Evaluating Agricultural Research and Productivity

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FUTURE RESEARCH EVALUATION NEEDS

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It is useful to remind ourselves that we are now in the third generation of agricultural research assessment studies. During the first generation our efforts were devoted to measuring the shifts in production functions and supply curves. In this early work by Schultz, Solow, Ruttan, Griliches and Peterson, shifts in the production function or the supply curve were identified with technical change. During the second generation, efforts were made to partition productivity growth among several non-conventional factors - grouped under three broad categories - investments in human capital, advances in technology, and improvement in infrastructure. We are now well into a set of third generation studies in which analysts are making more sophisticated attempts to understand how technology influences production (e.g., the Blakeslee paper on maintenance vs. productivity enhancing research), advances in the methodology that can be used to probe the sources of change in production and productivity (the papers by Geoff Edwards and by Huffman and Evenson), and application in neglected sectors (forestry, post harvest, and social science). I will, in my summary, make comments on several areas where additional effort is needed.

Post harvest technology

I agree with Max Langham and Joe Purcell that we need to develop a much better understanding of the sources and impact of technical change in the post harvest area.

- We need the micro studies that will enable us to understand the extent to which we are underestimating output, and output growth due to improvements in quality. We also need to understand the sources and value of the utility generated by market information - including advertising. Neither of the two items are at the top of my agenda.

- We need to understand the decline in competitiveness of the U.S. food processing industry. If we abstract from the cycle in agricultural exports of the last decade and a half and compare 1970 and 1986 we see agricultural commodity exports rising as a share of agricultural production and processed food imports rising as a percent of the value of processed food.

What is going on here? There are some scraps of information that do not quite add up to a coherent picture.

- The food industry devotes a smaller share of its sales to R&D than almost any other sector (0.5% compared to 2.0 for all manufacturing and 5-10% for high technology including seed and animal drugs).

- Most of the R&D in the food industry is on the product and marketing side and very little is process technology. Process technology is done by equipment suppliers.

- An increasing share of the process technology employed in the food industry is developed abroad - particularly in Europe (dairy in Denmark and Sweden, etc). And it is first employed in Europe to produce high value added products - another name for high quality.

- I see an industry that has devoted its creativity to promotion and has neglected process and product technology in favor of market research and promotion and is losing market share as a result (hypothesis).

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Production research

I would like to argue that we can no longer justify expansion of the agricultural research budget - or even the present level of research - on the basis of benefit to the American consumer. Saving part of the 10% of final product value contributed by the farm sector or even the 20% contributed by the farm or input sectors simply is no longer very important to the U.S. consumer.

If we are to justify expanded production and input saving research, it must by justified in terms of maintaining our competitive position in world agriculture. The traditional manufacturing sector generated over $100 billion in trade deficit in 1986. The high technology industrial sector will show a net trade deficit when the figures are in. Agriculture will generate a $5-10 billion surplus in spite of very substantial declines from the early 1980's. The major commodity producing sectors of agriculture are among the few world class industries left in the U.S. They will remain world class only if productivity growth is sufficient to enhance our competitive position. The effect of getting the dollar "right" will show a positive effect on trade, but this is a once and for all effect. Productivity growth, if achieved, is continuous.

There is one qualification to this view. The gains from trade will depend on the kind of agricultural policy we have. If new legislation should push us in the direction of an EEC type policy - with high domestic prices and subsidized exports - the potential gains from agricultural research will be viewed by OMB, the Treasury and the Congress as a burden - a cost - rather than a benefit.

Private sector agricultural research

It is time to get a better handle on the gains from private sector agricultural research. We are continuing to employ two sloppy assumptions that do not have the research base to support them. One is that the gains from private sector research are realized entirely by the private sector firm doing the research and hence can be captured by the price of the inputs purchased from the input industry. The second is that the social rate of return to private research must be about equal to public sector and we simply discount the estimated social rate of return to public sector research by the share of private to total research. (But if the benefits of private research are caught, even partially by input prices, this discounting is overly conservative.) It is time to repair this deficiency before it discredits the whole enterprise.

Productivity growth in the input industries

Productivity growth in the manufacturing sector of the U.S. economy has been depressed - barely positive - since the early 1970's. Both the farm machinery industry and the fertilizer industry have shared this low growth in productivity. Without productivity growth there are no input cost savings to pass on to the agricultural sector. It is important that some attempt be made to understand the sources of the slowdown in productivity growth in these important suppliers of inputs.

Maintenance research

I was very excited about the Blakeslee paper on maintenance research. In my 1982 book on Agricultural Research Policy, I argued that, as partial productivity indicators (yields) or total productivity indicators rise, a higher share of a constant research budget would have to be devoted to maintenance research. Very little maintenance research is required to maintain a gross yield of 1.0 metric tons/ha. At 8.0 metric tons a much larger level of maintenance research would be required. At that time I could not find a single reference that discussed either the biology or the economics of maintenance research. Researcher managers should insist on more intensive economic research in this area.

Technology assessment

Society is insisting, and will insist even more strongly, that the agricultural and general research community provide more accurate guides to the environmental, social and economic impacts of new technology. A state research director who cannot provide his legislature with such information will stand exposed - nude - before both his friends and his critics.

Perhaps I can illustrate my point by comparing the way that California handled the "hard tomatoes" case and the way Cornell is handling the "bovine growth hormone" concerns.

California made no attempt to prepare the interest groups, either those supporting or that later opposed the new biological and mechanical technology, as to what to expect. The development of the machine harvestable tomato and the harvest machinery was an outstanding example of successful collaboration between biological scientists and engineers. But the failure to develop an adequate understanding of its potential impact resulted in a serious threat to the political credibility of agricultural research in California.

Cornell, in contrast, has maintained an active public affairs extension program to help New York dairy farmers and the general public understand the implications of the bovine growth hormone. This effort is backed up by the best set of technology assessment studies that I have seen. Cornell has also had negative feedback. But by the time the new technology reaches the market, its impact will by understood and Cornell will have maintained its political credibility.