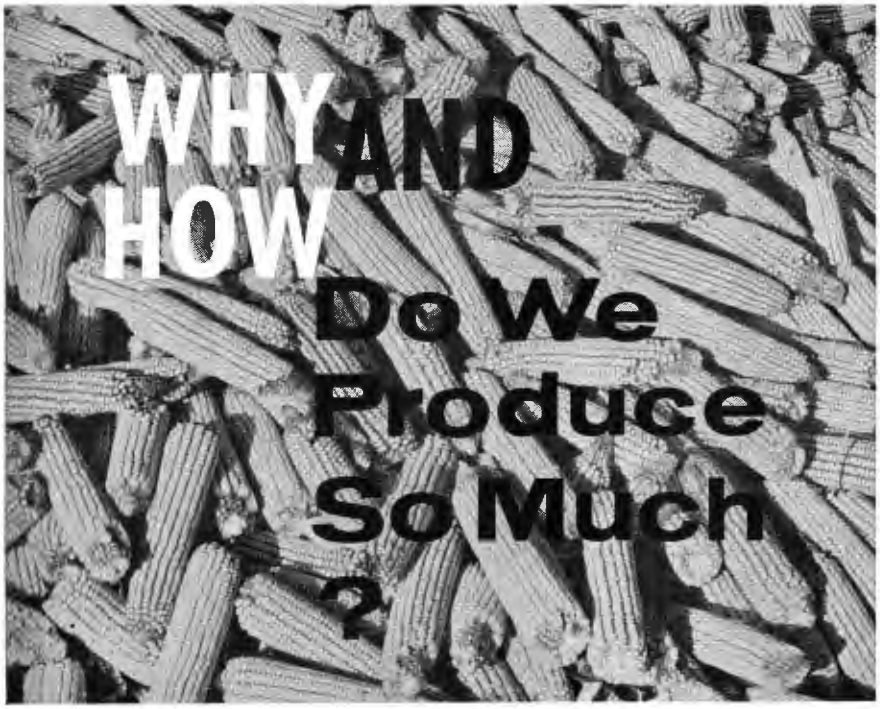

If our surplus output depresses both farm product prices and farm family incomes, why and how—even in the face of the national forces outlined last month—do farmers and agriculture in total produce so much?

by Earl O. Heady and John F. Heer

OUR FARM production has increased 50 percent since 1940—by 25 percent in the last 10 years. Our grain stocks are almost large enough for 2 years of normal domestic and export needs. How has farm output grown so rapidly? Why?

Last month we looked mainly at the forces operating "outside of" agriculture and their impact on farming (see "What Agriculture Is Up Against" in the September issue or reprint FS-881). We indicated that agriculture's predicament isn't exclusively a problem of agriculture's own making—that it stems partly from the economic growth and development of the nation as a whole. We pointed out that the forces stemming from the changes in our national economy are the ones which tend to dictate agriculture's place and role as a part of the national economy.

We reviewed those forces first since they're less well recognized than a related part of agriculture's predicament — the very apparent surpluses from agriculture's excess production capacity. The fact that farm output is in surplus adds to the impact on agriculture of the forces outlined last month. This month, let's look at the supply or surplus production problem *within* agriculture.

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Why So Much?

How has agriculture reached its surplus position? With about the same amount of total acres and with a decreasing farm population, the answer, at first glance, looks simple — improved technology. But there's much more than this behind the increase in output and the growth of agriculture's actual and potential productivity.

Before new technology can be put to use, it must be developed, and people who might use it must know about it. And some of the uncertainty about the use of the new technology must be overcome before people are willing to take chances in using it. Other conditions related to knowledge and customs also must be favorable to adoption.

But even then, new technology isn't adopted just for technology's sake—at least not in an economy such as ours. The new technology is adopted by farm operators *if*, and only if, it's *profitable* to use it.

The application of new technology often calls for more or different resources to go along with it. Chemicals used for weed and insect control, for example, tend to increase output. But these chemicals aren't just new technology as such. They're resources or inputs that have to be purchased. And to be adopted, they must control weeds or insects more cheaply, effectively or easily than older methods. Fertilizer, likewise, isn't just a new practice that can be freely adopted or not. It's a material resource, requiring a cash outlay. The same is true of the seed of a new crop variety, a new feed ingredient or mixture, or a new piece of machinery—any of which may help increase yield or replace labor.

There are few important developments in farm practices or technology that, in this day and age, are costless. Adoption, therefore, depends not only on awareness, custom, status, etc., but especially on profitability.

Must Be Profitable: To be adopted, a new technique must give or promise a profit. Whether it increases output, does a better job than other methods or substitutes for other resources, the return from adopting a new technique must still be enough to make it worthwhile. The resources used in applying the new technology must be priced favorably in relation to the prices of the products they produce.

Three things are important with regard to the possible profitability of a new technique or practice: (1) the amount it adds to production, (2) the cost of the resources necessary to use it in relation to the price of the output it produces or (3) the cost of the resource in relation to the cost of the other resources for which it may substitute.

Here's an example. Suppose a new practice (or, more exactly, the resources it calls for) is applied as a dose of material and adds 3 bushels to yield or output. If no other costs are involved, it will be profitable if the cost of the material is no more than 3

times the price per unit of output. This is because 1 dose of the material adds 3 units to output. Use of the material would be highly profitable if the dose costs only 2 times the price per bushel of product. If the dose costs, say, $2 and the price of each unit of added yield is $1, the total return is 3 times $1, or $3—a return of $1.50 for each $1 invested.

It's this relationship of the resource or input cost to the price of the output (along with the increased productivity of the practice) that's important in the profitability and adoption of a new technique or practice. Simple arithmetic? Yes. Almost anyone could figure it out in one way or another. Millions of farm operators have. And this basic kind of reasoning goes a long way in explaining why our total farm output has increased so greatly and so rapidly.

We've Added Resources: The great increase in our farm output has taken place largely because agriculture has *purchased* and *added* great amounts of inputs or resources from off the farm. These have been added and used along with the land and labor resources already in farming. They've far more than offset the labor migration from farming and have added a tremendous amount of resources and potential productivity to agriculture.

The large and rapid increase in farm output wouldn't have been possible without these purchased and "imported" physical and material resources, some of which have productive power in themselves. But it is by no means just the *knowledge* of new practices that has led to the output increases over the past 20 years. More nearly, it is the putting to use of materials produced in industries outside of farming that accounts for this.

Take away fertilizer, insecticides, power machinery, feed ingredients, etc., and the knowledge of them would still exist. But farm output would drop about as rapidly as it has increased.

Where From? The additional agricultural resources coming from what we might call "resource furnishing industries" have made possible the rapid and large increases in farm output. Even such things as hybrid corn seed and special ingredients for feeds are coming less and less from firms producing commodities for consumers in general and more and more from firms specializing in producing resources to be used in agriculture. And these products have had a sizable role in contributing to our farm productivity.

These products aren't just produced for the fun of it any more than the practices and techniques that use them are adopted that way. The fact that they're profitable lies behind both their production and use. Their use is profitable because these products are priced favorably in relation to the farm commodities they produce or help in producing.

How It Works: Especially in the past 20 years, the prices of important purchased and "imported" resources have fallen in relation to the prices of the farm products they produce. Accordingly, it has become more and more profitable to use them in spite of the lower farm prices resulting from increased output.

Hybrid corn seed is one example. It was adopted quite early in Iowa. Its cost, in relation to market prices for corn, was less than proportional to the yield increase it gave. Over time, the price of hybrid corn seed has fallen even lower relative to the market prices of farm-produced corn. It was more profitable to use hybrid corn seed in the 1950's than it was in the 30's. From 1935-1939 the price of a bushel of hybrid corn seed averaged about 15 times the price of market corn; today, it's roughly only 11 times.

Fertilizer is an even more striking example. With inflation, the prices of both fertilizer and farm products have increased. But farm product prices increased more rapidly than fertilizer prices in the 20-year period, 1940-59. Even now, with farm prices receding, it takes fewer bushels of corn to buy 100 pounds of fertilizer than in 1939. In the most recent 5-year period, it took only 70 percent as much in farm products to buy 100 pounds of fertilizer as it did in 1935-39. It's more profitable to use fertilizer now than in 1939 or than in the more prosperous war years.

It's true that many more farm operators now know about fertilizer and use it, but the profit incentive and reward also is greater. Farm operators do respond to these price relationships—whether for fertilizer or the many other chemicals and materials that represent additions to our agricultural resources.

Without these additions to resources being purchased and brought into agriculture, we couldn't produce a farm output at today's levels. Farmers might produce more of their own improved seed, though not at as low a cost as they can now buy it. But farmers could hardly supply their own chemical fertilizers, insecticides and pesticides, tractors, other machinery, mechanical livestock equipment and feed additives.

Some of the increase in farm output has come purely within agriculture — improved rotations, more timely planting and harvesting dates, etc. But take away the resources now supplied and purchased from outside, and a major portion of our farm productivity increases over the past 20 years would be erased. These resources, however, are available—and most important—generally profitable.

Why Profitable? These resources that are bought and brought into agriculture have been favorably priced, and the practices involving their use have been adopted because of two things: (1) The prices of farm products have been high enough for a favorable cost-return ratio. (2) The prices of these purchased resources have been kept comparatively low by technical improvements and competition among the firms that produce and supply them—also contributing to a favorable cost-return ratio.

Technical improvements in the resource furnishing industries are perhaps more the key — through achieving favorable prices — to widespread adoption and use than

the technical improvements discovered in the agricultural research institutions. The latter, in effect, opened up knowledge of a practice and its productive response. The supplying industries helped the practice to become more and more profitable through new technology and distribution methods that kept the cost relatively low.

Added to this are the sales programs of firms selling these inputs to agriculture. They, likewise, are important in calling attention to the materials and the practices in which they're used. Is this an attempt to fix blame? No. To do this, we'd first have to decide that the development, improvement and promotion of something that is and remains profitable—both for the supplying firm and for the individual farm operator who uses it—is "bad" or a "sin." And actually only those things which have, in fact, been profitable have been widely adopted by farm operators.

Can we, then, blame this "individual farm operator?" Not unless the adoption and use of a profitable material or practice is blameworthy in the absence of deception or fraud. Bear in mind, too, that economic progress—the availability of more goods and services per person—comes from the knowledge, development and application of new technologies in *all* industries and the availability of the manpower and other resources to produce them. And there's still more to the picture.

Not all costs in agriculture have fallen or kept low relative to farm product prices. Otherwise, farming wouldn't now be the victim of a cost-price squeeze. Fixed costs in particular have gone up. The cost of labor (a resource migrating from agriculture) has gone higher and higher because of higher wages in other industries. The machines and capital substituting for this labor have sometimes been expensive—but low in cost in relation to the labor they replace.

Substitution: The resources purchased and brought into agriculture that we've been talking about have served largely to substitute for both *land* and *labor* in farming. We can now produce our food needs with much less of both than at any time within the past 50 years. Estimates indicate that we could withdraw at least 40-60 million acres of cropland and still easily meet our food needs. Total farm employment already has declined by half in the last 30 years; by more than a third in the past 10.

These substitutions are possible because the nonfarm capital items used in much of today's farm technology replace land and labor in producing a given output. We can produce more with fewer laborers and with fewer acres of land by using these added and substitute resources.

Bags of fertilizer, cans of insecticide, etc., as well as machines and power units substitute for farm labor, freeing it and causing it to seek employment elsewhere. They make it possible to meet our food requirements with fewer acres—or to produce a surplus if we continue the same acreage in field crop production. We've tended to follow the latter course—keeping the land mostly in production and mopping up the surplus in government storage operations. And with current domestic rates of demand and population increasing slower than the rate of our output increase, we're now faced with (1) stepping up the rate at which labor and land are withdrawn, (2) slowing down the rate at which substitute resources are injected into agriculture or (3) opening up new markets.

Why, in the face of our mounting surpluses and the national forces outlined last month, do farmers continue to buy and use these added or substituted resources? Mainly because it remains profitable for farm operators to do so in terms of the costs of the resources compared with the prices of the products produced. The cost-price relationships have been favorable—particularly for commodities that have had high price supports and also for some crops without supports.

Thus, the "HOW" of our rapidly increased agricultural productivity *is the rapid increase in the use and substitution of purchased and brought in resources.* The "WHY" *is that these resources have been priced favorably in relation to the prices of farm products produced with them* — low enough to encourage widespread adoption because of their profitable returns.

It isn't the mere knowledge of improved farm technology or its discovery that has affected the burst in farm output. More accurately, it's the addition and substitution of these purchased and brought in resources and the widespread adoption of the improved practices for which they're used. These have been profitable to the firms producing them and also to the farm operators who buy them and use them — notwithstanding surplus production.

While a surplus output depresses both farm product prices and incomes, it hasn't put much of a damper on the use of these still profitable resources and practices that add to output. This is partly because of the competitive nature of farming and its millions of farm firms. One producer himself can't influence the market. If he merely cuts back his own output, he still gets only the going market price per unit and has less income and higher costs than before. But if he boosts his output, he still gets the going market price, and his income goes up—though he'd be even better off if agriculture in total weren't overproducing.

With continued ability to draw profitable resources from "outside itself," agriculture will have a surplus producing capacity for some time into the future. The current problem, and that of the next decade, will be to figure out how to manage this surplus capacity to avoid further depressed incomes and to balance this against the consequences of different courses of action or inaction.

As we mold farm policies and programs for the future, we must consider the forces mentioned in this article, the national forces outlined last month and the economic and social costs and consequences of the proposed solutions.