IMPACT OF PHASING OUT MILK QUOTAS ON STRUCTURE AND PRODUCTION OF FINNISH DAIRY SECTOR

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Paper prepared for presentation at the 107th EAAE Seminar *"Modelling of Agricultural and Rural Development Policies"*. Sevilla, Spain, January 29th -February 1st, 2008

Abstract

We evaluate impacts of milk quota abolition in Finland where production costs and producer price of milk are among the highest in the EU. We analyse several price scenarios for dairy products corresponding to 10-30% reductions in raw milk prices in the EU following milk quota expansion of 2% per year. The sector model includes 18 dairy products and regions and other agricultural activities. Armington -assumption is used in modelling foreign trade. Trade of milk quotas and structural change are endogenous in the model.

The results suggest that 10-15% reductions in the EU milk prices would result in less than 10% decrease in Finnish dairy production. Investments to large farm units would still increase. However, if the EU milk prices decreased by 15-20% production would fall by 10-22%. Overall it seems that milk quota abolition is not likely to result in any drastic downscaling of dairy sectors in Finland.

Key words: Milk quotas, EU, milk production, dairy product processing, farm size, investments

1. Introduction

Milk quota system has been considered in Finland as an important part of the Common Agricultural Policy of the EU which supports agriculture in less favoured areas. It has been in the interests of Finnish farmers that EU milk quota system has been kept in place despite the fact that quotas have constrained dairy production and caused significant costs for dairy farmers in many EU countries.

We evaluate the impacts of milk quota abolition on Finnish dairy sector where production costs, as well as the producer price of milk, are among the highest in the EU. The self-sufficiency rate of dairy products varies between 110–130%, partly due to the milk quota system. Any changes in the EU and Russian markets or in quota system may have large impacts on Finland. Dairy product prices have increased rapidly in the EU and world markets during 2007. Positive market prospects could increase the likelihood of relatively small decrease in dairy product and raw milk prices due to milk quota abolition. Our initial hypothesis is that the relative position of Finland as milk and dairy product producer will become weaker when milk quotas do not constrain production in the EU. However, if market demand remains strong, milk quota abolition would ease structural change and investments to large farms also in less favoured areas such as Finland where also national support are paid. region-specific price support of 3–9 c/litre was paid in 2007. If such support remains, as well as public supports for investments, it is possible that milk quota abolition may not drive down Finnish dairy production.

First, we outline the price scenarios following milk quota abolition at the EU dairy markets based on literature review. Then we make assumptions influencing the development of dairy production in Finland. The dynamic sector model used in the analysis is presented. We then present the main results and conclusions.

2. Material and methods

2.1. Scenarios of dairy product prices at the EU level

Earlier European studies on milk quota phase-out report larger reductions for butter and milk powder prices compared to cheese and fresh products. On that basis we construct several sets of consistent price scenarios of dairy products which correspond to 10-30% reductions in raw milk prices in the EU (Table 1). We assume expansion of milk quotas by 2% per year in 2011-2020 which in fact makes milk quotas irrelevant in 1-2 years in Finland which currently produces 3% under the quota. The prices of EU dairy products thus start to decline in 2011 in all scenarios.

Table 1. Generalised EU level price scenarios for dairy products constructed using the research results of Bouamra-Mechemache ym. 2007; Bouamra-Mechemache & Requillart 2000 and Colman 2002.

Scenario	Raw milk	Butter	SMP	WMP	Cheese
Baseline - milk quotas in place	-6,5% change from 2002/2003 level	-23,5 %	+5,9 %	-6,0 %	+1,0 %
Scenario 1: milk quotas are expanded 1 % per year	-14,5 % from the baseline (-20 % from 2003/2004 level)	-19,3 % (-38,3 % from 2003/2004)	-7,4 % (-1,9 % from 2003/2004)	-7,7 % (-13,2 % 2003/2004)	-8,1 % (-7,2 % 2003/2004)
Skenaario 2: milk quotas are expanded 2 % per year	-18,3 % (-23,6 % from 2003/2004)	-23,5 % (-41,5 % from 2003/2004)	-10,1 % (-4,8 % from 2003/2004)	-10,1 % (-15,5 % from 2003/2004)	-10,4 % (-9,5 % from 2003/2004)
Skenaario 3: milk quotas are expanded 2 % per year, strong EU supply	- 24 % (- 30,6 % from 2002/2003 level 0,266 eur/litre	-24,1 % - baseline 2,715 eur/kg	-25,5 % - baseline 1,757 eur/kg	-27,4 % - baseline 2,378 eur/kg	-10,5 % baseline average 2,685 eur/kg

2.2. Other assumptions

We assume the demand for dairy products to stay relatively strong, i.e. we assume 2006 EU price level to remain if milk quotas were kept in place until 2010. However we assume cereals prices to sustain at the level which is 35 % higher than the average price level in 2001-2005, until 2020. We assume beef and pork prices to remain at 2006 level whereas poultry meat price remain 10% higher than 2006 until 2020. These price predictions are consistent to OECD-FAO Agricultural Outlook 2007–2016 published in July 2007.

Prices of inputs of agricultural production is assumed to increase by 1.8% per year, on the average in 2007-2020.

Concerning the trade of milk quotas we assume the current three distinct trade areas (A-B; C1-C2, C2P-C3-C4; see Fig. 2) to remain in place. In other words, the trade of milk quota is not free in the entire country but take place within the three distinct areas.

National payments per litre of milk (3-9 c/litre) is unchanged, as well as other support payments for agriculture.

2.3. DREMFIA sector model

General features

The dynamic regional sector model of Finnish agriculture (DREMFIA) is a dynamic recursive model simulating the development of the agricultural investments and markets from 1995 up to 2020. The model consists of two main parts: (1) a technology diffusion model which determines sector level investments in different production technologies; and (2) an optimization routine simulates annual price changes (supply and demand reactions) by maximizing producer and consumer surplus subject to regional product balance and resource (land and capital) constraints. The major driving force in the long-term is the module of technology diffusion. However, if large changes take place in production, price changes, as simulated by the optimization model, are also important to be considered.

Contrary to comparative static models, often used in agricultural policy analysis, current production is not assumed to represent an economic equilibrium in the DREMFIA model. The endogenous investments and technical change, as well as the recursive structure of DREMFIA model implies that incentives for changes in production have implications on production gradually in subsequent years, i.e. all changes do not take place instantaneously. The current situation in agricultural production and markets may include incentives for changes but these changes cannot be done immediately due to fixed production factors and animal biology. Hence, the continuation of current policy may also result in changes in production and income of farmers. However, the production in DREMFIA model will gradually reach a long-term equilibrium or steady state if no further policy changes take place.

Four main areas are included in the model: Southern Finland, Central Finland, Ostrobothnia (the western part of Finland), and Northern Finland. Production in these is further divided into sub-regions on the basis of the support areas. In total, there are 18 different production regions. This allows a regionally disaggregated description of policy measures and production technology. The final and intermediate products move between the main areas at certain transportation cost. The most important products of agriculture are included in the DREMFIA model. Hence, the model provides a complete coverage of land use and animal production, which compete on production resources with dairy production. A more detailed description of model can be found in Lehtonen (2001, 2004).

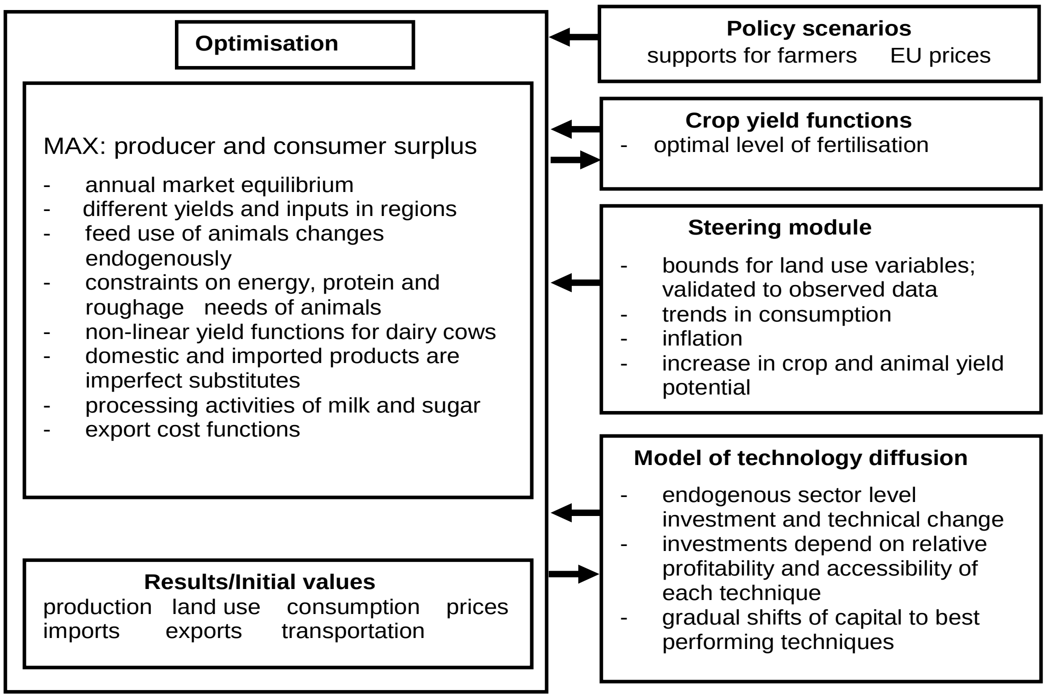

Figure 1. Basic structure of the sector model DREMFIA. Investment model simulates structural change. Risk aversion using mean-variance approach is implemented for cereals and oilseeds.

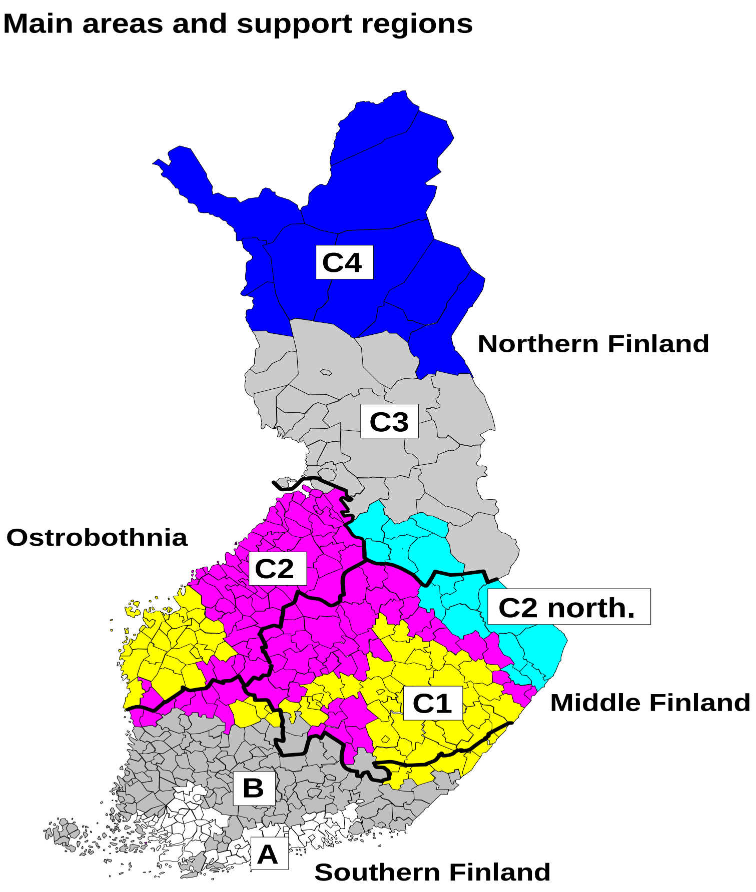

Figure 2. Regional disaggregation on DREMFIA model; four main regions which are divided in 18 production regions, in total.

The model of technology diffusion

The purpose of the technology diffusion sub-model is to make the process of technical change endogenous. This means that investment in efficient technology is dependent on the economic conditions of agriculture such as interest rates, prices, support, production quotas and other policy measures and regulations imposed on farmers. Changing agricultural policy affects farmers' revenues and the money available for investment. Investment is also affected by public investment supports. The model for technology diffusion and technical change presented below follows the main lines of Soete & Turner (1984). The choice of this particular diffusion scheme is further motivated in Lehtonen (2001).

Let us assume that there is a large number of farm firms producing a homogenous good. Different technologies with different production costs are used and firms can be grouped on the basis of their technology. The number of technologies is N. Each technology uses two groups of factors of production, variable factors, such as labour (L), and fixed factors, such as capital (K). A particular production technique is labelled α. The rate of return on capital for firms using the α technique, under assumption of fixed exogenous input prices (w), is

$$r_\alpha = \frac{Q_\alpha - wL_\alpha}{K_\alpha}. \qquad (1)$$

The surplus available for investment—$Q_\alpha - wL_\alpha$ (Q_α is the total revenue on the α technique)—is divided between all firms using the α technique. $f_{\beta\alpha}$ is the fraction of investable surplus transferred from α technique to β technique. This transfer will take place only if the rate of return on the β technique is greater than the rate of return on the α technique, *i.e.* $r_\beta > r_\alpha$. The total investable surplus leaving α technique for all other more profitable techniques is

$$\sum_{\beta : r_\beta > r_\alpha} f_{\beta\alpha} \sigma r_\alpha K_\alpha , \qquad (2)$$

where $\sigma < 1$ is the savings ratio (constant). To make the model soluble, a form of $f_{\beta\alpha}$ has to be specified. Two crucial aspects about diffusion and adaptation behaviour are included: first, the importance of the profitability of the new technique, and secondly, the risk, uncertainty and other frictions involved in adopting a new technique. The information about and likelihood of adoption of a new technique will grow as its use becomes more widespread with a growth in cumulated knowledge of farmers.

To cover the first point, $f_{\beta\alpha}$ is made proportional to the fractional rate of profit increase in moving from technique α to technique β, *i.e.* $f_{\beta\alpha}$ is proportional to $(r_\beta - r_\alpha)/ r_\alpha$. The second point is modelled by letting $f_{\beta\alpha}$ be proportional to the ratio of the capital stock in the β technique to the total capital stock (in a certain agricultural production line), *i.e.* K_β/K. If β is a new innovation then K_β/K is likely to be small and hence $f_{\beta\alpha}$ is small. Consequently, the fraction of investable surplus transferred from α to β will be small. Combining these two assumptions, $f_{\beta\alpha}$ can be written as

$$f_{\beta\alpha} = \eta' \frac{K_\beta}{K} \frac{(r_\beta - r_\alpha)}{r_\alpha}, \qquad (3)$$

where η' is a constant. A similar expression can be written for $f_{\alpha\beta}$. The total investment to α technique, after some simplification, is

$$I_\alpha = \sigma r_\alpha K_\alpha + \eta(r_\alpha - r)K_\alpha = \sigma(Q_\alpha - wL_\alpha) + \eta(r_\alpha - r)K_\alpha \qquad (4)$$

where r is the average rate of return on all techniques. The interpretation of this investment function is as follows. If η were zero then (4) would show that the investment in the α technique would come entirely from the investable surplus generated by the α technique. For $\eta \neq 0$ the investment in the α technique will be greater or less than the first term, depending on whether the rate of return on the α technique is greater than r. This seems reasonable. If a technique is highly profitable, then it will tend to attract investment and conversely if it is relatively less profitable, investment will decline.

Assuming depreciations, the rate of change in capital invested in α technique is

$$\frac{dK_\alpha}{dt} = [\sigma r_\alpha + \eta(r_\alpha - r) - \delta_\alpha]K_\alpha, \qquad (5)$$

where δ_α is the depreciation rate of α technique. If there is no investment in α technique during some time period, the capital stock K_α decreases at the depreciation rate. To summarise, the investment function (4) is an attempt to model the behaviour of farmers whose motivation to invest is greater profitability but nevertheless will not adopt the most profitable technique immediately, because of uncertainty and various other retardation factors. Total investment is distributed among the different techniques according to their profitability and accessibility. The most efficient and profitable technique, which requires a large scale of production, is not equally accessible for all farmers and, thus, farmers will also invest in other techniques which are more profitable than the current technique. When some new and profitable technique becomes widespread, more information is available about the technique and its characteristics, and farmers invest in that technique at an increasing rate.

Three dairy techniques (representing α techniques) and corresponding farm size classes have been included in the DREMFIA model: farms with 1-19 cows (labour intensive production), farms with 20-49 cows (semi-labour intensive production), and farms with 50 cows or more (capital intensive production). Parameter σ has been fixed to 1.07 which means that an initial value 0.85 (*i.e.* farmers re-invest 85% of the economic surplus on fixed factors back into agriculture) has been scaled up by 26% which is the average rate of investment support for dairy farms in Finland. The η (fixed to 0.77) is then used as a calibration parameter which results in investments which facilitate the ex-post development of dairy farm structure and milk production volume. The chosen combination of the parameters σ and η (1.07:0.77) is unique in the sense that it calibrates the farm size distribution to the observed farm size structure in 2005 (Farm Register 2006). Choosing larger σ and smaller η exaggerates the investments on small farms, and choosing smaller σ and larger η exaggerates the investments on large farms. Choosing smaller values for both σ and η result in too low investment and production levels, and choosing larger values for both σ and η results in overestimated investment and production levels, compared to the ex post period.

The investment function (1) shows that the investment level is strongly dependent on capital already invested in each technique. This assumption is consistent with the conclusions of Rantamäki-Lahtinen *et al.* (2002) and Heikkilä *et al.* (2004), *i.e.*, farm investments are strongly correlated with earlier investments, but poorly correlated with many other factors, such as liquidity or financial costs. Other common features, except for the level of previous investments of investing farms, were hard to find. Hence, the assumption made on cumulative gains from earlier investments seems to be supported by empirical findings.

The recursive programming model

The optimization routine is a spatial price equilibrium model which provides annual supply and demand pattern, as well as endogenous product prices, using the outcome of the previous year as the initial value. Production capacity (number of animal places available, for example), which is an upper boundary for each production activity (number of animals) in each region, depends on the investment determined at a sub-model of technology diffusion.

The use of feed is a decision variable, which means that animals may be fed using an infinite number of different (feasible) feed stuff combinations. This results in non-linearities in balance equations of feed stuffs since the number of animals and the use of feed are both decision variables. There are equations ensuring required energy, protein and roughage needs of animals, and those needs can be fulfilled in different ways. The use of concentrates and various grain-based feed stuffs in dairy feeding, however, is allowed to change only 5–10 % annually due to biological constraints and fixed production factors in feeding systems. Concentrates and grain based feed stuffs became relatively cheaper than silage feed in 1995 because of decreased grain prices and CAP payments for grain. The share of concentrates and grain has increased, and the share of roughage, such as silage, pasture grass and hay, has gradually decreased in the feeding of dairy cows. There has also been substitution between grain and concentrates (in the group of non-roughage feeds), and between hay, silage and pasture grass (in the group of roughage feeds). The actual annual changes in the use of different feed stuffs have been between 5–10%, on the average, but the overall substitution between roughage and other feed stuffs has been slow: the share of concentrates and grain-based feed stuffs in the feeding of dairy cows has increased by 1% annually since 1994.

Feeding affects the milk yield of dairy cows in the model. A quadratic function is used to determine the increase in milk yield as more grain is used in feeding. Genetic milk yield potential increases exogenously 110–130 kilos per annum per cow (depending on the region). Fertilization and crop yield levels depend on crop and fertilizer prices via empirically validated crop yield functions.

There are 18 different processed milk products, many of which are low fat variants of the same product, in the model as well as the corresponding regional processing activities. There are explicit skim milk and milk fat balance equations in the model. In the processing of 18 milk products, fixed margins representing the processing costs are used between the raw material and the final product. This means that processing costs are different for each milk product, and they remain constant over time in spite of gradually increasing inflation. In other words, it is assumed that Finnish dairy companies constantly improve their cost efficiency by developing their production organisation, by making structural arrangements (shutting down small scale processing plants) and substituting capital for labour (enlarging the processing plants), for example. Such development has indeed taken place in Finland in recent years.

All foreign trade flows are assumed to be to and from the EU. It is assumed that Finland cannot influence the EU price level. Armington assumption is used (Armington 1969). The demand functions of the domestic and imported products influence each other through elasticity of substitution. Since EU prices are given the export prices are assumed to change only because of frictions in the marketing and delivery systems. In reality, exports cannot grow too rapidly in the short run without considerable marketing and other costs. Hence, the transportation costs of exports increase (decrease) from a fixed base level if the exports increase (decrease) from the previous year. The coefficients of the linear export cost functions have been adjusted to smooth down the simulated annual changes in exports to the observed average changes in 1995–2006. In the long-term analysis the export costs play little role, however, since they change only on the basis of the last year's exports. Hence the exports prices, (the fixed EU prices minus the export costs), change only temporarily from fixed EU prices if exports change. This means that Finland cannot actually affect EU price level. In fact the export specification is asymmetric to the specification of import demand. Export prices may be only slightly and temporarily different from EU average prices while the difference between domestic and EU prices may be even significant and persistent, depending on the consumer preferences. According to Jalonoja and Pietola (2004), there seems to be a significant time lag before Finnish potato prices move close to steady state equilibrium after shocks in EU prices. A unit root of domestic price process was found to be statistically significant which indicates that domestic price changes are rather persistent.

The export price changes due to changing export volume are relatively small and temporary compared to changes in domestic prices which are dependent on consumer preferences. In terms of maximizing consumer and producer surplus, this means that exports may fluctuate a lot and cause temporary and relatively small changes in export prices (through export costs), while the difference between domestic and average EU prices may be more or less persistent, depending on the consumer preferences. Hence, in addition to the import specification, the export specification explains why the domestic prices of milk products, as well as the producer prices of milk, remain at a higher level than the EU average prices even if Finland is clearly a net exporter of dairy products.

Trade of milk quotas

Milk quotas are traded within three separate areas in Finland. Within each quota trade area the sum of bought quotas must equal to the sum of sold quotas. In the model the support regions A, B and BS is one trade area (Southern Finland), support region C1 and C2 another trade area (Middle Finland – consisting of both Central Finland and Ostrobothnia regions in the model), and support areas C2P, C3 and C4 constitute a third region (Northern Finland). The price of the quota in each region is determined by the shadow value of an explicit quota constraint. A depreciation period of five years is assumed prior 2008, and the depreciation period becomes then shorter each year, i.e. the uncertainty of the future economic conditions and the future of the quota system rule out high prices after 2007.

3. Results

According to the results milk quota abolition is challenging for Finnish dairy production despite the assumed relatively good market demand and EU price level in the baseline. Decoupling milk payments and other CAP support in 2003 CAP reform is one reason why milk supply is not so strong in Finland but 2006/2007 milk production is forecasted to be less 5-6% less than the national milk quota. High cereals prices and increased input prices are another reason for weak milk supply. Since support payments are increasingly linked to farmland instead of livestock production high cereals prices induce decreasing milk production especially in Southern Finland. In these circumstances it would take some time before aggregate milk production reaches quota in baseline (Fig. 3).

If prices of dairy products decrease by 10-15% at the EU markets the aggregate dairy production would decrease relatively little below the baseline until 2020. This is because structural development, i.e. investments in larger farms and re-allocation of production to relatively most competitive regions, may still continue even if returns to investment somewhat decline due to price reduction. However if the EU milk prices decrease by 15-20%, or if some part of national subsidies were cut or decoupled from production, then the investments on large farms would be too slow to compensate for the exit of small and medium-sized dairy farms from production. Production would fall by 10-22%. A 25-30% drop in the EU milk prices, or a full abolishment or decoupling of national price subsidies, would decrease Finnish dairy production by 26-31%, i.e. well below the domestic consumption. However, national tastes, large product variety, and relatively high consumption of liquid dairy products, would partly retain producer prices in Finland if domestic supply decreases. Hence larger drops than 35-40% in Finnish milk production seem unlikely in the case of milk quota abolition.

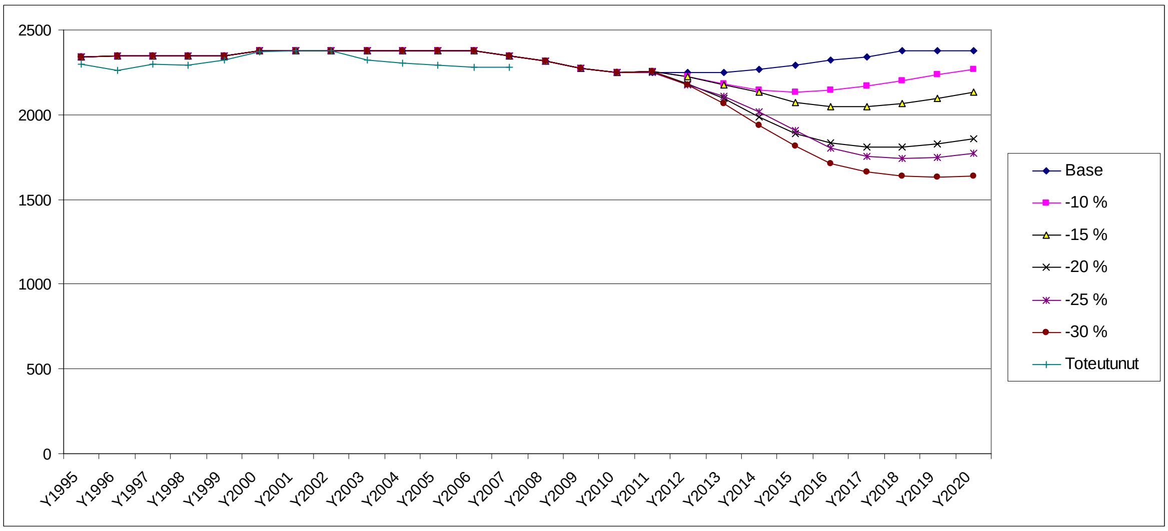

Figure 3. Aggregate milk production (million litres) in Finland in baseline and in different EU price scenarios for dairy products.

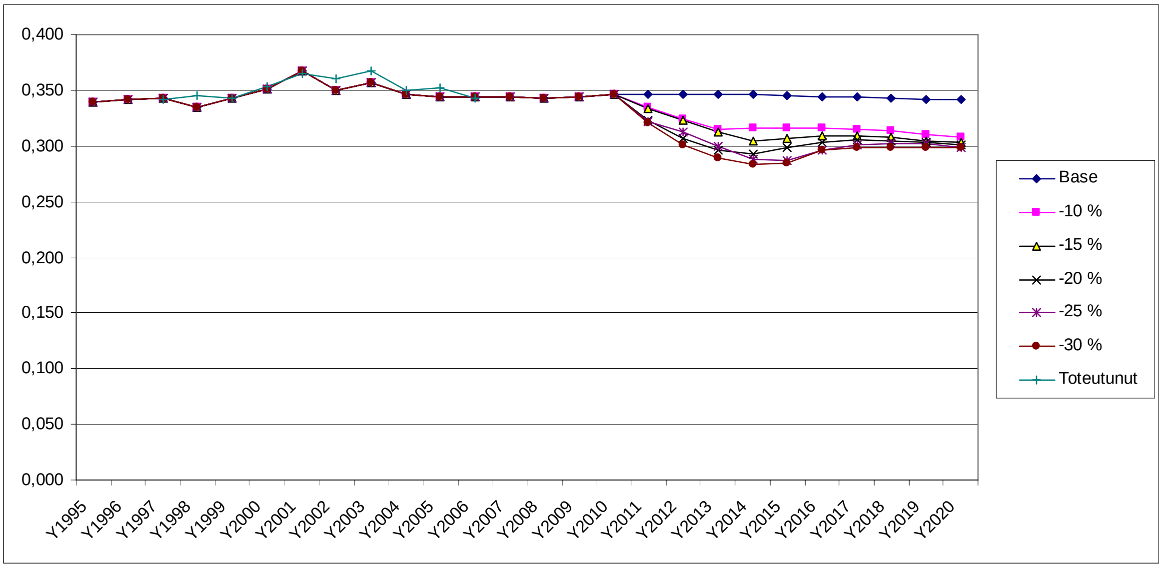

Figure 4. Producer price of milk (eur/litre) in baseline and in different EU price scenarios for dairy products.

It is remarkable that domestic prices of raw milk (Fig. 4) are rather different in EU price scenarios up to 2015-2016 but thereafter raw milk prices converge to the level of 30-31 cents per litre in all scenarios. Such equilibrium price level is characteristic for a dynamic equilibrium model like this, and the price level is reflected by the possibilities of decreasing costs of milk production in large farms in Finnish conditions. Based on the farm level production cost data used when constructing the investment module of the DREMFIA model it is hard to reduce the costs of milk production below 30 cents per litre even at large farms. There many factors resulting to high costs, such as climate, the small size of field plots, distances between field plots, short peak load period in grass silage harvesting etc. Hence the low EU prices of dairy products imply decreased exports and increased imports of dairy products and consequent negative pressure to domestic raw milk prices. After shutting down most unprofitable exports and specialisation to most competitive products in dairy product processing it is possible however to retain some market share in liquid and fresh milk products, as well as on some cheese products on domestic markets. Hence the decreasing supply of raw milk and dairy products make it possible to cut domestic prices less than the EU average.

Milk production decreases significantly more in Southern Finland (support regions AB) in response to the EU dairy product price scenarios compared to production development in C-regions (Fig. 5-6). In fact it seems that the level of milk production in C-regions eventually exceed 2006/2007 quota level despite the milk quota abolition if the EU dairy product prices decrease less than 15%. If the milk quota trade area restrictions were relaxed then milk quotas were traded from south to north and production would increase even more in C-regions. It has been taken into account in the simulation that production support in region C is restricted to 160 million euros (17 million euros in regions AB) and if production exceeds the 2006/2007 quota level the payment per litre is decreased. However the abolition of the milk quota system challenges the current system of national system for production payments which is regulated by the quotas, i.e. production support is paid only up to the quota level. If there are no quotas then the higher level of overall payments in the C-regions may stimulate production in favourable market situation, and production is then likely to shift from south to north due to higher support. Such development would not be in line with the EU agricultural policy.

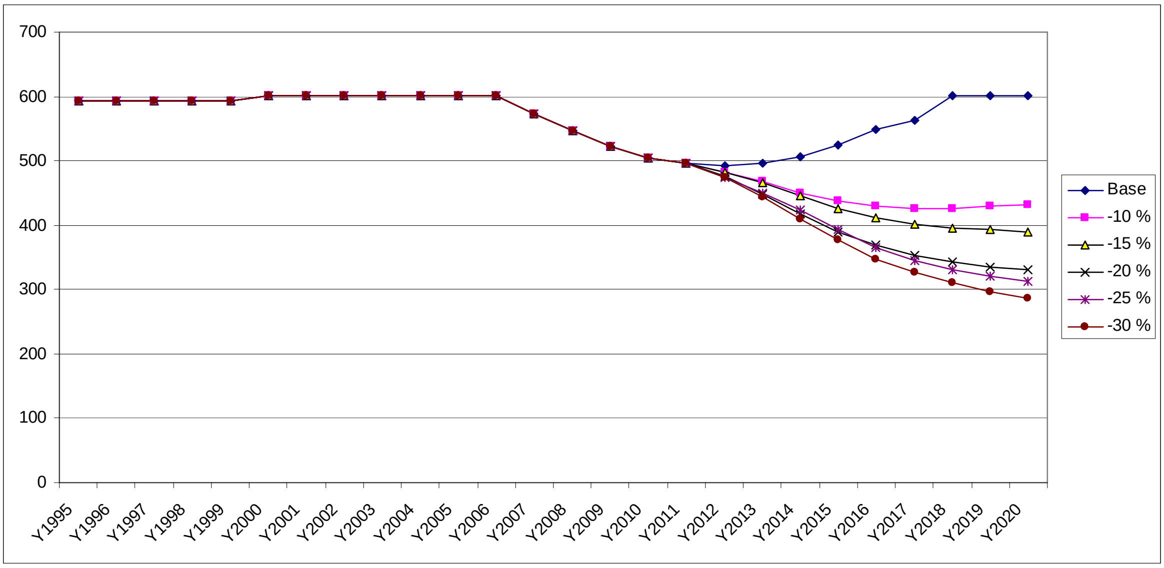

Figure 5. Milk production (million litres) in Southern Finland (support regions A and B; national price support 3 cents/litre).

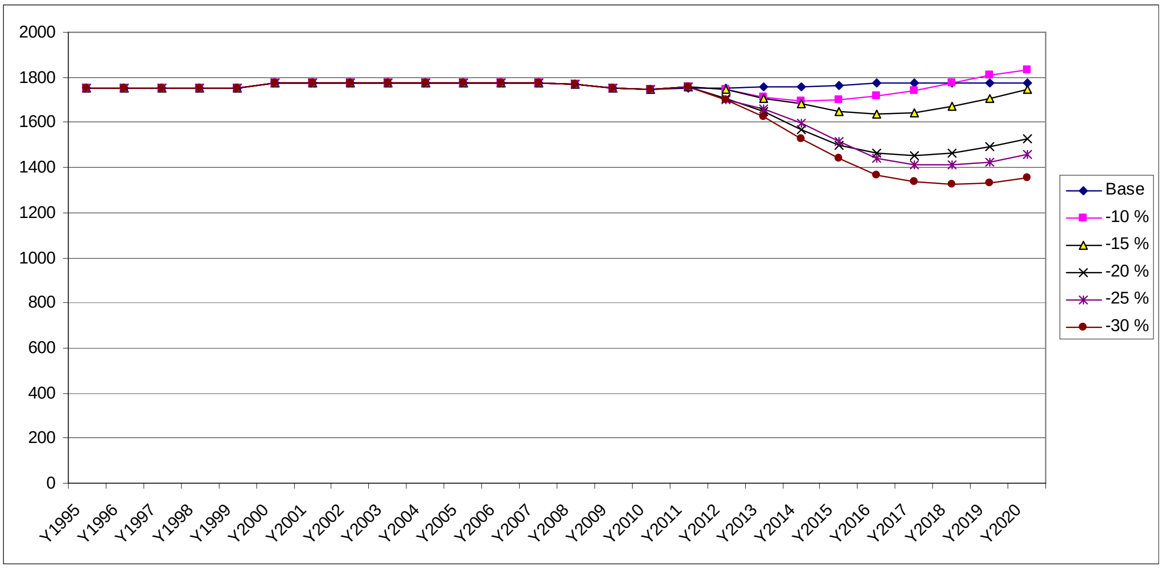

Figure 6. Milk production (million litres) in Central and Northern Finland (support region C; national price support 7-9 cents/litre).

In Fig. 7 one can see how investments to large farms (simulated by the technology diffusion module of the DREMFIA model) are retarded due to lower EU dairy product price scenarios. Since large dairy farms are still few in Finland (less than 10% of cows are kept on farms with more than 50 cows), and may of the large farms have invested in recent years, it takes time for the large farms to expand production and replace the decreasing production at smaller farms. Lower milk price reduce the accumulation of capital and economic surplus needed for production expansion. If surplus for capital inputs, still needed despite the investment subsidies, decreases to a low level due to milk price reduction, then the expansion of large farms decrease considerably. This is because there are relatively few large farm in the beginning which are capable of profitable investment at low milk prices.

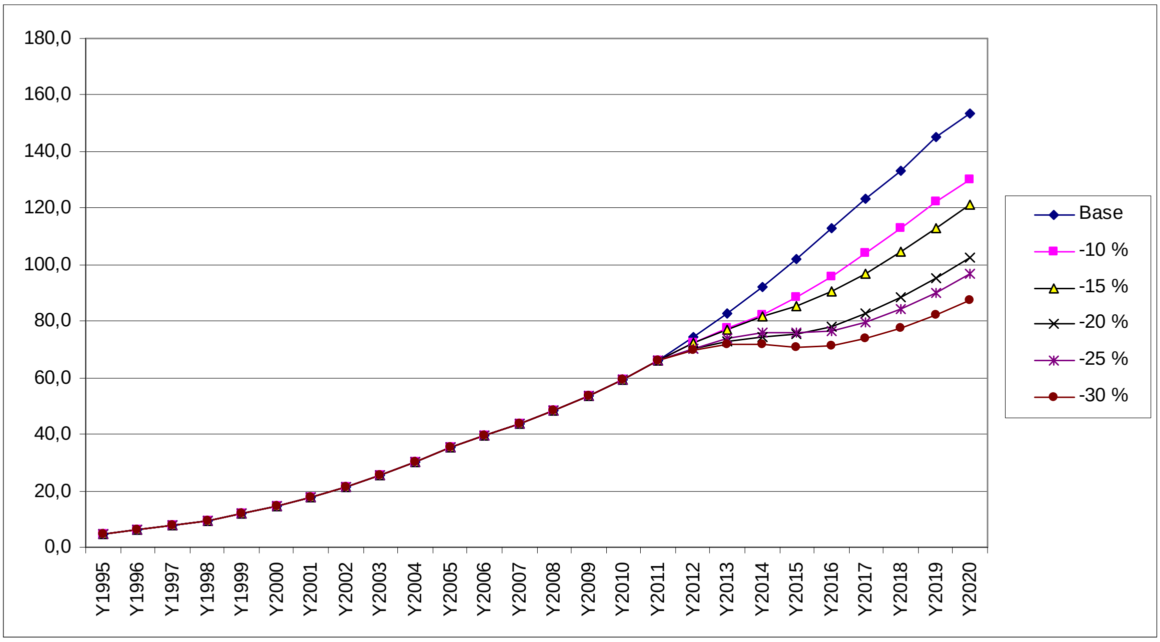

Figure 7. Animal places (1000) on farms with 50 cows and more (in 2006 there were appr. 295 000 milk cows in Finland) in different EU price scenarios.

4. Discussion

Competitive countries and dairies are likely to have plans how to expand production and change and improve dairy product processing to meet market demand in a situation where milk quotas do not constrain production. After structural rearrangements the sector will then look somewhat different to that we are used to.

Milk quota abolition also means the EU milk producers will be very dependent on the demand on developing milk markets in Asia. Russia is very important for Finnish milk sector. The profitability of export activities and producer price of milk depend very much on the price level on Russian markets which has been relatively favourable in recent years. If the EU milk sector starts building more production and processing capacity then prices may decrease steeply in Russian and EU markets if demand decreases in Asian and other export markets. Such decreases in demand seem unlikely now but are very much possible when Asian and global economy faces crisis or a period of weak development. If there are no milk quotas milk prices may then go down for a long period of time. From the viewpoint of dairy farmers in LFA regions some safety nets would be important in such situations. Safety nets should provide some support based on production if there is political will to maintain production in less favoured areas. Decouopled per hectare payments, for example, demotivate farmers especially if cereals prices remain strong.

So far the prospect is positive even for milk producers in LFA regions. It seems that the milk sector is relatively less hit by high cereals prices compared to pig and poultry sectors, for example. However the rapidly rising production costs have hit also milk producers. Rapidly increasing prices of energy, machinery and construction materials, and also wages in the overall economy hinder young farmers in entering and investing in milk production. Similar reasons are likely to be found behind the quota under-use in other EU countries as well. Decoupling due to 2003 CAP reform has effect now since production costs have increased. Increase in production costs are indeed more harmful for LFAs where production costs are higher than the milk price, compared to the competitive milk producing regions where milk prices still cover all production costs. Soaring prices of energy, machinery and building materials are harmful in LFAs where the use of these inputs is more intense due to more difficult production conditions. However the very recent increase in milk prices has been encouraging since it provides a fair compensation for the increasing costs. If the prices of dairy products do not collapse but remain above 2006 levels then there is future potential in milk production even in LFA regions. Some structural development and production rationalisation can then be done as long as investments produce some surplus after variable costs. Such important restructuring takes time and hence the safety nets through article 69 would assure risk averse farmers on the profitability of investing in larger and more efficient farms, which however cannot be as efficient as in most competitive areas of Europe. Time is in a key role here, i.e. how long can farmers count on relatively high milk prices, develop their production and pay back their investments.

5. Conclusion

Phasing out milk quotas is a challenge for Finnish sector where 90% of milk is still produced on farms with less than 50 cows. Hence many dairy farms should grow, decrease the cost of production and increase the efficiency of production. Since it seem evident that production costs cannot be reduced to less than 30 cents per litre even at largest farms then large reductions in the EU dairy product prices will inevitably decrease Finnish milk production significantly. However in such circumstances concentration to most competitive dairy products would reduce Finnish producer prices relatively less. Considering also consumers' tastes and preferences it is likely that milk production will not decrease more than 10-20% in favourable market and demand conditions, and not more than by 20-30% in most pessimistic price scenarios which seem unlikely in the 2007-2008 dairy market environment. In any case Finnish dairy sector is very dependent on national price support esp. in Central and Northern part of the country, and increasingly on supply and demand development not only in the other EU countries but also in Russia. There the level of export competition is also likely to be more intense after the milk quota abolition in the EU.

References

Armington, P.S. 1969. A Theory of Demand for Products Distinguished by the Place of Production. *International Monetary Fund Staff Papers* 16(1): 159-178. Washington D.C.

Bouamra-Mechemache, Z., Jongeneel, R. & Requillart, V. 2007. The dairy industry in an expending EU policies and strategies. EDIM/KOM: Meeting at DG Agri, April 24, 2007.

Bouamra-Mechemache, Z., Chavas, J., Cox, T. & Requillart, V. 2002. EU dairy policy reform and future WTO negotiations: A spatial equilibrium analysis. *Journal of Agricultural Economics 53 (2), 233–257.*

Bouamra-Mechemache, Z & Requillart, V. 2000. Analysis of EU dairy policy reform. *European Review of Agricultural Economics Vol 27 (4). s. 409–430.*

Colman, D. (ed.) 2002. Phasing out milk quotas in the EU. Main report to DEFRA, Scottish Executive Environment and Rural Affairs Department, National Assembly for Wales, Agriculture Department and Department of Agriculture and Rural Development, Northern Ireland, April 2002.

Farm Register 2006. Official Statistics of Finland. Information Centre of the Ministry of Agriculture and Forestry. Helsinki. http://tike.mmm.fi

Heikkilä, A-M, Riepponen, L. & Heshmati, A. 2004. Investments in new technology to improve productivity of dairy farms. *Paper presented in 91st EAAE seminar "Methodological and Empirical Issues of Productivity and Efficiency Measurement in the Agri-Food System*", Rethymno, Greece, September 24-26, 2004.

Jalonoja, K., Pietola, K. 2004. Spatial integration between Finnish and Dutch potato markets . *Acta agriculturae Scandinavica. Section C Food economics* 1, 1, April 2004: 12-20.

Lehtonen, H. 2001. Principles, structure and application of dynamic regional sector model of Finnish agriculture. Academic dissertation. *MTT Publications 98*. Helsinki, Finland.

Lehtonen, H. 2004. Impacts of de-coupling agricultural support on dairy investments and milk production volume in Finland. *Acta Agriculturae Scandinavica, Section C: Food Economics* 1: 46-62.

Lehtonen, H. (ed.) 2007. Impacts of phasing out EU milk quotas on Finnish milk sector. This publication is in Finnish but includes a 1-page abstract in English (p. 5). 89 p. http://www.mtt.fi/mtts/pdf/mtts144.pdf

Pietola, K. 1997. A generalised model of investment with an application to Finnish hog farms. *Agricultural Economics Research Institute, Finland. Publications 84. 113 p*

Rantamäki-Lahtinen, L., Remes, K. & Koikkalainen, K., 2002. The investment and production plans in Finnish bookkeeping farms. *Agrifood Research Finland, Economic Research (MTTL), Working Papers* 4/2002, 6-40.

Sckokai, P. 2004. Modelling impacts of agricultural policies on farm investments under uncertainty: The case of arable crop regime. Paper presented in OECD workshop on de-coupling in Paris 3-4 June 2004. http://www.oecd.org/dataoecd/14/27/34996395.pdf

Soete, L. and R. Turner. 1984. Technology diffusion and the rate of technical change. *Economic Journal* 94: 612-623.