European Dairy Industry Model

IMPACT OF DECOUPLING AND QUOTA TRADE ON THE FRENCH AND GERMAN DAIRY SECTORS

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Abstract

This paper analyses the impacts of the 2003 CAP reform and of milk quota trade at the national level. To this end, a mathematical programming model has been further developed for Germany and extended to other main milk-producing EU member states like France. Homogeneous farm groups are built on the basis of EU Farm Accountancy Data Network. The results show that quotas will be fully used in both countries if quota trade is possible. A clear tendency in the reallocation of production from small towards large farms can be seen in all regions for France. In Germany, the redistribution of direct payments induced by the implementation of the regional scheme of decoupled payments leads to higher reductions of income in dairy & beef farms than in France.

Keywords: 2003 CAP reform, milk quota trade, model, mathematical programming

1 Introduction

The reform of the CAP in 2003 induced a radical shift in common agricultural policy, and especially the milk sector will be affected due to a reform of the milk market organisation including the full decoupling of the milk premium. This study looks at the respective effects in the two main milk producing countries in the EU, namely Germany and France. The study focuses on the assessment of impacts on milk production as well as on farm income, covering different price scenarios and the hypothetical option of milk quota trade at the national level. The comparative-static farm group model EU-FARMIS is used for a quantitative evaluation of the impacts. First, the German and French dairy sectors are portrayed briefly, including the current system of milk quota transfer. Further, the national implementation of the reform of the CAP (2003) in Germany and France is described. In the subsequent section, the FARMIS-EU model, the respective data base, the modelling of milk quota transfers and the scenarios are outlined. The results follow in the third section, focussing on the respective dairy sectors. A brief summary and conclusions round off the paper.

1.1 Milk production

In Germany, the farm size distribution of dairy farms differs between the East and West as a result of different historical developments. In Eastern Germany, large farms and holdings (average farm size 156 cows in 2001) predominate. Since 1991 (former data was not available) the number of farms decreased by about 21 % from 6 500 to 5 132 in 2003. In Western Germany dairy farming, especially in the South, is based on family farms. The average farm size in Western Germany (29 cows per farm in 2001) is significantly smaller than in the East. Since 1971 the number of dairy farms in West Germany decreased by about 80 % from 711 064 to 116 392 in 2003 (Statistisches Jahrbuch ueber Ernaehrung Landwirtschaft und Forsten, diverse volumes).

In **France**, the main cow milk producing regions are Brittany, the Loire and the Normandy. In addition, the production of sheep and goat milk is important. The latter is mainly located in Poitou-Charentes and sheep's milk is mainly produced in the Midi-Pyrenees. Altogether, milk production in France is rather balanced over the regions compared to other European countries. The average farm size was 35 cows per farm in 2001 (ZMP, 2004) whereby the distribution over the size classes shows a high degree of concentration in the medium size classes (10-50 cows per farm). Since 1990, the total

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number of dairy farms decreased by about 50 % from 226 610 to 113 930 farms in 2003 (Eurostat, 2005).

1.2 Milk quota system

In Germany, at the beginning of the milk quota regime the milk quota was attached to land and transfer of quota was only possible in combination with land transfer. The possibility of leasing milk quota was introduced in 1990/91. This was based on leasing contracts between the firms. In 1992/1993 milk quota transfer without land was introduced. In April 2000 the domestic milk quota system was fundamentally reformed. The transfer of quotas based on leasing contracts is no longer possible (however, existing contracts retain their status and can be even prolonged until at least 2008). The milk quota transfer system is now based on a regionalised auction system. There are 21 trading zones based on NUTS I or, in two cases, based on NUTS II level, and the transfer is restricted to these trading zones (Bailey, 2002; Deutscher Bauernverband, 2005). A small part of the transferred milk quotas are siphoned off for the national reserve, and can be reallocated by the young farmers programme or in the case of hardship.

In France, milk quotas are linked to land (consolidated in 1996 by the French government) that means milk quota is distributed according to the areas used for milk production. In the case of transfer of milk quota (gift, sale, inheritance) the new owner has to prove that milk production in the firm continues and that quota received has not been previously allocated to him/her in another holding (Bailey, 2002). In 1995, siphons on milk quota transfer were introduced. There is a 10 % siphon on a merger with less than 200 000 kg and a 40 % siphon on a merger with more than 200 000 kg. The released quota goes to the Department's reserve to be used for new entrants or young farmers. The redistribution of the reserved quota is carried out at Department level without charge to young farmers depending on the number of farm workers, the producer's quota and the location of the respective farm. As a result, this regulation makes it easier for young farmers in France to receive milk quota from the national reserve than in Germany. Each farm has a fixed ceiling of the amount of quota they receive in line with the Department's policy for agriculture. This levy was introduced to limit the growth of farms and to avoid the concentration of milk quotas. Another objective was to enhance structural change by the removal of very small herds. However, in practice, this siphon acts the other way around and keeps small producers in the dairy business (Bailey, 2002).

1.3 The reform of the CAP in 2003

France and Germany took rather divergent paths for national implementation of the reform. For Germany, the implementation of the 2003 CAP reform will lead to fully decoupled payments. After a transition period where a dynamic hybrid model is implemented, the level of payment entitlements will be based on regional references, leading to regionally uniform entitlement levels for all eligible land in 13 regions in 2013. For France, decoupled payments are based on farm individual historical references. Using the option of partial decoupling, premia for suckler cows and slaughter premium for calves in total remain coupled. Furthermore, 40 % of the slaughter premia, 50 % of sheep and goat premia, and 25 % of the payments for arable crops remain coupled. The special beef premium and the milk premium will be fully decoupled. France opted for partial decoupling because it wanted to prevent the abandonment of agricultural land in mountainous and other disadvantaged regions. As suckler cow production is of special importance in these regions, it was decided to leave the suckler cow premium fully coupled (Lambert 2005, Meyer 2004).

2 Methodological approach

In the following sub sections, a short overview of model structure, database, target year projections and scenario assumptions is given.

2.1 Model structure and database

EU-FARMIS is an extension of the farm group model FARMIS, a comparative-static process-analytical programming model, representing the German agricultural sector based on the German Farm Accountancy Data Network (FADN). Within two EU funded research projects of the 6th

Framework Programme[2], the model has been and is still further developed and extended to other EU Member States using the EU-FADN as the main source of data.

The core of FARMIS is a standard optimisation matrix which contains 27 main activities of crop and 15 activities of livestock production in the current version. The matrix restrictions cover the areas of feeding (energy and nutrient requirements, calibrated feed rations), intermediate use of young stock, fertiliser use (organic and mineral), labour (seasonally differentiated), crop rotations, and political instruments (e.g., set-aside, quotas). Key elements of the model, like the generation of farm groups, the generation of input-output coefficients, the model calibration and the target year projection are described in the following. More detailed descriptions can be found in Jacobs (1998), Osterburg et al. (2001), Bertelsmeier et al. (2003), Bertelsmeier (2004) and Offermann et al. (2005).

Part of the information needed to define the coefficients for the activity-based optimisation matrix is directly available from the farm accounts, e.g., production levels, physical yields and corresponding output prices. Activity-specific input coefficients, however, generally need to be generated as the respective information in the farm accounts is aggregated. To this end, in the first step input coefficients like fertiliser, fodder, and machinery are set based on a normative approach. Based on information from farm management handbooks, the use of input factors of each process is determined either in relation to yields (e. g., input of feed or fertiliser) or in relation to structural characteristics (e. g., use of machinery).[3] In a second step, these normative input coefficients are adjusted according to corresponding monetary accounts in the accounting data of the respective farm group. This is trivial in cases of single inputs and corresponding farm accounting data, resulting in a simple correction factor. The consistency problem gets more complex when more coefficients have to be matched with a single account. It is especially complex if model coefficients are in physical units, like fodder or fertiliser, and data provided in the farm account is of monetary nature. Cross-Entropy estimators (Golan et al. 1996) are used in this case, which allows the inclusion of prior information about the unknown parameters (a detailed description can be found in Offermann et al. 2005).

A positive mathematical programming procedure (see, e.g., Howitt 1995, Heckelei 2002) is used to calibrate the model to the observed base year levels, with non-linear terms standardised to external elasticities (details of the approach are described in Bertelsmeier, 2004). In the linear part of the objective function, farm income[4] minus (opportunity) costs for land and labour, as well as the interest on borrowed capital, is maximised.

Usually FADN data of at least two consecutive years are used in order to enhance the stability and significance of the results. For the underlying analysis, only data from 2002 is used, because basic statistical data required for the re-calculation of aggregation factors was not yet available at the EU level.

2.2 Generation of farm groups

FARMIS uses farm groups rather than single farms to ensure the confidentiality of individual farm data, but also to increase manageability and increase the robustness of the model system in the face of data errors which may exist in individual cases. Homogenous farm groups are generated by the aggregation of single farm data, using a stratification tool which allows for a flexible aggregation (Gocht 2004). Standard stratification criteria for the establishment of farm groups are region, farm type (field crops, milk, grazing livestock, permanent crops, pigs and poultry, horticulture) and farm size (criteria for size depend on farm type, e.g., size of field crop farms refers to ha UAA). Generally,

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[2] EDIM (European Dairy Industry Model) and GENEDEC (A quantitative and qualitative assessment of the socio-economic and environmental impacts of decoupling of direct payments on agricultural production, markets and land use in the EU).

[3] For this study, supplementary data came from the *Office National Interprofessionnel des Viandes* (OFIVAL) and AGRESTE (2002) for France and from the KTBL for Germany.

[4] Farm income here refers to net value added. Costs of fixed factors have to be covered irrespective of whether they are owned by the farmer or not.

stratification of farm groups is flexible and can be adjusted depending on the specific policy to be analysed.

For confidentiality reasons, the aggregation of EU-FADN data to farm groups requires the aggregation of at least 15 farms per farm group. This restriction can lead to some problems with respect to farm group representativeness and/or homogeneity. Taking into consideration the data availability in the EU-FADN, the following criteria were used to aggregate farm groups for Germany and France:

- **Region** is based on FADN regions (16 FADN regions for Germany, 19 FADN regions for France).
- **Farm type** is based on the A30 variable in the EU FADN grouping grazing livestock (ANI), arable farms (CCR), pigs and poultry (PIG) and mixed farms (MIX).
- **Farm size** for grazing livestock farms depends on the number of dairy cows in the respective farm group (0 cows; >0-25 cows; 25-50 cows; 50-70 cows; 70-90 cows; >90 cows).

Using these criteria for the stratification of 2002 FADN data, there are 108 farm groups for Germany and 114 farm groups for France.

2.3 Implementation of milk quota trade in the model

The exchange of milk quota between farms via quota trade has been integrated in the model as a rental market where farm groups act in defined trading zones (e.g., NUTS I or national level) (Bertelsmeier 2004). The marginal rate of return of milk production, compared to the quota price, is the decision criterion to lease in or to lease out milk quota. In the model, the existing equation restricting milk production Y_n^{milk} to own milk quota b_n^{milk} for each farm group was extended to allow quota leasing $QUOTTRADE_n$ (Equation 1). The sum of the activities leasing in and leasing out must be in balance to ensure that the quota available in the trading zone is not exceeded (Equation 2).

$$Y_n^{milk} \leq b_n^{milk} + QUOTTRADE_n \quad \forall\, n \tag{1}$$

n = indices of farm groups

$$\sum_w QUOTTRADE_w = 0 \quad \left[\pi_w^{quot}\right] \text{ for all trading regions} \tag{2}$$

w = indices of farm groups in trading region

In the projection part of the model, either a simultaneous or an iterative optimisation of the farm groups is used for modelling quota trade in the target year, depending on the number of farm groups that have to be optimised in a trading zone. The simultaneous optimisation used for small trading zones (NUTS II) allows direct competition of farm groups for available quota in a defined region. The equilibrium price equals the shadow price π_w^{quot} of the regional balance restriction (see Equation 2). For computational reasons, the iterative procedure is used when trading regions are large as in the case of analysing milk quota trade at the national level. Following the underlying algorithm, after each iteration an adjustment of the quota price is made depending on the ratio of used quota to total regional quota, until milk production equals the regional quota (unless the quota price is zero if the quota is not fully utilised).

For the calibration step, milk quota prices need to be externally specified, ideally based on observed values where possible. The calibrated model will then reproduce these prices if run for the base year. For this study, for Germany, the rental prices for milk quota were derived from the regional purchase prices for milk quota observed at the regional quota auctions in Germany. Prices from the respective auctions were used and transformed to leasing prices taking into account depreciation and

interest. In France, there is no official leasing market. Hence, regional quota rents estimated by Cathagne et al. (2005) were used for the calibration step. To exclude depreciation in the calibration step, quota rents based on short-term cost functions were used. To attain consistency to the cost specifications in FARMIS, these regional quota rents were adjusted using labour costs of FARMIS, resulting in farm individual quota rents. Additionally, interest and maintenance costs were not considered in the calibration step.

2.4 Implementation of decoupling

Decoupling is implemented in the model by the extension of the objective function and the introduction of constraints limiting the number of entitlements for each farm group. In the case of the Single Farm Payment scheme implemented in France, the number and level of entitlements is determined according to the Regulation (EC) No 1782/2003 based on individual farm group areas and milk quota in the base year, taking into account partial decoupling. In the case of the Regional scheme implemented in Germany, the number of entitlements is established for each farm group based on the total UAA in the base year excluding permanent crops, while the regional level of the payment entitlements is externally determined based on projections from the Federal Ministry of Consumer Protection, Food and Agriculture (2005).

While Modulation is not taken into account for Agenda 2000, it is included in the scenarios based on 2003 CAP reform. However, the use of these funds is not modelled. Cross compliance is not considered in the model except for the restriction that entitlements can only be activated on land which fulfils minimal requirements regarding land management[5].

2.5 Scenario assumptions and target year projections

For the model calculations in this study, the base year is 2002 and the projection is done for the target year 2013. For France as well as for Germany several scenarios based on the respective national implementation of the 2003 CAP Reform are analysed. To better assess the impacts of decoupled payments in the target year, a reference scenario with coupled payments was also analysed, representing the situation in the target year 2013 which would have been realised if no changes had been made to the Agenda 2000 package. Compared to the base year 2002, all important elements of the policy scenarios like respective reductions of intervention price for milk, beef and cereals, modulation and adjustment of direct payments and the milk quota increase by 1.5 % were implemented.

Model exogenous variables not defined in the policy scenario are projected for the target year. Two types of exogenous variables can be distinguished:

- Variables which are assumed to develop independently of the policy scenario, e. g., yields and most input prices, and which are usually projected to the future based on observed trends in the past.
- Variables the development of which may depend on the policy scenario, e. g., product prices, and which are forecasted by the use of other models available at the FAL (Bertelsmeier et al. 2003).

Prices of factors like energy and buildings were projected based on trends estimated for Germany because country specific estimations of trends were not available. Labour input for dairy cows is currently reduced by 1.9 % per year (1.6 % for other livestock activities) to reflect technical progress, based on an analysis of time series data from the German national FADN. Milk yield per cow is projected to increase by 2.1 % annually. The developments of resources and capacities like family workers are projected based on trends, too, and availability of family labour is projected to decline in both countries.

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[5] Land has either to be agriculturally used or managed according to minimal requirements e.g., mulching.

Price responses to the modelled impacts on quantities were estimated using GAPsi, a partial equilibrium model developed and maintained by the Institute of Market Analysis and Agricultural Trade Policy of the FAL. Farm gate milk price was projected to decline by 12.75 % in the Agenda 2000 scenario and by 17 % with 2003 CAP Reform, compared to base year values. As some uncertainty with respect to the transmission of intervention price decreases for butter and skimmed milk powder to farm gate milk prices remains, for the 2003 CAP Reform a worst case scenario with milk price decline of 25 % is additionally analysed.

For all scenarios, we also looked at the potential effects of an introduction of free trade of milk quota at the national level. Table 1 provides an overview of the scenarios analysed.

Scenario name	**Agenda_2000**	**Agenda_2000_QT**	**CAP_reform**	**CAP_reform (Mp-25%)**	**CAP_reform_QT**	**CAP_reform_QT (Mp-25%)**
Political framework	Agenda 2000	Agenda 2000	2003 CAP Reform	2003 CAP Reform	2003 CAP Reform	2003 CAP Reform
Milk price vs. base year 2002	-12.75 %	-12.75 %	-17 %	-25 %	-17 %	-25 %
Milk quota trade	without	quota trade at national level	without	without	quota trade at national level	quota trade at national level

Table 1. Overview about scenarios.

3 Results

While the modelling approach is undertaken for the whole agricultural sector, the following presentation of results focuses on the German and French dairy sector. Main points to be presented are impacts of decoupling and of milk quota trade on milk production and farm income.

3.1 Impacts on allocation of milk production

The economic conditions of milk production will change in the future due to reduction of intervention prices for butter and skimmed milk powder and the partial compensation by a milk premium. With the 2003 CAP reform, a further reduction of intervention prices has been decided, accompanied by increasing milk premia, which must be fully decoupled from 2007 onwards at the latest. The full decoupling induces lower producer incentives prices, which might stimulate farm adjustments. Experts argue that milk producers will come under economic pressure (Hoffmann, 2004). Still, the model calculations indicate that in the target year 2013 milk production would only be reduced in a few farm groups even if quota was not tradable. The economic situation of milk production is stabilised by

- technical progress (increase of milk yield per cow) which is greater than for competing activities,
- reduced competitiveness of beef production due to decoupling and
- changing competitiveness in fodder production between formerly subsidised maize and other roughage fodder crops.

For the analysed milk price scenarios, in both countries total national quotas will fully be used with quota trade. Figure 1 shows changes of milk production in France and Germany with quota trade

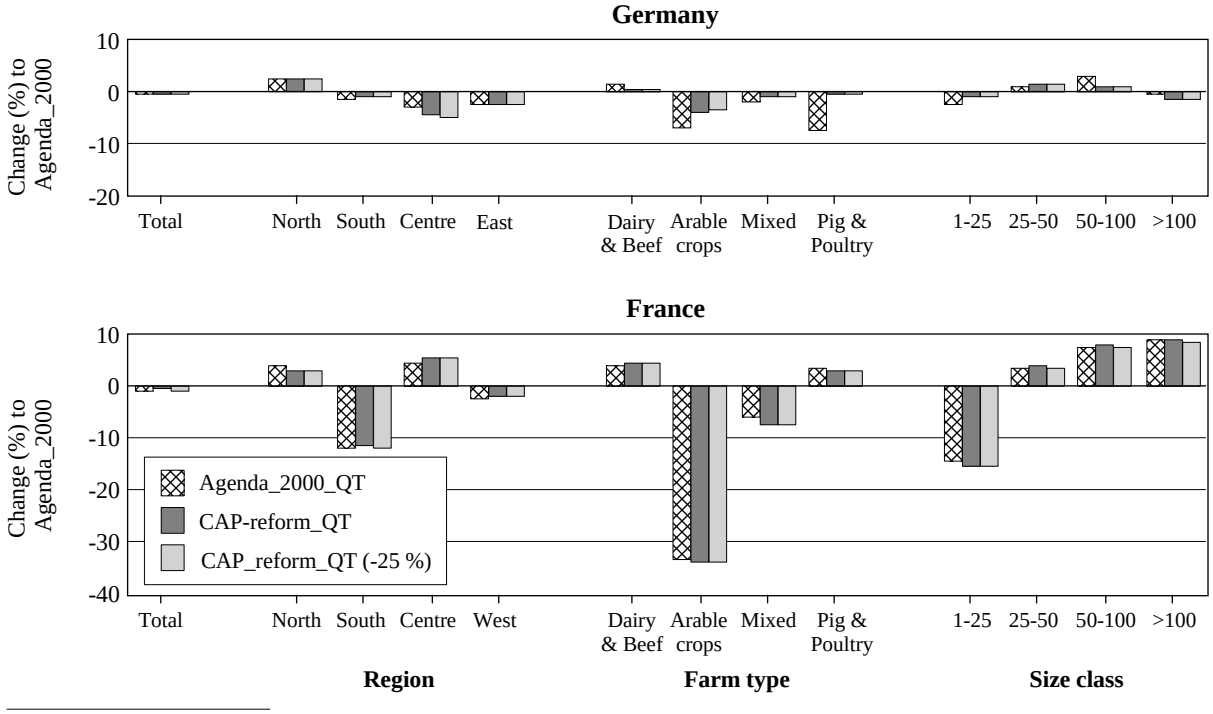
at the national level between regions[6], farm types and size of dairy stock. Main reallocation tendencies for **France** are

- from the South and West towards the North and Centre,
- mainly towards dairy & beef farms and
- from small towards larger farms.

Changes of milk production are almost the same for Agenda 2000 as well for 2003 CAP reform scenarios with different levels of milk price changes. The partial decoupling options chosen by France increase suckler cow production by up to 10 %, which induces a stronger competitive relationship against dairy production compared to the situation in Germany.

Main tendencies for **Germany** are

- the reallocation of milk production from the Centre and East towards the North, while milk production in the South remains rather constant,
- the reallocation from arable towards dairy & beef farms which is more pronounced under conditions of the coupled milk premium of Agenda 2000 and
- within dairy & beef farms, medium-sized farms extend their milk production, while the small and the large ones slightly reduce milk production.



Source: EU-FARMIS, FADN-EU-GD AGRI/G.3

[6] For France : **North**: 121 (Ile de France), 131 (Champagne Ardenne), 132 (Picardie), 133 (Haute Normandie), 135 (Basse Normandie), 141 (Nord Pas de Calais), 151 (Lorraine), 152 (Alsace); **South**: 192 (Rhône Alpes), 201 (Languedoc-Roussillon), 203 (Provence-Alpes-Côte), 204 (Corse); **Centre**: 134 (Centre), 136 (Bourgogne), 153 (Franche-Comté), 184 (Limousin), 193 (Auvergne); **West**: 163 (Bretagne), 164 (Poitou-Charentes), 182 (Aquitaine);

For Germany : **North**: 10 (Schleswig-Holstein), 30 (Lower Saxony), 50 (North Rhine Westphalia); **South**: 90 (Bavaria), 80 (Baden-Wurttemberg); **Centre**: 60 (Hesse), 100 (Saarland), 70 (Rhine Land Palatinate); **East**: 113 (Mecklenburg-Western Pomerania), 112 (Brandenburg), 114 (Saxony), 115 (Saxony Anhalt), 116 (Thuringia).

Figure 1. Change of milk production with quota trade.

The effects of quota trade are in Germany are comparably small. This is partly due to the fact that in Germany quota trade is already possible, at least on a regional scale. Thus, for the modelling, the regional milk quota markets were assumed to be in equilibrium in the base year. In France, with quota trade being severely restricted in the base year, the quota values for each farm group are determined based on modified econometric estimates, causing a larger variance of quota values between farm groups than for Germany. This in turn obviously increases the scope for gains from quota trade in France.

Changes in milk production differentiated by region and size class are shown in Table 1. In all regions of **France** there is a clear tendency to reduce milk production in small farms and to reallocate quota towards the larger ones. Besides that there are no significant differences between coupled premia under Agenda 2000 and decoupled milk premia under CAP reform 2003.

In northern **Germany** all farm groups are extending milk production whereby relative changes of the smaller ones are more pronounced under decoupling. In the South milk production will be reduced in the small and larger size classes, while farms with 25 to 50 cows increase production. In the regions Centre and East, a clear tendency in reducing milk production can be seen under decoupling. The reallocation of quota is influenced by several effects:

- The regional decoupling scheme with unified area based entitlements has some production linkages, because all of the agricultural area (except permanent crops) is needed for the activation of the entitlements.
- Cross compliance constraints with respect to the minimum requirements for land management favour extensive fodder production compared to fallow.
- Silage maize production in the South, where smaller farms predominate, was favoured by higher reference yields in the past, but will become less competitive under decoupling, while other fodder growing becomes more attractive. This reduces the competitiveness of bull fattening and increases the relative competitiveness of milk production.
- Last not least, the regional implementation will induce significant redistributions of direct payments in favour of extensive locations and production systems, while intensive beef and dairy systems will be affected negatively. Reduction of milk production in the larger dairy farms might be induced by economic pressure under the national implementation scheme. This will not be the case with the coupled premia under conditions of Agenda 2000, where quota from small size classes will be transferred especially to medium sized farms.

		Germany				France			
			Agenda_ 2000_QT	CAP_reform_QT -17 %	-25 %		Agenda_ 2000_QT	CAP_reform_QT -17 %	-25 %
Region	No. of cows	1000 tons	% of Agenda_2000			1000 tons	% of Agenda_2000		
Total		30 145				26 534			
North	1-25	1 046	*3.0*	*4.2*	*4.3*	464	*-2.3*	*-3.0*	*-3.3*
North	25-50	3 344	*1.8*	*3.0*	*3.4*	5 299	*4.6*	*3.4*	*3.3*
North	50-100	4 268	*4.1*	*1.7*	*2.0*	2 373	*8.0*	*7.4*	*7.2*
North	>100	1 373	*2.3*	*1.4*	*1.7*	488	*8.4*	*7.3*	*6.9*
South	1-25	3 712	*-2.5*	*-0.3*	*-0.6*	765	*-27.9*	*-27.6*	*-27.7*
South	25-50	4 571	*0.4*	*0.4*	*0.1*	1 288	*-6.7*	*-6.4*	*-6.7*
South	50-100	1 872	*0.8*	*-0.4*	*-0.6*	598	*0.8*	*1.7*	*0.3*
Centre	1-25	623	*-5.9*	*-6.0*	*-6.6*	805	*-6.6*	*-7.2*	*-6.9*
Centre	25-50	497	*-1.5*	*-2.2*	*-2.7*	1 878	*6.8*	*8.4*	*8.4*
Centre	50-100	618	*2.5*	*-0.9*	*-1.7*	980	*12.9*	*13.7*	*13.7*
Centre	>100	152	*-0.1*	*-2.0*	*-2.9*	30	*24.3*	*20.4*	*18.9*
East	1-25	20	*-10.2*	*-5.3*	*-4.5*				
East	25-50	75	*-8.2*	*-7.8*	*-7.5*				
East	50-100	286	*-5.2*	*-5.2*	*-5.2*				
East	>100	4 976	*-0.3*	*-1.4*	*-1.4*				
West	1-25					2 087	*-13.8*	*-15.5*	*-15.4*
West	25-50					5 227	*3.1*	*4.3*	*4.3*
West	50-100					2 561	*5.4*	*6.9*	*6.9*
West	>100					299	*7.8*	*9.7*	*9.7*

Source: EU-FARMIS, FADN-EU-GD AGRI/G.3

Table 2. Produced milk and change of milk production due to milk quota trade differentiated by region and size class.

Further CAP reform impacts in other sectors on production are briefly summarized (Kuepker et al., 2005):

- Cereals, food oilseeds and protein crops will be reduced. Maize for silage will be substituted by other arable fodder crops. Despite the partial decoupling of 25 % of arable crop premia in France, the changes in production are almost the same as in Germany with full decoupling, except that non-food oilseeds and 'bare' set aside will increase in Germany and only slightly increase in France.
- Bull fattening will decline by about 15 % in both countries. Suckler cow numbers will be reduced in Germany, but slightly increased in France due to the coupling of the special premium for suckler cows.

3.2 Income effects of the 2003 CAP reform

The 2003 CAP reform includes several different elements which affect farm income. On the one hand, the decoupling of direct payments increases the freedom of farmers with respect to their decision making and positive income effects can be expected. On the other hand, measures are introduced which will influence the levels and distribution of income. Direct payments are reduced via modulation and the financial backflow will have a less positive income effect than direct payments themselves[7]. Milk price changes will influence income effects as well. Another aspect is the significant redistribution of direct payments caused by the regional implementation of decoupling in Germany.

Income effects of the 2003 CAP reform (without quota trade) in France and Germany are shown in Table 3, differentiated by farm types, regions and the size of dairy & beef farms. The analysed scenarios cover milk price changes of -17 and –25 %, which translates to milk price reductions of 4.25

[7] Also, the use of finances from modulation by, e.g., the extension of agri-environmental programmes is not yet included in the model.

and 12.25 %-points compared to the Agenda 2000 scenario. The income indicator used here is the Farm Net Value Added (FNVA).

Income effects in **France** are as follows:

- With low milk price changes there will be a slight increase of income by 0.34 %, and for milk price changes of 25 %, the sector income will decrease by 3.2 %.
- Income effects between farm types vary in a relatively small range of -0.8 % for 'dairy & beef' farms and 1.6 % for arable farms with low milk price changes. With higher milk price changes dairy & beef as well as mixed farms will have significant income losses of 8.6 and 6.5 % respectively.
- The variation of income effects by regions is in the same magnitude.
- There is no clear trend of income effects due to the size of dairy stock under terms of a low milk price decline. A strong milk price decline leads to income losses for large dairy farms of up to 19 % in the Centre.

Income effects in **Germany** are quite different. At first, slightly negative income effects can be expected even under favourable milk price development. Due to the redistribution of direct payments by the regional implementation, where the total of decoupled premia are transformed into unified but regionally differentiated area based entitlements, dairy & beef as well as mixed farms are negatively affected, while arable farms will profit especially due to windfall profits in the sugar sector.

Due to the redistribution of premia, income effects vary by the size of dairy stock. The following effects under a favourable milk price development are expected:

- Small sized dairy & beef farms will have moderate income effects, varying between +/- 2% in most of the regions. Farms with low beef and dairy density will profit from premia redistribution, others by higher beef prices projected for these scenarios (East 0-25 cows).
- Income losses increase with the size of dairy herd, reaching 11 % in the three regions of the West and 6 % in the East.

In the scenario with 25 % lower milk prices, the income of the sector will decline by 7 % and is more than twice as high as in France. Dairy & beef farms will suffer through high income losses of 16 % on average, varying from 10 and 26 % between the size classes in the Western regions and +/-17 % in the East.

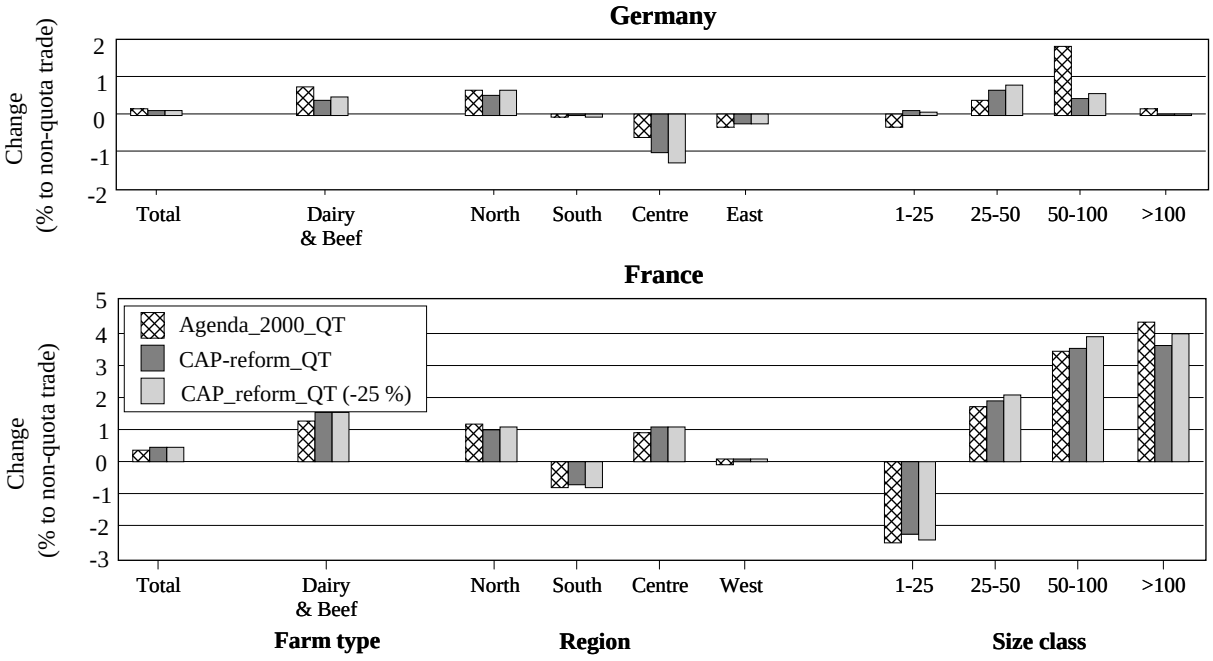
		Germany		France	
		CAP_reform		CAP_reform	
		-17 %	-25 %	-17 %	-25 %
		% to Agenda_2000		% to Agenda_2000	
Total		-0.2	-7.0	0.3	-3.2
... by farm types					
Dairy & Beef		-2.8	-16.1	-0.8	-8.6
Arable crops		2.9	1.4	1.6	1.0
Mixed		-2.6	-11.9	0.7	-6.5
Pig & Poultry		1.1	1.0	0.0	0.0
... by regions					
North		-0.2	-5.9	0.5	-4.7
South		1.6	-7.1	1.6	-1.5
Centre		0.5	-6.5	-1.6	-4.2
East		-2.3	-8.7		
West				0.8	-2.5
... by size of dairy stock					
1-25		0.9	-9.6	-0.2	-7.1
25-50		-2.2	-15.9	0.0	-11.6
50-100		-7.0	-21.2	-0.3	-12.5
>100		-6.7	-18.6	1.0	-12.9
... by regions and size of dairy stock					
North	1-25	-1.2	-10.4	0.5	-10.4
North	25-50	-2.9	-14.5	1.1	-9.0
North	50-100	-7.2	-20.9	1.5	-13.5
North	>100	-9.6	-22.6	0.4	-14.5
South	1-25	2.1	-8.8	-1.8	-8.6
South	25-50	-1.9	-17.2	-0.8	-15.2
South	50-100	-7.6	-22.1	-1.0	-16.0
Centre	1-25	-2.5	-12.9	-1.9	-7.4
Centre	25-50	1.0	-15.1	-2.5	-15.4
Centre	50-100	-5.2	-20.6	-2.1	-16.7
Centre	>100	-11.3	-26.9	1.1	-18.8
East	1-25	33.9	16.8		
East	25-50	6.2	-15.6		
East	50-100	-5.1	-20.6		
East	>100	-5.9	-17.4		
West	1-25			1.2	-5.9
West	25-50			-0.4	-12.8
West	50-100			-0.9	-10.3
West	>100			1.9	-10.4

Source: EU-FARMIS, FADN-EU-GD AGRI/G.3

Table 3. Impacts of 2003 CAP reform on income (FNVA).

3.3 Partial income effects of quota trade

With the 2003 CAP reform, the rental values for milk quota decrease by about 3 ct/kg for 17 % lower milk prices and 5.5 ct/kg for 25 % lower milk prices. Changes of absolute values in Germany and France are almost the same. Income effects of quota trade compared to the respective scenarios without quota trade are shown in Figure 2. The income indicator shown here is based on the FNVA plus the costs for leasing additional quota or the income from lending quota.



Source: EU-FARMIS, FADN-EU-GD AGRI/G.3

Figure 2. Effects of milk quota trade on Farm Net Value Added plus quota costs.

For **Germany** total income is projected to increase by around 11 mio. Euro or 0.1 %. Dairy & beef farms will have positive income effects of 0.4 %. Dairy size classes of 25-50 and 50-100 cows will profit the most. Contrary to expectations negative income effects are indicated for those regions where quota transfers towards other regions are important. This result must be seen in the light of the income indicator used here, which doesn't account for changes in the level and the costs of fixed factors, e.g., land and labour.

Partial income effects of quota trade in **France** are about 0.34 % and therefore higher than for Germany. The total sectoral income effect is about 60 mio. Euro. Income effects for dairy & beef farms, between regions and size classes are more pronounced than in Germany.

The quota trade contributes to a better allocation of production factors. However, in the model calculations reported here, the income effects of quota trade are much smaller than income effects of the CAP reform and especially those which are due to the national implementation of decoupling. For the interpretation of these results it needs, however, to be taken into account that endogenous structural change and the option of a complete cessation of milk production, both of which could lead to higher volume of quota trade, have not been modelled.

4 Summary and conclusions

Within the EU research project EDIM, a farm group model based on FADN data is further developed and applied for CAP scenarios analysis, focussing on the analysis of CAP reform including decoupling and trade of milk quota at the national level. The model is applied for Germany and France; farm groups are selected based on EU-FADN data. The disaggregation of farm groups is, however, limited by the rather large FADN regions and the minimum number of farms required for each group, and therefore regional quota trade cannot be modelled. The level of specification of quota rent in the model is one of the sensitive points which might also influence the model results with regard to supply and reallocation of quota between size classes of farms.

The model results show that despite lower milk prices and the decoupling of direct payments, milk production will only be reduced in a few farm groups in the target year 2013. The total quota will fully be used if quota trade is possible at the national level. The economics of milk production are stabilised by considerable technical progress and the reduced competitiveness of competing activities.

In France, quota will be transferred from small towards larger farms. This tendency also holds for Germany under conditions of coupled milk premia (Agenda 2000). This trend is somewhat reduced with the 2003 CAP reform, due to the redistribution and the production linkages of direct payments under the national scheme via unified area based entitlement. Income effects are influenced by decoupling and milk price development. Low milk prices induce significant negative income effects. Income effects in France are more balanced between farm types. The redistribution of direct payments within the German scheme of decoupling causes negative income effects for dairy & beef as well as mixed farms. Compared to the effects of the 2003 CAP reform, partial income effects of quota trade are relatively low.

Following this first application, it is intended to apply the model for other main milk producer countries of the EU. Further model developments are planned with regard to implementing structural change.

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