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I

"The principal question to which we address ourselves . . . is then--How does the farm firm respond to price changes? . . . And until more evidence is in, we shall hold to the following propositions: the aggregate output function of a representative commercial, family farm, whether a single or multiple-enterprise unit, is perfectly inelastic or approximately so; but this inelastic aggregate output function shifts to the right as technological developments are adopted on farms." --Willard W. Cochrane and William T. Butz, "Output Responses of Farm Firms," Journal of Farm Economics, Vol. XXXIII, No. 4, November 1951.

". . . We now know how to create new high levels of production on medium to low producing land in short periods of time . . . . /but/ it is difficult to find tenants able and willing to spend their share of an initial soil building program costing $50 an acre. We say to our clients, therefore, that they should add the first heavy application, adding it, if they wish, as an additional expenditure to the original purchase price of the land." --D. Howard Doane, Chairman of Board, Doane Agricultural Service, Inc., before Annual Convention of American Plant Food Council, Inc., Hot Springs, Virginia, June 21, 1952.

II

Questions as to where and how ideas originate, become current and find the kind of acceptance which actually influences the course of events have generally had too little attention from agricultural economists, especially so in view of their increasing concern with agricultural policy over the 30-odd years since the great deflation of 1920-1921.

It seems to me that this field of inquiry deserves attention alongside our efforts to better understand the functioning of American agriculture as evidenced by our absorption in aggregative, structional, and inter-industry analyses of one kind or another, including our concern with possible multiplier effects and other inter-relationships existing between the farm and non-farm sectors of the American economic system.

Meanwhile, I now want to center attention on three leading ideas which underlie many farm policy discussions, both within and without farm circles.

1. None of us wants to see the current level of American diets deflated.

2. We are all assuming a substantial increase in U. S. population over the next several decades.

3. We know that the acreage available for cultivation in the United States is relatively fixed.

As a skeptical scientist, I of course recognize that a number of qualifications have to be attached to each of these three ideas and I further reserve the right to examine or question (from time to time) the factual basis upon which they are based. But what I have tried to do is state in the simplest possible language the essential elements of the ideas because it is these elements which are most easily understood and which have most effect.

Acceptance of these ideas raises some very specific questions. Obviously, the ideas add to the proposition that American agriculture is faced with the problem of

maintaining a continuous increase in production per acre, per animal, and probably per man, over the years ahead. There is no need to spend much time before this audience on the question as to what means are available for increasing agricultural production. The direction of the answer is indicated by the two opening quotations, one from an able economist and one from a very successful farm manager.

When we begin to consider this question of technological improvement in detail, we step beyond the old or static idea of "the arts remaining constant" and are facing a much more difficult, dynamic task. There are a number of questions which I want to raise in this connection, and I suppose the easiest way is to state a series of what we might think of as working hypotheses, together with certain observations relating thereto:

The first suggestive assumption which I should like to advance is that the problem of maintaining continuous technological improvement places new stress upon the need for and importance of research.

Some researchers seem to feel that the problems ahead are not too difficult. But it was not ever thus,[1] and I feel that we not only need more emphasis on research but that we also need more research as to how various natural-science practices can be fitted together into operating units or, as some researchers call it, "packages," just as we are increasingly interested in similar analyses in connection with economic and marketing research.

The second suggestive assumption is that our ideas of extension or educational work are also undergoing change as a result of the need for maintaining continuous technological improvement.

We accept the fact that research developments must be brought to the immediate attention of farmers and ranchers to obtain results. It seems to me that we are now faced with accepting the further fact that farmers are also asking for an increasing amount of actual technical assistance from experts. Consider, for example, the activities of the Soil Conservation Service, almost all of which fall within this technical assistance field; the development of the "balanced farming" program in Missouri; and on the purely commercial side, the increasing dependence of the farmers on mechanics to take care of their tractors, on seed breaders to supply their seed, and (with the increased attention to antibiotics and trace elements) on feed companies to mix their feed.

The third suggestive assumption which is that of the maintenance of continuing technological improvement calls for a reevaluation of some of our accepted ideas of agricultural efficiency.

Our more commonly quoted measures of efficiency are so simple as to sometimes be misleading. That is, we tend to talk in terms of simple ratios--we talk about increased crop yields per acre, increased output per unit of animal breeding stock, and increased output per farm laborer. But at the same time we know that improvements in these partial measures of efficiency have been accompanied by steady increases in the requirements of cash, or out-of-pocket, costs per unit of farm production, that these partial efficiencies have been achieved in considerable part

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1/ Fifteen years ago, many research administrators were arguing that agricultural research had done well to simply offset the inroads of insects, disease, and erosion on crop yields. For example, "There can be but one explanation for the stubbornness with which acre yields have resisted the farmer's efforts to improve them. The natural productive capacity of the land has been deteriorating at a rate almost fast enough to offset all of these improvements in soil and crop management . . . ." R. M. Salter, R. D. Lewis, and J. A. Slipher, Our Heritage--the Soil, Extension Bulletin 175, Ohio State University, April 1936.

by transferring what was formerly farm work to our industrial system or outside experts. This fact seems to me to have some especially important implications, especially if we should again find ourselves with falling or seriously depressed farm prices. The fact that farm people are becoming accustomed to an improved standard of living also means increased cash outlays for farm family living which must of course be chiefly supplied by the farm enterprise.

The fourth suggestive assumption is that we should apparently reexamine some generally accepted ideas as to the manner in which benefits of technological improvement are distributed.

Agricultural and other economists generally argue that the benefits of technological improvements accrue first and for a temporary period to a relatively few innovators, spreading then to the general public in the form of the same products at lower prices or more and better products at the same price due to the effects of competition as the particular improvements became generally accepted.

But American business and American labor are in many instances today able to retain for themselves a substantial portion of the benefits of technological change. We still have administered prices, the patent structure and cost of entering into competition with large-scale organizations on the business side. And in the case of labor, there is currently a strong drive toward insisting upon increasing wage rates from year to year as a reward for the increasing productivity of labor--in short, a direct effort to hold indefinitely through collective bargaining the effects of increased and improved technology no matter how widely diffused. Farmers must have equal bargaining strength with other groups in the American economy and I think it significant that Johnson, in his recent study of the burley tobacco control programs, concludes, among other things, that "In effect, the programs have retained for the benefit of burley producers the income derivable from the increased productive efficiency." 2/

The fifth suggestive assumption is that the problem of maintaining continuous technological improvement in agriculture further emphasizes the role of commodity prices in the farm income picture, raising some most difficult problems on the price front.

Commercial farming is a complex, costly business and is likely to become more so in the future (as a result of technological progress, assuming constant prices). And I can see little reason to expect that cost rates of goods and services purchased by farmers are likely to decline relative to farm prices; rather the trend could run in the opposite direction over the next several years. With semi-administered prices and creeping inflation on the non-farm fronts, by what combination of research, sales effort and price support can we increase the consumption of agricultural commodities while at the same time holding farm incomes at a fair relative level?

The sixth suggestive assumption is that the necessity for simultaneously maintaining per capita food consumption and a firm farm price structure high-lights the need for a continued, concerted attack on the whole problem of costs and methods of marketing farm commodities and the products thereof.

We have started in this direction several times over the last 30-odd years, most recently under the impetus of Title II of the Research and Marketing Act of 1946. It seems to me that marketing research, services, and information need a great deal more attention and that perhaps the realities of the situation in which we now find ourselves will be compelling enough this time to not only sustain what we are now doing but also force further development.

2/ See: Glenn L. Johnson, Burley Tobacco Control Programs, Their Over-All Effect on Production and Prices, 1933-50. Kentucky Agricultural Experiment Station Bulletin 580, February 1952.

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Some of you may feel this is a wholly credulous performance. Perhaps so: certainly I am aware that many farmers still fear over-production, that some economists are again beginning to speculate on the possibility of the "terms of trade" turning against farmers. Starting from such an alternative would still lead me to the same conclusion (even though the successful handling of some of the problems would become far more difficult). We still need a strong agricultural program, covering not only research and education but equally support prices, technical assistance, and increasing attention to market reform and development.