RAPID REPORTS

eurostat Agriculture, forestry and fisheries

1994 ☐ 4

SUMMARY AND COMPARISON OF TRENDS IN EC AGRICULTURAL PRICE INDICES (OUTPUT AND INPUT) 1985-1993

"All figures in this note for 1993 are based on forecasts",
using information available up to 1st January 1994

This note summarises recent trends in the EC agricultural price indices and
compares methods of combining output and input measures into a single statistic.

The **index of producer prices for agricultural products** in the Community (EUR 12) fell in real terms by 25.2% over the period 1985-1993. The overall decline in prices has been similar for both crop and animal products, although their patterns of year-to-year changes have differed. For the first three years after the base year, 1985, the real price indices for both output categories fell, with animal product prices falling ahead of those for crop products. In 1989, these trends were temporarily halted when real prices for crop and animal products rose by 1.1% and 4.3% respectively. From 1989 to 1993, the cumulative fall in the real price index for crop products was 19.5%, most of this occurring during 1992. The decline in real prices of animal products during 1989-93 was 20.2%, with prices falling sharply in 1990, 1991, and 1993. For some individual products

within these categories (such as fruit, wine, olive oil, cattle and pigs), year-to-year changes in real producer prices have fluctuated sharply.

The cumulative fall in real producer prices for agricultural output was greatest in Portugal (-39.1%), Denmark (-36.1%), Spain (-29.2%) and Germany (-29.0%) and least severe in Ireland (-11.6%) and Luxembourg (-19.4%).

Over the period 1985-1993, the **price index for the means of agricultural production** (Input 00) fell in real terms by a total of 16.9% for the Community as a whole. Real input prices fell by 8.5% between 1985 and 1987, and by a further 1.0% over the next two years. The index declined in real terms by a further 8.3% from 1989 to 1993.

The price index for Input 00 fell in real terms for every Member State during 1985-1993. The cumulative fall in this index over the period was greatest in Portugal (-36.4%), Spain (-25.8%) and Belgium (-21.9%), and smallest in Luxembourg (-8.2%) and Italy (-10.5%).

The Input 00 index combines information on the purchase prices of inputs for both current consumption (Input I) and investment (Input II). The weight given in this index to the prices of investment goods is 21.5% for EUR 12, but varies greatly between individual Member States (from under 10% in Belgium and Portugal to 40% in Italy).

The real **price index of inputs for current consumption (Input I)** fell in every Member State. Real prices of some current consumption items (such as animal feedingstuffs and fertilizers) fell each year throughout the period, whereas real energy prices rose from 1988 to 1991 and again in 1993, and maintenance costs moved up slightly in real terms in most years.

The real Input I price index fell by 38.5% in Portugal and 28.5% in Spain, with five other countries also showing cumulative falls of 20 per cent or more. Real Input I prices fell least in the United Kingdom (-16.1%).

The real **price index for goods and services contributing to investment (Input II)** was steady over the period 1985-93 for the Community as a whole, standing little more than 2% higher than its 1985 level throughout the period.

By contrast, there were large differences between individual countries. The cumulative rise in the Input II index was 16.8% in Luxembourg and 17.2% in the Netherlands, whereas the largest net falls were in Greece and Spain (-11.6% and -14.1% respectively). Belgium, Denmark, Germany, France, Ireland and Italy saw cumulative increases of 9% or less, whilst by 1993 the index was less than 7% below its 1985 level in Portugal and the United Kingdom.

COMPARISON OF OUTPUT AND INPUT PRICE INDICES

In recent years, Eurostat has published several statistics designed to combine information on agricultural output and input price changes into a single measure. Prior to 1993, the statistic used was the **net price effect**, which measures the change in gross value added (defined here as output sales minus intermediate consumption purchases), due to price changes alone, *expressed as a percentage of the value of final output* (see Table 1). This statistic has been used to combine information on annual real price changes for output and Input I, and to compare real price changes between a given quarter and the same quarter of the previous year. In each case, this approach assumes that (a) the ratio of intermediate consumption to final output remains the same as in the base year of the index (b) there are no changes in the volume of output or of intermediate consumption during the period for which price comparison is made.

The net price effect can be adjusted to show the *percentage change in gross value added* due to price changes alone (see Table 2). This **modified net price effect** will always be larger in absolute value than the net price effect itself, since it relates the change in gross value added to the level of gross value added itself rather than the level of total output.

The net price effect (and statistics derived from it) measure what the effect of price changes on gross value added would be *if* volumes remain unchanged. But even for periods where these assumptions are more or less met, the net price effect may not be a reliable indicator of the actual change in gross value added as a proportion of final output. This is because the EC agricultural price indices are based on representative prices (that is, prices of products matching a precise specification) rather than on unit values (that is, *average* prices for a product category). This

feature of price indices is important for isolating pure price changes from the effects of quality changes and other changes in product specification.

Since early 1993, the net price effect has been replaced in Eurostat quarterly publications by the **percentage change in the index of the agricultural terms of trade**. The terms of trade index used is the ratio of the price index of real agricultural producer prices (Output) relative to the index of real purchase prices of agricultural inputs (Input 00) (see Table 3). For individual Member States, the terms of trade index is the same regardless of whether nominal or deflated indices are used. However, this is not the case for the terms of trade calculated at Community level.

As both component indices are expressed relative to the base year, the terms of trade index itself takes the value 100 in the base year. When this index is above 100, the revenue earned by the bundle of products defining the output price index could have bought a larger bundle of inputs, as specified by the input index, than in the base year.

Annual changes in the terms of trade index reflect changes in the purchasing power of farmers' output relative to inputs (see Table 4). As with the net price effect, these price changes relate to the prices of specific items rather than to unit values, and it is assumed that the output and input "bundles" have the same structure as in the base year of the index.

Tables 3 and 4 show that up to 1991, the index of the agricultural terms of trade for the Community as a whole (EUR 12) remained at or above its 1985 level but fell sharply between 1991 and 1993. This fall was reflected in most individual Member States. The exception was Ireland where the index rose by more than 8 percentage points to 108.1.

Eurostat's agricultural terms of trade index should be distinguished from indices calculated in some Member States to compare agricul-tural output prices with the prices of inputs for current consumption only. The idea underlying this "narrow" terms of trade index

is that farmers must purchase current consumption items each year, whereas some investment expenditure may be postponed if relative prices or the overall income situation are unfavourable, particularly in relation to future expectations. It is therefore of interest to measure changes in the purchasing power of agricultural output relative to intermediate consumption.

A comparison of the terms of trade in EUR 12 as measured by Eurostat's agricultural terms of trade index (using Input 00) with the more narrowly defined index relating output prices to Input I prices, shows that their movement over time has been very similar, although the levels differ due to the contrasting behaviour of the Input I and II indices.

The agricultural terms of trade index fluctuated much less from year to year than either of its component indices, both at Community level and for 10 out 12 Member States (exceptions are Ireland and Luxembourg). This indicates that input prices move to partly offset the effects of output price changes within the same year. One factor here is the significant share of animal feedingstuffs in the composition of Input I.

In fact, over the period 1985-92, annual percentage changes in the output and Input 00 price indices are positively correlated for all Member States, except for Italy where output price changes are correlated with Input 00 price changes of the previous year. The positive correlation is strong for Germany, the Netherlands, Belgium and Denmark.

Agricultural Terms of Trade Indices, using Input 00 and Input I, EUR 12, 1985-1993

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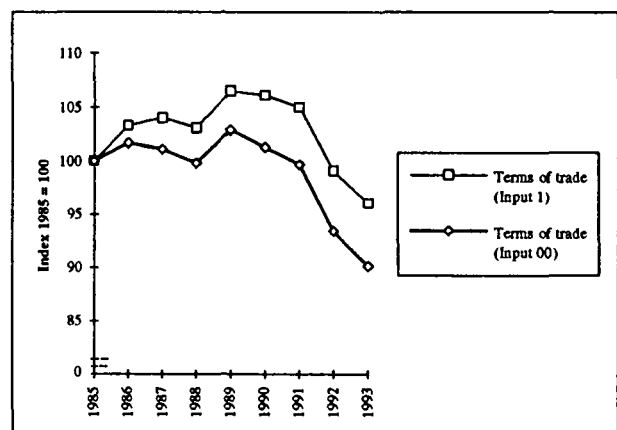
FORECASTS OF PRICE INDEX CHANGES 1990-1992

Each year, Eurostat publishes **forecasts of the EC price indices for agricultural output and Inputs I and II** in December of the year in question (see *Rapid Report, 1992/15* for the 1992 forecasts). This section examines the accuracy of these forecasts by comparing the net price effect and the change in terms of trade (Input I) based on the forecast indices with those based on the actual values of the indices. These comparisons are carried out for EUR 11 only, for the period 1990-1992.

With few exceptions, the forecast net price effects are close to those based on actual price index figures. The forecast terms of trade index (using Input I) is also a reasonable indicator of the actual value of this index (see Table 5). Where discrepancies occur, they are more likely to originate from the output price forecasts. Average absolute percentage forecast errors for eleven Member States in 1990, 1991, and 1992 were 1.4, 1.0 and 1.4 for the output index, compared with 1.0, 0.8 and 0.8 for the Input I index.

Comparison of Forecast (F) and Actual (A) Net Price Effects, 1990-1992

	1990		1991		1992	
	F	A	F	A	F	A
B	-2.6	-4.5	-2.6	-2.8	-1.8	-1.6
DK	-5.9	-7.6	-3.0	-2.6	-0.7	-0.8
D	-4.7	-4.7	-4.3	-3.4	-3.4	-4.5
GR	0.9	0.1	-2.1	-0.8	-9.5	-10.1
E	-3.3	-3.3	-4.3	-4.2	-8.1	-9.4
F	-1.7	-1.8	-1.0	-2.0	-7.1	-8.0
IRL	-13.3	-12.8	-5.4	-4.7	1.2	1.2
I	-1.6	0.0	2.3	0.7	-4.4	-9.4
L	-3.9	-4.5	-6.1	-9.8	-5.7	-6.1
NL	-3.3	-4.9	0.2	0.7	-6.6	-6.5
UK	-3.4	-4.4	-6.2	-5.1	-1.9	-1.8
EUR 11	-2.9	-3.0	-1.9	-2.1	-5.4	-6.9

METHODOLOGY FOR COMBINING OUTPUT AND INPUT PRICE INDICES

As has already been stated, the net price effect measures the change in gross value added, due to price changes alone, *expressed as a percentage of the value of output (sales).*

$$\text{NPE} = \left(\begin{array}{c} \text{Percentage change} \\ \text{in Output price index} \end{array} \right) - \left(\begin{array}{c} \text{Percentage change} \\ \text{in Input I index} \end{array} \right) * \left(\begin{array}{c} \text{Value of Input I relative to} \\ \text{value of output in 1985} \end{array} \right)$$

The NPE can be adjusted to represent the *percentage change in gross value added* due to price changes alone. This gives the *modified net price effect* (MNPE):

$$\text{MNPE} = \frac{\text{NPE}}{\text{Value added relative to value of output in 1985}}$$

In contrast, the percentage change in the agricultural terms of trade index is an indicator of the change in the purchasing power of agricultural output *of the same composition as in the base year* relative to purchased agricultural inputs for both current consumption and investment *if purchased in the same proportions as in the base year.* The percentage change in the terms of trade between year t and year t+1 is equal to:

$$\left(\frac{\text{Input 00 price index in year t}}{\text{Input 00 price index in year t+1}} \right)$$

* (Percentage change in Output price index - Percentage change in Input 00 price index)

It follows that in years when there has been little change in the Input 00 index, the percentage change in the terms of trade index is approximately equal to the difference between the percentage changes in the output index and the Input 00 index.

There is a thus complex relationship between the percentage annual change in actual gross value added, the net price effect, the modified net price effect and the percentage change in the terms of trade index.

Briefly, the net price effect will *underestimate* the annual change in gross value added as a proportion of total output if (a) the volume of output has increased since the previous year (b) the volume of intermediate consumption has decreased since the previous

year and/or (c) the share of intermediate consumption in total output has fallen since the base year *and* Input I prices have fallen since the previous year. If (a), (b) or (c) is sufficiently large, a negative net price effect could be recorded even when the actual change in gross value added is positive. In addition, the direction of the discrepancy caused by the use of representative prices rather than unit values in the price indices is unknown. These arguments also apply to the MNPE.

When Input I prices are falling, the percentage change in the terms of trade (using Input 00) will always be greater (or, if negative, less strong) than the NPE unless Input II prices are increasing at a much faster rate than Input I prices are falling. Table 6 gives figures for the **percentage change in the agricultural terms of trade** (using Input 00), the **net price effect,** and the **modified net price effect.**

Clearly, the interpretation of these statistics should adhere closely to the definitions given in this note. Interpretations in terms of actual gross value added should be avoided. Table 6 also illustrates that the ranking of countries according to these statistics changes significantly depending on the statistic used. Therefore, these rankings should not be used to indicate the ranking of countries according to changes in their actual gross value added.

Table 1: Net Price Effect (%), 1986-1993

	1986	1987	1988	1989	1990	1991	1992	1993*	1985-93*
B	-3.1	-0.4	-1.7	7.6	-4.5	-2.8	-1.6	-6.7	-12.3
DK	-2.4	-3.2	-3.6	3.3	-7.6	-2.6	-0.8	-10.9	-22.9
D	-0.7	1.4	-1.9	4.1	-4.7	-3.4	-4.5	-7.6	-14.9
GR	-6.9	-2.5	0.2	4.0	0.1	-0.8	-10.1	-5.5	-19.8
E	1.9	-5.8	0.0	2.2	-3.3	-4.2	-9.4	2.4	-16.5
F	0.3	-3.2	-1.8	3.7	-1.8	-2.0	-8.0	-5.9	-16.7
IRL	-0.7	4.6	7.8	0.3	-12.8	-4.7	1.2	5.1	-1.1
I	0.1	-3.8	-2.3	1.1	0.0	0.7	-9.4	-3.2	-15.4
L	2.2	2.9	1.4	6.2	-4.5	-9.8	-6.1	-4.5	-12.1
NL	-1.9	2.6	-0.3	5.6	-4.9	0.7	-6.5	-5.2	-9.6
P	-1.3	-1.4	3.3	8.7	-4.1	-12.0	-10.6	-3.5	-18.4
UK	1.7	-0.2	-4.9	2.0	-4.4	-5.1	-1.8	1.4	-11.2
EUR 12	-0.3	-2.1	-1.5	3.1	-3.1	-2.4	-7.0	-3.6	-15.1

Table 2: Modified Net Price Effect (%)[1], 1986-1993

	1986	1987	1988	1989	1990	1991	1992	1993*	1985-93*
B	-7.2	-0.9	-4.3	17.7	-10.4	-6.6	-3.6	-15.5	-28.4
DK	-5.0	-6.7	-7.5	6.8	-15.8	-5.4	-1.8	-22.7	-47.6
D	-1.8	3.9	-5.3	11.4	-13.2	-9.6	-12.7	-21.2	-41.9
GR	-9.3	-3.4	0.3	5.4	0.1	-1.0	-14.1	-7.5	-26.9
E	3.4	-10.4	0.0	4.0	-6.0	-7.6	-20.6	4.3	-29.8
F	0.5	-5.7	-3.2	6.6	-3.2	-3.5	-14.3	-10.5	-29.7
IRL	-1.3	8.8	15.1	0.6	-24.6	-9.0	2.3	9.9	-2.2
I	0.1	-5.5	-3.4	1.6	-0.1	1.1	-13.7	-4.7	-22.3
L	3.7	4.9	2.4	10.3	-7.5	-16.3	-10.2	-7.4	-20.0
NL	-4.0	5.5	-0.6	11.9	-10.4	1.5	-13.9	-11.0	-20.4
P	-2.8	-3.0	7.1	18.9	-8.9	-25.9	-23.0	-7.6	-39.8
UK	3.9	-0.4	-11.3	2.2	-10.3	-11.7	-4.2	3.2	-26.0
EUR 12	-0.6	-3.8	-2.7	5.7	-5.6	-4.4	-13.5	-6.6	-27.9

1. Net Price Effect divided by the share of Gross Value Added in Total Output, 1985.
* Forecast

Table 3:   Index of Agricultural Terms of Trade in Real Terms[1], 1985-1993

	1985	1986	1987	1988	1989	1990	1991	1992	1993*
B	100	98.8	100.8	98.3	105.6	103.2	101.0	100.1	93.9
DK	100	100.4	99.5	95.6	99.0	92.1	90.3	90.3	80.5
D	100	100.1	102.0	99.9	103.6	98.9	95.4	91.1	84.6
GR	100	93.9	95.6	99.0	103.8	105.8	103.5	94.4	89.3
E	100	104.5	100.1	101.5	105.2	103.9	101.7	92.2	95.4
F	100	102.5	100.8	99.0	102.3	101.8	100.5	93.0	87.7
IRL	100	102.1	109.9	117.9	117.5	103.3	99.5	101.9	108.1
I	100	102.0	99.7	97.3	98.7	99.9	102.0	92.5	87.9
L	100	102.5	106.3	107.8	113.3	106.9	96.3	91.1	87.8
NL	100	100.4	104.8	103.7	108.2	103.8	105.1	99.0	94.3
P	100	100.3	99.3	104.6	117.0	116.2	104.6	96.4	95.7
UK	100	102.9	103.7	98.6	100.1	97.5	92.9	91.4	92.4
EUR 12	100	101.7	101.2	99.8	102.9	101.3	99.7	93.1	90.0

1.   100   x   (Real) Output price index   +   (Real) Input 00 price index
*   Forecasts

Table 4:   Annual and Cumulative Percentage Changes in Real
Agricultural Terms of Trade[1], 1985-1993

	1986	1987	1988	1989	1990	1991	1992	1993*	1985-93*
B	-1.2	2.0	-2.4	7.4	-2.3	-2.1	-0.9	-6.2	-6.1
DK	0.4	-1.0	-3.9	3.5	-7.0	-1.9	-0.1	-10.8	-19.5
D	0.1	1.9	-2.0	3.7	-4.5	-3.6	-4.5	-7.2	-15.4
GR	-6.1	1.8	3.5	4.9	2.0	-2.2	-8.1	-5.4	-10.7
E	4.5	-4.2	1.4	3.6	-1.2	-2.1	-7.1	3.5	-4.6
F	2.5	-1.7	-1.8	3.4	-0.5	-1.3	-7.5	-5.6	-12.3
IRL	2.1	7.6	7.3	-0.3	-12.1	-3.7	2.5	6.0	8.1
I	2.0	-2.2	-2.4	1.4	1.3	2.2	-9.3	-4.9	-12.1
L	2.5	3.7	1.4	5.1	-5.6	-9.9	-5.5	-3.6	-12.2
NL	0.4	4.4	-1.1	4.3	-4.1	1.2	-5.8	-4.7	-5.7
P	0.3	-1.0	5.4	11.9	-0.7	-10.0	-7.8	-0.8	-4.3
UK	2.9	0.7	-4.9	1.6	-2.6	-4.7	-1.6	1.1	-7.6
EUR 12	1.7	-0.5	-1.3	3.2	-1.6	-1.7	-6.3	-3.3	-10.0

1.   100   x   (Real) Output price index   +   (Real) Input 00 price index
*   Forecast

Table 5:   "Narrow" Real Terms of Trade (Input I), Forecast and Actual, 1990-1992

	1990			1991			1992		
	F	A	Error %	F	A	Error %	F	A	Error %
B	108.1	106.4	1.6	105.3	104.5	0.7	103.8	103.9	-0.1
DK	96.6	96.3	0.3	94.8	95.2	-0.4	95.2	95.5	-0.3
D	103.4	103.6	-0.2	99.6	100.5	-0.8	97.6	96.6	1.1
GR	110.6	109.3	1.2	102.3	105.3	-2.9	96.4	95.3	1.1
E	108.2	107.6	0.5	104.9	105.1	-0.2	99.4	95.5	3.9
F	106.3	105.9	0.4	105.9	105.2	0.7	98.3	98.0	0.4
IRL	106.2	107.0	-0.8	102.6	103.4	-0.8	106.5	106.3	0.3
I	105.8	108.3	-2.3	115.1	112.7	2.1	109.3	103.9	5.2
L	116.8	116.5	0.2	110.9	105.6	5.1	100.7	101.3	-0.6
NL	112.0	110.1	1.7	111.6	112.8	-1.0	106.2	106.8	-0.5
UK	100.1	99.9	0.1	94.8	95.6	-0.9	94.7	94.2	0.5
EUR 11	105.5	105.7	-0.2	105.0	104.9	0.1	100.5	98.7	1.8

Table 6: Comparison of Terms of Trade Change, NPE and Modified NPE: 1985-93

	Change 1985-1993* in deflated price indices for			Share of Input I in output 1985	% change in terms of trade (Input 00)	Net Price Effect %	Modified Net Price Effect %
	OUTPUT	INPUT I	INPUT 00				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
B	-26.7	-25.3	-21.9	0.568	-6.1	-12.3	-28.4
DK	-36.1	-25.4	-20.6	0.519	-19.5	-22.9	-47.6
D	-29.0	-21.8	-16.0	0.644	-15.4	-14.9	-41.9
GR	-24.2	-16.4	-15.0	0.264	-10.7	-19.8	-26.9
E	-29.2	-28.5	-25.8	0.447	-4.6	-16.5	-29.8
F	-25.1	-19.2	-14.6	0.437	-12.3	-16.7	-29.7
IRL	-11.6	-21.7	-18.1	0.480	8.1	-1.1	-2.2
I	-21.3	-19.1	-10.5	0.310	-12.1	-15.4	-22.3
L	-19.4	-18.5	-8.2	0.397	-12.2	-12.1	-20.0
NL	-23.4	-26.0	-18.8	0.530	-5.7	-9.6	-20.4
P	-39.1	-38.5	-36.4	0.538	-4.3	-18.4	-39.8
UK	-20.3	-16.1	-13.7	0.567	-7.6	-11.2	-26.0
EUR 12	-25.2	-22.1	-16.9	0.460	-10.0	-15.1	-27.9

Notes: (5) = 100 x (1993 Terms of trade - 1985 Terms of trade)/ (1985 Terms of trade), where

Terms of trade = 100 x (Real) Index of producer prices for output
                                       (Real) Index of prices paid for all inputs (Input 00)

(6) = (1) - (2) x (4)

(7) = (6)/[1-(4)]

* Forecast