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**DISCUSSION: ECONOMIC RESEARCH TRADE-OFFS BETWEEN EQUITY
AND EFFICIENCY****Luther Tweeten**

I applaud Quentin West for what he said in his paper and commend him for the directions he had outlined for the Economic Research Service. If there was a time when economists could ignore the equity dimension in their analysis, it is no more. The agricultural establishment, largely uncritical lovers of traditional agricultural research and education, and the young radicals, largely unloving critics exemplified by *Hard Tomatoes -- Hard Times*, hold very different images of who pays for and who benefits from publicly supported agricultural research and education. Differences will not be resolved without better information in the hands of both groups.

It would be hard to quarrel with the thrust of ERS analysis reported by West for Tobacco and other programs. So I will deal with his shortcomings of omission rather than commission. Specifically, I will quantify the distribution of costs and benefits from agricultural research and education.

**THE DISTRIBUTIVE DIMENSION OF
AGRICULTURAL RESEARCH AND EDUCATION**

The most recent estimates indicate that the social rate of return on public plus private investment in agricultural research is approximately 50 percent, on elementary schooling of farm youth is 20 percent and on secondary schooling is 10 percent.¹ Rates of return on vocational agriculture expenditures are unavailable, but are likely to be near zero because supply greatly exceeds demand for students trained in this field. No one is contending that overall outlays for agricultural research and education have not been efficient and productive. The distributive dimension is now the issue. Let us turn to it.

Costs

Taxes for agricultural research, extension, vocational agriculture and general education of farm youth in 1961 from local, state and federal sources that raised productivity of agriculture are shown in Table 1. Although research and extension were supported quite heavily from federal sources, local sources were the largest single component of funds because general schooling dominates the \$1.6 billion in public tax outlays. The Tax Foundation has given substantial attention to the incidence among income classes of local, state and federal taxes of various forms. These measures of incidence are used to distribute taxes among the U.S. families, by income level, who paid them (Table 2).

Benefits

Schooling makes farmers better managers, more aware and able to appraise the potential payoff from new investment opportunities, and also prepares them for mobility -- all important components of agricultural productivity gains. While research may be more productive per dollar invested than the other items listed in Table 1, this problem of different productivities among investments is circumvented by using "expenditure benefits." Expenditure benefits are defined as benefits from agricultural research and education normalized to total the volume of taxes, \$1.6 billion in 1961. This approach is tantamount to assuming all benefits are realized in the same year taxes are paid and the average rate of return on the 1961 investment in agricultural research and education of farm people is zero. In fact the ultimate gross benefits (expressed in present or capitalized value), net benefits and benefit-tax ratios are larger

Luther Tweeten is regents professor of agricultural economics at Oklahoma State University and visiting professor of the Institute for Research on Poverty at the University of Wisconsin.

¹ See Luther Tweeten, *Foundations of Farm Policy*, University of Nebraska Press, Lincoln, 1970, Ch. 5.

Table 1. ESTIMATED TAXES IN SUPPORT OF AGRICULTURAL PRODUCTIVITY, 1961*

	Taxes for Agricultural Productivity			
	Federal	State	Local	Total
----- Millions of dollars -----				
General education (elementary & secondary)	54	480	693	1,227
Research	63	122	--	185
Extension	54	54	53	161
Vocational Agriculture	14	22	30	66
Total	185	678	776	1,639

*Source: U.S. Department of Commerce, *Statistical Abstract of the United States*, U.S. Government Printing Office, Washington, D.C., 1966; U.S. Census.

than indicated in Table 2 -- but with the same ranking among income groups.

The presumption in Table 2, quite contrary to *Hard Tomatoes -- Hard Times*, is that the benefits of research and education accrue to consumers rather than corporations or large farm proprietors. To be sure, early adopters gain windfall profits from agricultural technology. But evidence indicates that even large, efficient farmers are unable to retain benefits and the gains are passed to consumers. Pure profits do not exist for the farming industry, and gains to farmland owners through appreciated land values are explained by commodity programs, pressures for farm consolidation to use larger machinery and by urban demand for land rather than by output-increasing technology flowing from publicly supported education and research.

Benefits are distributed among U.S. families in Table 2 according to the outlays for farm food ingredients by income classes. The assumption is that a dollar of farm ingredients has the same proportion of benefits from agricultural research and education whether consumed by a rich or poor family. In fact, low income families who consume much (say) wheat, may realize different benefits per dollar of farm ingredients than the high income families who consume relatively more beef. Unfortunately, data are inadequate to differentiate gains from education and research to increase agricultural productivity among consumers except on the basis of the total dollar value of farm food ingredients.

Expenditure benefits are greater for high income than low income families (Table 2). But taxes increase even faster, moving from low to high income

families, hence taxes to improve agricultural productivity redistribute income toward low income families. The benefit-tax ratio (a) in Table 2 of 1.5 for low income families declines to .4 for high income families.

Taxes for elementary and secondary schooling of farm youth were included in Tables 1 and 2 to estimate benefits, net benefits and benefit-tax ratio (a) because common schools have contributed substantially to the productivity of the farming industry. However, a sizable portion of benefits from taxes to support common schools accrue to those who received the schooling rather than to food consumers as such. The redistribution of income resulting from taxes for common schools has been examined in detail by David Holland.² The benefit-tax ratio for common schools is somewhat similar to (a) if it is assumed that pupils received the benefits and will have incomes proportional to those of their parents. Thus whether taxes for common schools accrue as benefits to schooling recipients or to consumers of food does not markedly change the benefit-tax ratio (a).

THE DISTRIBUTIVE DIMENSION OF AGRICULTURAL RESEARCH

There is merit in examining the redistribution of income from taxes for agricultural research alone, unconfounded by the redistributive issues discussed above for education. Expenditure benefits for research of \$185 million (equal to taxes shown in Table 1) are distributed among income groups in the nation exactly as were expenditure benefits from all

² See Dave Holland, "The Distribution of Costs and Benefits of Public Schooling," in the issue of *Southern Journal of Agricultural Economics*, 1973.

Table 2. DISTRIBUTION OF TAXES FOR AND BENEFITS FROM AGRICULTURAL PRODUCTIVITY IN THE UNITED STATES WITH COMPARISONS, 1961*

	Income Class (Money income after personal taxes)							
	Under \$3,000	\$3,000-3,999	\$4,000-4,999	\$5,000-5,999	\$6,000-7,499	\$7,500-9,999	\$10,000-14,999	\$15,000- & over
No. of families (mil.)	13.9	6.3	7.0	7.0	8.4	7.6	4.0	1.1
Persons per family	2.3	2.9	3.2	3.5	3.7	3.9	4.1	3.9
Taxes for agr. productivity	Dollars per family							
Local	6.28	10.10	11.97	14.48	16.72	20.14	25.69	40.35
State	4.00	8.07	10.15	12.24	14.57	17.82	23.95	56.47
Federal	.61	1.60	2.13	2.76	3.51	4.83	8.06	30.92
Total Taxes	10.89	19.77	24.25	29.48	34.80	42.79	57.70	127.74
Total agr. exp. benefits	16.63	24.37	28.67	32.98	35.56	39.00	43.87	48.46
Redistribution (net benefits)	5.74	4.60	4.42	3.50	.76	-3.79	-13.83	-79.28
	Benefit-tax ratio							
a) <u>All agr. prod. benefits</u> All agr. prod. taxes	1.5	1.2	1.2	1.1	1.0	.9	.8	.4
b) <u>All agr. research benefits</u> All agr. research taxes	2.0	1.4	1.3	1.2	1.1	.9	.6	.3
c) <u>All state-local benefits</u> All state-local taxes	2.1	1.3	1.1	1.0	1.0	.9	.8	.6
d) <u>All federal benefits</u> All federal taxes	4.7	1.9	1.3	1.1	.9	.8	.6	.3
e) <u>Total U. S. benefits</u> Total U. S. taxes	3.3	1.7	1.2	1.1	.9	.8	.7	.4

*Source: Agricultural productivity benefit data calculated by Daryll Ray from Stephen Hiemstra, *Food Consumption, Prices, Expenditures*, Agr. Econ. Rpt. No. 138, U.S. Department of Agriculture, Washington, D.C., 1968.

Incidence of taxes from Tax Foundation, *Tax Burdens and Benefits of Government Expenditures by Income Class, 1961 and 1965*, Res. Publ. No. 9, Tax Foundation, Inc., New York, 1967.

agricultural research and education in Table 2, except they are only 11 percent (185/1639) as large per family. While benefits are distributed according to farm food ingredients purchased by families by income class as earlier, the incidence of taxes is different because greater reliance is placed on progressive federal income taxes for research funds. The resulting benefit-tax ratios (b) from agricultural research alone in Table 2 ranges from 2.0 for low income families to .3 for high income families. The principal conclusion of this discussion is that taxes and benefits from agricultural research alone or research and education combined redistribute income from the rich to the poor. This conclusion is not changed by altering the assumptions within a reasonable, expected range.

THE DISTRIBUTIVE DIMENSION OF ALL STATE AND FEDERAL EXPENDITURE PROGRAMS

Estimates (c), (d) and (e) do not apply to agriculture but are included only for comparison. Estimate (c) is the ratio of all state-local taxes for all purposes, adjusted (as for all other benefit-tax ratios in Table 2) so that taxes equal expenditure benefits. Estimate (d) is the ratio of all federal expenditure benefits to all federal taxes for all purposes. Lastly, estimate (e) shows the ratio of all local, state and federal expenditure benefits to all taxes in the nation. The comparisons indicate that taxes and benefits for agricultural research and education redistribute income away from the rich to a greater degree than all state-local taxes and benefits, but to a lesser degree than federal taxes and benefits.

