22.096	98.769	12.416
Year 2	18.040	101.623	14.270
	Intermediate Run		
Year 3	20.819	99.848	13.495
Year 4	21.575	99.324	12.971
Year 5	23.408	97.453	11.100
Year 6	24.889	94.679	8.326
Year 7	26.000	93.394	7.041

[a] Adjusted total farm output is cash marketings adjusted for inter-farm transfers and government payments for land diversion as described in Reference 2.

[b] Data based on information from References 2 and 3, p. 472.

put and resource use in the intermediate run. The estimated output in the third year was $20.819 billion and the cost to society pesticide restrictions was $13.495 billion. In the intermediate run farm output increased to $26 billion and the cost to society decreased to $7.041 billion in the seventh year. Exports of food stuffs would be zero for the short and intermediate runs because estimated output was less than the average domestic consumption in 1965-1969 (3).

In the short run and intermediate run there are no economical substitutes for pesticides. Thus, if they were restricted, farm output would decrease as farmers attempted to maximize profits. Resource adjustment to this level of output is not instantaneous. It is assumed that, without pesticides, it would take two years for inputs to adjust to the short run optimum and then five more years to adjust to the intermediate run.

The resulting quality of the environment from such pesticide restrictions is difficult to quantify. There would be less pesticide residues in the soil and water; fish and wildlife might benefit from this aspect. However, there is a strong possibility that additional environmental quality problems would result. Additional cropland now in land diversion programs, woodlands and marshes would have to be cultivated to make up for pesticide restrictions. This increased cultivation would result in more sedimentation and a reduction in both wildlife habitat and recreational land. These losses in environmental quality and the resulting costs to society are not included in this analysis, but should be considered before all pesticides are restricted.

A more specific project in this area of pesticide use and environmental quality is underway at OSU. Aerial applicators, farmers, personnel from state and federal regulatory agencies, and businessmen are being interviewed to determine pesticide use on pasture and cotton in Oklahoma and the resulting environmental costs. Economic analyses will be accomplished to determine the reduction in farm output and economical substitutes available if pesticides are restricted.

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