Pesticides C

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ESTIMATED ECONOMIC IMPACTS OF CANCELLATION OF A HYPOTHETICAL SOYBEAN PESTICIDE

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A regionalized econometric-simulation model (AGSIM) was used to evaluate the economic impacts of canceling the use of pesticide X.[1] The model, which was designed specifically to estimate the aggregate economic impacts of policies or programs that change per-acre crop yields and production costs, includes acreage response functions for five major field crops (cotton, soybeans, corn, grain sorghum, and small grains) in each of 13 producing regions (figure 1) in the U.S. Each acreage response function depends on expected per-acre net returns of that crop and any competing crops, thereby allowing logical derivation of acreage shifts resulting from changes in per-acre yields and production costs. Yield and acreage equations for all crops in a region were estimated as a block of equations using Zellner's procedure for seemingly unrelated regressions. For competing crops in a given region, the symmetry condition was imposed on cross-effects. Signs of all coefficients for own net return coefficients were positive, and all signs of cross net return coefficients were negative.

The consumption side of the model is given by a set of 42 demand equations, estimated in sub-blocks using Zellner's procedure for seemingly unrelated regressions. Symmetry was imposed on cross price effects in the feed demand equations. The weighted percentage of variation explained by the regression ranged from 69 percent to 98 percent. Coefficients of all variables had expected signs.

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[1]Complete documentation of AGSIM is given in Collins.

The simulation component of the model simulates the dynamics of the econometric model, solving in each crop year for a set of prices that simultaneously clears all markets. The model does not predict actual price in any particular year because it does not consider random variation in factors such as crop yields; rather, the model gives an equilibrium set of prices that could be expected in a year when all random variables in the system had values equal to their respective averages.

Economic impacts of cancellation of pesticide X were estimated as the difference between the item of interest in a baseline simulation, and a simulation based on yield and cost changes for pesticide X. Since the production component of AGSIM was based on groups of states, it was necessary to use weighted average state yield and cost changes as the yield and cost changes in each AGSIM region.[2]

Since cancellation of a pesticide may affect crop prices, consumers of agricultural products as well as producers of agricultural products may be affected by the cancellation. In this report, the term "consumers" has a very broad meaning and includes all market participants beyond the farm gate. Thus, in addition to including final consumers of processed agricultural crops, this definition includes processors of crops such as gin owners and textile mills. Market participants between the farm gate and final consumers can also be viewed as consumers in the sense that they purchase goods for processing. Final consumer benefits are defined as the difference between what consumers are willing to pay for a commodity

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[2]Historical crop acreages were used to weight yield and cost changes.

and what they actually pay. In markets without price discrimination, (most agricullural markets), consumers pay the same price for all units of a good purchased at a particular point in time. Since consumers are willing to pay more for the first units of a good purchased than they actually pay, they are said to enjoy a benefit on these units. A decrease in market price with no change in consumer willingness to pay can be seen to increase this benefit. The area under a (income) compensated demand curve and above price is the compensating variation measure of this benefit. But since compensated demand curves are not empirically observable, we must approximate this benefit with ordinary demand functions. The amount of bias depends on the effect on real income of a price change.

RESULTS

Estimated economic impacts of cancellation of pesticide X are shown in Tables 1 through 5. Table 1 gives the average annual impact on producers and consumers. Consumers' benefits decreased because the cancellation increased commodity prices (Table 2). Producers' income increased because the price impact of the cancellation was greater than the negative impact of increased per-unit soybean production costs.[3] Excluding environmental and public cost considerations, the net social cost of the cancellation was estimated to be $1.35 billion annually.

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[3] A theoretical discussion of this farm income paradox is given in Taylor.

AGSIM PRODUCTION REGIONS

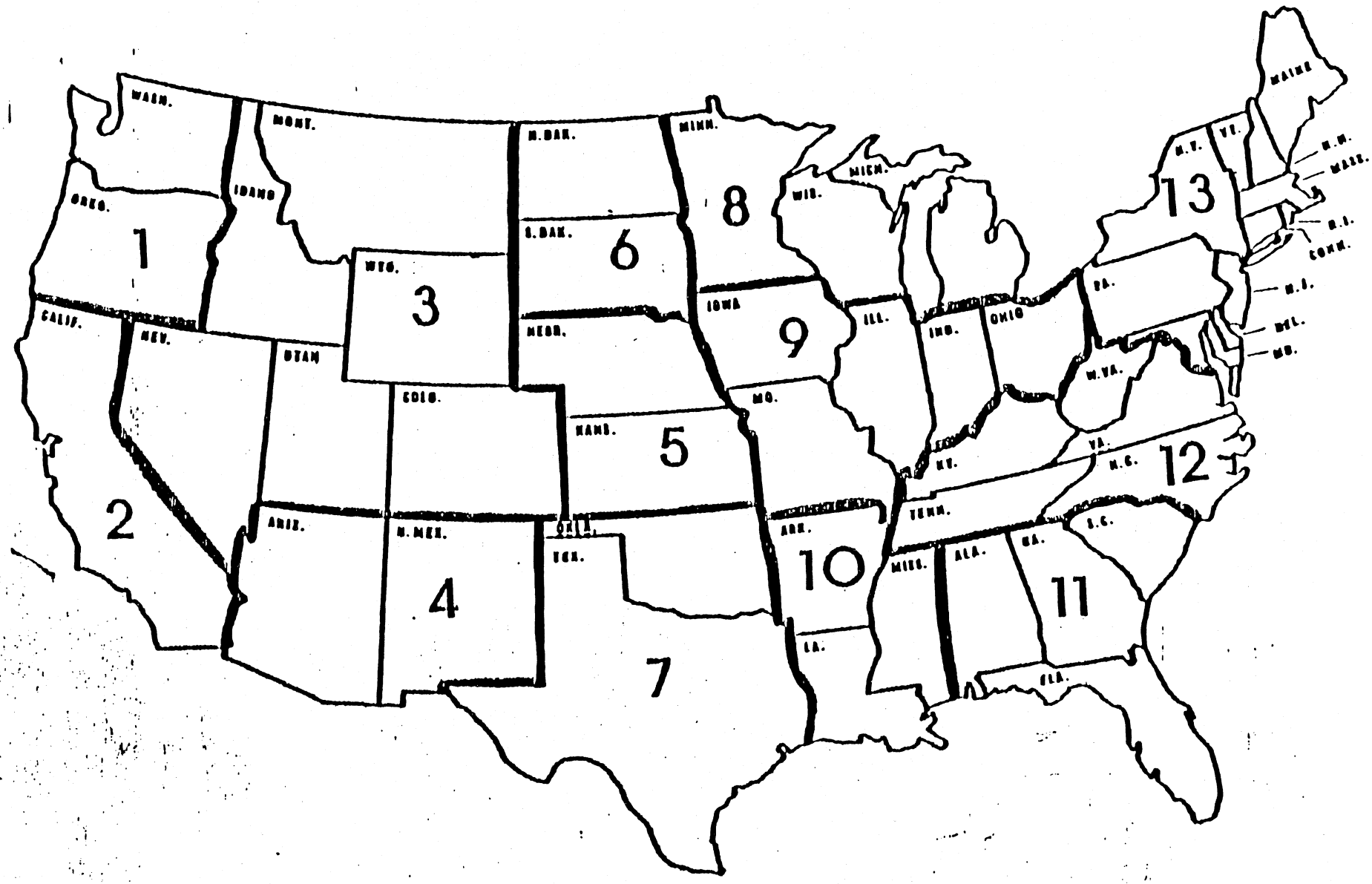

Figure 1

Table 1. Estimated Annual Impacts of Cancellation of Pesticide X on Producers and Consumers.

Group or Item	Average Annual Impact (million dollars)
Consumer benefits[a]	$ -5,967.00
Net income[b] to soybean producers	2,909.00
Net income to feed grain producers	1,465.00
Net income to small grain producers	211.00
Net income to cotton producers	32.00
Total annual impact on society, excluding any potential environmental benefits or costs and any changes in public costs	-1,350.00

[a] This is a very broad category that includes all market participants beyond the farm gate.

[b] In the long-run, net income changes will accrue to owners of fixed factors of production.

Table 2. Estimated Impact of Cancellation of Pesticide X on Crop Prices.

Crop	Simulated Benchmark Price	Simulate Price Without Pesticide X	Difference
Soybeans ($/bu)	$7.[illegible]	$9.73	$2.39
Feed grains ($/bu)	2.9[illegible]	3.17	0.25
Small grains ($/bu)	3.07	3.15	0.08
Cotton lint ($/lb)	.8661	.8709	.0048

Table 3. Estimated Impact of Cancellation of Pesticide X on Net Income to Crop Production by AGSIM Region.

AGSIM Region	Change in Net Income (million dollars) From:				
	Soybeans	Feed Grains	Small Grains	Cotton	Total
1	0	2	16	0	18
2	0	9	7	9	25
3	0	27	28	0	55
4	0	4	3	4	11
5	117	204	40	0	361
6	37	27	44	0	108
7	50	86	22	11	169
8	329	248	16	0	593
9	2,025	669	25	0	2,719
10	125	5	2	7	139
11	76	41	1	1	119
12	104	79	4	<1	188
13	46	63	4	0	113
U.S.	2,909	1,464	212	33	4,618

Table 4. Estimated Impacts of Cancellation of Pesticide X on Crop Acreages by AGSIM Region.

AGSIM Region	Changes in Acreage (1000 acres) of:			
	Soybeans	Feed Grains	Small Grains	Cotton
1	0	1	12	0
2	0	4	0	2
3	0	57	-40	0
4	0	1	0	1
5	213	48	12	0
6	97	2	-1	0
7	39	-236	51	-17
8	776	200	-152	0
9	1,699	-1,001	92	0
10	57	31	9	-21
11	121	31	8	-18
12	162	26	12	-15
13	64	33	12	0
U.S. Total	3,228	-803	15	-68

REFERENCES

Collins, G.S. "An Econometric Simulation Model for Evaluating Aggregate Economic Impacts of Technological Change on Major U.S. Field Crops." Unpublished Ph.D. dissertation, Texas A&M University, December, 1980.

Taylor, C.R. "The Nature of Benefits and Costs of Use of Pest Control Methods." Amer. J. Agr. Econ, 62 (1980): 1007-11.