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COMPARATIVE STATEMENTS ON PRODUCTION COSTS AND COMPETITIVENESS IN AGRICULTURAL COMMODITIES

by

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October 1986 No. 86-27

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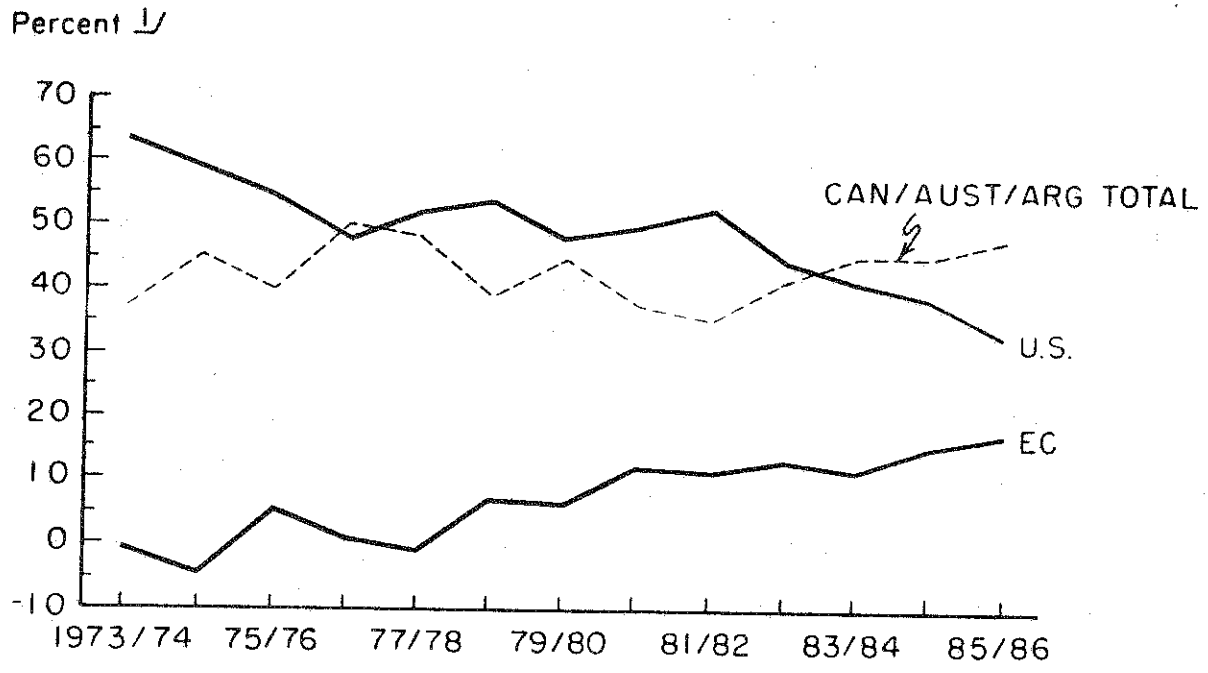
There is substantial concern about loss of foreign markets and the competitiveness of U.S. agriculture in world trade. Many believe that American farmers are among the most efficient producers in the world of each of the major agricultural commodities grown and marketed in this country. Thus, loss of markets must be tied in some manner to some form of unfair trade practices, export dumping, border taxes or the changing exchange rate of currencies. While there is some recognition that, in fact, New Zealand dairy producers are among the lowest cost producers in the world, that Western Canada has long been an effective competitor in world wheat markets, and that Caribbean sugar is produced for less than the American equivalent, American producers and the general public largely assume these are exceptions to the more general rule.

With about one third of U.S. cropland now devoted to crops which are intended for export, there is reason to examine with greater care the degree to which production from this country is efficiently produced and competitive in the world commodity markets both as they exist currently and can be expected to develop in the future. Clearly, competitiveness at any point in time involves more than the economic efficiency in the use of farm resources, however, that may be measured. Nevertheless, that is a major consideration in the longer run. It was in this setting that a comparative study

of production costs for cereals was made in four major producing countries of the European Community (EC) and the United States (11).

The EC moved from the status of net importer to net exporter of wheat in the mid 1970's.

Chart 1. WHEAT TRADE: CHANGING PROPORTIONS ACCOUNTED FOR BY EC AND MAJOR EXPORTERS (1973/74 - 1985/86 AS CURRENTLY FORECAST)

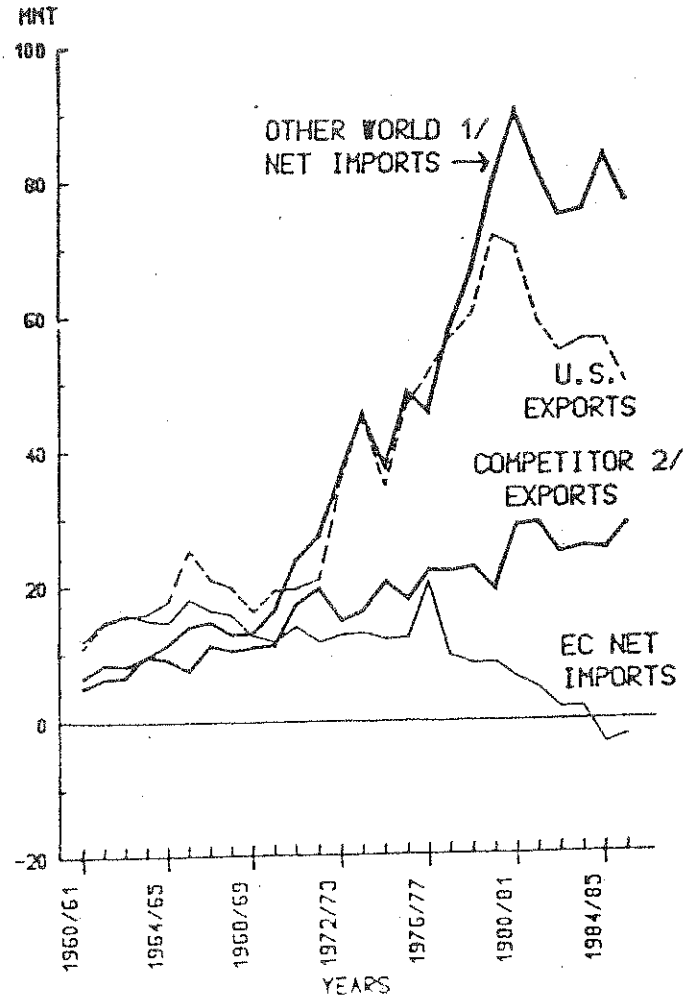


1/ PROPORTION OF THE TOTAL EXPORTS BY THE U.S., CANADA, AUSTRALIA, ARGENTINA, AND NET EXPORTS BY THE EC.

Source: USDA Foreign Agricultural Circular, F6-15-85, November 1985.

Even more surprising, EC imports of feed grains continued to shrink in the late 1970's and in the mid 1980's the EC became a net exporter (12).

Chart 2. WORLD TRADE IN COARSE GRAINS
EC-10, U.S. and Other Importers and Exporters, 1960-1984



1/Net imports by world less U.S., EC, and other exporters.
2/Canada, Australia, Argentina, South Africa and Thailand.

Source: USDA Foreign Agricultural Circular F6-15-85, December 1985.

It was commonly assumed that the primary reasons for this surprising turn of events were the high internal prices within the protected walls of the Community and the subsidization of exports to clear

internal markets and reduce costs of storage. The purpose of the comparative study of costs was to examine the relative efficiency of commercial cereal production in the EC insofar as that could be done using published sources and a common methodology. In the last 15 years, the world's capacity to produce cereals has increased more rapidly than has effective demand.

In this environment, major exporters must understand each other's respective capacities to produce and their abilities and determination to compete in the international arena (4). Production costs will only be one of the issues to consider in this environment but it remains an important one.

Purpose

This paper considers some of the important methodological issues in making regional or national comparisons of production costs and efficiency. Particular attention is given to the problem of fixed costs and the evaluation of land, family labor and management. The importance of comparisons of variable or direct production costs is underlined. Finding an acceptable common base in terms of exchange rates and differential inflation is explored.

Issues in Making Regional or National Comparisons

Anyone who has worked with enterprise budgets or worked with production cost statements is well aware of the many pitfalls in putting together a consistent and acceptable cost and returns report. There are many assumptions required over which reasonable

people can disagree. Nevertheless, the basic methodology has evolved so that most analysts use the opportunity cost principle in evaluating resources and major differences in approach are in reality quite small. But there remain many places where difficult decisions must be made and honest debate can arise over the most appropriate procedure to use.

Some of the more important issues that complicate regional and national comparisons of production costs include:

1. The representativeness of the data and the situations for which costs were presented and the sampling procedures used in collecting data.
2. The comparability of the enterprises or systems which are studied including climate, quality differences in the final products, size of enterprise, etc.
3. The choice of appropriate exchange rates for currencies to use in making national comparisons.
4. A procedure to handle different rates of inflation within individual countries and the choice of appropriate deflators.
5. Agreement on the list of items which are treated as direct or variable costs.
6. The time period over which production costs are calculated.
7. The treatment of fixed costs and their relative importance in making comparisons.
8. Mechanisms to recognize government subsidies or special programs which influence prices and costs.

9. The time span considered and the economic environment in which production occurred.

Before considering these issues where there are differences in points of view, it is also important to recognize that there are many areas where consensus has developed over a period of years. In studying published reports from Western Europe and North America, there are many points on which agreement has been reached in principle, if not in detail.

1. Nearly all of these studies start with the value of agricultural output, gross receipts or cash receipts. The yield of physical product sold per unit of area and the price received are generally reported. The value of by-products such as straw for cereals is usually included if it is harvested and used productively.
2. Direct or variable costs are calculated. These are the out-of-pocket costs of production specific to the crop or commodity. Seed, sprays, fertilizers, chemicals, contract work, irrigation water, specific management fees and custom operations are typically included.
3. The difference between gross receipts and variable production costs is commonly determined. This is called Gross Margin by the British and equivalent calculations are made throughout Europe and quite commonly in the United States (5). Gross margin is the amount available to cover fixed or unallocated costs including overhead expenses, real estate taxes, insurance, hired and family

labor, interest on capital and returns to risk and management. This long list of unallocated expenses, all very real claims on income and true costs of production, are the places where problems of allocation are most likely to arise. The calculation of gross margin is not difficult to agree upon, and in part that is one of its merits. Moreover, it shows what is left to pay for the use of fixed resources and overhead costs.

4. Most cost of production studies use quite similar headings or categories to divide up the non-variable costs. These include:

   a. General overhead.

   b. Taxes and insurance.

   c. Labor -- direct and overhead.

   d. Capital replacement and depreciation.

   e. Net land rent or rates.

   f. Return or payment for use of non-land capital.

   g. Return to management and risk -- sometimes a residual.

   It is also quite common to use the opportunity cost principle to establish rates of interest, wage rates and land charges. Within the broad framework of methodology, in fact, there is more agreement than published reports might imply. In debate, differences are emphasized. Nevertheless, it is more in the detail of calculations and the specifics concerning individual items where real differences exist.

Cost Comparisons for Internal Production Decisions

One of the common uses of cost of production studies is the comparison of alternate enterprises requiring the same resources including cropland. Such comparisons are less complex because many more of the variables in comparative analysis are held constant. Emphasis can be placed on the components of variable costs. Gross margin becomes an effective standard for making statements about relative profitability. Here the frame of reference is toward the individual producer and the intent of the study is toward improved management and production efficiency.

Increasingly, however, cost of production studies have been mandated for most of the important crop and livestock enterprises as government programs on both sides of the Atlantic have intervened in one way or another in agricultural markets. This has expanded the data base and directed professional attention to interpretation of these studies. The primary sources of data have come from farmers' experiences either from farm account records or personal interview surveys sponsored by national governments such as the NASS Costs and Returns Survey in the U.S., which yielded 11,497 sample observations in the February-March 1986 study (7).[1]

In Western Europe, there have been few national cost of production studies with the exception of those made in the United Kingdom over a span of many years (5). Emphasis has been placed by EC countries on estimates of gross margin for individual crops and livestock units.

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[1]Methodology for the sampling procedure and calculation of production costs is described in some detail in ERS publications ECIFS4-1 and Ag. Info. Bul. 500.

The primary source of data within the Community has come from the Farm Accountancy Data Network established in 1965 by the original six member countries. The aim of the Network is to collect from agricultural holdings accountancy data needed for the determination of incomes and a business analysis of the holdings. The results are used in particular in the Commission report, "The Agricultural Situation in the Community," and for the annual fixing of Community prices for agricultural products. In 1983, there were about 40,000 farms included in the Network proportionately distributed across the ten member countries (3).

The complete farm accounts provide a way of examining changes in income from year to year classified by type and size of farm. Complete cost of production records are not provided, but approximations are available on specialized farms such as dairy, poultry, or cereals' units. Gross margins are published regularly for individual enterprises using these data. Year to year comparisons are thus available at both the national and regional level.

The Community has also adopted a concept called <u>Standard Gross Margin</u> as a measure of size of business instead of relying on the value of gross sales as has been done in the U.S.. Gross margin is a rough approximation of value added and comes much closer to this calculation than does gross sales. Thus, the Europeans have established the <u>European Size Unit</u>, where one ESU equals 1000 European Units of Accounts[1] (a weighted bundle of European

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[1]In 1982 and again late in 1986, 1000 EUA is approximately equal to U.S. $1000.

currencies) of Standard Gross Margin. Each ministry of agriculture or its equivalent develops a set of SGM's for each important enterprise produced in each of its defined regions. The FADN provides the primary data for these annual figures. Thus there is a SGM for each hectare of crops and animal units in each of the 120 regions established in the Community Survey of Agricultural Holdings made in 1979-80 (6).

Perhaps the most comprehensive use of the farm account data and detailed calculation of Standard Gross Margin is made in West Germany. While there are eight official agricultural regions designated by the Community in West Germany, there are 32 regions where SGM's are established annually. Moreover, a quasi-government agency, KTBL, calculates SGM for each of the principal enterprises and further subdivides them into five groups on the basis of yields and management abilities. These estimates are published annually and provide indications of some of the variability among farms as well as the standardized averages.

A combination of the data on gross margins for an individual crop like winter wheat together with that for other cereal crops which are the natural alternatives for the same resources, provides an effective way to look at comparative costs within a region, even though there remain important differences in soils and climate as well as levels of technology available.

Table 1. WINTER WHEAT: CALCULATION OF STANDARD GROSS MARGIN Distribution of Farms, West Germany, 1983-1984

Description	Distribution of farms (1) Lowest 15%	(2) Next 20%	(3) Middle 30%	(4) Next 20%	(5) Highest 15%
Output per hectare (kg):					
Crop sold	2880	3280	3640	3990	4400
Crop used on farm and other	1490	1690	1880	2050	2260
Total yield, kg	4370	4970	5520	6040	6660
Prices per kg:					
Crop sold	0.525	0.525	0.525	0.525	0.525
Crop used on farm	0.51	0.51	0.51	0.51	0.51
Gross revenue per hectare:					
Crop sold	1512	1722	1911	2095	2311
Crop used on farm and other	744	844	939	1023	1128
Total revenue per ha.	2256	2566	2850	3118	3439
Variable costs per hectare:					
Seed	151	151	151	151	151
Fertilizer	376	401	422	465	503
Pesticides	165	185	205	235	260
Machinery	309	309	315	320	326
Other	47	53	58	63	69
Total variable costs	1048	1099	1151	1234	1309
Standard Gross Margin (standard deckungsbeitrag)	1208	1467	1699	1884	2130

Source: KTBL, Daten fur die Betriebskalkulation in der Landwirtschaft, 1984.

In Table 2, gross margins for seven different cereal crops in West Germany are compared over four crop years. If one assumes that the fixed costs for land, operator's and regular hired labor, management, insurance, taxes, etc. are essentially equal for each of these alternatives on most farms, then internal comparisons are possible. If one has a basis for introducing different yield levels from those given in the KTBL report but with similar costs, then a different set of internal comparisons can be constructed. It is this kind of information base which allows regular discussion of the

relative profitability of alternative crops without arguing at length about the fixed cost component of full production cost statements. If someone wishes to construct such an estimate, a good approximation can be made using the fixed costs per hectare as calculated annually in the FADN reports for specialized cereal farms.

Table 2. STANDARD GROSS MARGINS FOR CEREAL CROPS
KTBL, Standard deckungsbeitrag, West Germany, 1980-83

Competing Cereals	Crop Year			
	1980-81	1981-82	1982-83	1983-84
	(D.M. per hectare for average yields)			
1. Winter wheat (Winterweizen)	1359	1371	1636	1699
2. Corn for grain (Kormermais)	1227	1377	1473	1477
3. Winter barley (Wintergeiste)	1214	902	1240	1359
4. Spring wheat (Sommerweizen)	1013	1155	1392	1159
5. Rye (Roggen)	881	732	929	873
6. Spring barley (Sommergeiste)	775	824	1029	729
7. Oats (Hafer)	806	771	933	694

Source: Kuratorium fur Technik und Bauwesen in der Landwirtschaft.

Representativeness and Sampling

To make valid comparisons across regions or nations, it is necessary to compare like or at least similar situations. It is

quite easy to argue that this is impossible by the way the problem is stated. There are always differences in soils or weather or varieties or even more major issues like technology. The fact remains, however, that such comparisons will still be made. The practical question is how to make them as valid as possible.

One clear objective should be to find representative situations for the basic production environment. In the Community, this issue has been taken seriously in establishing the sample for the Farm Accountancy Data Network. Here, tracking net incomes of all units called farms is the central objective. The individual business or farm family is the principal unit of concern. In a national or regional cost of production study, the principal center of interest should focus on output and in most cases, in my view, on farm production that moves off the farm into the market place.

Under this rubric sampling and selection of enterprises should be weighted by production. Thus each unit of production (crop acre) has an equal chance of being counted. This sampling methodology will include more of the larger enterprises because a farm with 1000 acres has more than twice the probability of being sampled as compared with one of 400 acres of the same crop. This is the methodology currently used in the U.S. and U.K. but is opposed by some farmers' organizations in the Community. They argue that each producer of any crop should have an equal chance of being counted, giving much more weight to the many small and generally high cost producers.

Table 3. CEREAL DELIVERIES FOR SALE BY SIZE OF ENTERPRISE
France, 1982-1983

Total area in cereals	Number of producers	Percent of total	Tons of cereals delivered	Percent of total
hectares				
Less than 5.0	87,697	17.5	237,523	0.6
5.0 - 9.99	64,741	12.9	475,671	1.3
10.0 - 14.99	43,803	8.7	539,970	1.4
15.0 - 19.99	32,027	6.4	557,062	1.5
20.0 - 39.9	78,510	15.7	2,263,990	5.9
40.0 - 59.9	43,666	8.7	2,149,816	5.7
60.0 - 79.9	28,861	5.8	2,002,604	5.3
80.0 - 99.9	20,193	4.0	1,807,691	4.8
100.0 - 199.9	51,836	10.4	7,337,637	19.3
200.0 and over	49,393	9.9	20,559,257	54.2
Total	500,727	100.0	37,931,221	100.0

Source: Office National Interprofessionnel des Cereales (ONIC).

An indication of the importance of the sampling problem is provided by the data from France in Table 3. In 1982-83, some 20 percent of the cereal producers accounted for nearly three-fourths of total production. Much of the net increase in production during the past ten years has come from this same group. Yet politically the 60 percent of cereal producers with less than 40 hectares (100 acres) have more votes and believe their costs are those which are "representative". While there is some of the same kind of problem in the U.S., it has not affected the calculation of national cost estimates or prevented publication or discussion of the standard ERS figures (8).

For purposes of international comparisons, production that may compete in international markets should get primary consideration.

In the case of wheat, this remains a complex problem because there are a large number of grades and qualities to consider. There are also the fundamental differences between spring and winter wheat. In comparing EC production with the U.S., the majority of output comes from winter wheat in each case. Yet there is a substantial difference from the high yield, low quality wheats of Eastern England to the hard red winter standard product of the Central Great Plains. Direct comparisons of national averages for the U.K. and U.S. were thus subject to question even though both methods of sampling wheat producers were equivalent. The comparisons for record-keeping farms from Northern France with U.S. averages were subject to greater question, although it is from these large, well-managed farms that "surplus" wheat production in the EC is largely derived.

Exchange Rate Issues

Cost studies are expressed in the units of some national currency. In making regional comparisons within a country this poses no problem. No space is spent in discussing the value of the dollar in the methodology sections of ERS cost of production studies as reported in ECIFS 4-1 (8). Making comparisons across national boundaries requires that cost series put together in individual countries be converted to some recognized international unit of currency, very often the U.S. dollar. In any given year, exchange rates are quoted daily and statistical agencies publish weekly, quarterly and annual averages. There is no lack in the availability

of exchange rate statistics. The problem rests in choosing the most appropriate ones to use for making comparisons.

Most Americans are painfully aware of the shifting fortunes of the dollar in relation to the major currencies of Western Europe and Japan. Somewhat less publicity has been given to relationships with the currencies of competing producing countries like Australia, Argentina, Brazil and Canada. In the past ten years, there have been major changes in all of these relationships (Table 4).

Table 4. ANNUAL AVERAGE RATES OF EXCHANGE FOR EUROPEAN CURRENCIES
One U.S. Dollar Equivalents, 1975-1984

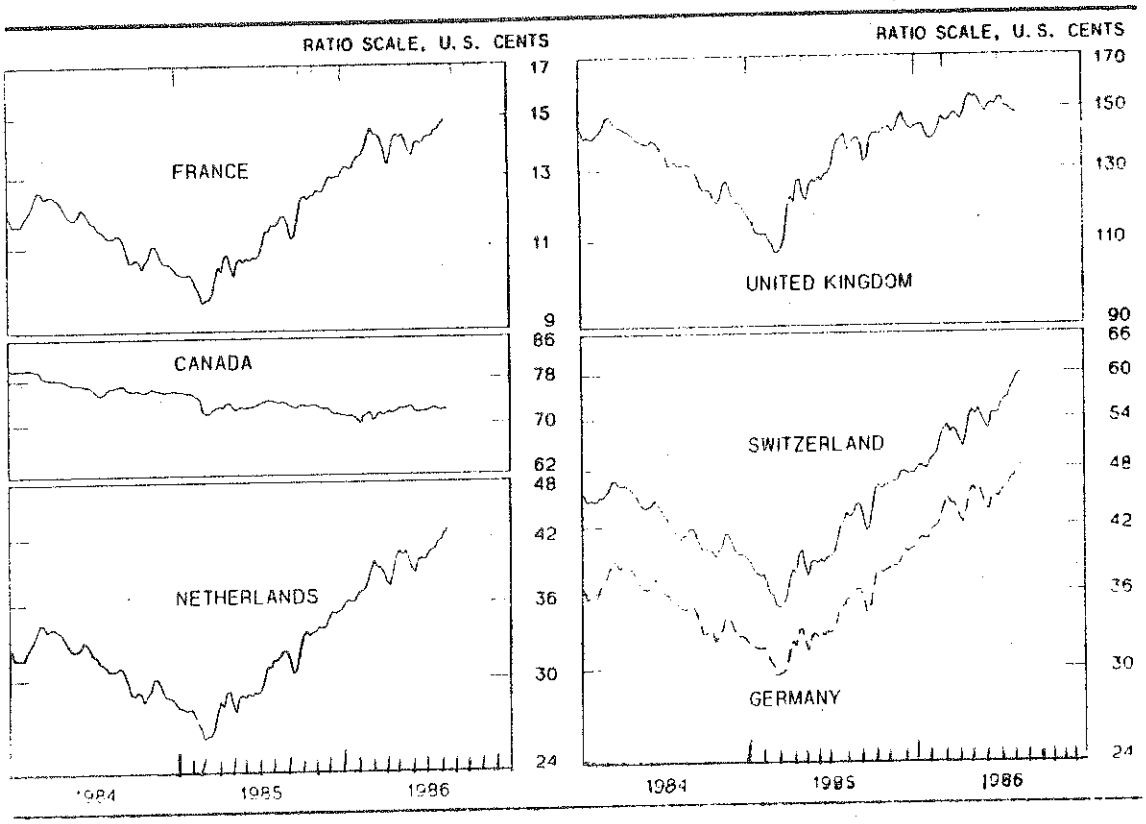
Year	West German D Mark	French Franc	Italian Lira	British Pound	E.C.U.
	- Number of units to equal one U.S. dollar -				
1975	2.4576	4.2870	652.45	0.45135	0.80595
1976	2.5182	4.7805	831.94	0.55595	0.89441
1977	2.3208	4.9128	900.48	0.57286	0.87633
1978	2.0062	4.5050	966.16	0.52101	0.78472
1979	1.8319	4.2531	830.62	0.47159	0.72958
1980	1.8129	4.2152	854.11	0.42985	0.71822
1981	2.2517	5.4099	1131.43	0.49542	0.89570
1982	2.4252	6.5644	1351.20	0.57206	1.02071
1983	2.5505	7.6058	1515.95	0.65940	1.12332
1984	2.8454	8.7355	1756.10	0.74855	1.26738
1985	2.9419	8.9799	1908.90	0.77077	1.31024

Source: EUROSTAT: Monthly External Trade Bulletin.

To get some perspective on the size of the changes in the value of the dollar between 1975 and 1985 in relation to four major European currencies and the ECU (European Currency Unit), annual average ratios to the dollar were calculated (Table 4). The dollar reached a low point relative to this group of currencies in 1979 and

1980 and was generally described as undervalued. In the next five years, the relative value of the dollar increased by more than 60 percent in West Germany and more than 125 percent in Italy based on these annual averages. Early in 1985, the extent of the "overvaluation" of the dollar began to become evident. Some 18 months later the dollar has returned to 1982 levels relative to the ECU. In February 1985, it took 1.48 ECU to obtain $1.00 U.S.; in September 1986, it took only 1.02 ECU to obtain $1.00 U.S.

Chart 3. **FOREIGN EXCHANGE RATES**
Weekly Averages of Daily Figures



Source: Federal Reserve Chartbook, August 1986, p. 85.

The volatility of movements in exchange rates charted on a weekly basis is shown in Chart 3 as provided by the Federal Reserve Bank. While European rates tended to move together against the dollar in the same direction, the Canadian experience was different as was also true for Australia. The impact of changes of this magnitude in international markets is obvious. To make cost comparisons consistent and understandable, some constant base rates are necessary.

In the study of cereal costs, the average annual exchange rates in 1982 for each of the countries was chosen as the base for comparison. This was a year in which the ECU and the U.S. dollar traded approximately at par. In the years of fixed exchange rates before 1970, the dollar and the European Unit of Account traded approximately at par as well. The decision on an average exchange rate for the study was made in mid 1985 after a turning point in the relative value of the dollar had just been reached. This choice was made after examining historic data and obtaining the wise counsel of a number of European economists. A second exchange rate, the average rate in 1984, was selected for making comparisons as well. This illustrated the importance of the choice of an exchange rate on the comparisons; it also underlined the competitive disadvantage that the higher-valued dollar made in international trade.

Inflation

Any examination of cost of production data over a period of years must consider changes in the rate of inflation as part of the

analysis. This is an old and familiar problem somewhat compounded when cross country comparisons are made because of the need to examine exchange rates as well. Almost all western countries use deflators in studying price and cost data. Unless there is some strong evidence to the contrary, it seems logical to accept the decision of local analysts in the choice of the appropriate index to use. In the Community, the price deflators of private consumption are the most commonly used index numbers to deflate cost and price series by agricultural economists. These are published regularly by EUROSTAT.

Table 5. WINTER WHEAT: PRODUCTION COSTS AND RETURNS
Seine-et-Marne Independent Farmers, France, 1977-1983

Year	Yield in kg. per hectare	Farm price per kg.	Gross returns per hectare	Direct costs per hectare	All other costs per ha.	Total production costs per hectare	Yield to cover all costs
	kg.		- F.F. per hectare -			kg.	
1977	5860	0.820	4809	981	2207	3188	3880
1978	5820	0.825	4800	1006	2504	3510	4260
1979	5890	0.886	5218	1226	2831	4057	4580
1980	6580	0.965	6350	1354	3273	4627	4800
1981	6400	1.080	6906	1680	3800	5480	5070
1982	7190	1.200	8627	1829	4415	6244	5200
1983	6790	1.270	8628	2148	4657	6805	5360
			- constant 1982 prices F.F. -				Net return per hectare
1977	59.11	1.387	8136	1660	3734	5394	2742
1978	64.90	1.271	7396	1550	3858	5408	1988
1979	71.91	1.232	7256	1705	3937	5642	1614
1980	80.02	1.206	7936	1692	4090	5982	2154
1981	88.55	1.262	8072	1964	4442	6406	1666
1982	100.00	1.200	8627	1829	4415	6244	2383
1983	107.01	1.187	8063	2007	4352	6359	1704

Source: Perspectives Agricoles, August 1984.

Once a decision has been made with respect to the base exchange rate to use in making comparisons, a table showing the undeflated original data and the deflated series is helpful in studying farmer response to internal prices before making international comparisons. In Table 5, one can observe that sale prices for wheat rose as did yields between 1977 and 1983; direct costs per hectare rose more rapidly than gross returns. When considered in constant terms, prices received fell in about the same amount as yields increased so that gross returns were roughly constant. Such study helps one understand some of the concerns of French farmers during this period and provides perspective in choosing results from any one or two years for comparisons (1).

Some argue that the appropriate index numbers to use in making international comparisons of costs are the price deflators of GDP or GNP because they are the most general indicators of price movements in the national economy. Others argue for the use of a series based on prices paid by farmers. The majority view of most agricultural economists is that such a choice is unwise because so many of the items included in the index are also components of the cost of production series being studied.

Variable Costs

The most important numbers in any cost comparisons are the direct or variable costs. For some enterprises like broiler meat production, they make up more than 80 percent of total costs. For others that are more extensive in the use of land and other natural

resources like hay, pasture, and cereal crops, variable costs are a much smaller part of the total. Nevertheless, it is this set of costs which are most crucial in the final analysis in comparing production costs along with the yields obtained.

Table 6. COST and RETURNS: WHEAT PRODUCTION
United States, 1982-84

Description	1982	1983	1984
Yield per planted acre, bu.	32.64	36.89	35.37
Harvest period price/bu.	$3.38	$3.48	$3.37
	- U.S. dollars per acre -		
Cash Receipts			
Primary crop	$110.32	128.52	119.33
Secondary crop	4.37	4.45	4.62
Total	114.69	132.97	123.95
Cash Expenses			
Seed	6.65	6.37	6.90
Fertilizer	17.56	18.36	18.98
Fuel and lubrication	11.77	11.06	10.94
Repairs	7.18	7.77	8.07
All other variable	9.72	10.00	10.22
Total variable expenses	52.88	53.56	55.11
General farm overhead	7.11	8.05	8.79
Taxes and insurance	6.90	7.69	8.10
Interest	18.45	21.86	23.87
Total fixed expenses	32.46	37.60	40.76
Total cash expenses	$85.34	$91.16	$95.87
Receipts less cash expenses	29.35	41.81	28.08
Capital replacement	19.41	21.02	21.67
Receipts less cash expenses and replacement	9.94	20.79	6.41
Economic Costs			
Variable expenses	52.88	53.56	55.11
Overhead, taxes, insurance, replacement	33.42	36.76	38.56
Allocated returns to owned inputs			
Return to operating capital	3.09	2.51	2.94
Return to other non-land capital	6.94	7.49	7.35
Net land rent	29.75	34.41	30.57
Labor, paid and unpaid	9.74	10.35	10.26
Total economic costs	$135.82	$145.08	$144.79
Residual Returns to Management and Risk	-21.13	-12.11	-20.84
Net Returns to Owned Inputs	28.39	42.65	30.28

Source: ECIFS 4-1, Table 21, pp. 51.

The costs and returns statement published by ERS each year for each of our major enterprises (Table 6), includes most of the same variable expense items listed in other countries, but there are a few differences. These relate to hired labor, fuel and machinery repairs, specialized equipment only used for that enterprise and hired management fees. One of the difficulties in working with published data from another country, when you do not have direct access to the author, is the difficulty of finding out how some of the decisions on what to include as variable or fixed costs were made. In the case of cereals, all included seed, fertilizer, agricultural chemicals, pesticides and custom applications, irrigation fees and drying expenses where appropriate. The majority of analysts also include hired labor directly allocated to that enterprise such as harvest crews, weeders, or any other day or hourly labor so identified. The biggest differences appeared in the treatment of fuel, repairs and machinery.

When good detail of the items included in variable expense is provided, an acceptable comparison is readily made by including only the same expense items. In most of the cases, a very large proportion of the totals involved were the same or essentially so. Thus, the direct costs per unit of area could be established for direct comparison and the cost per unit of yield could be examined as well.

In the longer run it is the differences in variable costs per unit of output which are most important in making comparisons. This is true because the fixed resources generally take on the value of expected future earnings from a profitable enterprise. Thus, the

value of cropland or the rental rate of land reflects expected future earnings for that resource when used for this or another profitable enterprise. The pricing of variable inputs are determined by current economic conditions and only need adjustments when they are directly affected by government action or subsidy. For most of the comparisons made for cereals this was not observed to be an important problem.

Fixed Costs

Most analysts accept the principle of opportunity cost as the basis for determining fixed costs. Furthermore, as farms have grown more specialized in production it is now much easier to get accounting data on fixed costs per unit of area from farm records systems which are part of a supervised program. Thus, one may raise questions about the representativeness of such estimates of fixed costs but not about the practical reality of the numbers. They come directly out of farmer experience. Even if one estimated full costs of production using budgets and the survey method or conversely had farmers keep enterprise costs for a period of years, most analysts would tend to check out their estimates of fixed costs against similar figures obtained from FADN or farm accounts nationally.

The reason that fixed costs remain a major issue in making comparisons is because major resources like land, owner capital, and management are valued in relation to the current and expected future profitability of these resources. One only has to think about the changes in the value of cropland in the United States or in Britain

between 1975 and 1985 to recognize the nature and inherent difficulty of the problem.

Table 7. ECONOMIC INDICATORS FOR AGRICULTURE
United Kingdom, 1975-1984

Year	U.K. Price deflator of private consumption	England and Wales Farmland price per acre	England and Wales Net farm income per acre	Units of British £ to equal $1.00 U.S.
	1982 = 100	constant 1982 prices		
1975	42.4	£1243	£97.7	0.451
1976	50.2	1462	90.3	0.556
1977	57.2	1719	78.0	0.573
1978	62.7	2113	97.4	0.521
1979	70.3	2482	65.1	0.472
1980	83.0	2080	60.3	0.430
1981	92.3	1872	70.7	0.495
1982	100.0	1844	73.8	0.572
1983	105.1	1980	68.5	0.659
1984	110.5	1792	--	0.749

Sources: EUROSTAT and Maunder, A., Estates Gazette, July 1985.

Looking at the experience in England and Wales provides a reminder that land prices respond very quickly to changing expectations about future earnings. Between 1975 and 1979 land values doubled in real terms as farm incomes were sustained at relatively high levels. In 1979 and the years following, net returns per acre remained good but not at the levels of the late 1970's. Thus, land values have been sliding back in real terms, especially as Community surpluses have been accumulated in more and more commodities. Current rental rates continue to be used in calculating costs of production and they fluctuate between years reflecting present and future profitablility.

One might discuss the problems associated with choosing an interest rate for owned capital at some length. Other than agreeing that opportunity cost remains the appropriate principle to use in choosing this rate, there is substantial variability in what is done in practice. It is quite common for analysts to make owned capital and management the residual claimants of net returns, which avoids making a decision on interest rates. Charges actually made range from the rates paid on borrowed capital at the margin to the "real" rate of interest usually calculated at 4 or 5 percent.

Increasingly the function of operator's management is recognized either as a separate item of fixed costs or as an important component of net returns. For some crops where the practice of hired management is common it is a part of cash variable costs because it is charged as a cash item on this basis. Another approach in making a cash charge for management is to take a certain percentage of variable costs as a proxy for the value of this resource. It is quite common for management charges to appear in cost of production statements when they are prepared as part of the evidence in discussing target prices or changes in farm legislation.

All of the preceding comments are intended to argue for less rather than more emphasis on fixed costs when comparing production costs across regions or nations. These are the components most subject to question. Moreover, they are most influenced by producers' expectations about the future profitability of an enterprise. Thus, if the prices of cereals in the Community continue to move more closely to those received by farmers in the U.S., Canada and

Australia, the values of fixed resources and thus fixed costs will also move toward those of their competitors. It is the variable cost per unit of output within the country and at the dockside that becomes crucial in the long run. Even if farmers do not cover all of their fixed costs, they will continue to produce as is clearly evident for many farmers in the U.S. in 1985 and 1986. In many respects, a long and never ending argument about the best way to calculate fixed costs is not productive because these costs are not the crucial figures in studying competitiveness.

Government Subsidies

One of the most important components of the study of competition among countries engaging in international trade is the treatment of subsidies at every level in the production process. This is one of the more important and often unrecognized parts of the final analysis of cost and returns studies. The initial cost and returns statement should reflect the prices received and paid by farmers and any other incentives or payments, such as the deficiency payment in the U.S. associated with compliance to set aside provisions under current farm legislation. This provides a true picture of the economic environment faced by individual farmers. It is the frame of reference in which enterprise choices and planning decisions are made. Thus, in comparing cost and returns statements between the EC and the U.S., Europeans are quick to point out to Americans that their revenue statement includes all of the returns that farmers receive often including the value of straw or by-products in the

case of cereals. In contrast, the ERS cost of production reports include receipts from the sale of primary and secondary crops but omit direct government price support payments except in the case of wool. As stated in ECIFS5-1, "...most crop price support programs are voluntary and contain special provisions for compliance. Both program payments and the costs of compliance need to be excluded when policy makers use cost and returns information to determine if support prices will encourage or maintain production at adequate levels." The ERS reports are prepared for national policy makers. Thus, adjustments need to be made when making comparisons across national boundaries for an individual crop.

The same basic principle applies when comparing costs, particularly for cash inputs. When irrigation water or fertilizer is subsidized by government efforts to encourage production, the true opportunity cost of the input should be reflected in the final adjusted cost and returns statement. In some cases this is not difficult. One can determine the price of fertilizer delivered to an importing country and add the cost of transport and handling to a major producing region without great difficulty. This is commonly done in estimating production costs for major crops in LDC situations. It is less common to carry through the full procedure suggested by the literature on comparative advantage when comparing production costs in developed countries like Canada, the U.S. and the EC. There are a host of subtle subsidies at a variety of levels from major items like irrigation water (sometimes dismissed as a sunk cost of earlier periods) to such minor things as electricity rates in rural areas as affected by programs like REA.

It is instructive to at least read and think about the procedures suggested for making comparisons by research workers in the field of international trade. Byerlee and Longmire recently reviewed these procedures in a readily understandable form in their CIMMYT Working Paper No. 01/86, "Comparative Advantage and Policy Incentives for Wheat Production in Rainfed and Irrigated Areas of Mexico (2)." One of the central conclusions of their study was that, "...in Tlaxcala wheat production has a comparative advantage relative to other crops, especially maize. This potential for wheat has not yet been realized, partly because price policies have generally not encouraged wheat production and partly because more profitable wheat varieties have still to be developed and extended to local farmers." This analysis was based on converting the prices of competing crops to world price levels and removing the effects of subsidies on fertilizer, diesel fuel, credit, seed and water, all of which exceeded 50 percent for some crops in the period 1979-82.

While it may not be necessary or possible to make such calculations as the effective protection coefficient (EPC) and the resource cost ratio (RCR) the concepts are both useful and instructive. Opportunity cost undergirds all of these cost and returns calculations. Land and labor are valued in terms of their next and highest uses. Often getting good estimates of these rates is complex at the very least. Local prices, strongly influenced by other national policies, may not provide the true estimates that the opportunity cost principle would demand. For example, to take an extreme case, rental rates for some hay land in New York would approach zero when

the alternative use is brush or forestry, even though the sale value of the land might never fall below $250 per acre because there always seems to be a buyer for land to be used for recreation or simply the joy of owning some real estate.

Concluding Comments

Comparative statements about production costs for a given crop in competing countries will continue to be made whether or not there are comparable data sets to support these statements. If an assessment of competitive position is desired, then cost of production information will be an important component when judgments are finally made. In putting together a cost of production statement from original data or in appraising someone else's study, the issues listed at the beginning of this paper all have some relevance. A few deserve special priority. Competitiveness is linked to production at the margin. While most cost statements provide data on some kind of average situation or representative farm, the products moving into international trade are influenced strongly by shortage or surplus conditions. If there are internal incentives for greater production, then those units which can best respond to these incentives will provide the extra or added product. In most cases, these will be above-average farms in terms of productivity or efficiency. Marginal production costs should be expected to be below the averages obtained from representative samples of producers. In my view, the most relevant data for comparison in competitive situations come from production units that have alternatives and can respond to market or other incentives.

A study which concentrates on differences in the ways in which fixed costs are calculated and the magnitudes of the resulting differences is placing emphasis on the wrong issues. Over a period of years fixed costs will rise or fall as a proportion of the total as technology changes or as market forces lead to a reevaluation of the expected future earnings from the use of land, buildings and fixed investment. Central concern must be given to variable costs per unit of output. The content of those variable costs and the skill with which comparability is obtained will be much more crucial in making valid comparisons. It is always nice to have similar systems of production to compare. But in practice that is unlikely. If the products compete directly in final markets, then comparisons, however complex, cannot be pushed aside.

The analyst must try to understand on what basis competitiveness is sustained. Production costs and government actions or subsidies must be investigated together. The frame of reference used in studying comparative advantage remains a useful basis for carrying out a study recognizing that competitiveness involves many other facets as well as cost comparisons, however effectively they are adjusted. No empirical study of costs can hope for perfection. On the other hand, the concepts used should be defensible and the rank order of differences ought to be correctly identified. An historical perspective is useful. Production at the margin is where the important differences occur.

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