

FARM COSTS AND EXPORTS

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The basic question is do costs at the farm level really matter to our basic production and export policy for agricultural commodities?

Over the decade of the 1970s there was a tremendous expansion of agricultural exports. This has been viewed as a good thing — improving incomes for farmers (and landlords) and benefiting consumers by providing foreign exchange for the purchase of more foreign goods especially oil. Farm groups are pushing for programs to enhance exports. Both political parties view expanded exports as essential to improve farm incomes.

The assumption has been that the U.S. is the low cost producer of major grains, and that given this basic comparative advantage the expansion of a free and open export market can only benefit the U.S. One problem is that this basic assumption may not be true.

Many biological and physical scientists have expressed concern that the expansion of production has come at high cost to resources. There have been a number of articles about soil erosion on marginal lands and groundwater depletion that link these problems to the expansion and intensification of agricultural production for export.

These resource based studies point to a declining efficiency of agricultural production as agriculture expanded from its base in the early 1970s. That is, increased inputs were needed for a given additional level of output at the margin. In most of these resource based studies farmers were viewed as being forced to expand crop production into less productive and erosive land by economic circumstances threatening their survival. The implication here is that farmers respond to short run economic pressures that do not reflect the long run costs and benefits of resource use.

Economists have not responded to the claims of the physical and biological scientists and looked at the expansion of agricultural production of the 1970s in economic terms that parallel the physical and biological scientists' concerns about declining productivity. In addi-

tion, the economics of resource use and full cost of production analysis needs to be put in a gains from trade framework to ensure a comprehensive look at societal costs and benefits from an agricultural export promotion policy.

Our first step in bringing together those pieces necessary to analyze the impact of farm costs on production and export policy will be to look at the private costs the farmer pays to produce corn and wheat. These private costs will be compared with farm prices received and will provide one perspective for viewing decisions made at the farm level. This will be followed by estimates of some of the agricultural input subsidies, long term resource depletion costs of agricultural production, potential tax advantages to farmers, and government farm program costs to get an estimate of the non-private or social costs of production. Finally, we take a look at export policy to determine the net gains to U.S. and foreign consumers.

Farm Level Costs of Production

Most of the information gathered about costs of production on the farm is expressed in terms of average costs for a group of farms. For our purposes, what would be most helpful would be information about the marginal cost of production. The cost of producing one more unit beyond a given level of production. Initially, as a firm gets into business and starts production, the marginal cost of production is expected to decrease as the firm expands beyond its first unit because fixed costs can be spread over more units. Ultimately, the marginal cost begins to level off and then increase as diminishing returns to one or another limited resource sets in. Graphically this is pictured as a "U" shaped curve.

Some analyses of the current agricultural situation see inflation or disinflation (which causes the whole cost curve to move up and down) as the determinants of the state of the farm economy. The focus here is not on general cost increases or decreases, but on changes in costs as agricultural production expands. The determination of where different levels of agricultural production are located on the aggregate marginal cost curve for the U.S. is especially important to the analysis of whether we should expand our production to increase exports. If we are on the right hand side of the cost of production curve, increased production will come only at higher marginal cost, which will result in higher average cost. Implicitly, the analyses of the physical and biological scientists are assuming we are facing increasing marginal costs when they see expanded agricultural production bumping up against resource constraints causing diminishing returns.

There is some cost information available which we can use to approximate our position on the cost curve. In 1974 the U.S. Department of Agriculture carried out a nationwide cost of production survey on major agricultural commodities. Samples were taken in 40 regions

providing data from more than 4000 farms. For any specific commodity, farms were surveyed in those regions accounting for the bulk of the production of that commodity.

The costs reported on in the survey included labor, power and machinery, seed, fertilizer, chemicals, custom services, irrigation, interest on operating capital, and other materials. Also included were overhead costs, including taxes, electricity, insurance, farm auto — i.e., all costs which were not directly related to a specific crop. A management charge was included and then six different alternative land charges were estimated. The land charge that we use here is the lowest one calculated. Land is valued when the farmer actually purchased it (acquisition value). The charge for that land is then figured so that it reflects the actual proportions of cash rent, share rent and owner-operator arrangements, rather than just taking a straight percentage charge.

There is much discussion among economists about whether land should really be included as a cost of production for agriculture. It is the major capital cost in farming, but unlike a factory it does not wear out if it is well treated — it remains as a store of value. However, as society looks at farming and makes judgment about whether there should be public support of the agricultural sector there is a general feeling that farmers should be able to make a living while meeting land rent or land mortgage costs over the bulk of their lifetimes.

In this analysis we have included what we call a “direct” cost which includes direct, overhead and management costs. We have also included a “total” cost which is the sum of the direct costs and the lowest available land charge.

No comprehensive cost of production survey has been made for all the major commodities since the original 1974 survey. The national and regional average cost figures for major crops have been updated annually by USDA using a computer budget generator and information based upon limited spot surveys.

The Food and Agriculture Act of 1977 required the establishment of national average cost figures for all major commodities in succeeding years, because it linked changes in government price supports to changes in production costs (excluding land). However the original level of price support was such to include land costs for many farmers. These annual average “cost of production” estimates are given for wheat and corn on Table 1.

In addition to the average per unit cost figures provided in the 1974 survey, the average per unit costs of the sample producers were arrayed from high cost to low cost for a specific commodity. Cumulative cost curves were then constructed to indicate which portion of the crop was produced below a given cost. These cost curves were constructed for both the direct and total costs referred to above. Cumulative cost curves are not really marginal cost curves, but they are often the best

TABLE 1.
USDA Cost of Production Estimates

Year	Corn		Wheat	
	Direct	Total	Direct	Total
	(dollars per bushel)		(dollars per bushel)	
1974	\$1.62	\$2.39	\$2.04	\$2.95
1975	\$1.60	\$2.23	\$2.36	\$3.15
1976	\$1.62	\$2.15	\$2.55	\$3.37
1977	\$1.60	\$2.12	\$2.43	\$3.10
1978	\$1.49	\$1.98	\$2.48	\$3.29
1979	\$1.63	\$2.12	\$2.79	\$3.72
1980	\$2.36	\$3.07	\$3.62	\$4.82
1981	\$2.38	\$3.11	\$4.13	\$5.32

approximation that we have to what an economist would call a marginal cost curve. The cumulative cost curves certainly provide something better than national or regional average cost figures for a commodity.

These cost distributions were updated occasionally by USDA for internal use and analysis. We followed a similar procedure and updated the cumulative cost curves for corn and wheat on the basis of the original 1974 distributions. The shape of the 1974 distribution was thus maintained for each commodity for succeeding years as the distribution was shifted to match the change in value of the average per unit cost of production from one year to the next.

The scale of the distribution was proportionally adjusted to the changes in the value of the average. A check was made to see whether the constructed 1980 curve for wheat yielded approximately the same results as the actual regional data for 1980 laid out on a cumulative cost curve. The results appeared to be approximately the same.

Having constructed a set of cost distributions for wheat and corn, one can locate on each distribution the average price farmers received in a given year. In each year the seasonal average price becomes a dividing point on each cost distribution of direct and total cost and allows the estimation of that proportion of the crop produced at a cost greater than the average seasonal price. This information is presented on Table 2. It shows that at various times large proportions of the corn and wheat crops have been produced at costs that are higher than the seasonal average farm level prices.

Costs Beyond the Firm

The costs that we have looked at so far that are analyzed in Table 2 are only the costs actually paid by a farmer to produce the commodity. A number of other "costs" for producing corn or wheat are borne by others not involved in the actual production of these commodities. These social costs may take the form of transfer payments or com-

TABLE 2.
Proportion of Wheat and Corn Produced At A Cost Greater
Than the Average Selling Price for That Season

Year	Corn		Wheat	
	Seasonal Average Price	Proportional Greater Than Costs	Seasonal Average Price	Proportional Greater Than Costs
1974	\$3.02	11%	\$4.09	11%
1975	\$2.54	23%	\$3.55	24%
1976	\$2.15	41%	\$2.73	70%
1977	\$2.02	48%	\$2.33	77%
1978	\$2.25	24%	\$2.97	53%
1979	\$2.52	18%	\$3.78	35%
1980	\$3.27	28%	\$3.96	81%

modity programs for producers, tax concessions to producers, costs of production that are borne by future generations, and input subsidies that lower the cost of production or increase the price received by the farmer. The social costs considered here are prominent ones and provide good examples. There are others that would have to be included in a complete inventory of total social costs of production for corn and wheat.

Input Subsidies

Over the years, public and private investment in agricultural research has yielded high rates of return through increases in productivity. The primary beneficiaries of such research investment have been consumers, both domestic and international, and to a lesser extent early adopters of new technology who benefit from a period of reduced per unit production costs relative to price.

Public research performed by the USDA and the state agricultural experiment stations totaled \$1.2 billion in 1979 while private agricultural research expenditures exceeded \$2 billion. Private research costs are assumed to be recovered in the marketplace and are reflected in farm input prices or other costs to the farmer. In contrast, the expenditure on publicly supported research does not get included in private cost of production estimates.

There is a delay between research outlays and the associated productivity impacts. We thus used a seven year lag in calculating the total state and federal research outlays for corn and wheat. These estimates indicate that the annual expenditure per bushel for 1974 to 1980 was \$.002 per bushel for corn and \$.006 per bushel for wheat.

A more comprehensive accounting of research which included extension and education expenditures might show substantially higher costs. However, the base figures presented above are so low relative to the subsidization of other aspects of production that questions should

probably be raised about this low level of expenditure given the high returns from such investments.

Transportation is another area where there have been public subsidies that have either reduced the cost of inputs or increased the price of commodities at the farm by reducing the price differential to market. As an example: transportation subsidies for Canadian wheat averaged \$0.27 per bushel for the period 1975 through 1979. A conservative estimate of U.S. transportation subsidies was arrived at by taking just current and future estimated operating cost subsidies for water transportation. This amounts to roughly \$0.03 per bushel for the transportation of corn and wheat by water. Nothing is included here for the past or future capital cost contributions made by the public. The subsidies for truck and rail are slightly less than the subsidies for water transportation.

Long Term Societal Costs:

A national concern links increases in soil erosion to increases in the volume of American farm exports. The impact of increasing soil erosion is felt in terms of decreasing soil productivity and declining environmental quality — especially water quality. The amount of land cropped in the U.S. has increased from under 300 million acres in 1970 to over 350 million acres in 1980. Much of this increase was to satisfy export demands, and much of the cropland expansion occurred on soils more prone to erosion than those already cropped.

USDA's 1977 National Resource Inventory gives some indication of the seriousness of soil erosion. Considering five tons per acre to be a tolerable long term level of erosion and looking at sheet and rill erosion, 16 percent of the cropland was suffering moderate threats to long run productivity (five to 14 tons per acre per year). Seven percent of the cropland was suffering serious threats (greater than 14 tons). Similar estimates were reported for wind erosion. As these numbers indicate, a relatively small portion of the cropland, one which might not be needed under a more modest export scenario, suffers the serious erosion threat.

If we look just at the excess sheet and rill erosion, they account for the annual loss of approximately 500 million tons of topsoil in corn production and 100 million tons of topsoil in wheat production. This is about four million acre inches per year. The value of an inch of topsoil to productivity has been estimated conservatively at \$60 per acre inch for Iowa.

Using this value for the nation, the annual soil productivity foregone in corn production would be about \$200 million and \$44 million for wheat production. Taken against the whole crop this would amount to \$0.03 per bushel for corn and \$0.02 per bushel for wheat. If this charge is taken against just those bushels exported the costs would be 0.10 per bushel for corn and \$0.14 per bushel for wheat.

Some qualifications of these estimates are in order. First, while they may overstate the productivity value of topsoil, only sheet and rill erosion were included. Wind erosion was not included, and it tends to be an important productivity factor for cropland for wheat. Second, the damage caused by the eroded soil is not included. The costs to the public of reduced water and air quality is not included here, and it would have to be in any complete account of total social costs.

The downstream social costs may be larger than the productivity costs, and pertain to domestic production as well as to that for export. Finally, even though the productivity costs of soil erosion are largely incurred by a present or future generation of private landowners, consumption of the soil capital stock is a long-term cost that will have to be borne by consumers as well.

Tax Advantages

Tax advantages to one group are increased tax liabilities to others if a budget target is to be met. In this sense tax advantages to farmers may result in increased tax costs to non-farmers. Farms are allowed to use cash accounting where most other businesses are required to use accrual accounting. Cash accounting gives the farmer more flexibility to choose when costs and profits will be accounted for, and thus allows the balancing out of enterprise costs and profits resulting in a lower average tax obligation over the multi-year period than would otherwise be possible. Somewhat the same advantage is granted to authors who may have many years of work sold at one time.

Based upon a study of large Iowa cash grain farms (sales of \$100,000 to \$200,000 annually), the annual after-tax income advantage of cash over accrual accounting is about \$0.30 per bushel of corn that might be raised on such a farm. There is also an increase in the value of the net worth of the farm allowed to practice cash accounting which amounts to \$0.43 per bushel. It is crucial to note that the magnitude of the advantage is dependent upon the tax rate which, of course, reflects the level of income of the farm. A smaller farm with sales of \$20,000 to \$30,000 annually has an income advantage due to cash accounting of only \$0.14 per bushel annually and an increase in net worth of only \$0.13 annually. About half of the grain produced in the U.S. comes from cash grain farms with sales over \$100,000. Thus we might expect the tax benefit from cash accounting to be just a bit less than for the group with sales from \$100,000 to \$200,000. We estimated the per bushel tax advantage for wheat production to be lower — about half of that for corn.

At times when there was little or no profit from farming over a period of years, the provisions allowing farms to utilize cash accounting would be of substantially less value because of the lower marginal tax rates.

When it is difficult to understand from the results in Table 2 just what keeps farms in farming, because private costs alone are higher than farm prices, tax policy may provide a partial answer. This is especially true in cases where producers or outside investors may have income from other activities which can be enhanced on an after-tax basis with cash accounting. The tax advantage thus has the most impact during times of high commodity prices, which imply strong demand and little need for government intervention in the marketing of commodities.

Costs of Government Commodity Programs

Since 1933 a number of federal programs have been initiated aimed at increasing farm incomes through influencing the supply and demand of wheat and corn in the U.S. An analysis of the costs of support programs for wheat and corn from 1965 through 1969 (a period of chronic surpluses and heavy government involvement) indicates program costs of \$0.26 per bushel for corn and \$0.65 per bushel for wheat for all wheat and corn produced over that period. Adjusting these program costs by the price increase in the commodities from the late 1960s to the late 1970s gives subsidy costs of \$0.52 per bushel of corn and \$1.35 per bushel of wheat. These might be considered a high level of subsidy cost that would be required during a period of surplus.

An analysis of the farmer-owned reserve program from 1978 through 1980 gives a per bushel program cost of \$0.04 per bushel for corn and \$0.06 per bushel for wheat. Over this period this was a true storage and release program. There was good cyclical demand for the commodities and the government activity involved encouraging storage in years of surplus and allowing release during periods of higher prices. These may thus be considered lower bound government program costs for corn and wheat.

Total Costs of Production

The total costs of production are given in Table 3. The starting point is an average of the private costs for 1978 through 1980 taken from Table 1. To these are added the non-private or social costs discussed so far. However, there is a problem here in just adding up these costs because the dynamics of weather and changing demand result in changes in some farm costs. Within the social costs there is a trade-off between rather high levels of tax advantages (and relatively low levels of government program costs) in years of strong demand for commodities as compared with the high costs of government programs during years of continuing surplus production (when prices and tax advantages would be lower). These trade-offs are reflected in the first two total cost estimates.

The third total cost estimate includes private costs from some of the regions that have higher production costs than the rest of the U.S..

TABLE 3.
Total Costs of Production and Farm Level Prices

		Corn	Wheat
		(dollars per bushel)	
Private Costs:	1978- 1980 ⁽¹⁾	2.39	3.94
Input Subsidies:	Transportation	.03	.03
	Research	.002	.006
Social Costs:	Erosion	.03	.02
Tax Advantage:	Profitable Period	.60 - .90	.30 - .50
	Unprofitable Period	.15 - .25	.07 - .12
Program Costs:	Surplus Purchases	.26 - .52	.61 - 1.35
	Managing Reserves	.04	.06
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Total Costs:	1. Assuming Profitable Period and Managing Reserves	3.09 - 3.39	4.36 - 4.56
	2. Assuming Unprofitable Period and Surplus Purchases	2.86 - 3.22	4.68 - 5.47
	3. Assuming High Cost ⁽²⁾ Region Producing Unprofitably With Surplus Purchases	3.61 - 3.97	5.05 - 5.84
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Farm Level Prices:	1978 - 1980 Average	2.68	3.57

(1) These are Total costs from Table 1

(2) Three year (1978 - 1980) cost for highest regions producing 9 percent of U.S. corn and 14 percent of U.S. wheat.

These are then added to a set of social costs under conditions of unprofitable production and surplus purchases by government. The regions chosen here produced 9 percent of the corn and 14 percent of the wheat. This is as close as we can come conceptually to what the marginal cost of expanding production for export might be. It represents the lower bound of that cost of expanding exports if we are on the right side of the marginal cost curve. It is much higher than average farm price levels over this period.

Analysis

If we look at Table 2, it seems as though we have devised a system that enables farmers to continue to produce at an apparent loss. The factors that allow farmers to do this relate to a general policy decision taken many years ago to provide relatively inexpensive food to the American public. One of the first direct steps taken in this direction was the provision of public research support for agriculture.

This policy has been politically supported on progressive grounds and has resulted in general tax revenues being utilized to encourage agricultural production at volumes above those that would be achieved if private costs of agricultural production had to be completely covered by the average prices received. That is, some of the difference between

private costs and social costs goes to reduce the costs of producers or raise the total revenues of producers. One result has been a measure of overproduction and a reduction of commodity prices in the marketplace.

This policy has made political sense given the lower prices that American consumers have paid for these agricultural commodities. Prior to the early 1970s there was no compelling reason to analyze this public spending from tax revenues to enhance consumer welfare because most of the consumers were American and it was politically acceptable to subsidize their basic food consumption on a progressive basis. However, the issue changes when an increasingly high proportion of the consumers benefiting from commodities being marketed below private and total costs are European, Japanese, Soviet, or Chinese. There is even more concern if there have been resource constraints and a reduction in the development of new technology which result in increasing marginal costs for agricultural production.

Exports and Marginal Analysis

The numbers in Table 3 are important with respect to the cost and value of U.S. exports of corn and wheat. The numbers show that the price per bushel of the good sold in the export market is too low to cover the full production costs. For wheat, the price received from exports covers only 65 percent of the high cost of production.

Looking just at the excess supply that farmers would have for export, the provision of input subsidies to farmers would lower their effective cost of production and more could be sold at a lower price. Add on the notion of domestic price supports, and farmers would produce at an even higher level with the expectation of the higher price while the actual export price received would decline on the basis of the increased quantity. Input subsidies and/or price supports create a divergence between the cost of exports and the average price received for their sale. This divergence increases as costs increase and quantities produced increase.

Now it may well be that at times producers receive prices which are adequate to cover their private costs but not total costs. In Table 3, the three-year average price for corn exceeds private costs; however, it does not cover full costs. Thus, importers in essence obtained a subsidy paid by the exporter (the United States) of over \$1 per bushel for corn and over \$1.50 per bushel for wheat even though prices received may have covered private production costs. These are implicit or hidden export subsidies.

Explicit subsidies such as PL 480 sales and subsidized credit for export sales are not included here. If the prices that producers received had to cover both private and social costs, output would be less than it has been in past years, exports would be less, and the marginal acres in crop production would be returned to less intensive use. This

is because the value of an additional unit of output sold on the export market does not cover the cost of producing it.

Concluding Observations

In looking at the distribution of costs for producing corn and wheat in the U.S. we see that in recent years a large proportion of these crops is produced at private costs greater than the average price received by farmers. Even if there are problems with the data so that the proportion of farmers producing at private costs above prices received is only half as many as indicated, this proportion would still be alarming.

In addition, private costs are not the only ones that are important. The additional costs in the form of input subsidies, social costs, tax advantages, and various government programs are borne by a broader segment of society. These have been borne willingly in the past, because they resulted in lower food costs for domestic consumers when most of the nation's corn and wheat was consumed at home. The recent trend has been to export an increasing proportion of our corn and wheat. Under these circumstances it appears reasonable to view these quantities exported as the marginal units produced after domestic demand is satisfied. On this basis the gains from trade from further expansion of exports, or even the maintenance of the current level of exports at normal crop prices are marginal at best.

The problems outlined here are based primarily on average costs and average revenue calculations. The situation is even less favorable to the expansion or maintenance of high production for exports if we are in a situation of increasing marginal costs and decreasing marginal export revenues.

Our basic problem is distorted market signals caused by input subsidies, output price supports, and environmental factors external to the private firm decisions. These distorted prices have caused the flow of excess resources into agricultural production and export expansion. Likewise, the seeming permanence of resources committed to production during periods of higher commodity prices further aggravates the problem.

If improvements in technology do not allow us to get out of this dilemma by changing the shape of the cost curves to put us in the declining or stable cost region, we may be forced to slide back down the cost curve by withdrawing resources from agricultural production.

Our other alternative is to increase agricultural prices further to address agriculture's financial problem or devise some combination of the two. If we actually are on the increasing portion of the cost curve for agricultural production, the policy alternatives to deal with this

are very different from those being suggested which center around increased emphasis on exports.