Paper prepared for the 122nd EAAE Seminar

"EVIDENCE-BASED AGRICULTURAL AND RURAL POLICY MAKING: METHODOLOGICAL AND EMPIRICAL CHALLENGES OF POLICY EVALUATION"

Ancona, February 17-18, 2011

Agricultural policy analysis in Finland with the AGMEMOD model: Lessons to be learnt?

Niemi J.[1] and Kettunen L.[1]

[1] MTT Agrifood Research Finland/Economic Research, Latokartanonkaari 9, Helsinki, Finland

Contact: jyrki.niemi@mtt.fi

Agricultural policy analysis in Finland with the AGMEMOD model: Lessons to be learnt?

Niemi J. and Kettunen L.

Abstract

The objective of this paper is to assess empirically the impacts of further reform of the Common Agricultural Policy (CAP) on the agri-food sector in Finland. To meet the objective, an econometric model for Finnish agriculture - built as a part of the AGMEMOD project - was utilised. The projection and policy simulations presented in the paper demonstrate that the model provides the basis for relatively straightforward baseline projection, and an initial framework for agricultural policy analysis. Yet, there remains substantial scope for further work on the model. In particular, the effects of big policy shocks are clearly not adequately captured by the model. The linear equations of supply together with low elasticities estimated from historical data generate simulation results, which do not in our opinion fully capture farmers' reactions to these changes.

Keywords: policy analysis, econometric models, Finland, commodity markets

JEL classification: C54, E17, Q18.

1. INTRODUCTION

The Common Agricultural Policy (CAP) of the EU has changed significantly since the early 1990's. Successive reforms have diminished the role of market management tools, and increased market orientation of the CAP. Further reform of the CAP is firmly back on the political agenda as the EU gears up for the next round of changes, scheduled for 2013. Serious debate on the post-2013 CAP started following European Commission's Communication which was released on November 18th, 2010. This Communication explores avenues on the future of the CAP to the public debate and consultation before preparation of legal proposals. Formal legislative proposals will be published in the middle of 2011 together with the proposals for the financial perspectives from 2014 onwards.

In the context of the ongoing CAP reform negotiations, quantitative analysis is crucial for policy-makers. Agricultural models are important tools for assessing the impact of policies and economic parameters on market variables and sector income, though analysts face many challenges in modelling and analyzing CAP policies. It is utmost important to correctly represent all policy instruments when assessing a policy change with economic models. It is also necessary to have a model that includes explicit representations of each of the product markets. The interrelationships among these markets must be properly captured as well. However, even the best models are "dangerous tools" in inexperienced hands. Credible policy analysis relies on a combination of modelling expertise, market intelligence, and specialized knowledge.

This paper examines the potential impact of further changes to CAP on the Finnish agri-food sector utilising an AGMEMOD model, which is an econometric model developed within the framework of projects financed by the European Commission. It is a sectoral, dynamic, partial equilibrium model, which takes into account national specifics and is built up with models for the EU27 Member States. Compatibility and performance of the country models is promoted by the common guidelines for model building in the AG-MEMOD partnership. This approach captures the inherent heterogeneity of the different agricultural systems across the EU, while still maintaining analytical consistency across the country models via as close as possible adherence to the template.

One of the principal objectives of this paper is to assess the impact of various policy scenarios on the Finnish agriculture as part of the EU and the global market up to 2020. To simulate the response of the Finnish agricultural production and farm income on different policy changes over the period 2010-2020, the no-policy change baseline scenario will be conducted and several alternative policy scenarios regarding the future CAP will be developed. To identify the policy effect, these alternative different policy scenarios will be compared with the 'non-policy change' baseline.

This paper is organized as follows. Section 2 provides an overview of the main trends in the development of agriculture as well as agricultural policies in Finland, which serves as starting point for the policy analyses. Section 3 summarizes the AGMEMOD model, and describes the policy variables implementation in AGMEMOD. The results of the policy scenarios conducted in this study are available in Section 4, while the conclusions can be found in the section 5.

2. AGRICULTURAL POLICY DEVELOPMENTS IN FINLAND

This section provides background information on the development of agriculture as well as agricultural policies in Finland. It also examines the implementation of recent CAP reforms in the Finnish agricultural sector.

2.1. Operating environment of Finnish agriculture

The operating environment of Finnish agriculture and food economy has been under constant change for years. The economic environment changed radically when Finland joined the EU in 1995 and the sectors became subject to the market and guidance instruments of the CAP. It was no longer possible to regulate the market price level of agricultural products through national border protection and export subsidies. Producer prices fell by 40-50% at the beginning of 1995, and the fall in input prices was insufficient to compensate for the decrease in the total return. Furthermore, the accession to the EU was an initiative for successive policy reforms, rather than a transition from one set of established policies to another. The CAP has changed significantly during Finland's membership years.

The change in the operating environment has highlighted the need to improve the competitiveness of Finnish agriculture and food industry. The transition from an economy with closed markets to open and more competitive markets has not been easy to realise in a short notice. The preconditions for agriculture are much weaker in Finland than in the more southern EU countries. The growing season is shorter and effective temperature sum is much lower than in Central Europe. The adverse natural conditions are the most clearly reflected in the yield levels: cereal yields in Finland are only about a half of those harvested in Central Europe. Because of the large surface area and sparse population, maintaining the population of the rural areas is far more problematic than in the other Member States.

2.2. Implementation of CAP reforms in Finland

The national objectives of Finnish agricultural policy have been founded on the view that the permanent competitive handicap of Finnish agriculture due to the adverse natural conditions must be compensated for so that Finnish production can succeed on the common EU market. Efforts to this end have been made by utilizing the common agricultural policy measures and through national measures allowed by the conditions of the Accession Treaty (1994).

On market prices alone, Finnish agriculture would have struggled to survive, so support payments have had a central role in maintaining the preconditions for competitive agriculture in different parts of the country and production sectors. In 2010 these payments totalled € 1.9 billion, representing 43% of the total return on agriculture and horticulture (€ 4.3 billion). The support payments are more significant in the income formation of agriculture in Finland than in the other EU countries.

The support payments under the common agricultural policy to the Finnish agriculture total about € 1,341 million in 2010. These consist of the CAP support for arable crops and livestock (€ 545 million), natural handicap payments for less-favoured farming areas (€ 422 million) and environmental support (€ 374 million). These are supplemented by national aids, totalling about € 565 million. The principles to be applied in determining the level and regional distribution of national aid were agreed in the membership negotiations (Accesssion Treaty 1994). The aid may not increase the production, nor may the amount of aid exceed the total payments before the accession.

Most of the CAP support for arable crops and livestock is paid through the single payment scheme adopted in Finland in 2006. The single payment scheme is implemented as the so-called hybrid model. Former CAP payments were converted into payment entitlements, which consist of a regional flat-rate payment and farm-specific top-ups.

CAP support has two main components: decoupled single payments and payments which continue to be coupled to the production. In Finland about 90% of the CAP support was decoupled from the production in 2006. The CAP support for arable crops was decoupled almost completely. Coupled support has still been paid up to € 5.8 million/year for certain arable crops. Coupled support has also continued to be paid for suckler cows, male bovines and ewes and starch potato.

In the context of the 2008 health check reform the majority of the remaining coupled payments in the Member States are decoupled and transferred to the Single Payment Scheme. In the bovine sector the special premium for bulls and steers and other production premiums are abolished by 2012. Under the Article 68, however, 10% of all CAP payments may be targeted to disadvantages faced by specific sectors. Of this 10% up to 3.5% may be coupled support. Finland was granted the derogation to pay all of the 10% as coupled support, which increases the amount of coupled CAP support payable in Finland by a little under € 20 mill. Article 68 therefore allows Finland to retain the coupled payments for beef cattle farms after 2012. This means that the health check reform does not require any major changes to the payments to the Finnish beef cattle farms.

2.3. Development of Finnish agricultural production

Membership of the EU has not led to any significant changes in the volume of Finnish agricultural production. However, structural change has been very rapid. Before the accession to the EU there were more than 100,000 farms in Finland but now, 15 years later, there are less than 64,000 farms left. The number of farms has fallen by more than 3% a year overall, with the livestock sector changing even more rapidly. For example, the number of farms specialising in milk production has decreased by almost 7% a year.

Structural change has led to a positive development in the productivity of agriculture. In 2009 the same amount of inputs yielded almost 21% more output than in 1992. . In 2009 the total output was 99% and use of inputs 81.6% of the levels in 1992. On average the productivity of agriculture grew by 1.15% a year. The productivity of labour in particular has increased rapidly in the past 15 years, by the average of about 5% per year in 1992–2009. In 2009 the output volume per unit of labour input was 2.2 times that in 1992. There have been no major changes in the productivity of capital in Finnish agriculture.

Despite the positive productivity development Finnish agriculture has not been catching up with the leading agricultural countries of the world as regards the difference in the level of productivity due to the unfavourable climate and small farm size. Finland has reached a development path which for the most part corresponds to the trends in the other EU countries.

The fall in the number of cattle farms has led to a fall in the grass area, from 754 600 hectares in 1995 to 630 000ha in 2009. However the cereal area grew from 978 000ha to 1.270,000 ha in the same period, reflecting a doubling of the spring wheat area and general growth in bread grain production.

Milk production declined initially, but grew again between 1997 and 2001. Since then the production has decreased by 7%. In 2009, deliveries to dairies totalled 2.215m litres, which was 3,5% less than in 1995. The average yield per cow has risen by about 30% since 1995.

Finland's beef self-sufficiency has fallen from 100% to 84% in the past fifteen years, with production down by about 15 000t to 81 000t, and per capita consumption down 5%. Pigmeat production, on the other hand, has grown by 23%, amounting to 206 000t in 2009. Consumption has fallen by 11 000t, but export volume has grown five-fold, exceeding 45 000t in 2009.

Poultrymeat production has grown by an average of 9% per year during Finland's EU membership. In 2009 it totalled 95 000t, which was double the amount in 1995. Turkey meat production has grown the most, almost seven-fold, but the impact in total volumes is quite small as 90% of the poultry meat produced in Finland is broiler meat. Poultrymeat consumption has also been rising rapidly: in 2009 it was 90% higher than in 1995. However, production and consumption of eggs have fallen. Egg production was 27% smaller than in 1995. Egg consumption has decreased by about 16% since 1995.

3. THE AGMEMOD MODEL

This section presents the EU agricultural policy analysis model known as AGMEMOD (AGricultural MEmber States MODelling) , employed by the study for analysing the impacts of CAP policy changes on the Finnish agri-food sector.

3.1. Overall structure

AGMEMOD is an econometric, dynamic, multi-product partial equilibrium model which is built up as a system that integrates 25 EU Member State models and the world level variables. Based on a common country model template, country level models with country specific characteristics has been developed to reflect the specific situation of their agriculture (Chantreuil, Levert and Hanrahan (2005), Erjavec and Donnellan, (2005) and to be subsequently combined in a composite EU AGMEMOD model. Many components of these templates are based on the information and common guidelines delivered by Hanrahan (2001) and Riordan et al. (2002), but then adapted to country-specific conditions. This approach captures the inherent heterogeneity of the agricultural systems existing across the EU while still maintaining analytical consistency across the country models via as close as possible adherence to template. The maintenance of analytical consistency across the country models is essential for the aggregation and also facilitates the comparison of the impact of a policy across different member states (Salamon et al. 2008).

Each country level model is built up as a system of mutually related commodity markets models. The EU model distinguishes 34 primary and processed agricultural commodities, although not all commodities have been introduced in each country model. The ruling conditions to incorporate commodities for the individual country are that they should either be influenced by CAP, or they should be of major importance for a country agricultural production. Any commodity model includes behavioural equations and identities explaining production supply, demand creation and price formation. The supply and demand sides for all commodities have been modelled using behavioural equations based on the microeconomic theory of consumer and producer behaviour.

To represent rigidity in the adjustment of agricultural production levels and consumption patterns, previous production or stock levels are used in order to explain production development, while previous consumption levels are used to explain consumption growth. This introduces the dynamics into the model. Also, time trends are used as a proxy for technological change, while dummy variables are used to represent a special policy regulation (e.g. a quota period) or extraordinary events such as very bad weather and periods of animal health crises. Besides of the variables mentioned above, the agricultural production and consumption is influenced by agricultural policy variables.

Commodity markets are mutually linked via technological relations on the production side and via complementarity/substitutability relations on the consumption side. To assure common trend in agricultural price developments for all EU counties, the agricultural prices are not determined as market-clearing prices but they are linked to the EU prices via price transmission equations. Therefore, for each commodity market there is one endogenous variable, generally the export or import variable, which is determined through a supply and demand identity and which closes the commodity market balance. At the EU-level, the EU net export variable is used as the closure variable.

The EU price (the so called 'key price' in AGMEMOD language) is mostly defined as the price of the most important national market for that commodity in the EU. The EU key price formation equation is the only behavioural equation of the EU model. It explains the EU key price formation as a function of the world price, the intervention price level, the EU market equilibrium condition for the commodity in consideration - described by the EU level self-sufficiency rate - and EU trade policy variables. The self-sufficiency ratios in the EU key price equations, in combination with the country specific price transmission equations, ensure a mutual link between all national models. The remaining EU model equations consist of accounting identities, summing the demand and supply variables of all individual country models up to EU level balances and self-sufficiency ratios.

3.2. The policy variables

Among other variables, the agricultural policy variables influence the agricultural production and consumption levels in AGMEMOD. There are five types of policy variables, which influence both crop and animal production:

- production quota and payment rights quota;
- intervention prices;
- direct (headage or area) payments;
- decoupled payments;
- budget available for the direct support measures.

The production quota and payment rights quota influence the production levels through stock equations in the animal sector model and through harvested area equations in the crop sector model. The intervention prices influence the EU key prices and enter the stock level equations of the commodities in the country models. The coupled direct payments influence the production levels as well. It is also assumed that the decoupled payments increase the returns from production and accordingly influence the production levels. Finally, the level of the support payments is affected by the budget available (Tabeau and van Leeuwen 2008).

The importance of policy variables on the development of agricultural production depends on the parameter values for these variables in the model equations. These parameters have been estimated econometrically or calibrated using the historical data up to 2006. In cases, where an estimated parameter in a particular equation had a wrong sign or a wrong magnitude, the parameter value had been set (or calibrated) based on expert's knowledge and literature, while the remaining parameters in that particular equation were estimated. The economic plausibility of the estimated equations are regarded as superior to statistical tests and this could result to the adjustment of particular model specifications (although these could be statistically correct).

Analysts face many challenges in modelling and analyzing CAP policy reforms. As a result of the CAP reforms since 1992 price support mechanisms have progressively been transformed into decoupled direct payments for farmers (the so-called Single Farm Payment). Agricultural production is no longer required to receive the benefits of the payment. On the other hand, farmers will be subjected to cross-compliance conditions, in particular, the obligation to keep their land in good agricultural and environmental condition. The move from coupled payment policy instruments to payments that are decoupled from production has made estimating the future behaviour of farmers clearly more difficult.

One important issue affecting the AGMEMOD model results is therefore the assumptions relating to the supply inducing impact of decoupled direct payments. Decoupling represents a relatively new policy shift for EU agriculture and there is considerable uncertainty regarding the extent to which these payments are treated by farmers as being 'truly' decoupled. The decoupled payments still require that farmers carry out some activity on land, and imposing conditions on maintaining land in agricultural use generate costs that make the "set aside" option less attractive than other alternative activities. It is also known that risk-related effects of direct payments can be quite large and often a similar magnitude to standard relative price effects. Decoupled payments influence farmers' behaviour by increasing overall wealth, decreasing risk aversion or making credit more accessible (Hennessy 1998, Adams et al. 2001).

Recent studies (Bhaskar and Beghin, 2009, Howley et al. 2010b) which have examined this issue suggest that decoupled payments appear to still have a positive impact on agricultural production, although this effect is less than would be observed if these payments were still fully coupled. The empirical observations in Finland after decoupling also indicate that the intensity of farming has not decreased as expected.

In the following analysis, the supply inducing effect of decoupled payments in Finland is assumed to have a 20% lower impact on production than the coupled payments had.

4. CAP REFORM ANALYSIS

The CAP reform impacts on the Finnish agri-food sector are examined by means of policy simulations with the Finnish component of the AGMEMOD model. To simulate the response of the Finnish agriculture on different policy changes in 2010 - 2020, the no-policy change baseline scenario will be developed and several policy experiments regarding future

CAP options will be conducted. To identify the policy effects different policy scenarios will be compared with the baseline.

4.1. 'Business as usual' baseline scenario

The baseline scenario, which is applied to assess the suitability of the model for policy purposes, is a view of the world where policies remain unchanged over the projection period to 2020. More specifically, the baseline simulation corresponds to the continuation of EU agricultural policy agreed under the CAP Health Check agreement of 2008. Milk quotas will be raised by 1 per cent by 2011 and they will be abolished by 2015. The CAP budget and national ceilings of the support will stay constant at the 2007 level. The current mix of historic, static and dynamic regional models and hybrid models will also continue for the complete projection period to 2020. National support in Finland will stay at 2007 level.

Projections of world prices of agricultural commodities are taken from the 2010 FAPRI World Outlook. First observation of the baseline is that changes in prices are relatively small (Table 1). Grain prices are also rather stable. Dairy prices are increasing slightly. Finnish prices follow closely the key prices.

Table 1: Price development in Finland according to the baseline scenario, euro/100 kg.

Product	2000	2005	2010	2015	2020
Wheat	13.5	10.6	13.4	13.9	13.4
Barley	11.9	10.0	10.0	10.2	10.0
Oats	11.8	8.7	9.4	9.6	9.4
Rye	13.1	11.8	14.3	14.8	14.2
Oilseeds	17.6	20.0	28.8	28.3	28.5
Beef and veal	206.0	205.0	227.8	230.6	233.8
Pork	129.2	128.0	133.0	127.7	128.6
Poultry	114.2	114.0	140.2	146.3	146.5
Eggs	5.1	3.9	6.0	6.2	6.4
Cow milk	31.7	31.5	35.7	34.2	33.9

[1] Historic values for 2000 and 2005 and projected values for 2010 - 2020.

The projections for the baseline are dependent on the assumptions of various macroeconomic indicators. The most important of these indicators are population, macroeconomic growth rates and inflation rates and key currency exchange rates such as the euro/US dollar. Macroeconomic projections for each EU Member State date from spring 2009 and reflect the medium term outlook for economic growth in Europe. Finnish macroeconomic variables are updated in 2010.

Under the baseline, where current polices continue to 2020, no significant changes in the Finnish agri-food sector are projected to occur (Table 2). Livestock sector is characterized by the increase in the production of poultry meat and the decrease in the production of beef. Pork production is also projected to decrease when comparing 2020 to the base period of 2010.

Table 2: Areas (000 ha) and production (000 tons) of main products and farm income (mill. euros) in Finland according to baseline scenario[1].

Product	2000	2005	2010	2015	2020
Total grain area, '000 ha	1170	1186	1145	1129	1102
Wheat area, '000 ha	149.5	215.1	211.6	220.8	224.5
Barley area, '000 ha	559.0	594.8	561.0	540.7	518.3
Oats area, '000 ha	399.9	345.9	326.8	322.3	314.4
Rye area, '000 ha	44.6	14.3	26.8	26.7	26.0
Oilseeds area, '000 ha	52.5	76.5	84.5	88.7	93.4
Beef production, mill. kg	91.4	86.7	85.5	80.8	77.2
Pork production, mill. kg	172.3	203.6	222.7	214.4	196.8
Poultry production, mill. kg	64.4	87.0	105.3	112.5	117.2
Eggs, mill. kg	59.0	58.2	57.1	56.8	56.1
Cow milk, mill.kg	2450	2362	2280	2239	2206
Farm income, mill. euros	940	868	836	731	664

[1] Historic values for 2000 and 2005 and projected values for 2010 - 2020.
Source: own elaboration

Beef production - which is closely linked with milk production - falls due to the decrease in the number of dairy cows. Average slaughter weight is increasing but not enough to keep beef production at the present level. Therefore, an important issue in the future development of the beef production is on how the weakened supply of calves from the dairy herds is compensated by the specialized, suckler cow based beef production. Specialized beef cattle stock has been increasing in recent years but it is still relatively small compared to the beef production originating from the dairy sector. The decoupling of premiums in 2006 results in the number of suckler cows being projected to stay at current level over the projection period.

Milk production in Finland has turned into a downward sloping trend and decreased to a level well below the national quota. Milk production is projected to decrease by 3 per cent by 2020 from the 2010 level (2280 mill litres).

Total grain area seems to be rather stable towards 2020, but total grain production is increasing due to the rising hectare yields. The relatively stable grain area is also an indication of small supply elasticity with respect to price. Feed grains cover the major part of the grain production. Domestic use of feed grains depends mainly on livestock production. Livestock production is decreasing slightly and the feed use efficiency improves. Thus, the self-sufficiency in grain sector tends to increase.

Since milk and beef meat production is decreasing, it means that the pasture area for grass decreases and a part of that may be utilized for grain production. Total area for agriculture is not expected to grow, however. Low quality land will drop out of agricultural production and will be used for other purposes or will be afforested. The clearing of new land is rather limited.

Income development is assessed through the concept of farm income, which indicates the compensation for farm family's labour and capital invested in agriculture. Farm income is calculated by deducting the total costs from the total return on agriculture. Under the Baseline scenario, farm income is projected to decline by 32% from EUR 868 mill. in 2005 to 586 mill. in 2020. The productivity of agriculture is assumed to continue growing by 1 % a year on average.

4.2. CAP reform scenarios

The alternative policy scenarios represent different reform options relating to the first (P1) and second pillar (P2) policies of the CAP. According to the European Commission's (2010) Communication, released on November 2010, there are "three broad policy options" which could be used to orient the CAP reforms. A 'status quo' option is outlined as solution with the lowest ambition and least disruption to current support patterns. This would involve - at most - a limited redistribution of P1 funding between member states while failing to alter the underlying criteria; a small increase in funding for the new challenges (climate change, water, biodiversity) in P2; and strengthened market measures along the lines of the current model.

Option two involves taking on the more ambitious reform options which are put forward in the paper - and is clearly put forward as the Commission's preference. This path is described as "more balanced, targeted and sustainable support". A "more equitable distribution" is called in P1, without "major disruptive changes" occurring to given regions or production systems. To erode the big discrepancies which currently exist, the Commission floats the idea of introducing a minimum level of direct payments for all farmers across the EU. Under such a scheme, even the least endowed farms would only be able to deviate a given percentage below the EU-wide average. In terms of P2 policies, this option does not propose a radical change in terms of the type of measures which are on offer, but looks to rethink the way that measures are combined and packaged together, in a bid to ensure that more joined-up principles and goals underpin P2 and help it to complement P1 and other EU policy areas. This option also envisages putting a 'risk management toolkit' on the P2 menu, to deal more effectively with income uncertainties and market volatility.

The third potential path is the wholesale liberal reform option, whereby income support payments and market measures are abolished, and CAP support is limited to targeted environmental payments or compensation premiums for national handicaps.

To assess the impacts of the possible future CAP reform decisions on the Finnish agriculture, the following policy experiments have been conducted:

- Scenario 1) Introducing a common EU wide flat rate payment entitlement per eligible hectare across all Member States adjusted with purchasing power parity. Second pillar policies remain unchanged. Such a policy will not change the level of EU overall support within the first pillar, but it results in significant changes at a Member State level.
- Scenario 2) Introducing the same flat rate payment entitlement fixed at EUR 100 per eligible hectare applies to all Member States. Second pillar policies remain unchanged. Such a policy will decrease the level of overall EU support within the first pillar.

- Scenario 3) Abolition of the Single Farm Payment in a linear fashion over a seven year period during 2014-2020. Second pillar policies remain unchanged.
- Scenario 4) First pillar policies remain unchanged, but the possibilities for national co-financing of second pillar policies are decreased. National co-financing cannot exceed 50% after 2013. Such a policy will not change the level of overall EU support within the second pillar, it decreases support financed at a Member State level.

The results of these reforms will be compared with the baseline simulation results. All other variables – mostly macroeconomic variables concerning GDP population, inflation and world prices developments – are kept the same in all simulations.

Table 3 summarizes the scenario effects on the incentive prices faced by farmers in Finland. In the grain production, the direct supports take account for 62 percent in the gross returns (euro per hectare) in 2020. In the beef and milk sector, the direct supports take account for 37 percent, and 27 percent in the gross returns, respectively.

Table 3: Changes of the incentive prices under alternative scenarios (in percent compared to the baseline scenario).

	Baseline 2020	Change, %			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
	euro/ha				
Grains – total returns	990	5,8	-10,0	-17,9	-12,2
- support price	615	9,1	-16,4	-29,4	-19,6
- market price	374	0,2	0,5	0,9	0,0
	euro/100 kg				
Beef price – total	373	3,6	-5,6	-10,4	-7,2
- support price	139	8,8	-16,0	-28,9	-19,3
- market price	234	0,5	0,6	0,7	0,0
Milk price – total	47	1,2	-0,9	-2,0	-2,0
- support price	13	3,2	-4,7	-9,3	-6,9
- market price	34	0,4	0,6	0,9	0,0

Source: own elaboration

The move to EU wide flat rate payment (adjusted with purchasing power parity) increases the policy support impacts in Finland for grains, beef, and milk (relative to the baseline). However, the introduction of a €100/ha EU wide flat area payment and the abolishment of the SFP reduces the policy support in Finland.

Since the EU-wide flat rate payment increases the incentive price faced by grain farmers, the total grain area is projected to increase by 2 percent relative to the baseline (scenario 1). All other three scenarios, on the other hand, lead to a reduction in the production of grains (Table 4). Under the scenario 2, where a 100 Euro/ha flat area payment is introduced, the total grain area is projected to decline by 3 percent relative to the baseline. Under the scenario where the

SFP is gradually reduced to zero, the total grain area harvested is projected to be 6 percent lower, and under the scenario where national co-financing of second pillar policies cannot exceed 50%, the grain area is projected to be 4 percent lower by 2020 compared to the baseline scenario.

The decline in the oilseed area under the scenarios 2-4 is clearly smaller than the change in the cereal area harvested. The largest change is projected to occur under the scenario where the SFP is gradually reduced to zero, in which the total oilseed area declines by 0.5%.

The impact in the beef and veal production is expected to be dominated by the developments on the dairy sector. Changes in beef and veal production and cattle slaughter are a direct consequence of changes in total cattle stocks, which are made up of beef cow stocks and dairy cow stocks. As a result of the CAP reform changes, beef and veal output will decline slightly to stand at around 1-1,5 percent below the baseline levels by 2020.

Table 4: Changes in the areas of grains, production of main animal products, and in farm income under alternative scenarios (in percent compared to the baseline scenario).

Item	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total grains area	1,69	-2,94	-5,29	-3,59
Wheat	1,68	-3,11	-5,58	-3,66
Barley	1,73	-2,94	-5,28	-3,65
Oats	1,72	-2,99	-5,38	-3,65
Rye	1,70	-3,05	-5,48	-3,65
Oilseeds	0,22	-0,25	-0,48	-0,42
Beef and veal	0,72	-1,11	-1,44	-1,06
Pork	0,24	0,16	0,18	0,00
Poultry	0,33	0,33	0,43	0,00
Eggs	0,10	0,09	0,11	0,00
Cow milk	0,28	-0,31	-0,64	-0,52
Farm income	27,1	-58,5	-98,6	-62,4

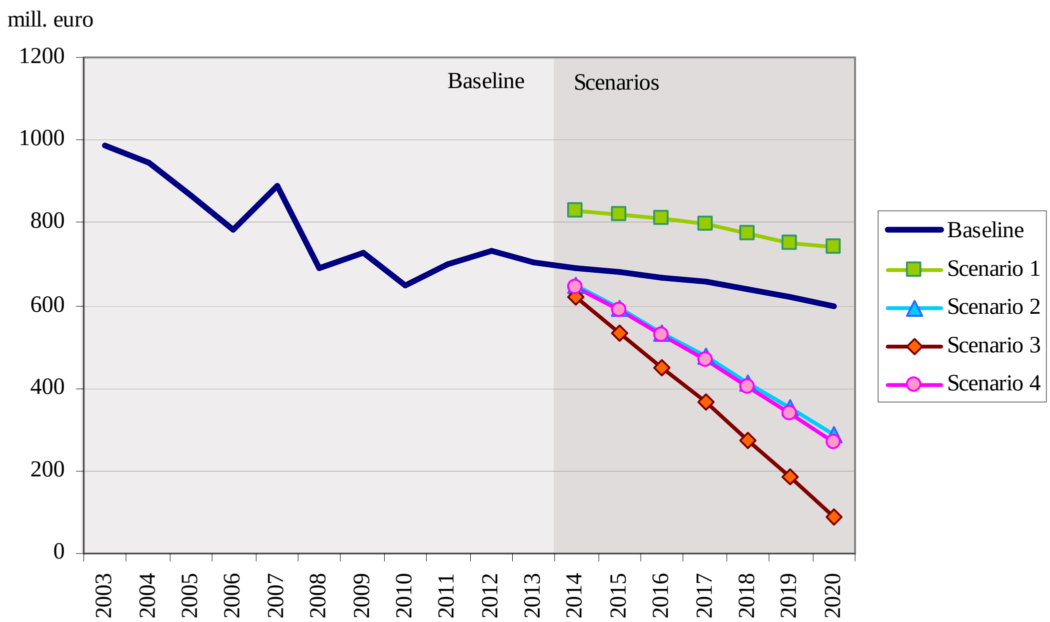
Source: own elaboration

The impacts of the four scenarios on the pig meat, poultry meat and egg production sectors are relatively minor. The scenarios are based on different levels of direct payments which are not playing important roles in these two sectors. Due to the tiny increases in the prices of grains and oilseeds, the cost of producing grain based meats and eggs increases only slightly relative to the baseline and, as expected, production of pig and poultry meat are quite stable under all of the scenarios.

As regards to milk, the main outcome of the alternate policy scenarios analysed is a relatively small decrease in milk production over the projection period to 2020. The largest change is projected to occur under the scenario where the SFP is gradually reduced to zero, in which the milk production declines by 0,6%. The support on milk is relatively smaller than the support on grains or meats. Therefore, by 2020 the milk incentive price decrease in Finland is only 1 to 2 percent depending on the scenario.

Although of the impacts of the four scenarios on production levels are very small, scenarios 2, 3 and 4 lead to very drastic reduction in Finnish farm income (Figure 1). Under the scenario 2, where a 100 Euro/ha flat area payment is introduced, farm is projected to decline by 59 percent relative to the baseline. Under the scenario where the SFP is gradually reduced to zero, farm income is projected to be 97 percent lower, and under the scenario where national co-financing of second pillar policies cannot exceed 50%, farm is projected to be 63 percent lower by 2020 compared to the baseline scenario. These drastic results are explained by the significant role of support payments in the income formation of Finnish agriculture, representing 43% of the total return on agriculture.

Figure 1. Development of farm income under alternative scenarios (million euros).



5. CONCLUSIVE REMARKS

After the simulation carried out to assess the impacts of further reform of the Common Agricultural Policy (CAP) on the Finnish agro-food sector, the following questions naturally arise: What are the major findings and what do they mean? To what extent do the results reflect reality and to what extent can they be ascribed to the characteristics of the analytical tool used? How useful is the chosen modelling approach as an analytical tool? What are the methodological or analytical lessons to be learned from the research?

The projection and policy simulations presented in the paper demonstrate that the Finnish AGMEMOD model provides the basis for relatively straightforward baseline projection, and an initial framework for agricultural policy analysis. The baseline projections allow us to highlight key medium term market developments and draw some conclusions about future policy developments and their likely impact on Finnish agriculture. It should be also acknowledged that the Finnish model is well adapted for inclusion into a framework of multi-country model of the whole EU. Such a comprehensive interactive framework of model is suitable for the study of the commodity market, its responses to EU market changes, and the international transmission of concurrent price changes.

The impacts of the CAP reform experiments in Finland analysed by the model can be summarised as follows:

- A small projected reduction in the production level as a result of CAP policy reforms
- A large projected decrease in farm income as a result of cuts in support payments

However, caution is deemed necessary when interpreting these simulation results which show very small reactions in production levels, even though farm income is reduced considerably. There are some important modelling limitations involved in the use of AGMEMOD as a base for agricultural policy analysis. In particular, the effects of big policy shocks are clearly not adequately captured by the model. The development of agricultural production depends on the parameter values for price and policy variables in the model equations. These parameters have been estimated econometrically or calibrated using the historical data up to 2006. The historical data exhibit relatively small changes in prices and support payments, and the parameter estimates are known to apply best within the range of the variation of the variables. The confidence interval for the model estimates gets worse, if the values of the scenario variables are a good deal outside the observation range. Yet, in this study we used these parameter estimates for situations involving policy changes that are much larger than those in the historical data. Therefore, our linear equations of supply together with estimated low elasticities generate simulation results, which do not fully capture farmers' reactions to these changes.

One further point is that the projections produced with the model are conditional in that they depend on data used on the future evolution of the wider economy (economic growth rates, inflation and currency exchange rates), and on assumptions relating to the wider set of policies that affect agriculture (agricultural policy in non-EU countries, WTO). Large shocks to the wider macroeconomy and/or unforeseen changes in agricultural and other policies affect agriculture and are "missed" by this analysis.

ACKNOWLEDGMENT

The authors would like to acknowledge the work of their AGMEMOD Partners in the development of the AGMEMOD model used in this article. This research was supported by the 5th Framework Project QLK5-CT-2000-00473 and 6th Framework Project SSPE-CT-2005-021543. The authors remain responsible for all errors.

REFERENCES

Adams, G., Westhoff, P., Willott, B. and Young, R.E. II (2001). Do 'Decoupled' Payments Affect US Crop Area? Preliminary Evidence from 1997-2000, *American Journal of Agricultural Economics* 83:5-20. Proceedings, 2001.

Bhaskar, A. and Beghin, J.C. (2009). How coupled are decoupled farm payments? A review of the evidence. *Journal of Agricultural and Resource Economics*, 34:130-153.

Bureau, J.C. and Mahe, L.P. (2008). *Cap reform beyond 2013: An idea for a longer view.* Notre Europe.

Chantreuil, F., K. Hanrahan and F. Levert (2005). "The Luxembourg Agreement Reform of the CAP: An Analysis using the AG-MEMOD Composite Model" in Modelling Agricultural Policies: State of the Art and New Challenges, In: Arfini, F. (ed.). Modelling agricultural policies: state of the art and new challenges. Parma: Monte Universitá Parma Editore, 632-652.

Donnellan, T., Gracia, A., Jensen, J.D., and Riordan, B. (2001) Guidelines for Model Building in the AG-MEMOD Partnership. . Dublin: Teagasc, Rural Economy. Online at www.tnet.teagasc.ie/AG-MEMOD/modellingag.htm

European Commission (2010). Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future. Brussels, 18.11.2010. COM(2010) 672 final.

Hanrahan, K. (2001). *The EU Gold Model 2.1: An Introductory manual.* Dublin: Teagasc, Rural Economy Research Centre.

Gohin, A. (2006). Assessing CAP Reform: Sensitivity of Modelling Decoupled Policies. Journal of Agricultural Economics,
57: 415-440.

Hanrahan, K., Donnellan, T., Chantreuil, F. (2010). Agricultural policy change in the EU : Analyzing the impact at member state and aggregate levels. *Journal of International Agricultural Trade and Development* 6:83-100.

Riordan B., Donnellan T., Hanrahan K. and K. McQuinn, (2002). "Projection of Policy Impacts on the Agri-food Sector: Overview and Introduction to AG-MEMOD", paper presented at the 10th Congress of the European Association of Agricultural Economists (EAAE) in Zaragoza.

Hennessy, T.C. and Thorne, F.S. (2005) How decoupled are decoupled payments? The evidence from Ireland, *Eurochoices*, Vol. 4, No. (3).

Howley, P., Donnellan, T. and Hanrahan, K. (2010a). Does the CAP support cohesion objectives? An examination of the distributional impact of agricultural support. *Journal of International Farm Management* 5:1-20.

Howley, P., Donnellan, T. and Hanrahan, K. (2010b) An Analysis of the Potential Impact of Decoupled Payments: An Irish Case Study. *Eurochoices,* (In Press).

Moreddu, C., Antón, J., von Lampe, M., Martini, R., Tallard, G. and P. Vavra (2004): Analysis of the 2003 CAP Reform. OECD paper, Paris.

Niemi, J., Jansik, C., Kettunen, L., Lehtonen, H. (2005). A Tool to Analyse the Impact of Policy Changes on the Agri-Food Sector of Finland. In: Arfini, F. (ed.). Modelling agricultural policies: state of the art and new challenges. Parma: Monte Universitá Parma Editore, 609-629.

Niemi,J J. & Ahlstedt, J. (eds.). 2010. *Finnish Agriculture and Rural Industries 2010. MTT Economic Research* publications 110a. Helsinki: MTT. 96 p.

Osterburg, B. and von Horn, L. (2006) Assessing the impacts of decoupling EU direct payments from agricultural production and the potential for recoupling. *Outlook on Agriculture* 35:107-113.

Salamon P., Chantreuil F., Donnellan T., Erjavec E., Esposito R., van Leeuwen M., Salputra G. (2008). How to deal with the challenges of linking a large number of individual national models: the case of the AGMEMOD Partnership." Agrarwirtschaft, Vol 57 (8).

Tabeau, A. and van Leeuwen, M. (2008). Importance of CAP reforms for the Dutch agricultural sector in 2000-2020. A
paper presented at the 109th EAAE Seminar "The CAP after the Fischler reform: National implementations, impact assessment and the agenda for future reforms", November 20-21, 2008, Viterbro, Italy.