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# THE CHALLENGE OF INCREASING PRODUCTIVITY IN THE FOOD INDUSTRY

by

Dr. Don Paarlberg  
Director of Agricultural Economics  
U. S. Department of Agriculture

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Defines and outlines productivity concepts and their relation to the food industry.

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The challenge of increasing productivity? By productivity I am going to consider the same concept as the concept of efficiency, to me these are synonymous. The measurement of efficiency, that we use in economics, is the output per unit of input - counting all the outputs, counting all the inputs and attaching prices to the inputs and to the outputs. It is a difficult thing to get all these measurements and to price them accurately.

There are an enormous number of erroneous measures of efficiency and productivity floating around. Let me give you some erroneous measures of efficiency. One that is very widely used is output per farm worker. "X" number of years ago a farm worker fed so many people, today he feeds so many more people. The increase has been phenomenal and the inference often drawn is that agriculture productivity has gone up at a tremendous rate. Well, the error with that definition is that it takes account of one input only, which is labor, which has been diminishing, and ignores the input of capital which has been increasing at a tremendous rate. It attributes the total increase in output to the diminishing input, labor, and ignores all the others. Another measure of efficiency that you often hear, is yield per acre, this also has risen rapidly. But that again takes account of the input of only one factor which is land and ignores the inputs of capital, it ignores the fertilizer, the better

plant breeding, the better mechanical equipment and all the other costly inputs that could go in.

Sometimes you will hear it said that American agriculture is efficient because we are well equipped using advanced science and technology; we have good tractors, we produce rice with a huge combine while the Asian's harvest rice with hand sickles, we are thought of as being much more efficient. This is not necessarily true. Sometimes that Asian with his hand sickle can beat us in the market and in the true test of efficiency he may be more efficient than we, (in the state of technology development).

We have tried in the Department of Agriculture to estimate the changes in productivity. Going back 60 years or so, we have tried to take account of all the inputs; land, labor, capital, management, and all the outputs, not just the physical products, but the added services, such as slicing and wrapping, etc. What we come out with is an increase in productivity and at a rate of about 1.4 percent annually. That is about the annual rate of improvement in productivity. We are productive in that the outputs are greater than the inputs and the ratio of the two improves annually on the average at a rate of about 1½ percent. This slowed down a little during the late 60's for a variety of reasons. Some were yields in agricultural land held out of production, and there was some concern about whether the rate of efficiency was plateauing. But in the last several years the rate of efficiency in agriculture, as we compute it, has again improved and we are about back on trend.

There is another rough way of measuring efficiency in agriculture production,

and that is the relationship of prices of farm products to prices of nonfarm products. Other things equal, price equals the cost of production and if prices have been going down relatively over time that means that production costs have been going down relatively over time. This means that efficiency must have been improving relatively over time. In agriculture the relationship of prices received to prices paid, has over a long period of time, gradually declined. If you compared prices with 60 years ago, it now is about 90 percent of what it was at that time. Since our farm prices have fallen relative to nonfarm prices, in a competitive market, it is an indication that productivity in agriculture has improved relative. We do not have measures of total productivity, in the food marketing business and in the food manufacturing industries. There we have only a measure of labor productivity. We do not have a measure of all the inputs so that we cannot really give a definitive answer to the rate of change in efficiency in the food marketing business. We do have a measure of the labor productivity in food marketing and that has been increasing at a rate of about 3 percent a year. Largely the result of substituting capital for labor and that rate of improvement in labor productivity is about the same as it is in the economy as a whole.

There are some fascinating questions about this, at least they fascinate me, I have no idea whether they fascinate you. I have discovered that my reaction is not always identical to that of other people. But a public policy problem is - who captures the benefits of increasing productivity and of increasing efficiency? That is a very, very important problem. The simple assumption of a lot of people is that the gain is captured by the man who makes the change. And that if agriculture becomes more productive, improves in efficiency, these gains are captured by agriculture. That is an over simplification and it is not necessarily true. It is only true in part. The early adopter gets the

advantage, that is perfectly clear. He adopts the new efficient productive technique before the others have, he lowers his production costs by adopting the new efficient practice, and he gains by it. He is an enthusiast, and he is the early adopter, the innovator, the aggressive type, he is the fellow that is beating on your door to ask you to do more research.

As more and more people adopt the new practice, production costs in the industry decline, production increases in response to the profit to be gained by production, and the price of the product declines. The fellow who has not adopted the new practice, who does not or cannot or will not, experiences the same high production cost as before and he now faces a lower price for the product he sells so that he is put in a squeeze. The early innovator gains and the late adopter loses. Most of the gains in the long run are passed on through the system and the real gainer in this process over time is the consumer. As a result of these improvements in efficiency, he gets the product at a lower cost. The farmer does gain. He gains, however, more as a citizen than he does as a farmer.

You cannot capture for your industry the gains that come from productivity. These are disseminated broadly throughout the society. Some people think that this is unfortunate and a lot of people try to rig devices to keep this from happening, to try to hold close to themselves the gains made in their industry. But that does not work. Our system is, in my judgment, benevolent. In that it insists on disseminating broadly the efficiency gains that accrue in almost any part of the society only if through cartelization or restricted legislation. By these techniques can you keep these gains from being widely disseminated - a simple illustration: the barber has made no productivity gains for 40 years. I guess the last productivity gain in barbering was the adoption of the electric hair clipper. But he has gained from the efficiency that is being experienced in the total society. His real income has increased even though he is professional. His vocation has experienced no gains whatever.

Some other fellow achieves enormous gains in efficiency. We change over from the pick to the jackhammer and try to repair our streets. The efficiency gain here is prodigious, but the jackhammer operators do not capture this by themselves. It is passed on and part of that gain is won by the fellow who is still using the pick, because he gets so much per hour even though his gains have not increased. The system disseminates these advantages very broadly.

We made a study at Purdue while I was there. Bob Lattimer, who did his doctorate with me, made a study to see whether the gains that are made from agriculture technology, that came from the Indiana experiment station, whether these were captured by the Indiana farmers, or whether they were disseminated generally into the system. He concluded, after a very intensive study, and a very difficult undertaking, that they were not captured by the Indiana farmers. That the Indiana farmers got some of the benefits of what we did at Purdue, but the Illinois farmers and the Ohio farmers also did, and we in Indiana got the advantage of work done in Wisconsin, Michigan, Ohio, Kentucky, Beltsville and everywhere else. The new gains simply were disseminated through the system.

I went to a meeting in New York during the holidays and I heard Professor Bob Evinson from Yale recording on a study he had made of the Green Revolution and the question of whether gains made in a particular area were held to that area and he concluded that this was true to a limited extent but only to a limited extent that these gains disseminate themselves very broadly. There are some barriers; cultural, traditional, ethical, that inhibit them but they are disseminated very widely. All of which is a very strong argument for the public funding of research work. If the results of research are disseminated widely among the citizenry, then the costs of carrying on that research should properly be born by the tax system. Well, that's one subject that fascinates me.

I will give you another one that fascinates me and that is what measure of return to research work? Is it possible to come to some conclusion as to what degree of public benefit results from the expenditure of a dollar in the research field? Now this is exceedingly difficult to do. We have had some very able people who have dug into this and they come up with some very rough measures. These measures have to be rough, but they are very interesting to me. There is one classic study done in the University of Chicago by a man by the name of Grilligis. In 1968, he studied the returns to research in hybrid corn in the United States from 1940 to 1955. Another fellow by the name of Ardito Beleta studied the effects of public and private investment, in research in wheat in Mexico from 1943 to 1963. Then the same gentleman I mentioned, Mr. Evinson, reported a study on the results of research in sugarcane in South Africa from 1945 to 1962.

There have been studies not just of particular commodities or particular targeted kinds of research but overall research. Now in general, these results show a good return. What they show is that you make the investment in research and it takes a couple of years before you get any payoff. Then you begin to get increments of payoff and the rate at which these come along depends very largely on the particular enterprise. But as a generalization, according to Mr. Evinson, it takes about 7 years before this thing really gets going. It is productive for a period of time until some new technology comes along and replaces it which may be a brief time or it may be a longer time. These gentlemen who have studied this activity come up with what is called an internal rate of return. This is the rate of return that is not strictly a benefit cost ratio. It really is the flow of gains accumulated to the ending period that is under scrutiny and this flow of gains adjusted for the investment in terms of actual dollars spent plus the interest costs thereof. In this fashion the rate of return on wheat was fantastic. 90 percent return in Mexico from the Green Revolution. The rate of return on hybrid corn, as Evinson calculates it, is about 35 or 40 percent, and for the sugarcane about 40 percent. These are some of the real

successful ones and there the returns are very high. There were many that failed. If you look at this in the aggregate, Evinson says that you come up with a rate of return that is somewhat better than the usual returns from other forms of public investments; such as roads, communications, and the like. These are rough and I am sure they can be challenged but they are indicative and show research to be an undertaking that leads to a payoff in terms of the public good which is the intuitive judgment of the citizenry as well as the conviction of the scientist.

Professor Shultz from the University of Chicago has done some work on the return to education and these, too, are very rough. He comes up with rates of return from about 8 to 15 percent based on earnings only, giving no credit for the satisfactions for the consumer element in education.

We don't have very much in the way of results of research in the food marketing area. The results that are available, rough though they may be, are confined almost entirely to research in the field of agriculture production. We are further ahead in agriculture production research because we have been working longer in that field than we have in the marketing area. There are some obstructions to productivity. Some obstructions of course, that are natural, and that is the disinclination of people to change, commitment to things past, skepticism and difficulty of uncovering new truth. All those things are natural but there are some artificial obstacles to productivity. We have them in all areas, and being very frank, we have some in agriculture.

Some of the commodity programs we have are deliberate obstructions to efficiency gains, gains in productivity. The tobacco program keeps tobacco from being grown in other areas where the land is suited to it. It keeps it from being produced in larger amounts. This is a cost raising obstruction to efficiency. The same thing is true for

other crops such as rice and peanuts. In the field of labor there are obstructions to productivity. A whole long list of feather-bedding; work rules that are imposed by the laboring people. These are cost raising and are obstructions to efficiency. You have them to some degree in industry but I think to a smaller degree. It is a very interesting thing. These interferences with efficiency that come from what you might call cartelizing the industry, you find them required in agriculture in certain areas, as I say in tobacco. It is required of the farmers, they get fined if they don't go along with it. You find these things condoned in labor and you find them prohibited in industry. Very interesting thing, which people do not very often reflect on.

Industry, by and large, is prohibited from engaging in activities that inhibit productivity gains, efficiency gains. They have some devices of their own, however, that I guess we might reflect on. I attended a food merchandisers meeting in Florida some time ago. I heard a very interesting speech, a fellow giving a pep talk to the guys. He says, "Now look boys, let's face it. People don't really need any new kinds of foods. They've got all the kinds of food they need. They really need. The only way that you can really tap a new market is to devise a food that they haven't thought of, dream up a service that they haven't thought of and convince them that they need it and then produce the product and sell it to them in satisfaction of the need that you have created." Well, that is a very frank statement and according to conventional standards, perfectly appropriate. But a person of a philosophical bent has to ask some questions about this. Is it really efficient to create some need that does not really exist? And then in response to it, use scarce resources to fulfill it. Interesting question. Perhaps more of philosophical than of an economic question. All of that leads into another set of questions. Broader questions about productivity.

The measures of productivity that I have given you and the measures of efficiency, all have looked at the particular

industry, the particular firm that was involved in these efficiency gains. Things other than those they have impounded in ceteris paribus, other things equal, which is the economists phrase. Side effects, no account of them; secondary effects, ignored; social effects, externalities or whatever these are, not part of the consideration. Now that simplifies the research job but it leaves the public with some unanswered questions.

Some of the results of these efficiency gains have a rather significant impact. Indeed, the secondary effects may be more important to the society than the primary effects. For example, we mechanized the production of cotton and developed the use of fertilizers, herbicides, pesticides and modernizing with enormous efficiency gains. However, measured in terms of the impact on the entrepreneur some other effects, the disemployment of millions of people is a side effect. Some consequences for the environment, some consequences as far as wildlife is concerned and fertilizer runoff is concerned. Some of these side effects are good, they have a good social effect. The development of new skills associated with a new technique; riding a tractor probably is better from the standpoint of satisfactions than wielding a hoe, or picking cotton by hand. On the other hand, some of these effects may be hurtful. Some of them may be hurtful in the short run, advantageous over the long run.

It may be that moving a man off the farm was hurtful to that particular man. However, his son who grows up in a different area may now have more opportunities. This is advantageous to him. The public is increasingly asking if these externalities be brought into the model, that they be brought into the decision-making forum when we try to see the results of efficiency gains.

We economists have kind of tunnel-vision lots of times, and our whole discipline is built around this efficiency concept. That is why it is so important to me and that is why I get so

worked up about it. That is the single criteria that we in economics have focused on. If a thing is efficient, it is good. If it is not efficient, it is bad. The more efficient it is the better it is.

Kenneth Boulding says that society has a number of goals. Efficiency is only one of these. Boulding thinks there are others. There is a goal of stability; we do not want to get torn apart, and a goal of justice; not just legal justice, but commutative justice. Justice in exchange, what people consider to be just in terms of what reward is given for whatever the contribution is, there are various notions about this.

A simple one is, and that is the historical one we have had, that if you produce more you get the total benefit of the extra you produce. If you do not produce anything, you do not get anything. That is the old idea. There is a communist idea which is totally different. From each, according to his ability, to each according to his needs. That is a different system. Then there is a bureaucratic system, everybody gets 10 gallons of gas whether he has a car or not. Then there is another one which is the welfare state which says that everybody gets so much to meet his basic needs and above that he gets according to what he produces. Another one is freedom. The desire to exercise your own decisions and to be responsible for what you do. Not to be dictated to. Now, my only point is that it is good to know when you begin a conference on efficiency or productivity and consider efficiency the only goal, and when you go ahead dealing with this thing then you find all sorts of obstructions and all sorts of questions. These questions probably come from these other goals and while it is a simple thing, professionally, to dismiss them as being inconsequential because they are not in our own concepts and our own professional teaching, they are there nevertheless. These things, in some cases, are mutually reinforcing and in other cases are contradictory and it is a real challenge to the agriculture man to maximize the degree of compatibility in these divergent goals.