# DISCUSSION: MORAL RESPONSIBILITY IN AGRICULTURAL RESEARCH

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My experience in this assignment confirms Agnes' law that "almost anything is easier to get into than to get out of." In his timely and well-organized paper, Dr. Ruttan addresses increasingly serious problems and raises issues at the heart of research and development policy.

He begins with the generally accepted statement that modern agricultural productivity results from the fusion of technology and science. However, questioning of some of the by-products of technical change is generating a growing scepticism over the role of science in our society, leading to a rising demand for more effective social control over the development and use of agricultural technology. He argues that agricultural scientists must assume responsibility for both the cost and benefits of technical change, but feels that it is in society's interest to let the burden of responsibility rest lightly on scientists, as long as they maintain their commitment to expand the productive capacity of the resources used in agricultural production. Otherwise, their selection of research projects will be biased away from areas with high potential benefits that also have a high risk of conflicts. Nevertheless, he argues that society should insist that agricultural scientists embrace an agenda that includes a concern for (1) the effects of agricultural technology on the health and safety of agricultural producers; (2) the nutrition and health of consumers; (3) the impact of agricultural practices on the aesthetic qualities of both natural and man-made environments; (4) the quality of life in rural communities; and (5) the implications of technical choices for the future. In return, the agricultural scientist should expect that society will acquire a more sophisticated perception of the contributions of agricultural technology to the balance between man and nature and that procedures for resolving conflicts leading to a rational allocation will be forthcoming.

As the strongest of all possible endorsements of how well this fusion process has gone in agriculture, Dr. Ruttan argues that the pattern developed by agricultural scientists in embracing the fusion of science and technology should be followed by the general science community.

Most of us feel quite comfortable with Dr. Ruttan's identification and description of the issues. He provides a number of insights and makes contributions that I must not take time to identify or comment about. Some of his conclusions I found both hopeful and comforting, albeit in places, somewhat utopian.

Dr. Ruttan is aware of the dilemma faced by research managers and scientists growing out of the "technology assessment movement" which requires that they understand and measure the social welfare function *before* it is revealed in the political and/or economic market place. He suggests that "research leading to a better understanding of the discrepancies or the disequilibrium in the economic, political, and social weighting system is essential. But the objective of such research should not be to provide research directors with the weighting system for internal research resource allocation. The objective should be to contribute to a political dialogue that will result in institutional changes leading to convergence of the several weighting systems." In a pluralistic society such as ours, consensus is highly unlikely. Not only will weights differ, but they will change over time, and conflicts will continue to prevail. In this sense, Ruttan's suggestion is utopian. Moreover, I would argue that research that helps us better understand the disequilibrium in the economic, political, and social weighting system will not only provide a more informed basis for the continuing dialogue, but should also improve internal research allocation. My point is that we should not expect, nor can we wait for, consensus. Instead, we enter the dialogue with the intention of injecting as much economic rationality as possible into the allocation of research resources. The product of this dialogue should be particularly useful to research directors and, if appropriately used in this latter capacity, can have a significant beneficial effect.

There is no end to the list of problems that might arise with no clear resolutions. The tomato harvester is a classic case for which Ruttan's prescriptions have merit. Let me pose the problem in more general terms. Suppose a new technology developed through socially funded research benefits farmers who adopt it early by, say, $10 million and improves profits to farm suppliers by $5 million, while decreasing revenues to farm labor by $20 million. However, suppose this technology generates consumer surpluses of $70 million. Clearly, the benefit/cost ratio is positive. But if farm workers are compensated for their loss, who should do it? Ob-

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Invited discussion presented at the annual meeting of the Southern Agricultural Economics Association, Feb. 6–9, 1983 Atlanta. Invited discussions are routinely published in the July *SJAE without* editorial council review but with review by the copy editor (as per Executive Committee action June 25, 1982).

viously, the combined gains by farmers and farm suppliers are insufficient, and taxing the public would surely create inequities since (let us say) only 20 percent of consumers use the commodity. Although he doesn't supply answers, Ruttan's discussion is relevant and helpful.

As we look to the future, the issues Ruttan raises become even more poignant. Some of you are already involved in trying to assess the possible impacts of such high-technology research as bioengineering and biogenetics, which probably have tremendous potential. Some of this research may well also have very profound revolutionary impacts. Neither Pareto-Optimum nor positive benefit-cost ratios (in economic terms) provide sufficient criteria for decisions concerning research resource allocation with such alternatives. I think Ruttan would agree that to better cope with these emerging issues, we must move beyond economic positivism (if he doesn't he ought to).

But normative analysis *is philosophy,* not economics, sociology, or anthropology. These latter social disciplines provide tools for understanding and possible quantifying what society's welfare function *is* and how it got there. This we will always need to know. However, by themselves they will not tell us what this function *ought to be.* In this area, we can gain from methods found useful in philosophy. And it is quite possible (even probable) that decisions on resource allocation in research during the next few decades will profoundly influence the very structure of our society.

Hence, it is incumbent on us as research economists and research resource allocators to explore, ponder, and assess the total possible impacts of research alternatives early on. Not only must the alternatives be explored, their impacts must be identified and measured, as Ruttan explicitly states, in terms of a defined utility function. He does not, however, adequately address the problem of assigning probabilities to possible outcomes from alternative research actions. Having made this accusation, I must confess that my only additional contribution is to say that it is a difficult task. Perhaps geneticists and statisticians can make probabilistic statements about possible outcomes of bioengineering, but they probably have little basis for assessing probabilities of social and economic gains and losses or of changes in social structure and values. Yet this is the kind of information research directors need.

I found less than I expected in Ruttan's paper that would either guide or comfort me when getting into bed with philosophers, as I am arguing we must now do. He did, however, clearly point us in that direction. Ruttan's rich experience with both physical and other social scientists gives him a vantage point from which to more fully address this pressing issue. Let me add that I found nothing in his paper that suggests a reluctance to address this broader problem. It simply was not, unfortunately, included in his treatise. I am convinced that economists must be an integral part of the decision process that charts the course and allocates resources for high-technology research—along with philosophers and other social scientists (including political scientists) and physical and biological scientists. The central question is: how do we intermarry these disciplines? Since plural marriage is illegal in the U.S., I hope that Dr. Ruttan and others will not only continue their flirtations with both philosophy and the basic physical and biological sciences, but will let them expand and blossom into a full-blown intellectual and professional infidelity leading to cross-fertilization. Those who do this could well be the research pioneers in the closing decade of the twentieth century, with all the professional hazards and potential rewards this status implies.

In the last decade or two, our profession has developed rather powerful quantitative tools and computer techniques to move rapidly in research analysis and synthesis. Dr. Ruttan seems to be in total agreement with me that we now can afford to be less concerned about getting there faster, but must be more concerned about where we're going.