# The EC grain price policy at the core of the CAP

Louis-Pascal Mahe, Knud J. Munk, Siegfried Bauer, Wilhelm Henrichsmeyer, .
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L. MAHE : INRA, Rennes, France
K. J. MUNK : University of Aarhus, Danmark

## 1. Introduction

The EC's Common Agricultural Policy (CAP) has been strongly criticized from the very beginning. However, as long as the EC was a net importer of nearly all agricultural products there was no political pressure for reform and for 20 years the original market regulations and the level of price support has been kept more or less constant.

Rapid technological changes and stagnating consumption of agricultural products in the EC over this period has today created a situation where the EC is a net exporter of nearly all temperate zone agricultural products except animal feed ingredients. Amplified by world market developments this has created a totally new situation where huge budget costs has put enormous pressure on decision-makers to reform the CAP. Significant steps have already been made to keep surpluses under control, either by quantity restriction or cuts in support prices : production quotas have been successful in reducing the milk surplus and in reducing budget costs, without hurting farmers' incomes. Now, in order to reduce the surplus of grains various measures are being implemented or being considered by politicians. These include price cuts, co-responsibility levy and subsidies for incorporation of grains into animal feed.

The purpose of this paper is to investigate how these policy instruments affect the goal variables with which it seems politicians are most concerned i.e. the commodity surpluses, farm income, the level of the budget and the increase in self-sufficiency for products in which the EC is net importer.

The paper is structured as follows. In Section 2 the structure of a model of the EC agricultural and feed processing sectors (AGRIBUS). is presented and its use justified in relation to the policy issues considered. In Section 3 the economics of the three policy changes, a co-responsibility levy, an incorporation subsidy and a general price cut is presented. In Section 4 the implications of the policy changes are analysed on the basis of simulation runs with the model and in section 5 the main results of the paper are summarized.

## 2. The structure of the model

### 2.1. Introduction

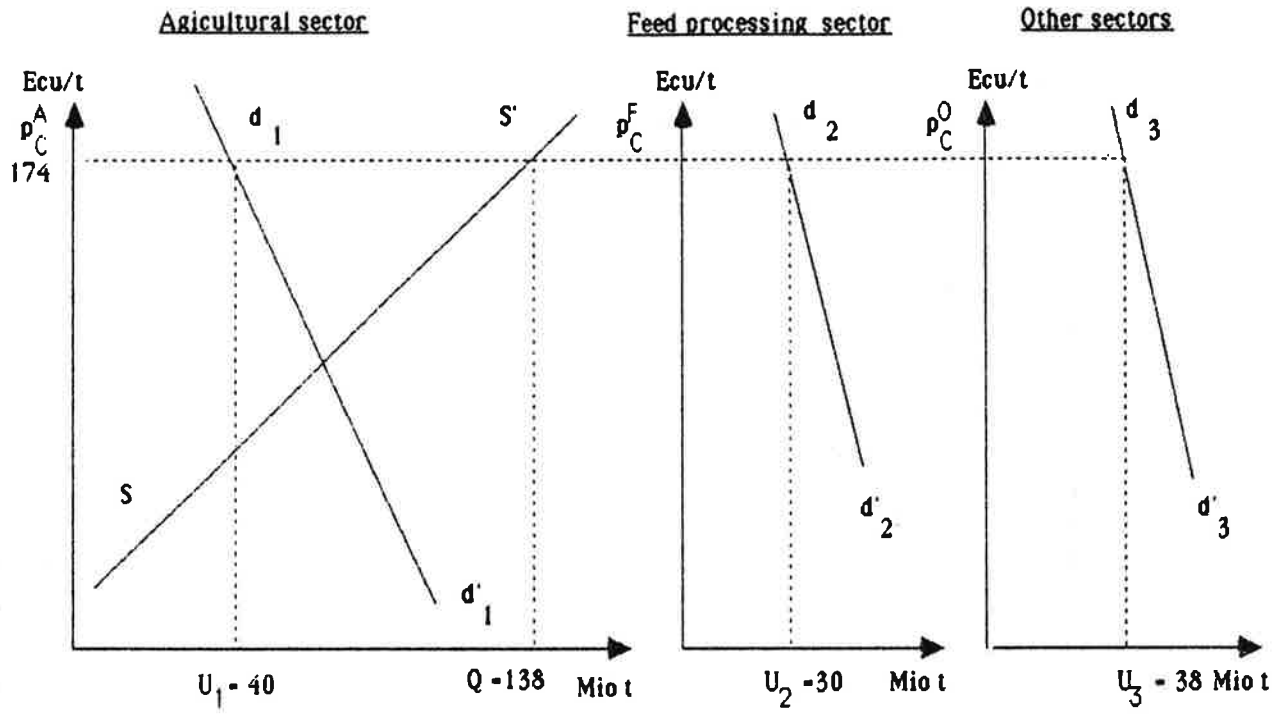
The EC market situation for grains in the mid 1980s may be illustrated by the panels in Fig. 1. Panel 1.1 shows the demand and supply of grains in the agricultural sector. Panels 1.2 and 1.3 show the demand for grains from the feed processing sector and from other sectors. Panel 1.4 summarizes the supply and demand situation for the EC as a whole. Panel 1.5 illustrates the EC export supply and the import demand for EC produced grains from the rest of the world.

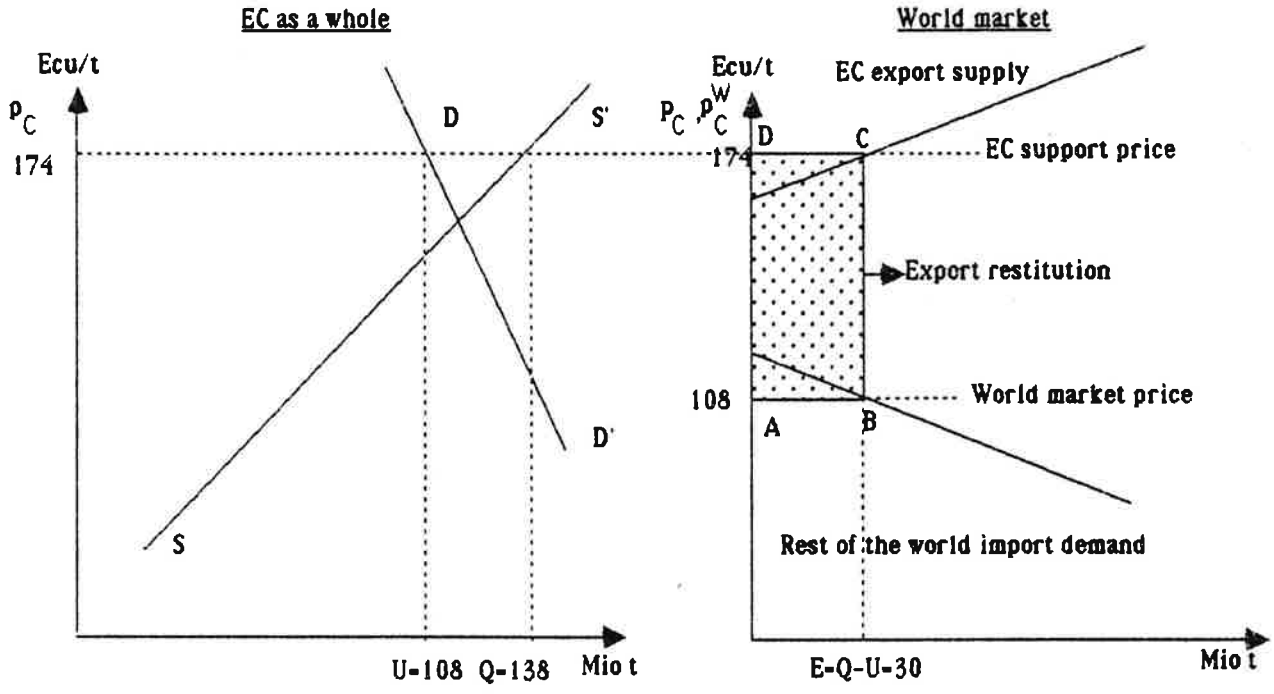
At a support price of 174 ECU/t, total EC-10 production was 138 million tonnes (Q) and use in the EC agricultural sector was 40 million tonnes ($U_1$) including both farm use and purchased grains fed straight. The net sale of grains by the EC agricultural sector was thus 98 million tonnes (the horizontal difference between $d_1d'_1$ and SS'). 30 million tonnes of grains ($U_2$) was used in the EC feed processing sector for the production of compound feed. Other domestic uses of grains amounted to 38 million tonnes ($U_3$). The exportable surplus was 30 million tonnes (the horizontal difference between DD' and SS' in panel 1.4 and E in panel 1.5).

Assuming that the whole EC surplus of grains was exported and that the world market price was 108 ECU/t the export restitutions were nearly 2000 million ECU (the area ABCD).

It might be possible to analyse the changes to the EC grain policy on the basis of summary EC supply and demand elasticities (i.e. corresponding to the curves in panel 1.4). When the EC milk policy was under the political spotlight a few years ago such an approach provided a fairly satisfactory framework for assessing the impact of policy change. The EC milk and grain policy has some common features. They used to rely on similar support mechanisms and they affect a large number of farmers including small ones, but there are also important differences.

*Figure 1. Overview of the market situation for EC grains.*



In an international perspective the important difference between grains and milk is that for grains there exist a market which is not the case for milk. Whereas support in developed countries for grain production varies a lot, for dairy products high protection seems to be the rule. The policy instruments used by exporters are in general different from the traditional EC levy-restitution system, which was created when the EC was in an importing situation. The external pressure for changes of the EC grain policy is therefore much stronger than in the case of the milk policy.

From a domestic point of view the significant difference between milk and grains is that grains is much more linked to other agricultural products than milk. The grain policy is not only important because grains constitute a big share of agricultural production and hence has great importance for agricultural sector income, but because it affects the whole balance in the EC's agricultural sector and therefore in the CAP.

In the agricultural sector grains are close substitutes of most crop products including roughage. However, grains are also closely linked to animal production. Grains like all crop competes directly with animal production for the use of labour and capital, but the link through the cost of animal feed is even more important. A change in the price of grains affect the cost of animal feed through

- the price of grains fed straight and
- the price of compound feed in which grains is a major ingredient.
- the opportunity cost price of roughage,

A decrease in the price of grains decreases the cost of feed through these three channels and therefore lead to expansion of animal production .

In the feed-processing sector grains can substitute easily for most other ingredients in the production of compound feed as the energy and protein content of grains is nearly balanced for use as feed. Grains substitute easily for by-products and over a certain price range for meals.

Both the supply and the demand response of grains to a price change therefore crucially depend on the correct assessment of these linkages. The demand elasticity for most agricultural products are increasingly small because they are used for human consumption only. This is not the case for grains which has important alternative outlets.

For these reasons it is not satisfactory to analyse the effects of changes in the EC grain policy in a traditional partial equilibrium framework

A further reason why a partial analysis based on summary supply and

demand elasticities is not adequate for the analysis of the grain policy is that the linkages mentioned above are different for different policy instruments. Some instruments such as a general price cut can be analysed fairly easily, although it is necessary to specify adequately the policy instruments used for other products. (In particular it is important to make precise which margin of expansion is allowed for animal production: if animal production is regulated by a quota type policy this margin is clearly rather limited). Other policy instruments such as the co-responsibility levy will, however, not affect the cost of grains for use in the agricultural and the feed processing sector in the same way as a simple price cut and therefore require the two sectors to be modelled separately.

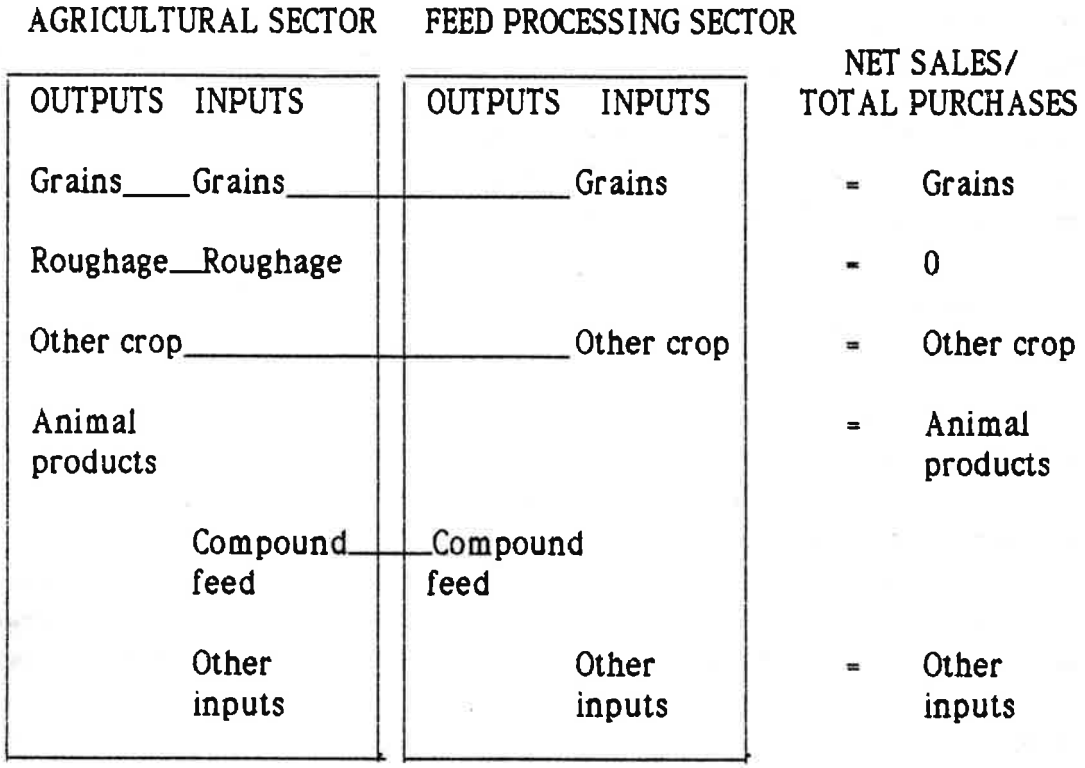
## 2.2. The structure of the model used

The AGRIBUS model (see Mahé and Munk (1988)) has been designed to represent the various policy instruments and linkages mentioned above. It represents separately the agricultural sector and a feed processing sector and it covers all agricultural products and inputs in both sectors.

In terms of the demand and supply diagrams in fig. 1 the model represent panel 1.1 and 1.2. The model not only represents the slope of the curves but also how they shift in response to various policy changes. The model will calculate the effect of policy changes on production and use of grains in the two sectors covered and hence on the amount of grains available for use in other sectors and for export. It will also calculate the effect on the sales of other products and the purchase of intermediate inputs including imported feed ingredients. The overall structure of the AGRIBUS model is presented in Fig. 2.

The AGRIBUS model is constructed using general equilibrium methodology, but is not a general equilibrium model because other production sectors and final demand is not covered by the model. The use of general equilibrium methodology implies that all outputs and all inputs are represented by the model and that the interaction between inputs and outputs is modelled. It also implies that the model calculates equilibrium prices in the cases where the output produced are totally consumed in the two sectors. This is the case for roughage and the various types of compound feed. For other products the prices has to be specified exogenously because the market equilibrium for these products is not modelled.

*Figure 2 The overall structure of the AGRIBUS model*




The model combines elements from two other models: the AGRISEC model (see Munk (1984, 1985,1988)) and the feed module of the MTM model (see Mahé (1987) and OECD (1987)). The AGRISEC model is a model of the EC agricultural sector. It has not much detail with respect to feed and the price of compound feed, - which in the AGRIBUS model is endogenous - has to be specified exogenously. The feed module of the MTM model give a detailed representation of the substitution possibilities between feed ingredients within the EC.

The structure of the agricultural sector is specified on the basis of a nested primary factor contingent profit function.

The structure of the feed processing sector is specified on the basis of a nested cost function for three different types of feed. The prices of these feeds are determined on a unit cost basis.

The aggregation function for each nest is specified as a full matrix of Allen elasticities of substitution using the same methodology as in Munk (1984,1985). This avoids the restrictive assumptions of CES aggregation functions and input-output separability often used in the literature, but secures that the supply and the demand functions have the properties implied by profit maximizing behaviour (homogeneity of supply and demand functions, and symmetry of demand or supply response to price

changes).

The matrix of own- and cross-price elasticities between items at the lowest level of aggregation, taking into account the substitution elasticities specified at the higher levels, have been calculated using the methodology used in the context of the OECD study (OECD (1985, 1987), Mahe(1987)). Such elasticities has been useful in evaluating the realism of the model parameters in the light of the econometric evidence available.

The AGRIBUS model represents the supply of all products produced in the agricultural sector and the derived demand for feed ingredients both by the agricultural sector and the feed processing sector. It is therefore particularly well suited to simulate the effects of feed price changes on feed use, indicating explicitly both the substitution effects due to changes in relative feed prices and the expansion effects due to changes in animal production in response to the induced changes in feed costs.

The model is constructed for comparative static analysis with a time horizon of from 3 to 5 years. The parameters and other assumptions are specified with this in mind.

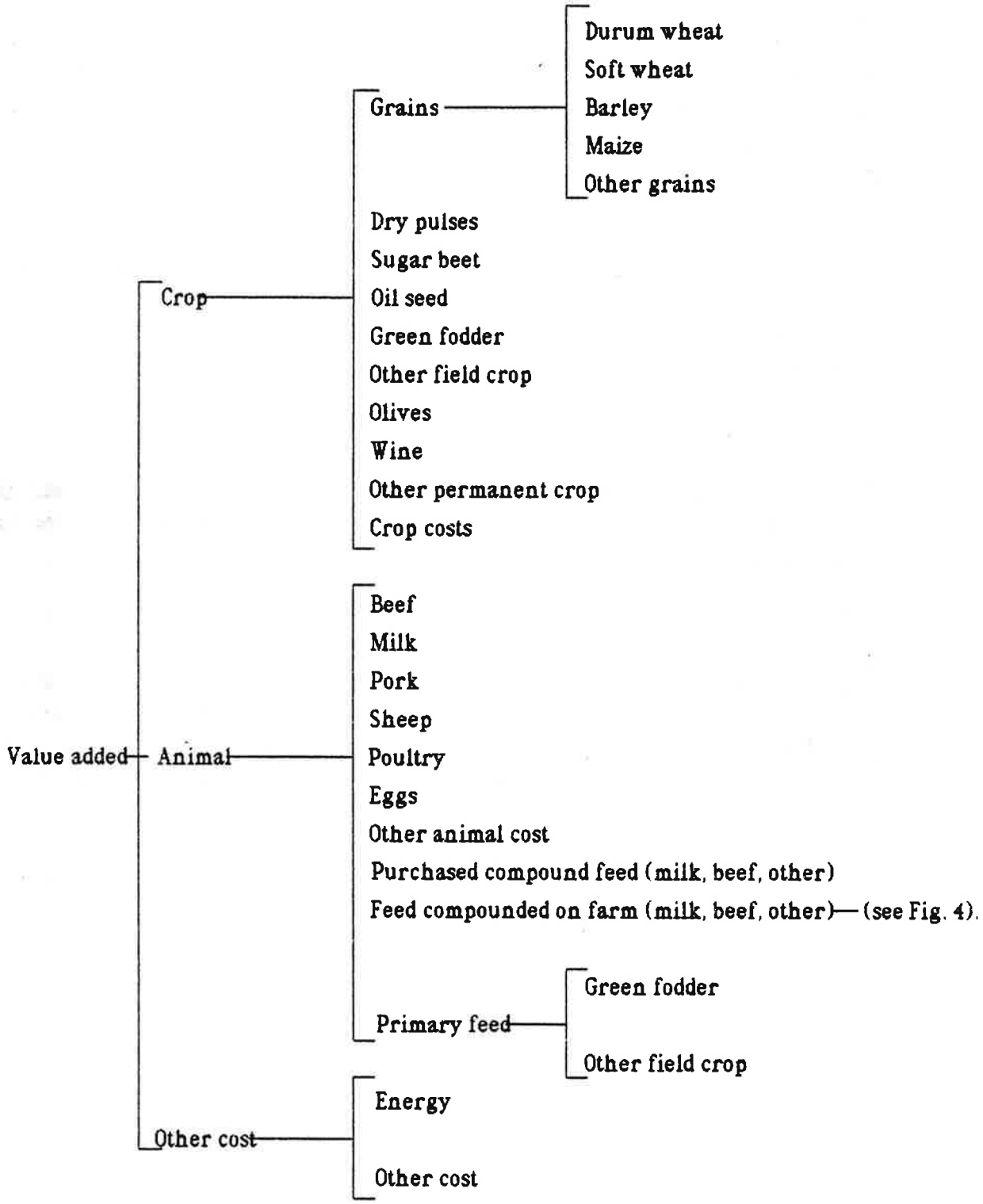
(i) The agricultural sector sub-model.

The outputs and the intermediate inputs in the agricultural sector sub-model are aggregated in three steps. In the first step the purchased feed ingredients and farm grains are aggregated in a feed module similar to the one used in the feed processing sector and also grains and primary feed are aggregated from a lower level.

In the second step outputs, feed inputs (including the different rations of purchased feed, green fodder and the intra-sectoral use of grains) and other intermediate inputs are aggregated into three main aggregates

- a crop aggregate,
- an animal aggregate, and
- an aggregate of inputs which are not specific to neither crop nor animal production.

*Figure 3. The structure of aggregation in the agricultural sector.*




The commodity breakdown and the aggregation structure is shown in Fig. 3. The aggregation structure for feed compounded on farm is the same as in the feed processing sector. ( The aggregation structure for the feed

processing sector is indicated in Fig. 4. ).

The elasticities are calibrated such that changes in output and input in response to price changes are consistent with known input requirements. In the AGRIBUS model special attention has been given to establish consistency between the own-price elasticities of animal products (beef, milk, pork, poultry and sheep) and the cross-price elasticities for purchased feed. This has been particular easy when only one type of animal uses on type of feed ration as in the case of beef. In the case of monogastrics where several types of animals use the same feed ration, the elasticities has been calibrated taking into account the input requirements and the relative importance of each type of animal.

At the highest level of aggregation a full matrix of Allen elasticities is specified between crop, animal and non-specific inputs.

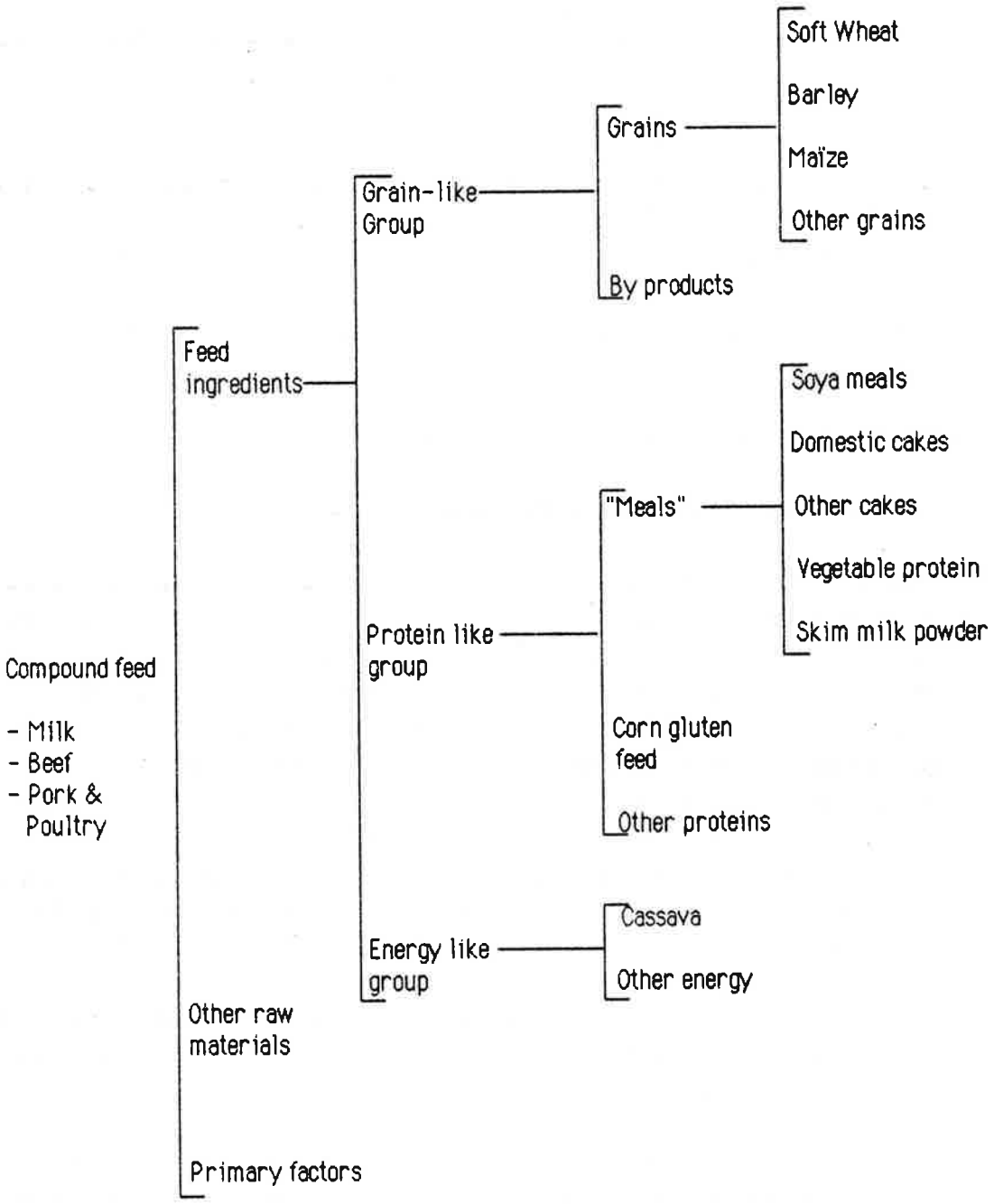
(ii) The feed processing sector sub model.

The feed processing sector is represented by three cost functions : one for beef feed (including veal), one for dairy feed (including feed for other grazing livestock) and one for other feed (feed for pork and poultry). At the highest level of aggregation total feed ingredients, non-feed inputs and primary factors are aggregated into total costs. The crucial part of the sub-model is the feed module which aggregates the feed ingredients for each of the three types of compound feed. At the highest level of aggregation the feed module distinguishes between three groups of feed ingredients: grain-like, energy-like and protein-like. In order to make use of available empirical evidence for some ingredients groupings, a nested structure has been used to disaggregate further the demand system, as between grains within the grain group or as between cakes within the protein group. The aggregation structure has been built mainly on the basis of the energy and protein contents of the ingredients and on the assumption that substitution is easier between elementary ingredients than between groups. The break-down of ingredients and the aggregation structure is illustrated in figure 4.

The objective of the feed module is to reflect as well as possible the substitution possibilities between ingredients. Since the trade regimes are different for various groups of ingredients, a detailed disaggregation has been desirable both with respect to feed ingredients and feed types. Available information on total use of feed raw materials used both on farm and in the production of compound feed is rather well known and on the basis of feed formulae and practices it has been possible to estimate a likely allocation of the ingredients to the three types of compound feed. This cost structure is important both in determining the price elasticities of ingredients and of the impact of the change in the price of any

particular ingredients on total feed cost and therefore on animal supply.

*Figure 4 The structure of aggregation in a typical feed activity.*



## 3. Alternative policy instruments affecting the grain surplus

Since bringing the milk surplus under control decreasing the EC surplus of grains has increasingly been seen as the major problem for the EC agricultural policy.

The measures which has been considered by the EC Commission and of which some have already been implemented, include

i) co-responsibility levy for grains
ii) subsidy to the incorporation of grains in the production of compound feed
iii) decrease in the support prices for grains
iv) taxes on oil cakes and other feed ingredients
v) tariff on the import of oil seed, oil cakes and other feed ingredients
vi) quota on import of feed ingredients

In choosing how to use these instruments it seems that the policy-makers are motivated in particular by their effect on

- EC agricultural sector income
- EC budget
- EC surpluses of agricultural products
- EC import of non surplus products

To provide a quantitative assessment of the impact of changes in the EC grain policy on these goal-variables the AGRIBUS model has been used to simulate

- a 10% co-responsibility levy on grains (CL)
- a 10% subsidy to the incorporation of grains in the production of compound feed (IS)
- a 10% general cut in the price of grains (PC)

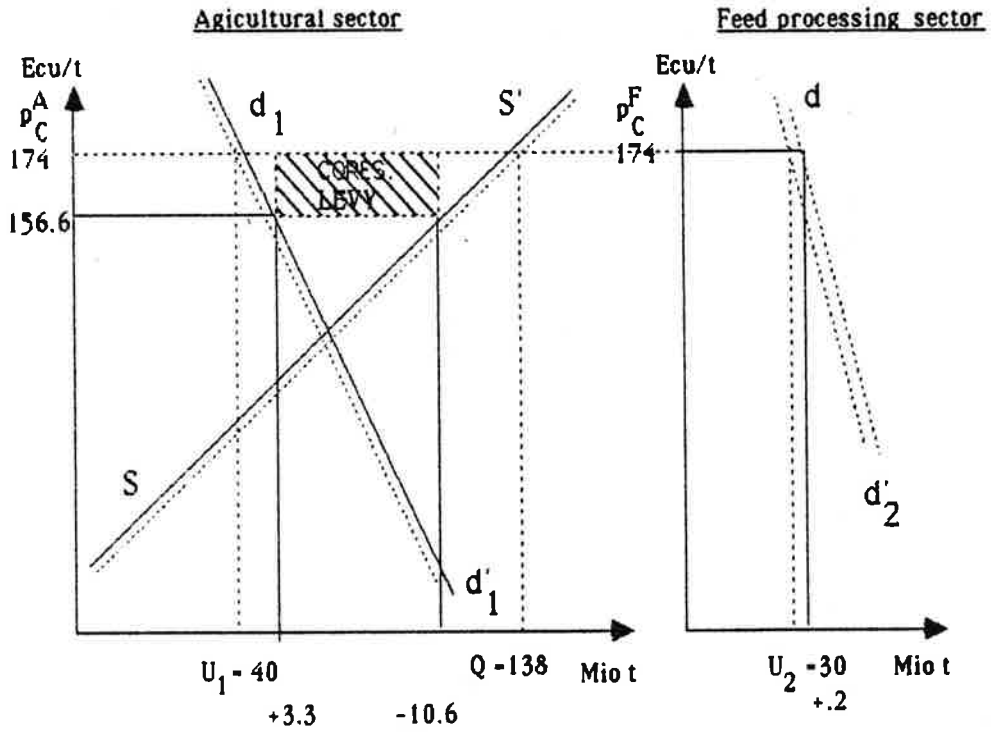
The model may also be used to analyse the impact of the other policy instruments, but the model is less suited for this because it lacks detail on the oilseed-crushing sector and the foreign sector.

Fig. 5, 6, and 7 illustrate how the three policy options analysed have been interpreted and how the impact on the grain market has been calculated by the model.

i) co-responsibility levy (CL)

The co-responsibility levy for grains in the EC may be considered as a tax paid by all users who buy grains from the market. These include the feed processing (FP) sector and the farmers buying feed grains from the market. Out of about 70 million tonnes of marketed grains used in the EC, about 30 million tonnes are used in the FP sector and 10 million tonnes are used directly on farms. A 10 % co-responsibility levy would ,however, provide a fairly strong incentive for the farmers buying grains to avoid the tax by direct transaction with farmers selling grains. As a consequence, the CL is simulated as if all grains used in agricultural sector (AG) escape the levy i.e. the 10% co-responsibility levy is interpreted as meaning that the price of all grains produced of all grains used in the agricultural sector is decreased by 10% whereas the price of grains to the FP sector and other sectors remains unchanged (see fig. 5).

*Figure 5. The effect of 10% co-responsibility levy.*

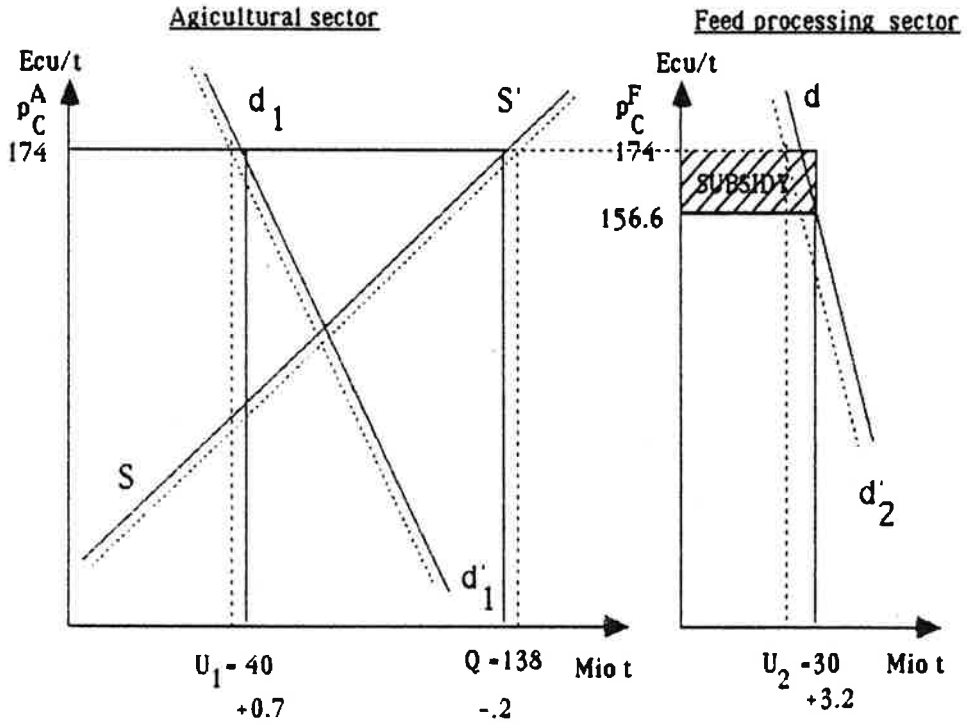


The CL has often been justified on the grounds that it forces producers to participate in the cost of the EC grain policy. The policy has come under fire from feed-compounders and economists who argue that it means discrimination against the feed processing industry as compared to farmers. However, it has been suggested (see Munk (1987)) that this measure may not be as bad as implied by its reputation among economists since it provides a more favorable ratio between budget savings and decrease in farm income than alternative instruments.

ii) Incorporation subsidy to the use of grains for feed (IS)

The interpretation for the calculations of the incorporation subsidy to the use of grains for feed is the mirror image of the interpretation above of the co-responsibility levy i.e we assume that the subsidy is only granted to the use of grains in the feed processing sector. A subsidy to any purchase of grains is even less practical than a co-responsibility levy on all sales of grains. A subsidy to agricultural sector purchases of grains would induce the farmers to sell their whole production at the high price such that all grains used in the agricultural sector would be purchased grains.

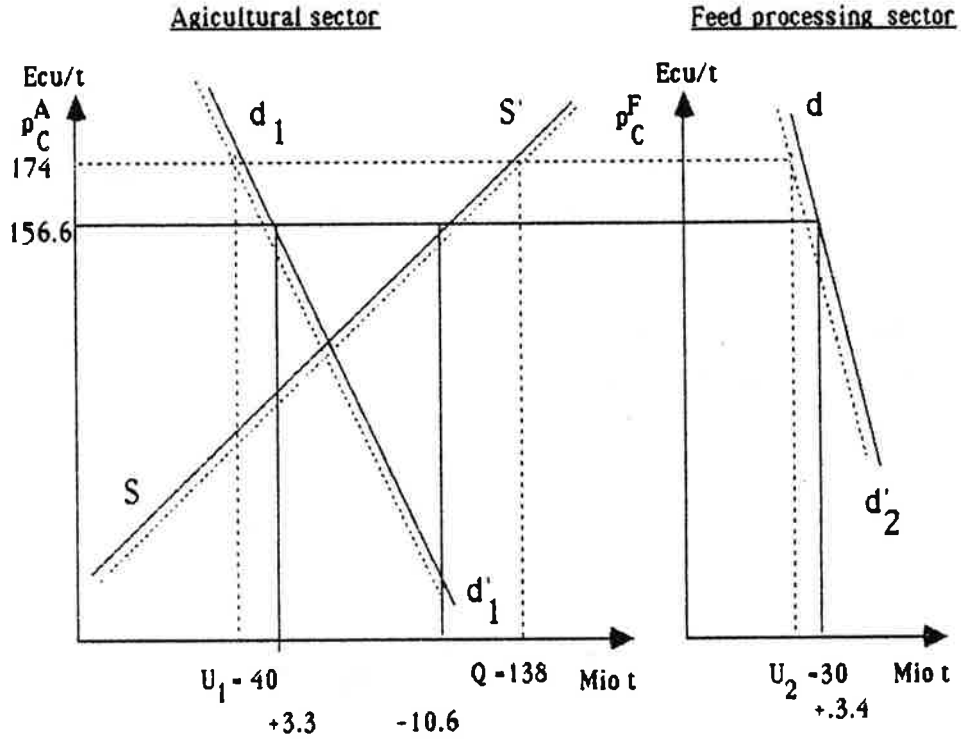
*Figure 6. The effect of a 10% incorporation subsidy to the use of grains in the feed processing sector.*



iii) Price cut (PC)

A market-oriented policy for grains would imply a direct cut in the support price for grains both at producer and user levels (see fig. 7). This scenario compounds the two previous options. The cost of feed falls with the same magnitude as in the subsidy option. Both supply, derived demand and final demand are affected by the price decrease and exportable surplus therefore responds more than under the other options.

*Figure 7. The effect of 10% decrease in the support prices for grains.*



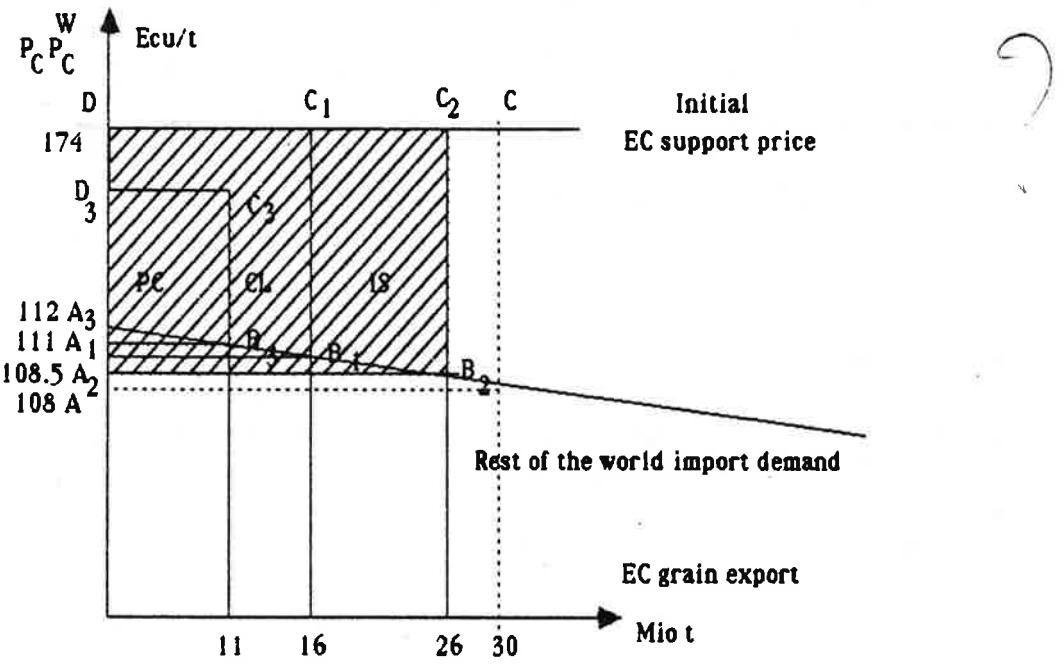

iv) The effect on exportable surplus and export restitutions

Changes in the grain policy have important implications for the budget and for EC agricultural trade. Export restitutions for grains is now greater than for any other product and the EC grain policy my significantly affect the world market price for grains. The effects on the world market prices and on the budget are not calculated by the AGRIBUS model, but are dealt with by simplified ex post calculations.

The net exportable surplus will be quite different under the three different policy options envisaged and hence also the savings on export restitutions as illustrated in fig. 8. From ABCD in the base situation it falls

only to $A_2B_2C_2D$ as a consequence of the incorporation subsidy (IS) but to $A_1B_1C_1D$ for the co-responsibility levy (CL) and to $A_3B_3C_3D_3$ for the price cut (PC). For the price cut the budget benefits not only from a further reduction of exportable surplus but also from a cut in the restitution rate due to the fall of the support price. Terms of trade effects also contribute to increased savings when moving from IS to CL and to PC. While the budget is only affected by restitutions in the PC case, savings are increased by levy proceeds in the case of CL (shaded area on fig. 5) and curtailed by the cost of the subsidy in the case of IS (shaded area in fig. 6). Budget effects also include the effect of induced changes on export restitutions for other commodities as shown in the table 1.

*Figure 8. The effect on exportable surplus and export restitution for the policy options considered.*



## 4. The effects of the three policy options

### 4.1. The effect of a 10% co-responsibility levy (CL) (see annex 1)

This option reduces the price of grains in the agricultural sector for both producers and users by 10%.

We first look at the effects in the agricultural sector. The production of grains fall by 7.7%. The primary factors are transferred to the production of other crop products and to animal production. As resources are shifted out of grains production the opportunity cost price of green fodder falls by 1.6%. The production of milk increases by only 0.17% because the sales of milk is assumed fixed by quota regulation (the opportunity cost price of milk falls by 2%), but the production of beef increases by 1.3%., and the production of pork increases by 2.9%. The increase in animal production is partly due to the fact that grain production has become less profitable and partly because the animal production has become more profitable due to the lower feed costs. The relatively high increase in pork production is consistent with the importance of grains in the feed ration for pork. The increase in beef production is mainly due to the lower opportunity cost price for roughage. The use of grains in the agricultural sector increases by 8.3% whereas the total use of compound feed increases slightly (-0.3% for dairy feed, 0.7% for beef feed and 0.9% for feed for monogastrics). These effects may be divided into substitution effects (due to the changes in relative prices of feed ingredients) and expansion effects (due to the changes in animal production ). For the use of grains in the agricultural sector, both the substitution effect and the expansion effect are positive. For the use of compound feed the substitution effect is negative, but the expansion effect is sufficiently positive to outweigh the negative substitution effect.

We now turn to the effects in the feed processing sector. The small increase in the use and hence in the production of compound feed is transformed into a small increase in the use of all inputs, including grains in the FP sector. There is no substitution effect since the input prices do not change. The different impact for the different feed ingredients is due to the different composition of the three types of compound feed produced in the FP sector. That a co-responsibility levy will increase the use of grains in the feed processing sector may go against conventional wisdom. This result crucially depend on the expansion of animal production in the agricultural sector. Whether the increase in animal production due to the decrease in feed costs is realistic is open to discussion which can only be settled when further empirical evidence is available. In this context it is important to realize that the model assumes that the use of primary factors in the agricultural sector do not change in response to the policy changes considered. If the outflow of primary fac-

tors were taken into account - as it should be in the long term perspective - the expansion effect in animal sector would be smaller.

The CL has a significant effect on the grain surplus. Total net sales (production minus use of grains in the agricultural sector and the feed processing sector) is reduced by nearly 21% or 14 million t.

The co-responsibility levy hardly affects the use of imported feed ingredients. The decrease in the use of these inputs in the agricultural sector is outweighed of the increased use in the feed processing sector which uses much more of these inputs than the feed proces-sing sector.

From the budget point of view the co-responsibility levy seems to be a good solution as the proceeds are about 1 450 million ECU and the savings on restitution for grains is about 1000 million ECU. However, the total net savings are not equal to the sum of the two items above since the expansion of animal production implies increases in restitution expenditures, for beef, pork and poultry evaluated at 388 million ECU, and for other crops 100 millions so that global net savings are only 2000 million ECU. Farmer incomes fall but livestock producer gains are partly offset the loss to grain growers. Aggregate value added drops by about 1400 million ECU.

### 4.2. The effect of a 10% subsidy to the use of grains for animal feed (IS) (see annex 2)

The subsidy to grains used in the feed processing industry makes compound feed relatively cheaper than feeds grown on farm. The use of compound feed increases by 1 per cent for beef and by up to 3 per cent for pork and poultry. For dairy which does not expand, the increase in compound feed use is due to substitution for on-farm feed. For beef and monogastrics an expansion effect is added. It is especially large in the latter case since compound feed is a large item in the cost of monogastrics and since the price of compound feed for monogastrics fall relatively more than the price of compound feed for milk and beef.

As the prices of agricultural products are assumed unaffected by the incorporation subsidy ( although the price of pork and poultry might in reality fall somewhat) the effect of the incorporation subsidy is quite limited quantity wise. The use of grains in the feed processing sector increases by nearly 11 per cent but total use of grains increases by only about 4.7 per cent. The incorporation subsidy reduces total grain use by a similar amount as the co-responsibility levy although with a slightly smaller expansion effect on the animal sector. This difference may be explained by a) that the use of grains in the agricultural sector is greater

than in the feed processing sector b) that the incorporation subsidy does not reduce the opportunity cost price of green fodder.

From the budget perspective the outcome differs more. First because of the cost of the subsidy, second because the exportable surplus is not cut down as much. Grain production is only reduced very slightly in this option. Exportable surplus falls by only about 4.1 millions tonnes compared to the 14 millions in the previous case. Savings on restitutions spent on grains are about 260 millions ECU but 170 million more are spent on animal product restitutions, mainly because of pork expansion. The cost of the subsidy itself would reach about 565 million. The overall impact on the budget would be an increase in expenditures of about 475 millions ECU. The impact on the farm value added is positive and would be about 575 millions. The use of a subsidy to increase the use of grains in animal feed appears in fact a rather costly way to get a slight improvement of the market balance for grains. The incorporation subsidy, however, looks more attractive from a community preference viewpoint : the incorporation subsidy has a much larger effect on import substitution than the co-responsibility levy. This is due to the wider use of imported feed in the compound feed industry than in the agricultural sector. The effect on the import of feed ingredients remains, however, limited (about 1 million tonnes).

### 4.3. The effect of a general 10% reduction in the price of grains (see annex 3)

In the case of a general price cut the use of grains increases significantly in both the agricultural and the feed processing sector. The opportunity cost price of green fodder falls for the same reason as in the CL option. The fall is smaller due to a stronger expansion of animal production. The use of grains in the agricultural sector increases by 8.4% mainly due the substitution of grains for other inputs, but also the use of compound feed increases due to the expansion of animal production ( by .8 for milk feed, 1.7% for beef feed and 3.7 for monogastrics feed). The increase in the agricultural sector use of compound feed and the substitution away from imported feed ingredients in the production of compound feed leads to a 11.5% increase in the use of grains in the feed processing sector.

The PC has a greater effect on exportable surplus than the two previous options. The total use of grains for animal feed increases by 6.7 million tonnes and total net sales decrease by 17.3 million tonnes. As human consumption would react somewhat but less than animal feed, export surpluses would be reduced by even more than 19 million tonnes.

The budget benefits in this case only from the decrease in export restitu-

tions. The savings reach more than 1400 million ECU for grains but the expansion of animal production increases budget expenditures by about 560 million ECU and increase in the production of other crops by another 130 million ECU. The net savings is smaller than in the case of the co-responsibility levy. These estimates of the impact on the budget are biased downwards as terms of trade effects are not taken into account[1].

Farm income is hurt significantly, but the loss is offset to an even greater extend than in the case of the CL by lower feed costs. Livestock producers benefit now from the reduction in the cost of both farm produced feed and compound feed, cumulating the gains from CL and IS. Grain producers suffer a income loss of about 4000 million ECU but cheaper feed bring the net income loss for the agricultural sector as a whole back to 900 million ECU.

The PC option implies also the largest import substitution in animal feed. The use of manioc drops by 1.5 per cent and the use of energy rich by-products drop by up to 4 per cent. Corn gluten and other protein rich ingredients are not reduced as much (from -0,8 to -2.1 per cent).

### 4.4. Overview and comparison of the results for the three policy options

Table 1 summarizes the main results. The budget calculations are only indicative because of model does not cover final demand and the foreign sector.

The results are also subject to the limitations of the model with respect to parameter specification. The parameters are only partly derived on an empirical basis. However, the model provides a theoretically consistent and detailed representation of the interaction between all outputs and inputs in the EC agricultural and feed processing sectors. This hopefully compensates for the deficiencies in sectoral coverage and empirical foundation.

Table 1 suggests that a co-responsibility levy will always be more budget saving than a price cut, while the incorporation subsidy increases domestic use of grains without hurting farmers income. The co-responsibility levy hurts farmers most as they do not benefit from the reduction in the cost of compound feed as in the case of a price cut.

If the objective were to obtain the greatest budget saving per unit

[1] A rough calculation from an international trade model suggest (see Mahé and Morredu (1987)) that 200 million ECU should be added to the savings to account for human consumption response and terms of trade effects.

reduction in farm income, the co-responsibility levy appear the most efficient instrument.

Surplus reduction is smallest with the incorporation subsidy and largest in the case of the price cut. Surplus reduction is quite large even in the case of the co-responsibility levy as both supply of grains and the use of grains in the agricultural sector (which is the major use of grains for feed) is affected.

Table 1. Budget and income effects of three grain policy options

| | Co-responsibility Levy (CL) | Incorporation Subsidy (IS) | Price Cut (PC) |
|---|---|---|---|
| 1. Budget changes (Mio ECU) | | | |
| export restitution on | | | |
| - grains (a) | - 1052 | - 260 | -1457 [1] |
| - animal products (b) | + 388 | + 170 | + 560 |
| - other crops (c) | + 107 | | + 130 |
| tax(-), subsidy(+) (d) | - 1451 | + 565 | 0 |
| Total: (e) = (a)+(b)+(c)+(d) | - 2008 | + 475 | - 767 |
| 2. Income change (f) (Mio ECU) | - 1449 | + 575 | - 892 |
| 3. Budget cost/income ratio (g) = (e)/(f) | + 1.38 | + 0.82 | + 0.86 |
| 4. Surplus (Mio t) | - 14.1 | - 4.1 | - 17.3 [2] |

1. Terms of trade and final consumption could add about 200 million ECU extra savings.
2. Accounting for human consumption response would approximately add a further 1.5 million tonnes to the surplus reduction.

### 4.5. Substitution and expansion effects.

The significant response of the animal sector gives rise to the following questions: First, what is the relative importance of the expansion and the substitution effect for the use of grain and imported feed ingredients in animal feed ? and secondly what decreases in the prices of animal products would be necessary in order to neutralise the expansion of animal production due to the lower feed costs ?

Table 2. Substitution and expansion effects of the three policy options [1].

| | With expansion of animal products: | | Without expansion of animal product: | |
|---|---|---|---|---|
| | Change in grain use in animal feed[2] | Change in imported feed use | Change in grain use in animal feed[2] | Change in imported feed use |
| | ---------- Million tonnes ---------- | | | |
| 1. Co-responsibility levy (CL) | | | | |
| Feed process | 0.2 | 0.2 | -0.6 | -0.7 |
| Agr. sector | 3.3 | -0.24 | 2.5 | -0.5 |
| All feed | 3.5 | -0.04 | 1.9 | -1.2 |
| 2. Incorporation subsidy (IS) | | | | |
| Feed process | 3.2 | -0.85 | 2.7 | -1.4 |
| Agr. sector | 0.7 | +0.05 | -0.5 | -0.0 |
| All feed | 3.9 | -0.8 | 2.2 | -1.4 |
| 3. Grain price cut (PC) | | | | |
| Feed process | 3.4 | -0.7 | 2.1 | -2.1 |
| Agr. sector | 3.3 | -0.2 | 1.8 | -0.4 |
| All feed | 6.7 | -0.9 | 3.9 | -2.5 |

1. in all sub-option milk and sugar quotas are maintained.
2. "Imported feed" includes manioc, by-products other energy rich ingredients, all cakes and corn gluten feed.

Table 2 provides the answer to the first of these two questions The substitution effects account in all cases for more than half the total effect on the use of grains for feed.

The change in the use of grains due to the expansion of the animal sector varies from about 2 million tonnes for the CL case to 4 million for the PC. The expansion effect is quite significant particularly in the PC case (2.8 million tonnes).

Import substitution is also quite sensitive to whether or not the animal sector is allowed to expand. In the CL case there is no significant reduction in the use of imported feed when expansion is allowed whereas it falls by 1.2 million tonnes when no expansion is allowed. Similarly in the IS case keeping animal sector supply constant means a 1.4 million tonnes cut in imported feed use. The largest import substitution occurs for the PC

cut in imported feed use. The largest import substitution occurs for the PC case when the level of animal production is fixed. In this case 3.9 million tonnes of grains replaces 2.5 million tonnes of imported feed.

The model makes it possible to calculate the changes in output prices which would be necessary to keep the production of the corresponding products fixed when other prices change. This feature is used to calculate the decreases in animal prices necessary to neutralize the expansion effects of the three policy options ( see Table 3).

Table 3. Price cuts necessary to neutralize expansion in animal production (per cent)

| | CL | IS | PC |
|---|---|---|---|
| Beef meat | - 2.1 | - 0.3 | - 2.4 |
| Dairy | - 2.2 | - 0.5 | - 2.6 |
| Pork | - 2.4 | - 1.5 | - 4.0 |
| Poultry | - 2.4 | - 1.7 | - 4.1 |
| Eggs | - 2.3 | - 1.7 | - 4.1 |
| Other animals | - 2.2 | - 0.3 | - 2.6 |

The resulting price decreases reflect both the structure of feed costs of the different animal products as the difference in supply elasticities of the different animal products. Monogastrics are compared with grazing livestock relatively more sensitive to the PC than the CL option since they use relatively more compound feed.

## 5. Concluding comments

The AGRIBUS model has been used to simulate the effects of three policy changes and to compare their effects on budget, income and import substitution.

The results indicate that changes in the grain policy strongly influence the production of other products, in particular animal products. This in turn has significant budget implications. The model hence emphasize the need for the use of general equilibrium models or at least the use of a multi-product framework in the analysis of the changes in the EC grain policy which are currently considered by policy makers.

Both the co-responsibility levy and a general cut in the price of grains entail significant budget savings, but the ratio of budget savings to the decrease in farmers income is more favorable in the first case. The incorporation subsidy increases farmers income at the cost of increased budget expenditures without significantly reducing the import of feed ingredients. Considering the likely objectives of policy-makers it is therefore not surprising that the use of the co-responsibility levy has been chosen irrespective of the distortions between the agricultural and the feed processing sector which it the use of this instrument implies. This naturally does not means that the co-responsibility levy is justified from a welfare economic point of view. A welfare economic evaluation must, however, take into account the relative weights given to the real income of producers, tax payers and consumers and the distortion costs of raising tax revenue. Assuming as often done that these weights are the same disregarding second best issues leads to results of little relevance for the political debate.

The model has allowed the effect of changes in the EC grain policy on the use of grains to be divided into expansion effects and substitution effects. The expansion effect indicate to what extend policies aimed at reducing the surpluses in the grain sector shifts the surpluses to the animal sector. Only the substitution effects represent a genuine reduction of the over all surplus problem.

The model has also been used to calculate the price decreases for animal products which are necessary to neutralize the expansion effects. These calculation provide an alternative quantitative measure of the pressure which changes in the grain policy exert on the policies in the animal sector.

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ANNEX I: Effect of 10% corresponsibility levy on grains. (Quota on Milk and Sugar)

| | SBP Prices changes LWH (percent) | | | | Quantity changes (percent) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ag. Sector | | Feed Pr. Sect | | Ag. Sector | | Feed Pr. Sector | Ag + Feed Pr. Sector | |
| | Supply | Demand | Supply | Demand | Production | Use | Use | Total use | Production - use |
| Wheat Durum | | | | | 2.27% | -0.68% | | 0.68% | 2.29% |
| Wheat Soft | -10.00% | -10.00% | | | -7.73% | 8.09% | 0.68% | 4.63% | -13.28% |
| Barley | -10.00% | -10.00% | | | -7.73% | 8.67% | 0.50% | 6.65% | -31.01% |
| Grain Maize | -10.00% | -10.00% | | | -7.73% | 9.26% | 0.82% | 2.89% | -52.10% |
| Other Cereals | -10.00% | -10.00% | | | -7.73% | 6.62% | -0.06% | 5.76% | -41.92% |
| TOTAL CEREALS | | | | | -7.73% | 8.28% | 0.78% | 5.07% | -20.85% |
| Dry-Pulses | | | | | 3.14% | -1.28% | 0.68% | 0.43% | -3.52% |
| Sugar Beet | -2.68%* | -2.68%* | | | 0.00% | | | | |
| Oilseed | | | | | 2.82% | | | | 2.82% |
| Green-Fodder | -1.62%* | -1.62%* | | | 0.95% | 0.95% | | 0.95% | 0.00% |
| Oth-Field crops | | | | | 2.82% | -0.68% | | -0.68% | 2.95% |
| Olives | | | | | 0.11% | | | | 0.11% |
| Wine | | | | | 0.11% | | | | 0.11% |
| Oth. Permanent crops | | | | | 0.79% | | | | 0.79% |
| Beef Meat | | | | | 1.33% | | | | 1.33% |
| Milk | -1.98%* | -1.98%* | | | 0.17% | 1.56% | | 1.56% | 0.00% |
| Pork | | | | | 2.95% | | | | 2.95% |
| Sheep and Goat | | | | | 1.82% | | | | 1.82% |
| Poultry | | | | | 2.74% | | | | 2.74% |
| Eggs | | | | | 2.41% | | | | 2.41% |
| Oth.anim. Products | | | | | 1.65% | | | | 1.65% |
| Crop-interm. inputs | | | | | | -2.46% | | -2.46% | |
| Milk compound feed | | 0.00%* | 0.00%* | | | -0.30% | | | |
| Beef compound feed | | 0.00%* | 0.00%* | | | 0.71% | | | |
| Other compound feed | | 0.00%* | 0.00%* | | | 0.94% | | | |
| Manioc | | | | | | | 0.82% | 0.82% | |
| By products | | | | | | -1.40% | 0.40% | -0.25% | |
| Other energy rich | | | | | | | 0.80% | 0.80% | |
| Soya-cake | | | | | | -0.98% | 0.65% | 0.41% | |
| Corn gluten feed | | | | | | -1.37% | 0.16% | 0.13% | |
| Rape and sunflower | | | | | | -1.36% | 0.17% | 0.06% | |
| Other cakes | | | | | | -1.38% | 0.16% | -0.07% | |
| Skim milk powder | | | | | | 1.28% | 0.78% | 0.89% | |
| Other protein rich | | | | | | 1.41% | 0.72% | 0.84% | |
| Other cost | | | | | | -0.49% | 0.57% | -0.41% | |
| Energy | | | | | | -0.49% | 0.57% | -0.44% | |

(* endogeneous price charge)

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ANNEX II : Effects of a 10 percent incorporation subsidy for Grains in animal feed.
(Quota on Milk and Sugar)

| | SBP Prices changes LWH (percent) | | | | Quantity changes (percent) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ag. Sector | | Feed Pr. Sect | | Ag. Sector | | Feed Pr. Sector | Ag + Feed Pr. Sector | |
| | Supply | Demand | Supply | Demand | Production | Use | Use | Total use | Production - use |
| Wheat Durum | | | | | -0.13% | 0.18% | 0.00% | 0.15% | -0.13% |
| Wheat Soft | | | | -10.00% | -0.13% | 0.11% | 10.77% | 5.08% | -2.47% |
| Barley | | | | -10.00% | -0.13% | 0.03% | 11.29% | 2.82% | -4.89% |
| Grain Maize | | | | -10.00% | -0.13% | -0.07% | 10.56% | 7.95% | -33.89% |
| Other Cereals | | | | -10.00% | -0.13% | 0.34% | 12.64% | 1.93% | -5.32% |
| TOTAL CEREALS | | | | | -0.13% | 0.08% | 10.84% | 4.68% | -5.13% |
| Dry-Pulses | | | | | -0.16% | 0.38% | -1.47% | -1.09% | -2.79% |
| Sugar Beet | 0.12%* | 0.12%* | | | 0.00% | | | | 0.00% |
| Oilseed | | | | | -0.13% | | | | -0.13% |
| Green-Fodder | 0.14%* | 0.14%* | | | 0.04% | 0.04% | | 0.04% | |
| Oth-Field crops | | | | | -0.14% | 0.17% | | 0.17% | -0.14% |
| Olives | | | | | -0.10% | | | | -0.10% |
| Wine | | | | | -0.10% | | | | -0.10% |
| Oth. Permanent crops | | | | | -0.10% | | | | -0.10% |
| Beef Meat | | | | | 0.27% | | | | 0.27% |
| Milk | -0.35%* | -0.35%* | | | 0.06% | 0.52% | | 0.52% | 0.00% |
| Pork | | | | | 1.84% | | | | 1.84% |
| Sheep and Goat | | | | | 0.27% | | | | 0.27% |
| Poultry | | | | | 1.85% | | | | 1.85% |
| Eggs | | | | | 1.64% | | | 1.64% | |
| Oth.anim. Products | | | | | | | | | |
| Crop-interm. inputs | | | | | | -0.05% | | -0.05% | |
| Milk compound feed | | -1.67%* | -1.67%* | | | 1.07% | | 1.07% | |
| Beef compound feed | | -0.98%* | -0.98%* | | | 0.96% | | 0.96% | |
| Other compound feed | | -2.95%* | -2.95%* | | | 2.77% | | 2.77% | |
| Manioc | | | | | | | 0.72% | 0.72% | |
| By products | | | | | | 0.33% | -4.30% | -1.90% | |
| Other energy rich | | | | | | | 0.40% | 0.40% | |
| Soya-cake | | | | | | 0.19% | -1.44% | -1.21% | |
| Corn gluten feed | | | | | | 0.33% | -1.30% | -1.28% | |
| Rape and sunflower | | | | | | 0.34% | -1.31% | -1.20% | |
| Other cakes | | | | | | 0.29% | -1.30% | -1.06% | |
| Skim milk powder | | | | | | -0.14% | 0.88% | -0.10% | |
| Other protein rich | | | | | | 0.03% | -1.48% | -1.22% | |
| Other cost | | | | | | 0.15% | 1.77% | 0.27% | |
| Energy | | | | | | 0.15% | 1.78% | 0.23% | |

(* endogeneous price charge)

ANNEX III : Effect of a 10 percent Grain price cut. (Quota on Milk and Sugar)

| | SBP Prices changes LWH (percent) | | | | Quantity changes (percent) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ag. Sector | | Feed Pr. Sect | | Ag. Sector | | Feed Pr. Sector | Ag + Feed Pr. Sector | |
| | Supply | Demand | Supply | Demand | Production | Use | Use | Total use | Production - use |
| Wheat Durum | | | | | 2.14% | -0.50% | 0.00% | -0.41% | 2.16% |
| Wheat soft | -10.00% | -10.00% | | -10.00% | -7.86% | 8.21% | 11.45% | 9.72% | -15.76% |
| Barley | -10.00% | -10.00% | | -10.00% | -7.86% | 8.70% | 11.78% | 9.46% | -35.90% |
| Grain Maize | -10.00% | -10.00% | | -10.00% | -7.86% | 9.20% | 11.38% | 10.84% | -85.99% |
| Other Cereals | -10.00% | -10.00% | | -10.00% | -7.86% | 6.95% | 12.53% | 7.67% | -47.24% |
| TOTAL CEREALS | | | | | -7.86% | 8.37% | 11.52% | 9.71% | -25.77% |
| Dry-Pulses | | | | | 2.98% | -0.94% | -0.79% | -0.82% | -6.30% |
| Sugar Beet | -2.56%* | -2.56%* | | | 0.00% | | | | |
| Oilseed | | | | | 2.69% | | | | 2.69% |
| Green-Fodder | -1.48%* | -1.48%* | | | 0.99% | 0.99% | | 0.99% | |
| Oth-Field crops | | | | | 2.69% | -0.49% | | -0.49% | 2.81% |
| Olives | | | | | 0.02% | | | | 0.02% |
| Wine | | | | | 0.02% | | | | 0.02% |
| Oth. Permanent crops | | | | | 0.69% | | 0.00% | 0.00% | 0.69% |
| Beef Meat | | | | | 1.60% | | | | 1.60% |
| Milk | -2.33%* | -2.33%* | | | 0.23% | 2.09% | | 2.09% | |
| Pork | | | | | 4.80% | | | | 4.80% |
| Sheep and Goat | | | | | 2.10% | | | | 2.10% |
| Poultry | | | | | 4.60% | | | | 4.60% |
| Eggs | | | | | 4.05% | | | | 4.05% |
| Oth.anim. Products | | | | | 2.01% | | | | 2.01% |
| Crop-interm. inputs | | | | | | -2.51% | | -2.51% | |
| Milk compound feed | | -1.67%* | | -1.67%* | | 0.77% | | 0.77% | |
| Beef compound feed | | -0.98%* | | -0.98%* | | 1.67% | | 1.67% | |
| Other compound feed | | -2.95%* | | -2.95%* | | 3.71% | | 3.71% | |
| Manioc | | | | | | | 1.54% | 1.54% | |
| By products | | | | | | -1.07% | -3.90% | -2.44% | |
| Other energy rich | | | | | | | 1.19% | 1.19% | |
| Soya-cake | | | | | | -0.76% | -0.80% | -0.79% | |
| Corn gluten feed | | | | | | -1.04% | -1.14% | -1.14% | |
| Rape and sunflower | | | | | | -1.22% | -1.13% | -1.10% | |
| Other cakes | | | | | | -1.00% | -1.15% | -1.13% | |
| Skim milk powder | | | | | | 1.42% | -0.06% | 1.08% | |
| Other protein rich | | | | | | 1.38% | -0.76% | -0.39% | |
| Other cost | | | | | | -0.34% | 2.34% | -0.15% | |
| Energy | | | | | -0.34% | 2.34% | -0.21% | | |

(* endogeneous price charge)