FOOD AND AGRICULTURAL POLICY RESEARCH INTSITUTE
AT THE
UNIVERSITY OF MISSOURI
101 S. 5TH STREET
COLUMBIA, MO. 65203 – USA
WWW.FAPRI.MISSOURI.EDU

MODELING THE EUROPEAN UNION AGRI-FOOD SECTOR

An Update On the FAPRI Approach

Robert E. Young II and Patrick W. Westhoff

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ABSTRACT

The paper reviews the status of efforts by the Food and Agricultural Policy Research Institute (FAPRI) to model EU and world agriculture. FAPRI has developed multi-market, structural, dynamic, non-spatial, partial equilibrium models of international agricultural markets for use in preparing market projections and conducting policy analysis. An experimental model for the grain, oilseed, livestock, and dairy sectors solves for quantities and prices in France, Germany, Italy, the United Kingdom, and the European Union as a whole. Further work to disaggregate additional countries is also underway. The paper provides discussion on the theoretical basis for the model, a brief description of selected model parameters and demonstrates the model responsiveness to changes in country specific yields, suckler cow quotas and the Euro exchange rate. It concludes with comments on the Berlin Accord and the implications thereof from a policy and analytical standpoint.

Keywords: econometric modeling, agricultural trade, grains, oilseeds, livestock, dairy, European Union, Berlin Accord.

BACKGROUND

The Food and Agricultural Policy Research Institute or FAPRI, is a joint institute between the University of Missouri and Iowa State University with linkages to three other universities in the United States and with the Republic of Ireland and the United Kingdom. It has also participated in a long-term project in Japan and has conducted training programs for a number of African countries.

FAPRI was established in 1983 in order to provide quantitative, objective, non-advocacy analysis of policy options to decision makers. This mission statement has remained the keystone of the organization since it's founding. The group will not initiate a policy option, nor will it provide recommendations on policy alternatives. It will strive to provide the best analysis of the consequences of a policy option, regardless of who is asking the question.

The group has been heavily involved in conducting analysis of options for the United States congress in the 1985, 1990 and 1996 farm bills – as well as nearly every other piece of commodity program legislation in between and since. Staff from the unit regularly testify before Congress or provide briefings to members and staff in more informal settings.

The analysis effort is based on a large scale, partial-equilibrium econometric model of the world agricultural sector. This modeling system has been in place in various forms for the past 16 years. Initially this modeling system included wheat, maize, and soybeans. It has since been expanded to include global markets for rice, barley, sorghum, sugar, meats, and dairy products.

In general, this system consists of a set of country or regional models with linkages established across countries, commodities, and time. Thus, changes in corn production in one country due to weather or policy shifts affect feed grain prices in another country and filter through to the livestock sector in still another country, with acreage, demand and food prices adjusting through time. Currently, this system includes 24 commodities in 29 countries and/or regions.

It should be made clear from the beginning that these models are in a near constant state of evaluation, adjustment and re-estimation. As new data becomes available, policies change, or the performance of a particular component of the model fails to perform adequately, the various equations are examined and modified where appropriate. The unit uses these models in an operational mode, not only for policy analysis, but also to develop a long-term, constant policy outlook for the sector. This long-term outlook is discussed in more detail in the FAPRI 2000 World Agricultural Outlook and the FAPRI 2000 United States Agricultural Outlook. Both are available on-line at WWW.FAPRI.MISSOURI.EDU. This places the various model components in a situation where they are regularly tested, in concert with the rest of the modeling system, as to the adequacy of their response - adequacy being a somewhat relative term in this case.

The structural econometric models that make up the system are both estimated and synthetic. Macro-economic factors such as interest and exchange rates, economic growth rates and population or various manufacturing producer price indicies are exogenous to the system. These are typically taken from the WEFA Group, a private economic forecasting firm, or from Project LINK, the global economic outlook effort by the United Nations. Johnson, Meyers, Westhoff and Womack (1989) give a review of the sensitivity of earlier versions of the modeling approach to changing economic conditions.

Historically, the member countries of the European Union have been treated as one block. Given the nature of their joint markets, agricultural policies, and trade agreements, this approach probably made sense. FAPRI at Iowa State operates a global model that includes this European block. Why worry about intra-European Union trade if it is not required?

The Berlin Accord on reform of the Common Agricultural Policy (CAP) however, probably places at least some member countries, for some commodities, in a position where trade with third-country parties may be possible without facing export constraints. Further, the potential expansion of the European Union requires that some work be performed on individual countries prior to their entry. Thus, it was a significant advantage to the Institute when the opportunity arose to interact closely with various institutions in the Republic of Ireland as well as with Queens University – Belfast.

In early 1998, FAPRI-Missouri undertook the task to try to disaggregate the European Union's agricultural sector. This has led to the development of an experimental modeling system, the European Union Grains, Oilseeds, Livestock and Dairy models (EU-GOLD) which covers the wheat, barley, maize, rapeseed, soybean, sunflower, beef, pigmeat, poultry, sheepmeat, milk, cheese, butter, skim milk, and whole milk powder sectors. Country-level estimates of production, consumption, stocks, trade, and prices are provided for France, Germany, Italy, and the United Kingdom with the rest of the European Union treated as a single block. While this model is still in an experimental mode, it is fully operational and was used in 1999 to conduct an analysis of the Berlin agreement. Further work is underway in the summer of 2000 to separate Ireland from the 'rest of Europe' block, as well as exploratory efforts to split out Spain as well.

This paper provides an overview of the FAPRI global modeling system in general and the EU-GOLD modeling system in particular. Finally, output of the EU-GOLD model with respect to the Berlin agreement is provided as an example of the systems policy analysis capabilities. The paper should very much be seen as a work in progress and not as a completed product. As discussed, effort is now underway to split out additional countries as well as continued examination of the underlying parameters incorporated in the model.

For a typical crop commodity the model includes three to four types of demand equations. These include retail demand, derived demand, stock-holding behavior and trade equations.

- Retail demand for direct human consumption categories, with QDH_{it}^{x} as the quantity of good i demanded for human use in country x, in time t, P_i the price of good i, P_j the price of a competing good j where j may range from 1 to n, Y, the real per capita income level and Z representing a number of other factors which may influence human consumption of the product;

$$QDH_{i,t}^{x} = F(P_{i,t}^{x}, P_{j,t}^{x}, Y_t^{x}, Z_t^{x})$$

- Derived demand for grains, oilseeds or fibres. As an example consider the feed demand, which represents the derived demand for either grains or oilseed products by the livestock sector where QDP_i is the quantity of good i for feed use, P_i and P_J as before, ANNUM an index or other measure of the numbers of animals, PAN the price of those animals and Z again representing various other factors;

$$QDP_{i,t}^{x} = F(P_{i,t}^{x}, P_{j,t}^{x}, ANNUM_t^{x}, PAN_t^{x})$$

- Stock holding demand, with particular attention paid to government policies where there is either significant government stock involvement or where there is interaction between government and commercial stockholding behavior, is expressed mathematically as QDS, the quantity of good I held for storage, P_i is as before with PGOV representing the appropriate government policy variable, QS the supply of the good for the respective year, QI the imports and QP the production of the same good. Lowry, Glauber, Miranda and Helmberger (1987) discuss the issue of storing crop commodities

$$QDS_{i,t}^{x} = F(P_{i,t}^{x}, PGOV_{i,t}^{x}, QDS_{i,t-1}^{x}, QS_{i,t}^{x}, QS_{i,t+1}^{x})$$
$$QS_{i,t}^{x} = QP_{i,t}^{x} + QDS_{i,t-1}^{x} + QI_{i,t}^{x}$$

- Export demand for the major exporters or import demand by importers is generated by solving the various individual country models for a given world price;

$$QDE_{i,t}^{x} = QP_{i,t}^{x} + QDS_{i,t-1}^{x} + QDI_{i,t}^{x} - QDH_{i,t}^{x} - QDP_{i,t}^{x} - QDS_{i,t}^{x}$$

- The world for each of the commodities is closed in one of the major exporting countries, usually the United States, but for products such as rice Thailand is used;

$$QDE_{i,t}^{THAI} = \sum_{x} (QI_{i,t}^{x} - QDE_{i,t}^{x})$$

- The "world price" is then generated by solving the system of equations for the country used to close the world as the solution to the standard market clearing equation, recognizing that each of the various supply and demand equations for that country include this price;

$$QDH_{i,t}^{US} + QDP_{i,t}^{US} + QDP_{i,t}^{US} + QDE_{i,t}^{US} + QDS_{i,t}^{US} = QP_{i,t}^{US} + QI_{i,t}^{US} + QDS_{i,t-1}^{US}$$

THE EUROPEAN MODEL

As is the case in every country or region incorporated in the FAPRI modeling system, specific adjustments to these general equation specifications are applied in particular countries. Policy variables play an important role in European agriculture, and as such, occupy a significant amount of effort in the EU-GOLD system. Further, quotas also affect the size of the suckler and dairy herds making provisions for these policies also important.

A word on data sources is also important when considering the EU-GOLD model. At this point in time, data on production and consumption needed to operate the model come from the United States Department of Agriculture, Economic Research Service's PS&D View data set. The conference where this paper is being presented, clearly indicates there are other data sources available. Further, the PS&D View data will often conflict with some of that reported by EuroStat. The PS&D View data was selected in part because of completeness as well as the effort made by those involved in maintaining the data set to ensure internal consistency. For the most part, supply equals demand in the PS&D View data, implying that staff there has gone through a set of assumptions or other data adjustments to bring it into conformance. Further, the same data set is used to drive much of the other work by FAPRI modelers in their global effort, thus supply and demand are not only equal in Europe, but to the maximum extent possible on a global basis. That being said, there is great interest on the part of FAPRI researchers to shift to other more local data sources, when such sources have been well identified, available and shown to be fairly consistent.

The general provisions of the model will be discussed by sector – grains/oilseeds, livestock and dairy. Detail on the French model is provided throughout as an example of the specifics of some of the equation specifications.

It should also be noted that the EU-GOLD model currently operates with synthetic equations. In other words, the parameters incorporated are based on assumed elasticities, with the parameters generated to reflect those assumptions. Further, parameters needed to demonstrate other factors, such as biological lags or other fixed factors are also imposed. To move from this imposed set of parameters to statistically estimated behavioral and other technical parameters is an area of major interest.

THE GRAINS AND OILSEEDS MODEL

The amount of land devoted to production of various crops is strongly influenced by EU set-aside policies and compensation payments. The EU-GOLD model estimates crop area by means of a two-stage allocation process. First, the total area harvested for the three major cereals (wheat, barley, and maize) and three major oilseeds (rapeseed, sunflowers, and soybeans) is determined as a function of real expected returns and rates of compulsory set aside. The real expected return variables reflect a moving average of market prices, trend yields, and a portion of compensatory payments. The total area harvested equations in most countries are relatively inelastic with respect to market prices, but react strongly to changes in the compulsory set-aside rate. Voluntary set aside is implicit; one reason that estimated area harvested falls when prices fall is that lower market prices encourage more participation in voluntary set aside. Compensation payments have some impact on area harvested, but it is assumed that a one-unit change in per-hectare compensation payments will have a smaller effect on area harvested than a one-unit change in expected returns from the market. Again, part of the explanation lies with the voluntary set-aside program. Under the Berlin Accord, future payments for voluntary set-aside are the same as compensation payments for production.

If the voluntary set-aside program were open for all producers to idle as much land as they desired, it could be argued that future compensation payments would be largely decoupled from production, and thus should have little effect on area harvested. Limitations on the voluntary set-aside program mean that compensation payments will continue to have a significant effect on producer planting decisions.

The second stage of the area allocation process determines the share of total area devoted to each crop as a function of relative expected returns from the market. Again, once the Agenda 2000 reforms are fully implemented, compensation payments per hectare will be the same across these six crops, thus the compensation payments should have a minimal effect on the share individual crops obtain of total area harvested.

Using the French model as an example, the 3-grain area harvested short-run elasticity on the adjusted average gross returns is 0.05, with the long-run elasticity at 0.10. Further, the elasticity on the set-aside rate is –0.09, with a one-hectare increase in oilseed area reducing the 3-grain planted area by 0.5 hectares. Within the specific grains, the elasticity on the ratio of the maize and barley adjusted gross returns to the average gross returns for the 3-grains is one in both equations. The set-aside rate also appears in the maize and barley acreage equations, preferentially affecting barley over maize plantings. Further, the coefficients on set-aside in the maize and barley equations reflect the behavior of the set-aside affecting barley first, wheat second and maize plantings least. Wheat area is then determined as the residual share after accounting for maize and barley.

*Table 1 - Implied Short-Run Grain Area Elasticities for France**

	Wheat	*Barley*	*Maize*	*Rapeseed*	*Sunflower*	*Soybean*
Wheat	0.25	-0.09	-0.13	-0.01	-0.005	-0.005
Barley	-0.30	0.41	-0.06	-0.01	-0.005	-0.005
Maize	-0.32	-0.07	0.45	-0.01	-0.005	-0.005
3-Grains	0.03	0.01	0.01	-0.01	-0.005	-0.005

* -- Long run elasticities are roughly twice the short-run elasticities shown.

As in the global FAPRI model, feed demand in the EU-GOLD model is a function of livestock production and feed prices. For each of the feeds covered in the model (wheat, barley, maize, soybean meal, rapeseed meal, and sunflower meal), a livestock index is created. The contribution of each livestock type to the index depends on assumed levels of feed efficiency and ration shares. Parameters are adjusted so the index matches reported feed demand in a recent year. While this livestock index is one argument in the model's feed demand equations, prices of the various feeds are also included so ration shares can change as these relative prices change. Symmetry is imposed on model coefficients, however, own-price elasticities are slightly larger in absolute terms than the sum of the cross-price elasticities. This means that a proportional reduction in the price of all six feeds would result in a modest increase in demand for each of the feeds, implying some substitution away from other feeds not explicitly incorporated in the model, or in the reverse, an increase in the price of all feeds will result in a reduction in the overall feed use.

Table 2 – French Feed Demand Direct and Cross Price Elasticities

Price\Quantity	*Maize*	*Barley*	*Wheat*	*Soymeal*	*Sunmeal*	*Rapemeal*
Maize	-0.85	0.29	0.20	0.04	0.08	0.07
Barley	0.20	-0.95	0.14	0.03	0.05	0.05
Wheat	0.40	0.40	-0.61	0.11	0.23	0.20
Soymeal	0.04	0.04	0.06	-0.48	0.66	0.57
Sunmeal	0.01	0.01	0.02	0.08	-1.47	0.17
Rapemeal	0.01	0.01	0.02	0.08	0.20	-1.20

Again, the French model gives an example of this approach. Table 2 gives the direct and cross real price elasticities for feed use of the various products. The large direct elasticities for sun and rape meal reflect the relative size of those commodities in terms of the total protein meal consumption in the European Union.

Equations determining ending stocks reflect both commercial stock holding and intervention agency behavior. When market prices exceed intervention levels, the model assumes a modest elasticity of demand for commercial stock holding (-0.5 to –1.0), along with other traditional terms related to adjustment models and pipe-line approaches to commercial stocks.. When prices fall to intervention levels however, the elasticity of demand for stocks is assumed to be much larger. Stock levels rise rapidly when prices fall below intervention, thus ensuring that market prices never fall too far below intervention prices. There does however, remain some slope to the stock equation, even at prices below intervention.

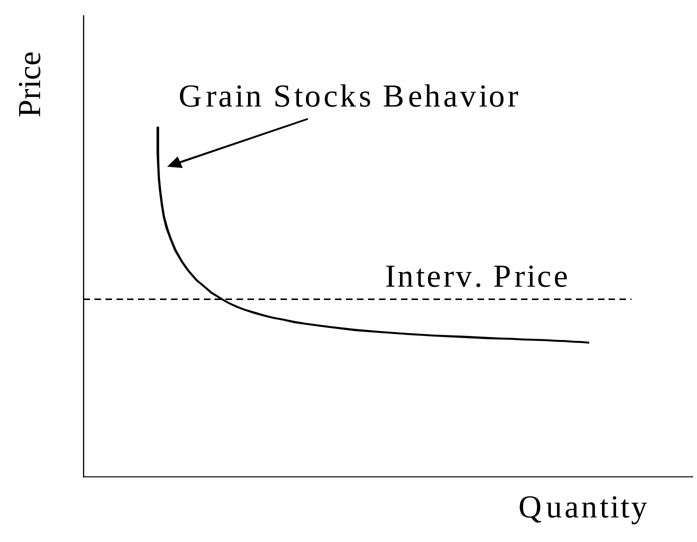

Figure 1 -- Conceptual Behavior of Grain Stock Equation

LIVESTOCK SECTOR

As with crops, EU beef supplies are strongly influenced by policies. Suckler cow quotas play a strong role, just as dairy cow numbers – and thus the calves produced by those dairy cows – are strongly affected by dairy quotas. Inventories of suckler cows and other cattle are affected by a variety of payment schemes. In the EU-GOLD model, suckler cow inventories depend on cattle market prices, feed and other input prices, suckler cow payments, suckler cow payment quotas, and payments for other cattle.

Parameters in the typical suckler cow inventory equation vary depending on the relationship between suckler cow inventory levels and suckler cow payment quotas. If inventories far exceed the quota, it implies that many producers are holding cows that are ineligible for suckler cow payments. In such a case, model parameters reflect the notion that market prices have a major effect on marginal production decisions, while suckler cow payments are largely irrelevant. In contrast, if inventories are near the payment quota, it may imply that few producers are willing to hold animals ineligible for payments. In this case, model parameters indicate that the payments and payment quotas have a major influence on marginal production decisions, while the effect of market prices is muted. Table 3 gives the long-run elasticities at various herd sizes relative to the suckler quota levels for France. The short-run elasticities would be roughly one-fourth the size suggested for the long-run.

Table 3 -- Long-Run Suckler Cow Elasticities for France

	90% of Quota	*100% of Quota*	*110% of Quota*
Cattle Price	0.80	0.40	0.80
Suckler Quota	0.00	0.40	0.00
Suckler Payment	0.48	0.24	0.00
Beef Payment	0.10	0.05	0.10

In addition to cattle price deflated by an endogenous feed price index and the size of the suckler cow quota – adjusted for the relation between cow numbers and the size of the quota, the suckler cow inventory equation also includes factors dealing with the size of the dairy herd. This accounts for some of the competition between beef and dairy cows for the same forage input. Further, the equations also incorporate information on the male bovine premium as this also provides financial incentive to hold suckler cows.

For the most part, other equations determining livestock and meat sector supply and demand follow the structure used in the global FAPRI modeling system. Where data permit, the model estimates different categories of slaughter (e.g., cow, calf, and other cattle slaughter; sow and other hog slaughter) separately. Model equations reflect investment behavior, as well as accounting for the biological nature of the various livestock sectors. For example, cattle slaughter may actually decline in the short run in response to a price increase, as producers hold back heifers to add to the breeding herd.

Meat demand is handled conventionally, with demand for each meat product a function of its price, the prices of other meats, and income levels. Assumed demand elasticities are relatively low (own-price elasticities typically range from –0.2 to –0.3). The current version of the model uses producer prices to drive both supply and demand. One possible enhancement would be to shift to retail prices for demand equations.

DAIRY SECTOR

Given the current structure of EU dairy policy, milk production in most member states is largely determined by milk quotas. The model reflects this fact, allowing output and input prices to have only a modest effect on milk supplies. In Italy, the influence of the quota level on milk production is assumed to be weaker than in the other modeled countries. Milk production per cow is assumed to increase in line with historical trends, with some variation depending on prices and quota levels. As a result, for a given level of quota, milk cow numbers tend to fall over time in most countries. Model equations are not intended to handle large deviations from current dairy policies. In order to examine a major change in dairy price or quota policy, it would be necessary to modify the current model equations.

The EU-GOLD model handles milk allocation so as to ensure both milk fat and protein balances are preserved. Milk production determines the total supply of fat and protein, given assumed technical parameters that are allowed to change over time. Fat and protein are allocated to various uses depending on relative product values (e.g., more protein will be allocated to cheese, all else equal, when cheese prices increase relative to milk powder prices). Assumed technical coefficients convert the component allocations into estimates of cheese, butter, skim milk powder, and whole milk powder production. This is also an area where continuing input would be of great help.

Fluid milk prices are modeled as a function of product prices, with weights depending on production levels. Given a set of product prices, then, the amount of milk allocated to the drinking milk market is determined where fluid milk price intersects the demand curve. The model assumes that the fat content of drinking milk is declining over time in most countries.

TRADE AND PRICES

In the EU GOLD model, net export supply for each country is simply the difference between domestic supply and demand. Likewise, the net export supply for the European Union as a whole is equal to the sum of the net export supplies for the member states, which in turn is also equal to the difference between domestic EU supply and demand.

The problem is that EU net export supply at a given set of domestic market prices may not be consistent with the likely demand for EU exports at those prices. In the model, a net export demand function is specified for each commodity. These functions generally consider three different types of factors that can affect the demand for EU exports.

1. European Commission's desire to export surpluses. The Commission may wish to encourage exports with the use of export subsidies in order to support market prices and avoid accumulation of intervention stocks. In the model, the Commission's demand to export products is a function of exportable supplies and the relationship between domestic and world prices. When world market prices increase relative to domestic prices, per-unit export restitutions decline, which is assumed to lead to greater exports, all else equal.

2. World Trade Organization (WTO) restrictions. The Uruguay Round agreement limits quantities that can be exported with subsidies and requires that minimum access commitments be met for imports. The model does not permit net EU exports to exceed the amounts suggested by the agreement unless EU market prices fall to world market levels.

3. Commercial export opportunities. The European Union already exports a number of products without the use of export subsidies (e.g., pork and certain cheeses). Model

equations make the demand for EU exports more elastic when EU prices fall to levels that allow unsubsidized exports, i.e., when domestic EU prices fall to levels prevailing for like products in world markets. In many cases, EU products may not be perfect substitutes for the products exported by other countries, so it is not assumed in the model that the demand for EU exports ever becomes perfectly elastic at the prevailing world price.

Equilibrium prices are those that bring EU export supply and export demand into balance. The model solves for French market prices, but prices in all other EU countries are linked to those French prices. The price linkage equations also consider relative self-sufficiency ratios in France and in the country in question. Thus, if the self-sufficiency ratio falls in a given country, that country's price will rise relative to the French price. If the model were shocked by reducing supply in one country, the result would be higher prices across the European Union, with the sharpest price increase in the country experiencing the supply shock.

When operated in stand-alone fashion, the EU-GOLD model uses reduced-form equations to estimate the response of world prices to changes in EU net exports. This allows the model to mimic the behavior of a global modeling system that recognizes that the European Union is a "large" trading bloc that can affect world market prices.

MODEL APPLICATION

To give an example of model performance, three shocks are discussed, a boost in French wheat yields, an increase in suckler cow quotas and a strengthening of the Euro. These will provide an indication of the reaction of the model to weather, policy and macroeconomic shocks as an indication of the overall responsiveness of the system.

Under the French yield increase, all other factors are held constant, including the yields in other member countries. This serves as an increase in wheat supplies in France, relative to Germany, the United Kingdom, Italy and the other member countries. With a 10% increase in French yields, EU wheat production is expected to rise by 3.7 million metric tons (mmt) in the first year. This in turn reduces French wheat prices by just over 2%, with German wheat prices dipping by only 1.5%. The EU average wheat price is also expected to decline by 1.5%. Of the increase in production the first year, 1.7 mmt is expected to move into export markets, lowering the world price for wheat by a similar 1.5%. Feed utilization of wheat is expected to rise by 0.3 mmt, with the remaining 1.7 mmt of increased production moving into stocks. In the subsequent year, EU wheat area is expected to decline overall by just under 0.5% as a result of the lower wheat price.

With the increase in wheat feed use, barley and maize feed utilization is expected to decline. This increase in overall grain supplies and the reduction in the utilization of barley and maize is expected to lower the price for these other grains – slightly less than 1%. This shift in relative prices then is anticipated by bring a modest increase in barley and maize plantings in the follow-on year. The livestock sector is also expected to react, albeit marginally, to the change in feed costs. The biggest effect for poultry occurs in the same year as the yield increase, with the pork sector showing the largest change in the second year and beef in the third.

The suckler cow quota increase begins by assuming a 1% rise in the quota. The increase in quota is assumed to begin in year 1. Given biological lags and inventory timing, there is no response in the first year, but one year after the increase suckler cows have filled nearly 40% of the increased quota, and are expected to capture nearly 100% of the quota increase by the following year. The increase in beef production that follows the rise in suckler cow numbers translates to lower prices for beef, in turn, reducing the incentive to hold suckler cows. This results in a modest decline in suckler cow numbers so that in the long-run, roughly 80% of the quota increase is filled.

In the beef market, the initial rise in suckler cows reduces the number of animals available for slaughter. Consequently, in the initial and subsequent year, beef production actually declines relative to conditions without the increase in quota. By the third year, however beef production is very nearly equal to the pre-quota increase level and should be 0.2% above pre-quota increase levels by

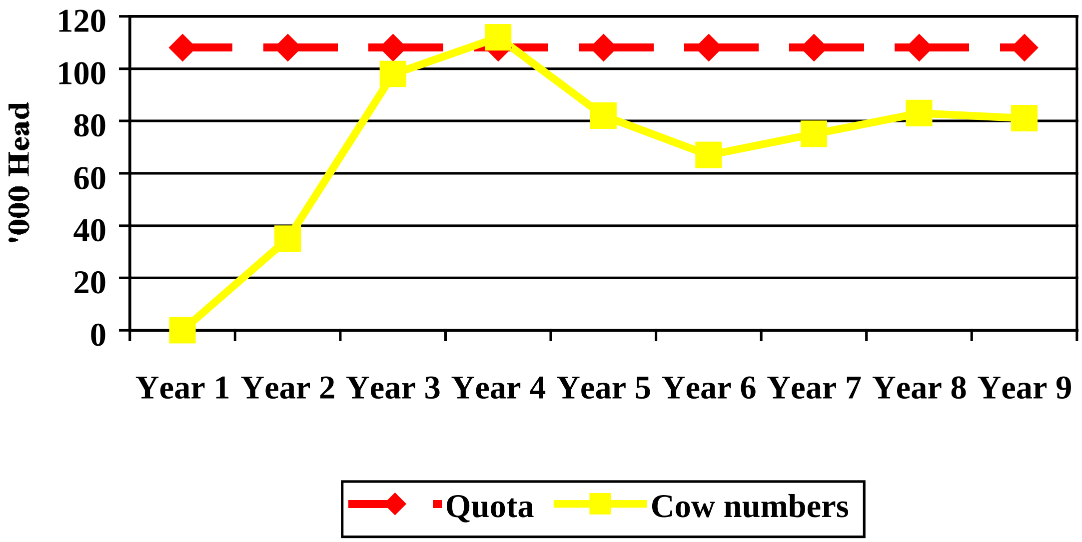

Figure 2 -- Beginning Suckler Cow Inventory Under Change in Quota Scenario

the fourth year and subsequently hold near that point in the long-run. Recall that a large portion of beef production comes from the dairy herd and not only from the suckler herd, thus the difference in beef production relative to the change in the suckler cow quota. There are modest cross-price effects associated with the other meats due to the increase in beef production. Beef prices are expected to soften by 0.6% in the long-run, after actually increasing modestly in the first two years due to the modest reduction in beef supplies. Hog prices in percentage terms, for example, are anticipated to dip by only one-sixth the amount of the decline in beef prices.

As commented on earlier, the euro at less than par to the dollar places the Union in a much different position than would be the case if the euro was trading at a 10-20% premium to the dollar – a situation many analysts thought would be the case at the euro's introduction. The model suggests that a 10% strengthening of the euro would reduce wheat and barley exports by roughly 4%, with cheese exports declining by nearly 5%. Internal prices for wheat would be expected to fall by 7%, barley and maize by 5%, with cattle, hogs and milk prices dipping by 3, 4 and 2% respectively. In addition, the lower feed prices would likely be sufficient to offset the decline in livestock prices, thereby stimulating additional livestock production.

CONCLUSIONS

Again, the FAPRI EU-GOLD model, like any operational econometric model, should be viewed as a work in progress and not a finished product. It will continue to undergo revision, update and reform as additional data or other information becomes available.

From an operational standpoint however, the model is in place and capable of providing input into the policy development assessment process. It played this role during the discussion leading up to the recent Berlin Accord. Results of those analyses have been reported in Young, Westhoff, Adams, Brown and Womack (1999) and Westhoff and Young (1999). The former includes discussion of the early proposal, as well as the effects of the proposal on world trade. The later looks at the final version of the Accord.

Compared to a baseline extending the earlier CAP provisions, the Berlin accord is expected to reduce prices for most of the targeted commodities. In the case of wheat, the drop in prices is not expected to fully reflect the adjustment in intervention support as world market prices should provide a floor to prices before the full decline is realized. For beef, the adjustment in price is expected to moderate the growth in production, while at the same time, stimulating additional domestic utilization. This combination should result in a significant decline in beef stocks and may place the Commission in a position where their export subsidy decisions will be critical in determining the price of beef in the domestic market. Overall beef prices should become closer to world prices adjusted for quality concerns, but will still remain somewhat above those world levels. This should give some opportunity for commercial exports of beef however, as the full provisions of the reform implemented. The dairy sector is essentially unchanged during much of the coming years. In the short run, the increase in production quota for the targeted countries should down-side pressure on prices as the additional supplies will need to be dealt with. The full increase in production quotas are not expected to be realized in actual production levels as some countries, such as Italy, will likely use the quota increase to deal with past production growth. The expansion of quotas to the full set of member states in later years, coupled with the reduction in intervention price supports will likely result in price reductions that fully reflect the intervention cut.

The analysis indicates at least three issues. First, it clearly reflects the importance of Commission action on policy implementation, particularly when internal EU prices are close to world levels or when markets are close to equilibrium without intervention. This is particularly demonstrated in the case of beef as the analysis suggests that internal price adjustments will be much less than the full decline in intervention, if the Commission provides for the full WTO allowed level of beef export subsidies. In short, the Commission, by operating at the margin, will be able to have a significant impact on internal beef prices. This may also be the case for the wheat sector as prices after intervention support reduction should be close to world market levels. This would allow the European Union to export wheat on a commercial basis, thus eliminating the need to restrict exports.

Second, the analysis also suggests the importance market exchange rates play in determining the effects of the world market on European agriculture. The recent weakness of the euro has placed the Union in a much different position than anticipated by many with the euro's introduction. The weak Euro has brought internal EU prices much closer to world price levels. This is a critical assumption for the future of policy implementation in the Union.

Third, the interaction of European agricultural markets with the rest of the world indicates the importance of having a world model capable of linking to an European Union analysis system. In many respects, the European Union is not a 'small-country' in terms of its effects on the world market. Consequently, knowing the extent to which the rest of the world will adjust to changes in

European export levels is critical in knowing the extent to which European market prices will adjust, or the extent to which the rest of the world will react to surges in European Union agricultural products.

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