European Commission

Evaluation of Measures Applied Under the Common Agricultural Policy to the Cereals Sector

Final Report

Written by:

LMC International

December 2012

Table of Contents

Contents

List of Tables

List of Diagrams

Acronyms

List of acronyms

AAF — European Starch Industry Association

CAP — Common Agricultural Policy

CGF — Corn gluten feed

CMO — Common Market Organisation

CNDP — Complementary National Direct Payments

COP — Cereals, oilseeds and protein

DDGS — Distillers' dried grains with solubles

EAGF — European Agricultural Guarantee Fund

EFM — European Flour Millers' Association

FADN — EU Farm Accountancy Data Network

FEFAC — European Feed Manufacturers' Federation

FNVA — Farm Net Value Added

FWU — Family Work Unit

GAEC — Good Agricultural and Environmental Conditions

GATT — General Agreement on Tariffs and Trade

GM — Genetically Modified products

IMS — Integrated Management System

ILUC — Indirect Land Use Changes

IPR — Inward Processing Relief

LIFFE — London International Financial Futures and Options Exchange

LLP — Low Level Presence

MS — 10 Member States

MTR — Mid-Term Review

NFI — Net Family Incomes

SAC — Scottish Agricultural College

SAPS — Single Area Payment Scheme

SPS — Single Payment Scheme

SRW — US Soft Red Winter

TRQ — Tariff Rate Quota

UAA — Total utilised agricultural area

UNAFPA — Union of Organizations of Manufacturers of Pasta Products of the EU

URA — Uruguay Round Agreement

VWG — Vital wheat gluten

WTO — World Trade Organization

Glossary

This glossary introduces a number of technical concepts, which relate to the Cereals Common Market Organisation (CMO) and the subsequent single CMO, or relate to the methodology employed in this report.

Arable land: is land worked (ploughed or tilled), generally under a system of crop rotation.

Complementary National Direct Payments (CNDPs): are coupled or decoupled payments that EU-12 MS can make to raise the level of overall direct supports above the phasing-in level.

European Size Unit (ESU): the economic size of an agricultural unit or farm in the Farm Accountancy Data Network (FADN) classification is expressed in European Size Units (ESUs). The value of one ESU is defined as a fixed number of Euros of Farm Gross Margin. Over time the number of € per ESU has been re-valued at regular intervals to account for inflation. Over the period covered by the Evaluation, the value of one ESU has remained fixed at €1,200. FADN classifies the farms in its sample in six ESU size classes: A to F, where A contains the smallest farms (in terms of economic size) and F the largest farms.

Farm Net Value Added (FNVA): indicates the remuneration to the fixed factors of production (labour, land and capital), whether they be externally supplied or through the family holding itself. It takes account of current subsidies and taxes, but does not deduct either subsidies on investments or the remuneration of the external factors (wages, interest and rent paid). **Family Farm Income** is calculated after these last items have been subtracted from the FNVA.

General Field Cropping: This is one of the standard types of farming established by FADN in its sampling approach and, together with Specialist COP crops farming (defined below), constitutes a larger category that is defined as 'Specialist field crops'. A farm enterprise is allocated to General Field Cropping if more than two-thirds of the farm's standard gross margin are obtained from the farming of general field crops.

Genetically modified organisms (GMOs): are organisms, such as plants and animals, whose genetic characteristics are being modified artificially in order to give them a new property.

Genetically modified (GM): refers generically to the products produced from these GMOs.

Mixed Crops-Livestock: This is one of the standard types of farming established by FADN in its sampling approach. A farm enterprise is allocated to this category if more than two-thirds of the farm's standard gross margin are obtained from mixed crops-livestock farming.

Other gainful activity: is any activity other than one relating to farm work, including activities carried out on the holding itself (camping sites, accommodation for tourists) or that uses its resources (machinery, etc.) or products, such as processing farm products, renewable energy production), and which have an economic impact on the holding. Other gainful activity is carried out by the holder, family members or one or more partners on a group holding.

Permanent crops: are those crops (fruit trees and vines) not grown in rotation, other than permanent grassland, which occupy the soil for a long period and yield crops over several years.

Permanent grassland and meadow: This refers to land used permanently (for five years or more) to grow herbaceous forage crops through cultivation (sown) or naturally (self-seeded) and that is not included in the crop rotation on the holding; the land can be used for grazing or mowed for silage or hay.

Permanent fallow: This commits the farmer to setting aside the same parcel(s) of land for the full period of the agreement.

Rotational fallow: enables the farmer to set aside different parcels of land each year as part of the normal arable rotation. There are detailed rules for the management of the fallow land to ensure that it is kept in good agricultural condition.

Single Area Payment Scheme (SAPS): was a simplified and transitional decoupled payment scheme available to new MS before they applied the SPS (defined below).

Single Payment Scheme (SPS): was introduced as a decoupled payment scheme for EU-15 MS between 2004 and 2006, with the date of its adoption decided by each MS. It was also available to EU-10 MS on accession, but only two (Malta and Slovenia) chose to apply it.

Specialist COP crops: Specialist Cereals, Oilseed and Protein crops. This is one of the standard types of farming established by FADN in its sampling approach and, together with general field crops farming (defined below), represents a larger category defined as 'Specialist field crops'. A farm enterprise is allocated to this category if more than two-thirds of the farm's standard gross margin are obtained from cereals, oilseed and protein crops farming.

Utilised Agricultural Area (UAA): describes the area used for farming. It is the sum of arable land, permanent crops, permanent grassland and meadow and other agricultural land such as kitchen gardens (even if they only represent small areas of total UAA). The term excludes unutilised agricultural land, woodland and land occupied by buildings, farmyards, tracks, ponds, etc.

Introduction

I1 Context of the evaluation

This evaluation examines the impact of measures applied under the Common Agricultural Policy (CAP) to the cereals sector. In 2003, the Mid-Term Review (MTR) marked a major change in policy with the introduction of 'decoupled' direct aids and with further adjustments made under the CAP Health Check of 2008, the focus of measures in agricultural markets, and specifically the cereals sector, shifted from automatic price support to safety net measures reserved for certain market conditions. Increased emphasis was also placed upon meeting good agricultural and environmental standards, greater market orientation and a competitive agricultural sector.

I2 Instruments covered

The evaluation focuses on specific instruments that are set out in the following regulations:

- Council Regulation (EC) No 1782/2003, laying down all direct support schemes. It also includes the subsequent changes introduced by Council Regulation (EC) No 73/2009.

- Council Regulation (EC) No 1784/2003, subsequently integrated into Council Regulation (EC) No 1234/2007, laying down cereal-specific measures as part of the common organisation of agricultural markets. It also includes the subsequent changes introduced by Council Regulation (EC) No 72/2009.

I3 Time period

The evaluation covers the period from 1 January 2005 onwards; however, for analytical purposes, data from 2000 to 2010 have been used to capture the impact of reform and to place developments in a proper context, but 2005 to 2010 is the main focus of this evaluation. For comparative purposes, we have analysed developments over three key periods to reflect the shift away from a framework with extensive price supports and market management:

- The pre-reform phase is 2000-2003 covering four years under the Agenda 2000 measures (Council Regulation (EC) No 1253/1999), which preceded the MTR.

- The transitional period, after implementation of the MTR, is 2004-2006. It starts with 2004/05 as the first year in which measures, such as the Single Payments Scheme (SPS), were phased in. It is also a period of significant price supports, via active public intervention and border measures. In addition, it was the period in which ten Member States (MS) (EU-10) entered the EU.

- The post-reform period is 2007-2010 covering the time after all MS had applied the MTR measures. Further reforms occurred in intervention rules, set-aside and remaining coupled payments, and Bulgaria and Romania (EU-2) became the newest MS.

I4 Crops examined

- The crops examined in this evaluation are common wheat, durum wheat, barley, maize, rye, oats and triticale. The focus is on grain cereals, but silage maize is also considered.

I5 Geographical coverage

This evaluation addresses developments in the EU-27 as a whole. CAP policy impact is reviewed in aggregate, but complemented with analysis of the results of fieldwork as appropriate. The 10 MS and regions were selected (and are shown below) to yield comparative analyses of the impact of particular measures and provide empirical observations. These regions account for a sizeable share of EU cereal output and use, and provide insights into the impact of CAP measures across the wide diversity of production structures, productivity levels, agro-climatic conditions and crop specialisations:

- Bulgaria: Severozapaden
- Estonia (treated as one region)
- France: Picardie & Poitou-Charente
- Germany: Niedersachsen
- Greece: Central Macedonia
- Hungary (treated as one region)
- Poland: Mazowieckie
- Romania: Sud-Muntenia
- Spain: Castilla y León
- UK: East Anglia

I6 Main report

The report consists of 11 chapters and has the following structure:

Chapter 1: Data methodology presents an overview of the tools and methodology applied throughout this evaluation report.

Chapter 2: Description of the cereals sector presents a review of the EU-27 cereals sector since 2000, covering the following aspects:

- Supply — cultivation practices and crop rotations; areas, production and yields; by-products from cereal output and the cereal share in total agricultural output.

- Demand — consumption of individual cereals in food, feed, biofuels and industrial uses.

- Supply-demand balances and cereal import and export trade.

- Prices — producer prices and competitiveness in the operation of domestic cereals markets.

- Review of changes in the location of durum wheat farming — for which the reforms greatly reduced support.

Chapter 3: Description of the intervention logic analyses the range of CAP measures applied to cereals, describing the current measures applicable and how these evolved from 2005 to 2010. Furthermore, logical diagrams are used to illustrate the evolution of reforms.

Chapters 4-10: Answers to the evaluation questions address each of the fifteen evaluation questions listed below. Each section is approached with an interpretation of the key terms of the question, a summary of the judgement criteria, indicators, data sources and the evaluation tools. We describe the relevant CAP measures and our hypotheses regarding their expected impact upon the cereals sector, with reference to these specific questions. Different tools are then applied to test these hypotheses and assess the degree to which other factors have been important and we conclude with our principal findings.

Theme 1: Impacts on the production of cereals

EQ 1: *To what extent have the CAP measures applicable to the cereals sector affected the production of cereals (with regard to choice and diversity of crops, area, yield, intensity of production, crop rotation, choice of production technology, prices and geographical localisation of production)?*

Theme 2: Impacts on the supply to the EU processing industry

EQ 2: *To what extent have the CAP measures applicable to the cereals sector influenced the supplies to the processing industry with regard to crop, quantity, quality, prices, geographical distribution and substitution with other sources?*

EQ 3: *To what extent have the CAP measures applicable to the cereals sector ensured that supplies corresponded to the needs of the processing industry?*

Theme 3: Competitiveness of the cereals sector

EQ 4: *To what extent have the CAP measures applicable to the cereals sector contributed to fostering the competitiveness and promoting the market orientation of EU cereal production?*

EQ 5: *To what extent have the CAP measures applicable to the cereals sector influenced the level and volatility of cereal prices?*

EQ 6: *To what extent have the CAP measures applicable to the cereals sector contributed to maintaining/increasing the income of the cereal producers?*

EQ 7: *To what extent have the 2003 and subsequent changes in the CAP measures applicable to the cereals sector influenced the administrative costs for the cereal producers?*

EQ 8: *To what extent have the CAP measures applicable to the cereals sector contributed to fostering innovation in cereal production?*

EQ 9: *To what extent have the CAP measures applicable to the cereals sector contributed to fostering innovation in cereal use?*

Theme 4: Sustainability of the cereals sector

EQ 10: *To what extent have the CAP measures applicable to the cereals sector contributed to encouraging environmentally sustainable production methods in the cereals sector?*

EQ 11: *To what extent has the suspension and subsequently the abolition in the health check reform of the set-aside obligation influenced the area of land left uncropped by cereal producers?*

Theme 5: Efficiency, coherence and relevance

EQ 12: *To what extent are the CAP measures applicable to the cereals sector after the 2003 reform efficient in achieving the objectives of these measures?*

EQ 13: *To what extent are the CAP measures applicable to the cereals sector after the 2003 changes coherent with the overall concept and principles of the 2003 reform of the CAP and with the overall EU objectives?*

EQ 14: *How far do the objectives aimed at correspond to the needs of the cereal producers and to those of the cereal users?*

EQ 15: *To what extent does the implementation at EU level of the CAP measures applicable to the cereals sector provide added value given the objectives of the policy and the reform?*

Chapter 11: Conclusions and recommendations: This final chapter draws upon the answers to the evaluation questions to compare the pre- and post-reform periods in the EU cereals sector. The chapter assesses the extent to which the differences identified between the two periods are attributable to the CAP reforms in the sector and highlights any unintended consequences of the measures. The chapter concludes with policy recommendations.

Chapter 1: Data Methodology

This evaluation assesses the relevance, effectiveness and efficiency of measures applied under the Common Agricultural Policy (CAP) to the cereals sector over a period of significant reform and relies heavily upon the collection and validation of a range of statistical data covering the full EU-27, supplemented by case study work. The main focus of the approach, applied in this evaluation, is upon detailed micro-economic analyses, although the impact of macro-economic conditions is inevitably covered. Much of the analysis relates to the responses of individual participants, namely producers, processors and intermediaries, to the new structure of incentives created by policy reforms.

Four main sources of data are used:

- DG Agriculture and European Commission data.
- EU Farm Accountancy Data Network (FADN).
- National and regional official databases.
- Structured questionnaires with producers, processors, government representatives and industry associations.

1.1 DG Agriculture and European Commission data

Databases maintained by DG Agriculture, Comext and Eurostat provide EU-wide and national data, since 2000, on the main structural variables behind this report. Data from DG Agriculture, particularly covering market management measures, are used extensively throughout the analysis.

1.2 EU Farm Accountancy Data Network (FADN)

The key component of the evaluation is the calculation of production costs and gross margins. These are then used as a basis for calculating simple supply elasticities to analyse the effect of a change in gross margin on the area under the different cereals.

The accounting data supplied by FADN by MS and by region provide the basis of comparative information on area, production and gross margins on farm holdings, from the accounting year of 2000 onwards. Since FADN provides data on both income and business activities for around eighty-one thousand holdings across the EU-27, it acts as a consistent source of information for micro-economic analysis across MS.

FADN farm typology distinguishes between many types of specialisation and farm sizes and, for this evaluation, the primary emphasis will be on specialist cereal, oilseeds and protein (COP) holdings. Comparisons will be made with other types of holdings that receive a significant share of their incomes from field crops. These include general field crop producers, mixed crop-livestock producers and all other producers as a group.

The degree of agricultural specialisation is based on the FADN classification of types of farming (TF)[1] and is summarised in Table 1.1.

- FADN category TF13 denotes holdings for which cereals are the main income source and most of the crop is for sale.
- FADN category TF14 denotes holdings for which significant cereals are grown, but are less important as an income source.
- FADN category TF80 denotes holdings for which livestock units have significant on-farm feed-use.

[1] Council Regulation (EC) No 85/377/EEC of 7 June 1985 establishing a Community typology for agricultural holdings.

Table 1.1: Farming types included in the evaluation

TF14	FADN types of farming	Producers for whom …
13	Specialist cereals, oilseed and protein (COP) crops	Cereals are the main income source and most of the crop is for sale
14	General field cropping	Significant cereals are grown, but are less important as an income source
80	Mixed crops and livestock	Livestock units have significant on-farm feed-use

Source: FADN.

It is important to note that the FADN data put emphasis upon holdings rather than individual crops, and the FADN excludes the smallest holdings from its coverage. Consequently, national data on crop-specific production costs and gross margins over time from MS, revealed through the case study analysis, are of particular importance.

The analysis is broken down into three categories: EU-15 (the 15 MS which joined prior to the 2004 accession), EU-10 MS which joined in 2004, and the EU-2 MS which joined in 2007. We have also aggregated the years into the three periods of analysis outlined in the Introduction (i.e. pre-reform, the transitional period and post-reform). However the post-reform period for FADN data has been adjusted to cover 2007-2009, as 2009 is the latest full year of FADN data available. The number of holdings represented in the breakdown of results is above fifteen holdings to preserve the guaranteed confidentiality of the dataset. We have produced results for all MS and the ten case-study MS described in the Introduction.

FADN classify farms according to their farm sizes into six different size classes. This is based on economic size, which is defined in terms of European Size Units (ESUs). The value of one ESU is defined as a fixed number of euros of the Standard Gross Margin[2]. We have reclassified a new typology of farms, presented in Table 1.2, for the purpose of this evaluation as follows:

- 'Small' comprises the FADN classifications of fewer than 8 ESUs.
- 'Medium' comprises the FADN classifications of more than 8 ESUs, but fewer than 40.
- 'Large' comprises the remaining larger two classifications of greater than 40 ESUs.

Table 1.2: Reclassification of size classes

ES6 grouping	FADN ESU classes	LMC categorisation
1	Very small (<4)	
2	Small (4-<8)	Small: FADN size classes 1+2 (<8 ESUs)
3	Medium low (8-<16)	
4	Medium high (16-<40)	Medium: FADN size classes 3+4 (8-<40 ESUs)
5	Large (40-<100)	
6	Very large (>=100)	Large: FADN size classes 5+6 (>=40 ESUs)

Source: FADN and LMC.

1.3 National and regional official databases

For in-depth analysis of the case-study countries and each of the individual regions selected for special scrutiny, official data maintained by national government and local government agencies have been used to assess both national practices and diversity across regions. Since government agencies have the responsibility of administering cereal measures, their data have been used extensively and supplemented with the findings from structured interviews.

[2] Over the period covered by this evaluation report, the value of one ESU has remained fixed at €1,200.

1.4 Structured questionnaires

1.4.1 Cereal producer surveys

For the fieldwork in the ten case-study MS, two hundred and five cereal producers were surveyed. A random sample, with a target of twenty respondents per MS, was selected to represent large and small producers, reflecting the distribution of the different cereals in the MS. From Table 1.3 shows that one third of the total farmers surveyed fell into the size group category of fewer than 50 hectares. Table 1.4, summarising 2007 Farm Structure Survey data on all holdings, reveals that this size group had the largest number of holdings in the EU-27.

Table 1.3: Number of respondents by Member State, by total farm size (hectares)

Country	<50 ha	51-100 ha	101-200 ha	201-400 ha	401-600 ha	>600 ha	Total Number of Farms
Bulgaria	7	1	1	2	2	7	20
Estonia	2	3	2	3	1	9	20
France	8	7	3	3	1	0	22
Germany	9	1	4	2	1	5	22
Greece	11	6	2	0	1	0	20
Hungary	5	0	1	3	1	10	20
Poland	7	2	2	4	3	2	20
Romania	6	2	4	3	2	3	20
Spain	3	4	1	5	2	5	20
UK	5	3	4	5	2	2	21
Total	**63**	**29**	**24**	**30**	**16**	**43**	**205**

Source: LMC Producer Questionnaire.

Table: 1.4: Total number of holdings by agricultural farm size (UAA) for cereal farms in the case-study MS and EU-27 in 2010 (percentage)

	< 50 ha	51 - 100 ha	> 100 ha
Bulgaria	97.7%	0.8%	1.5%
Estonia	85.7%	5.6%	8.8%
France	62.8%	18.9%	18.3%
Germany	71.5%	17.3%	11.2%
Greece	99.0%	0.8%	0.2%
Hungary	97.6%	1.1%	1.3%
Poland	98.2%	1.1%	0.6%
Romania	99.5%	0.2%	0.4%
Spain	89.5%	5.3%	5.2%
UK	61.3%	17.7%	21.0%
EU-27	94.2%	3.2%	2.6%

Source: Eurostat - Farm Structure Survey (2010).
Note: Cereals: Number of farms, areas and combine harvesters by size of farm (UAA) and size of cereal area [ef_lu_alcereal]

The questionnaire had five main areas of focus of how the position in 2010 changed from 2005.

- Farmers' cropping decisions, rotations and how these changed over time.
- Responses to changes in different aspects of policy, with an emphasis on cereal-specific income support measures.
- Environmental practices and the intensity of production, including water use and irrigation, as well as fertiliser and chemical input application rates and mechanisation.
- Data on key aspects of production and costs, particularly on-farm cereals use, and the split of labour time (especially between paid and unpaid/family labour).

- Other activities or areas of relevance (including innovation, farming and non-farming activities and the administrative implications of policy reforms).

1.4.2 End-user analysis

To reinforce the official data on policy impacts on cereal end-users, specific data for the downstream sectors were collected from European-wide and national trade associations supplemented, where possible, with data from LMC's own databases, notably on starch processing and biofuel production.

Structured interviews were held with processing companies, as well as their national and European associations, to reinforce the results of the quantitative analyses.

Interviews were held with Coceral[3] and its associate members (Euromalt, Euroflour and Euromaisiers), FEFAC, the European Starch Industry Association, as well as processors across the food, feed, starch, bioethanol and sweetener sectors. The membership of these trade associations are representative of the bulk of capacity in their respective industries.

- Availability and security of supply (including the issue of substitutability).
- Appropriateness of supplies in terms of meeting needs.
- Identification of CAP measures of relevance and the efficiency of these measures.
- Innovation in processes, products and market outlets.

1.5 Tools and methodologies

Comparative statics are used to address several of the evaluation questions that relate to structural changes within the cereal sector before, during and after the MTR. This approach permits a systematic comparison of the observed outcomes in 2007-2010 with the situation in 2004-2006 and, for some aspects of the evaluation, of that in 2000-2003.

Some of the information requested in the questionnaires is quantitative, but other information is of a more qualitative nature, which uses terms such as 'higher' or 'lower' in the questions.

A number of dynamic analyses are also undertaken. These apply techniques such as the estimation of correlations and measures of volatility, which are a major aspect of the analysis of price behaviour and competitiveness of markets.

The short time-series of annual data available during the period covered by the evaluation and the difficulty of constructing consistent and accurate cross-sectional series of key data in different regions make the application of sophisticated econometric models unsuitable to the preparation of answers to the evaluation questions.

Quantitative methods are particularly important in terms of analysing the regional data that are central to the case studies. Thus, information about gross margins of individual crops are central to an understanding of the response of producers to specific policy reforms. These data are complemented by microeconomic data from the FADN database about the costs and revenues of different types of holding (but, in the case of this database, not of individual crops) by size, specialisation and region.

The quantitative methods are also applicable to the consideration of aspects such as measures of price and income volatility, and to correlations between different price series within and outside the EU.

---

[3] Coceral is the EU association representing the trade with cereals, oilseed, feedstuffs, olive oil and agrosupply. Its members are national associations representing grain merchants, storers and international traders. Associate first processing associations are Euromalt, Euroflour and Euromaisiers.

Chapter 2: Description of the Cereals Sector

2.1 Introduction

This chapter describes the development of the EU cereals sector, under the following headings:

- Cultivation practices and crop rotations.
- Cereal crop areas.
- Cereal production and yields.
- Cereal producer prices.
- The share of cereal output in total agricultural output.
- Supply-demand balances in the cereals sector.
- Cereal consumption in food, feed, biofuels and industrial uses.
- Cereal imports and exports.
- By-products from cereal production and processing.
- Competitiveness in the operation of domestic cereals markets.
- The evolution of durum wheat production.

2.2 Cultivation practices and crop rotations

The diversity of crops and cultivation practices across the EU-27 is a consequence of the range of climates and soil qualities across the MS, as well as a response to market signals and policy measures. However, in all these farming systems, crop rotations are an essential part of cereal production. Cereals are not ideally suited to be a monoculture (without another crop acting as a break crop). Recommendations from agronomists in different MS are for cropping patterns that avoid having more than two or three successive cereal crops (which may differ). The Good Agricultural Environmental Conditions (GAEC), that form part of the cross compliance requirements, include the maintenance of crop diversity[1].

Every crop plays a different role in a rotation in ways that range from their nitrogen intake to the agricultural residues left post-harvest. A diverse rotation is also essential to break cycles of disease and pests and limit weed infestation, while providing a measure of sustainability to the cropping system. The overall health and fertility of the soil are especially important when producing cereals for demanding end-markets, such as milling wheat and malting barley.

An ideal balance in a rotation involves crops from the different crop groups (cereals, oilseeds, legumes, roots and broad-leaved arable crops). The traditional 'combinable break crops', i.e. those harvested using combined harvesters, are oilseeds and protein crops (pulses, field peas and beans). However, agronomists recommend low limits on the frequency of these break crops in rotations with cereals to limit the incidence of pests and diseases in these crops.

For oilseed rape (rapeseed), the usual recommendation is that at least three years should pass before it is planted again on the same land. Rapeseed is popular in a cereal farmer's annual calendar because it is drilled and harvested at different times to cereals. Sunflower is more suitable as a break crop in the hotter, drier regions of the EU, but the recommended rotation in its case is for at least four years before replanting. Soybeans have the highest frequency in a cereal rotation. They can be planted every other year, providing nitrogen to the following cereal crop via their nitrogen-fixing properties.

---

[1] Council Regulation (EC) No 73/2009 of 19 January 2009 (OJ L 30, 31.1.2009 p. 16, Annex III) establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers.

Nitrogen-fixing and an increase in yields in the following crop are key reasons for putting protein crops in a rotation. However, they may create weed problems for following crops and the risk of fungal outbreaks limits their appearance in a cereals rotation to one year in five or more. Good practice leaves land fallow every few years to allow it time to rest and recover.

The constraints imposed by rotations have underpinned the dominant share of cereals in EU-27 crop areas.

2.3 Cereal crop areas

Diagram 2.1 reveals how the balance of EU-27 planted areas changed between the 2000/01 and 2010/11 marketing years for cereals, as well as the alternative COP crops, and the areas left uncropped. Total cereal areas fell from 60.9 to 56.2 million hectares during the decade, divided 37.2/23.7 and 34.4/21.8 between the EU-15 and EU-12 in 2000/01 and 2010/11, respectively. It should be noted that the cereals grown for silage are not included in these totals, but the German national scheme to promote biogas production increased the German silage maize area from 1.15 to 1.85 million hectares over the decade.

Diagram 2.2 depicts the division of areas between cereals and oilseeds for the EU-15 and EU-12. The EU-15 cereal and oilseed totals are plotted as separate areas on the diagram, while EU-12 areas are plotted as lines: for cereals alone and for cereals plus oilseeds combined. The diagram demonstrates that, while the areas planted to cereals declined in both groups of MS between 2000/01 and 2010/11, oilseed crop areas increased during the same period.

Cereals occupy the largest share of the total area in the EU. The cereal area has declined in both the EU-15 and EU-12 since 2000/01 and also fell between 2005/06 and 2010/11.

Oilseeds areas grew in the same two periods in both the EU-15 and EU-12, led by rapeseed. The 2010/11 EU-27 rapeseed area was nearly 70% above the 2000/01 level. The sunflower area barely changed in the same decade. Soybean areas fell almost 30% in the same period.

Protein crops occupy less than 2% of the EU COP area. Their total area in 2010/11 was virtually unchanged from ten years earlier. Uncultivated land includes set-aside and fallow land and its area rose 25% from 2000/01 to 2005/06, but fell back with the application of zero rates of set-aside. In 2010/11, the total uncropped area was 10% lower than it had been in 2000/01.

Diagram 2.1: EU-27 cereal, oilseed and protein crops and uncultivated areas

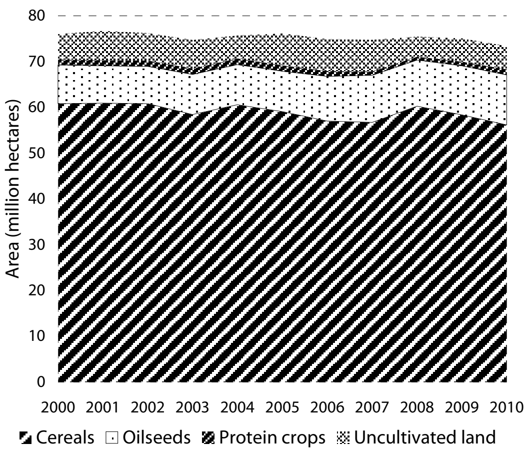
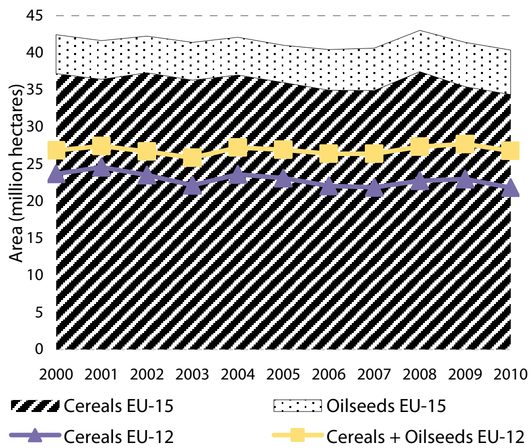


Diagram 2.2: EU-15 and 12 cereal and oilseed crop areas



Source: Marketing year data from DG Agri, Prospects for Agricultural Markets and Income, December 2011; Eurostat.
Note: Uncultivated land includes set-aside and fallow land.

Diagram 2.3 plots changes since 2000 in COP crops' shares of the total EU utilised agricultural area (UAA), which includes uncultivated land. The total UAA fell from 191.4 to 177.5 million hectares over the decade. For ease of comparison, the oilseed, protein crop and uncultivated land shares are measured on the right hand axis. Cereals accounted for over 31% of the total EU UAA in the period since 2000/01, with this share surging in 2008/09, largely at the expense of the uncropped area. The oilseeds' share of the total UAA rose considerably, moving above 6% in 2009/10. The protein crop share remained well below 1% over the entire period.

Diagram 2.4 depicts proportions of the main cereals within the total EU cereals area. Common wheat is the main cereal grown, and now occupies over 40% of the total. Its share has increased significantly since its low point in 2003/04. The share under barley fell sharply after 2009/10.

The maize share in the total fluctuated around 15% after 2000/01, while the shares of both durum wheat and rye have declined over the same period. Other cereals include triticale, oats, millet and also mixtures for on-farm feeding. The category has increased its share of the total.

Diagram 2.3: EU-27 cereal, oilseed and protein crop areas as a share of total area (UAA)

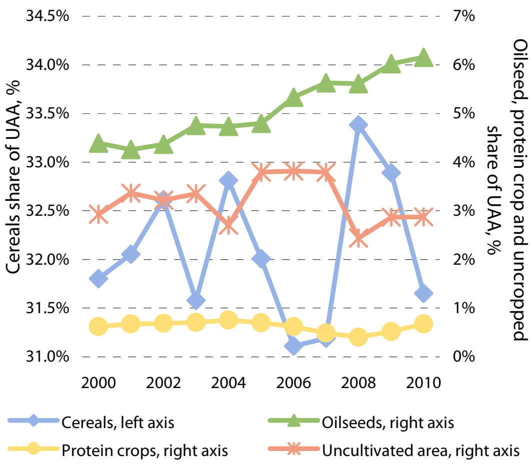
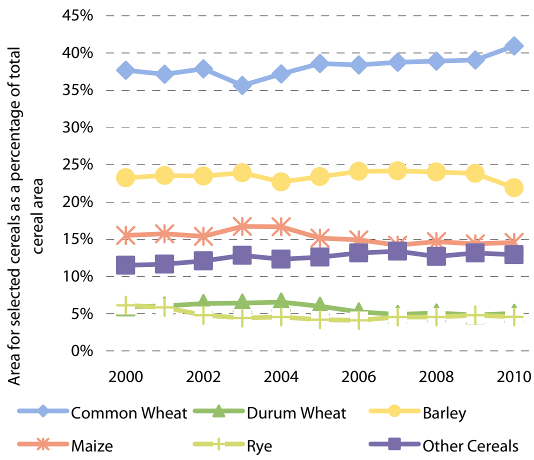


Diagram 2.4: Areas of different cereals as a percentage of the total EU-27 cereal area



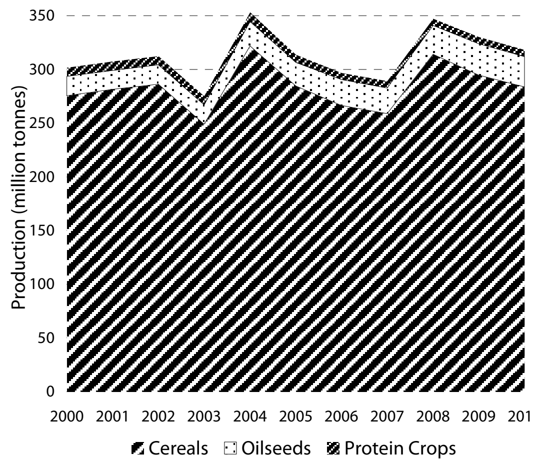
Source: Marketing year data from 'Prospects for Agricultural Markets and Income' DG Agri, December 2011; Eurostat.

2.4 Cereal production and yields

Diagram 2.5 illustrates the dominance of cereals in EU COP crop output. Total cereal output rose by 3% between 2000/01 and 2010/11, but fell by 0.3% from 2005/06 to 2010/11.

Production fluctuated significantly, in particular in response to climatic factors, with both the 2003 and 2007 crops adversely affected by exceptionally poor weather in many MS. The major change in COP crop output over the decade was the growth in the contribution of oilseeds, up from 18.3 million tonnes in 2000 to 21.8 million in 2005 and 28.2 million in 2010.

Diagram 2.5: EU-27 output of cereals, oilseeds and protein crops



Source: Marketing year data from 'Agriculture in the EU', DG Agri, various issues, and Eurostat Yearbook 2011.

Table 2.1 describes changes in cereal areas and production by MS between the 2000, 2005 and 2010 marketing years. France and Germany are the largest producers; together they accounted for 39-40% of the EU-27 total in each of those years.

Within the total, there was a major rise in the role of the EU-12. Every EU-12 MS increased its cereal output between 2000 and 2010, though several experienced a drop between 2005 and 2010. The EU-12 share of the EU-27 total was 22% in 2000, 30% in 2005 and 28% in 2010, with a corresponding decline from 78% to 70% and 72% in the EU-15 share, in which the fall in Spanish output was particularly striking. Spain's cereal production fell by over ten million tonnes in 2000-2005 and only made up half of the loss in output in the next five years.

The planted areas under cereals fell in the EU-12 and EU-15 in both five-year periods, but there were six MS in which cereal areas increased between the 2000 and 2010 marketing years. These were Belgium, France, Italy and Luxembourg in the EU-15, and Latvia and Lithuania in the EU-12.

Table 2.1: Cereal output and areas by MS in 2000/01, 2005/06 and 2010/11 (million tonnes and '000 hectares)

	2000 Output	2000 Area	2005 Output	2005 Area	2010 Output	2010 Area
Austria	4.5	830	4.9	796	4.8	812
Belgium	2.5	314	2.8	322	3.1	339
Germany	45.3	7,016	46.0	6,839	44.3	6,636
Denmark	9.4	1,500	9.3	1,509	8.7	1,484
Spain	23.7	6,690	13.5	6,479	18.7	5,878
Finland	4.1	1,167	4.1	1,188	3.0	947
France	65.6	9,055	64.0	9,158	65.3	9,229
Greece	4.1	1,193	4.2	1,221	3.9	983
Ireland	2.2	279	1.9	282	2.0	272
Italy	19.4	3,913	20.1	3,778	21.0	4,058
Luxembourg	0.2	29	0.2	29	0.2	30
Netherlands	1.8	226	1.9	222	1.9	220
Portugal	1.5	554	0.7	366	0.8	275
Sweden	5.7	1,208	5.1	1,013	4.3	959
UK	24.0	3,348	21.0	2,919	23.4	3,076
EU-15	**213.8**	**37,320**	**199.5**	**36,121**	**205.4**	**35,199**
Bulgaria	5.2	1,966	5.8	1,704	7.0	1,740
Cyprus	0.0	52	0.1	62	0.1	32
Czech Republic	6.5	1,650	7.7	1,612	6.9	1,463
Estonia	0.7	329	0.8	282	0.7	275
Hungary	10.0	2,761	16.2	2,931	12.3	2,584
Lithuania	2.7	980	2.8	956	2.8	1,006
Latvia	0.9	420	1.3	469	1.4	512
Malta	0.0	3	0.0	3	0.0	3
Poland	22.3	8,814	26.9	8,329	27.3	8,479
Romania	10.5	5,654	19.3	5,825	16.7	5,096
Slovenia	0.5	102	0.6	93	0.6	101
Slovakia	2.2	838	3.6	800	2.6	707
EU-12	**61.6**	**23,566**	**85.1**	**23,066**	**78.3**	**21,998**
EU-27	**275.4**	**60,887**	**284.6**	**59,187**	**283.7**	**57,196**

Source: Marketing year data from 'Agriculture in the EU', DG Agri, various issues, and Eurostat Yearbook 2011.

Diagram 2.6 compares the growth since 2000/01 in EU-27 yields of the five main cereal crops, common wheat, maize, barley, durum wheat and rye, with that of rapeseed, the leading competing COP crop. Maize and common wheat consistently record the highest yields.

In Diagram 2.7, linear trends are fitted to the annual EU-27 crop yield series in the preceding diagram. They reveal a divergence between the comparatively fast-rising trends for maize and durum wheat yields and the less steep increases in the yields of common wheat, barley, rye and rapeseed.

Diagram 2.6: EU-27 yields per hectare of major cereal crops and rapeseed

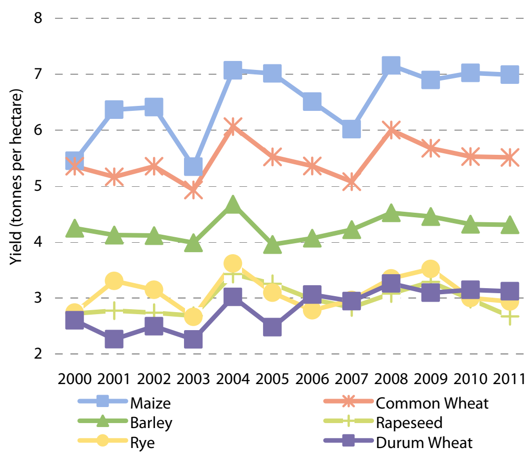
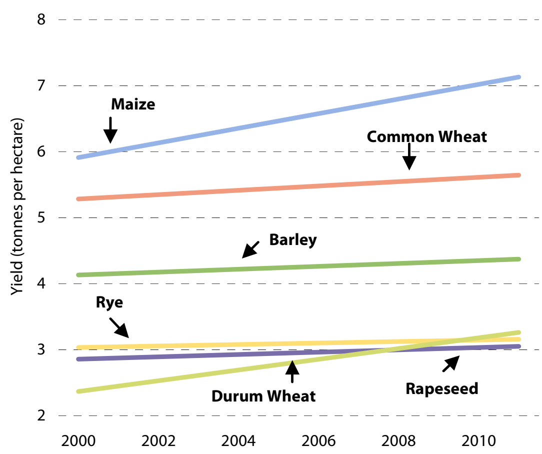


Diagram 2.7: Linear trends in EU-27 yields of major cereal crops and rapeseed



Source: Marketing year data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011; Eurostat.

2.5 Cereal producer prices

We have derived producer price series for different cereals by MS by analysing the FADN database, which provides data based on the volume of sales of individual cereals and the revenues from these sales. The producer prices were computed by dividing total revenues from each cereal from all COP specialist, mixed crop-livestock and general field crop holdings by the total sales volumes for each accounting year.

Diagrams 2.8-2.10 plot the weighted average producer prices for individual cereals for the EU-15, EU-10 and EU-2 MS, where the weights that are applied are the outputs of these cereals in each MS. The EU-15 series extend from 2000 to 2009 (the latest year for which FADN data are available). The EU-10 series extend from 2004 to 2009 and the EU-2 series run from 2007 to 2009, since FADN data are not available for years prior to accession.

Table 2.2 compares the weighted average cereal producer prices (using output as weights) in the different groups of MS over the longest periods for which comparable data exist.

The periods are the 2004-2009 accounting years for the EU-15 and EU-10 and 2007-2009 for the EU-15, EU-10 and EU-2.

The EU-15 prices are the highest for every cereal in the comparisons both with the EU-10 and EU-2 MS. Average EU-10 MS producer prices for cereal crops are higher than those in the EU-2, except for rye and oats, which are minor crops in the EU-2 MS.

Diagram 2.8: Weighted average EU-15 cereal producer prices, 2000-2009*

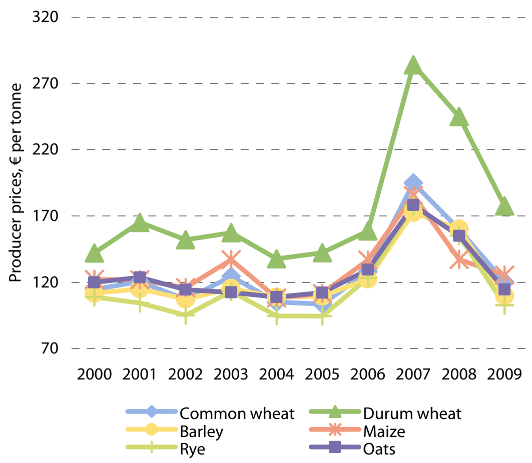


Diagram 2.9: Weighted average EU-10 cereal producer prices, 2004-2009*

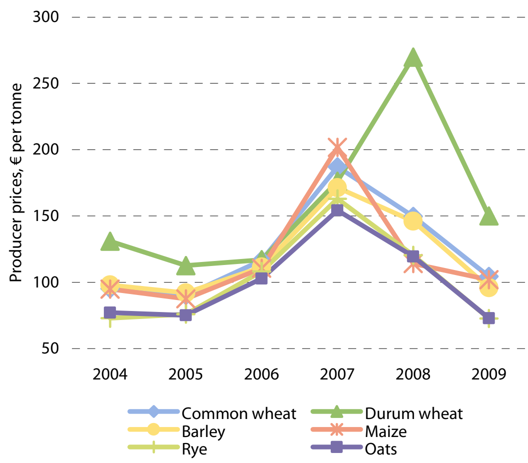
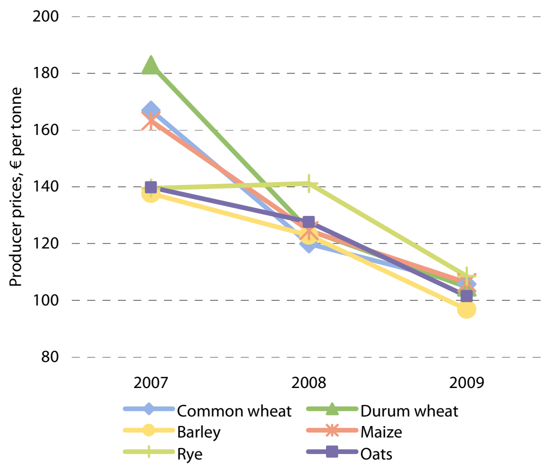


Diagram 2.10: Weighted average EU-2 cereal producer prices, 2007-2009*



A close correlation between the producer prices of individual cereals is evident for the EU-15, though the maize price dipped faster than the prices of the other cereals in 2008.

Durum wheat commanded a consistent sizeable premium over all the other cereals.

The pattern of price movements was slightly different for the EU-10 in that durum wheat lost its premium price for this group of MS in 2006-2007.

EU-2 producer prices for the different cereals were more closely grouped than those in the other sets of MS over 2007-2009.

*Source: Derived from analysis of the FADN database for the 2000-2009 accounting years and marketing year area data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011.
*Note: The prices are computed as the weighted averages of the producer prices for individual MS, using the output of the individual cereals by MS as the weights.

Table 2.2: Comparison of cereal producer prices, EU-15, EU-10 and EU-2 (€ per tonne)

	EU-15 2004-2009	EU-10 2004-2009	EU-15 2007-2009	EU-10 2007-2009	EU-2 2007-2009
Common wheat	134	123	157	146	132
Durum wheat	191	140	235	172	138
Barley	127	119	145	138	119
Maize	133	117	148	137	131
Rye	120	102	142	119	130
Oats	128	100	145	116	123

Source: Derived from analysis of the FADN database for the 2000-2009 accounting years and marketing year area data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011, and Diagrams 2.8-2.10.
Note: The prices are computed as the weighted averages of the producer prices for individual MS, using the output of the individual cereals by MS as the weights.

2.6 The share of cereal output in total agricultural output

Table 2.3 lists the changes in the cereals sector's share of the total value of EU agricultural output and of total crop revenues in 2000-2010. At the 2007-2008 peak, cereals accounted for close to 14% of the value of agricultural output and over 25% of the value of crop production.

Table 2.4 ranks (in descending order) the cereal shares of total agricultural output in individual MS in 2000, 2005 and in 2010, the last year marking the point at which the cereal share in six MS exceeded 20%.

Table 2.3: The share of cereals in the value of crop and agricultural output, 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cereals % of total agricultural output in revenue	9.9%	9.1%	9.3%	9.6%	11.5%	9.3%	9.9%	13.8%	13.8%	10.4%	12.3%
Cereals % of total crop production in revenue	18.8%	17.6%	17.4%	18.0%	21.0%	17.8%	18.8%	25.1%	25.4%	19.7%	22.6%

Source: 'Agriculture in the EU', DG Agri, various issues.

Table 2.4: Cereal output as a share of total agricultural production by value by MS

	2000	2005	2010
Hungary	21.5%	25.3%	28.1%
Czech Republic	19.6%	20.3%	24.8%
Latvia	20.5%	17.0%	23.4%
Bulgaria	13.4%	15.7%	22.1%
Slovakia	13.4%	19.7%	21.9%
Lithuania	21.4%	14.9%	21.0%
Romania	18.2%	16.2%	18.2%
Estonia	14.4%	14.9%	17.7%
Poland	17.6%	14.0%	16.7%
France	12.3%	11.3%	16.6%
Denmark	13.8%	12.4%	15.2%
Sweden	13.0%	11.5%	14.0%
Germany	12.9%	10.9%	14.0%
Austria	9.8%	8.1%	13.2%
Finland	14.3%	12.1%	13.0%
UK	13.2%	10.9%	11.6%
Luxembourg	7.3%	6.6%	10.0%
Spain	9.6%	5.4%	9.5%
Greece	7.2%	6.7%	8.7%
Italy	8.0%	7.1%	7.8%
Slovenia	6.6%	5.5%	7.3%
Belgium	3.2%	4.2%	6.4%
Ireland	4.5%	3.5%	4.9%
Portugal	4.4%	1.9%	3.4%
Cyprus	0.0%	2.4%	1.5%
Netherlands	0.9%	0.8%	1.1%
Malta	0.0%	0.0%	0.0%

Source: 'Agriculture in the EU', DG Agri, various issues.

2.7 Supply-demand balances in the cereals sector

Table 2.5 describes EU-27 supply/demand balances for cereals in three periods: 2000-2003 (pre-reform), 2004-2006 (in transition) and 2007-2010 (post-reform). The difference between production and [consumption *plus* net exports] is the net change in stocks in the period.

The level of self-sufficiency in the sector as a whole increased from 104.3% to 106.8% over the three periods, with common wheat, barley and oats all with surpluses throughout, and durum wheat the only cereal with a consistent deficit.

Table 2.5: EU-27 annual supply/demand balances for the cereals sector (million tonnes)

		2000-2003	2004-2006	2007-2010
Common wheat	Production	116.41	126.70	127.33
	Consumption	110.59	115.90	115.30
	Net Exports	6.49	8.45	14.43
	Self-sufficiency (%)	*105.3%*	*109.3%*	*110.4%*
Durum wheat	Production	8.97	10.12	8.98
	Consumption	9.52	10.63	9.66
	Net Exports	-0.54	-0.52	-0.45
	Self-sufficiency (%)	*94.2%*	*95.2%*	*93.0%*
Barley	Production	58.49	58.33	59.66
	Consumption	51.19	54.98	52.80
	Net Exports	6.97	6.09	5.72
	Self-sufficiency (%)	*114.2%*	*106.1%*	*113.0%*
Maize	Production	56.18	63.21	56.79
	Consumption	59.68	62.51	63.20
	Net Exports	-2.09	-1.82	-5.46
	Self-sufficiency (%)	*94.1%*	*101.1%*	*89.8%*
Rye	Production	9.61	7.83	8.51
	Consumption	9.49	8.66	8.25
	Net Exports	0.45	0.44	0.07
	Self-sufficiency (%)	*101.3%*	*90.4%*	*103.1%*
Oats	Production	8.99	8.29	8.38
	Consumption	8.32	8.08	8.26
	Net Exports	0.67	0.23	0.14
	Self-sufficiency (%)	*108.1%*	*102.7%*	*101.4%*
All cereals	Production	390.66	417.47	412.53
	Consumption	374.73	394.34	386.13
	Net Exports	19.13	21.48	28.99
	Self-sufficiency (%)	*104.3%*	*105.9%*	*106.8%*

Source: Marketing year data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011.

2.8 Cereal consumption in food, feed, biofuel and industrial uses

The changes in the consumption of individual cereals by end-use from the pre-reform to post-reform periods are described in Table 2.6. In every end-use category identified in the table, total cereal use rose between 2000-2003 and 2004-2006, but then fell back by 2007-2010 for the three largest end-use categories: feed (combining both on-farm feed and industrial feed compounding), human use (including flour milling, baking and pasta making) and industrial (which includes starch processing and malting). The two end-uses that grew in importance from 2004-2006 and 2007-2010 were other uses (primarily seeds for planting) and biofuel (notably bioethanol, since green silage maize use for biogas is not included in these figures, although it is discussed in the consideration of EQ9 in Chapter 8).

If biofuel had not developed to consume 6.59 million tonnes of cereals in 2007-2010, the combined EU-27 cereal consumption in 2007-2010 would have been barely 2 million tonnes above that in 2000-2003, which would have implied average annual growth of only 0.1%.

Table 2.6: EU-27 annual grain cereal consumption by end-use (million tonnes)

		Common wheat	Durum wheat	Barley	Maize	Rye	Oats	Combined
Human use	2000-2003	45.60	8.10	0.44	4.77	2.59	1.70	63.19
	2004-2006	46.22	9.09	0.43	5.04	2.92	1.73	65.42
	2007-2010	46.82	8.45	0.35	4.75	2.99	1.69	65.04
Feed	2000-2003	54.59	0.62	38.10	48.72	5.19	6.43	153.65
	2004-2006	57.03	0.72	38.61	50.33	4.07	6.19	156.94
	2007-2010	52.68	0.40	40.25	50.09	3.38	6.48	153.27
Industrial	2000-2003	5.31	0.04	9.13	4.96	1.01	0.20	20.64
	2004-2006	5.56	0.10	8.72	5.57	0.82	0.17	20.93
	2007-2010	5.96	0.09	8.43	4.87	0.56	0.10	20.02
Biofuel	2000-2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2004-2006	1.00	0.00	0.37	0.19	0.22	0.00	1.78
	2007-2010	3.13	0.00	0.42	2.23	0.80	0.00	6.59
Other	2000-2003	5.10	0.76	3.53	1.23	0.69	0.00	11.32
	2004-2006	6.09	0.72	3.52	1.39	0.64	0.00	12.35
	2007-2010	6.71	0.72	3.35	1.26	0.52	0.00	12.55
Total	**2000-2003**	**110.59**	**9.52**	**51.19**	**59.68**	**9.49**	**8.32**	**248.80**
	2004-2006	**115.90**	**10.63**	**54.98**	**62.51**	**8.66**	**8.08**	**260.76**
	2007-2010	**115.30**	**9.66**	**52.80**	**63.20**	**8.25**	**8.26**	**257.47**

Source: Marketing year data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011, USDA PSD database.

The feed sector is the largest end-use for cereals, representing roughly 60% of total demand, as indicated in Table 2.6. Table 2.7 presents information about the changes in this consumption.

Table 2.7: EU-27 consumption of feed cereals (million tonnes per annum)

	2000-2003	2004-2006	2007-2010
Total feed cereal use: of which	153.7	156.9	153.3
On-farm feed cereal use	85.9	85.8	81.7
On-farm feed cereal share	*55.9%*	*54.6%*	*53.2%*
Total industrial feed production	157.0	152.6	150.9
Industrial feed cereal use	67.7	71.2	71.6
Cereal share of industrial feed	*43.1%*	*46.7%*	*47.5%*
Imports of cereal substitutes	8.4	5.5	2.6
Substitute share of industrial feed	*5.3%*	*3.6%*	*1.7%*

Source: Marketing year data from DG Agri, 'Prospects for Agricultural Markets and Income', December 2011; FEFAC.
Note: Industrial feed is the manufacture of compound feed at industrial mixing plants.

On-farm cereal feed use fell slightly from 2000-2003 to 2007-2010, and its share in total feed use fell 2.7% to 53.2%. The fall in on-farm feed use almost exactly matched the rise in sales for industrial feed. Its cereal share of inputs rose 4.4% to 47.5% from 2000-2003 to 2007-2010, off-setting the decline in industrial feed output in the same period. The main cause of the higher cereal share of industrial feed output was a sharp drop in cereal substitute imports, notably corn gluten feed, tapioca, citrus pulp and distillers' dried grains with solubles (DDGS). These imports fell by 70%, reducing their share of industrial feed inputs from 5.3% to 1.7%.

The decline in industrial feed production reflects the slow growth or declines in output in the livestock sector, while feed conversion ratios continued their long trend of lower feed inputs per tonne of output. Table 2.8 describes the production of meat and eggs from 2000/01 to 2010/11, as the EU grew from 15 to 27 MS. Comparing 2004/05, the first year with EU-25 data with 2010/11, with EU-27 data, one observes that egg and beef output declined, despite the addition of 2 MS.

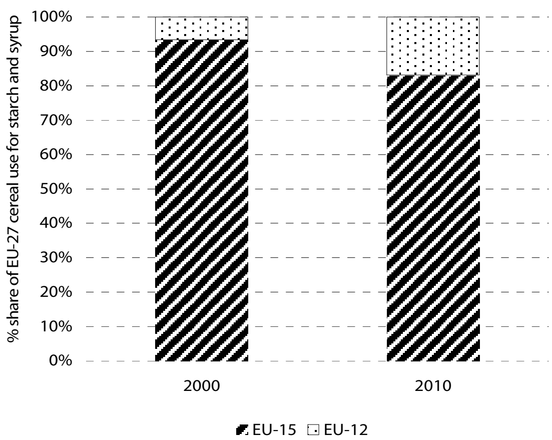
Table 2.8: EU production of meat and eggs ('000 tonnes)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	EU-15				EU-25			EU-27			
Poultry meat	8,801	9,088	9,382	8,953	11,251	11,223	10,746	11,453	11,607	11,693	12,132
Eggs	5,708	5,633	5,680	5,453	7,097	7,003	6,920	6,960	7,058	6,920	7,033
Pigmeat	17,596	17,574	17,873	17,787	21,197	21,101	21,400	22,858	22,596	21,449	22,219
Beef/veal	7,464	7,265	7,467	7,387	8,135	7,910	7,880	8,152	8,033	7,667	7,884

Source: Marketing year data from 'Agriculture in the EU', DG Agri, various issues.

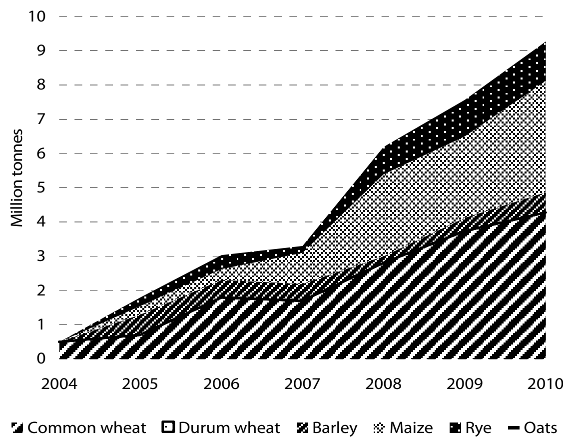
Within the starch sector, one of the more significant developments during the period under review was the expansion of new processing capacity in Central and Eastern Europe. Diagram 2.11 indicates that most of the cereal grind capacity is still located in the EU-15; the EU-12 now accounts for a greater share of total EU grind. In addition to cereal starch production capacities, the period until 2011/12 continued a system of coupled aids for producers and processors of potato starch within a quota of 1.949 million tonnes of starch (slightly under 20% of recent cereal starch output).

Diagram 2.11: Distribution of cereal use in starch processing by MS



Source: Calendar year data from the LMC starch database.

Diagram 2.12: EU-27 bioenergy use of grain cereals



Source: Marketing year data from DG Agri, Prospects for Agricultural Markets and Income, December 2011; Eurostat

Diagram 2.12 illustrates the growth in grain cereal use in the dynamic bioenergy sector since 2004. Initially, wheat was the favoured feedstock, but since 2008, maize has been used more heavily, particularly in Central and Eastern Europe.

2.9 Cereal imports and exports

Table 2.9 summarises the largest EU-27 export and import flows in cereals (excluding seeds for planting) over the three key periods. Besides the total extra-EU volumes, the table also lists all export destinations and import origins for which average flows in at least one of the three periods for the main cereals exceeded one million tonnes.

It reveals the importance of North Africa as an export destination for common wheat and Saudi Arabia for barley. Ukraine, Russia, the US and Canada are the leading overseas suppliers of common wheat, while Brazil and Argentina are the main suppliers of maize.

Table 2.9: EU-27 annual foreign trade in the main cereals, 2000-2010 (million tonnes)

			2000-2003	2004-2006	2007-2010
Common wheat	Exports	Total	10.60	10.06	16.35
	of which:	*Algeria*	*2.02*	*2.47*	*3.42*
		Morocco	*1.52*	*0.85*	*2.04*
		Egypt	*1.06*	*1.23*	*1.40*
Common wheat	Imports	Total	5.72	4.73	4.11
	of which:	*Ukraine*	*1.49*	*1.14*	*1.29*
		US	*1.23*	*1.26*	*0.81*
		Canada	*1.02*	*0.96*	*0.85*
		Russia	*1.51*	*0.75*	*0.53*
			2000-2003	2004-2006	2007-2010
Durum wheat	Exports	Total	0.60	1.02	1.03
Durum wheat	Imports	Total	1.38	1.85	1.89
			2000-2003	2004-2006	2007-2010
Barley	Exports	Total	6.02	2.78	3.40
	of which:	*Saudi Arabia*	*3.11*	*1.14*	*1.59*
Barley	Imports	Total	0.78	0.32	0.21
			2000-2003	2004-2006	2007-2010
Maize	Exports	Total	0.84	0.50	1.17
Maize	Imports	Total	3.12	3.49	6.76
	of which:	*Argentina*	*1.86*	*1.42*	*1.81*
		Brazil	*0.79*	*0.94*	*3.24*

Source: Calendar year trade data from COMEXT, European Commission.

2.10 By-products from cereal production and processing

Cereal crop residues have long been incorporated into the soil or used for animal feed or bedding, but their value as a source of biomass is increasingly being appreciated. The theoretical availability of straw for uses such as renewable biomass may be derived directly from EU cereal production, as is summarised in Table 2.10. Theoretical cereal straw supply can be split between maize stover (the stalk, leaves, cob or husks) and other cereal straw. Maize produces more residue than the other cereals per tonne of grain, reflected in a coefficient of 1.3 tonnes of straw per tonne of cereal, as against an average of 0.8 for all other cereals (which includes common wheat and barley, as well as other minor cereals).

Not all the theoretical availability of straw is translated into realistic, so-called technical, availability. The traditional uses of straw as animal feed and bedding have the first claim upon supplies, and the residual tonnages (the technical availability of straw) are listed in Table 2.10. These represent the quantities that are potentially available for other novel biomass applications. The decline for maize is more marked than that for all the other cereals, and reflects the drop in maize production between 2005 and 2010.

Table 2.10: Technical availability of straw from EU-27 cereal crops (million tonnes)

Cereal source	2005	2010
Maize (including cobs)	57.14	52.23
Other cereals	62.03	61.73

Source: DG Agri, Prospects for Agricultural Markets and Income, December 2011; LMC estimates.
Note: The 'other cereals' category includes common wheat and barley, as well as other minor cereals.

Straw use as a renewable biomass resource is still largely a potential future end-use. One source of by-products from cereal production that is already becoming well-developed is the supply of DDGS obtained from ethanol dry milling from cereals. Table 2.11 demonstrates our estimates of EU cereal-derived DDGS supplies, combining the bioenergy production of ethanol with estimates of traditional non-bioenergy ethanol production, such as for the chemical industry, perfumes and potable purposes.

The bioenergy dry milling of cereals only overtook traditional demand in importance in 2005, but by 2010, its share of dry milling production was close to 75%, when 4.16 million tonnes of DDGS were produced by EU dry mills. This quantity of DDGS substituted for over 3 million tonnes of cereals in feed.

Table 2.11: EU cereal use in ethanol dry milling and linked DDGS output (million tonnes)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cereal use	1.21	1.27	1.41	1.49	1.68	4.64	5.70	5.15	7.56	11.03	13.00
DDGS	0.39	0.41	0.45	0.48	0.54	1.49	1.82	1.65	2.42	3.53	4.16

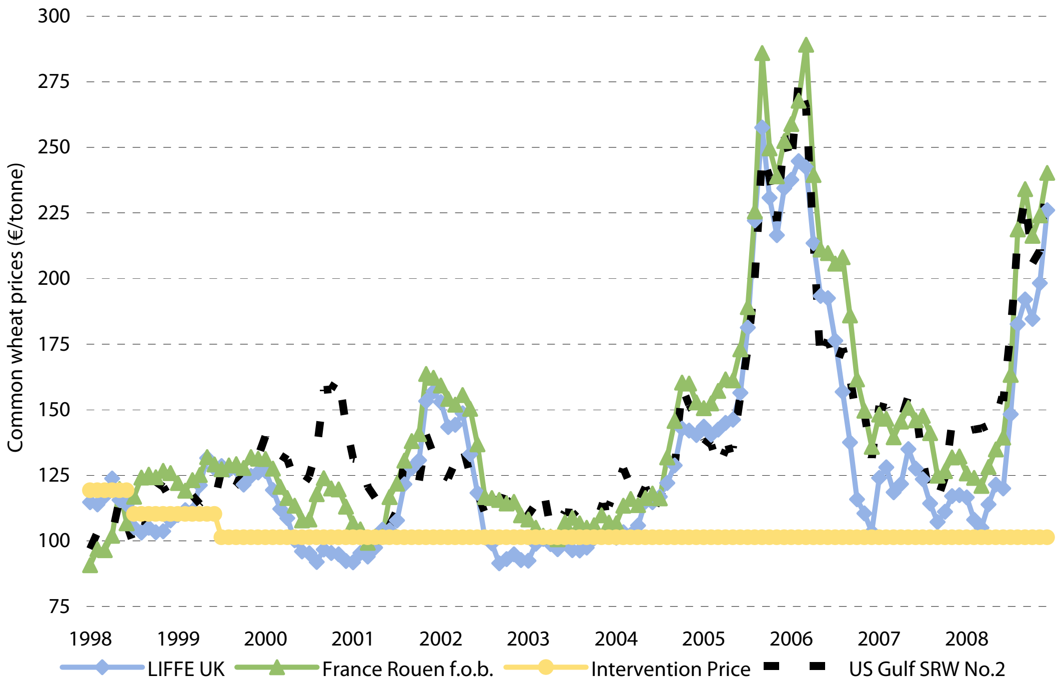
Source: DG Agri, Prospects for Agricultural Markets and Income, December 2011; LMC estimates.

2.11 Competitiveness in the operation of domestic cereals markets

Competitiveness in the operation of EU cereals markets is evident in the link between prices in the internal market and world market prices. Diagram 2.13 provides a visual indication of such competitiveness for the leading EU cereal, common wheat. It plots local prices (using the LIFFE feed wheat futures price as the reference) against French f.o.b. export prices, EU intervention prices and US Soft Red Winter (SRW) wheat prices, all in Euros per tonne.

An indication of the higher competitiveness of the operations of domestic cereal markets, as measured by the correlations between domestic and world market prices, is presented in Table 2.12. The correlation between monthly LIFFE feed wheat and US SRW prices rose from *minus* 7.3% to *plus* 92.5% from 2000-2003 to 2007-2010, and that between Rouen and Canadian Thunderbay barley prices rose from *minus* 12.1% to *plus* 88.5%. For maize, that between Bayonne and US Gulf prices rose from *minus* 34.4% to *plus* 49.9% (though, unlike the case with the other two cereals, the correlation declined between 2004-2006 and 2007-2010).

Diagram 2.13: EU soft wheat prices versus world market soft wheat export prices



Source: Agriculture & Horticulture and Development Board (HGCA), UK.
Note: The intervention price depicted in this diagram does not include the monthly increments in the price.

Table 2.12: Correlations between world market and EU local cereal prices (€ per tonne)

	2000-2003	2004-2006	2007-2010
Common wheat			
Level of EU price	112.7	111.9	158.4
Premium over world market reference price	-10.1	-7.4	-13.9
Correlation between the prices	-7.3%	77.7%	92.5%
Barley			
Level of EU price	114.8	111.7	148.2
Premium over world market reference price	7.9	32.8	32.7
Correlation between the prices	-12.1%	62.1%	88.5%
Maize			
Level of EU price	131.7	133.1	167.9
Premium over world market reference price	32.4	44.5	30.8
Correlation between the prices	-34.4%	83.8%	49.9%

Source: Monthly data from Agriculture & Horticulture and Development Board (HGCA), UK.
Note: The EU prices in these calculations are LIFFE feed wheat futures, the Rouen delivered barley price and the MATIF Bayonne maize quotation. The world market reference export prices are the US Gulf soft red winter wheat and maize prices and the Canadian Thunderbay barley export price.

2.12 The evolution of the location of durum wheat production

We conclude with a consideration of developments in the durum wheat sector, as the sector was exceptional among other cereals in the manner in which coupled support was provided[2]. Therefore, it is particularly interesting to assess the effect of the CAP measures upon planting decisions in the durum wheat sector, where the reforms had a significant impact upon producers' incomes from the crop.

Table 2.13 describes how the planting of durum wheat changed between 2000-2003 and 2007-2010, distinguishing between the changes in those regions identified as traditional areas and all other areas (non-traditional). It reveals the contrasting trends in areas in the traditional and non-traditional regions. Durum wheat areas fell by over 940,000 hectares between 2000-2003 and 2007-2010 in the former regions, but rose by 95,000 hectares in the latter.

Table 2.13: Traditional and non-traditional durum wheat planted areas by EU-15 MS 2000-2003 and 2007-2010 ('000 hectares)

		2000-2003	2004-2006	2007-2010
Italy	Traditional	1,683	1,542	1,383
	Non-traditional	4	3	3
	Total	1,687	1,545	1,386
Spain	Traditional	896	822	493
	Non-traditional	2	3	1
	Total	898	824	494
Greece	Traditional	688	683	575
	Non-traditional	8	7	3
	Total	696	690	578
France	Traditional	250	292	263
	Non-traditional	78	136	187
	Total	328	429	451
Portugal	Traditional	151	52	6
Austria	Traditional	14	16	17
Germany	Non-traditional	6	10	12
UK	Non-traditional	2	2	0
EU-15	***Traditional***	***3,683***	***3,407***	***2,737***
	Non-traditional	***100***	***162***	***206***
	Total	**3,783**	**3,569**	**2,943**
Bulgaria	Non-traditional	21	21	4
Cyprus	Non-traditional	6	6	6
Hungary	Non-traditional	13	10	11
Romania	Non-traditional	2	4	4
Slovakia	Non-traditional	5	5	10
EU-12	***Non-traditional***	***47***	***47***	***35***
EU-27	***Traditional***	***3,683***	***3,407***	***2,737***
	Non-traditional	***147***	***208***	***242***
	Total	**3,830**	**3,616**	**2,979**

Sources: Agriculture in the EU, DG Agri, various issues, DG Agri; Evaluation of the durum wheat CMO, 2009; case study interviews.

[2] The evolution of support to the durum wheat sector is described fully in Chapter 3.

Chapter 3: Description of the Intervention Logic

3.1 Introduction

The first part of this chapter describes a chronology of Common Agricultural Policy (CAP) measures applicable to the cereals sector. Logical diagrams illustrate a comprehensive model of the intervention logic in the measures applied to the sector and have been constructed from an analysis of the relevant legislation. The chapter opens with an explanation of the key terms used to classify the objectives of policy interventions, followed by a logical diagram to summarise the chronology of the major regulations, the measures included within them and the objectives of these measures since 2000. The historical evolution of cereal-specific CAP measures is described, together with their overall (global) objectives from 2000 to 2010. The chapter concludes with a summary of current measures following the CAP Health Check (approved in January 2009), and includes a logical diagram summarising the key measures in the period after the 2003 reform, accounting for adjustments that were made in 2009.

3.2 The objectives of CAP policy measures since Agenda 2000

Diagram 3.1 lists the chronology of regulations, measures and objectives in the cereals sector from 2000 to 2010. We classify objectives of a policy intervention in terms of the specificity and duration of impact, i.e. whether objectives are *specific*, *intermediate* or *global* in scope.

3.2.1 Specific objectives of measures

Specific objectives relate to short-term impacts upon direct beneficiaries of the measures. Measures directed towards the cereals sector have evolved away from price supports, initially towards coupled income supports and, under the Mid-Term Review (MTR), towards decoupled payments. Thus, the focus of specific objectives has moved, since 2000, from impacts that affected cereal producers or users (as distinct from producers or users of other crops).

Specific objectives that are identified in Diagram 3.1, describing the intervention logic for the CAP measures since 2000, start with the Agenda 2000 reform, Regulation (EC) No. 1253/1999, which included a reduction in cereal prices for end-users in the EU. The MTR Regulation (EC) Nos. 1782/2003 and 1784/2003 included as specific objectives a reduction in the sale of cereals to intervention stocks, as well as an increase in the output of biofuels and renewable energy (an objective applying to a wider range of crops than cereals alone) and the targeting of income support to smaller holdings.

The specific objectives of the Health Check, Regulation (EC) Nos. 72/2009 and 73/2009, took further earlier reforms' specific objectives of reducing cereal prices for end-users, making intervention stocks more of a safety net and targeting income support to smaller holdings. In addition, the reform gave producers greater freedom to determine which land to leave fallow.

3.2.2 Intermediate objectives of measures

Intermediate objectives are wider in scope, affecting both direct and indirect beneficiaries of the measures, some of whom are not cereal producers or users, and cover short- and medium-term outcomes. The intended impacts may take longer to be evident than specific objectives. Since much of the period being assessed was marked by relatively high cereal and agricultural product prices, the impact of the measures may take a number of years to emerge.

Direct examples of intermediate objectives in Diagram 3.1 include the impact of the measures on producers' total incomes, notably their stability and the establishment of a floor to these incomes. These objectives were evident in Agenda 2000 and the MTR, as well as Regulations (EC) Nos. 583/2004 and 864/2004 applying Single Payment Schemes (SPS) to new MS.

Diagram 3.1: A chronology of regulations, measures and objectives in the cereals sector, 2000-2010
(specific objectives are shaded orange, intermediate objectives are shaded yellow and global objectives are shaded blue. New regulations are shaded green)

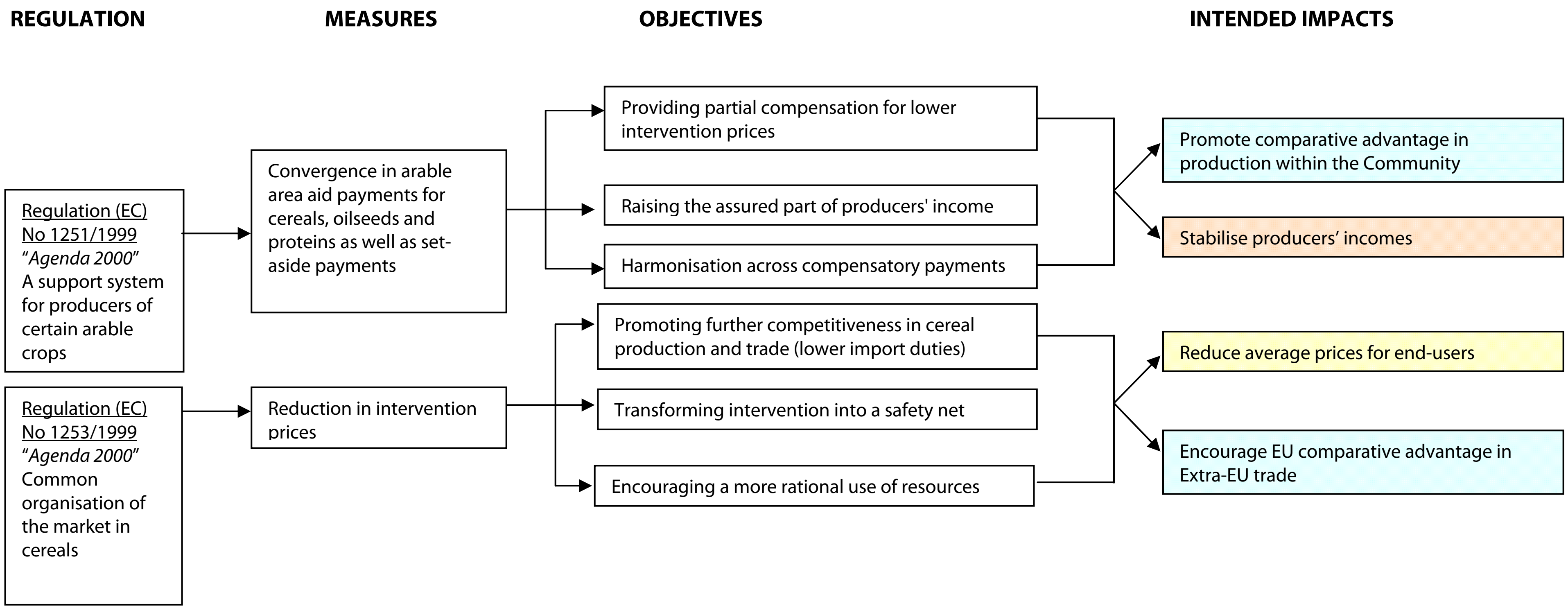


Diagram 3.1 (*continued*): A chronology of regulations, measures and objectives in the cereals sector, 2000-2010 *(specific objectives are shaded orange, intermediate objectives are shaded yellow and global objectives are shaded blue. New regulations are shaded green)*

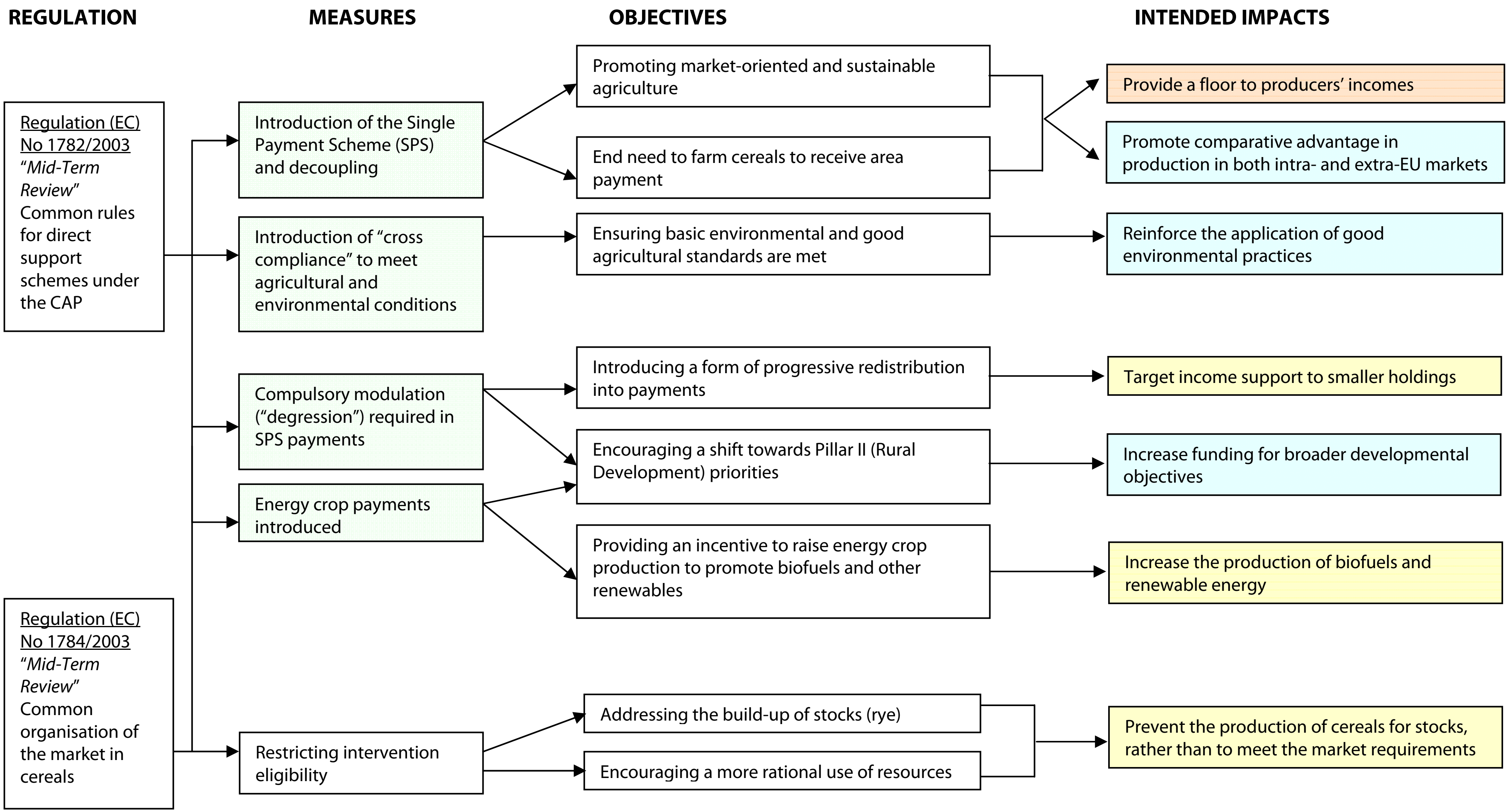


Diagram 3.1 (*continued*): A chronology of regulations, measures and objectives in the cereals sector, 2000-2010
(specific objectives are shaded orange, intermediate objectives are shaded yellow and global objectives are shaded blue. New regulations are shaded green)

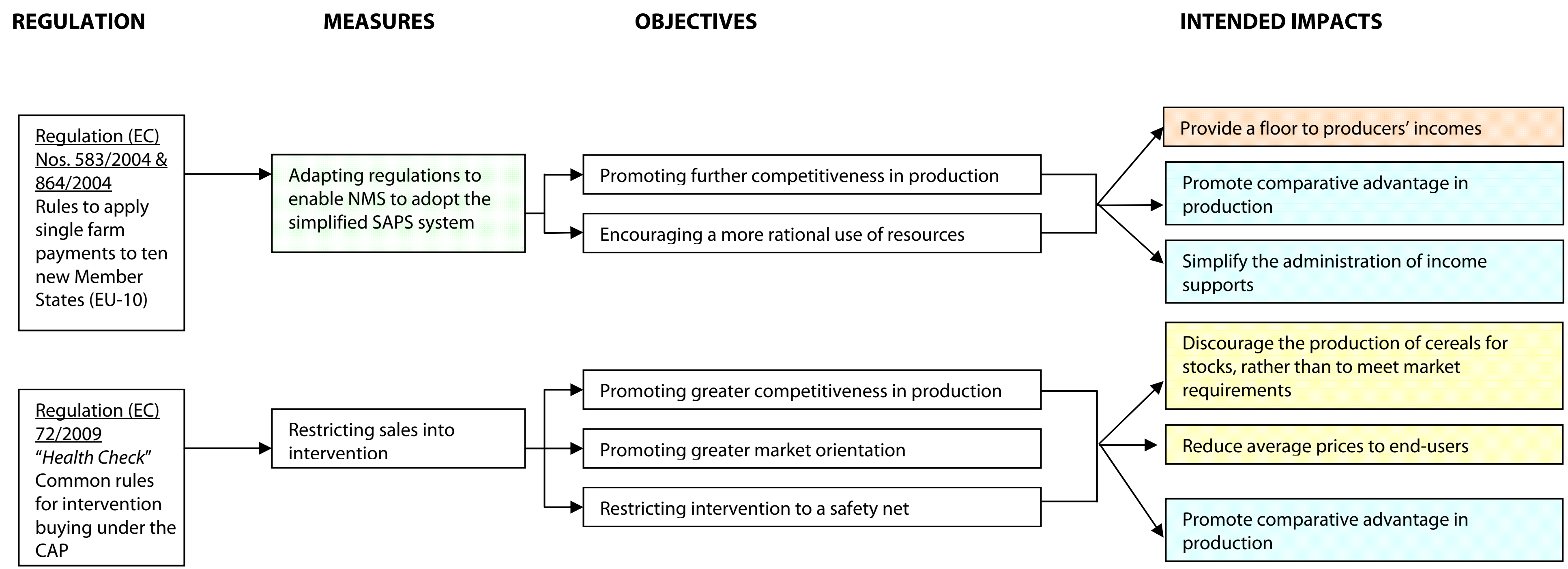
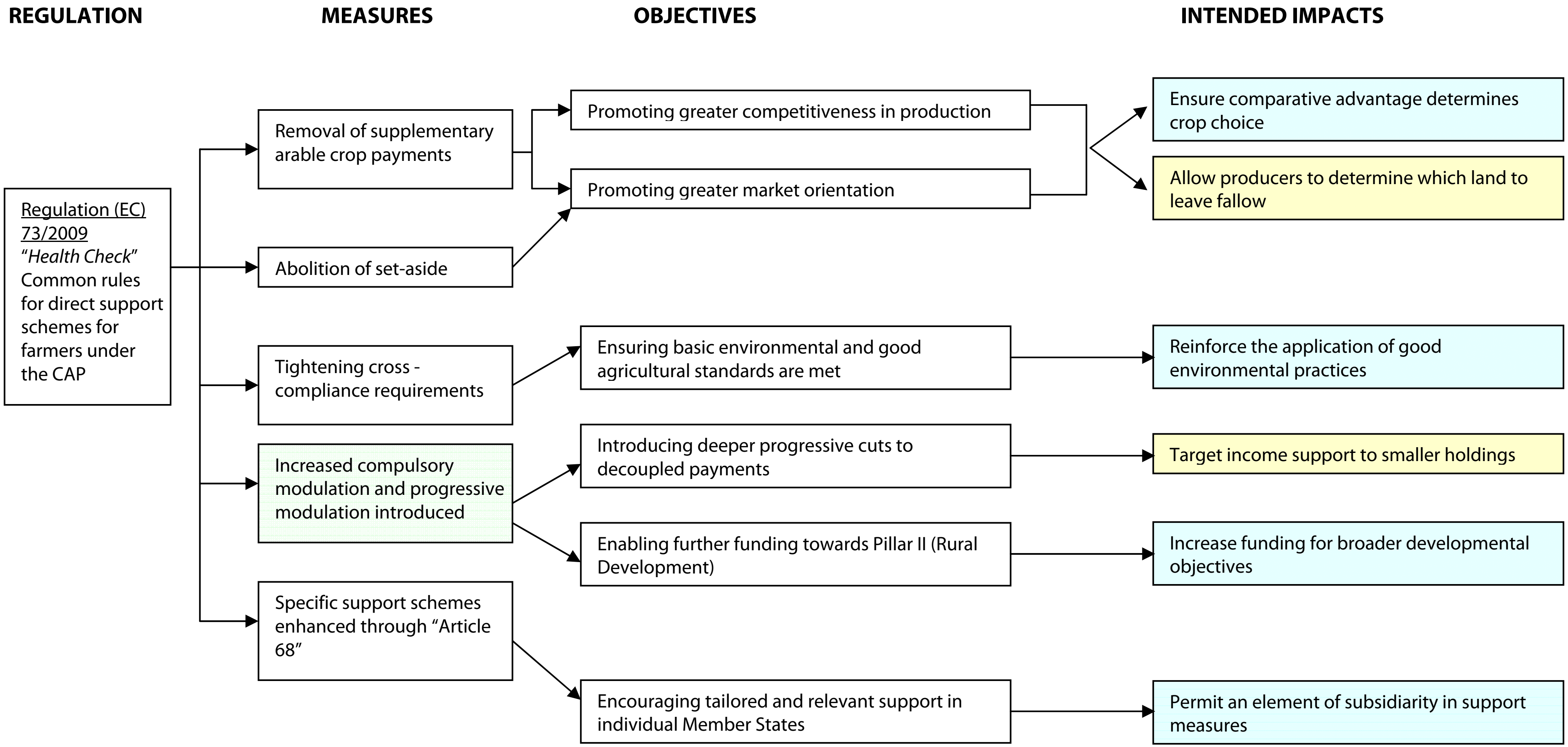


Diagram 3.1 (*continued*): A chronology of regulations, measures and objectives in the cereals sector, 2000-2010
(specific objectives are shaded orange, intermediate objectives are shaded yellow and global objectives are shaded blue. New regulations are shaded green)



3.2.3 Global objectives of measures

Global objectives have a longer-term horizon and are assessed in terms of the wide and diffused impacts of the intervention. Since Agenda 2000, reforms have become increasingly global in focus, in the sense that they are not targeted specifically towards cereal producers or users. Furthermore, the benefits are expected to take some time to be realised.

In the Agenda 2000 reforms, the global objectives were primarily the encouragement of comparative advantage in production, both between alternative cereals, oilseeds and protein (COP) crops within the EU, and between EU producers and those outside the EU. The benefits from the measures would be diffused across a number of production sectors.

The MTR increased the focus of CAP measures on global objectives. The encouragement of comparative advantage within and outside the EU was reinforced, as well as the promotion of developmental objectives within Pillar II (covering Rural Development) and the application of good environmental practices. The following year's regulation applying the SPS to the EU-10 included similar global objectives in its scope, together with simplification of administration.

The Health Check, reinforced the global objectives for greater comparative advantage, the application of good environmental practices and Pillar II developmental goals, and combined these with a degree of subsidiarity, via Article 68 measures, in national coupled supports.

3.3 The historical evolution of cereal-specific CAP measures since 2000

The cereals Common Market Organisation (CMO) provided the legal framework for internal and external market measures from 1967 to 2007 in the CAP. The creation of a Single CMO in 2008 brought together different agricultural products under one Regulation.

Diagrams 3.2 and 3.3 compare total CAP expenditures in billions of Euros across all agricultural sectors by type of measure in 2005 and 2010, derived from DG Agriculture financial unit data. The diagrams make clear the shift from coupled to decoupled payments over the period.

Diagram 3.2: CAP expenditure in 2005, €bn

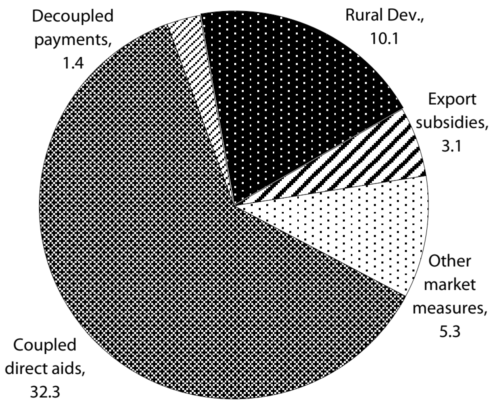
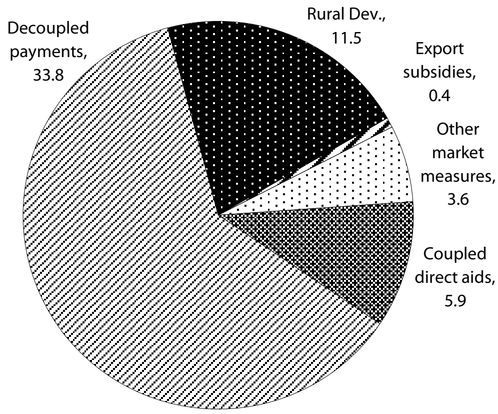


Diagram 3.3: CAP expenditure in 2010, €bn



Source: European Commission - DG Agriculture and Rural Development, October 2011.

In the period from 2000 until 2003, Agenda 2000[1] cereal measures combined coupled crop-specific payments, supply control (via a set-aside obligation), production refunds for starch processors, market support through public intervention stocks and border measures.

[1] Council Regulation (EC) No 1251/1999 of 17 May 1999 (OJ L 160 26.06.1999 p. 1).

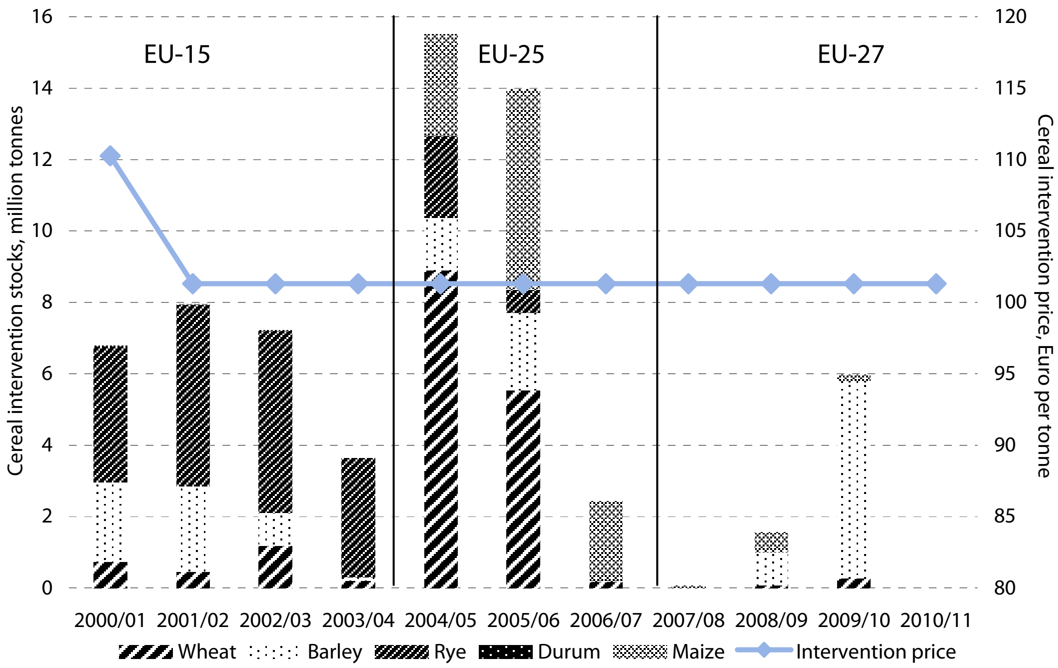
The 2003 MTR reformed the measures affecting the cereal sector. Most direct payments were decoupled through the adoption of a SPS, with payments made irrespective of the type or level of production in a particular crop year. The MTR also introduced cross compliance and compulsory modulation as part of a trend away from traditional coupled support. The 2009 Health Check[2] continued the move away from crop-specific measures, but gave MS the option to apply coupled Article 68 supports, to achieve objectives that could not be realised under broader CAP measures.

3.4 Developments in public intervention

The public intervention system was designed to set a floor to internal market prices by allowing a broad range of cereals to be sold at the intervention price into publicly funded stocks. By reducing supplies onto the internal market, intervention stocks provided market protection when needed. Sales out of intervention stocks, for export to third countries or for use in the internal market, were made with the balance of the internal market in mind. Diagram 3.4 plots the cereal tonnages held in EU intervention stocks over the 2000/01 to 2010/11 marketing years[3]. The data cover the period of enlargement from 15 to 27 MS.

Since 2000, criteria for cereal sales to intervention stocks have been tightened. Agenda 2000 reduced cereal support prices from €119.19 to €110.25 per tonne in 2000/01 and €101.31 from 2001/02. In 2003, the MTR removed rye from the scope of intervention and halved monthly increments to the intervention price during the marketing year. In 2007, limits were applied to maize intervention. There was a limit of 1.5 million tonnes in 2007/08, of 0.7 million in 2008/09 and zero in 2009/10, but, unlike rye, maize intervention could be reintroduced if it were appropriate. The Health Check extended intervention tonnage limits to other cereals. For common wheat it introduced tendering if sales to intervention exceeded 3 million tonnes.

Diagram 3.4: EU-27 cereal intervention stocks and the support ('intervention') price



Source: European Commission - DG Agriculture and Rural Development.
Note: Sorghum has been excluded as the quantities are negligible in most years.

[2] Council Regulation (EC) No 73/2009 of 19 January 2009 (OJ L 30, 31.1.2009 p. 16).
[3] The marketing year runs from 1 July of the first year to 30 June of the following year.

3.4.1 Background to changes in rye intervention

Intervention stocks fell significantly from 1998/99 to 2003/04 for all cereals, apart from rye. A single cereals intervention price made rye expensive vis-à-vis other feed cereals. The World Trade Organisation ceiling on subsidised EU exports of coarse (non-wheat) grain limited subsidised rye exports. With 2004 enlargement looming, there was a fear that intervention stocks would grow, and hence rye was excluded from eligibility for intervention sales in 2003.

3.4.2 Background to changes in maize intervention

Total EU cereal intervention stocks reached a new peak after enlargement in 2004/05, following high cereal output in the EU and worldwide, forcing down internal and external prices. In the landlocked Czech Republic and Hungary, market outlets were limited and transport costs to export markets were significantly above those of North West EU exporters. Central EU MS producer sales to intervention stocks became attractive.

The composition of intervention stocks also changed in 2004/05. In mid-2004, maize stocks had been reduced to zero and intervention cereal stocks comprised mainly common wheat and barley. After enlargement, total intervention stocks in 2004/05 reached their highest level since 1993/94 at 15.5 million tonnes, with maize accounting for 18%. By mid-2006, maize stocks had risen to 5.6 million tonnes, 40% of the total. Without a policy change, the Commission forecast that maize stocks would reach 14.1 million tonnes by 2013[4]. Therefore, limits were introduced to maize intervention stock purchases in 2007, as described above.

3.4.3 The Health Check reform amid rising barley intervention stocks

In 2009/10, barley intervention stocks rose substantially following two years of higher EU barley output. Surplus barley brought pressure to feed barley prices which fell below the intervention level, encouraging offers into intervention. As revealed in Diagram 3.4, cereal intervention stocks rose to 5.98 million tonnes and barley accounted for 91.8% of the total (total stocks had ranged between 0.06 and 2.44 million tonnes in the three prior seasons).

The Health Check extended the maize model, that had been applied in 2007, by applying zero quantitative limits to durum wheat, from 2009, and other feed grains, which comprised barley and sorghum, from 2010. Should intervention be considered necessary by the Commission for these cereals, it would operate through a tendering system that is regulated via a Commission Regulation. It also introduced tendering for common wheat where, since the 2010/11 marketing year, the buying-in of common wheat has been permitted at the fixed support price of €101.31 per tonne, up to a maximum quantity of three million tonnes per year. Once this threshold has been breached, the tendering procedure opens automatically, allowing operators to submit bids for adjudication by the Management Committee. In a further tightening of the terms for intervention buying, the monthly increments that had previously helped to compensate for carrying costs were abolished in 2010[5].

3.5 Developments in external trade mechanisms

Import and export trade between the EU and third countries takes place via the licence system. To simplify import and export licensing[6], the Commission modified licence requirements in 2008, cutting the number of cereal products requiring licences to 21 and 9, respectively, from the 133 products that previously required both.

---

[4] European Commission press notice IP/07/793 of 11 June 2007.
[5] Council Regulation (EC) No 72/2009 of 19 January 2009 (OJ L 30, 31.1.2009 p.1).
[6] European Commission press notice IP/08/922 of 12 June 2008.

3.5.1 Variable import duties

The EU's import regime is designed to protect the internal market from lower-priced world market imports. Since July 1995, a maximum duty-paid import price has applied to cereal imports[7]. This governs import arrangements for six clearly defined cereal categories: high quality common wheat[8], durum wheat, maize, flint maize, sorghum and rye. The duty is set at the difference between 155% of the EU intervention price and a representative import (c.i.f.) price at the port of Rotterdam.

The representative c.i.f. price for each type of cereal comprises three components: its world price (based on a US reference market) *plus* the cost of freight to a US export port (the US Gulf or US Great Lakes/Duluth) *plus* the cost of freight between the US export port and Rotterdam. This is then converted into Euros using the US$/€ exchange rate.

Import duties are capped by the high level of bound tariffs agreed in the 1994 General Agreement on Tariffs and Trade (GATT) Uruguay Round Agreement (URA) on Agriculture. However, the URA allows the Commission to invoke safeguard measures and raise tariffs at times of unusually low world prices. Conversely, at times of high world prices, duties may be wholly or partly suspended, as in 2007 and 2008.

3.5.2 Tariff Rate Quotas (TRQ)

In 2002, a review of the variable import duty arrangements was carried out following strong pressure from some MS to address the issue of low-priced cereal imports from the Black Sea region, notably from Russia and Ukraine, whose landed prices were not reflected in the formulae applied to compute representative c.i.f. prices for the determination of import tariffs.

In November 2002, following negotiations under Article XXVIII of GATT, the EU, US and Canada had agreed to modify the cereal variable import regime from 1 January 2003. As a consequence, TRQs were introduced for low and medium quality wheat and barley, and they were expanded following enlargement. For the period under review, the arrangements were:

- **Wheat**: A TRQ for low and medium quality wheat was opened for 2,981,600 tonnes at an in-quota duty of €12 per tonne in 2003. It was raised in 2006 to 2,989,240 tonnes to account for enlargement. Out-of-quota rates are set at the WTO maximum bound rate of €95 per tonne. Included in the total were country-specific sub-quotas for the US and for Canada, with the remainder available for other third countries in quarterly tranches[9].

- **Barley**: A TRQ of 300,000 tonnes, created in 2003, was raised in 2006 to 306,215 tonnes, with an in-quota tariff of €16 per tonne. The out-of-quota bound rate is €93 per tonne[10].

- **Maize**: A duty-free TRQ was introduced in 2006 for 242,074 tonnes of maize in two six month tranches[11]. Imports outside the quota pay the WTO bound rate of €94 per tonne.

The following TRQs have also existed for a range of other cereals, processed products, by-products of cereal processing and animal feed preparations imported from third countries:

---

[7] Commission Regulation (EC) No 642/2010 of 20 July 2010 (OJ L 187, 21.7.2010 p.5).
[8] High, medium and low quality wheat are defined in Regulation (EC) No 642/2010.
[9] Commission Regulation (EC) No 1067/2008 of 30 October 2008 (OJ L 290 31.10.2008 p.3). The TRQ has been further increased to 3,112,030 tonnes, effective from 1 January 2012.
[10] Commission Regulation (EC) No 970/2006 of 29 June 2006 (OJ L 176 30.6.2006 p.49), increased to 307,105 tonnes from 2012.
[11] Commission Regulation (EC) No 969/2006 of 29 June 2006 (OJ L 176 30.6.2006 p.44), increased to 277,988 tonnes from 2012.

- **Malting barley**: 50,000 tonnes of malting barley at an in-quota rate of €8 per tonne[12].
- **Cassava**: Cassava products pay an import tariff fixed at 6% under the Uruguay Round. The EU applies a duty-free TRQ to Thailand of 10,000 tonnes, the main supplier, plus smaller TRQs, which include cassava and cassava starch, for other suppliers.
- **Durum and high quality wheat**: A zero-duty 300,000 tonne TRQ for high quality durum, common wheat or spelt is opened each calendar year. A zero-duty durum wheat TRQ of 50,000 tonnes (without a quality stipulation) is also opened each marketing year.
- **Trading concessions**: Reduced or zero import duties apply for certain cereals imported from countries with preferential trading agreements with the EU, e.g. ACP and Less Developed Countries, as well as under trade agreements with candidate countries for enlargement. In addition, a trade agreement with Moldova[13] granted duty-free access for 60,000 tonnes of wheat, barley and maize in 2008, rising to 135,000 tonnes by 2012.
- **Abatimento:** After Spain and Portugal's accession in 1986, the EU and US agreed to the application of reduced-duty import quotas into Iberian markets. *Abatimento* refers to the lowering of maize and sorghum import tariffs into these countries in accordance with EU WTO obligations[14], compensating for the loss of competitiveness for US supplies to these two countries. The scheme gives Spain a reduced-duty import quota of 2 million tonnes of maize and 0.3 million tonnes of sorghum, which may be satisfied by importing cereal substitutes[15]. Portugal has an allocation of 0.5 million tonnes of maize, up to a maximum duty of €50 per tonne.

3.5.3 Inward Processing Relief (IPR)

The IPR scheme provides relief on import duties/tariffs on goods imported from outside the EU for processing, with the final product exported from the EU. While the IPR scheme is not a specific CAP measure, cereals are eligible for duty-free imports under the scheme.

3.6 Cereal starch production refunds

Starch production refunds were paid to compensate EU starch manufacturers for the higher cost of raw materials used in their products that resulted from the Cereals CMO. The starch production refund system for all starches ended in June 2009.

3.7 Export refunds

As with import trade, exports require licence authorisations. Historically export refunds helped to ensure the competitiveness of EU exports, but the ability to subsidise exports is constrained by WTO commitments. The refunds were intended to bridge the gap between high prices on the internal market and lower export prices.

The GATT URA capped both the cost of export subsidies and the volume of subsidised exports. The tightening of cereal intervention rules and strength of world cereal prices have meant that export refunds have become less relevant as a policy tool, but the mechanism remains in place. The use of export refunds has fallen across all sectors in terms of

[12] Council Regulation (EC) No 1234/2001 of 22 June 2001 (OJ L 168 23.06.2001 p.12), increased to 50,890 tonnes from 2012.
[13] Commission Regulation (EC) No 55/2008 of 21 January 2008 (OJ L 20, 21.1.2008 p.1).
[14] Commission Regulation (EC) No 1296/2008 of 18 December 2008 (OJ L 340 19.12.2008 p.57).
[15] This includes maize starch by-products, brewing and distilling by-products, and citrus pulp.

expenditure, quantities and product coverage. The last refund was granted for cereals in 2006 and for Annex 1 processed cereal products in 2007[16].

When world cereal prices are viewed as excessive, the Commission can apply its discretion to restrict or stop exports from leaving the EU. This has not been done for many years.

3.8 Special intervention measures for oats in Sweden and Finland

Oats are not covered by the intervention system, but special measures were agreed for Sweden and Finland under their accession agreements. These sought to prevent land being converted from oats to barley production, which might have added to intervention stocks. Both countries have oat supply surpluses and the scheme allowed an aid to be granted for a certain volume[17]. The last use of this power was in the 2006/07 marketing year.

3.9 Direct support

In 2000-2010, the change from a system of coupled supports to one of decoupled payments for producers under the SPS was accompanied by cross compliance requirements to receive aid. Farm payments were also modulated, to ensure a budgetary transfer, as a percentage reduction in direct payments under Pillar I (measures that support agriculture) to Pillar 2 (support for Rural Development). The main reforms to such payments in 2000-2010 were, first, under Agenda 2000, which progressively harmonised the payments between different COP crops. The arable aid area payment system continued until 2004.

The 2003 MTR broke much of the link between coupled payments and output by introducing the SPS with decoupled payments, though some coupled payments remained. The MTR also introduced cross compliance as a condition for SPS and other aids and made modulation compulsory. The 2009 Health Check streamlined the cross compliance requirements and set final dates for fully decoupling direct payments in the arable crop sector. It also introduced progressive modulation to target the recipients of larger aid payments.

3.9.1 Arable aid payments

Arable aid payments were introduced in the 1992 MacSharry Reforms and remained until 2004, to compensate producers, fully or in part, for losses of income resulting from cuts in the intervention price. Under Agenda 2000, the *basic amounts* for cereals were set at €58.67 per tonne in 2000/01 and €63.00 from 2001/02 multiplied by average *regional reference yields* for cereals[18] determined by the *regionalisation plans* for the regions concerned.

3.9.2 Single Payment Scheme (SPS)

From 2005, the SPS merged the different arable and headage payments made in the reference period (2000-2002) into a single annual support payment, either per holding (the 'historical model'), or summed per region and then divided by the hectares declared in the first year of application ('regional model'), or a combination of both (dynamic or static 'hybrid'). Farmers were allocated payment entitlements. SPS is decoupled in the sense that the aid is no longer linked to the type or level of output or even whether production took place at all. MS were given the option to retain coupled payments for up to 25% of their arable direct payments, with SPS decoupled payments applied at a rate of 75%. France and Spain exercised this option. The Health Check decoupled all payments in the arable sector from January 2010.

---

[16] DG Agriculture (Unit C5) 'The EU Cereals Regime', October 2011. Non-annex 1 export refunds for some products containing cereals still exist, to compensate for high EU market prices for products such as eggs.

[17] It was 100,000 tonnes in 2006/07 Regulation (EC) No 1278/2006 of 25 August 2006 (OJ L 233, 26.8.2006 p.6).

[18] This average regional yield excluded maize yields in those regions with separate reference yields for maize.

To be eligible for the SPS, farmers must meet cross compliance requirements and keep land in Good Agricultural and Environmental Condition. In instances of non-compliance, the SPS payment may be reduced or even, in extreme cases, cancelled in its entirety. To facilitate the transition, the new system was phased in from 2005. MS were given some discretion over the implementation model and the start date (of end-2004, end-2005 or end-2006).

3.9.3 Modulation

Agenda 2000 gave MS the option to apply *modulations* (percentage deductions) rising from 3% in 2003 to 5% in 2005 to Pillar I payments (direct aids and market support), and transfer sums generated in this way to Pillar II funding (support for rural development). Under the MTR, modulation was made compulsory at a rate of 5% in 2005, but could be topped up by MS at higher rates through voluntary modulation. The UK and Portugal[19] were the only MS to state they would take up the option, but only the UK applied it, at differing rates by region. The Health Check increased compulsory modulation to 7% in 2009 (rising to 10% by 2012). It also applies higher modulation rates (of 12% in 2010) to farms with an annual SPS income of over €300,000. This compares to 8% modulation applied to a farm that received between €5,001 and €99,999. Farms receiving less than €5,000 per year under the SPS are exempt.

3.9.4 Supplementary payments

The SPS Regulation allowed certain exceptions to the decoupling of aids, but the Health Check has ended most of these. The supplementary aids among COP crops were as follows.

- **Durum wheat**: Producers in defined traditional growing areas received a supplement, set under Agenda 2000 at €344.5/hectare; in non-traditional areas special aid was paid at €138.9 (with all payments subject to a Maximum Guaranteed Area). Under the MTR, the supplement and special aid were integrated into the SPS. To maintain output in traditional areas and promote minimum quality requirements, a quality premium of €40/hectare was introduced for higher quality durum wheat, payable only in traditional areas in MS that had adopted the SPS, provided certified seed was used. This premium was decoupled under the Health Check and integrated into the SPS from January 2010.
- **Protein crops:** A supplement of €55.57/hectare was paid on protein crops until 2012.
- **Energy crops:** A payment for cereals used for bioenergy of €45/hectare applied for crops on non-set-aside land up to a maximum EU area of 2 million hectares until 2010.

3.9.5 Article 69 and Article 68 support

Prior to the Health Check, Article 69 measures allowed MS to use 10% of their budget to grant specific coupled payments outside of the SPS. In theory, this could be used to support the cereals sector and in practice, a number of MS directed this form of support towards livestock and, in particular, the ruminants sector. While this has less direct relevance for the cereals sector, they are important in influencing demand for feed cereals, including on-farm feed use. Schemes to protect the environment or improve quality and marketing also fell under this provision. In the Health Check, the revised measures became the new Article 68[20] and were made more flexible to encompass support for crop risk management and output in economically sensitive areas.

---

[19] Report from the Commission to The European Parliament and the Council in accordance with Article 7 of Council Regulation (EC) No 378/2007 of 27 March 2007.

[20] Council Regulation (EC) No 73/2009 of 19 January 2009 *(*OJ L30, 31.01.2009 p.16).

A number of MS have used this provision for COP crops, including Greece and Italy to improve durum wheat quality or support competing crops (such as protein crops and cotton) in France, Poland and Greece. The EU-12, operating SAPS, were previously unable to apply Article 69 provisions, but are allowed to apply Article 68.

3.9.6 Specific national provisions

As part of their accession agreements, Sweden and Finland were allowed to provide national support to ensure agricultural activity was maintained in northern regions. This included support for cereal seeds to 2010 and for certain quantities of cereals used as feed.

3.10 The new Member States — the Single Area Payment Scheme (SAPS)

The EU-12 could opt for either a simple Single Area Payment Scheme (SAPS) that decoupled all area payments or the SPS applied in the EU-15. All except Malta and Slovenia opted for the SAPS [21]. The application of SAPS implemented direct payments over a 10-year transitional period to allow integration into the main SPS. Table 3.1 provides details of the transition, after which the SPS will be based on the same (full) rates as those applicable in the EU-15.

Under the SAPS, all farmers receive a uniform sum per hectare of agricultural land under the regional model. The payment is obtained by dividing the country's annual financial envelope by its utilised agricultural area. The area supported in this manner is capped under ceilings in the accession agreements. Originally, SAPS was established for a period of up to 5 years after the accession. Following the Health Check, SAPS will remain in place until the end of 2013.

Table 3.1: Transition to full SPS in the EU-12 (% of direct payments receivable)

	EU-10		EU-2
2004	25	2007	25
2005	30	2008	30
2006	35	2009	35
2007	40	2010	40
2008	50	2011	50
2009	60	2012	60
2010	70	2013	70
2011	80	2014	80
2012	90	2015	90
2013	**100**	2016	**100**

Source: European Commission — DG Agriculture and Rural Development.

3.10.1 Complementary National Direct Payments (CNDP)

The EU-12 were also allowed to make CNDPs on a coupled or decoupled basis, for specific crops and livestock, within national budgetary envelopes. These allowed for an increase in the overall direct support level above the phasing-in level. Subject to approval, the EU-12 could opt to top up direct payments with CNDPs up to a combined maximum level of 100% during phasing-in. In the first three years post-accession, it was possible to transfer 20% of the sums allocated to rural development to CNDPs and differentiate the total direct support level received by the various sectors.

[21] Council Regulations (EC) No 583/2004 of 22 March 2004 *(*OJ L 91, 30.03.2004 p.1-14); No 864/2004 of 29 April 2004 Corrigendum to *(*OJ L161, 30.04.2004 p.48-96) and No 2012/2006 of 19 December 2006 *(OJ L384, 29.12.2006 p.8-12)* allowed SAPS to continue until the end of 2010. For the EU-10, exemption from cross-compliance requirements ended in 2008, but for Bulgaria and Romania, an exemption applied until 2011.

Most EU-12 used this provision to support their livestock sectors or sectors where the application of the standard EU support scheme would result in a higher per hectare support rate than the SAPS payment. Once a direct payment is decoupled under the SPS, the corresponding CNDPs should be granted in a decoupled form as well.

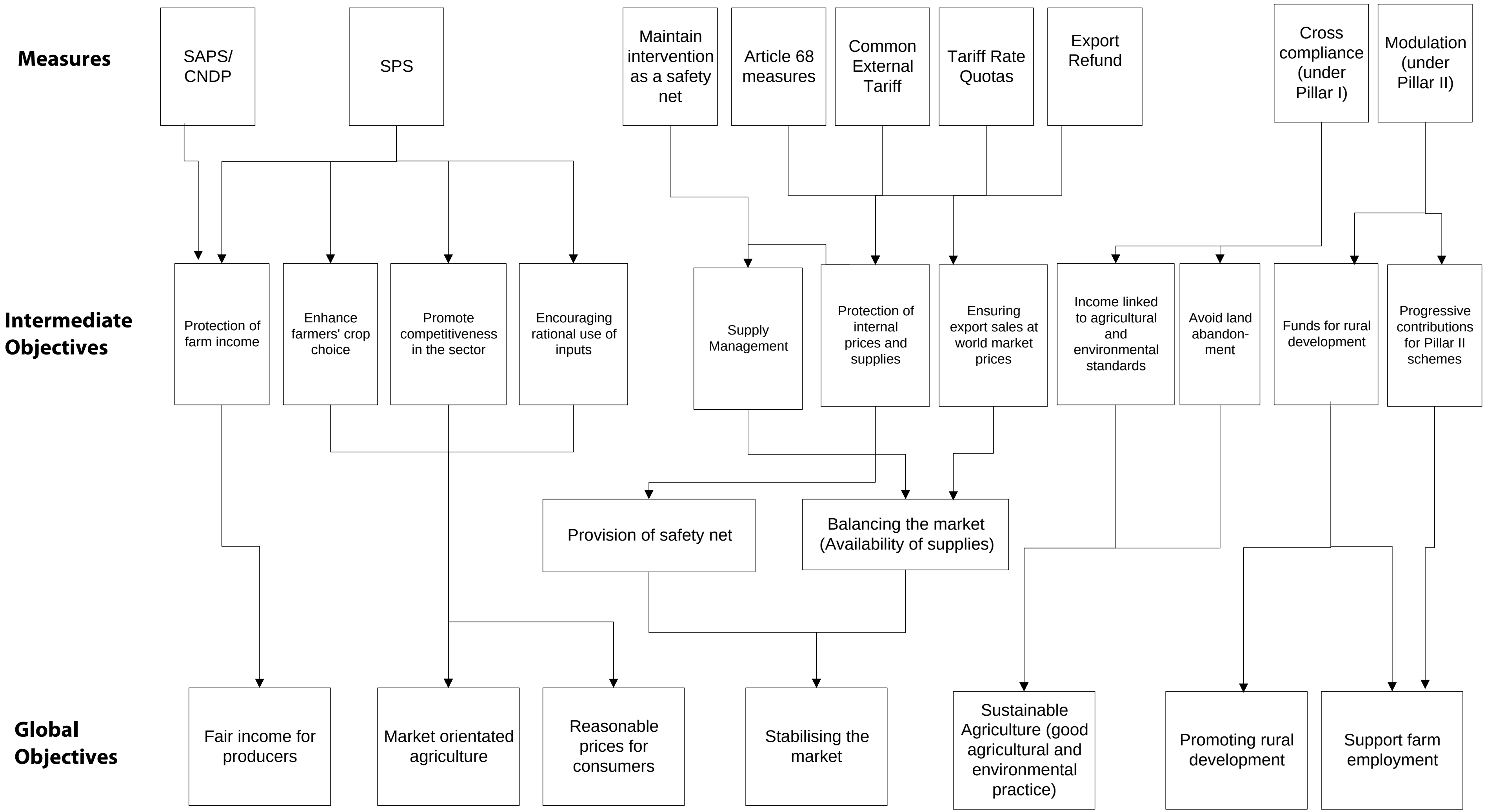
3.11 Set-aside

A set-aside obligation was established in 1992 to limit EU cereal production as a means of budgetary control and in anticipation of limits on subsidised exports in the GATT URA then under negotiation. To qualify for direct aids, arable holdings beyond a certain size were obliged to take a specified proportion of their land out of production in a given year. The scheme was originally designed as a tool of supply management for food and feed crops, but non-food industrial crops, notably energy crops, were allowed to be grown on set-aside land and uncropped set-aside land had to be maintained in a good condition. Set-aside remained in effect after the transition to the SPS. The set-aside rate was adapted every marketing year to take account of market developments. High prices in 2008 resulted in derogation from set-aside requirements in both 2008 and 2009, and the scheme was definitively abolished under the Health Check from 2010 onwards.

3.12 Current measures applicable to the cereals sector

The Health Check set the current intervention logic as presented in Diagram 3.5 and highlights the main components as internal market support with intervention acting as a safety net (as described previously in Section 3.4), border measures (Sections 3.5-3.8) and direct payments (Sections 3.9-3.10). Although the latter is not specific to the cereals sector, it is an important element of producer incomes.

Diagram 3.5: The intervention logic for current measures applied to the cereals sector



Chapter 4: Evaluation Question 1

Evaluation question 1: *To what extent have the CAP measures applicable to the cereals sector affected the production of cereals (with regard to choice and diversity of crops, area, yield, intensity of production, crop rotation, choice of production technology, prices and geographical localisation of production)?*

4.1 Interpretation of the question

This chapter assesses the impact on cereal production of CAP measures, from the Agenda 2000 to the MTR and Health Check reforms. The evolution of measures applied to the cereals sector is described in Chapter 3. The major measures of relevance in the decade since 2000 were the phasing out of coupled arable aids and the application of the SPS; the adoption of stricter criteria for sales to intervention stocks; the end of starch production refunds and suspension of cereal export refunds; the reduction and eventual elimination of two important measures applied only in EU-15 MS, namely set-aside and special coupled payments for durum wheat producers; the ending of the energy crop payment in 2010; and application of national supports under Articles 69 and 68.

4.2 Judgement criteria, indicators, data sources and evaluation tools

The judgement criteria, indicators and data sources that are relevant to this question are summarised in Table 4.1.

Table 4.1: Judgement criteria, indicators and data sources regarding production

Judgement Criteria	Indicators	Data Sources
Changes in area for the main cereals by MS vs. area changes for other arable crops and vs. set-aside/fallow land	Areas and changes in proportion of cereals by type Other COP & non-COP crop areas, and uncropped land use	Eurostat; DG Agri EU-wide trade associations National official and research bodies Case study questionnaires
Changes in the distribution of each cereal crop by MS	Distribution of cereal areas by type of cereals by MS	As for preceding criterion
Changes in the degree of specialisation	Relative changes since 2003 in cereal and competing crop areas Distribution of cereal output by MS vs. other crops	As for preceding criterion
Evidence of different supply responses in individual MS	Proportional changes in the areas of different cereals and competing crops since 2003	As for preceding criterion
Changes in yields over time by crop type	EU yield levels and growth in relation to leading non-EU producing countries	Reference is made to analysis under EQ4
Changes in gross margins pre-and post-reform and the effect on planted areas	Proportional changes in areas of different cereals and competing crops since 2003	Reference is made to analysis under EQ6
Changes in production practices on-farm	Changes in crop rotations, in production technology, input use and mechanisation	Reference is made to analysis under EQ10
Reduction in intensification in input use	Rates of change in variable input use per hectare and per tonne	Reference is made to analysis under EQ10

4.3 Our hypotheses

Decoupling: The bias between margins on individual COP crops was largely removed under Agenda 2000, which harmonised arable aids for different COP crops, apart from continued supplements for durum wheat, protein crops and energy crops. The MTR continued the process of decoupling and thus altered the relative profitability of alternative crops, which would have been reflected in changes in the choice of crop and greater specialisation.

Decoupling occurred at different times in different EU-15 MS which adopted different models (as described in Section 3.9.2). For MS applying a hybrid model, the bias of the SPS historic system, making higher payments to crops with higher reference yields, such as irrigated maize, in certain MS, disappeared gradually, favouring cereals with lower reference yields as decoupling moved towards a regional model. The examples of France and Spain, which applied partial coupling of 25% of the previous arable aids until this option ended in 2010, should reveal biases caused by the retention of this degree of coupling.

In the case of crops with specific coupled supports, notably durum wheat among the cereals, the reforms should have led to a fall in their areas as the aids were lowered. This has to take into account some MS' retention of coupled supports via the application of Articles 69 and 68. National policy outside the CAP can also affect cereal production. An important example is MS' encouragement of energy crops for biofuels within the Renewable Energy Directive.

Cross compliance: The GAEC requirements at the core of the cross compliance standards to receive the SPS under the MTR were already meant to be satisfied for producers to benefit from supports under previous measures. However, it was only under the MTR that the Commission, rather than MS, audited the adoption of the norms systematically. Any changes in production techniques as a result of the MTR would only have arisen because of fears about stricter enforcement. Our hypothesis is that changes due to the MTR would be small, and would be reflected in a reduced use of chemical inputs and stricter crop rotation practices.

Set-aside: With zero rates of set-aside in 2008 and 2009 and its subsequent abolition in 2010, we would expect some of the lower yielding land previously put into set-aside to return to cereal cultivation, raising cereal areas while causing a small drop in reported average yields.

Intervention: Over the decade, volume limits were applied on certain cereals going into intervention. The withdrawal of intervention as an outlet should have caused price differentials between land-locked MS with cereal surpluses and those with deficits to reflect transport costs more closely. To the extent that this reduces the prices of the cereal crops previously sold into intervention in relation to the prices of those cereals that were not, this should have redistributed areas away from the former towards the latter crops.

4.4 Choice and diversity of crops

The shift away from coupled payments gave producers greater freedom to choose the type and level of production, or not to produce. Our hypothesis is that producers would become increasingly specialised and focus on crops in which they have a comparative advantage.

Table 4.2 summarises changes from pre- to post-reform in the distribution of total EU-27 areas among the major COP crops, sugar beet and uncultivated areas, including set-aside and fallow land. The uncultivated area shrank after 2007, reflecting the zero rates of set-aside.

Table 4.3 summarises the changes that occurred by MS in the areas of different COP crops as a share of the total utilised agricultural area (UAA). The sugar beet area is included as a guide to areas under the leading non-COP alternative crop.

Table 4.2: EU-27 areas under cereals and other crops, 2000-2010 (million hectares)

	2000-2003	2004-2006	2007-2010
Cereals	60.4	59.0	58.0
Common wheat	22.4	22.4	22.9
Durum wheat	3.9	3.6	2.9
Barley	14.2	13.8	13.6
Maize	9.5	9.2	8.4
Rye and meslin	3.3	2.6	2.8
Oats and mixed cereals	4.7	4.5	4.4
Other cereals	2.3	2.7	3.0
Oilseeds	8.3	9.1	10.5
Protein crops	1.7	1.9	1.3
COP area	62.1	60.9	59.3
Sugarbeet	2.0	2.0	1.6
Uncultivated land[1]	6.1	6.3	5.4
Utilised agricultural area	188.3	184.2	179.4

Source: DG Agri, Prospects for Agricultural Markets, March 2012
Notes: 1. These marketing year data include set-aside land in the uncultivated total.

Table 4.3: Areas under different crops by MS as % of UAA, 2000-2003 vs. 2007-2010

	Total Cereals		Oilseeds		Protein		COP		Sugar beet	
	'00-03	'07-10	'00-03	'07-10	'00-03	'07-10	'00-03	'07-10	'00-03	'07-10
Austria	24.3	25.3	2.7	3.3	1.3	0.9	28.3	29.4	1.3	1.4
Belgium	21.9	25.1	0.4	0.7	0.2	0.1	22.4	26.0	6.8	5.0
Bulgaria	36.0	32.7	10.0	15.3	0.4	0.2	46.4	48.1	0.0	0.0
Cyprus	42.4	25.5	0.0	0.0	0.5	0.7	43.0	26.1	0.0	0.0
Czech Rep.	39.7	43.0	8.7	10.9	0.8	0.8	49.3	54.7	1.7	1.5
Denmark	56.7	54.9	3.5	6.3	1.3	0.3	61.5	61.4	2.1	1.4
Estonia	33.6	36.8	4.1	10.3	0.4	0.7	38.1	47.8	0.0	0.0
Finland	52.9	50.1	2.2	4.3	0.3	0.4	55.4	54.7	1.4	0.7
France	30.5	32.4	6.3	7.4	1.6	0.9	38.4	40.7	1.3	1.2
Germany	40.9	40.1	7.2	8.8	1.1	0.6	49.2	49.5	2.6	2.2
Greece	13.6	27.2	0.2	1.2	0.2	0.6	14.0	28.9	0.5	0.4
Hungary	49.4	48.3	8.8	13.9	0.3	0.4	58.5	62.6	0.8	0.4
Ireland	6.6	6.9	0.1	0.2	0.1	0.1	6.7	7.2	0.7	0.0
Italy	25.7	25.4	2.6	1.9	0.4	0.6	28.8	27.9	1.5	0.5
Latvia	20.8	29.0	0.7	5.3	0.1	0.1	21.7	34.4	0.7	0.0
Lithuania	29.6	38.5	1.9	7.3	0.9	1.6	32.4	47.4	0.9	0.5
Luxembourg	22.2	22.7	2.6	3.8	0.5	0.0	25.2	26.6	0.0	0.0
Malta	29.1	0.0	0.0	0.0	0.0	0.0	29.1	0.0	0.0	0.0
Netherlands	11.8	12.0	0.0	0.1	0.2	0.1	12.1	12.3	5.6	3.9
Poland	48.9	53.8	2.5	5.0	0.5	0.8	52.0	59.6	1.9	1.3
Portugal	12.7	8.2	1.1	0.5	0.4	0.5	14.2	9.2	0.2	0.0
Romania	39.9	37.2	7.4	9.4	0.4	0.4	47.8	47.0	0.0	0.2
Slovenia	20.4	20.9	0.3	0.9	0.1	0.3	20.8	22.1	1.3	0.0
Slovakia	37.6	39.4	8.4	12.9	0.5	0.6	46.6	52.9	1.5	0.8
Spain	25.9	25.1	3.3	3.0	1.3	1.2	30.5	29.3	0.5	0.2
Sweden	37.9	32.7	1.7	3.1	0.7	0.8	40.3	36.6	1.7	1.3
UK	19.7	18.7	2.7	3.7	1.5	1.1	23.9	23.5	0.9	0.6
EU-15	28.3	28.0	3.9	4.6	1.1	0.8	33.4	33.3	1.4	1.0
EU-12	38.1	43.1	5.2	9.0	0.4	0.6	43.8	52.7	0.8	0.6
EU-27	31.5	32.3	4.3	5.9	0.9	0.7	36.7	38.9	1.2	0.9

Source: EU Agriculture – Statistical and Economic information (2011), Eurostat and previous issues.
Note: The UAA data for 2010 are preliminary estimates.

The cereals share of the total EU-15 UAA fell after the MTR, although ending compulsory set-aside released land for arable farming. In contrast, the cereal share of total EU-12 UAA rose 5.0%, to 43.1%. This ensured that the overall cereal share of EU-27 UAA grew 0.8% to 32.3%.

The UAA share under oilseeds grew in the EU-15, EU-12 and EU-27, rising 0.7%, 3.8% and 1.6%, respectively. Rapeseed benefited from the cultivation of non-food crops on set-aside land and the energy crop payments, and was the main feedstock in the biodiesel sector.

Protein crops' share of overall EU-27 UAA fell 0.2%, but rose in the EU-12. The end of coupled support for protein crops in the EU-15 spurred the decline in EU-15 areas[1]. Sugar beet areas fell as a result of the 2006 sugar reform, which reduced production quotas from 2006 to 2009.

We conclude that CAP measures boosted oilseed areas. In cereals, the main impact occurred in the EU-12, where the adoption of the CAP measures raised cereal plantings appreciably.

4.5 Areas planted to individual cereals

Table 4.4 lists individual cereals' shares (not including silage maize) in MS' total cereal areas in 2000-2003 and 2007-2010. We hypothesised that specialisation by cereal would have risen as a result of decoupling and reductions in coupled aids. As EU-12 MS did not receive arable aids, the impact should have been less than in EU-15 MS. Among cereal crops, the drop in coupled supports was greatest for durum wheat, in particular in traditional EU-15 production regions; thus, these regions should have suffered the greatest reductions in area following the MTR.

Table 4.4 supports these hypotheses. There was greater specialisation in cultivation of common wheat, notably in the EU-15, where its share rose from 36.9% to 40.3% from the pre- to post-reform periods. The EU-12 MS experienced a more modest increase, rising from 37.2% to 38.3%. The net impact for the EU-27 was greater specialisation from 37.0% to 39.5%. The EU-15 durum wheat share fell from 10.3% to 8.0%. The decline occurred in traditional areas; non-traditional areas actually rose (see Table 2.13 in Chapter 2).

Among the EU-12 MS, the most striking change was a rise from 5.3% to 8.2% in the area under 'other cereals' (mainly triticale and mixed cereals). For the EU-27, the share rose from 3.9% to 5.2%. Poland alone accounted for over 80% of the total increase in EU-12 'other cereals' areas. These cereals are mainly used as feed on-farm, and in Poland, average yields per hectare from these crops were higher post-reform than those for rye, barley and oats, the main alternative on-farm feeds. Much of the growth in 'other cereals' areas in Poland was at the expense of rye. Continued coupled supports to the livestock sector, both EU-wide and under Article 69/68 measures (including in Poland) in some MS, supported the demand for such on-farm feed.

Table 6.2 in Chapter 6 reveals that the three MS (France, Spain and Italy) making higher coupled payments for maize than for common wheat or barley under Agenda 2000 all cut maize plantings after the MTR. The overall decline was 12.4%. In this group, France and Spain continued coupled payments under the MTR at 25% of the previous rates, and so did not end a bias towards maize plantings, yet their maize areas fell by 8.8% and 25.2%, respectively. Among MS that did not pay higher area payments for maize, total maize areas rose 3.1% from 2000-2003 to 2007-2010. In just two MS in this group (Germany and Greece), maize areas fell, but the falls (4.9% and 5.0%) were smaller than those of any of the three MS in the first group. We conclude that the CAP reforms improved the competitiveness of the EU cereals sector by reducing maize plantings in MS that gave extra coupled payments to maize production under the Agenda 2000 measures, while maize areas were in general maintained in those MS that did not have this bias when implementing Agenda 2000 measures.

---

[1] Evaluation of measures applied under the Common Agricultural Policy to the protein crop sector, 2009 http://ec.europa.eu/agriculture/eval/reports/protein_crops/index_en.htm.

Table 4.4: Individual cereal areas as a percentage of total cereals areas, 2000-2003 and 2007-2010

	Common Wheat		Durum Wheat		Barley		Rye		Maize		Oats		Other Cereals	
	2000-2003	2007-2010	2000-2003	2007-2010	2000-2003	2007-2010	2000-2003	2007-2010	2000-2003	2007-2010	2000-2003	2007-2010	2000-2003	2007-2010
Austria	33.1%	35.1%	1.7%	2.1%	26.1%	22.6%	6.0%	6.4%	20.8%	23.0%	4.9%	4.1%	7.4%	6.7%
Belgium	65.3%	62.8%	0.0%	0.0%	15.3%	14.7%	0.3%	0.2%	14.5%	18.9%	2.1%	1.5%	2.6%	2.0%
Bulgaria	58.9%	66.6%	1.1%	0.3%	15.1%	13.3%	0.8%	0.5%	21.1%	17.3%	2.2%	1.4%	0.9%	0.7%
Cyprus	0.0%	0.0%	10.2%	15.4%	88.8%	74.6%	0.0%	0.0%	0.0%	0.0%	0.8%	9.8%	0.0%	0.0%
Czech Republic	53.9%	53.4%	0.0%	0.0%	32.2%	29.7%	2.6%	2.4%	4.2%	7.0%	3.8%	3.4%	3.4%	4.0%
Denmark	41.2%	47.8%	0.0%	0.0%	49.8%	42.6%	3.2%	2.6%	0.0%	0.0%	3.4%	4.5%	2.4%	2.5%
Estonia	23.2%	37.0%	0.0%	0.0%	49.8%	43.5%	7.4%	5.6%	0.0%	0.0%	18.1%	12.2%	1.6%	1.9%
Finland	14.0%	18.7%	0.0%	0.0%	45.9%	47.7%	2.9%	2.1%	0.0%	0.0%	37.1%	31.4%	0.1%	0.2%
France	51.9%	52.5%	3.7%	4.7%	18.3%	18.3%	0.3%	0.3%	19.9%	17.2%	2.0%	1.7%	3.9%	4.6%
Germany	42.5%	46.8%	0.1%	0.2%	29.5%	27.3%	10.7%	10.4%	5.8%	6.8%	3.9%	2.7%	7.5%	5.9%
Greece	11.5%	16.1%	57.5%	45.3%	8.5%	10.8%	1.2%	1.8%	17.6%	19.7%	3.7%	5.9%	0.1%	0.4%
Hungary	37.7%	38.9%	0.4%	0.4%	12.0%	11.3%	1.6%	1.4%	41.1%	40.8%	2.1%	2.0%	4.9%	5.2%
Ireland	31.1%	30.0%	0.0%	0.0%	62.1%	61.2%	0.0%	0.0%	0.0%	0.0%	6.4%	7.2%	0.9%	1.5%
Italy	16.1%	17.7%	42.7%	39.8%	8.4%	9.0%	0.1%	0.1%	28.1%	27.9%	3.7%	3.9%	1.0%	1.6%
Latvia	37.8%	50.1%	0.0%	0.0%	31.3%	22.7%	11.5%	10.1%	0.0%	0.0%	14.2%	13.1%	5.2%	4.1%
Lithuania	37.7%	42.9%	0.0%	0.0%	36.8%	29.5%	10.2%	6.7%	0.3%	0.6%	6.6%	7.8%	8.5%	12.4%
Luxembourg	38.3%	46.6%	0.0%	0.0%	37.0%	30.5%	3.1%	4.1%	0.0%	0.0%	8.5%	4.5%	13.0%	14.3%
Malta	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%	
Netherlands	57.1%	65.6%	0.0%	0.0%	24.4%	18.9%	1.8%	1.0%	10.4%	9.2%	1.1%	0.7%	5.2%	4.7%
Poland	29.3%	26.9%	0.0%	0.0%	12.4%	13.9%	21.6%	17.1%	3.1%	3.4%	22.9%	22.3%	10.7%	16.5%
Portugal	10.8%	20.6%	31.2%	2.0%	2.9%	11.9%	7.6%	7.0%	30.4%	33.4%	13.3%	18.2%	3.8%	7.0%
Romania	36.3%	40.2%	0.0%	0.1%	7.9%	8.8%	0.2%	0.3%	51.3%	45.8%	4.0%	3.9%	0.2%	0.9%
Slovenia	36.6%	33.6%	0.0%	0.0%	12.5%	18.9%	0.7%	0.8%	45.7%	39.7%	2.1%	2.0%	2.5%	4.9%
Slovakia	46.7%	46.5%	0.6%	1.3%	26.1%	24.7%	4.1%	2.7%	17.8%	20.7%	2.8%	2.3%	1.8%	1.9%
Spain	21.3%	22.7%	13.7%	8.0%	47.8%	51.1%	2.0%	2.5%	7.2%	5.7%	7.2%	8.9%	0.8%	1.1%
Sweden	33.4%	36.9%	0.0%	0.0%	34.0%	34.5%	2.5%	2.8%	0.0%	0.0%	26.7%	21.0%	3.4%	4.8%
UK	59.6%	62.1%	0.1%	0.0%	35.9%	32.6%	0.2%	0.3%	0.0%	0.0%	3.8%	4.4%	0.5%	0.6%
EU-15	36.9%	40.3%	10.3%	8.0%	28.8%	28.6%	3.1%	3.0%	11.9%	11.2%	5.9%	5.6%	3.0%	3.3%
EU-12	37.2%	38.3%	0.2%	0.1%	15.2%	15.2%	9.2%	7.7%	21.9%	19.5%	10.8%	10.9%	5.3%	8.2%
EU-27	37.0%	39.5%	6.4%	5.0%	23.5%	23.5%	5.4%	4.8%	15.8%	14.4%	7.8%	7.6%	3.9%	5.2%

Source: Marketing year data from *Agriculture in the EU*, DG Agri, various issues.

4.5.1 The impact of changes in the criteria for sales to intervention stocks

Section 3.4 in Chapter 3 described the changes in public intervention stocks and the impact of CAP reforms on these stocks. Since rye could not be sold into intervention after 2003, we hypothesise that the ending of this form of price support would have reduced its share of total cereal areas after the MTR. Table 4.4 reveals that its share did fall, but by only 0.1% from 3.1% to 3.0% from 2000-2003 to 2007-2010 for the EU-15 and from 9.2% to 7.7% for the EU-12.

We conclude that the impact in the EU-15 MS of ending rye sales into intervention stocks was very small. For the EU-12 MS, the decline in rye areas reflected a shift towards 'other cereals' used in on-farm livestock feed. The share of these cereals expanded significantly.

Phasing out intervention buying for maize from 2007 to 2010 should have lowered the appeal of grain maize plantings. However, high world market cereal prices in 2010, when maize intervention purchases were limited to zero, meant that the impact of this reform was muted.

The maize share of cereal areas fell from 11.9% to 11.2% and from 21.9% to 19.5% in the EU-15 and EU-12, respectively. This is consistent with our hypothesis, but also reflects the end of the higher coupled aids paid for maize than other cereals in some MS under Agenda 2000.

4.6 Yields

In Section 6.4 of Chapter 6, EU-27 cereal yields are contrasted with those in leading producing countries of common wheat, barley and maize. Average EU crop yields per hectare were the highest of all for the first two crops. EU maize yields were close to the world average. The volatility of EU yields was lower than most other major producers for all three cereal crops.

The respect in which the EU performance was most mixed in the international comparison is in the absolute growth in yields between 2000-2003 and 2007-2010. For common wheat, it achieved the largest increase of all the leading producers, but for both maize and barley, it recorded some of the lowest yield increases in the group being compared. One measure identified as the cause of the relatively poor growth in both barley and maize was the ending of set-aside, which was estimated to have reduced all cereal yields by approximately 0.9%. (This makes the high recorded growth in common wheat yields all the more impressive).

4.7 Intensity of production

Yields are also influenced by the input intensity of production, reviewed in Chapter 9. It concludes that the chemical fertiliser intensity of COP specialist farming declined from 2000 to 2009, but the main reason was high fertiliser prices rather than CAP measures.

Yields are also determined by the choice of seeds. Chapter 8 includes a detailed review of EU certified cereal seed production and demand. The questionnaires revealed that one of the main factors which influenced the development of new varieties was barriers to the planting of GM crops. Among cereals, this affects only maize. Therefore, seed companies are not devoting priority to developing seeds specifically for the EU market, and local producers do not benefit from chemical input cost reductions associated with genetically modified (GM) maize seeds. Evidence of these benefits is provided by analysis of US and EU maize production costs in Chapter 6. It reveals that agri-chemical costs per hectare in the EU and US fell by 4.2% and 29.8% respectively, between 2001-2003 and 2007-2010.

4.8 Crop rotation and production technology

Crop rotation is examined in Chapter 9, with a view to its environmental implications. The evidence reveals that several EU NUTS 2 regions have responded to the profitability of oilseed farming by planting oilseed crops on areas above the maximum agronomic recommendations for oilseed/cereal rotations of one year in four for rapeseed plantings (i.e. 25% of combined areas). High frequencies of oilseed plantings, encouraged by CAP measures, will eventually have adverse implications, since a good rotation practice is designed to break pest and disease cycles, while also restoring soil quality and fertility.

Changes, promoted by CAP reforms, in production technology are the subject of Chapter 8. The fieldwork provided an indication that in some of the larger EU-15 MS, producers were increasingly applying new technologies on farm. There was evidence, corroborated by interviews with producer associations and cooperatives, of a growing trend towards collaborative arrangements to pool capital resources together and employ more efficient and newer mechanisation on farms. Interviews in the larger cereal-growing regions of these MS, revealed more selective approaches to crop spraying, using GPS technology and satellite data, had become increasingly common. In part, producers cited that the primary driver was to reduce costs, through improved fuel efficiency and work rates, but also a desire to implement improved sustainable practices. Broader CAP support such as that provided under agri-environmental schemes or national grant schemes were considered important.

4.9 Prices and gross margins

Price developments are analysed in Chapter 6, where there is also a detailed review of the impact of the CAP measures and, in particular, coupled aids upon gross margins of cereal and oilseed crops and the relationship to planted areas. That analysis breaks the quantification of changes in individual crop areas by MS into two stages: first, it assesses the relationship between the total COP crop area and the weighted average gross margin on these crops; then it determines how the allocation between individual crops changes as their relative gross margins change. From that analysis, we conclude that total COP crop areas are sensitive to the impact of coupled payments upon gross margins. A 1% increase in average gross margins earned on these crops was estimated to raise total COP crop areas by 0.4%.

Simulations of the impact of the removal of all coupled aids in 2007-2010 upon total cereal and oilseed crop areas indicated that they would have fallen as follows from their actual level: a 7.3% fall for durum wheat (with the largest dependence on coupled aids in that period); a 3.3% drop for barley; and falls of between 2.3% and 2.5% for common wheat, maize, rye, rapeseed and sunflower.

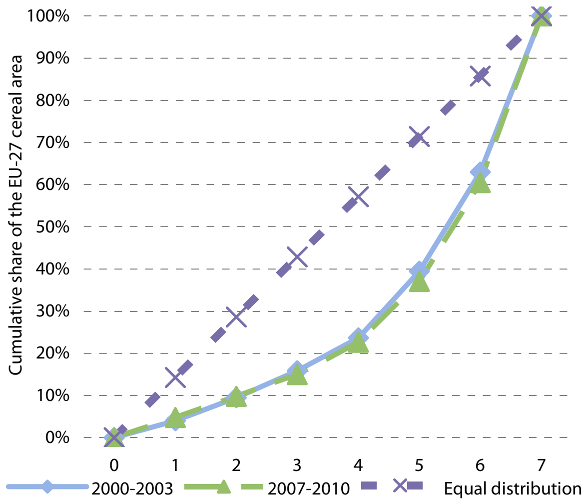
4.10 Geographical concentration of production in the EU-27

The reduction of coupled payments should have encouraged farmers to grow crops in which they have a competitive advantage. We therefore hypothesise that the CAP measures, notably decoupling, would encourage greater specialisation, as was stated in interviews with farmers' representatives in four EU-15 MS who paid coupled aids (France, Germany, Spain and the UK).

Gini coefficients provide a rigorous means of determining changes in the distribution of areas between individual cereal crops. They measure the extent to which the actual distribution of areas, by ranking crops in terms of increasing shares of the total area, diverges from the distribution that would occur if the areas planted to each crop were identical. In Diagram 4.1, we plot the actual distribution of EU-27 cereal crop areas in 2000-2003 and 2007-2010 where the seven types of cereals are ranked in increasing order in terms of their shares of the total cereal crop areas. We have also added a straight line illustrating what the distribution would look like if each cereal occupied exactly one-seventh of the total area.

The Gini coefficients of the 2000-2003 and 2007-2010 distributions are the ratios of (A) the areas lying between the straight line and the actual distributions each period, to (B) the full area of the triangle under the straight line. The Gini coefficient, A/B, is zero in the event of full equality in the distribution of areas between different cereals. At the other extreme, where the entire area is planted to a single crop, the Gini coefficient would be 100%.

Diagram 4.1: Distribution of EU-27 cereal areas by individual crops, ranked by rising shares of the total area, 2000-2003 to 2007-2010



Source: Derived from EU Agriculture –Statistical and Economic information (2011), Eurostat and previous issues.

As mentioned, Diagram 4.1 plots the actual distributions of cereal areas by crop for the EU-27. The lower curve represents the distribution in 2007-2010 and the upper one (which is slightly more equally distributed) plots the distribution in 2000-2003.

The legend lists the rankings, where 1 is smallest. The Gini coefficient increased (from 63.5% to 64.3%) from 2000-2003 to 2007-2010, implying that the farming of cereal crops became slightly more concentrated.

We conclude that changes in the Gini coefficients provide very weak support for the view that the CAP measures induced an increase in specialisation among cereal crops.

Table 4.5: Legend — Ranking of EU-27 cereals by areas, 2000-2003 and 2007-2010 (1 = smallest)

Ranking	1	2	3	4	5	6	7
2000-2003	Other cereals	Rye	Durum wheat	Oats	Maize	Barley	Common wheat
2007-2010	Rye	Durum wheat	Other cereals	Oats	Maize	Barley	Common wheat

4.11 Key conclusions

We hypothesised that decoupling encouraged producers to specialise in crops for which they have a comparative advantage. We observed that, at an aggregated level, the main impact was to boost the oilseed share of total COP areas via energy crop payments.

Within the cereals sector, there was increased specialisation in the cultivation of common wheat, notably in the EU-15, where its share of the total rose from 36.9% to 40.3% from the pre- to post-reform periods. The EU-15 durum wheat share fell from 10.3% to 8.0%, but this decline was concentrated in the traditional areas, where the reduction in coupled payments was particularly great; there was an increase in non-traditional durum wheat areas.

Among the EU-12 MS, the most striking change in areas was the increase from 5.3% to 8.2% in the area under 'other cereals' (primarily triticale and mixed cereals), used mainly for on-farm feed. Poland alone accounted for over 80% of the total increase in 'other cereals' areas in

EU-12 MS, and this was mainly at the expense of lower yielding feed cereals, notably rye. We conclude that the continuation of some coupled supports to the livestock sector, both EU-wide and in MS' Article 69/68 measures, supported the demand for such on-farm feed.

Evidence from the changes in the Gini coefficients by MS provides very weak support for the view that the CAP measures induced an increase in specialisation among cereal crops.

Total COP crop areas are sensitive to the impact of coupled payments upon gross margins. A 1% increase in average gross margins earned on these crops was estimated to raise total COP crop areas by 0.4%. Simulation of the impact upon total cereal and oilseed areas of removing all coupled aids in 2007-2010 indicated that the planted areas would have fallen most sharply from their actual 2007-2010 levels in the case of durum wheat, which would fall 7.3%. For barley, the drop would have been 3.3%. For other cereals and oilseeds, the decline in areas in the event of the removal of coupled payments would have been between 2.3% and 2.5%.

Cross compliance was thought likely to have encouraged tighter application of environmental and agricultural standards, such as reducing the intensity of input use. It was also believed it would favour more sustainable patterns of crop rotation. Yet, higher oilseed plantings in crop rotations, encouraged by measures such as energy crop payments, occurred across the EU.

Phasing out set-aside led to areas of EU-15 land with lower than average cereal yields returning to production. This conclusion was supported by the relatively poor growth recorded in both barley and maize yields. Overall, the ending of set-aside was estimated to have reduced cereal yields by 0.9%, but the background annual growth in yields continued. Despite the return of some set-aside land to arable farming, the EU-15 area under cereals fell 3.5% from 2000-2003 to 2007-2010, but total cereal production increased 2.8%.

The introduction of volume limits to annual tonnages eligible for sale into intervention should have altered price relativities between cereals and resulted in a closer correlation between planting decisions and prices in the external market.

Our analysis suggests that the impact upon EU-15 rye areas of its removal from eligibility for intervention was very small. For the EU-12 MS, the decline in rye areas was largely linked to a shift towards 'other cereals' used in on-farm livestock feed.

In the case of changes in the intervention rules for grain maize, the decline in its share of cereal areas in both the EU-15 and EU-12 is consistent with our hypothesis regarding the impact of these changes, but it also reflects the end of the higher coupled aids paid for maize in some MS under Agenda 2000.

Chapter 5: Evaluation Questions 2 & 3

***Evaluation Question 2**: To what extent have the CAP measures applicable to the cereals sector influenced the supplies to the processing industry with regard to crop, quantity, quality, prices, geographical distribution and substitution with other sources?*

***Evaluation Question 3**: To what extent have the CAP measures applicable to the cereals sector ensured that supplies corresponded to the needs of the processing industry?*

5.1 Interpretation of the question

This chapter combines the answers to EQ2 and EQ3, as there is considerable overlap in the discussion of supplies and needs. The volumes imported under CAP import arrangements, in particular, provide insights into how processors are securing supplies for their needs and the degree of substitution between EU-produced and imported supplies.

We begin with an assessment of developments in the milling, malting and pasta industries, all of which require higher quality cereals. We then consider the starch, feed and biofuels sectors, which are significant users of cereal products. We focus mainly on availability and trade flows, both internally and with third countries, and how this has been affected by changes to import arrangements. In our discussion of the different sectors, we examine developments in downstream processing activities to gauge whether they are attributable to changes in CAP measures. Earlier, in Chapter 3, we described trade arrangements in detail, focusing on TRQs. Other factors external to cereal-specific CAP measures will also be considered in this chapter.

5.2 Judgement criteria, indicators, data sources and evaluation tools

The judgement criteria, indicators and data sources relevant to the two questions are summarised in Table 5.1. Interviews were held with Coceral[1] and its associate members (Euromalt, Euroflour and Euromaisiers), FEFAC (the federation representing the European feed compounding sector), the European Starch Industry Association, as well as processors across the food, feed, bioethanol, starch and starch sweetener sectors. The membership of these trade associations is representative of the majority of capacity in their respective industries.

Table 5.1: Judgement criteria, indicators and data sources (EQ2 and EQ3)

Judgement Criteria	Indicators	Data Sources
The availability of domestic (EU-27) supplies of cereals for end-users	Volume trends of EU-27 and MS supplies Statements by end users on the importance and scale of local sources of supply	EU-wide trade associations Case study interviews Eurostat output data Specialist information sources Processor interviews
Significance of domestic supplies for processing requirements, by type of cereal and volume	Self-sufficiency ratios by cereal type Volumes required by end-use, local vs. imported Statements by processors regarding the importance of local supplies	EU-wide trade associations COMEXT National and regional sources Case study interviews Processor questionnaires
Evolution of imports over time (including imports of cereal substitutes)	Scale of EU-27 and MS vs. imported supplies Volumes of imported cereals and cereal substitutes	EU-wide trade associations COMEXT data Processor questionnaires Case study interviews with national trade associations
Significance of tariffs in foreign trade	Import tariff structure for cereals	DG Agri data on import measures COMEXT data EU-wide trade associations

[1] Coceral is the EU association representing the trade in cereals, oilseed, feedstuffs, olive oil and agrosupply. Its members are national associations representing grain merchants, storers and international traders.

Ease of substitution, the availability of EU vs. imported supplies of cereals (and cereal substitutes)	Statements by processors regarding ease of substitution	EU-wide trade associations Case study interviews with national trade associations Processor questionnaires
Change in the geographical location of the processing industry by MS	Changes in the geographical distribution of the processing industry Changes in processing capacity	EU-wide trade associations National and regional sources Processor interviews
Changes in the quality requirements of cereals	Statements by processors regarding ease of substitution Volume trends of EU-27 and MS supplies, by quality Areas planted by variety and varietal developments	EU-wide trade associations Case study interviews with national trade associations Processor interviews
Changes in relative prices	Statements by processors regarding the ease of substitution between alternative feed cereals.	Processor questionnaires National and regional sources Case study interviews

5.3 Our hypotheses

Changes to import arrangements: The variable import duty system and TRQs provide preferential low or zero duty access to the primary raw materials of wheat, barley and maize for the processing sector. Our hypothesis is that the degree to which processors have had to procure imports to supplement domestic supplies indicates whether higher quality cereals have had to be sourced from abroad. In the feed sector, the scope for substitution is greater. Import arrangements will be evaluated in terms of how they have facilitated supplies.

Decoupling: Our analysis of EQ1 assessed the impact of CAP measures upon local cereal output. In terms of the relevance for the processing sector, we hypothesised that greater liberalisation would encourage producers to give a greater weight to market-based influences in their planting decisions. To validate this statement, we analyse processors' statements during our interviews and data reflecting the choices being made on-farm, which are revealed through area changes. This is particularly relevant for the milling and malting sectors, where producers determine the varieties of crops to sow with these specific markets in mind.

Intervention: Reforms made to the intervention system by 2010 ended automatic triggering of a price safety net, other than up to a pre-determined limit for intervention buying for common wheat. Our hypothesis is that this reform would have shifted production decisions further towards catering for perceived market demand and end-use requirements.

5.4 The malting sector

5.4.1 Supply-demand balance for malting barley

We start our end use analysis with the premium barley sector. Barley, for industrial use, is mainly used for malting purposes to produce malt for the brewing and distilling industries. Table 2.5 in Chapter 2 described the supply and demand balance for all barley. It revealed that EU-27 output grew from 58.5 to 59.7 million tonnes from 2000-2003 to 2007-2010, the result of output rising in 2008 and 2009 following higher cereal prices. This caused a sharp rise in ending stocks and flows of feed barley into intervention in 2009. Intervention is not used for malting barley since it always sells at a premium, but by influencing feed barley prices, intervention had implications, which we cover in Section 5.4.4, for the malting premium.

Table 5.2 summarises the supply and demand balance for malting barley based on data from Stratégie Grains. Malting barley accounts for approximately 20% of total barley production, and output ranged between 10 million and 14.5 million tonnes from 2000 to 2010.

Table 5.2: EU-27 supply/demand balance for malting barley (million tonnes)

	EU-15			EU-25			EU-27				
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Malting barley prod.	10.63	10.37	10.52	12.96	13.65	12.16	10.46	10.81	13.45	14.52	9.98
Internal demand (a)	9.18	9.35	9.30	10.92	10.71	10.48	10.58	10.74	10.68	9.94	9.93
Surplus (b)	1.46	1.02	1.22	2.05	2.94	1.68	-0.12	0.06	2.77	4.58	0.05
Extra-EU exports	0.63	0.79	1.44	0.73	0.55	0.59	0.38	0.32	0.48	0.59	1.22
Ratio of (b)/(a)	15.9%	10.9%	13.2%	18.7%	27.4%	16.0%	-1.1%	0.6%	25.9%	46.1%	0.5%
Potential malt production	8.37	8.17	8.28	10.21	10.75	9.57	8.24	8.51	10.59	11.43	7.86

Source: Stratégie Grains.
Note: Stratégie Grains data is based on field survey analysis and quality results of protein and screenings. The estimate of malt production is based on a conversion rate of 1.27 tonnes of barley to malt (Euromalt).

The analysis is built up from data for the EU as it expanded over time, in the manner indicated in the top row. Using Euromalt's[2] conversion rate of 1.27 tonnes of malting barley to produce 1 tonne of malt, we have derived estimates of malt production over the decade[3].

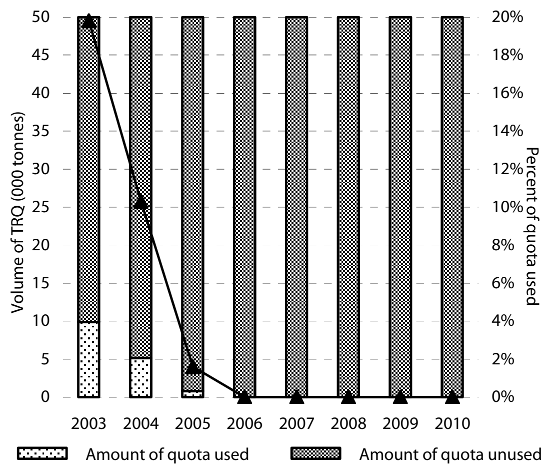
Over the period, malting barley output fell as a result of bad weather in 2006, 2007 and 2010. Nevertheless, the EU-27 produced a supply surplus in most years. Output was higher post-reform (2007-2010) than in earlier periods (though the earlier data covered a smaller number of MS). Local demand fell 7% to 9.9 million tonnes in 2009 and remained at that level in 2010.

Interviews with Euromalt and national trade associations revealed that they believe there has been a good availability of local malting barley for their needs. This is indicated by the low uptake of malting barley in the annual TRQ for 50,000 tonnes of high-grade barley (discussed in Section 3.5.2). Diagram 5.1 plots the annual use of the malting barley TRQ since it began in 2003. The scale on the left-hand axis is drawn up to the maximum amount allowed under quota of 50,000 tonnes, while the right hand axis depicts the percentage actually utilised.

The diagram demonstrates that, over much of the period, the TRQ was not utilised. In fact it was only in the first three years of the TRQ that a small proportion of the quota, of 10% or less, was used. However, the interviews revealed that this low utilisation rate reflected the requirement to produce 'beechwood-aged' beer[4] at the brewing end (the relevant Regulation states that the beer has to be made in vats specifically containing beechwood).

We conclude that maltsters were able to find sufficient supplies of the required quality from EU malting barley production.

Diagram 5.1: Malting barley tariff rate quota utilisation, 2003-2010



Source: European Commission — DG Agriculture and Rural Development.

Tables 5.3 and 5.4 list Comext intra- and extra-EU trade data for processed malt from 2000-2003 to 2007-2010. Table 5.3 indicates that there is significant intra-EU export trade, and that the total

[2] From Euromalt: http://www.coceral.com/cms/beitrag/10010776/248454.
[3] Agrosynergie's Evaluation des effets sur les marchés du découplage partiel, October 2010, stated that Euromalt's members account for 40% and 55% of world malt production and trade, respectively.
[4] Council Regulation (EC) No 1234/2001 of 22 June 2001 (OJ L 168 23.06.2001 p.12).

volume has risen over time. Nearly 80% of total intra-EU trade is accounted for by the MS listed in the table. Table 5.4 data, on extra-EU malt exports to major destinations, reveal that annual exports were 2-2.5 million tonnes. The quality of these exports depends, in part, on the balance of import demand between beer and lager producers. A major development has been the growth in lager beer demand in some export markets, notably in Asia.

Table 5.3: Intra-EU-27 processed malt exports ('000 tonnes)

	2000-2003	2004-2006	2007-2010
Total Intra-EU-27 trade	**1,453**	**1,706**	**1,852**
Of which:			
Belgium	171	381	415
Germany	316	279	292
Italy	117	122	107
Netherlands	279	294	312
Poland	182	188	229
Romania	38	68	124

Source: Comext, European Commission.
Note: Data for malt trade are those for HS code 1107 for malt, whether or not roasted.

Table 5.4: Extra-EU-27 processed malt exports by main destination ('000 tonnes)

	2000-2003	2004-2006	2007-2010
Total Extra-EU-27 exports	**2,382**	**2,494**	**2,055**
Of which:			
Egypt	5	1	2
India	0	1	2
China	5	7	6
Singapore	25	35	33
Nigeria	39	62	86
Russia	554	352	81
Japan	291	276	258
Brazil	247	255	235
Venezuela	241	330	249

Source: Comext, European Commission.
Note: Data for malt trade are those for HS code 1107 for malt, whether or not roasted.

5.4.2 Quality and substitution

Malting barley is the main ingredient in beer production. Whether brewers purchase malting barley to manufacture the malt themselves or purchase malt from maltsters, a key aspect is the capability of the barley to germinate. Hence a minimum germination capacity is sought, as well as specific protein and purity levels. Euronext's malting barley futures contract stipulates a minimum germination capacity of 95%. Interviews with maltsters revealed that this is a floor; generally they favour a minimum of 96-98%, with moisture and protein contents below the maximum amounts set by Euronext. Individual maltsters' quality specifications are commercially driven and are not made public.

Table 5.5 presents the evolution of the share of the total barley production (feed and malting) that achieve malting barley quality, derived from Stratégie Grains data. The proportion of total spring barley production which met the malting specification has remained close to one-third for the EU-15. The slight decline in 2007-2010 reflects a poor 2007 crop (notably in France and Germany), rather than a downward trend. Results for the enlarged EU reveal that malting quality represented roughly 30% of total spring barley output. For winter barley, the share meeting malting specifications ranges between 10% and 11.5%.

Table 5.5: The shares of total EU barley production meeting the malting specifications (%)

		2000-2003	2004-2006	2007-2010
Spring barley	EU-15	33.5%	34.1%	32.4%
	EU-25	:	30.6%	29.9%
	EU-27	:	:	29.7%
Winter barley	EU-15	10.8%	11.4%	11.2%
	EU-25	:	10.5%	10.2%
	EU-27	:	:	10.5%

Source: Stratégie Grains.

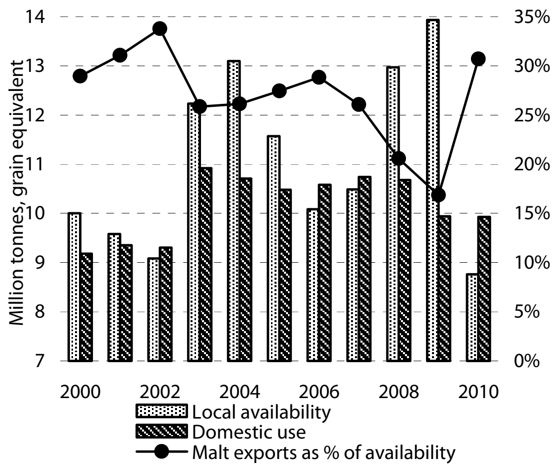
We conclude that the results broadly corroborate processors' statements that there were few issues with obtaining suitable local malting quality supplies. The proportions of winter and spring barley areas meeting specification were fairly stable, with relatively small fluctuations.

5.4.3 Barley usage by maltsters

Diagram 5.2 plots local malting barley supply and demand alongside the share of malt exports (in grain equivalent) in total local availability from 2000 to 2010. The diagram demonstrates that EU-27 availability has remained sufficiently high to meet domestic requirements of 9-10 million tonnes per annum and enable a steady level of EU malt exports outside the EU to be maintained over the period.

Average malt exports in 2000-2010 were 4-5 million tonnes, in grain equivalent. As the diagram reveals, extra-EU malt exports as a share of local availability, have tended to range between 25% and 30%.

Diagram 5.2: Availability, domestic use and extra-EU exports of malting barley



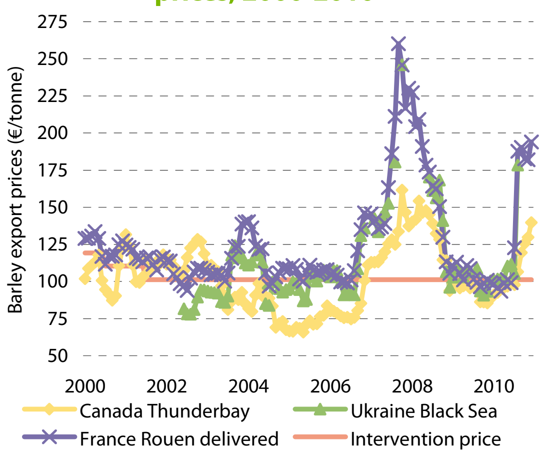
Source: European Commission — DG Agriculture and Rural Development, and Comext data.

5.4.4 Barley prices

Diagram 5.3 plots an EU feed barley price (delivered to Rouen) against Ukrainian and Canadian export prices and cereal intervention prices. Intervention was an effective safety net over the period for French prices.

When the barley TRQ was introduced in 2003, the Black Sea exporters, particularly Ukraine, had developed a significant presence in the world feed barley market, accounting for 30% to 40% of world trade[5]. Successive bumper crops in the region caused Ukrainian prices to trade at a discount to French prices before poor harvests raised Ukrainian prices.

Diagram 5.3: Local and export feed barley prices, 2000-2010



Source: Agriculture & Horticulture Development Board (HGCA).

[5] Based on analysis of USDA PS&D data for barley trade.

Consistent series of international malting barley prices are not available, but for the few MS for which price data exist, Diagrams 5.4 to 5.7 reveal that malting barley prices mirrored the movements in feed barley prices.

Diagram 5.4: French barley export prices vs. intervention

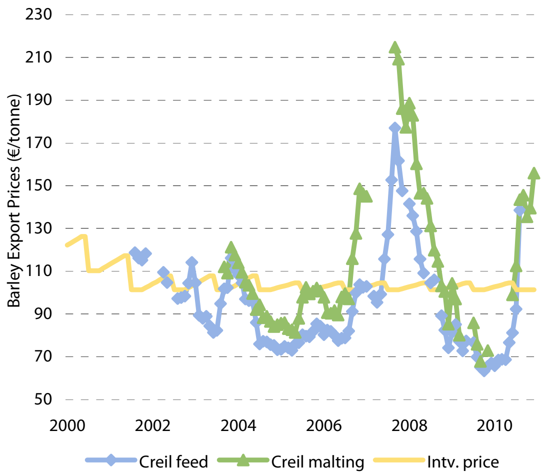


Diagram 5.5: German barley export prices vs. intervention

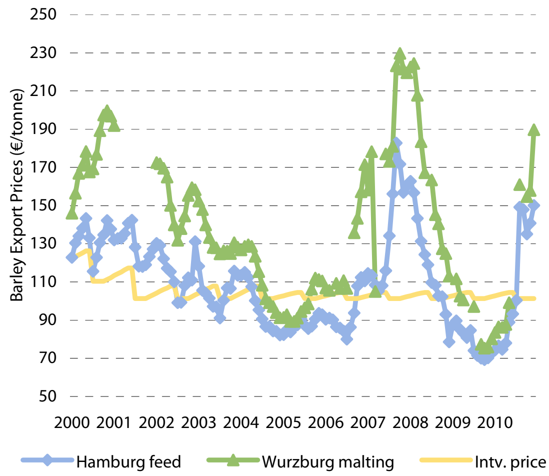


Diagram 5.6: Polish barley export prices vs. intervention

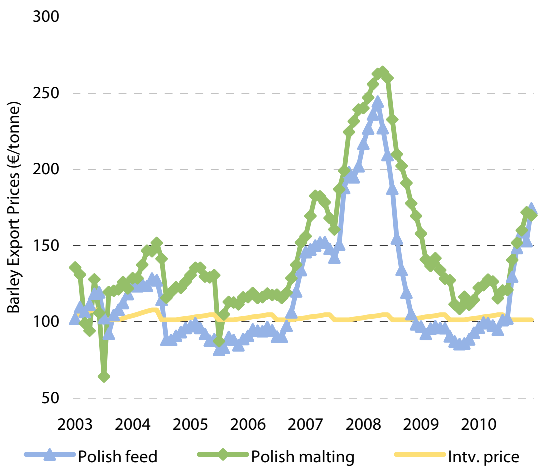
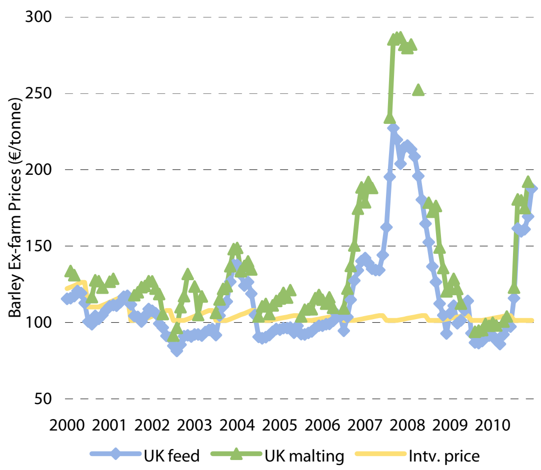


Diagram 5.7: UK barley ex-farm prices vs. intervention



Source: The graphs are based on weekly French and German delivered price data collated from the UK's Agriculture and Horticulture Development Board's (AHDB). UK prices are from AHDB on an ex-farm basis. The Polish prices are on a delivered basis provided by MARD, Integrated System of Market Information, Poland.

5.4.5 Geographical distribution of malt processing capacity

Table 5.6 summarises Euromalt data on the distribution of malt production by MS from 2000-2003 to 2007-2010. We observe a distinct contrast between the trends in the EU-15 and EU-12 regions. 7.56 million tonnes of processing capacity existed in the EU-15 MS in 2007-2010, but the region had experienced total capacity growth of only 0.9% since 2000-2003. The EU-12 MS experienced stronger growth of 8.9%, but their combined capacity was still only 1.57 million tonnes in 2007-2010. The bulk of this growth occurred in the three major EU-12 malt producing MS, the Czech Republic, Poland and Slovakia.

Table 5.6: The evolution of EU-27 malt processing capacity ('000 tonnes per annum)

	2000-2003	2004-2006	2007-2010	Absolute change post vs. pre-reform	Percentage change post vs. pre-reform
Austria	127.7	147.3	169.3	41.5	32.5%
Belgium	692.0	639.0	740.0	48.0	6.9%
Bulgaria	59.5	63.0	53.8	-5.8	-9.7%
Czech Republic	510.0	513.4	554.6	44.6	8.8%
Denmark	261.5	271.0	269.0	7.5	2.9%
Finland	180.3	185.7	184.0	3.8	2.1%
France	1,413.4	1,420.4	1,298.9	-114.5	-8.1%
Germany	2,095.3	2,006.7	2,073.5	-21.8	-1.0%
Greece	45.0	45.0	46.3	1.3	2.8%
Hungary	135.0	137.7	129.5	-5.5	-4.1%
Ireland	161.7	137.7	115.8	-46.0	-28.4%
Italy	62.2	62.9	71.0	8.8	14.1%
Lithuania	85.0	85.0	101.0	16.0	18.8%
Netherlands	249.5	287.4	342.6	93.1	37.3%
Poland	300.0	312.0	338.0	38.0	12.7%
Portugal	74.3	75.0	87.3	13.0	17.5%
Romania	98.2	98.2	113.8	15.6	15.9%
Slovakia	255.0	256.4	280.9	25.9	10.1%
Spain	408.1	444.5	479.0	70.9	17.4%
Sweden	164.5	229.3	200.5	36.0	21.9%
UK	1,551.4	1,504.6	1,478.0	-73.5	-4.7%
EU-15	7,486.9	7,456.5	7,555.0	68.1	0.9%
EU-12	1,442.7	1,465.6	1,571.5	128.9	8.9%
EU-27	8,929.6	8,922.2	9,126.5	197.0	2.2%

Source: Euromalt.

Interviews with the sector revealed that the causes of these structural changes were external to CAP measures. Factors cited included consolidation in brewing, driven by a declining beer market, and increased exposure to a volatile world market environment. Table 5.7 provides further evidence of structural change in the sector in terms of the integration between malting operations and breweries. Overall the extent of such integration increased by 2010, but the closer integration was confined to the EU-15 MS, with no similar trend observed in the EU-12.

Table 5.7: Number of European maltings companies in the EU-15, EU-12 and EU-27

		2003	2007	2010
EU-15	Independent	76	69	65
	Associated with breweries	30	24	37
	Associated with other industries	6	8	5
	Total	**112**	**101**	**107**
EU-12	Independent	n.a	33	30
	Associated with breweries	n.a	27	23
	Associated with other industries	n.a	0	0
	Total	**n.a**	**60**	**53**
EU-27	Independent	n.a	102	95
	Associated with breweries	n.a	51	60
	Associated with other industries	n.a	8	5
	Total	**n.a**	**161**	**160**

Source: Euromalt data for 2010. 2003 and 2007 data is drawn from Agrosynergie's 'Evaluation des effets sur les marchés du découplage partiel'.

We conclude that the malting industry has been well-placed to secure its needs from internal EU supplies. The lack of use of the malting barley TRQ confirms this. At the same time, there has been consolidation in the sector, driven by external economic factors rather than CAP measures, alongside a shift of processing capacity to EU-12 MS.

5.5 The milling sector

5.5.1 Supply-demand balance for milling wheat

Flour milling (for breads and baked goods) is the second largest market for EU-27 wheat, the largest being feed. The industry is demanding in its quality requirements, setting different parameters for the wide range of flours. Imports represent an important element of suitable wheat supplies. Here we assess how these have evolved. As with malting barley, milling wheat is not sold to intervention. Table 5.8 reveals that EU-27 common wheat output rose from 116.41 million tonnes in 2000-2003 to 127.33 million in 2007-2010. The volumes used in the milling of flour increased from 58.61 to 61.01 million tonnes over the same period.

Table 5.8: EU-27 supply/demand balance for common wheat (million tonnes)

	2000-2003	2004-2006	2007-2010
Opening stocks	13.30	22.03	18.47
Production	116.41	126.70	127.33
Consumption	110.59	115.90	115.30
Exports	12.56	12.82	18.54
Imports	6.07	4.37	4.11
Ending stocks	16.47	24.37	16.07
Availability for millers	58.61	60.72	61.01

Source: DG Agri, Prospects for Agricultural Markets and Income, December 2011, USDA PSD database.
Note: Common wheat availability = opening stocks + production + imports – seed use – animal feed use - exports - crop losses.

Our interviews with Coceral, national trade associations and large milling companies in the case study countries provided clear statements that, first, both the availability and quality of local cereal supplies were generally well-perceived in terms of meeting end-user needs. Second, the amounts available under the TRQs were viewed as effective in facilitating access to supplies. Nevertheless, it is clear that some MS have to rely on a certain proportion of imported wheat in their flour grists as a matter of course, given the quality profile of their local grain.

To validate these statements, Table 5.9 presents the utilisation rates of the different country-specific sub-quotas available for the medium to low quality wheat TRQ[6] since it was introduced in 2003. The table makes clear that these sub-quotas vary substantially in size for the US, Canada and other importers.

It is evident that in most years, the US wheat TRQ was heavily under-utilised. Only in 2004 and 2007 was there a significant take-up of the 572,000 tonnes TRQ available, although the circumstances were very different in the two years. In 2004, a good EU-27 wheat crop led to an expansion in its share of world common wheat exports trade, as Table 5.10 also demonstrates.

[6] The TRQ for low and medium quality wheat was opened from 1 January 2003 for a volume of 2,981,600 tonnes at an in-quota duty rate of €12 per tonne. It was increased to 2,989,240 tonnes in 2006 to account for enlargement, effective from 2008 to 2011. At the same time, the country-specific TRQs for Canada and other importers were expanded. Commission Regulation (EC) No 1067/2008 of 30 October 2008 (OJ L 290 31.10.2008 p.3).

Table 5.9: Tariff rate quota by country, 2003-2010 (million tonnes and percent)

	2003	2004	2005	2006	2007	2008	2009	2010
Sub-quota I: US	0.572	0.572	0.572	0.572	0.572	0.572	0.572	0.572
Amount of quota used	0.046	0.123	0.006	0.028	0.199	0.000	0.000	0.011
Amount of quota unused	0.526	0.449	0.566	0.544	0.373	0.572	0.572	0.561
% of quota allocated	*8.0%*	*21.4%*	*1.1%*	*4.8%*	*34.9%*	*0.0%*	*0.0%*	*1.9%*
Sub-quota II: Canada	0.038	0.038	0.038	0.038	0.039	0.039	0.039	0.039
Amount of quota used	0.038	0.038	0.016	0.038	0.038	0.004	0.002	0.001
Amount of quota unused	0.000	0.000	0.022	0.000	0.001	0.035	0.037	0.038
% of quota allocated	*100.0%*	*100.0%*	*42.8%*	*100.0%*	*97.8%*	*9.6%*	*4.0%*	*1.4%*
Sub-quota III: Other importers	2.372	2.372	2.372	2.378	2.378	2.378	2.378	2.378
Amount of quota used	1.638	1.529	2.372	2.206	1.127	1.169	2.378	0.317
Amount of quota unused	0.734	0.843	0.000	0.172	1.251	1.210	0.000	2.061
% of quota allocated	*69.1%*	*64.5%*	*100.0%*	*92.8%*	*47.4%*	*49.1%*	*100.0%*	*13.3%*
Total quantity available	**2.982**	**2.982**	**2.982**	**2.982**	**2.982**	**2.989**	**2.989**	**2.989**
Total uptake	**1.722**	**1.690**	**2.394**	**2.272**	**1.365**	**1.172**	**2.380**	**0.329**
% of quota allocated	***58%***	***57%***	***80%***	***76%***	***46%***	***39%***	***80%***	***11%***

Source: European Commission — DG Agriculture and Rural Development.

Table 5.10: The share of the EU-27 and other leading exporters in world wheat exports (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Canada	4.5%	3.5%	2.8%	4.2%	4.0%	4.2%	4.2%	3.3%	4.2%	3.9%	3.6%
EU-27	22.6%	21.1%	23.3%	19.9%	23.4%	21.4%	20.9%	19.6%	22.1%	20.2%	20.8%
United States	10.4%	9.1%	7.7%	11.5%	9.4%	9.3%	8.3%	9.1%	10.0%	8.8%	9.2%
Black Sea	9.2%	13.9%	14.7%	8.9%	11.6%	12.5%	12.1%	13.0%	15.0%	14.5%	10.4%

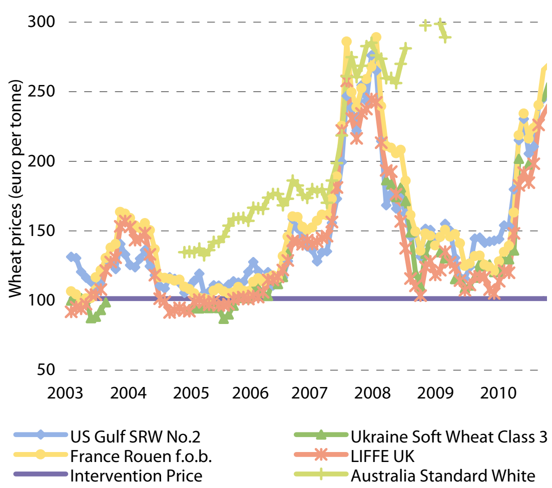
Source: USDA PSD Database.
Note: The Black Sea refers to Ukraine, Russia and Kazakhstan, which export mainly via Black Sea ports.

In 2004, the US had also produced a good crop and the increased availability caused US prices to trade at a significant discount to EU prices early in the 2003/04 marketing season. This is illustrated on Diagram 5.8, which plots French f.o.b. soft wheat prices against US Soft Red Winter wheat.

In 2007, the situation was very different. EU-27 wheat output had fallen for a second consecutive year and, with tight world supplies, the price spikes that followed caused the European Commission to suspend cereal import duties. In interviews, millers said that this action helped to alleviate immediate supply problems.

Table 5.9 also demonstrated that Canada's use of quota, which had been increased from 38,000 tonnes to 38,853 tonnes in 2007, was either at or near full utilisation in four years out of the 2003-2010 period.

Diagram 5.8: International soft wheat export prices, 2000-2010



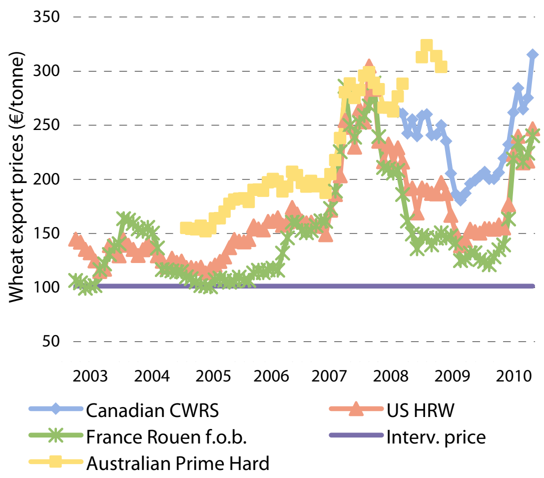
Source: Agriculture & Horticulture Development Board (HGCA).

Canadian wheat is favoured in certain EU markets, particularly where the climate makes the production of high protein wheat difficult.

Hard wheat export prices from Australia, the US and Canada are plotted in Diagram 5.9, alongside EU cereal intervention and EU soft wheat export prices. Australia and Canada are large suppliers of hard protein wheats to the world market and both countries experienced weather-related crop problems in 2007.

Data showing the destinations of third country wheat imported under TRQs are available only for 2007 and 2008, but they reveal important points. First, that import arrangements are used when supply problems arise and, second, they fill a supply shortfall for some MS. In 2007, Canadian wheat plugged gaps in Austria, the UK, Spain and Germany and nearly all the TRQ was used. In 2008, 10% of the TRQ was used, meeting an ongoing UK demand for high protein wheat.

Diagram 5.9: International hard wheat export prices, 2000-2010



Source: Agriculture & Horticulture Development Board.

The largest sub-country quota available is for other importers, equivalent to 2.38 million tonnes, which was generally filled at rates of 50% or higher. The one exception was in 2010 when global wheat production suffered significant problems, particularly in the Black Sea countries, and supplies from this group of countries fell drastically.

5.5.2 Wheat availability and quality for milling

Interviews with trade associations and milling companies provided clear evidence that the availability and quality of local wheat supplies were generally sufficient for end-user needs, and the amounts available under the TRQs were viewed as effective in facilitating access to supplies, allowing for those MS that have to import a certain proportion of wheats of suitable bread-making potential. This is demonstrated by the utilisation rates of the different TRQs which indicated that these measures were helping to procure supplies at times of need.

Millers stated that, as the cereal market became more liberalised, the sector increasingly had to adapt to volatile prices, a subject which is analysed further in EQ5 (Chapter 6).

Common wheat use for premium markets relies on a range of unique properties to produce different flours. Criteria are defined for a wide range of bread and other baked goods. Protein content is the most important single measure; it affects processing properties such as water absorption and gluten strength and determines the suitability of wheat for a particular end product. It is specified for all bakery flours and a level above 13% is generally preferred.

The European Flour Millers' Association (EFM), representing over 90% of European milling capacity, stated in interviews that substitution is a minor option. The only degree of flexibility is that some processors can use 12.5-12.7% protein with the newer varieties. Furthermore, improvements in blending technology and the ability to add vital wheat gluten (VWG) to the milling process have enabled the industry to work with lower proteins, though there are limits to the level of VWG inclusion. To some extent, the availability of VWG, derived as a by-product of the industrial milling of wheat for starch products and ethanol, can provide a means of off-setting the comparatively low protein content of most EU wheat supplies.

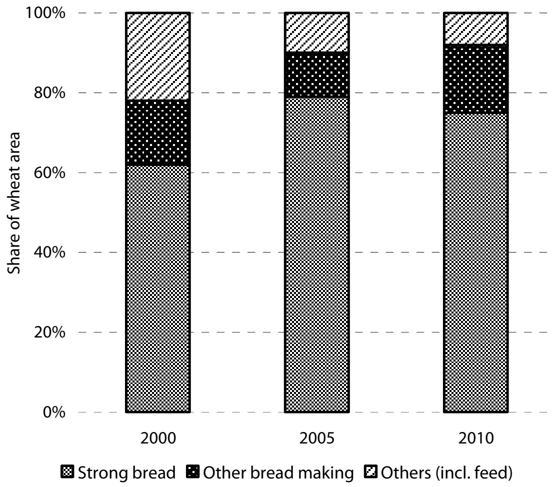
The quality profile of wheat varies across MS. The following diagrams illustrate data available from a cross-section of MS regarding the distribution of wheat quality in 2000, 2005 and 2010.

Diagram 5.10 reveals that 'Exceptional' classes (E or *Améliorant* wheats) and other bread-making grades account for 80%-90% of total French common wheat areas. French millers reported no problems with local supply and indicated that 98% of the wheat they mill is typically met by local (i.e. French) origin.

In the UK and Bulgaria (illustrated in Diagrams 5.11 and 5.12) there has been a shift away from higher quality wheats. The UK recorded a substantial rise in the share of Group 4 feed varieties in total UK certified seed sales.

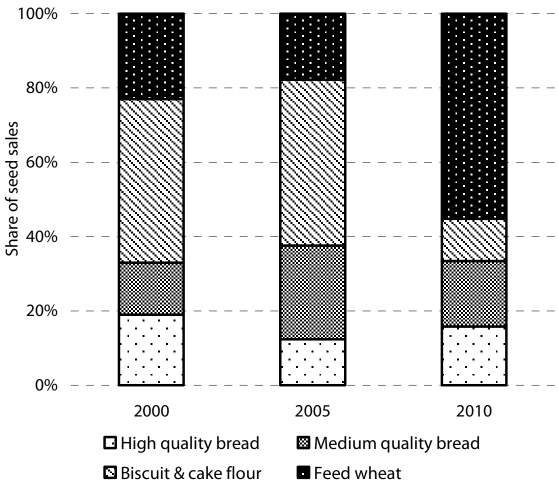
In Bulgaria, Group I, the highest quality, is only planted on a very small proportion of the total common wheat area. Yet, when interviewed, millers recorded no issues with quality.

Diagram 5.10: French wheat quality in 2000, 2005 and 2010



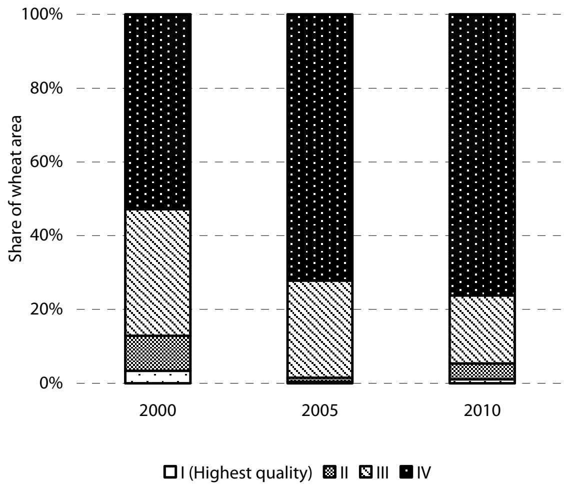
Source: FranceAgriMer & Arvalis (Institut du végétal).

Diagram 5.11: UK wheat quality in 2000, 2005 and 2010



Source: Agriculture & Horticulture and Development Board (HGCA), UK and (NIAB).

Diagram 5.12: Bulgarian wheat quality in 2000, 2005 and 2010



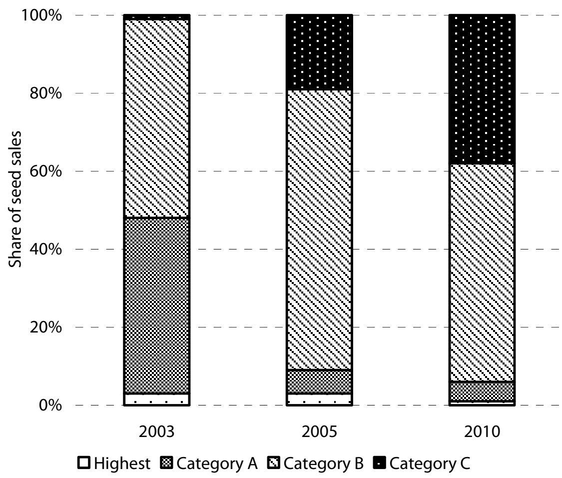
Source: MAF, National Grain Agency, Bulgaria.

Diagram 5.13 depicts a similar decline in the higher quality wheats in Greece. The bread making varieties (classified as highest and the Categories A and B) have suffered a sharp drop, in favour of varieties of feed quality. However, the interviews again did not reveal issues in terms of processor needs.

In Germany (Diagram 5.14), elite 'E' and 'A' (13.3% and 12.6% protein) breadmaking varieties together represent 80%-85% of wheat output. Other MS often import German 'E' wheats for blending with their own lower protein wheat. The share of domestic wheat milled in Germany is high, at roughly 95%.

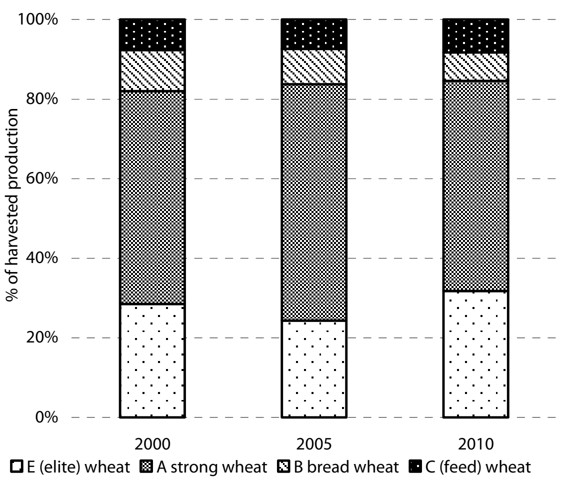
Hungarian bread wheat (minimum 12.5% protein) has maintained its share of production since 2000, as is revealed in Diagram 5.15.

Diagram 5.13: Greek wheat quality in 2000, 2005 and 2010



Source: Cereals Institute, Greece.

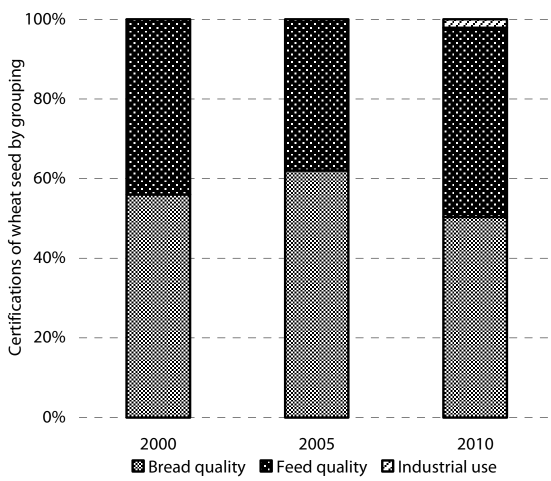
Diagram 5.14: German wheat quality in 2000, 2005 and 2010



Source: Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten.

Note: The quality classifications are applied by the Bundessortenamt (www.bundessortenamt.de).

Diagram 5.15: Hungarian wheat quality in 2000, 2005 and 2010



Source: 2000 and 2005 data is from the Hungarian Ministry of Agriculture and Rural Development and for 2010 from the Hungarian Agricultural Chamber.

We conclude from these comparisons for a cross-section of MS that the local flour milling sector has been able to obtain suitable supplies to meet occasional shortfalls in EU output as a result of import arrangements.

5.5.3 Geographical distribution of flour milling

Table 5.11 lists the tonnages of common wheat milled for flour production by MS from 2005 to 2010. National returns to the European Flour Millers' Association are patchy, but national associations in interviews report a decline in the number of companies in the sector and concentration into fewer and larger mills; yet significant structural over-capacity remains, with the average rate of capacity utilisation in the EU-27 estimated to be 65%.

Table 5.11: Wheat milled per annum for flour production in the EU-27 ('000 tonnes)

	2005	2006	2007	2008	2009	2010
Austria	550	550	550	545	632	667
Belgium	1,686	1,686	1,700	:	:	:
Czech Republic	1,150	1,150	1,150	1,100	1,080	1,230
Denmark	360	360	360	360	350	:
Finland	282	277	282	286	275	255
France	5,586	5,705	5,900	5,744	5,686	5,582
Germany	6,538	6,832	6,667	6,828	6,749	7,061
Greece	1,263	1,264	1,263	1,231	1,227	1,195
Hungary	1,200	1,260	1,260	1,200	1,300	:
Italy	:	:	:	5,220	5,140	5,140
Lithuania	234	227	227	300	:	:
Netherlands	:	:	:	1,175	:	:
Poland	4,100	4,000	4,000	4,200	4,200	4,000
Portugal	:	:	:	850	850	:
Romania	2,280	1,900	1,900	:	1,900	1,800
Slovenia	184	134	135	:	:	:
Spain	3,500	3,600	3,600	3,600	3,600	3,600
Sweden	2,247	2,247	2,247	:	:	:
UK	5,608	5,554	5,966	4,918	4,949	6,433

Source: The European Flour Millers' Association.
Notes: EU-12 data are only available from 2005. : means that data are not available.

The table indicates that milling is fairly concentrated by MS, with over 4 million tonnes per annum of wheat milling occurring in five MS, namely Germany, France, Italy, the UK and Poland.

As with malting barley, the consolidation in flour milling was stated by processors to be an outcome of continuous structural change, as mills sought to replace outdated facilities and upgrade to more efficient units, rather than a specific reaction to CAP measures.

We conclude that the TRQs have facilitated supplies to the milling sector to meet internal needs when internal production falls short of requirements. These measures have helped to address supply shortfalls, as and when they arise, and serve a continuing function in supplementing the availability of internally produced common wheat in individual MS.

The ability to substitute internal EU production with imported supplies through CAP measures provides the industry with a degree of manoeuvre in the event of production difficulties.

5.6. The starch processing sector

5.6.1 Analysis of cereal use in the starch sector

The EU starch sector processes roughly 15 million tonnes of cereals per annum, almost all of which is maize or wheat[7]. Information for this section has been derived from interviews with large processors with multi-national interests, as well as the AAF, the European starch industry association, and the *2010 Evaluation of the starch sector*[8].

In addition to cereals, the sector processes 7-8 million tonnes of starch potatoes annually to produce roughly 10 million tonnes of starch products from these two raw materials. Feed by-products amount to 5 million tonnes per annum (water is much of the 'missing' tonnage). Table

[7] The industry also processes rice and barley, although in very much smaller volumes.
[8] Agrosynergie 'Evaluation of Common Agricultural Policy measures applied to the starch sector', November 2010.

5.12 lists the main raw materials used by processors in the period under review, in which EU potato starch output was subject to quota. The total EU potato starch quota, which ended in June 2012, was 1.95 million tonnes of starch per annum.

Table 5.12: Raw material use in the EU-27 starch processing sector (million tonnes)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2000-2003	2004-2006	2007-2010
Maize	5.9	6.0	5.9	6.2	6.3	6.3	6.4	6.5	7.0	7.1	7.5	6.0	6.3	7.0
Wheat	5.5	6.0	6.1	6.2	6.7	6.9	7.1	7.1	7.0	7.2	7.6	6.0	6.9	7.2
Total cereals	11.4	12.0	12.0	12.4	13.0	13.2	13.5	13.6	14.0	14.3	15.1	12.0	13.2	14.3
Starch potatoes	8.3	8.0	7.9	7.1	7.5	8.7	7.9	6.9	7.5	7.5	7.0	7.8	8.0	7.2

Source: AAF (European Starch Industry Association) whose estimates are somewhat higher than those from DG Agri, Prospects for Agricultural Markets and Income, December 2011, used to construct Table 2.6.

Since 2000, new cereal starch capacity has been installed in both Western and Central and Eastern Europe. However, as Diagram 2.11 in Chapter 2 illustrates, the rate of expansion was at a faster rate in EU-12 MS, where capacity grew from a relatively smaller base. Our hypothesis is that the CAP reforms that reduced the volumes of sales that were permitted into intervention were a contributory factor behind this geographical shift. They made it easier for prices in surplus cereal producing regions to settle at a discount to prices in deficit regions, where these discounts reflected transport costs. Previously, when market prices were low, prices in landlocked cereal surplus MS were supported at narrower discounts to prices in deficit regions by sales to intervention stocks.

To assess this hypothesis, we have calculated the average cereal producer price discount in leading EU-12 starch processing MS versus prices in the main EU-15 starch processing MS. Table 5.13 (derived, as explained in Section 2.5 in Chapter 2, from the FADN database as total revenues from cereal sales divided by sales volumes) compares average cereal producer prices in EU-15 and EU-12 leading starch processing MS. It reveals the slight widening of the EU-12 price discounts for common wheat on the levels in the EU-15 since 2004-2006.

Table 5.13: Cereal producer prices in starch producing MS (€ per tonne)

			Discount on EU-15 producer prices	
Common Wheat	2004-2006	2007-2009	2004-2006	2007-2009
Average France, Germany	107	157	:	:
Average Czech, Hungary, Poland, Slovakia	98	142	8	15
Average Bulgaria, Romania	:	132	:	24
			Discount on EU-15 producer prices	
Maize	2004-2006	2007-2009	2004-2006	2007-2009
Average France, Italy, Spain	124	158	:	:
Average Czech, Hungary, Poland, Slovakia	99	134	24	24
Average Bulgaria, Romania	:	140	:	19

Source: Derived from analysis of FADN database, dividing total revenues from individual cereals by total sales volumes.

The AAF indicated that barriers erected to the cultivation and importation of GM maize are reflected in part in the widening premium for EU maize imports over the US Gulf export prices, to the disadvantage of local processors. In interviews, starch companies highlighted another cost that they attributed in part to the CAP reforms, which is a premium that they now pay for certificates to demonstrate the sustainability of the production systems for their cereal inputs, and which they interpret as a consequence of the cross compliance requirements.

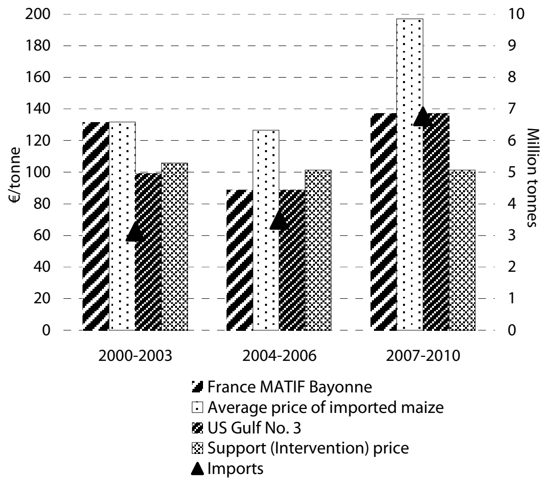
Diagram 5.16 compares French maize prices with US Gulf export prices for maize (which is mainly GM) and the average cost of maize imports (estimated by dividing total import expenditures by total import volumes each year), which are mainly non-GM varieties. Intervention prices and import volumes are also depicted.

Despite the growth in maize import volumes, most inputs for starch processing are supplied from the same MS. The recent evaluation estimated that 94% of starch maize inputs came from the MS where their operations were located, with 3% supplied by other MS and 3% from non-EU countries. Its interviews revealed that "*it is difficult to find GMO free maize on import markets*"[9].

Diagram 5.17, comparing ex-works EU and US native maize starch prices, reveals that the EU price disadvantage has grown. The evaluation observed that, since 2006, the EU cereal starch sector had lost world market share, compared with pre-2006[10]. However, we do not conclude that this is attributable to CAP measures.

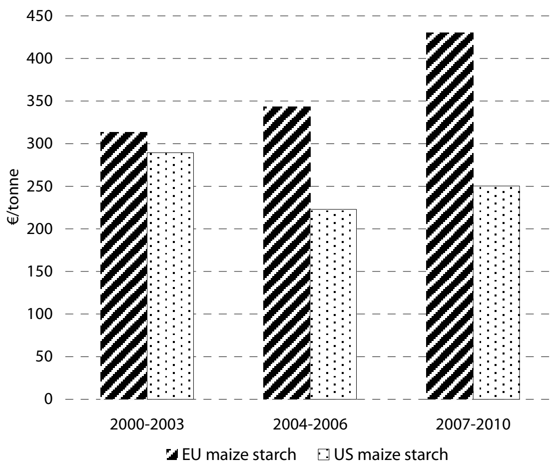
The measures have liberalised foreign trade, for example by suspending cereal export refunds in 2006, which should have aligned internal and external prices more closely. Instead, the outcome supports the conclusion of the 2010 starch sector evaluation regarding the barriers created by GM crop restrictions.

Diagram 5.16: French and US maize prices, average prices of imported maize, intervention prices, and import volumes



Source: LMC estimates.

Diagram 5.17: EU and US native maize starch prices, ex-works



Source: LMC estimates.

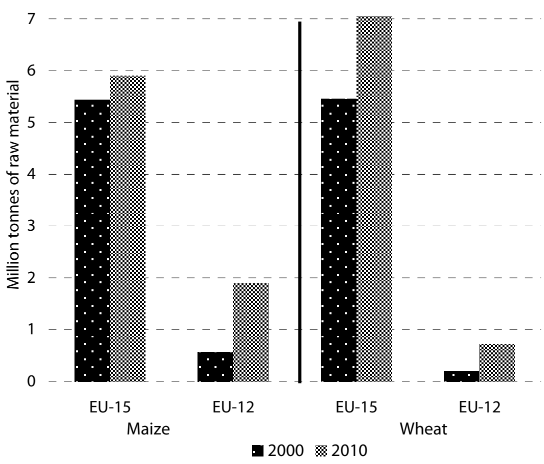
5.6.2 Geographical distribution

The faster rate of expansion in starch processing capacity in the EU-12, relative to that in the EU-15, is depicted in Diagram 5.18. This partly reflects lower cereal prices in landlocked EU-12 MS. The diagram also makes clear that this has resulted in different patterns of cereal use in the two groupings. In low cost maize-growing regions of the EU-12, the new grinding capacity has been based on maize. However, this trend also reflects the improved economics for those processors producing ethanol alongside starch and syrups. These integrated operations benefit from economies of scale in cereal milling, which, in turn, lower the cost of producing starch products in these locations. Wheat processing capacity has also increased in EU-15 MS, where the local price competitiveness of wheat has encouraged facilities to convert their grind from maize to wheat as a raw material. (It should be noted that some of the wet mills also produce ethanol and so their grind is higher than the levels depicted in Diagram 5.18.)

---

[9] Agrosynergie, op. cit. Table 125.
[10] Agrosynergie op. cit. Section 4.2.2.4.1.1.2.

Diagram 5.18: Starch capacity by cereal and region, 2000 and 2010



Source: LMC estimates.
Note: The volumes refer to the output of dry starches and starch sweeteners, thus excluding ethanol.

5.6.3 Price volatility and risk management

With greater openness to world prices, internal market prices have become more volatile (as discussed in Chapter 6, EQ5). Analysis in that chapter of trends in cereal futures trading volumes and open interest demonstrates the greater use that processors have been making of risk management techniques. In interviews, processors stated that the reforms, notably the suspension of export refunds, had improved the efficacy of risk management by allowing internal market prices to follow world market movements more closely than hitherto (EQ5 reveals that correlations between internal and external market prices increased significantly in 2007-2010 for all major cereals, apart from maize).

This enables processors to use US futures contracts at times when volumes to be hedged test the liquidity of EU cereal futures markets.

Abolition of starch production refunds in June 2009 should have affected the competitiveness of the EU starch industry. Yet, the Agrosynergie report concluded that *"Manufacturers confirmed that the change in the production refunds did not affect their market shares. They consider that, overall, their market shares have been much more affected by the recent financial crisis that led to reduction in starch consumption and by the Sugar CMO reform for starch hydrolysed products. End-users confirmed that they did not turn to imports or to non-starch substitute products".*

Regarding the impact of the suspension of export refunds, the same report noted that "[…] *as the refunds have been set at a low level since the MacSharry reform, they do not have a perceptible impact on their market shares in export markets, … which are not a major outlet of cereal starch products, unlike the case of potato starch"*[11].

5.7 Durum wheat use

Durum wheat is processed into durum wheat flour (semolina) for the pasta and couscous industries. The EU-27 is the world's largest producer. This analysis draws extensively upon data from the European Semouliers' Association (*Semouliers*), which represents 80% of the total semolina processing industry, and LMC's 2009 *Evaluation of the durum wheat sector*[12].

5.7.1 Supply-demand balance for durum wheat

Semouliers estimate that 7-8 million tonnes of durum wheat are processed by the EU industry. Table 2.5 in Chapter 2 revealed that durum wheat was the one major cereal sector with a consistent deficit. Table 5.14 indicates that the share of domestic output in the EU-27 demand for durum wheat fell from 94.2% in 2000-2003 to 93.0% in 2007-2010.

[11] Agrosynergie op. cit. Section 4.2.2.5.2.
[12] Evaluation of the durum wheat CMO, 2009 *op. cit.*

Table 5.14: Durum wheat EU-27 supply-demand balance (million tonnes)

	2000-2003	2004-2006	2007-2010
Opening stocks	1.10	1.40	1.24
Production	8.97	10.12	8.98
Consumption	9.52	10.63	9.66
Exports	0.88	1.30	1.44
Imports	1.42	1.82	1.89
Self-sufficiency (%)	94.2%	95.2%	93.0%
Ending stocks	1.45	1.41	1.01
Availability for millers	8.99	10.39	9.88

Source: DG Agri, Prospects for Agricultural Markets and Income, December 2011, USDA PSD database.

Chapter 3 (Section 3.9.4) described the measures relevant to durum wheat and the reduction in the amount of coupled support to producers. We hypothesised that producers would make decisions on the basis of comparative advantage. Our analysis for EQ1 in Chapter 4 found that the requirement to use only certified seeds to receive the traditional area premium acted as a strong disincentive for durum wheat plantings. Table 2.13 of Chapter 2 revealed that total durum wheat areas declined significantly post-reform. Table 5.15 summarises the net impact of these changes in area on production by MS.

The area in Italy, the largest producing MS, fell 17.8% post-reform, but output rose 3.7%. Processors indicated that lower domestic quality necessitated imports of high quality cereal. France's area and output rose 37.5% and 43.8% respectively, and quality was said to have been maintained. Experience differed in the other two large durum wheat producers, Spain and Greece. In Spain both area and output fell sharply while in Greece, the declines were less steep.

Table 5.15: Durum wheat areas and production by MS ('000 hectares and '000 tonnes)

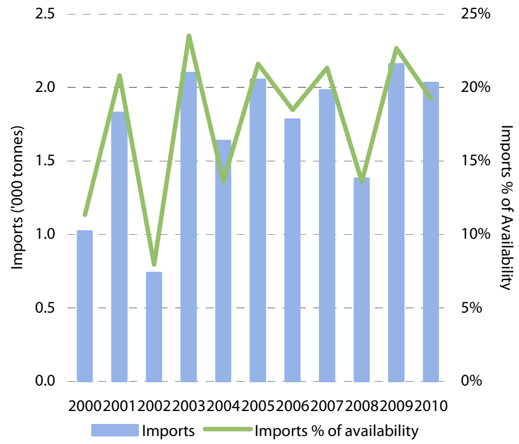
	Areas		Output	
	2000-2003	2007-2010	2000-2003	2007-2010
Austria	14.2	17.1	50.8	72.5
Bulgaria	20.6	4.3	50.8	16.3
Cyprus	6.1	5.9	12.1	12.0
France	327.7	450.7	1,519.5	2,184.5
Germany	6.5	11.6	31.9	64.0
Greece	696.0	578.1	1,397.5	1,219.0
Hungary	12.7	11.0	40.1	40.8
Italy	1,687.4	1,386.3	3,979.8	4,127.3
Portugal	151.4	6.0	179.2	11.5
Romania	2.4	4.4	6.0	9.3
Slovakia	5.3	9.9	17.5	39.8
Spain	898.0	493.7	1,995.1	1,183.3
UK	2.0	0.0	11.2	0.0
EU-12	47.0	35.4	126.5	117.5
EU-15	3,783.0	2,943.4	9,165.0	8,861.3
EU-27	3,830.0	2,978.8	9,291.5	8,978.8

Source: Agricultural Situation in the EU, various issues.

In terms of supplies, the data reveal that imports have been important in meeting processing requirements. Diagram 5.19 plots imports as a percentage of total availability (which includes domestic production and imports) in 2000-2010 for the EU-27. The results indicate that the import share rose from an average of nearly 16% in 2000-2003, with fairly sharp year-on-year fluctuations, to an average of over 19% in 2007-2010.

We conclude that the reductions in coupled payments on durum wheat both reduced EU-27 output and increased the reliance on imports.

Diagram 5.19: Imports as a % of availability



Source: DG Agri, Prospects for Agricultural Markets and Income.

5.7.2 Quality and substitution

Quality parameters for durum wheat in pasta production include a yellow-amber colour, a high protein and gluten content, superior cooking quality and consistency. Protein content is ranked most important, followed by specific weight and colour. Demand for durum wheat tends to be inelastic. This means that a relatively small shortage can result in a large increase in durum wheat premia over common wheat. Even if global supplies of common wheat are abundant, a shortage of durum wheat can result in high durum wheat prices. Likewise, because markets beyond traditional pasta and couscous output are small, a relatively small increase in durum wheat output can result in large price declines.

New technologies facilitate the use of common wheat in pasta, particularly fresh pasta. High temperature drying and the addition of gluten have improved common wheat pasta quality, encouraging substitution. However in many MS, the definition of pasta is enshrined in the national legislation where pasta is defined as a product containing durum wheat (these MS include Austria, Belgium, France, Germany, Greece, Italy, Netherlands, Portugal and Spain).

5.7.3 Prices

Diagram 5.20 plots EU durum wheat prices (from partial Italian data) alongside Canadian and US prices. There is close substitutability between the two products, as can be seen in price behaviour over 2000-2010. As further confirmation of this relationship, Diagram 5.21 presents the evolution in the price ratios of EU to US durum wheat, which we interpret as providing some indication of the evolution of crop quality. The hypothesis is that a narrowing of the differential of North American durum wheat over EU durum wheat would imply an improvement in EU quality, while a widening would suggest a reduction in crop quality.

The greater the substitutability between two competing materials, the closer their prices should remain over time. We observe that, since 2003, the prices of US and Italian durum wheat have shown considerable convergence, with the price ratio close to 100%, apart from 2006. This implies a considerable degree of substitutability between imported and domestic durum wheat.

Diagram 5.20: International durum wheat export prices

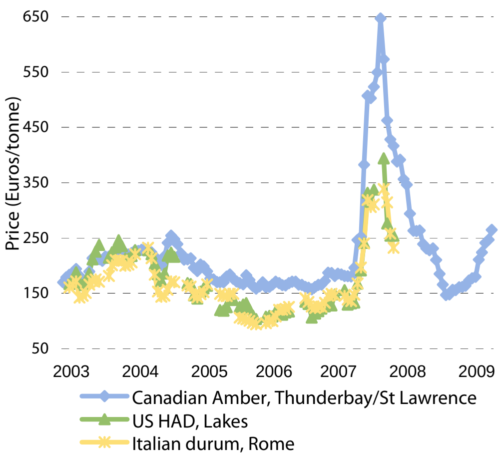
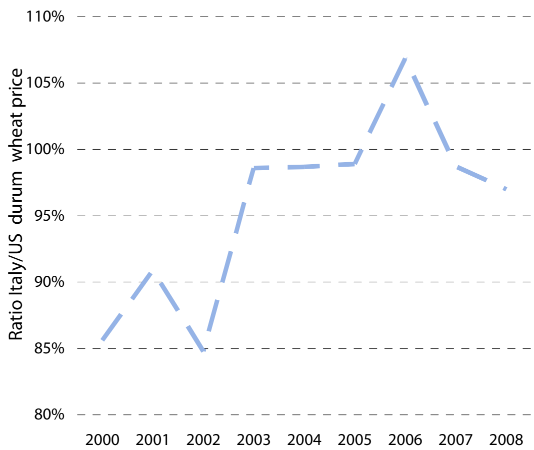


Diagram 5.21: Ratio of Italian to US durum wheat prices, 2000-2008



Source: Agriculture & Horticulture Development Board (HGCA) and International Grains Council.

5.7.4 Geographical distribution of durum wheat processing

Data from UNAFPA[13] reveal that the number of pasta factories in those MS for which data were available fell by 12.9% between 2000-2003 and 2007-2010. The process of consolidation was apparent before the reform and there is no evidence that the change in reform caused any change to industry structure or location. In interviews, producers stated that the plants that closed were typically the smallest factories, and were not a direct consequence of CAP measures. This evidence was supported by the processor questionnaire, which in all cases reported that the change in regime had had no effect on the geographical location of processing plants.

5.8 The feed sector

The feed sector is the largest user of cereals, which have to compete with other non-cereal ingredients for inclusion in animal feed rations, many of which are imported. The balance between the use of domestic cereals, imported cereal substitutes (notably tapioca, corn gluten feed and meal, and citrus pulp in the past) and oilseed meals has changed significantly since 2000.

Table 5.16: Industrial feed ingredient consumption in the EU (million tonnes)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2000-2003	2004-2006	2007-2010
Total industrial feed	126.19	127.18	126.15	144.32	141.94	142.12	151.19	153.60	147.83	151.03	125.97	142.79	150.91
of which feed cereals	*54.33*	*56.31*	*55.58*	*66.33*	*66.63*	*66.89*	*71.77*	*72.26*	*71.05*	*71.38*	*54.34*	*66.62*	*71.62*
Cereal % of total feed	43%	44%	44%	46%	46.9%	47.1%	47.5%	47.0%	48.1%	47.3%	43.1%	46.7%	47.5%

Source: FEFAC.
Note: Data exclude Luxembourg, Greece and Malta and cover the EU-15 until 2003, EU-25 until 2006, and EU-27 thereafter.

[13] The Union of Organisations of Manufacturers of Pasta Products of the EU represents pasta processors in the EU.

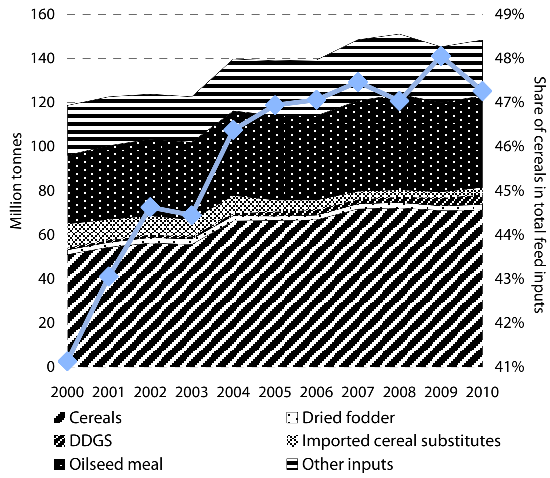
Table 5.16 describes the share of cereals in compound feed ingredients based on data supplied by the European Feed Manufacturers' Federation (FEFAC), which represents the majority of national compound feed associations in 21 MS. The data account for cereal use in feed in both on-farm use and compound feed production.

Cereals increased their share of EU-27 industrial feed use, from 43.1% pre-reform to 47.5% post-reform.

Diagram 5.22 makes clear the significant gains made in cereals' share from 2000 to 2005, which slowed after that. This is partly because cereals cannot replace the protein required in livestock diets, which is supplied by a certain amount of oilseed meals or vegetable protein feeds.

FEFAC has stated that issues with supplies have more to do with the 'zero-tolerance' policy towards unauthorised GMOs, rather than CAP measures:

Diagram 5.22: Compound feed ingredients



Source: FEFAC.

"Asynchronous approvals and asymmetric approvals (isolated foreign approval) of GMOs make the European supply chain even more vulnerable to the Low Level Presence of GM events which are authorised in third countries but not or not yet in Europe […] (Almost) no maize imports into the EU from the US since 1997 [...] Corn Gluten Feed and Dry Distiller's Grains imports reduced to almost 0"[14,15].

Table 5.17 summarises data on cereal and cereal substitute imports since 2001, when data are available from FEFAC. They reveal an increase in cereal use in compound feed partly at the expense of imported cereal substitutes. Feed cereal imports fluctuated fairly significantly while ingredients such as corn gluten feed (CGF) and distillers' dried grains and solubles (DDGS), declined sharply, particularly from 2007 for CGF. Overall CGF imports fell by 67.5% in 2007-2010, compared to 2001-2003. Table 2.5 of Chapter 2 indicated that annual maize use ranges between 59 and 63 million tonnes and that typically the EU-27 is deficit in maize. Feed use is its main form of demand.

Table 5.17: Imports of feed cereals and cereal substitutes into the EU-27 (million tonnes)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001-2003	2004-2006	2007-2010
Total Feed Materials	41.0	49.5	45.0	44.6	42.5	41.0	49.6	45.4	36.5	38.6	45.1	42.7	42.5
Feed cereals	5.0	13.0	11.0	6.0	6.1	5.5	13.5	10.0	4.5	6.5	9.7	5.9	8.6
Cereal substitutes:	8.8	8.0	7.1	7.6	4.7	4.1	3.6	3.0	1.4	2.4	7.9	5.5	2.6
Corn gluten feed and meal	4.2	4.1	3.6	3.3	2.5	2.4	0.7	0.2	0.1	0.6	4.0	2.8	0.4
DDGS	0.7	0.9	0.8	0.7	0.7	0.6	0.4	0.2	0.2	0.5	0.8	0.7	0.4
Citrus pulp	1.3	1.3	1.0	1.4	1.0	0.9	1.2	1.3	1.1	1.2	1.2	1.1	1.2
Tapioca	2.6	1.6	1.7	2.2	0.3	0.2	1.2	1.3	0.0	0.0	1.9	0.9	0.6

Source: Toepfer, Eurostat.

[14] Industry Perspectives on GMOs Low Level Presence, Impact on Europe's Trade, Coceral, 2012.
[15] Commission Regulation (EU) No 619/2011 on implementation of the 'zero-tolerance' policy on non-authorised genetically modified (GM) material in feed offers a solution by setting a technical tolerance GM material at 0.1%.

Table 5.18 presents Comext data for maize imports and reveals, first, that in some years, imports have been significant and second, a shift in the source of maize imports away from the US towards South America and South East Europe. US maize imports are now very small, reflecting concerns about the presence of unapproved GM events. Meanwhile, imports from Brazil have risen sharply, in part because it is predominantly GM-free.

Table 5.18: EU-27 Imports of maize ('000 tonnes)

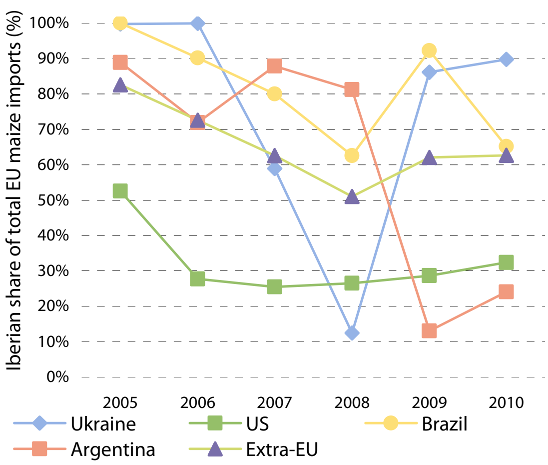
	2005	2006	2007	2008	2009	2010	2000-2003	2004-2006	2007-2010
Intra EU-27	**11,690**	**11,646**	**12,955**	**12,146**	**14,147**	**12,987**	**9,465**	**10,738**	**13,059**
Extra EU-27	**2,571**	**3,685**	**10,792**	**9,681**	**2,752**	**3,832**	**3,124**	**3,493**	**6,764**
US	31	25	26	33	26	266	141	54	88
Canada	0	0	1	2	0	71	5	0	18
Argentina	1,524	1,061	2,800	3,730	311	394	1,864	1,418	1,809
Brazil	117	847	6,975	4,152	255	1,580	786	938	3,240
Ukraine	340	378	82	1,177	636	538	89	381	608
Serbia	319	1,058	348	123	1,148	580	0	459	550

Source: COMEXT, European Commission.

Since the maize TRQ was introduced in 2006, it has been utilised fully. For the years in which data are available by country of origin (2007 and 2008), the 2007 allocation consisted purely of maize from South America and South East Europe. The small amount of US origin maize imports comprised either non-GM maize or approved GM varieties.

The CAP 'abatimento'[16] provides a TRQ for Iberian feed processors. Diagram 5.23 plots imports into the Iberian Peninsula, but the abatimento was last used in 2006. It was suspended along with all cereal import duties during the high prices in 2007 and 2008, but was reopened in 2009. Representatives of Spain's compound feed and livestock sectors and the trade find the abatimento scheme to be of benefit[17].

Diagram 5.23: Maize imports into the Iberian Peninsula, 2005-2010



Source: European Commission - DG Agriculture and Rural Development

An examination of maize imports into the Iberian Peninsula reflects the issue of GM that has affected EU maize imports since 2005. It provides further evidence of a shift of maize import trade away from the US towards South America and South East Europe.

In the feed sector as a whole, there are no specific quality requirements for the cereals used, other than that the grain must be clean and free of pests. A growing issue of relevance, however, is the issue of food safety, and since the BSE outbreak, this applies to feed ingredients as well.

We conclude that it is non-CAP factors, notably the issue of GM maize, rather than CAP measures, which affect the sources of supply of cereals for feed compounders.

[16] The abatimento scheme is described in Chapter 3, Section 3.5.2.
[17] 'Abatimento Update – Spain and Portugal's Reduced-Tariff Import Quota for Corn and Sorghum'; USDA, 2009.

5.9 The biofuels sector

In Chapter 2, we described how the biofuel sector has been the most rapidly expanding end-use for cereals. Diagram 2.12 presented the growth in bioenergy cereal raw materials since 2004, when the sector started to develop rapidly. Table 2.6, furthermore, revealed that bioenergy uses had developed to account for 6.59 million tonnes in 2007-2010, from less than 2 million in the 2004-2006 period. The initial growth in bioenergy use of cereals favoured feed wheat as a feedstock, but since 2008, maize has been used more heavily as a raw material for dry milling plants, particularly in Central and Eastern Europe, following the lead of the starch processing sector.

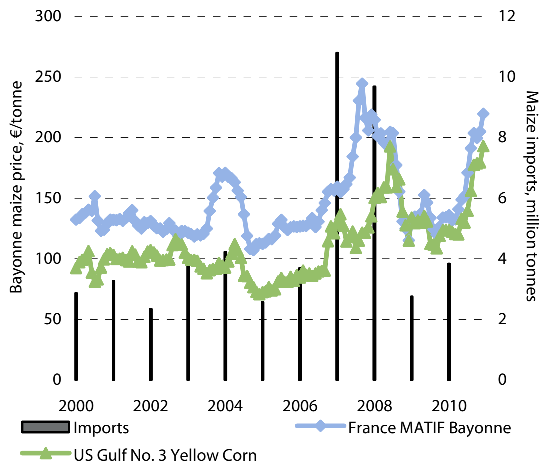
5.10 Other considerations

Statements from interviews with EU-wide and national associations indicated that the main issue concerning availability of supplies across all sectors has been the issue of policy with regard to GM raw materials, rather than CAP measures. EU policy on the Low Level Presence (LLP) of unauthorised GM events in maize was perceived to reduce the availability of supplies, in volume terms, from outside the EU and to create legal uncertainties.

In Table 5.18, we observed that imports were needed in years of limited EU supply to meet shortfalls in output. At such times, internal maize prices rose well above the import cost of world market maize, represented by US maize. This is because the export availability of non-GM maize is limited and hence sells at a premium to GM maize.

In order to attract imports to meet the shortfall in local supply, domestic prices had to rise to a level that made imports viable. This is highlighted in Diagram 5.24, plotting the French (Bayonne) price, the world price, and EU import volumes from 2000 to 2010. In 2004 and 2008, when domestic maize supplies were reduced because of drought, requirements were met by imports from South America.

Diagram 5.24: French and US maize prices and EU maize imports



Source: LMC estimates.

The issue of GM is further discussed in Chapter 6 with respect to competitiveness.

5.11 Key conclusions on the impact of supplies to processing

We conclude that the TRQ arrangements, particularly for the flour milling sector, have been utilised to meet processor needs, particularly at times when supply issues arise or to fulfil a supply need for MS whose output quality necessitates high quality wheat imports. For the malting industry, the situation is very different: internal EU supplies have been well-maintained to meet internal demand, resulting in a low utilisation rate of the TRQ system.

EU-27 durum wheat output declined in response to reductions in specific coupled aids, although in some of the larger MS, production increased. Nevertheless, processors stated that imported supplies of high quality durum wheat have been increasingly necessary to achieve the right quality in the largest durum wheat producing MS, Italy.

There has been consolidation across all sectors and in the malting and milling sectors, a general shift in processing capacity to the EU-12. Interviews with representatives from the different downstream sectors revealed, however, that this process of consolidation has more to do with external factors rather than specific CAP measures.

Access to supplies is more challenging in both the feed and starch sectors. Again, this has little to do with cereal-specific CAP measures. In the feed sector, a combination of CAP measures and external developments has boosted the use of locally grown cereals in feedstuffs. Cereal quality is not an issue in this end-use. Interviews from both sectors stated that it is the 'zero tolerance' policy towards unauthorised GMO events in the EU which is the main concern affecting supplies, rather than domestic availability.

Barley planting data revealed that the EU-27 has consistently been able to produce sizeable volumes of barley corresponding to the malting specification (in the absence of unfavourable weather events), and to maintain an export surplus of malt. This corroborates processor statements that there were few issues with crop quality.

One respect in which local cereal supplies can fail to meet the needs of local processors is for high protein bread-making wheat. The climate does not favour the cultivation of these varieties in many MS. Therefore, on top of what can be achieved by blending EU bread-making wheat with vital wheat gluten, there remains a need for imports of high protein wheat. To that end, import arrangements have served an important function.

Chapter 6: Evaluation Question 4, 5 & 6

***Evaluation Question 4**: To what extent have the CAP measures applicable to the cereals sector contributed to fostering the competitiveness and promoting the market orientation of EU cereal production?*

***Evaluation Question 5**: To what extent have the CAP measures applicable to the cereals sector influenced the level and volatility of cereal prices?*

***Evaluation Question 6**: To what extent have the CAP measures applicable to the cereals sector contributed to maintaining/increasing the income of the cereal producers?*

6.1 Interpretation of the questions

The discussion in this chapter combines our answers to EQ4, EQ5 and EQ6 as we examine the extent to which CAP measures have promoted competitiveness, the effect they have had on prices and finally, any consequences they have had for producer incomes.

Fostering the competitiveness of the cereals sector is interpreted in three ways. In economic terms, it is indicated by the competitiveness of EU MS direct cereal production costs versus those in the US, the world's largest cereal exporter, as well as Russia and Ukraine. We analyse how the CAP measures influenced gross margins and examine the counterfactual case in which all coupled aids are removed to gauge how their removal would have affected cereal areas.

From a technical perspective, competitiveness is indicated by cereal yields per hectare in the EU vis-à-vis other leading exporters and the changes in the yields in the period under review.

A further indicator is competitiveness in world trade, in terms of the EU exports and imports as a share of world trade. A particular aspect of this part of the analysis is the impact of the emergence of Ukraine, Russia and Kazakhstan as competitors in cereal export markets.

The promotion of the market orientation of EU cereal production is interpreted as inducing producers to generate the qualities of cereals that the internal and external markets desire.

We analyse the impact of CAP measures on the levels and volatility of cereal prices in the internal market vis-à-vis external markets. We discuss how participants have responded to the more liberalised market conditions by increasing the use of futures to manage price risk.

Finally, we focus on farm income. Cereal producers' incomes are compared before and after the MTR, with the contributions of coupled and decoupled aids identified, to quantify the impact of the counterfactual, the absence of these aids, on incomes.

The main CAP measures relevant to this question are those in the MTR and Health Check that marked a shift in aids away from coupled to decoupled payments, and which reduced price supports via border measures and changed the eligibility for buying-in intervention stocks. The decoupling of payments is particularly important for its direct influence on producer incomes. Among measures that affected incomes less directly via their impact on cereal market prices or production were a reduction in, and eventual elimination of, set-aside; of export refunds; and changes in the application of import tariff rate quotas.

6.2 Judgement criteria, indicators, data sources and evaluation tools

The judgement criteria, indicators and data sources relevant to these three questions are summarised in Table 6.1

Table 6.1: Judgement criteria, indicators and data sources regarding competitiveness, prices and incomes (EQ4, EQ5 and EQ6)

Judgement Criteria	Indicators	Data Sources
Stability of incomes over time and by holding/region	Levels of income over time Coefficient of variation in incomes	Case studies FADN data
Changes in gross margins and producer incomes per hectare, and the contributions of coupled and decoupled payments for COP specialist holdings	Time series of gross margins from MS selected for case studies Net farm incomes and farm value added per hectare	National governments FADN data
The importance of decoupled and coupled payments in the gross margins, farm net value added and net farm income of producers	Division of incomes into market sales, coupled and decoupled payments of cereals vs. other COP crops	FADN data Case studies
Cost competitiveness of EU cereal output in an international context	Cereal production costs in EU MS, the US, Russia and Ukraine	Graham Brookes *European Arable Crop Profit Margins;* USDA LMC *Black Sea Gross Margins*
Impact of CAP reforms on the profitability of EU cereal output	Gross margins in MS per hectare of cereals pre- and post-reform	Graham Brookes, *op cit.* USDA FADN database
Influence of reforms on producers' choice of crops	Areas of cereals and of other COP crops (as analysed in EQ 1) Coupled vs. decoupled payments Supplementary payments, e.g. energy crops and Articles 68/69	Eurostat; DG Agri National and regional sources, official and research institutions Case studies Producer questionnaires
Changes in the EU share of world trade in leading cereals	Changes in EU export surpluses vs. the EU cost competitiveness in leading cereal crops	Eurostat International Grains Council USDA, Graham Brookes, *op. cit*
International competitiveness in yields and yield increases	Trends in cereal yields vs yields for alternative crops	FAO
Appropriateness of cereal crops for end-users, in terms of quality and quantity	Statements by processors regarding ease of substitution.	Case study interviews Processor questionnaires National and regional sources
Degree of price volatility for EU internal cereal markets vs. that in the main world export markets	Internal cereal prices World cereal prices Coefficient of variation of prices	Eurostat; FADN data Agriculture & Horticulture Development Board (HGCA), UK Commodity exchanges
Level of cereal prices inside the EU and on the world market	Correlation between the two sets of prices	DG Agri National and regional sources
Role of intervention as a safety net	Volume of intervention stocks, by cereal and MS	DG Agri
The use of risk management instruments	Open interest and turnover of EU futures and options for cereals	Commodity exchanges Processor & producer interviews

6.3 Our hypotheses

For EQ 4, we hypothesise that the CAP reforms, by introducing decoupling and liberalising the market environment, will have meant that producers' decisions increasingly reflect EU international comparative advantage. We test this broad hypothesis through analysis of yields, changes in area and trade in cereal crops as a result of changes made to CAP measures.

We examine changes in both the level and volatility of yields per hectare. First, by reducing coupled aids for high yielding irrigated cereals, our hypothesis is that the measure will have reduced average yields. Second, the ending of compulsory set-aside will also have reduced average yields, as land put into set-aside was typically the least productive on a holding. We hypothesise, therefore, that the net effect of the ending of set-aside and coupled payments was to reduce average cereal yields. In terms of volatility, our hypothesis is that the decoupling of payments discouraged plantings in MS with low yields and encouraged them in the MS with the highest yields.

In terms of area, we hypothesise that producers' decisions on the area to devote to individual crops are determined by the relative profitability of the alternatives. We test this by examining whether the total area planted to the main COP crops are positively correlated with changes in the weighted average gross margins earned on those crops. This also allows us to simulate the impact upon these overall areas of removing all these measures in 2007-2009.

In terms of the effect on trade, we hypothesise that CAP measures, reducing barriers to trade flows and allowing internal prices to reflect world market values more closely, will have helped to raise the EU share of the world export market in those cereals, where it has a competitive advantage.

Under EQ 5 we hypothesise that the change to intervention rules, arrangement and trade would have brought the level and volatility of EU cereal prices into line with those in the world market. We test this in the following stages:

This should have brought average internal market prices closer to those in the world market, narrowing the average differential if internal market prices were typically higher than those in the world market. If domestic prices were typically below world market levels, CAP reforms should have widened the discount.

In both cases, the volatility of EU prices should have moved closer to that observed on the world market, but internal price volatility would be expected, on average, to be lower than that on the world market, since intervention buying for some cereals should moderate downward price movements.

EQ 6 assesses the success of CAP measures in maintaining or increasing cereal producers' incomes, by hypothesising that the level of income will have been maintained, but its volatility increased. Our hypothesis is that the transition from coupled aids to decoupled income supports per hectare was maintained for cereal producers. We also argue that other CAP measures, including intervention buying and border measures, helped to maintain incomes at times of low market prices, although our focus in answering this question is primarily upon the contribution of coupled and decoupled aids to producer incomes.

6.4 The competitiveness of EU cereal production (EQ 4)

In this section, we compare direct production costs per tonne of cereals in EU MS with those in the main producing regions namely the US, the world's largest cereal producer, Ukraine and Russia. Direct costs are defined as the sum of the following variable input costs: fertilisers, crop chemicals, seeds and irrigation. (Note that labour costs are not considered to be variable costs.) Later we analyse gross margins per hectare, defined as the difference between [sales revenue *plus* coupled payments[1]] and direct costs per hectare. Gross margins per hectare are judged to be the main determinant of crop choice, since fixed costs are not crop-specific.

The EU MS gross margin estimates are prepared from two sources: derivation of COP specialist producers' margins from the FADN database in the 2000-2009 accounting years; and G. Brookes', *European Arable Crop Profit Margins* (Brookes West, UK, 2003 and subsequent years). The FADN data are provided by holding, not by cereal; therefore, gross margins derived from its data are interpreted as average overall margins of holdings that specialise in COP crops, among which cereals are the most important, and which we consider to be representative of cereal producers as a whole. The FADN database cannot be used, therefore, to analyse production costs or gross margins for individual crops. For those estimates, we rely upon the Brookes study, which presents crop budget data by cereal from national sources for the 2001-2010 crop years for the ten case study MS in this report[2]. What is particularly important for the analysis undertaken here is that its direct cost data are prepared on a consistent basis, in line with the US, Russian and Ukrainian direct cost estimates by cereal crop.

The US data are by cereal and are derived from the US Department of Agriculture Economic Research Service. It surveys farm production costs on a regular basis, updating its estimates in the years between surveys to reflect changes in the prices of inputs and in yields per hectare. The Russian and Ukrainian data are drawn from an LMC report, drawing upon a number of local sources in different regions of these countries, in order to prepare estimates on the same basis as the Brookes study. The data presented here are national averages for these countries.

6.4.1 Comparisons of direct costs per tonne of different cereal crops

Direct costs per tonne from Brookes and the USDA are compared for the EU and US for common wheat, barley and maize for which time series data are available. The EU and US data are available for individual MS and (for the US) by region. In the case of the EU, as an indication of the average costs for the ten case study EU MS, we computed a weighted average, in which the weights for each MS' costs are the outputs of the relevant cereal in those MS. The weighted average direct cost estimates per tonne of common wheat, barley and maize are contrasted with US national figures in Diagrams 6.1-6.3.

Our hypothesis is that CAP reforms, by reducing coupled aids and liberalising overseas trade, encouraged producers to reflect EU international comparative advantage and maintain or increase net exports of those cereal crops in which the EU is cost-competitive, while remaining a net importer of the main cereal crop (maize) in which it is less competitive.

We analyse changes in maize areas in special detail because maize crops had higher coupled aids per hectare than other cereals in some MS under Agenda 2000. Also, two MS, France and Spain, applied partial coupling of arable aids until 2010. Thus, a comparison of changes in maize plantings in those MS with, and of those without higher coupled payments on maize than on other cereals, provides evidence of the impact of coupled payments on crop choice.

---

[1] Coupled aids are defined as cereal specific aids. These are FADN variables SE610 plus SE621 and SE650, covering arable area, agri-environmental, CNDP and Art. 68/69 payments; we subtract from SE610 set-aside payments (SE612), as they do not directly affect cereal margins.

[2] The data for the Brookes study are derived as follows: Bulgarian data are from field research, farm advisers and input usage monitoring service companies. Estonian data are from the Estonian Farm Advisory and Training Centre and DMR Kynetec. For France, the data are from Synthèse Agricole, ONIC, France AgriMer and regional Centres de Gestion. German data are from Standarddeckungsbeitrage of the Kuratorium fur Technik und Bauwesen in der Landwirtschaft. Greek data come from the Ministry of Agriculture and field research. For Hungary, data are from the Hungarian Agricultural Economics Institute (AKII). For Poland, the source is the Farm Advisory Service (WODR). Romanian data are computed from field research, farm advisers and input usage monitoring service companies, and relate solely to larger commercial farms. Spanish cost data are obtained from the Ministry of Agriculture and DMR Kynetec. UK data are from the DEFRA Rural Business Research Farm Business Surveys, the John Nix Farm Management Pocketbook and ADAS.

As well as average direct costs for the US and ten selected EU MS, Diagrams 6.1-6.3 include curves plotting the highest and lowest direct costs among the US regions and the EU MS.

Diagram 6.1: Direct production costs per tonne of common wheat, US vs. EU, 2001-2010

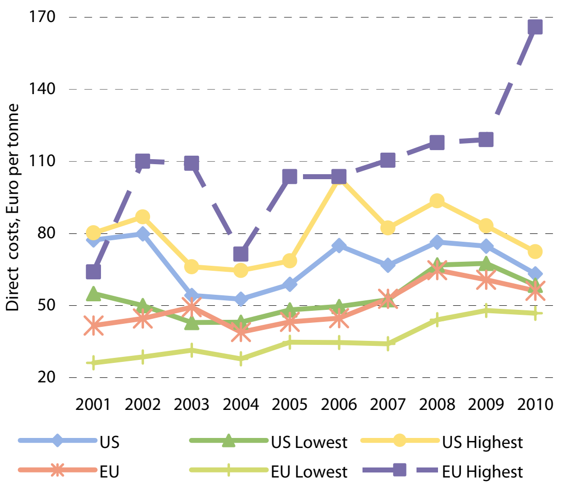


Diagram 6.2: Direct production costs per tonne of barley, US vs. EU, 2001-2010

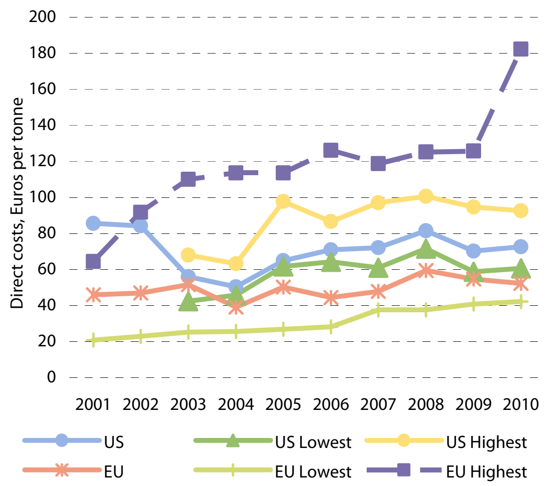
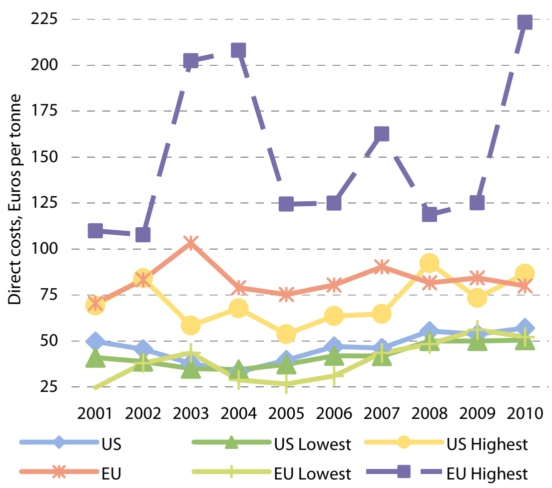


Diagram 6.3: Direct production costs per tonne of maize, US vs. EU, 2001-2010



Sources: Derived from USDA ERS, G Brookes, *op. cit.*

We conclude from Diagrams 6.1-6.3 that the EU maintained its competitive position versus the US in wheat and barley production. Weighted average EU direct costs per tonne were consistently below US costs. Even in the lowest cost US regions for these cereals, direct costs were higher than the EU average in nearly all years. However, the highest cost EU MS (which was Greece for both crops) had higher direct costs than the least cost-competitive US region in every year since the 2002 marketing year.

The position was reversed for maize. US average direct costs were well below the EU average level, and the highest cost US region achieved lower average costs than the EU as a whole. Only the most competitive EU maize producer (in most years, Hungary) produced maize at direct costs per tonne that were competitive with those recorded in the US.

Diagrams 6.4-6.6 illustrate production costs per tonne of the same three crops, comparing national averages for Russia and Ukraine with those for the ten EU MS and the US. The data cover 2002 to 2008, the maximum time span for which we have an estimate of production costs in Russia and Ukraine.

Our hypothesis is that the CAP measures, establishing TRQs for barley and common wheat imports in 2003, were intended to address the issue of low-priced cereal imports from the Black Sea region, notably from Russia and Ukraine. It is also postulated that the TRQs were introduced because the cost-competitiveness of Russian and Ukrainian production was such that the maximum variable import tariffs permitted under the EU's Uruguay Round commitments were not adequate to protect the internal market price from a large inflow of barley and common wheat shipped from the Black Sea exporters if internal EU market prices were supported at the level of the cereal intervention price. This was because the maximum variable import tariffs were calculated under the assumption that most imports would be supplied from the US Gulf, and our hypothesis is that the production costs in the US were significantly higher than those in Ukraine and Russia.

Diagram 6.4: Direct production costs/tonne of common wheat, EU vs. US, Russia and Ukraine, 2002-2008

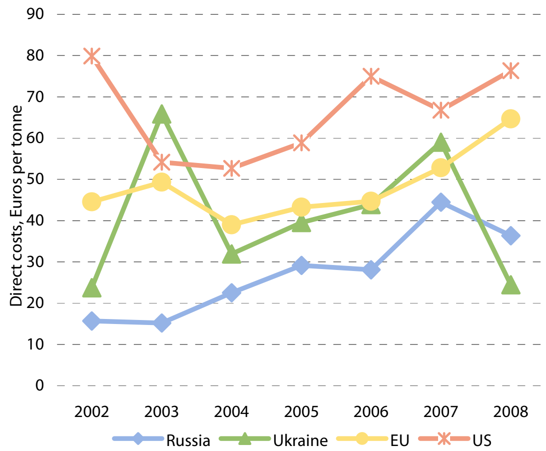


Diagram 6.5: Direct production costs/tonne of barley, EU vs. US, Russia and Ukraine, 2002-2008

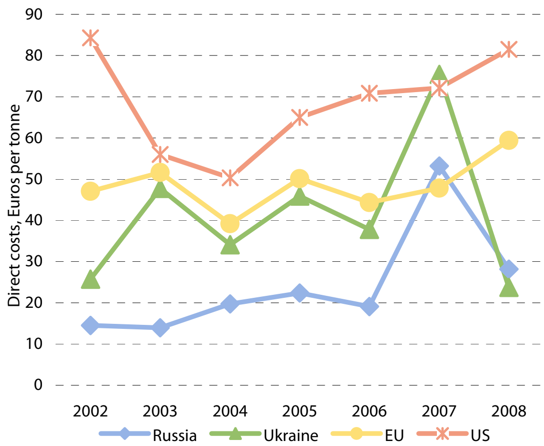
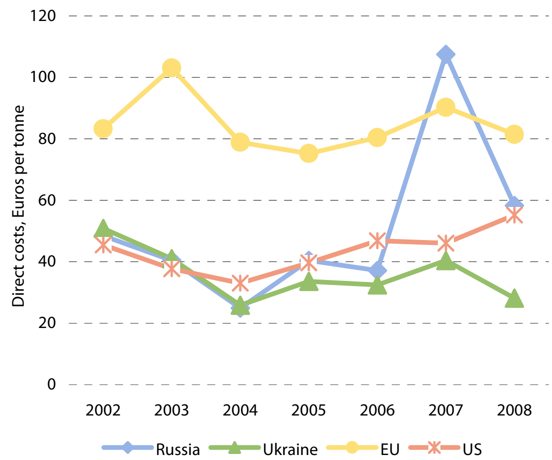


Diagram 6.6: Direct production costs/tonne of maize, EU vs. US, Russia and Ukraine, 2002-2008



Source: Derived from USDA ERS, G Brookes, *op. cit.*, and LMC, *Black Sea Gross Margins* data.

Diagrams 6.4-6.6 reveal that Russia and Ukraine were competitive producers of cereals. Average direct costs per tonne of common wheat in Russia were well below those in the EU in every year from 2002 to 2008. The costs in Ukraine were close to those in the EU on average.

Barley direct costs in Russia were significantly below those in the EU every year, except the drought-affected 2007 crop. Ukrainian direct barley costs were also below the EU level in every year but 2007, but the cost advantage of Ukraine was much smaller than that of Russia.

Ukraine recorded lower direct maize costs than the US from 2004. Russian costs were similar to those in the US, apart from 2007.

These comparisons support our hypothesis that TRQs were needed to defend EU internal prices.

6.4.2 Impact of CAP reform on competitiveness, the example of maize

To assess how the MTR affected maize areas in MS that applied higher reference yields for maize (for irrigated maize, in particular) than other cereals, and hence paid higher arable aids per hectare under Agenda 2000 for maize than other cereals, we prepared Table 6.2. This compares maize areas in 2000-2003 with those in 2007-2010, after decoupling under the MTR.

We include all MS planting over 100,000 hectares in 2010, to avoid giving undue significance to changes in MS where maize occupies small areas. The selected MS are split into two groups: (a) the three MS that applied higher reference yields in some regions for maize than other cereals under Agenda 2000 (France, Italy and Spain); and (b) the seven MS that did not make higher coupled payments for maize in 2000-2003. This group comprises Austria, Germany and Greece in the EU-15 and the Czech Republic, Hungary, Poland and Slovakia in the EU-10.

Table 6.2 reveals that the first group of MS (making higher coupled payments for maize under Agenda 2000) reduced maize areas between the two periods. For the second group of MS (not making higher area payments for maize), total maize areas rose from 2000-2003 to 2007-2010. In the two MS in this group whose maize areas fell (Germany and Greece), the percentage falls (4.9% and 5.0%) were smaller than that those recorded by any of the MS in the first group.

We conclude that the CAP reforms improved the competitiveness of the EU cereals sector by reducing the importance of grain maize farming in those MS that gave extra coupled payments before the MTR to maize production, while maize areas were in general maintained in those MS that did not have this bias in favour of maize production prior to the MTR.

Table 6.2: Maize areas in selected MS, 2000-2003 vs. 2007-2010 ('000 hectares)

	2000-2003	2007-2010	% change
France	1,799	1,640	-8.8%
Italy	1,112	972	-12.6%
Spain	470	351	-25.2%
Sub-Total, Maize Paid Higher Aids in 2000-03	***3,381***	***2,963***	***-12.4%***
Austria	170	186	9.3%
Czech Republic	66	107	61.4%
Germany	1,200	1,141	-4.9%
Greece	223	210	-5.9%
Hungary	405	463	14.4%
Poland	263	288	9.7%
Slovakia	148	158	6.7%
Sub-Total, Maize Not Paid Higher Aids in 2000-03	***2,476***	***2,553***	***3.1%***

Source: Derived from DG Agri data in *Agriculture in the European Union - Statistical and economic information.*

6.4.3 The impact of external factors — US$/€ exchange rate movements

An external factor affecting the cost competitiveness of EU output versus that in the US was the US$/€ exchange rate. A strong Euro lowers US direct production costs, expressed in €, versus EU costs. This is because for tradeable inputs, such as fertilisers and chemicals, EU and US border prices should move together in Euros, but distribution costs tend to be set in local currency, i.e. they are set in US$ inside the US, and in Euros inside the EU. Therefore, a weak US$ reduces US input distribution costs expressed in € per tonne of cereals in relation to those in the EU.

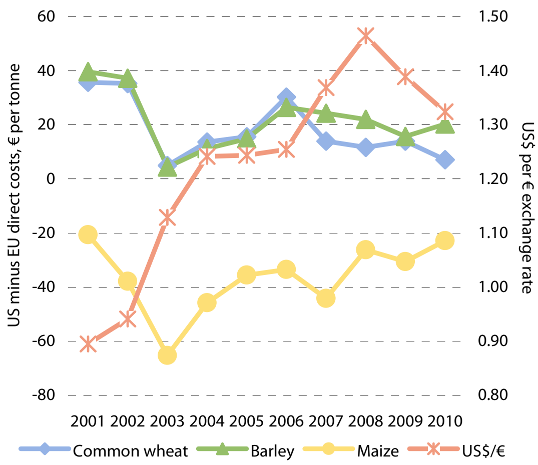
For this reason, we hypothesise that a strong Euro against the US$ would narrow the EU cost advantage versus the US. Accordingly, we have prepared Diagram 6.7, which plots the changes in EU cost competitiveness versus the US (which is taken to be indicated by the absolute difference between the direct costs in the US and in the EU) versus changes in the US$/€ exchange rate.

Correlations between the EU-US cost differences and the US$/€ exchange rate are not statistically significant; therefore, as an alternative approach to the analysis, we have drawn up Table 6.3. This table presents a simple qualitative comparison of the two sets of data. The table states for each year whether EU cost advantages versus the US are above or below their average values over all ten years, 2001-2010, plotted in Diagram 6.7. This is indicated by the words 'above' and 'below' in the table.

Table 6.3 also states, for each year, whether the US$/€ exchange rate is stronger (i.e. US$/€ rate is lower) or weaker (the US$/€ rate is higher) than the average over the same ten year period. This is indicated by the words 'strong' and 'weak' in the table.

The entries highlighted in yellow in the top three rows of Table 6.3, referring to each of the main cereals, indicate times that are not in line with the expectation that a strong US$ would be associated with a higher than average cost advantage (in Euros) for the EU over the USS and that a weak US$ would be associated with a lower than average EU cost advantage.

Diagram 6.7: EU direct cereal production cost advantage (defined as US direct costs per tonne minus EU direct costs) vs. the US$/€ exchange rate, 2001-2010 (€ per tonne)



Source: Derived from USDA ERS and G Brookes, *op. cit.* and Agriculture & Horticulture and Development Board (HGCA), UK.

This table implies that US$/€ exchange rate movements had only a minor impact upon EU cost competitiveness versus the US from one year to another.

13 of the 30 cells in the first three rows of the table are highlighted in yellow, i.e. they are years when the outcomes were not in line with expectations.

Thus, we conclude that, for nearly half of the time between 2001 and 2010, either a strong US$ was associated with a lower than average cost advantage for EU cereal producers, or that a weak US$ was associated with a higher EU cost advantage than the average level of this cost advantage over the same period.

These results are not in line with the hypotheses described above.

Table 6.3: Relating above-average and below-average direct cost advantages of EU vs. US cereal production to above or below-average strength of the US$ vs. the Euro

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Common wheat	above	above	below	below	below	above	below	below	below	below
Barley	above	above	below	below	below	above	above	above	below	below
Maize	above	below	below	below	above	above	below	above	above	above
€ vs. US$	***weak***	***weak***	***weak***	***strong***	***strong***	***strong***	***strong***	***strong***	***strong***	***strong***

Source: Derived from G Brookes, *European Arable Crop Profit Margins* (op. cit) and USDA ERS.
Note: Entries highlighted in yellow are contrary to expectation. They are when a weak US$ occurs alongside a below average EU cost advantage or a strong US$ coincides with an above average EU cost advantage.

6.5 Competitiveness, in terms of productivity

In analysing the impact of the CAP measures on competitiveness in yields per hectare, we define competitiveness in terms of both level and risk (indicated by volatility). One hypothesis is that CAP reforms reduced average EU yields via the impact on crop choice through changes in gross margins as coupled aids (defined in footnote 1) were reduced. This is because the crops most affected by the reform were high yielding irrigated cereals, receiving higher arable payments than rain-fed crops in France, Italy and Spain. By cutting these coupled aids, the MTR reduced the incentive to cultivate these high yielding crops, as Section 6.4.2 revealed.

Ending compulsory set-aside in EU-15 MS reduced average yields, since land put into set-aside was typically the lowest yielding areas on a holding. The 2002 *Evaluation report on the impact of the Community measures on set-aside* in 2002 estimated that between 1996 and 1999 set-aside land had a potential yield that was 70.5% of that of the land farmed actively.

The 2008 *Evaluation of the set-aside measure, 2000 to 2006*, estimated that on average 22% of total set-aside land was used to grow non-food crops and that a further one million hectares (out of an average of four million hectares of compulsory set-aside land) would not have been cultivated even if set-aside had not been applied. Hence, slightly over two million hectares of uncultivated land put into set-aside would have been cultivated in its absence.

We conclude that ending the set-aside obligation added slightly over two million hectares (3%) to the 70 million hectares under COP crops in the EU-27. Also, following the analysis in the 2002 report, the new area had 70.5% of the average yield on land already under COP crops. Consequently, ending set-aside reduced overall yields by 0.9% = 3% x (100%-70.5%).

We hypothesise, therefore, that the net effect of these measures was, via the ending of set-aside and the move from coupled payments, to reduce average cereal yields. To assess the actual outcome, we have prepared Diagrams 6.8-6.10. They compare EU yields per hectare for the three main cereal crops in 2000-2003 and 2007-2010 with those in the other leading producers of these crops in the same periods, as well as with the worldwide average yields.

Diagrams 6.8-6.10 plot average yields per hectare in 2007-2010 and the increase in yields from 2000-2003 to 2007-2010 for each producer. In terms of yields per hectare, the EU is a very competitive producer of both barley and common wheat, with the highest average yields of any of the producing nations in Diagrams 6.8 and 6.10. For maize, Diagram 6.9 indicates that EU-27 yields are above the worldwide average, but are not as high as in the US and Canada.

Diagram 6.8: Barley yields per hectare and growth, 2000-2003 to 2007-2010

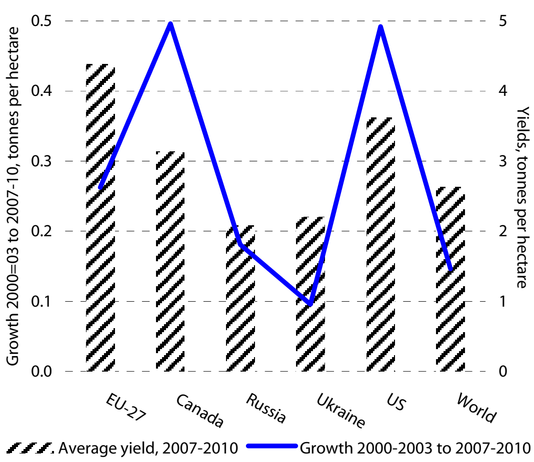


Diagram 6.9: Maize yields per hectare and growth, 2000-2003 to 2007-2010

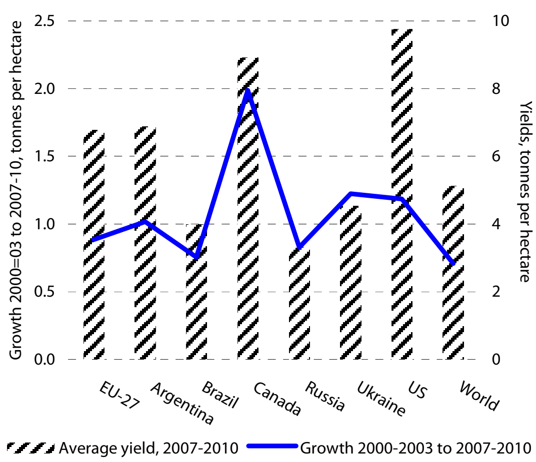


Diagram 6.10: Common wheat yields per hectare and growth, 2000-2003 to 2007-2010

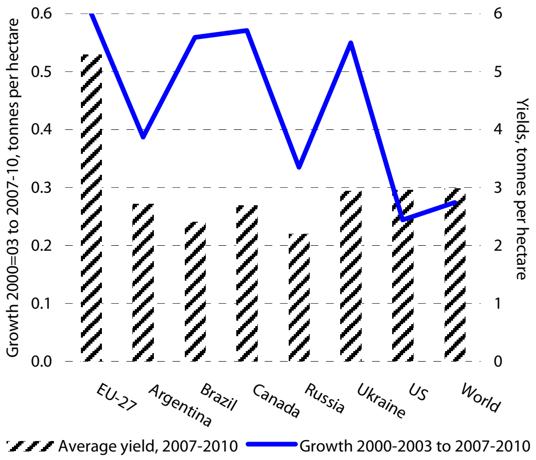
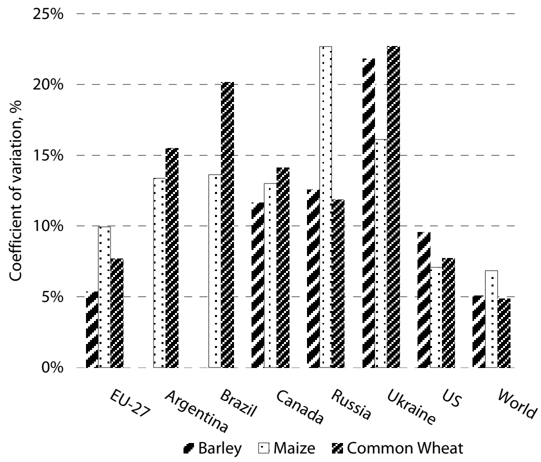


Diagram 6.11: Volatility of cereal yields in leading producing countries, 2000-2010



Source: Derived from FAO data.
Note: The coefficient of variation equals the standard deviation of the annual yields divided by their arithmetic mean.

When competitiveness is judged in terms of the growth in yields since 2000-2003, the EU fared very well in common wheat, with the largest yield increase of any producer. For barley, EU yields increased more than in any country, apart from Canada and the US. EU yield growth was most disappointing in the case of maize. The measures described above were among the causes of this low growth. Ending set-aside reduced yields by 0.9%, as explained above. The decline in coupled aids, by lessening the bias towards high yielding crops (e.g. irrigated maize) in some regions, also lowered yields, as demonstrated by the analysis of Table 6.2.

Competitiveness may also be assessed in terms of the risk associated with crop output, with higher yield volatility implying less reliability as a source of supply. The coefficient of variation (the standard deviation of annual yields divided by their arithmetic mean) in 2000-2010 is the measure we use to quantify yield volatility. Using this measure, the EU performs creditably. EU yields are more stable over time than in other major producers for all three cereal crops, apart from the US in the production of maize and common wheat, as Diagram 6.11 reveals.

In terms of the influence of the CAP measures on volatility, our hypothesis is that decoupling of payments discouraged plantings in MS with low yields and encouraged them in the MS with the highest yields, under the assumption that high yields were associated with high margins per hectare. We also postulate that the volatility of yields is highest in regions with low yields, because they tend to be the most vulnerable to shocks from droughts. Therefore, if this is correct, the measures would have led to a redistribution of areas from low yielding/high volatility MS to high yielding/lower volatility MS, and thus helped to reduce EU-27 volatility.

Table 6.4 provides weak support for this hypothesis. It compares (a) correlation coefficients between average 2000-2010 yields and their coefficients of variation for all EU-27 MS for each cereal, (b) average changes in crop areas from 2000-2003 to 2007-2010 for the five MS with the highest yields, and (c) changes in total EU-27 areas for each cereal in the same period.

We observe that there is a high negative correlation between yields and the volatility of yields for each cereal. Thus, MS with high yields tend to have lower volatility than those with lower yields. We also observe that, for both barley and maize, the average area increases in the five highest yielding MS were greater than the increases in the EU-27 as a whole (i.e. 10.0% versus 1.1% for maize). For common wheat, the result was inconclusive; the average change in areas in the five high yielding MS was just below the average for the EU-27 (9.2% versus 9.9%).

Table 6.4: Comparison of yields, volatility of yield and area changes 2000-03 to 2007-10

	Correlation across MS of yield with coefficient of variation of yield	Average change in area of 5 highest yielding MS	EU-27 change in area
Barley	-70%	2.7%	2.0%
Maize	-80%	10.0%	1.1%
Common wheat	-72%	9.2%	9.9%

Source: Derived from DG Agri data in *Agriculture in the European Union - Statistical and economic information.*

6.6 The impact of CAP reforms on gross margins and crop areas

The most important reform in its impact upon the gross margins received by the producers of different crops was the movement away from coupled towards decoupled payments. In the analysis that we undertake, gross margins per hectare are defined as revenues from crop sales *plus* coupled payments[3] *minus* direct costs per hectare.

In this section, we assess how reforms to coupled aids influenced EU crop choice. We estimate producer gross margins per hectare for crops in our ten case study MS and relate changes in these gross margins to changes in the areas planted to these crops in the same MS. We also consider the counterfactual case, in which no coupled payments would have been paid, in order to compare the resulting gross margin estimates with those that existed in practice.

The calculation of gross margins starts with estimates of producer prices, whose derivation is described in Section 2.5 in Chapter 2. Not all producer prices are available from 2001 to 2010. To estimate producer prices for years in which there are no FADN data (e.g. to provide data for 2001 for EU-12 MS who were not then in the EU), we first computed in all those years for which FADN data are available the average differential between (a) the producer prices for these MS and (b) the same years' reference market prices. These reference prices were those of LIFFE common wheat, MATIF Bayonne maize, Rouen barley and Thunderbay durum wheat. For feed rye, we used Rouen barley as the reference price, as these two feed cereals are close substitutes. We then assumed that the differential between producer and reference prices in years for which FADN data are not available would equal the average computed in this way.

The coupled payments per hectare are derived for cereal crops other than durum wheat from analysis of the FADN database for COP specialist producers with an adjustment to reflect the inclusion of special payments on durum wheat within the total coupled aids in the FADN data. (Note: no coupled aids were paid under the CAP measures to EU-12 MS prior to accession).

The specific aids paid on durum wheat were derived from the *Evaluation of the durum wheat CMO* and case study research. Calculations from the FADN database yielded estimates of the coupled aids paid per hectare on all COP crops. Coupled aids paid on COP crops, excluding durum wheat, are estimated by subtracting total durum wheat coupled payments by MS from the total coupled aids paid on COP areas (which include durum wheat aids) and deducting the durum wheat areas from the total COP crop area in the MS and finally dividing the remaining coupled payments (i.e. those not paid for durum wheat) by the non-durum wheat COP area.

Changes in gross margins by MS between 2001-2003 and 2007-2009 and changes in the areas of each cereal are presented in Diagrams 6.12-6.16, where the gross margin bar includes the contribution of coupled aids in the total (which is used in the counterfactual analysis below).

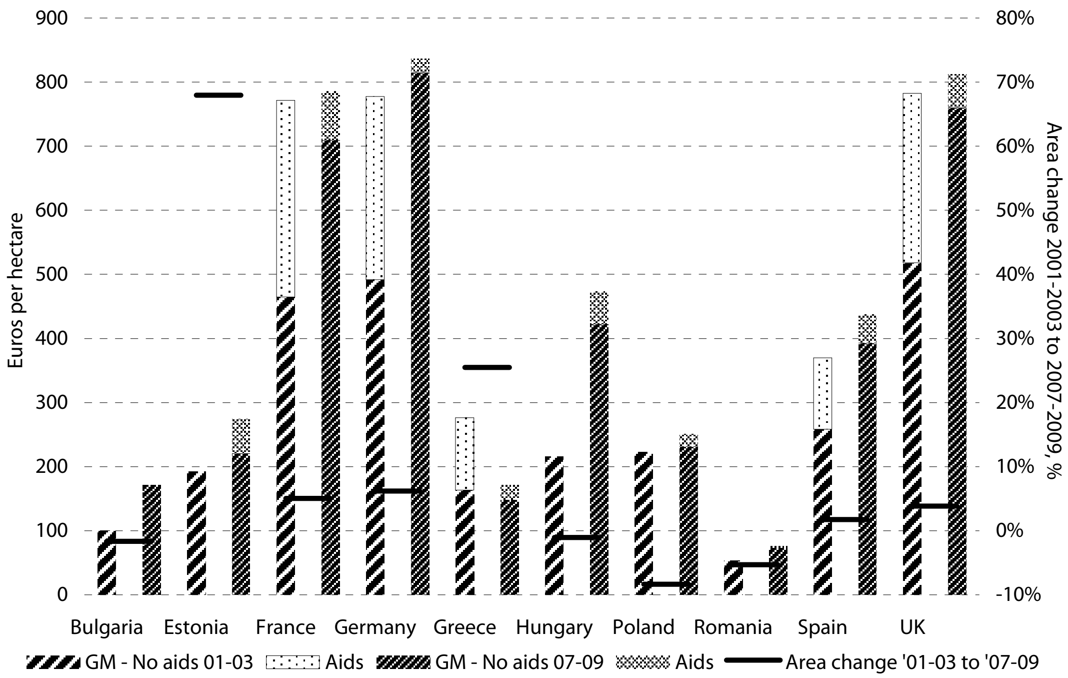
[3] These aids are defined in footnote 1 above, and include FADN variables SE610 (minus set-aside payments, SE612) plus SE621 and SE650, covering arable area, agri-environmental, CNDP and Art. 68/69 payments.

6.6.1 The impact of coupled aids upon gross margins

The five gross margin diagrams below reveal the contribution of coupled aids to gross margins pre- and post-reform, and compare changes in gross margins and in crop areas in the same period. The analysis is presented based on the results for the ten case-study countries.

Common wheat: Diagram 6.12 indicates that gross margins per hectare increased between 2001-2003 and 2007-2009 in every MS except Greece. The same would have been true in the absence of coupled aids. The common wheat area rose between the two periods in six of the ten MS, including Greece. The exceptions were Hungary, Poland, Romania and Bulgaria.

Diagram 6.12: Gross margins on common wheat, 2001-2003 and 2007-2009 vs. % changes in planted area between these two periods



Source: G Brookes, European Arable Crop Profit Margins (*op. cit*); DG Agri Agriculture in the European Union; coupled payments are derived by calculations from the FADN database.
Note: GM = Gross Margins; Aids = Coupled aids.

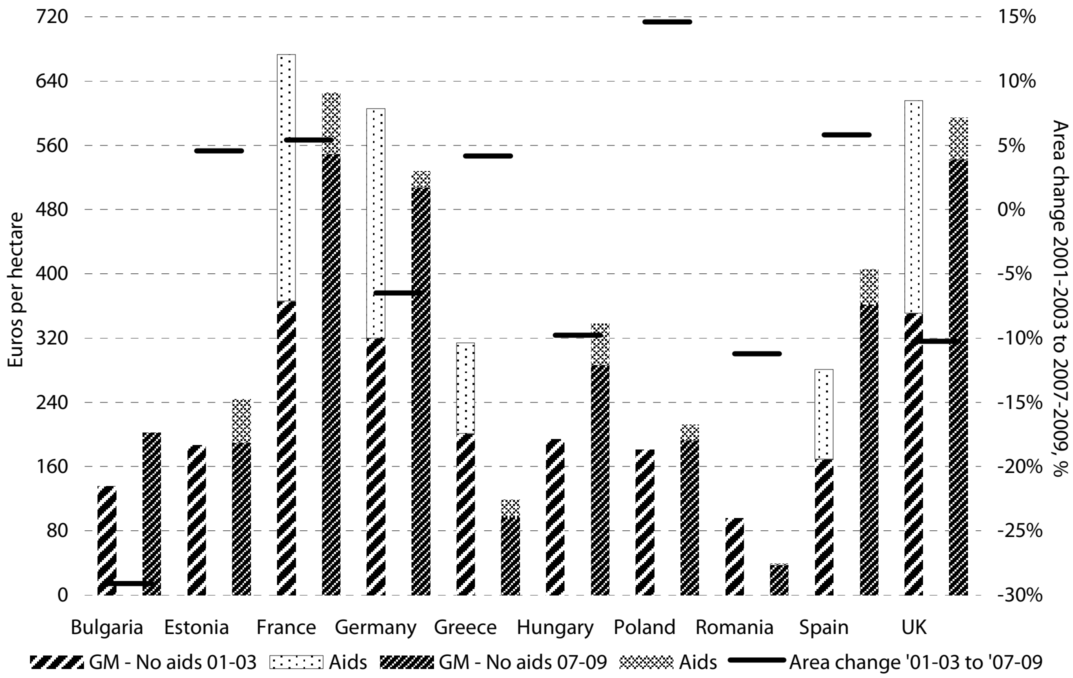
Barley: Five of the ten MS in Diagram 6.13 experienced a fall in gross margins between the two periods. If no coupled aids had been paid, gross margins would have risen in eight MS between the two periods, Greece and Romania being the exceptions. The area planted to barley rose only in Estonia, France, Greece, Poland and Spain.

Maize: Gross margins, both with and without coupled aids, rose in six of the eight MS in Diagram 6.14; Germany and Bulgaria were the exceptions. Yet, Germany was the sole MS in which the grain maize area (not include silage maize) increased between the two periods.

Rye: The gross margins on rye, including coupled aids, fell in three of the five MS in Diagram 6.15. The exceptions were Hungary and Poland. The planted areas also fell in three of the five MS. In this case, the UK and Germany were the exceptions.

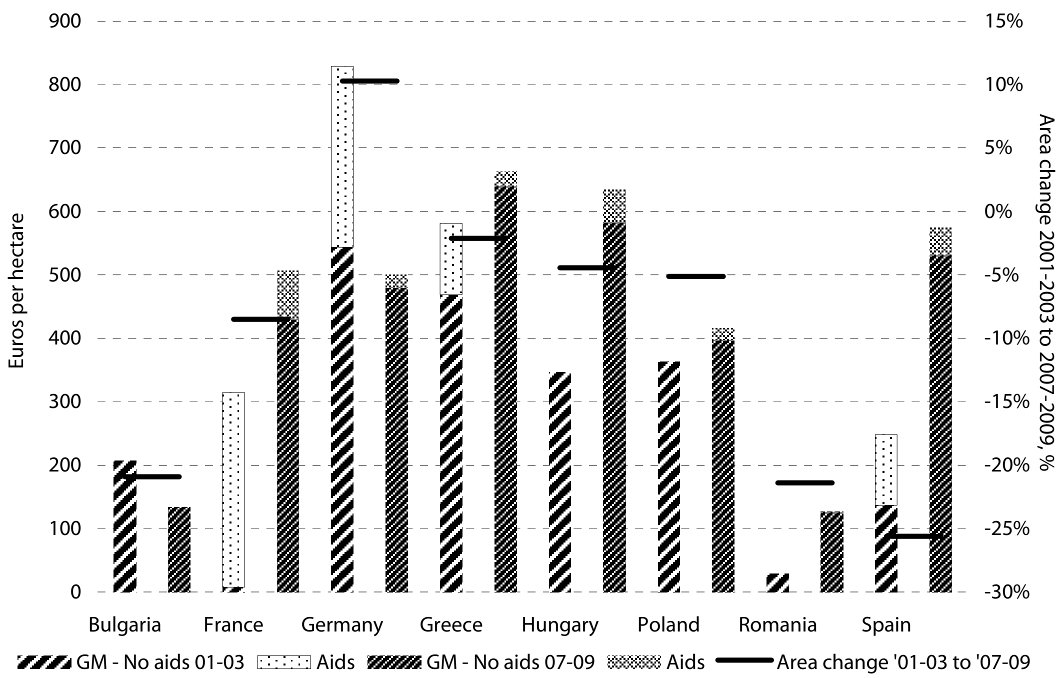
Durum wheat: Diagram 6.16 reveals that durum wheat gross margins fell after the reform. Without the coupled aids they would have risen in all MS. The crop area fell sharply in both Greece and Spain, but rose strongly in both France and (from a much smaller base) Germany.

Diagram 6.13: Gross margins on barley, 2001-2003 and 2007-2009 vs. % changes in planted area between these two periods



Source: G Brookes, European Arable Crop Profit Margins (*op. cit*); DG Agri Agriculture in the European Union; coupled payments are derived by calculations from the FADN database.
Note: GM = Gross Margins; Aids = Coupled aids.

Diagram 6.14: Gross margins on maize, 2001-2003 and 2007-2009 vs. % changes in planted area between these two periods



Source: G Brookes, European Arable Crop Profit Margins (*op. cit*); DG Agri Agriculture in the European Union; coupled payments are derived by calculations from the FADN database.
Note: GM = Gross Margins; Aids = Coupled aids.

Diagram 6.15: Gross margins on rye, 2001-2003 and 2007-2009 vs. % changes in planted area between these two periods

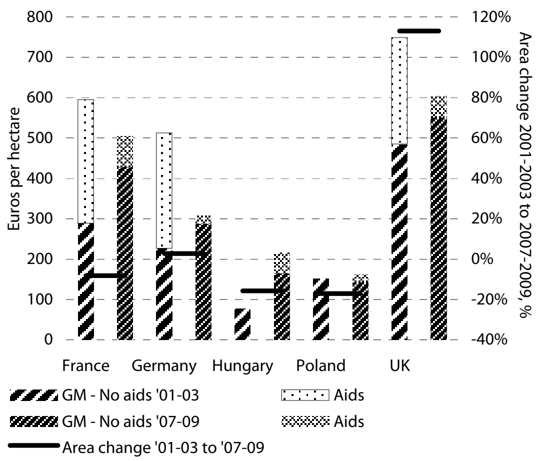
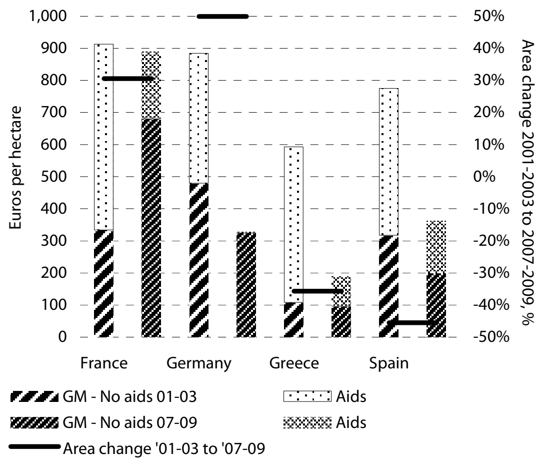


Diagram 6.16: Gross margins on durum wheat, 2001-2003 and 2007-2009 vs. % changes in planted area between these two periods



Source: G Brookes, European Arable Crop Profit Margins (*op. cit*), DG Agri Agriculture in the European Union; coupled payments are derived by calculations from the FADN database.

Note: GM = Gross Margins; Aids = Coupled aids.

A similar analysis for the main competing oilseed crops reveals that gross margins rose, both with and without coupled aids, in all seven MS in the rapeseed sample, and the rapeseed area expanded very substantially everywhere except Spain, where it fell. In three of the six MS for which we have sunflower data, gross margins, both with and without coupled aids, declined after the MTR; yet two of these three MS were among those recording an increase in areas.

6.7 Analysis of the impact of the CAP measures on total planted areas

In this section we assess the impact of the CAP measures upon the combined areas planted to cereals and to competing oilseed crops in the case study MS. In Section 6.8, we analyse the distribution of these overall areas by MS between the alternative cereal and oilseed crops.

The 2008 *Evaluation of the set-aside measure, 2000 to 2006*, concluded that around 25% of the land put into set-aside (which applied only to the EU-15 MS) would not have been farmed with arable crops if set-aside had not applied.

Coupled aids[4] also applied only in the EU-15 MS under Agenda 2000. Producer interviews in five EU-15 MS revealed that coupled aids encouraged farming of COP crops on some land that would have been unprofitable without coupled aids. We hypothesise that in 2007-2010, CAP measures, eventually ending the energy crop premium and compulsory set-aside, and cutting remaining coupled aids, while shifting support towards SPS decoupled payments, would have (a) increased arable crop areas on former set-aside land, while (b) reducing it on low yielding lands, unless higher market prices offset the loss of coupled payments.

Regarding the impact of the energy crop aids, the conclusions (p. 268) of the 2006 *Evaluation study on implementing the energy crop CAP measures and bio-energy market* were that non-CAP

---

[4] Coupled aids are defined as cereal specific aids. These are FADN variables SE610 plus SE621 and SE650, covering arable area, agri-environmental, CNDP and Art. 68/69 payments; we subtract from SE610 set-aside payments (SE612), as they do not directly affect cereal margins.

bioenergy measures were by far the most important influence on the cultivation of energy crops, by generating new demand. In terms of the impact of the set-aside measures, the analysis in Section 6.5 indicates that the arable crop area increased by roughly 3% in the EU-27 as a whole as a result of changes in the measures governing set-aside.

To assess how the main CAP measures affected overall COP crop areas, we applied a linear econometric model to relate changes in total COP crop areas to the average gross margins in each MS we calculated above in Section 6.6. The results allow one to simulate the outcome in the absence of these CAP measures. We now introduce the methodology that we have employed to undertake the analysis.

6.7.1 Gross margins and crop areas

We analyse the impact of the CAP measures on overall COP areas first by assessing how CAP measures and market price changes between 2001-2003 and 2007-2010 affected the total area under the cereal and oilseed crops for which we have gross margin estimates. Then we analyse how changes in individual crop gross margins in relation to one another affect the crop choice within the overall areas planted to cereal and oilseed crops.

The first measure we consider is set-aside. Table 6.5 indicates how the change in EU-15 COP crop areas between 2001-2003 and 2007-2009 would have altered if 2001-2003 compulsory set-aside rates had been the 1.25% average rate in 2007-2009, rather than the actual 10% rate. This is intended to isolate the impact of set-aside. The final column of the table reflects the conclusion from the 2008 *Evaluation of the set-aside measure* that only half the set-aside area would have been added to COP crop areas if the set-aside obligation had not existed.

Table 6.5: Areas under the main COP crops for selected EU-15 MS, 2001-2003 and 2007-2009 and the impact of set-aside on changes in areas between these periods ('000 ha)

	Total Area 2001-2003	Total Area 2007-2009	% Change 2001-2003 to 2007-2009	Change if set aside in 2001-2003 was at 2007-09 level
France	10,277	10,876	5.8%	1.2%
Germany	7,321	7,709	5.3%	0.7%
Greece	1,245	1,017	-18.3%	-21.9%
Spain	6,639	6,227	-6.2%	-10.3%
United Kingdom	3,387	3,485	2.9%	-1.6%

Source: DG Agri *Agriculture in the European Union,* various issues.
Note: The final column indicates how areas would change if set-aside in 2001-03 averaged 1.25%, as in 2007-09, rather than 10%, assuming that half the set-aside areas would not be under COP crops in the absence of set-aside. Crops in the area totals are common and durum wheat, barley, maize, rye, rapeseed and sunflower.

Table 6.6 contrasts these changes in the COP crop areas (assuming equal set-aside rates for EU-15 MS applied in both periods) with changes in the weighted average gross margins of the same crops (using the areas as weights). It also indicates, in the final column, how the removal of coupled payments would have affected weighted average gross margins in 2007-2010.

The corresponding analysis for the five case study EU-12 MS is summarised in Table 6.7, but without the inclusion of the impact of set-aside, which did not apply to these MS.

For the five EU-15 MS, who operated within the CAP framework in 2001-2003, we prepared a simple econometric analysis of the relationship between the following two variables: (a) the change in the COP crop area (assuming that set-aside had been at the same average rate in both periods), and (b) the change in the weighted average gross margin for the COP crops between the same two periods, where the weights applied to the gross margins of the individual crops in each period are the areas under those crops in the relevant periods.

Result A: The result of this linear regression, where the intercept is set at zero (since its coefficient was not at all statistically significant), is listed below. Its adjusted R^2 was 42.3%.

% change in COP crop area = 40.1% x % change in weighted average gross margin (t = 2.87)

Thus, we conclude that the total area under the COP crops is sensitive to the impact of the coupled payments upon the weighted average gross margin earned on these crops.

Table 6.6: Changes in main COP crops' areas and weighted average gross margins with and without coupled aids, by EU-15 MS, 2001-2003 and 2007-2009 (€ per hectare)

	Area Change 2001-2003 to 2007-2009	Change if set aside in 2001-2003 was at 2007-09 level	Margins 2001-2003	Margins 2007-2009	% Change in Weighted Ave. Margins	Margins without Coupled aids 2007-2009
France	5.8%	1.2%	758.8	771.3	1.6%	690.2
Germany	5.3%	0.7%	706.1	723.7	2.5%	703.5
Greece	-18.3%	-21.9%	474.2	136.4	-71.2%	100.8
Spain	-6.2%	-10.3%	368.1	397.6	8.0%	323.0
United Kingdom	2.9%	-1.6%	719.4	737.3	2.5%	685.7

Sources: G Brookes, *European Arable Crop Profit Margins* (op. cit); DG Agri *Agriculture in the European Union;* coupled payments are derived by calculations from the FADN database.

Note: In the derivation of the weighted average gross margins, the areas under the individual crops are the weights. Crops included in the area totals are common and durum wheat, barley, maize, rye, rapeseed and sunflower.

Table 6.7: Changes in main COP crops' areas and weighted average gross margins with and without coupled aids, by EU-12 MS, 2001-2003 and 2007-2009 (€ per hectare)

	Area Change 2001-2003 to 2007-2009	Margins 2001-2003	Margins 2007-2009	% Change in Weighted Ave. Margins	Margins without Coupled aids 2007-2009
Bulgaria	-1.0%	146.5	191.3	30.5%	191.1
Estonia	41.5%	192.4	295.4	53.5%	241.8
Hungary	3.3%	238.7	495.5	107.6%	449.2
Poland	-0.9%	203.8	266.5	30.7%	247.1
Romania	-14.6%	83.8	90.9	8.5%	89.6

Source: G Brookes, *European Arable Crop Profit Margins* (op. cit); DG Agri *Agriculture in the European Union;* coupled payments are derived by calculations from the FADN database.

Note: In the derivation of the weighted average gross margins, the areas under the individual crops are the weights. The EU-12 MS did not apply CAP coupled aids in 2001-2003, prior to accession. Crops included in the area totals are common and durum wheat, barley, maize, rye, rapeseed and sunflower.

The results of the regression analysis provide a means of simulating the impact of full decoupling in 2007-2009. For these five EU-15 MS, we prepared Table 6.8. This lists in the first two columns the actual changes from pre- to post-reform in the total areas under the identified COP crops and the changes in the weighted average gross margins of the same crops including all coupled aids. These columns repeat the values listed in Table 6.6. The third column estimates the change in weighted average gross margins if no coupled payments had been made in 2007-2009 (this contrasts the final column in Table 6.6 with the third column in the table, i.e. the actual margins with coupled payments made in 2001-2003).

The fourth column in Table 6.8 applies the result of the linear regression analysis to estimate the area change that would have occurred in 2007-2009 in the absence of all coupled aids. To indicate how values in the column were computed, we take the example of Spain. Its actual weighted average gross margins rose by 8.0% to €397.6 per hectare in Table 6.6, but they would have fallen 12.2% (to €323.0) had no coupled aids had been paid. Gross margins without coupled payments were therefore 18.8% below the level with coupled payments.

Applying the coefficient of 40.1% from the regression to the 18.8% drop in the gross margin if coupled payments had not been paid, we deduce that the COP area without coupled aids would have fallen 40.1% x 18.8%, i.e. 7.5%. This would have transformed the true decline of 10.3% in the total COP area, when coupled payments were made, to a larger drop of 17.9% in their absence. In the final column of the table we allow for the average compulsory set-aside rate of 1.25% in 2007-2009, but applying the earlier conclusion that roughly half the set-aside area was taken from areas that would have been planted to COP food crops, we add 0.625% to the area change computed in the fourth column, to arrive at a final decline of 17.2%.

We conclude that without any coupled payments or set-aside in 2007-2009 instead of actual growth of 1.2% in the area under the COP crops in France would it would have fallen 2.4%; for Germany, the area, rather than rising 0.7%, would have risen 0.2%; for Greece, the actual drop of 21.9% would have become even sharper at 31.7%; for Spain the fall of 10.3% would have been one of 17.2%; and the UK decline of 1.6% would have been magnified to one of 3.8%.

For these five EU-15 MS, an actual 2.8% decrease in the total area under these crops from 2001-2003 to 2007-2009 would have more than doubled to 6.6% in the absence of measures providing coupled payments and imposing set-aside.

Table 6.8: The impact on 2007-2010 crop areas of ending coupled aids and set-aside

	Area change 2001-2003 to 2007-2009	% Change in weighted average margins	% Change in wtd. ave. margins without coupled aids	Area change without coupled aid 2007-2009	Area change without coupled aid and zero set-aside
France	1.2%	1.6%	-9.0%	-3.0%	-2.4%
Germany	0.7%	2.5%	-0.4%	-0.4%	0.2%
Greece	-21.9%	-71.2%	-78.7%	-32.3%	-31.7%
Spain	-10.3%	8.0%	-12.2%	-17.9%	-17.2%
UK	-1.6%	2.5%	-4.7%	-4.4%	-3.8%
Total	***-2.8%***	***0.3%***	***-10.1%***	***-7.2%***	***-6.6%***

Source: G Brookes, *European Arable Crop Profit Margins* (op. cit); DG Agri *Agriculture in the European Union;* coupled payments are derived by calculations from the FADN database; and figures from Table 4.6.

For the five EU-12 MS, the data in Table 6.7 do not permit an analysis of the counterfactual case. This is because in three MS, Bulgaria, Poland and Romania, total COP areas declined in spite of sharp increases in weighted average gross margins in 2007-2009. This implies an illogical negative correlation between changes in average gross margins and changes in areas. Other factors within the cereals sector are the reason. We review these briefly.

Romania: The Romanian situation is a special one. It has a large small scale sector. Farms with a UAA of fewer than five hectares per holding occupy roughly 40% of total UAA while large holdings (with UAA of over 50 hectares) also account for around 40% of total UAA. A striking phenomenon in Romania is the outright abandonment of large areas of land. The 2010 Census of Agriculture revealed that 890,000 hectares were classified as fallow, while 1.35 million hectares were 'idle', making the combined unused area 14% of the country's total UAA, up from 4% in the 1990s. Among the reasons suggested for this abandonment of land was migration off the land by small farmers. A further barrier to arable farming has been the lack of maintenance of the irrigation system. In 1989, irrigation systems for agriculture covered 3.2 million hectares. By 2003, the area had slumped to 569,000 hectares (98% of which is used for arable crops). The arable irrigated area stood at a mere 83,000 hectares in 2010.

Another special factor explaining some of the decline noted in arable crop areas in Romania was the existence of tax fraud in cereals trading. Until 2011, a sizeable trade[5] existed in which producers were paid in cash for their output without any VAT added. The traders then sold the cereals and claimed repayment of the 24% VAT that should have been paid at the first stage. The government eventually introduced 'reverse taxation' in 2011, whereby the buyer, not the seller, was responsible for the payment of VAT. The relevance of this last factor is that the tax fraud created incentives to understate crop area and output to minimise potential tax liability.

There is one influence that works in the opposite direction. The crops included in the gross margin calculations were selected on the pragmatic grounds that they are the only ones for which gross margin data were available since 2001. One crop that has become important in Romania over the past decade is rapeseed. Official data report an increase of over 325,000 hectares in the average rapeseed area between 2001-2003 and 2007-2009. Yet, even if this were included, it is not large enough to alter the direction of change in the combined crop area analysed in Table 6.7.

Bulgaria: The causes of the decline in the Bulgarian arable crop area are similar to some mentioned in the discussion of Romania. A primary reason is the deterioration in the irrigation infrastructure in the country, which was cited in interviews with producers as a reason for the decline in maize farming, which relies more than the other major arable crops on irrigation.

The dependence on large holdings is greater than in Romania. 85% of the total arable crop area in the 2010 Agricultural Census was farmed on holdings of over 100 hectares in UAA. Some lack the capital to maintain production. In part as a result of this, over 8% of the arable crop area was uncropped in 2007-2009. Another factor that has already been mentioned in the context of Romania is that the rapeseed area, which is not included in the gross margin calculations, rose from 7,000 hectares in 2001-2003 to 85,000 in 2007-2009. If this had been included in the total area in Table 6.7, a drop of 1.0% would become an increase of over 3.5%.

Poland: This was another MS in which the data for products not included in the gross margin calculations affect the conclusions drawn from Table 6.7. Among the main cereal crops, there was a drop in the common wheat area, as well as a sharper drop in the rye area (according to producer interviews, this was because it was removed from eligibility for intervention sales). Partly off-setting these declines was the near doubling of the area under rapeseed.

Among the important cereal crops not included in the figures in Table 6.7 is mixed cereals, typically a mixture of wheat, barley and oats, used on-farm as feed; its area fell by almost 100,000 hectares. At first sight, this was surprising in view of Articles 68/69 support for livestock farming, but the reason was a sharp rise of 420,000 hectares (55%) in winter triticale areas, which has higher average yields than mixes (3.3 versus 2.7 tonnes per hectare) and a lower risk, in terms of the coefficient of variation of yields since 2000, at 8.9% versus 11.1%.

A near doubling of maize silage areas was another increase in areas that was not included in Table 6.7. This included production in regions near the German border for German biogas plants encouraged by its national renewable energy incentives.

---

[5] See *Raport privind investigația utilă pentru cunoaşterea pieței cerealelor de panificație*, declanşată prin Ordinul Preşedintelui Consiliului Concurenței nr. 264/06.09.2007

6.8 The link between CAP measures, gross margins and individual crop areas

The previous section presents a methodology and computes results to estimate the impact of the CAP measures upon total areas planted to the main cereal and oilseed crops in the ten case study MS. Our hypothesis was that changes from the pre- to post-reform periods in the total area planted to the main COP crops are positively correlated with changes in the weighted average gross margins earned on those crops. The same analysis also simulated the impact upon these overall areas of removing all these measures in 2007-2009 (the 'counterfactual').

In this section, we focus upon gross margin and area data for the individual crops by MS. The starting point in our analysis is the estimation of the linear relationship between the gross margins on individual crops in 2007-2009 by MS and the percentage change in each crop's area from 2001-2003 to 2007-2009. Our hypothesis is that producers' decisions on the area to devote to individual crops are determined by the relative profitability of the alternatives. A crop yielding a higher gross margin than another in 2007-2009 is likely to expand its share of the overall arable crop area more than the other crop. Since gross margins are directly influenced by the CAP measures, notably those that provide coupled aids, the impact of the decoupling of such aids (the counterfactual) can be derived from the results of this analysis.

In Table 6.9, we summarise the results of a series of linear regression analyses across crops for each individual MS. The equations that were estimated by MS all have the following form:

% change in the area share of Crop z = α + β {difference in €/ha. between Crop z gross margin and weighted average margin on all crops}

The first row in the table lists the coefficients, β, from the cross-sectional analyses for each MS, while the second lists the unadjusted statistical correlation (R), which we have not adjusted for degrees of freedom, which are as low as 2 (for the UK).

Table 6.9: Proportional change in area between 2001-2003 and 2007-2009 as a function of 2007-2009 gross margin and correlation coefficient of relationship by MS

	Bulgaria	Estonia	France	Germany	Greece	Hungary	Poland	Romania	Spain	UK
Coefficient	0.21%	0.44%	0.02%	0.04%	-0.06%	0.12%	0.08%	-0.01%	-0.04%	0.19%
Correlation	90.7%	84.2%	59.0%	81.4%	-69.4%	76.1%	63.2%	-19.0%	-80.0%	82.3%

Source: Derived by linear regression of the relationship between individual crops' gross margins and area changes.
Note: The coefficient is the slope estimated in the linear regression for the individual MS. The correlation is the unadjusted correlation between the % change in area and the gross margin by crop.

Negative coefficients for Greece, Romania and Spain are not in line with economic rationality, which would assume that, *ceteris paribus,* producers favour products that generate higher margins over those offering a lower return. Therefore, we pooled all the data for the different MS and undertook the linear regression analysis with all 49 data points, applying the following form, where the index i represents country i, so that Crop z,i may refer to rye in Germany.

% change in the area share of Crop z,i = β {difference in €/ha. between Crop z,i gross margin and weighted average margin on all crops in i}

Result B: The coefficient β, estimated from the pooled data, is 3.1%. This means that a 10% increase in the gross margin of one sector in MS i, relative to the MS's weighted average for all crops, lifts the share of the crop in the MS's cereal and oilseed areas by 10% x 3.1% = 0.31%

The t-value of the coefficient is 1.99, which put it on the margins of significance at a 95% level. However, the value of the adjusted R^2 is very low, at 5.5%. Therefore, conclusions drawn from analysis derived from this result are weak.

We investigated whether the results would be improved if we attach dummy variables to Greece, Romania and Spain, to reflect the negative coefficients for these two MS in Table 6.9, which may be a result of special circumstances in these countries, notably how producers in these MS state in interviews that dry weather and water scarcity has constrained their cultivation of heavily irrigated crops, such as maize. However, the dummy variables, whether entered as separate dummies for each of these MS or simply applying one dummy variable for all three, were not at all statistically significant. Therefore, in the analysis of the impact of CAP measures that provide coupled aids to producers, we use the results of the linear regression analysis of the pooled data (Result B) to assess the outcome in the counterfactual case.

When we analyse the impact of coupled aids upon relative gross margins for alternative crops by MS, we observe that coupled aids tended to be similar across the main cereals (apart from durum wheat) and oilseed crops in the same region of a MS. Because of this uniformity across crops in coupled payments per hectare, their removal has little impact upon rankings of crops by gross margins. The exception is durum wheat. (Spain and France were also exceptions, to some extent, in our sample since the reference yields applied to determine coupled payments differed in some regions between crops; for example, between irrigated and rain-fed crops).

The 2009 *Evaluation of the Durum Wheat CMO* highlighted some factors that caused durum wheat areas to decline markedly in both Spain and Greece, even though the gross margin data imply that durum wheat yielded a higher margin than some competing cereals. Among these factors were the scope for double-cropping some of the competing cereals, such as common wheat, with other crops, so that the annual return per hectare cultivated to these crops was higher than is indicated by simple gross margin calculations. A further factor mentioned in the evaluation was that the high coupled payments for the crop in traditional areas encouraged some producers in Greece and Spain, where the crop was planted in low rainfall areas with low levels of inputs, to grow the crop mainly to earn the coupled payment, which exceeded €450 per hectare in both MS in 2001-2003. The reduction in the coupled payment and the need to use certified seeds to earn the €40 per hectare quality premium made the crop much less attractive to such farmers.

Interviews with producers and government officials implementing the current Article 68 coupled supports in the Greek durum wheat sector of €90 per hectare reveal the sharp drop in incentives for producing this crop. Farmers had to use at least 80 kgs in 2010 (rising to 100 kgs in 2011) of certified seed per hectare and be inspected for compliance with the Integrated Management System (IMS) to receive the €90/ha. If they do not follow IMS requirements, they can qualify for Article 68 payments if they apply 160-200 kgs of certified seed per hectare. In practice, the costs of these seeds and of inspections are almost identical to the Article 68 payment, thus virtually removing the incentives to ensure quality standards. Together, these factors explain why the coupled aids provided for durum wheat in Greece have failed to maintain plantings in the sector, as the benefits are counterbalanced by the extra costs.

6.9 The impact of full decoupling on crop areas

In this section, we describe the effects of applying Result A of our analysis of the relationship between weighted average gross margins for all major cereal and oilseed crops and the total area under these crops, and Result B from our analysis of the allocation of individual crop areas within the total. We then estimate the impact of the counterfactual of full decoupling of the coupled aids and the elimination of set-aside, had these both occurred in 2007-2010.

This approach generates estimates of the impact upon the areas planted to each crop in each MS. We present the results of these simulations of the counterfactual aggregated, first, across crops and then by MS in Tables 6.10 and 6.11.

Table 6.10: The decline in combined areas under the main arable crops in all ten selected MS if full decoupling had been applied in 2007-2009 ('000 hectares)

	Fall in Area with decoupling	Actual Area in 2007-2009	% Change with decoupling
Common Wheat	-465	18,140	-2.6%
Barley	-387	10,411	-3.7%
Maize	-193	6,775	-2.8%
Durum Wheat	-126	1,417	-8.9%
Rye	-51	2,244	-2.3%
Rapeseed	-102	4,565	-2.2%
Sunflower	-98	3,378	-2.9%
Sum	**-1,422**	**46,931**	**-3.0%**

Source: Analysis based on G Brookes, *European Arable Crop Profit Margins* (op. cit); DG Agri *Agriculture in the European Union*

Table 6.11: The decline in total areas under the main arable crops in each of the ten selected MS if full decoupling had been applied in 2007-2009 ('000 hectares)

	Fall in Area with decoupling	Actual Area in 2007-2009	% Change with decoupling
Bulgaria	-1	2,324	0.0%
Estonia	-17	319	-5.2%
France	-378	10,876	-3.5%
Germany	-38	7,709	-0.5%
Greece	-133	1,017	-13.1%
Hungary	-122	3,386	-3.6%
Poland	-176	5,927	-3.0%
Romania	-40	5,661	-0.7%
Spain	-441	6,227	-7.1%
United Kingdom	-77	3,485	-2.2%
Sum	**-1,422**	**46,931**	**-3.0%**

Source: Analysis based on G Brookes, *European Arable Crop Profit Margins* (op. cit); DG Agri *Agriculture in the European Union*

We conclude that, on the basis of data representing roughly two thirds of the total EU-27 COP crop area, which may therefore be considered likely to be representative of the EU as a whole:

- The removal of all coupled aids and set-aside would have reduced the total area under the main cereal and oilseed crops in the ten MS studied in this evaluation by 3.0%. The biggest reduction would have occurred in durum wheat, with a decline of 8.9%.

- Barley would also have suffered a higher proportional area loss than the average, which is a reflection of the comparatively low margins earned on barley. As a result, a given absolute cut in coupled aids per hectare would have a greater proportional impact on barley than the average impact for the other crops yielding higher margins per hectare.

- Among individual MS, the biggest impact of the counterfactual would have been felt in Greece. Its total area under the crops analysed here would have fallen by 13.1%, largely because nearly half its total COP areas were was planted to durum wheat in 2007-2009.

- The second and third largest declines (of 7.1% and 5.2%) occurred in Spain and Estonia, respectively. For Spain, this was mainly because it came second behind Greece in the proportion of its COP land under durum wheat. For Estonia, it reflected the magnitude of the CNDP and agri-environmental payments made in the country.

- The three smallest declines in the counterfactual case were in Bulgaria (no change) and Romania (0.7%), which applied low coupled aids under their CNDP programme, and Germany, which was estimated to decline by 0.5%, partly because it has made very little use of the option to make targeted payments under Articles 68 and 69.

- This is somewhat misleading in that the expansion in the German cultivation of silage maize is not included in the total area. This expansion is not the result of CAP measures, but reflects producers' response to offtake contracts for the promotion of biogas output as part of measures to meet the objectives of the Renewable Energy Directive.

These conclusions should be treated with caution. As the German silage maize example and the discussion of minor cereals in Poland in Section 6.7 indicate, some important arable crops are missing from the area data included in the analysis. There is also a sizeable margin of error in the estimates of coefficients from the regression analysis of the relationship between total arable crop areas and weighted average gross margins of COP crops as a whole, and of the pooled data for individual crop shares of arable crop areas in relation to the competitiveness of their gross margins vis-à-vis alternative arable crops within the individual MS.

6.9.1 Simulations of the impact of the removal of partial decoupling in the MTR

One important analysis of the impact of partial decoupling upon production decisions within the EU-27 was that undertaken by the Scottish Agricultural College (SAC) for DEFRA[6]. The most important coupled aids, in terms of the cereal sector, under the MTR were the 25% retention of arable area payments in France and Spain and the specific aids, including Article 69/68 payments, in the durum wheat, protein crop and livestock sectors. The livestock sector is important in this context because of the derived demand for feed cereals, both that grown on-farm and that in purchased feeds.

The SAC report estimated that, for arable crops, Spain, France, Greece and Italy retained the highest proportion of coupling. In practice, livestock, and cattle in particular, was the most popular sector for retained coupling. The SAC paper simulates the impact of the removal of partial coupling on prices within the EU and the choice of crops in individual MS, using the CAPRI partial equilibrium model, developed for the European Commission. This model has two main components. It models the supply of agricultural commodities at a regional level. This supply is then combined with the second component to determine the feedback to farm gate prices, using a partial global equilibrium model.

The simulation found that the sector most affected by full decoupling is suckler cows, whose output would fall by almost 5%. Via feed demand, the reduction in livestock production would affect cereal output. However, the SAC study concluded that the biggest impact of full decoupling would be seen in durum wheat. In Greece, Article 69 coupled payments were estimated to have increased durum wheat output by 40%, while decreasing that of common wheat and barley by 26% and 24%, respectively. In Italy, Art 69 boosted production of durum and common wheat by 24% and 7%, respectively, while barley and rapeseed output declined by 10% and 8%, respectively.

---

[6] *Assessment of the impact of partial decoupling on prices, production and farm revenues within the EU*, A. Renwick et. al., DEFRA, UK, Dec. 2008.

6.10 The EU share of world trade in cereals

So far, we have focused our attention upon the competitiveness of EU cereal production as assessed by its competitiveness in costs and productivity (in yields per hectare) in an international context, and analysed the impact of CAP measures upon this competitiveness. In this section, we shall introduce another way in which the impact of CAP measures may be judged, this is in terms of the competitiveness of the EU in international trade.

Export refunds have not been utilised on cereals since 2006 and on Annex 1 cereal products since 2007. Import tariffs remain as a policy instrument, but the high level of world prices in some recent years has led to occasional reductions to zero in tariffs applied within Tariff Rate Quotas (TRQs). The trade measures are described in detail in Chapter 5 (EQ2). The hypothesis we examine in this section is that CAP measures, reducing barriers to trade flows and allowing internal prices to reflect world market values more closely, have helped to raise the EU share of the world export market in those cereals, such as common wheat and barley, in which has cost competitiveness, revealed by the discussion of production costs earlier in this chapter.

The key CAP measures that have affected cereal trade flows can be summarised under three main headings: measures that removed potential barriers arising from treaty obligations to higher export volumes (for example, the decision not to provide export refunds in recent years); measures increasing the international price competitiveness of domestic output, such as the application of limits on sales to intervention stocks; and measures that support domestic prices above the c.i.f. landed cost of imports from third countries via border measures, notably TRQs and import tariffs. The first two measures should have increased the EU share of world exports by removing policy-induced barriers to exports. The maintenance of the last set of measures, affecting imports, would not be likely to boost the exports of those cereals affected by these measures.

6.10.1 Export refunds

Export refunds have not been removed from CAP regulations, and may be applied as a safety net if circumstances change dramatically, but the way in which export refunds have been applied since 2007 (when the last export refunds were granted on exports of Annex 1 cereal products), overcomes the constraints that exist on EU cereal exports as a result of the Uruguay Round agreement (URA) in the WTO, which limits the volumes of subsidised exports. The annual volume of subsidised cereal exports (divided approximately 3:2 between wheat and other cereals) permitted under the WTO agreement for the EU-15 was 25.2 million tonnes.

6.10.2 The volumes eligible for sales to intervention stocks

One of the intended effects of the changes to intervention rules was to allow cereal prices in cereal surplus regions in Central Europe to settle at freight-determined discounts to the prices in deficit regions of the EU. In addition, liberalising the internal market and reducing border measures should have made exports easier. However, the decade after 2000 saw the 'Black Sea exporters', Ukraine, Russia and Kazakhstan, emerge as competitors in export markets. In order to assess whether the emergence of this competition and the decision not to offer export refunds prevented the MS with cereal surpluses from being able to export to third country markets, we have computed extra-EU exports from the MS (Hungary, Czech Republic, Slovakia, Romania and Bulgaria) whose exports are likely to be made down the Danube, and thus compete directly with sales from Black Sea exporters.

We discover that between 2000-2003 and 2007-2010, these five MS combined increased their extra-EU export volumes of common wheat from 944,000 to 1,981,000 tonnes; of barley from 383,000 to 547,000 tonnes; and of maize from 745,000 to 876,000 tonnes. Thus we conclude that the CAP measures, such as the reforms to the system of buying for intervention stocks, appear to have enhanced the competitiveness of cereal exports from the MS most likely to have faced direct competition from the Black Sea exporters.

6.10.3 The competitiveness of EU cereal exports

In this section, we examine how the more liberalised market framework after the reforms has affected the EU share of world trade in cereals, and also, in view of the earlier section on cost competitiveness, how well the balance of trade reflects the competitiveness of EU producers.

The DG Agriculture publication, *Agriculture in the European Union*, includes data on the EU share of world export and import trade in wheat (including flour) and other cereals. Exports in individual years may be harmed by bad weather, as in 2007; but the official data reveal that the share of EU net exports in total world exports of wheat and flour rose from 5.2% to 7.7% between 2000-2003 and 2007-2010. However, the EU share of world trade in other cereals fell from net exports of 6.2% to a net import share of 0.2%. This we interpret as a sign of the comparative advantage of the EU in wheat. The CAP reforms, including the decision not to utilise export refunds, the application of limits on intervention buying, a reduction in coupled aids, the ending of set-aside and easing of import barriers, all helped to boost exports.

The fall in the EU share of other cereal exports is also an indication of comparative advantage. The analysis of competitiveness in production costs earlier in this chapter revealed the EU cost disadvantage in maize production. In barley, the EU remains a net exporter, but a combination of intervention buying and import TRQs held barley prices well above Canadian export prices, and this is reflected in a less strong export performance than that of wheat.

The most stringent test of the competitiveness of EU exports in the face of supplies from Black Sea exporters is the ability of the EU to maintain its market shares in its traditional export regions, which are primarily in North Africa, Sub-Saharan Africa and the Near East.

Tables 6.12 and 6.13 describe, first, the regional distribution of the destinations of EU exports of the main export cereals, common wheat and barley, and then the source of supply of imports into these same regions. The data are published by the International Grains Council. From changes in the balance of imports and exports, it will be possible to determine whether the EU has been forced to adapt its export flows to accommodate supplies from the Black Sea.

Table 6.12 lists the destinations for EU common wheat and barley exports from the 2005/06 to 2010/11 marketing years. North Africa is consistently the most important destination for common wheat; the region’s share in total EU exports little changed between the starting and end-date. The Near East share has grown and the Sub-Saharan share rose until 2009/10, before falling back significantly in 2010/11. Overall, there are no indications that the EU has had to adapt its export destinations in response to the competition from other exporters.

Table 6.13 summarises sources of supply to the same regions. In the case of common wheat, we see that the EU share of imports into North Africa has risen over the five years from 2005/06, and the Black Sea exporters’ share has also grown, apart from the drought-affected year of 2010/11. Therefore other regions, notably North America, have lost ground. The EU shares of wheat imports into the Near East and Sub-Saharan Africa have tended to rise over the period, without squeezing the shares of the Black Sea exporters. The losers have been North American and Others (mainly Australian) suppliers.

Barley imports into the Near East and North Africa have displayed more volatility in the shares of major suppliers than those in common wheat, but, as with wheat, there is no indication that the EU has had to cut its market share in the face of competition from the Black Sea exporters.

We conclude, therefore, that CAP measures, liberalising external trade in cereals and limiting intervention buying, enabled the EU exporters to maintain and boost their share of imports into traditional export markets that are relatively close to the EU. Moreover, this EU export performance has been achieved in the face of stronger competition from Black Sea exporters.

Table 6.12: Regional distribution of EU export sales of common wheat and barley, 2005/06 to 2010/11

Export Cereal	Common wheat					Barley					
Destination	Near East	Other Asia	North Africa	Sub-Sahara	Other	Destination	Near East	Other Asia	North Africa	Sub-Sahara	Other
2005/06	9%	1%	52%	28%	10%	2005/06	48%	9%	28%	3%	12%
2006/07	9%	9%	46%	27%	9%	2006/07	65%	0%	22%	0%	13%
2007/08	12%	1%	53%	24%	11%	2007/08	70%	2%	20%	0%	8%
2008/09	23%	5%	43%	22%	7%	2008/09	62%	9%	23%	1%	5%
2009/10	19%	2%	41%	30%	7%	2009/10	62%	9%	23%	1%	5%
2010/11	11%	8%	53%	19%	8%	2010/11	57%	11%	15%	0%	16%

Source: Derived from marketing year data published by the International Grains Council, where 'Black Sea' represents total exports from Russia, Ukraine and Kazakhstan, which export from Black Sea ports.

Table 6.13: Distribution of origins of imports of common wheat and barley into the EU's main regional export destinations, 2005/06 to 2010/11

Destination	Near East - Common Wheat				North Africa - Common Wheat				Sub-Saharan Africa - Common Wheat			
Origin	EU	Black Sea	North America	Others	EU	Black Sea	North America	Others	EU	Black Sea	North America	Others
2005/06	9.8%	22.2%	32.5%	35.4%	39.4%	28.3%	14.6%	17.6%	28.8%	9.7%	41.1%	20.5%
2006/07	10.6%	35.2%	24.5%	29.7%	36.1%	26.3%	29.3%	8.3%	28.8%	8.2%	40.6%	22.4%
2007/08	11.0%	30.5%	37.5%	20.9%	27.2%	30.4%	29.1%	13.2%	24.4%	3.8%	47.6%	24.1%
2008/09	20.8%	31.5%	26.9%	20.9%	45.2%	33.0%	14.6%	7.2%	36.5%	9.0%	33.4%	21.2%
2009/10	18.1%	46.7%	15.8%	19.5%	40.5%	42.2%	10.1%	7.1%	38.6%	15.2%	34.1%	12.1%
2010/11	15.6%	17.4%	34.6%	32.4%	49.7%	12.8%	23.8%	13.6%	29.8%	3.5%	42.6%	24.1%

Destination	Near East - Barley				North Africa - Barley		
Origin	EU	Black Sea	Australia	Others	EU	Black Sea	Others
2005/06	13.7%	47.5%	22.7%	16.0%	60.3%	35.8%	3.9%
2006/07	25.0%	62.0%	7.3%	5.7%	51.5%	48.4%	0.1%
2007/08	28.8%	19.6%	21.9%	29.7%	75.5%	21.0%	3.5%
2008/09	17.2%	66.7%	2.9%	13.2%	58.0%	41.7%	0.4%
2009/10	3.0%	74.9%	11.0%	11.1%	19.5%	72.9%	7.7%
2010/11	34.8%	32.4%	5.0%	27.9%	59.1%	38.5%	2.4%

Source: Derived from marketing year data published by the International Grains Council, where 'Black Sea' represents total exports from Russia, Ukraine and Kazakhstan, which export from Black Sea ports.

6.11 Market orientation of the cereal sector

The second part of EQ4 refers to the promotion of the market orientation in the cereal sector. We interpret this to mean that cereal producers supply the quality and type of cereal that end-users desire and that they do so at prices that reflect world market levels, rather than with the benefit of aids such as export refunds and coupled payments. End-users may be divided in two ways: by geography, between internal and external users, or by particular end-use category within the domestic market.

The market orientation in an international context is assessed by considering the impact of changes in the provision of export refunds and reforms to coupled payments upon the ability of EU producers to maintain or increase exports. This is done by referring to the previous analysis of trade patterns. The issue of producing to meet market needs in the domestic market, rather than for sale to intervention stocks, for example, is examined in Chapter 5 (EQ3). Therefore, we shall summarise here the main points that emerge from that chapter.

Evidently, producing (and exporting) more of one crop would almost inevitably have consequences on the production (and possibly export) of another crop.

6.11.1 Market orientation in an international context

CAP measures, ranging from the decision not to offer export refunds to the decoupling of aids, should have improved the market orientation of EU common wheat exports. For barley and maize, the introduction of limits on sales to intervention towards the end of the period covered by this evaluation should also have improved the market orientation of local output towards the export market by enabling MS with supply surpluses to sell them at competitive prices that fully reflect freight costs to import markets.

In the case of common wheat, the absence of export refunds enhanced the international market orientation of domestic output in two ways. One was because their absence removed the constraint created by the WTO limit on the level of subsidised export volumes. This limit would have made it impossible in some years to export the total common wheat tonnage available for export if this tonnage had all received export refunds. The other is that the payment of refunds would have led to internal prices at the export port exceeding the f.o.b. export price (by the amount of the refund), with a consequent weakening of the market orientation of the production of common wheat for third markets.

Section 6.10 reveals that, following the reforms, after the ending of coupled aids on common wheat and decision not to offer export refunds, the EU has increased its share of the world wheat export market, without losing import market shares in the main traditional EU export regions, in which competition from the Black Sea exporters had increased. This is interpreted as indicating an improved market orientation for common wheat in the export market.

The EU is a modest net maize importer and a combination of border measures, notably TRQs, ensured that market prices in France, by far the largest producer in the EU-27, remained above world market export values throughout the period under review, which implies that no increase occurred in the export market orientation of local production.

For barley, the EU remains a net exporter, but a smaller one than before the MTR. One respect in which CAP measures have slowed the greater market orientation of the sector was through the operation of intervention stocks. Section 6.12.2 indicates that intervention buying, on average, supported internal feed barley prices at a premium to world market values during the period after the MTR. However, the reduction to zero in permitted intervention buying (though with the scope to resume intervention buying as a safeguard if market circumstances require it to defend a price safety net) should enhance the export market orientation in future.

6.11.2 Market orientation in a domestic context

The production of cereals to meet the need of local end-users is discussed in Chapter 5 (EQ3). There are three main conclusions to be drawn from that discussion.

In the feed sector, a combination of CAP measures and external developments has boosted the use of locally grown cereals in feedstuffs. In the EU market, CAP reforms, led by changes in the volumes permitted for sale to intervention stocks, were important in improving the orientation of domestic cereals towards the demand for feed ingredients. Rye's removal from eligibility for intervention sales and the subsequent lowering of the maximum annual intervention stock purchases for other cereals allowed lower quality cereals to find an equilibrium price below the intervention price.

Border protection remains significant for barley and maize, but there is a range of cereals used in feed, including triticale, mixed grains and oats, which are used mainly as ingredients in on-farm feed use in countries such as Poland. The prices of these cereals, like that of rye, find an equilibrium that is only indirectly linked to the intervention price, via their competition with cereals that receive a price safety net via intervention. Also, as noted above, the end of export refunds on cereals helped to bring feed wheat prices more closely into line with the prices prevailing outside the EU, boosting the market orientation of the cereal output.

Article 69/68 measures support livestock farming, particularly in less favoured regions, where cereals used as feed are often grown on-farm. Other coupled aids were important in the livestock sector during 2007-2010, which supported the sector as a whole, and thus helped to sustain its feed cereal demand. While these factors boosted cereal feed use, equally important were events outside the EU, described in Chapter 8 (EQ9), which reduced the use of imported feed ingredients. The importation of GM cereals and their by-products is regulated in the EU and the inclusion of unauthorised GMO events is a risk that has greatly limited the use of imported maize-derived products, such as corn gluten feed, from the US[7].

In addition, there are important CAP measures, notably the reductions in intervention prices and changes to the limits on sales to intervention since the 1990s, and the easing of border measures, which have enhanced the market orientation of cereals when competing against duty-free imported cereal substitutes, such as tapioca. As a result, the cereal share of feed ingredients in the 150 million tonnes of compound feed in the EU has risen from 41% in 2000 to 47-48% in 2007-2010.

In the starch and biofuel sectors, interviews with large multi-national processing companies in the sector revealed that neither quality nor price of local supplies is seen as an issue. The availability of relatively cheap maize in Central and Eastern Europe has increased starch processing based on maize in those regions, while in Western and Northern Europe, wheat processing for starch has grown. The CAP measures were seen by processing companies as significant in supporting development of these sectors by reducing the role of intervention buying. This made cereal processing more attractive in land-locked surplus regions in Central and Eastern Europe, which bear relatively high transport costs on sales to deficit regions.

Barriers to imports of many GM maize events were viewed by processors with plants in coastal regions as an obstacle to an improved market orientation, as these factories were often built to ensure access to competitive imported maize and therefore suffer from these barriers, but the same firms were also aware, in interviews, that imports of GM-derived maize by-products could depress the returns from their own by-product sales inside the EU.

---

[7] Regulation (EU) No 619/2011 on implementation of the 'zero tolerance' policy on non-authorised genetically modified (GM) material in feed offers a solution by setting a technical tolerance GM material at 0.1%.

The main concerns regarding the market orientation and suitability of cereal output for end-users are in the high quality segment, notably for baking and malting uses. In the case of malt, the EU is a net exporter and the market orientation of the sector remains strong.

Production of high protein wheat as a share of total output varies between MS. However, the availability of vital wheat gluten supplies as a by-product of wheat processing for starch has helped to improve the domestic market orientation of the overall common wheat supply chain. As the baking sector has become more industrialised, the incorporation of gluten into lower protein flours, which is not easy for artisanal bakeries to do on a small scale, has become more common. Thus, higher wheat use in applications, such as biofuel and starch, that use only the carbohydrate fraction of the cereal has helped to compensate for a relative lack of hard bread-making wheat in the EU by supplying high quality gluten to industrial bakeries.

6.11.3 Conclusions regarding market orientation

The discussion reveals that the reforms have played a role in improving the market orientation of the cereal sector. In an international context, the main benefits have occurred in the common wheat sector. The decision not to offer export refunds, by removing WTO ceilings on subsidised exports; the end of set-aside; and cuts in coupled aids; have enhanced the market orientation of the export sector. In other cereal sectors, less benefit has been seen from the reforms in the EU's international market orientation. Import barriers, including TRQs, as well as intervention buying for some of the period under review, helped to maintain internal market prices above world market levels.

Within the domestic market, and in the important feed sector, in particular, a greater market orientation of local cereals has reinforced the impact of measures restricting imports of GM products in raising the cereal share of feed ingredients. Starch and biofuel processors responded to the changing of intervention criteria by expanding capacities in cereal surplus regions in EU-12 MS. The only sectors where quality remains a concern are bread-making and malting. The EU is a major exporter of malt and, barring climate problems during a growing season, is able to secure local malting barley in adequate quantities. However, for the hardest bread-making wheat, the EU remains a deficit area, though supplies of vital wheat gluten as a wheat processing by-product have helped to provide some of the protein needed by bakers.

6.12 Level and volatility of prices in the internal cereal market in relation to the world market (Evaluation Question 5)

EQ5 raises the question of the extent to which CAP measures have affected cereal prices and price volatility. Therefore, we compare the behaviour of cereal prices within the EU and world markets. The EU represents a comparatively small percentage of world market exports in cereals. The EU's highest annual share of world common wheat exports, the cereal in which EU participation is greatest, was 14.4%. Therefore, we believe world market prices are a valid reference against which to judge the impact of the CAP measures upon price behaviour in the EU. The levels and degree of volatility of prices in these two markets are compared, using the coefficient of variation (the standard deviation divided by the mean) to quantify volatility.

Our hypothesis is that the CAP measures affected the level and volatility of EU cereal prices in the following manner:

Changes in intervention rules, increased access for imports at low tariffs and the decision not to offer export refunds on cereals since 2006 should have brought average internal market prices for cereals closer to those in the world market, narrowing the average differential if internal market prices were typically higher than those in the world market. If domestic prices were typically below world market levels, CAP reforms should have widened the discount.

In both cases, the volatility of EU prices should have become closer to that observed on the world market, but price volatility inside the EU market would be expected, on average, to be lower than that on the world market, since intervention buying for some cereals (which, via substitution in demand, should also help to create a price floor for other cereals that lack intervention buying) should moderate downward price movements.

In the following section we examine whether prices in the internal market and those quoted on representative world export markets have moved closer to one another. We use average differentials between the two sets of prices and the correlation coefficients between monthly prices over different periods as indicators of closeness.

We then examine whether the measures have increased the volatility of EU market prices and brought the level of volatility closer to that in the world market. We also consider whether exchange rate movements between the Euro and the US$ have affected the volatility of internal market prices; we do so by contrasting estimates of price volatility in Euros and US$.

We continue with a review of the openness of the transmission of prices to producers and the extent to which limits on sales to intervention stocks have weakened the price floor and brought greater stability to the differentials between producer prices in different MS.

We conclude this discussion of EQ5 by examining how, in the face of higher price volatility, EU producers, traders and users are using risk management tools to moderate the impact of price volatility.

6.12.1 Alignment between internal and world market common wheat prices

Diagram 6.17 contrasts an internal market reference price (the feed wheat price on the LIFFE futures market) with the intervention price and with three export prices to assess whether differentials between internal and external prices have narrowed after the CAP reforms.

Table 6.14 compares the internal and Rouen f.o.b. prices with two US export prices for soft and hard red wheat in 2000-2003, 2004-2006 and 2007-2010. (Ukraine is not included because its price series has gaps).

The table also lists the correlation coefficients for monthly prices between the LIFFE internal market feed wheat price and the different international prices over the three periods under review. In addition, it summarises the changes in the coefficients of variation of each of the prices in the same periods.

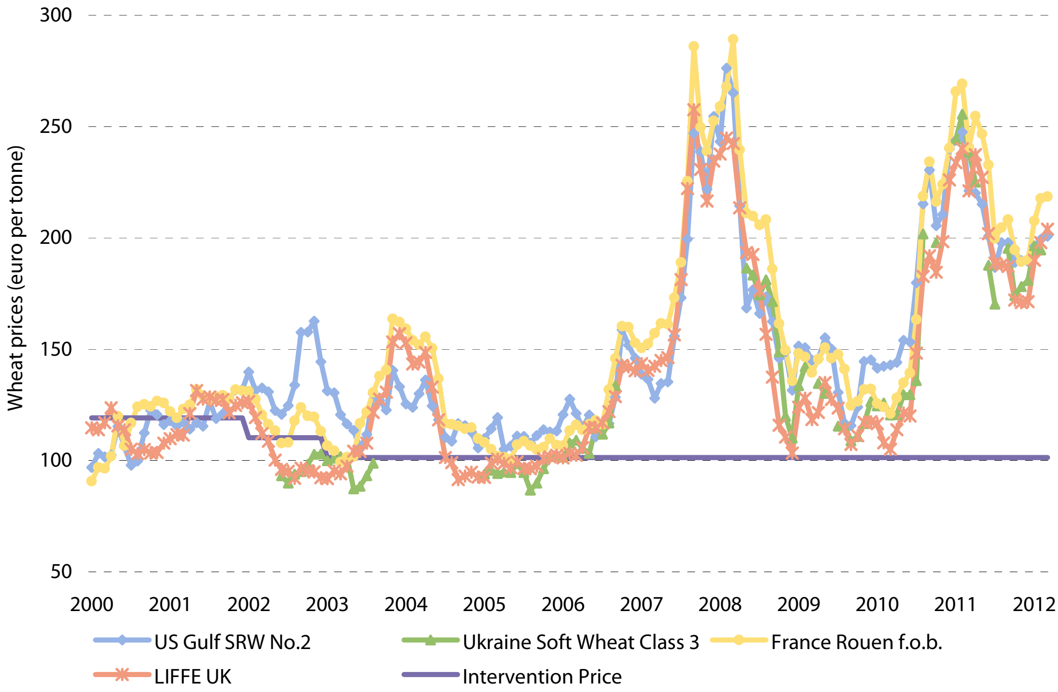
From the diagram and table, we conclude that the intervention price acted as a safety net for internal market prices after 2005. We observe from the table that internal market wheat prices increased their discounts against world market wheat values (in the table, this is described as the premium for the various world market prices over LIFFE) from 2000-2003 to 2007-2010.

Table 6.14 indicates that correlations between LIFFE quotations and world market prices rose substantially after 2000-2003. The correlation was highest for exports from Rouen, reflecting the fairly stable differential on account of local transport costs and port costs in Rouen.

The closer alignment with world market prices has been associated with an increase in the volatility of domestic prices, measured by the coefficient of variation, in both markets. Also, we observe that price volatility was slightly higher in the internal market in each period.

Higher volatility in the internal market price is consistent with a relatively stable discount of EU prices on export prices, as this would magnify the coefficient of variation of the LIFFE price by reducing its denominator (the mean price).

Diagram 6.17: EU and world market prices for soft wheat, 2000-2012 (€ per tonne)



Source: Agriculture & Horticulture Development Board (HGCA), UK and LIFFE.
Notes: The LIFFE wheat price is a French domestic price. The Rouen price is an f.o.b. export price.

Table 6.14: EU and world common wheat market prices, correlation coefficients and coefficients of variation, based on monthly prices, 2000-2010 (€ per tonne)

Average price levels	2000-2003	2004-2006	2007-2010
LIFFE feed wheat	112.7	111.9	158.4
Rouen FOB	120.6	122.6	180.6
Premium vs. LIFFE	*7.9*	*10.6*	*22.2*
US SRW	122.8	119.4	172.3
Premium vs. LIFFE	*10.1*	*7.4*	*13.9*
US HRW	140.9	138.5	195.1
Premium vs. LIFFE	*28.2*	*26.5*	*36.8*
Correlation, LIFFE with	2000-2003	2004-2006	2007-2010
Rouen FOB	68.8%	94.8%	97.4%
US SRW	-7.3%	77.7%	92.5%
US HRW	-23.2%	50.8%	87.2%
Coefficient of variation	2000-2003	2004-2006	2007-2010
LIFFE	13.4%	17.2%	29.5%
Rouen FOB	12.1%	16.4%	27.2%
US SRW	12.1%	12.7%	21.0%
US HRW	13.1%	10.5%	25.2%

Sources: Derived from Agriculture & Horticulture Development Board (HGCA), UK and LIFFE monthly data.

One possible influence upon price volatility was exchange rate movements against the US$. Therefore, we estimated coefficients of variation with prices in US$. The results were inconclusive in that volatility in prices expressed in US$ was lower than that when they are expressed in Euros in both 2004-2006 and 2007-2010 in the internal market, and yet volatility in the Rouen f.o.b. export price was higher in US$ terms than in Euros.

A further issue that we considered was whether the results were distorted by the use of monthly, rather than weekly, prices. The only weekly price series for which there are no gaps in the data from 2000 are for US soft wheat and Rouen f.o.b. prices, which are both reported in US$. We discover that the volatilities (the coefficients of variation) were very similar for weekly and monthly data in both 2004-2006 and 2007-2010, which were periods in which all price volatilities increased from their 2000-2003 levels.

For Rouen f.o.b. prices, the coefficients of variation of weekly prices were 17.1% and 31.0% in 2004-2006 and 2007-2010, respectively. The corresponding estimates using monthly data were 17.8% and 32.0%. The US SRW price volatilities were 11.5% and 28.0% with the weekly data, as against 11.4% and 28.1% with the monthly data for the same two periods.

We conclude that neither currency factors nor the use of monthly, rather than weekly, data explain changes in price volatility over time or higher volatility in internal than export markets.

6.12.2 Alignment between internal and world market feed barley prices

Diagram 6.18 compares an internal market feed barley price, delivered to Rouen, with the intervention price and with Canadian and Ukrainian export prices. Table 6.15 compares Rouen prices, correlations and volatility with Canadian export values from 2000-2003 to 2007-2010.

Table 6.15: EU and world feed barley market prices, correlation coefficients and coefficients of variation, based on monthly prices, 2000-2010 (€ per tonne)

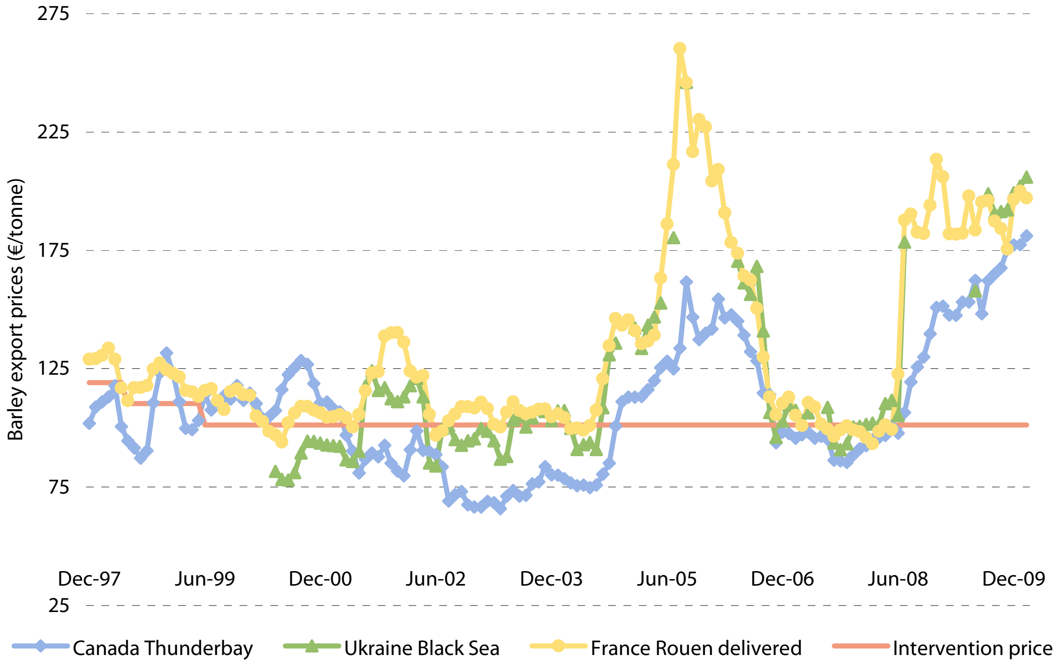
Average price levels	2000-2003	2004-2006	2007-2010
Rouen delivered barley	114.8	111.7	148.2
Canada, Thunderbay	106.9	78.9	115.5
Premium vs. Rouen	*-7.9*	*-32.8*	*-32.7*
Correlation, Rouen with	2000-2003	2004-2006	2007-2010
Canada, Thunderbay	-12.1%	62.1%	88.5%
Coefficient of variation	2000-2003	2004-2006	2007-2010
France, Rouen	9.4%	11.9%	32.3%
Canada, Thunderbay	11.8%	13.1%	18.5%

Source: Agriculture & Horticulture Development Board (HGCA), UK.
Note: A negative premium means that the Rouen price is above the Canadian export price.

From the table and diagram, we observe that the intervention price acted as a safety net until 2006 and again in 2009 and 2010. Barley prices internally and in Canada became more closely aligned in 2007-2010, as indicated by the correlation coefficient in the table. Also, as regards price differentials, the Canadian discount on Rouen prices (shown as a negative premium in the table) was steady at €33 per tonne in 2004-2006 and 2007-2010. As with common wheat, correlations between the internal and external market prices rose over time and the volatility of internal market prices was higher than that in the world market.

The greater price volatility in the internal market in 2007-2010 is a highly unexpected outcome for two reasons. First, since internal market prices are above the Thunderbay export price, one would have supposed that a relatively stable differential between the two prices would lower the coefficient of variation for internal prices by virtue of the higher denominator (the mean). Second, the role of intervention as a floor price to the internal market in 2008-2009, when intervention sales were made, should have reduced price volatility during that period.

Diagram 6.18: EU and world market prices for barley, 2000-2012 (€ per tonne)

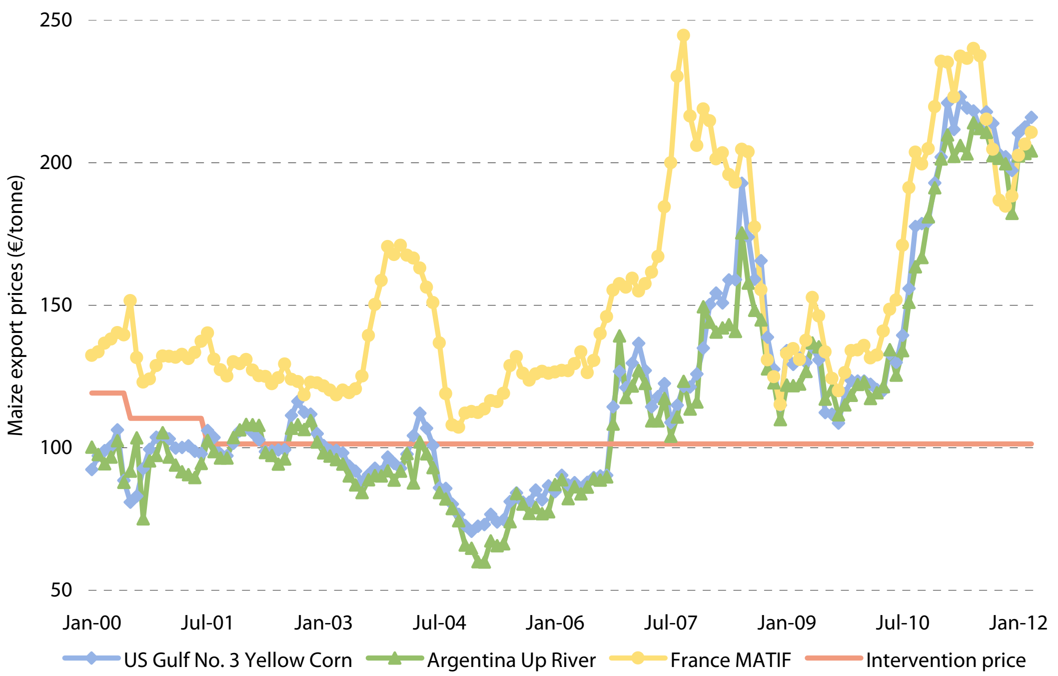


Source: Agriculture & Horticulture Development Board (HGCA), UK.
Notes: The Rouen price is a French domestic price.

6.12.3 Alignment between internal and world market maize prices

Diagram 6.19 plots an internal market maize price, the MATIF quotation (for Bayonne, France), alongside the intervention price and two export prices, in the US Gulf and Argentina.

Diagram 6.19: EU and world market prices for maize, 2000-2012 (€ per tonne)



Source: Agriculture & Horticulture Development Board (HGCA), UK and MATIF.
Notes: The MATIF price is a French domestic price at Bayonne.

We see that the intervention price was never breached at the coast, reflecting partly the effect of import tariffs. In surplus markets inside the EU, such as Hungary, which had to bear freight costs to take maize to deficit regions, intervention buying provided important price supports, particularly in 2004-2006. Since 2008, local and export prices have been closely aligned.

Table 6.16 describes the movements in maize price levels and in the premia (shown as negative discounts) for world export prices over internal EU market prices, as well as the correlations between the prices and their volatilities. After rising in 2004-2006, the discounts of export prices over EU internal prices narrowed in 2007-2010. Unlike the case for common wheat and barley, the correlation coefficients between monthly internal market and export prices fell in 2007-2010, and were actually negative for Argentina, reflecting the behaviour of the South American 'basis' (the discount of S. American prices on US prices), which typically widens after the local harvest period, when Argentine exports flow at their fastest rate, and then narrows.

The volatility of domestic maize prices rose steadily during the three periods under review, whereas the volatility of US export prices declined in 2007-2010. In this most recent period, price volatility was greater in the internal than the world market. This we believe was caused by the EU oscillating between import and export parity border prices.

Table 6.16: EU and world maize market prices, correlation coefficients and coefficients of variation, based on monthly prices, 2000-2010 (€ per tonne)

Average price levels	2000-2003	2004-2006	2007-2010
MATIF, Bayonne	131.7	133.1	167.9
US Gulf	99.2	88.7	137.1
Premium vs. MATIF	*-32.4*	*-44.5*	*-30.8*
Argentina	96.8	84.3	131.6
Premium vs. MATIF	*-34.9*	*-48.9*	*-36.3*
Correlation, MATIF with	2000-2003	2004-2006	2007-2010
US Gulf	-34.4%	83.8%	49.9%
Argentina	-26.2%	12.1%	-29.5%
Coefficient of variation	2000-2003	2004-2006	2007-2010
MATIF	8.9%	13.8%	21.2%
US Gulf	7.5%	19.0%	15.1%
Argentina	7.2%	15.6%	16.4%

Source: Derived from Agriculture & Horticulture Development Board (HGCA), UK.

6.12.4 Conclusions regarding internal vs. external price levels and volatility

The main CAP measures affecting local cereal prices since 2005 were sales to intervention stocks and border measures. Border measures continue to protect domestic market prices from cheap imports, but since 2006, no export refunds have been granted for cereals.

Intervention buying supported barley prices in late 2008- early 2010 (Diagram 6.18). The limits on maize intervention from 2007 prevented large maize stocks from being accumulated; yet, Bayonne delivered prices never tested the intervention price level (see Diagram 6.19).

The rise in price volatility may be explained by the greater openness of EU markets, which transmitted the higher price volatility that occurred in world markets. However, this does not explain why volatility should have been greater in the EU than in the world market for all three cereals from 2007 to 2010. For common wheat, the discount of internal on world prices would reduce the denominator in the calculation of the coefficient of variation and would raise the level of volatility, but this was not true of either barley or maize, whose internal prices were higher than world market quotations. Furthermore, intervention sales of cereal provided a cushion against low prices that occurred for a short period, which also would have been assumed to reduce volatility.

In practice, price volatility is a product of many influences, including weather, sea freight transport costs for both import and export commodities, and more recently the impact of trading on domestic futures markets. Therefore, the specifically cereal market factors that we have focused upon here are only some of the contributory factors as regards price volatility.

Regarding the price level, average internal market prices in 2007-2010 were much higher than they were in earlier periods. World market prices also rose. However, for common wheat and maize, the competitiveness of EU internal prices improved in that the premia of EU prices over world prices fell (or the discount rose). The sole exception was barley, for which it may be postulated that the sales to intervention stocks ensured that EU prices did not lose their average premium over world market prices.

6.13 Market openness in the EU cereal sector

In this section, we assess the market openness of the formation of EU cereal producer prices. The producer prices that we use are those calculated from the COP specialists, mixed crop & livestock and general field crop producers in the FADN database, dividing their revenues from the sale of individual cereals by the volumes of their sales. These were reviewed in Section 2.5 of Chapter 2. To assess the openness of the market and the efficiency of the transmission of published market prices to producers, we estimated the correlation coefficients of these market prices with producer prices in each MS.

One practical problem that arises with the annual price data derived from the FADN database is that one does not know the timing of the sales made by the producers. Consequently one does not know exactly which 12 month period of market prices (all of which, apart from durum wheat, are internal market prices) is the best one to compare with the FADN annual producer prices. Therefore, we computed the reference market prices for each cereal over three alternative 12 month periods, January-December, July-June and October-September to determine which one yielded the highest correlation with the computed producer prices.

The prices that we used as reference prices in computing correlations were: LIFFE for wheat, LIFFE for barley, MATIF for maize, Canadian export prices for durum wheat (in the absence of a comprehensive internal price series) and producer prices in the MS with the highest share of its UAA planted to the remaining cereals, namely Germany for rye and Finland for oats.

The producer prices were computed for all EU-15 MS, and for all but Cyprus and Malta (whose data were derived from too small a sample to be used) among the EU-10. With only three years of FADN data from the EU-2, correlation coefficients would have little significance.

After undertaking this analysis, we discovered that for 20 of the 23 MS analysed, correlation coefficients between LIFFE quotations and producer prices for common wheat exceeded 90%. For the remaining three (Finland, Portugal and Spain), the correlation exceeded 80%.

For durum wheat, the correlation coefficients for the nine MS with a sufficiently large sample of producers exceeded 80% for all but the Czech Republic, for whom it exceeded 75%.

For barley, we have computed the correlation coefficients for 21 MS. For only one (Spain) was the value (84%) below 90%.

Maize had by far the highest dispersion of correlation coefficients among the 15 MS for which adequate data exist. 8 MS have values above 90%, but 4 MS have coefficients below 50%. One possible explanation is that producer price differences between some neighbouring countries are unexpectedly large, in view of the scope for transporting quantities between them. This may be an indication that some green silage maize was included in the data.

For rye, all but two of the 9 MS for whom correlation coefficients were computed has values over 95%. Those two (France and Spain) had coefficients above 85%.

For oats, all but one (Greece) of the 14 MS for which the coefficients were calculated had values in excess of 75%, and 9 MS had correlations of 85% or more.

We conclude that, with the exception of maize, there is a good correlation between annual reference prices of the individual cereals and the producer prices estimated for each MS. This is evidence of market openness within the cereal market at the producer level, with the price transmission and flows of cereals between MS working efficiently.

The CAP measures undoubtedly assisted in this process by reducing barriers, via the ending of export refunds and the lowering of import tariffs, but equally important were the reforms making the conditions to be fulfilled for sales to intervention steadily stricter from 2003, with the removal of rye for eligibility for intervention sales. These reforms made it progressively more likely that the differentials between prices in deficit and surplus MS reflected transport costs between these MS in line with the results of a freight cost minimisation algorithm, as described in the previous *Evaluation of the Cereals CMO*.

6.14 The application of risk management techniques

From the field research with producers, traders and processors, it is evident that price volatility has become of growing concern. In this section, we summarise conclusions from interviews.

The introduction of fully decoupled SPS and SAPS provided an important assured element of farm income. As a result, there is evidence that producers are willing to accept a higher degree of risk in their crop marketing. They achieve this in two ways: by investing in larger on-farm storage capacities, they have greater freedom over the timing of sales (and reduce taxation on farm income, at the same time, by setting capital expenditure on storage capacity against taxable income); the other is to adopt price risk management techniques via the pricing of their sales to farmer cooperatives or private trading companies.

Interviews revealed that the direct use of futures and options is still very low among EU cereal farmers. They can achieve the benefits of hedging in a simpler manner by selling their output to a cooperative or private trader and leaving it to them to manage their own hedging.

Intermediaries, such as traders and processors, are much more likely to protect their margins via the use of futures and options. With higher price volatility, as demonstrated by the price analysis earlier in this chapter, their need for hedging protection has increased significantly.

There has been a major increase in the use of futures and options contracts, most significantly in 2010, when users who had failed to use these instruments in 2008 before prices slumped were more inclined to take advantage of such instruments for price protection in the EU. In the case of common wheat, annual EU futures volumes virtually trebled in late 2010, as may be seen in Diagram 6.20, and settled at the equivalent of 250% of the EU's annual output. For maize, futures volumes also trebled in late 2010, as is illustrated in Diagram 6.21, to a level equivalent to close to one third of total EU production.

For wheat, the Paris contract is now viewed as sufficiently distinct from US contracts in its price behaviour to be a valuable hedging medium. For maize, in contrast, large processors judge EU futures volumes to be inadequate to provide real liquidity. Moreover, with openness to imports making US futures contracts a worthwhile alternative, the domestic futures contract is still struggling to achieve a large turnover.

Diagram 6.20: Paris Milling Wheat Futures monthly volume and open interest, 2006-2012

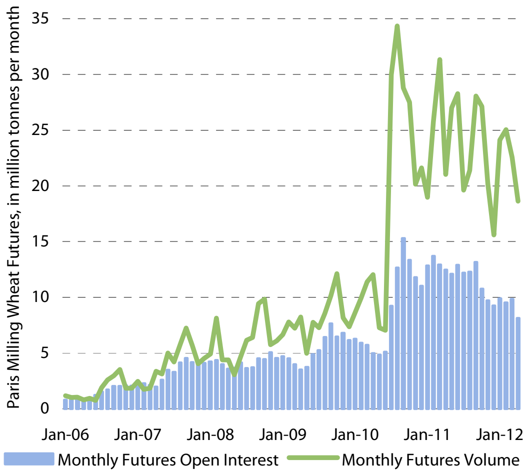
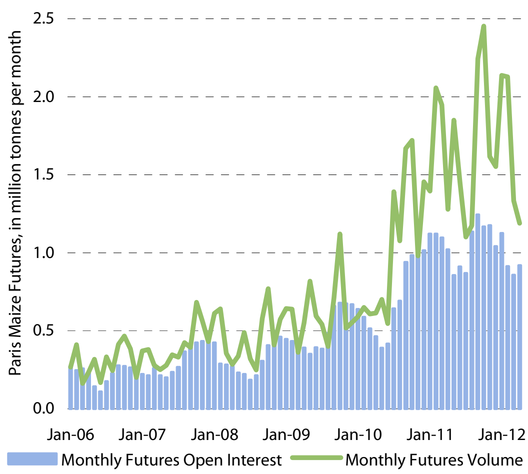


Diagram 6.21: Paris Maize Futures monthly volume and open interest, 2006-2012



Source: LIFFE.

6.15 Cereal producers' gross margins and incomes (Evaluation Question 6)

In this section, we discuss EQ6, which assesses the success of CAP measures in maintaining or increasing cereal producers' incomes. Our hypothesis is that the transition from coupled aids to the SPS maintained income supports per hectare for cereal producers. Other CAP measures, including intervention buying and border measures, helped to maintain incomes at times of low market prices, but our focus in answering this question is upon the contribution of coupled and decoupled aids to producer incomes per hectare and per family work unit.

To answer this question, we analyse the contribution of coupled payments to gross margins and of decoupled payments in incomes per hectare of EU-27 cereal producers. We examine how CAP reforms, shifting supports away from coupled to decoupled aids, affected levels and volatility of incomes. Support for cereal producers' incomes was increasingly decoupled after the MTR, but some coupled aids continued to be applied after the reform took effect. France and Spain took up the option to maintain 25% of the previous arable aids until 2010.

Also specific coupled aids were paid under Articles 69 and 68, as well as the CNDP, while support to the durum wheat sector in traditional areas was provided via a quality premium and energy crop payments were made to promote the cultivation of crops for bioenergy. Agri-environmental schemes rewarding farming practices that were more sustainable that those required under cross compliance were a further source of income for some cereal producers.

To assess the importance of the CAP measures in maintaining or increasing cereal producers' incomes in all EU-27 MS, we have relied mainly upon analysis of the FADN database for those holdings that are most heavily specialised in cereal production, namely the COP specialists.

We assume that the COP specialist holdings represent holdings that are predominantly cereal producers and that the trends in their gross margins and incomes are, therefore, a good approximation to the trends for cereal producers alone. Two other types of holding for which cereals represent a significant source of income are general field crop and mixed crop & livestock producers. We shall analyse the importance of CAP measures in determining the incomes of these two groups at some points in the following discussion.

It should be noted that the methodology applied earlier in this chapter, notably in Section 6.5, was based upon a consistent approach to the estimation of direct costs of production for individual crops, from which gross margins could be computed by crop. The FADN database contains a large number of detailed farm accounts for individual holdings, but does not derive separate accounts for individual crops.

6.15.1 Coupled and decoupled payments

To assess the importance of CAP measures in maintaining or increasing producers' incomes, we study the shares of coupled and decoupled aids in three alternative measures of income derived by FADN in its database, Farm Net Value Added, Net Farm Income and Gross Margins. Values are assessed in nominal and real terms at different points in the analysis.

Throughout this analysis, we rely upon the FADN database to estimate the average payment of coupled and decoupled aids per hectare for holdings. In the analysis that we present below:

- 'Coupled aids' are set equal to the sum of compensatory payments (FADN variable SE611), other crop subsidies such as CNDP (SE613), Environmental Payments (SE621) and Article 68/69 (SE 650).
- 'Decoupled aids' are defined to be the sum of SPS/SAPS (FADN variables SE631 and SE632), as well as Added Aids (variable SE640) and 'Other Subsidies' (SE699).
- To derive the coupled and decoupled payments per hectare, we divided total payments made to COP specialists under these headings by the appropriate UAA (variable SE025).

The FADN database details of coupled and decoupled payments per hectare are limited by the time span covered in the database: 2000-2009 for the EU-15 MS, 2004-2009 for the EU-10 and 2007-2009 for the EU-2.

The resulting estimates of coupled and decoupled aids per hectare paid to EU-27 COP specialists by MS in 2000-2003, 2004-2006 and 2007-2009 are listed in Table 6.17.

The table makes evident the evolution of support away from coupled aids in 2000-2003 towards decoupled aids in 2007-2009. However, the combined aids paid to the EU-15 MS rose by approximately 0.6% per annum in nominal terms in the FADN sample of COP specialists between 2000-2003 and 2007-2009.

We observe, therefore, that the reduction in coupled aids under the MTR for the EU-15 MS was almost exactly matched in nominal terms by the increase in decoupled aids per hectare over the period. In real terms, after applying the FADN deflators for each MS, the combined aids per hectare declined slightly over the decade. The average annual rate of inflation in the FADN deflators for the EU-15 from 2000 to 2009 was 1.3% per annum. This suggests that the real value of coupled *plus* decoupled aids per hectare in the EU-15 declined at 0.7%, on average, per annum (derived as the 1.3% underlying price inflation *minus* the 0.6% annual increase in combined nominal direct and indirect aids).

We conclude that the CAP measures with regard to coupled and decoupled aids broadly helped to maintain EU-15 producers' incomes in nominal terms, but reduced them by a small annual amount (estimated at 0.7% for the EU-15 MS) in real terms.

Table 6.17: Coupled and decoupled payments for COP specialist producers, by MS, 2000-2003, 2004-2006 and 2007-2009 (€ per hectare)

	Coupled Aids				Decoupled Aids				Both Aids		
	2000-2003	2004-2006	2007-2009		2000-2003	2004-2006	2007-2009		2000-2003	2004-2006	2007-2009
Austria	533	370	210	Austria	0	205	308	Austria	533	574	518
Belgium	291	113	65	Belgium	0	202	338	Belgium	291	316	403
Denmark	317	120	11	Denmark	5	196	307	Denmark	322	316	318
Finland	387	297	171	Finland	11	87	220	Finland	398	385	390
France	352	266	83	France	4	95	273	France	356	361	356
Germany	321	121	20	Germany	5	197	302	Germany	326	318	322
Greece	350	290	55	Greece	1	101	406	Greece	350	390	461
Ireland	322	158	57	Ireland	5	222	371	Ireland	327	381	428
Italy	372	236	91	Italy	7	234	351	Italy	379	470	442
Luxembourg	269	199	158	Luxembourg	11	132	222	Luxembourg	280	332	380
Netherlands	429	317	64	Netherlands	0	130	377	Netherlands	429	447	441
Portugal	221	214	103	Portugal	0	129	257	Portugal	221	343	361
Spain	179	136	54	Spain	0	44	136	Spain	179	180	190
Sweden	260	113	33	Sweden	11	130	207	Sweden	270	243	239
UK	309	127	51	UK	7	198	265	UK	316	326	316
EU-15	**311**	**179**	**54**	**EU-15**	**5**	**153**	**273**	**EU-15**	**315**	**331**	**327**
		2004-2006	2007-2009			2004-2006	2007-2009			2004-2006	2007-2009
Cyprus		102	2	Cyprus		80	231	Cyprus		182	233
Czech Republic		68	19	Czech Republic		74	188	Czech Republic		141	207
Estonia		55	54	Estonia		35	74	Estonia		90	128
Hungary		75	51	Hungary		78	142	Hungary		153	193
Latvia		60	84	Latvia		31	68	Latvia		91	152
Lithuania		50	39	Lithuania		47	83	Lithuania		97	122
Malta				Malta				Malta			
Poland		25	19	Poland		115	183	Poland		140	202
Slovakia		44	66	Slovakia		55	103	Slovakia		99	169
Slovenia		565	290	Slovenia		13	629	Slovenia		577	919
EU-10		**57**	**45**	**EU-10**		**68**	**134**	**EU-10**		**125**	**179**
			2007-2009				2007-2009				2007-2009
Bulgaria			0	Bulgaria			103	Bulgaria			103
Romania			2	Romania			120	Romania			121
EU-2			**1**	**EU-2**			**112**	**EU-2**			**113**

Source: Derived from analysis of the FADN database for COP specialist producers.

Note: Coupled payments = FADN variables SE610 plus SE621 and SE650 *minus* SE612. Decoupled payments = FADN variables SE631 *plus* SE632, SE640 and SE699.

6.15.2 Analysis of gross margins

Table 6.18 summarises the development of incomes based on FADN data on nominal gross margins per hectare, where gross margins are defined as [revenues from the sale of products *plus* coupled aids] *minus* the direct costs of production (the costs of variable inputs, notably fertilisers, irrigation, seeds and crop chemicals, but not labour) per hectare. When decoupled aids are added to gross margins, we derive estimates of total producer incomes per hectare. The four blocks of data in this table, and in Tables 6.19-6.20, below, are designed to highlight the importance of direct revenues from product sales, as well as coupled and decoupled payments in producers' total incomes per hectare. The columns within each block list data for 2000-2003 (by virtue of the scope of the FADN database this is possible only for EU-15 MS), 2004-2006 (which covers both EU-15 and EU-10) and 2007-2009 (covering all EU-27 MS).

- In the first three columns of each table, we list the incomes per hectare received directly from the production of cereal and other products, including revenues from crop sales, without any coupled or decoupled payments.
- In the next block of three columns, we list the incomes per hectare including all coupled aids but excluding all decoupled payments, in order to estimate producer incomes from all sources directly linked to the production of COP crops.
- In the third block of columns, we list incomes per hectare excluding all coupled aids but including all decoupled payments, thus highlighting their share in total incomes.
- In the final block of columns, we list incomes per hectare including both coupled and decoupled aids.

Analysis of the changes in gross margins by MS in the four blocks in Table 6.18 reveals that:

- In the first block, we see that incomes per hectare in the absence of all aids rose in all EU-15 MS between 2000-2003 and 2007-2009 and in all but one (Belgium) of these MS between 2004-2006 and 2007-2009. For EU-10 MS, only Cyprus experienced a drop in incomes per hectare between 2004-2006 and 2007-2009 in the absence of all aids.
- In the second block, which includes coupled aids, only four of the EU-15 MS recorded an increase in incomes per hectare between 2000-2003 and 2007-2009; also only four MS experienced a drop in incomes per hectare between 2004-2006 and 2007-2009. This reflects the substantial drop in coupled aids in 2004-2006. Two of the EU-10 MS experienced a drop in incomes per hectare from 2004-2006 to 2007-2009.
- In the third block, including decoupled, but not coupled, aids, incomes per hectare in all EU-15 MS rose between 2000-2003 and 2007-2010 and between 2004-2006 and 2007-2010. Incomes also rose in the last period for all EU-10 MS.
- The final block reveals that total nominal incomes per hectare from gross margins and both forms of aids rose in all EU-15 MS between earlier periods and 2007-2010. This was also true for all EU-10 MS but one (the exception was Cyprus).
- Between 2000-2003 and 2007-2009, average annual growth in total nominal incomes in the individual EU-15 MS exceeded the average annual growth in their national FADN deflators in all but two MS (the exceptions were Luxembourg and the Netherlands). Therefore, we conclude that in all but two EU-15 MS the CAP measures helped to maintain or increase average real incomes per hectare between the two periods. The same conclusion holds for the EU-10, where comparisons of growth in nominal incomes and in FADN national deflators from 2004-2006 to 2007-2009 reveal a rise in average real incomes per hectare between these periods for all MS apart from Cyprus.

Table 6.18: Gross margins by MS, with and without coupled and decoupled payments, 2000-2003, 2004-2006 and 2007-2009 (€ per hectare)

	GM minus coupled aids			Gross margin			GM plus decoupled minus coupled			GM plus decoupled aids		
Country	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009
Austria	632	560	783	1,165	930	992	633	765	1,091	1,166	1,135	1,300
Belgium	730	946	850	1,020	1,059	915	730	1,148	1,187	1,021	1,261	1,253
Denmark	786	1,043	1,152	1,104	1,163	1,164	792	1,238	1,459	1,109	1,359	1,470
Finland	271	231	350	658	528	520	282	318	570	669	615	740
France	494	497	690	846	764	773	498	593	963	850	859	1,046
Germany	556	565	709	877	686	729	561	762	1,011	882	883	1,031
Greece	400	364	621	750	654	677	401	465	1,027	750	755	1,082
Ireland	607	599	658	929	758	715	612	822	1,029	934	980	1,086
Italy	662	771	961	1,033	1,007	1,052	669	1,005	1,311	1,040	1,241	1,403
Luxembourg	599	533	634	868	732	792	611	665	856	880	865	1,014
Netherlands	1,810	1,188	2,055	2,239	1,505	2,119	1,810	1,318	2,432	2,239	1,635	2,496
Portugal	301	276	500	522	490	603	302	405	757	522	619	861
Spain	269	271	396	448	406	451	270	315	532	448	451	587
Sweden	376	412	547	635	525	579	386	542	753	646	655	786
UK	510	511	724	818	638	775	517	709	989	826	836	1,040
EU-15	501	538	705	812	716	759	505	691	978	816	869	1,032
Country		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009
Cyprus		159	9		261	11		239	240		341	242
Czech Republic		381	496		449	515		455	684		522	703
Estonia		176	248		231	302		211	322		266	376
Hungary		415	518		490	569		493	659		568	710
Latvia		212	341		272	426		243	409		304	493
Lithuania		184	350		234	389		230	433		280	472
Malta												
Poland		307	429		332	449		422	612		447	631
Slovakia		274	342		318	408		328	444		372	511
Slovenia		563	684		1,128	975		576	1,313		1,140	1,603
EU-10		313	422		370	467		380	556		438	601
Country			2007-2009			2007-2009			2007-2009			2007-2009
Bulgaria			279			279			382			382
Romania			233			235			353			354
EU-2			253			254			365			366

Source: Derived from analysis of the FADN database for COP specialist producers.

6.15.3 Analysis of Farm Net Value Added

Table 6.19 describes the changes in nominal Farm Net Value Added (FNVA) per hectare for COP specialist holdings over time, building up, as in Table 6.18, from an estimate of income without either coupled or decoupled aids, to one including the coupled aids, and then to one including only decoupled aids, and finally to one that includes both coupled and decoupled aids in producers' incomes. In this manner, one can identify the contributions of the different aids under the CAP to producer incomes.

FNVA, FADN variable SE411, equals [Gross Farm Income (value of output *minus* specific costs, overheads and taxes) *minus* depreciation], including income from coupled and decoupled aids. FNVA per hectare is derived by dividing total FNVA by total UAA for the holdings.

The structure of the table follows the same format as Table 6.18. The first block, on the left, is the FNVA per hectare without any aids, whether coupled or not. The second block includes coupled aids in the income per hectare. The third block includes decoupled, but not coupled, aids per hectare in the value of income in the table. The final block, towards the right of the table lists full FNVA, including all coupled and decoupled aids. We observe that:

- The first block, which does not include either coupled or decoupled aids in the income, implies rising FNVA per hectare over time for the EU-15 and EU-10 groups of MS as a whole. However, there are several MS which would have recorded negative FNVA per hectare in some periods in the absence of the aids. Two MS, Finland and Cyprus, would have experienced negative FNVA in each period in the table under this restrictive simulation regarding aids under the CAP.

- When coupled aids are included, but decoupled payments are not, every MS but one (Cyprus in 2007-2010) received a positive FNVA per hectare in each period in the table. Over time, reductions in coupled payments tended to reduce estimates of income per hectare. In the EU-15 only holdings in Portugal would have received a higher FNVA per hectare in 2007-2010 than in 2000-2003 if decoupled payments had not been paid.

- In the third block, which includes decoupled, but not coupled, aids in FNVA per hectare, the shift in policy towards decoupled payments was reflected in rising FNVA per hectare in all MS, with one exception, which was the Netherlands, where there would have been a decline between 2000-2003 and 2007-2010.

- The picture would have been fairly similar where both coupled and decoupled aids were included in the total, i.e., the actual FNVA in each period. For the EU-15 and EU-10 as groups, FNVA per hectare rose over time. However, in several MS, such as Finland and the Netherlands, FNVA per hectare fell between 2000-2003 and 2007-2009, while the FNVA per hectare declined between 2004-2006 and 2007-2009 for Cyprus.

- We have applied FADN national deflators to express FNVA estimates in real 2009 values. In addition, to take account of the growth that typically occurred in the average size of holdings, we have computed FNVA per holding, and then converted it into real terms. We found that real FNVA per holding fell from 2000-2003 to 2007-2009 in five of the EU-15 MS (Belgium, Finland, Ireland, Netherlands and Spain), but rose in the other ten MS.

- For the EU-10, real FNVA per holding fell in two MS from 2004-2006 to 2007-2009 (Cyprus and Slovenia), but increased in seven MS (Malta is not included in the data).

- We conclude that overall the CAP measures helped to raise real FNVA per holding, but that they did not prevent real incomes from falling in a significant number of MS.

Table 6.19: Farm Net Value Added by MS, with and without coupled and decoupled payments, 2000-2003, 2004-2006 and 2007-2009 (€ per hectare)

	FNVA Without Any Aids			FNVA Without Decoupled Aids			FNVA Without Coupled Aids			Farm Net Value Added		
Country	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009
Austria	116	19	197	648	388	406	116	223	505	649	593	715
Belgium	311	354	277	602	467	342	311	556	615	602	669	680
Denmark	210	374	382	527	494	394	215	569	689	532	690	700
Finland	-45	-113	-73	342	184	97	-34	-26	147	353	272	317
France	35	23	140	387	289	222	39	118	413	391	384	495
Germany	103	109	201	424	230	222	108	306	504	429	427	524
Greece	84	57	214	434	347	270	85	158	620	434	447	675
Ireland	277	221	184	599	379	241	282	443	555	604	601	612
Italy	230	298	414	602	534	506	237	532	765	609	768	856
Luxembourg	38	-12	18	307	187	176	49	120	240	318	320	398
Netherlands	1,047	218	610	1,476	536	674	1,047	349	987	1,476	666	1,051
Portugal	47	-11	212	268	203	315	47	117	469	268	331	573
Spain	150	132	224	329	267	278	150	176	360	329	311	414
Sweden	-86	-46	110	174	67	143	-75	84	317	185	197	349
UK	86	39	204	395	167	256	94	238	469	402	365	521
EU-15	106	109	214	417	288	268	111	262	487	422	440	541
Country		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009
Cyprus		-40	-110		62	-108		40	121		142	123
Czech Republic		82	102		149	121		155	290		223	309
Estonia		37	33		92	87		72	107		127	161
Hungary		121	181		196	233		199	323		274	374
Latvia		34	84		94	168		65	151		126	236
Lithuania		91	199		141	238		137	281		187	320
Malta												
Poland		86	131		111	151		200	314		225	333
Slovakia		2	-17		47	49		57	85		101	152
Slovenia		176	44		740	334		188	673		753	963
EU-10		74	116		131	161		142	250		199	295
Country			2007-2009			2007-2009			2007-2009			2007-2009
Bulgaria			139			139			241			242
Romania			74			76			194			196
EU-2			102			103			214			215

Source: Derived from analysis of the FADN database for COP specialist producers.

6.15.4 Analysis of Net Farm Incomes

In Table 6.20, we examine the contribution of coupled and decoupled aids to nominal Net Farm Income (NFI) per hectare for COP specialist producers in each MS.

NFI is FADN variable SE420 and equals [FNVA *minus* wages, rent, interest and *plus* the balance of current subsidies and taxes]. This includes payments of coupled and decoupled aids; thus NFI corresponds to the incomes received by the unpaid family members of the enterprise.

The basic layout of the table is again the same as Table 6.18. It starts on the left with a block of three columns, which contain estimates of incomes per hectare after subtracting both coupled and decoupled aids. The next block adds the income from coupled aids to the values in the first block. The third block adds decoupled aids to the values in the first block, but excludes coupled payments. Finally, the last block indicates how incomes evolved with all aids included. (It will be recalled that this last statistic, including all sources of farm income, corresponds to the definition of Net Farm Income in the FADN database.)

- The first block, subtracting both coupled and decoupled aids from NFI, paints a bleak picture. For the EU-15, EU-10 and EU-2 MS as combined groups, it emerges that there would have been negative incomes overall in each period in this block. Some MS would have earned positive incomes in some periods, but they are not representative of the groups as a whole. The best that can be said about trends over the decade from 2000 is that the negative incomes for the EU-15 and EU-10 as groups were reduced over time.
- In the second block, which includes coupled aids but not decoupled payments, net incomes were negative in some MS in some periods. For the EU-15 MS as a group, net incomes declined over the three periods in the absence of decoupled aids. This reflects the shift of supports under the MTR away from coupled towards decoupled payments. For the EU-10, incomes per hectare would have risen slightly between 2004-2006 and 2007-2010. For the EU-2, they would have been negative in 2007-2009.
- In the third block, which includes decoupled, but not coupled, aids in incomes per hectare, incomes rose over time in many, but not all, MS, and in the EU-15 MS as a group, they were negative in 2000-2003. All but three MS (Cyprus, Denmark and Slovakia), recorded positive incomes in 2007-2010 under this assumption.
- The final block reveals that total incomes per hectare from all sources (corresponding to the definition of Net Farm Income) rose between earlier periods and 2007-2010 in most, but not all, MS. Even with both aids included in estimates of incomes per hectare, Cyprus, Denmark and Slovakia recorded negative NFI per hectare in 2007-2010.
- As with the previous FNVA analysis, we computed the real NFI per holding, applying FADN national deflators to nominal estimates of the NFI per holding per MS.
- Real NFI per holding fell between 2000-2003 and 2007-2009 in six of the EU-15 MS (Belgium, Denmark, Finland, Ireland, Netherlands and Spain), but rose in the other nine.
- For the EU-10, real NFI per holding fell in three MS from 2004-2006 to 2007-2009 (these were Cyprus, Slovakia and Slovenia). It rose in six EU-10 MS.
- We conclude that overall the CAP measures helped to increase real NFI per holding in most MS, but did not prevent real incomes from falling in a significant number of MS.

Table 6.20: Net Farm Income by MS, with and without coupled and decoupled payments, 2000-2003, 2004-2006 and 2007-2009 (€ per hectare)

	NFI Without Any Aids			NFI Without Decoupled Aids			NFI Without Coupled Aids			Net Farm Income		
Country	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009	2000-2003	2004-2006	2007-2009
Austria	-53	-145	11	480	225	220	-52	60	319	480	430	529
Belgium	33	142	-162	324	255	-97	34	344	175	324	458	241
Denmark	-299	-215	-512	19	-95	-501	-293	-20	-205	24	101	-194
Finland	-155	-224	-214	232	73	-44	-144	-137	5	243	160	176
France	-145	-149	-45	207	118	38	-141	-54	228	211	213	311
Germany	-215	-204	-143	107	-83	-123	-210	-7	159	112	114	179
Greece	-68	-113	15	281	176	71	-68	-13	421	282	277	476
Ireland	10	62	61	333	220	118	15	284	432	337	443	489
Italy	77	95	214	449	331	306	84	329	565	456	564	656
Luxembourg	-143	-165	-140	126	34	18	-131	-33	83	138	166	241
Netherlands	796	-9	180	1,225	308	244	796	121	557	1,225	438	621
Portugal	-14	-53	149	207	161	252	-14	76	406	207	289	509
Spain	79	76	159	257	212	214	79	120	295	257	256	350
Sweden	-246	-205	-77	14	-92	-44	-235	-75	130	24	38	163
UK	-161	-191	3	147	-63	55	-154	8	268	155	135	319
EU-15	-108	-116	-47	203	62	7	-103	36	226	208	215	280
Country		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009		2004-2006	2007-2009
Cyprus		-237	-267		-134	-265		-156	-36		-54	-35
Czech Republic		-66	-80		2	-62		8	108		76	127
Estonia		29	14		84	67		64	88		119	142
Hungary		-48	0		27	52		30	142		105	193
Latvia		9	2		70	87		41	70		101	155
Lithuania		83	187		133	226		129	270		179	309
Malta												
Poland		16	30		41	50		131	213		156	233
Slovakia		-126	-172		-82	-106		-72	-69		-27	-3
Slovenia		181	119		746	409		194	748		759	1,038
EU-10		-30	-9		27	36		38	125		95	170
Country			2007-2009			2007-2009			2007-2009			2007-2009
Bulgaria			-3			-2			100			100
Romania			-46			-45			73			75
EU-2			-28			-27			85			86

Source: Derived from analysis of the FADN database for COP specialist producers.

6.15.5 Nominal and real Net Family Incomes (NFI) per Family Work Unit (FWU)

The most important indicator of income for a farming family is likely to be the NFI/FWU. This reflects changes in income per hectare, in the size of holdings and also in the number of family workers per holding. Table 6.22 describes the growth in nominal NFI /FWU in EU-15, EU-10 and EU-2 MS by farming type and size of holding. It is apparent that large holdings (over 40 ESU in size) consistently earn higher NFI/FWU than medium sized holdings (8-40 ESU in size); and that the medium sized holdings earn more than the small holdings (of less than 8 ESU in size). There is no clear trend in NFI/FWU. This is not surprising in view of the volatility of prices over the past decade. However, if one fits a linear trend to time series of nominal data in the table, most, but not all, the series rise over time. The exceptions all relate to Mixed Crop & Livestock holdings, for which all three size classes of EU-15 holdings saw a decline in nominal NFI/FWU over time.

To determine the trends in real NFI/FWU by MS and by farming type, we have applied FADN deflators by MS to the nominal values to correct for inflation in each MS. We have applied those deflators and estimated the linear trends in real NFI/FWU for the three farming types. The results are presented by MS, unlike the data in Table 6.21, since, in the absence of the weights in the FADN database required to combine real data across MS, it is a major task to aggregate the data across MS. The real NFI/FWU series for COP specialist, Mixed Crop & Livestock and General Field Crop producers by MS are described in Tables 6.23-6.25.

As with the nominal NFI/FWU series, there is no clear trend in the real incomes by MS, since fluctuations in crop prices introduce volatility to the incomes from one year to another. Table 6.21 pulls together conclusions from the three tables, summarising the trends from the data in Tables 6.23-6.25. It lists the names of EU-15 MS in which real NFI/FWU declined from 2000-2003 to 2007-2009; then the names of EU-15 MS in which real NFI/FWU declined between 2004-2006 and 2007-2009; and finally the names of EU-10 MS in which real NFI/FWU declined between 2004-2006 and 2007-2009.

Only in General Field Crop holdings are there MS (Italy and Spain) that are among the ten MS with the largest cereal areas and are listed as experiencing a fall in their real NFI/FWU in the period until 2007-2009. The other MS mentioned in the table are smaller cereal producers.

Table 6.21: Number of EU-15 and EU-10 MS in which real NFI/FWU declined after the MTR

	Number of MS with Decline in Real NFI/FWU to 2007-2009		
EU-15, from	COP Specialist	Mixed Crop & Livestock	General Field Crop
2000-2003	1	2	2
MS with declines	Denmark	Cyprus Slovenia	Denmark Spain
2004-2006	3	3	3
MS with declines	Denmark Ireland Netherlands	Denmark Ireland Netherlands	Denmark Italy Spain
EU-10, from	COP Specialist	Mixed Crop & Livestock	General Field Crop
2004-2006	2	1	4
MS with declines	Cyprus Slovenia	Cyprus	Estonia Latvia Malta Slovakia

Source: Derived from the FADN database for COP specialist, mixed crop & livestock, and general field crop holdings.

We conclude that CAP measures providing coupled and decoupled aids, as well as support for producer prices via intervention buying and border measures, have generally maintained the real NFI/FWU of the holdings most heavily dependent upon the production of cereal crops. In a clear majority of MS, an increase has occurred in this measure of real incomes. However, this cannot be attributed to the changing balance of decoupled and coupled aids, since their real combined value has fallen slightly over the period under review.

Table 6.22: Nominal net farm income per Family Work Unit (€ per FWU)

EU-15		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
General	Small	6,059	6,658	6,360	6,365	6,643	7,721	7,233	9,820	8,902	6,347
Field	Medium	13,029	13,942	13,560	13,427	12,937	13,774	13,123	17,386	14,744	12,884
Crop	Large	30,942	34,122	31,321	49,527	40,424	40,933	48,147	52,632	47,246	36,865
Mixed	Small	5,684	6,249	6,917	6,112	5,678	6,078	5,766	6,075	5,197	6,353
Crop &	Medium	13,002	13,547	12,929	12,955	12,573	12,898	12,999	15,547	11,687	9,337
Livestock	Large	28,670	27,031	19,330	23,361	26,856	26,947	30,110	33,276	14,964	13,033
Specialist	Small	5,406	5,641	4,930	4,963	6,279	9,453	10,121	18,380	8,284	6,580
COP	Medium	13,803	12,860	12,243	12,523	13,752	10,855	15,282	26,406	18,077	8,859
Holdings	Large	27,849	25,404	25,756	32,685	32,124	26,301	37,167	66,170	43,276	22,224
EU-10		**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
General	Small					3,467	3,950	5,323	5,526	4,934	4,565
Field	Medium					10,988	9,587	10,993	13,737	12,997	10,100
Crop	Large					34,647	33,792	19,876	58,095	45,201	35,995
Mixed	Small					2,419	2,485	2,783	3,424	3,134	2,842
Crop &	Medium					7,920	7,168	8,373	10,160	9,004	7,213
Livestock	Large					26,975	24,066	30,307	43,097	33,101	27,591
Specialist	Small					3,778	3,734	4,210	6,456	5,394	3,797
COP	Medium					14,522	10,455	12,067	22,602	17,777	11,657
Holdings	Large					42,574	32,350	29,008	71,516	53,521	30,169
EU-2		**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
General	Small								2,911	6,120	5,181
Field	Medium								8,588	13,969	29,631
Crop	Large								40,422	18,621	76,405
Mixed	Small								1,756	2,954	2,828
Crop &	Medium								8,057	5,767	6,500
Livestock	Large								29,779	7,843	16,707
Specialist	Small								2,188	3,762	2,875
COP	Medium								8,032	13,648	12,850
Holdings	Large								57,068	140,966	79,836

Source: Derived from analysing the FADN database for COP specialist, mixed crop & livestock, and general field crop holdings. Small holdings are <15 ESU; medium ones are 15-40 ESU; large ones are >40 ESU.
Note: The very high figure for large EU-2 holdings for COP specialists in 2008 and 2009 and for general field crop holdings in 2009 reflect the inclusion of a small number of holdings with very high NFI/FWU.

Table 6.23: Real net farm income per Family Work Unit by MS for COP specialists (2009 € per FWU)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria	25,311	27,446	24,130	30,207	28,136	27,076	32,028	42,144	40,437	21,832
Belgium	27,049	27,901	29,359	29,082	28,232	24,190	29,484	67,562	24,411	-13,918
Denmark	17,735	5,507	-9,876	4,334	1,270	12,898	31,366	20,059	-60,207	-46,456
Finland	26,561	20,105	22,787	19,468	15,681	14,207	20,377	50,579	14,084	2,480
France	28,595	21,859	26,351	27,054	26,045	19,703	28,370	57,720	38,708	8,891
Germany	25,280	26,557	14,233	22,127	31,393	17,568	24,509	41,738	35,519	25,046
Greece	13,701	15,393	12,822	11,275	13,194	11,685	14,370	25,992	16,208	12,589
Ireland	53,579	41,966	33,720	56,754	59,199	33,199	45,568	68,402	31,864	22,514
Italy	20,445	22,009	21,931	24,777	28,882	31,881	35,535	49,649	31,350	25,455
Luxembourg	31,789	3,524	11,839	12,271	8,734	24,229	14,605	49,080	22,593	10,553
Netherlands	788	44,141	33,002	156,222	34,130	24,968	66,375	56,143	21,464	36,313
Portugal	19,811	19,568	14,026	14,408	14,481	8,971	15,525	19,932	24,683	14,944
Spain	36,507	29,959	29,859	30,492	32,093	16,842	25,954	42,331	35,497	19,285
Sweden	1,186	3,824	4,542	5,008	9,870	5,579	1,789	56,520	35,046	-6,022
UK	26,140	18,946	36,756	49,641	21,780	23,899	40,537	91,486	72,464	40,262
Cyprus					-14,577	10,368	2,236	-2,740	-14,534	10,224
Czech Republic					18,288	12,403	17,600	31,778	22,865	14,308
Estonia					35,804	29,258	20,472	55,272	35,518	21,760
Hungary					32,587	26,915	25,839	46,020	43,043	20,794
Latvia					34,698	25,792	31,189	56,206	41,676	16,853
Lithuania					44,422	36,188	31,123	69,667	52,379	36,496
Poland					19,318	10,476	16,020	27,229	15,980	12,298
Slovakia					12,902	11,387	-629	36,036	18,006	1,742
Slovenia					66,280	47,215	4,466	28,521	29,445	15,089
Bulgaria								37,718	56,864	40,968
Romania								22,151	15,693	11,308

Source: Derived from analysis of the FADN database for COP specialist producers, applying national deflators from the same database.

Table 6.24: Real net farm income per Family Work Unit by MS for mixed crop & livestock holdings (2009 € per FWU)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria	21,646	26,202	21,295	20,229	20,801	21,869	26,226	30,132	26,163	21,602
Belgium	34,550	38,519	28,748	45,683	38,430	36,220	44,648	48,566	30,878	28,158
Denmark	53,569	61,511	-23,735	-22,703	14,646	2,207	26,500	-37,631	-187,304	-109,714
Finland	17,659	19,565	21,450	18,985	17,132	19,047	19,593	25,043	19,851	18,735
France	27,074	25,628	25,347	22,809	23,340	23,093	25,230	33,815	26,127	8,445
Germany	26,666	19,492	12,462	13,474	26,215	22,486	22,810	28,109	21,348	18,403
Greece	13,724	13,672	14,056	13,939	14,480	16,212	18,100	16,878	13,241	15,279
Ireland	29,038	27,038	23,511	30,310	33,832	28,727	28,568	32,454	18,981	17,427
Italy	26,274	26,104	27,325	37,671	27,217	31,938	29,323	38,403	35,953	28,523
Luxembourg	31,424	43,357	30,896	36,925	31,212	31,278	42,661	46,795	28,978	12,264
Netherlands	30,597	19,660	5,501	9,956	2,697	23,103	36,265	25,317	20,640	19,863
Portugal	14,046	11,767	10,601	12,164	12,930	7,546	9,100	7,605	8,696	8,652
Spain	37,698	36,115	39,914	40,394	42,199	37,812	40,066	44,812	37,512	29,689
Sweden	3,877	9,164	-1,137	-4,870	-2,564	5,423	-611	23,152	11,576	1,762
UK	18,240	13,713	24,054	37,121	24,713	30,855	30,847	39,027	36,106	27,233
Cyprus					13,086	9,210	6,196	1,827	9,822	9,672
Czech Republic					14,644	13,691	18,127	19,433	18,041	10,908
Estonia					17,457	15,745	18,282	34,090	25,319	8,166
Hungary					18,542	20,555	27,868	31,030	29,159	24,527
Latvia					19,402	15,519	27,648	23,532	15,292	15,441
Lithuania					17,943	21,532	16,466	24,746	19,440	17,284
Malta					12,488	10,526	14,840	15,869	37,845	8,607
Poland					12,599	10,609	15,173	16,096	38,227	8,607
Slovakia					7,542	5,992	8,122	10,064	8,006	7,223
Slovenia					15,744	7,589	12,728	76,750	-45,426	44
Bulgaria								11,154	14,382	11,541
Romania								11,840	7,197	5,691

Source: Derived from analysis of the FADN database for Mixed Crop & Livestock producers, applying national deflators from the same database.

Table 6.25: Real net farm income per Family Work Unit by MS for General Field Crop holdings (2009 € per FWU)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria	25,726	28,286	27,372	29,075	33,618	29,644	36,647	48,777	45,611	28,818
Belgium	45,980	47,163	43,299	59,703	46,000	41,350	57,319	62,460	43,627	37,310
Denmark	33,545	32,130	4,364	36,714	9,050	19,109	26,434	19,357	-47,847	-39,750
Finland	23,795	23,202	19,685	17,503	20,564	18,599	15,718	35,681	22,813	14,887
France	33,729	35,045	30,196	34,812	29,164	24,230	38,522	51,256	40,435	17,328
Germany	25,166	27,459	20,994	32,438	30,558	34,418	43,925	49,110	39,746	28,672
Greece	14,153	14,341	14,277	13,957	12,776	12,968	14,111	20,496	17,542	16,794
Ireland	52,282	42,310	43,348	36,407	22,828	42,849	64,574	59,770	37,908	2,729
Italy	21,603	25,705	27,114	49,283	49,183	43,522	35,907	34,884	42,656	42,635
Luxembourg	12,811	43,365	13,967	2,680	12,201	13,940	39,906	43,793	54,583	35,020
Netherlands	17,595	56,138	22,912	41,004	6,811	37,244	69,681	65,893	41,575	57,803
Portugal	22,167	16,824	20,506	18,158	25,156	14,929	13,761	16,537	33,268	20,030
Spain	34,395	32,815	35,073	29,978	29,762	24,748	27,148	28,848	28,321	19,969
Sweden	4,464	15,343	13,297	15,002	6,677	10,191	13,470	35,353	40,023	8,041
UK	68,473	35,631	43,468	79,555	22,101	50,739	80,600	103,043	96,959	65,929
Cyprus					4,450	9,118	8,593	10,022	15,872	8,245
Czech Republic					16,977	17,305	14,714	34,500	17,380	19,515
Estonia					10,756	18,339	12,079	13,185	10,871	10,620
Hungary					27,414	25,138	37,112	36,555	25,811	28,594
Latvia					35,171	26,828	28,659	20,044	12,186	-1,166
Lithuania					41,611	34,765	26,967	57,820	53,271	40,704
Malta					14,799	11,331	12,152	8,817	13,635	4,365
Poland					12,542	9,871	12,686	16,374	13,966	11,554
Slovakia					12,168	10,772	-461	28,262	-3,546	-12,583
Slovenia					15,420	23,232	5,826	35,449	37,173	27,198
Bulgaria								10,518	8,723	4,419
Romania								9,172	10,385	22,281

Source: Derived from analysis of the FADN database for General Field Crop producers, applying national deflators from the same database.

6.15.6 The impact of the measures on the volatility of producer income

We hypothesise that one respect in which CAP reform and the movement away from coupled towards decoupled payments may have affected producer incomes is in the volatility of these incomes, by changing supports from some that were tied to the production of particular crops. Coefficients of variation are not an appropriate indicator of volatility in this instance, since, in some cases, the mean income in Table 6.26 (the denominator for the calculation) is negative. Therefore, we have focused instead on the standard deviation of annual incomes as a guide to the volatility of incomes under the different assumptions.

Again, we compare the gross margin approach with the NFI and FNVA measures of income, where all are based on data derived by analysis of the FADN database. The results of the comparison for the EU-15 and EU-10 (we have not included the EU-2, as we have only three years of data in the FADN database from which to compute volatilities) are presented in the table. The column headed 'Full income' is the actual income received by producers, including all aids. 'Income without any aids' is the counterfactual with no coupled or decoupled aids.

We observe that, if we use gross margins as the basis for determining producer incomes, the CAP measures, including both coupled and decoupled aids, made minimal difference to the volatility of EU-15 incomes under the three alternative ways of measuring income. Standard deviations of the income with no aids (the first column) and of the income with both aids (the fourth column) were virtually identical for the EU-15 MS. The absence of coupled aids, which were very important in the period before the MTR, would have increased volatility a great deal. The absence of decoupled aids would have affected mainly NFI and FNVA, raising the volatility of their measures of income in the EU-15.

For the EU-10, decoupled aids are the main forms of support they received directly under the CAP. That explains why the third and fourth columns of the table both of which include decoupled payments, reveal higher volatility than the figures in the first two columns, in particular where gross margins are taken to be the indicators of income. Using NFI or FNVA as indicators of income, the CAP measures had no appreciable effect on income volatility.

Table 6.26: Standard deviations of producer incomes under alterative definitions of income (€ per hectare)

EU-15 (2000-2009)	Income without any aids	Income without decoupled aids	Income without coupled aids	Full income
Gross margin	118	102	231	122
Net Farm Income	81	134	175	83
FNVA	90	121	193	93
EU-10 (2004-2009)				
Gross margin	99	97	118	115
Net Farm Income	76	77	78	75
FNVA	81	81	87	85

Source: Derived from analysis of the FADN database for COP specialist holdings.

We conclude that the coupled and decoupled aids, when combined, have not significantly affected the volatility of producer incomes, when compared with the counterfactual of no such CAP measures. This is particularly evident in the case of the two indicators of income that are closest to the indicators likely to be used by producers, namely the Net Farm Income and the Farm Net Value Added per hectare.

6.16 Key conclusions

Production cost comparisons in the EU and US reveal that the EU is particularly competitive in the production of common wheat and barley, both of them crops in which the EU is a net exporter. In maize, the US is more competitive, with only Hungary, among the EU MS studied in this chapter, broadly in line with US production costs. Exchange rate shifts proved to be of no value in explaining changes in US versus EU competitiveness in cereal production over time.

Ukraine and Russia, between them, are very competitive producers of these three leading cereal crops. Therefore, TRQs were needed to avoid an unreasonable increase in intervention stocks.

The CAP measures have had a major impact on the profitability and levels of cereal output. Among the more important of the measures were coupled aids, which include arable payments, Article 69/68 aids and supplementary payments for specific crops.

Comparisons of post-reform changes in maize areas in MS that had applied higher coupled aids for maize than other cereals with the area changes in MS without coupled aids favouring maize demonstrated that the former group, which saw a reduction in the advantage of maize versus other cereals in terms of coupled aids, suffered a bigger drop in maize areas than other MS.

Defining international technical competitiveness in terms of crop yields, the EU performs very well in wheat and barley, but less well in maize. The EU also fares well in its yield volatility, an indicator of the perceived riskiness of the EU as a cereal supplier. It fares poorly in worldwide comparisons of the growth in yields in barley and maize, but achieves above average growth in common wheat yields. This is particularly good in view of an overall drop of 0.9% in yields attributed by our analysis to the ending of compulsory set-aside (which tended to be on low yielding land).

The impact of coupled aids on gross margins and on area plantings was analysed across MS and across crops. We concluded that the provision of coupled aids did affect crop choice and that the removal of coupled aids contributed to the reduction of the total area planted to COP crops.

Simulations of the counterfactual case of the absence of coupled aids and of set-aside indicate that their removal would have reduced total areas planted to the main cereal crops by 2.6%. The biggest reduction would have been in durum wheat (down 8.9%), which benefits more than others from coupled aids. Among MS, the biggest decline would have been in Greece, with a 13.1% fall in its arable crop area, reflecting its large dependence on durum wheat.

We conclude that CAP reforms boosted the EU share of world wheat trade, thanks to the decision not to grant export refunds on wheat products (which removed limits on subsidised exports under the WTO Uruguay Round), the ending of set-aside and decline in coupled aids. Evidence of the competitiveness of EU wheat exports was also provided by the maintenance of the EU's share of import markets where Black Sea exporters are major competitors. In the feed barley and maize sectors, less improvement has occurred in market orientation, since import barriers and intervention buying helped to maintain internal market prices above world market levels.

Within the domestic market, the availability and quality of local cereal supplies have generally been considered to have remained good by end-users after the CAP reforms. In the feed sector, price competitiveness of local feed cereals has reinforced the impact of the measures restricting imports of GM products in raising the cereal share of feed ingredients.

Our analysis of the effect of CAP measures on the level and volatility of cereal prices indicates that the CAP measures limiting annual sales to intervention stocks, as well as the relaxation of border measures, might have reinforced the correlations between internal and world market prices for the two main export cereals, common wheat and barley. For maize, in which the EU is a small net importer, the differential between internal prices and world export prices is more variable and the correlation between the two sets of prices declined in 2007-2010.

Internal price levels for all cereals in 2007-2010 were much higher than before the MTR; but this was mainly due to external developments, as world market prices also rose considerably. The premia of EU over world prices fell (or the discount rose) for two of the three main cereals. We attribute this to the combined impact of the CAP measures mentioned earlier. Barley was the exception; sales into intervention maintained the EU premium over world market prices.

Higher price volatility is partly explained by the greater openness of EU markets, which transmitted the higher volatility in world markets. Yet, this does not explain why volatility should have been greater inside the EU than outside for all major cereals from 2007 to 2010.

For common wheat, the higher volatility may be explained by the discount of internal prices on world prices, as this reduces the denominator in the calculation of the coefficient of variation, raising its magnitude. For both barley and maize, internal market prices were above world market levels, which should pull internal price volatility below that in the world market. Sales of cereals into intervention provided a cushion against low prices, which also should have lowered internal price volatility. Analysis of producer prices across MS demonstrates that one cannot blame poor transmission of price changes in the internal market, either.

In practice, a wide variety of external factors, ranging from the influence of climate on local prices and changes in sea freight rates (linking export and import markets), as well as trading on domestic futures markets, affect price volatility, and these have not been analysed here.

The rise in price volatility encouraged a much wider use of futures and options contracts for price risk management. Trading volumes in EU wheat futures are now large enough to provide the liquidity and depth needed for large companies to these contracts for the hedging of substantial tonnages of cereals to be possible without causing price distortions.

The combined impact of coupled and decoupled payments in the CAP measures was found to have helped to maintain EU-15 producers' incomes in nominal terms, but to have reduced them by a small annual amount (estimated at 0.7% for the EU-15 MS) in real terms.

More broadly, we concluded that CAP measures maintained or boosted average real incomes per hectare in the majority of MS, on the basis of gross margins. Applying two alternative definitions of income per holding, one based on Farm Net Value Added and the other on Net Farm Income, we concluded that the CAP measures helped to raise real income per holding, but that they did not prevent real incomes from falling in a significant number of MS.

The CAP measures also helped to maintain the real Net Farm Income per Family Work Unit on holdings in the main cereal producing MS.

Analysis of the volatility of producer incomes taking into account coupled and decoupled aids revealed minimal impact from such CAP measures, when the outcome is compared with the counterfactual of no such CAP measures.

Chapter 7: Evaluation Question 7

***Evaluation Question 7**: To what extent have the 2003 and subsequent changes in the CAP measures applicable to the cereals sector influenced the administrative costs for the cereal producers?*

7.1 Interpretation of the question

The definition of administrative costs for cereal producers may be interpreted in terms of time and actual financial costs of complying with obligations. The 2003 and subsequent reforms identified simplification and the reduction of red tape as core objectives. A difficulty in addressing this question is in disentangling changes attributable to specific changes in cereal measures in the minds of producers. A further consideration, external to CAP measures, is the extent to which the overall administrative burden on farms has changed as a result of greater national or end-user requirements (for example with the increased use of processor assurance schemes). The sources of information have been the producer questionnaires, interviews with representative producer organisations, farmer cooperatives and national payment agencies responsible for administering CAP schemes at the farm level. Table 7.1 presents the main judgement criteria, indicators and data sources relevant to EQ7.

Table 7.1: Judgement criteria, indicators and data sources (EQ7)

Judgement Criteria	Indicators	Data Sources
Complexity of the administration of measures from the perspective of producers	Changes in the administrative burden on producers and official agencies	National and regional payment agencies Producer questionnaires
Complexity of the administration of measures from the perspective of government agencies	Changes in the administrative burden on producers and official agencies	National and regional payment agencies Producer questionnaires

7.2 Our hypotheses

Key outcomes of the 2003 reform were the introduction of the single CMO and decoupling. The net effect was a reduction in the number of sector-specific schemes. However, our hypothesis is that the change would initially have been associated with greater administrative complexity from a producer perspective, given MS chose to apply different implementation models under the SPS. Coupled supplementary payments continued to apply before being phased out until relatively late in the evaluation period under the Health Check[1]. As improvements were made to these measures, however, the financial costs and time associated with administrative tasks should have eased over time. To test this hypothesis, we assess producer responses from the questionnaires and the ease with which national payment agencies have been able to implement the new system.

Closely associated with the perception of administration on cereal farms is the requirement to apply a baseline set of standards to farm management under cross compliance. We would hypothesise, however, that in theory there should have been no change to administration costs given that simplification of some of the cross compliance standards was carried out under the Health Check, coming into effect relatively late in the review period (from 2010).

It should be noted that although the SPS and cross compliance are outside the direct focus of this evaluation, they nevertheless affect the overall administrative burden that cereal producers face.

[1] These are described in Chapter 3, Section 3.9.4.

7.3 Impact of CAP reform on farm-level administration

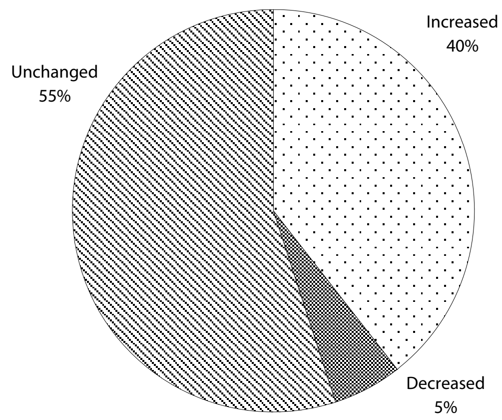
The major change over the period is the phasing out of coupled aids. The introduction of decoupling meant that administrative tasks were now carried out under the non-sector specific SPS, rather than the crop-specific area payment schemes.

In terms of how this development was viewed by producers, we consider the responses from the producer questionnaire. It is evident that of the 205 producers interviewed, 194 producers stated that the level of administration, which they associate with cereal measures, had either not changed or increased between the 2005 and 2010 periods. This is presented in Diagram 7.1. Only 5% (11 producers) had perceived a decline in the administrative burden. Despite simplification, their responses suggested that they perceived there to have been little change in the regulatory burden associated with CAP measures.

Where the responses were accompanied by further comments, it was clear that several producers recognised that administrative requirements now fell under the SPS.

It was also evident that some producers were treating the rise in the overall administrative burden in aggregate, rather than attributing it to specific measures. Increased paperwork was mentioned in relation to cross compliance in particular or increased audits under assurance or sustainability schemes that are driven by national or processor requirements, rather than being cereals or even CAP-related.

Diagram 7.1: Producer responses to changes in administration requirements since 2005



Source: LMC Producer Questionnaire, 205 respondents, with a minimum of 20 per MS.

To validate this statement, interviews were held with Copa-Cogeca which represents European farmers and national farming unions. Interviews were also held with regional farming unions and farm cooperatives in the cereal-producing regions of the different MS. These revealed that administration was closely associated with cross compliance rather than measures that were specifically cereals related. Furthermore, other measures such as the Natura 2000 scheme (the centrepiece of the EU nature and biodiversity policy)[2] were identified as sources of greater administrative cost, indicating that producers are not differentiating between administration for the CAP as a whole and administration attributable to the cereals sector. We conclude that the interviews with farming associations and cooperatives highlighted that they perceived there to be greater overall administration on-farm; however this was independent of CAP measures. Such examples included increased processor/end-user assurance requirements or compliance associated with national environmental management schemes.

7.4 Cross compliance

In terms of cross compliance, the increased paperwork required on-farm was identified as a heavy administrative duty and one that had become more onerous since 2005. This

[2] Natura 2000 is an EU-wide network of protected natural areas that make up 18% of EU land. http://ec.europa.eu/environment/nature/natura2000/index_en.htm.

development appears counter-intuitive as there had been no change in the level of paperwork until the Health Check which, in actual fact, sought to simplify certain cross compliance requirements.

This is a conclusion also reached in a 2007 evaluation of the administrative burden on farms:

> *"It should also be noted that the administrative costs related to cross compliance included in the scope of the study are relatively low. This is mainly explained by the relatively small number of farmers that is subject to cross compliance controls. However, cross compliance obligations create quite some anxiety among farmers"[3].*

The fieldwork identified that the major change over the period was concern over cross compliance penalisation[4]. While farmers have always been obliged to follow cross compliance rules, the rules have only been enforceable via audits and possible sanctions by the EU Commission since 2005. It had previously been assumed that MS were fulfilling their cross compliance measures and this finding suggests that this may not have been the case.

Table 7.2 presents official control statistics on cross compliance from 2006 to 2010 for when data are available. Although the table does not distinguish between sectors, it does provide useful indicators. It will be observed that since 2008, the total number of beneficiaries and percentage of those subjected to on-the spot checks declined across the EU-27. However those checked as a share of total claimants, was maintained above the required minimum control rate of 1%. The increase in the number of producers fined as a percentage of these checks might be interpreted as increased vigilance in the audit system and better risk analysis and/or increased cases of infringements of cross compliance standards.

Table 7.2: Overview of cross compliance claimants and inspections in the EU

		2006	2007	2008	2009	2010
EU-27	Number of beneficiaries	6,321,694	8,537,057	8,254,178	8,065,970	7,911,473
	Number of on-the-spot checks	371,138	270,290	257,159	204,230	178,903
	Checks as a percentage of beneficiaries	5.9%	3.2%	3.1%	2.5%	2.3%
	Fines as a percentage of checks	8.6%	16.2%	16.8%	17.3%	21.2%
EU-15	Number of beneficiaries	4,198,710	5,158,439	5,045,067	4,880,953	4,772,058
	Number of on-the-spot checks	238,515	180,454	165,666	137,620	113,247
	Checks as a percentage of beneficiaries	5.7%	3.5%	3.3%	2.8%	2.4%
	Fines as a percentage of checks	9.8%	15.4%	13.7%	13.5%	17.9%
EU-12	Number of beneficiaries	2,122,984	3,378,618	3,209,111	3,185,017	3,139,415
	Number of on-the-spot checks	132,623	89,836	91,493	66,610	65,656
	Checks as a percentage of beneficiaries	6.2%	2.7%	2.9%	2.1%	2.1%
	Fines as a percentage of checks	6.6%	17.9%	22.5%	25.2%	26.8%

Source: European Commission Annual Activity Reports (various issues).

Furthermore, in the interviews, producers' associations stated that the risks of a penalty increased as the range of farm activities and land use expanded. To validate this statement, Table 7.4 presents total inspection failures under cross compliance monitoring by the UK's

[3] 'Study to assess the administrative burden on farms arising from the CAP', Ramboll Management, October 2007. A study commissioned by DG Agriculture and Rural Development.

[4] While penalties are rarely applied, they can result in payments being reduced or withheld. In the case of negligence, the percentage of the overall SPS to be withheld is set at a maximum of 5%, or 15% for repeated offences. For intentional non-compliance, the parameters of the fine are meant to be between a minimum of 20%, and may go as far as total exclusion for one or more calendar years.

Rural Payment Agency, with data presented for the cereals and livestock sectors specifically. The data cover England only rather than for the whole of the UK. Unfortunately, similar data for the other MS are not available. However, the example demonstrates that the number of failed inspection rates is greater on livestock farms.

Indeed, there is a noticeable increase in total failed inspections in 2008 and 2009, suggesting increased vigilance (it should be noted that data on total inspections are not available). The table also presents the outcomes of failed inspections by contrasting the proportion of failed inspections that result in warning letters with the more severe category of fines (a greater then 5% reduction in payments). It is clear that there has been an increasing proportion of fines applied away from warning letters. However, for the cereal sector, the number of failed inspections showed no increase and even declined in 2008 and 2009. Therefore, for cereal growers the likelihood or severity of enforcement has not changed.

Table 7.3: Rural Payment Agency inspection statistics in England

	2006	2007	2008	2009	2010
Total number of inspections failed	1,793	1,858	2,026	2,459	1,848
Warning letters, % of total	24.2%	22.7%	10.9%	17.9%	10.7%
Greater than 5% reduction, % of total	3.5%	3.2%	5.6%	7.6%	12.8%
Number of inspections failed relevant to cereals	138	130	96	76	131
Warning letters, % of total	7.2%	20.0%	24.0%	30.3%	18.3%
Greater than 5% reduction, % of total	3.6%	3.8%	0.0%	2.6%	6.1%
Number of inspections failed relevant to livestock	1,419	1,213	1,286	1,804	1,267

Source: Rural Payment Agency – Cross Compliance Inspection Statistics.
Notes: The inspections relevant to cereals are SMR 1 to 5 and SMR 9. Those relevant to livestock are SMR 7 and 8.

Chapter 9 reveals that farmers expressed that concerns over possible penalisation has resulted in a greater adoption of zero grazing by some farmers wanting their livestock activities to be separate from their field operations. This is the system whereby dairy cattle, which are often managed intensively, are kept indoors in tightly-packed, warm barns. Interviewees argued that this development was because livestock farming was viewed as being particularly vulnerable to penalties, because of failings over issues such as the conditions under which animals are kept, the disposal of manure and nitrogen leaching into groundwater. Table 7.3 supports this view as it shows that livestock regulations are the greatest source of inspection failures. Overall they account for almost 70% of failed inspections. Chapter 9 reveals that an unexpected outcome over possible penalisation has resulted in a greater adoption of zero grazing by some farmers wanting their livestock activities to be separate from their field operations. It should be noted, however, that farmers can opt for this production method for efficiency reasons or for better working conditions. Therefore cross compliance should not necessarily be considered the only or most important motivation.

7.5 Impact of CAP reform on national payment agencies

As many of the measures vary depending on the MS, and as payment schemes are implemented at a national level, it is instructive to consider the experience of individual national payment agencies in implementing the changes. Feedback from those interviewed revealed that the administrative costs, in terms of labour, were greater with the initial introduction of the SPS. After teething problems were resolved, these agencies broadly stated that they welcomed the new measures. Unfortunately, there is very little quantitative information on this aspect by MS, even among the larger MS that would provide very interesting case studies. However these statements broadly corroborate the finding that the administrative cost of cereal-specific measures, applied at the farm level, have declined.

7.6 The impact of Article 68 measures

A further aspect that emerged from the fieldwork (although, again, this is external to cereal measures), was differences in the application and administration of Article 68 measures.

In Greece, one of the main users of Article 68 for durum wheat, the fieldwork revealed that insufficient guidance was provided by the Ministry of Rural Development and Food leading to high failure rates in applications. Furthermore, the cost of seed certification was stated to be so high as to nullify any advantage from the Article 68 payments.

In France, the fieldwork revealed that the use of a global fixed sum for Article 68 payments for protein crops resulted in a greatly varying payment per hectare, depending on uptake. This introduced significant confusion when farmers anticipating a fixed payment of €150 per hectare received an actual payment of €844 per farm. Producers stated that the subsequent smaller payment had the effect of reducing their plantings of protein crops the following year, which then resulted in a payment nearly 30% larger (based on lower claims).

Both examples demonstrate two points. First, the role of Article 68 measures which producers may not necessarily disassociate from other CAP measures has added to the overall administrative complexity. Second, calculation methods differ widely amongst MS and can potentially give rise to volatile changes in area and production. It should be noted that the actual payments per hectare are not known due to the absence of information requested from one major national payment agency.

7.7 Key conclusions on administrative costs for cereal producers

We have tested our hypothesis that the new measures should have resulted in a simplification of the administrative system, based on responses from the producer questionnaires and the ease with which national payment agencies have been able to implement the new system.

- The analysis of expenditure allocated to the cereals sector implies a strong decline in the administrative burden associated with cereal measures. While total expenditure has increased slightly, the amount allocated to administering specific cereals measures has plummeted.

- Interviews with cereal producers provided a different perception. It was evident that some producers surveyed were treating the rise in the overall administrative burden in aggregate, rather than attributing it to specific measures such as those applicable in the cereals sector. The majority of those surveyed stated that the level of administration, which were then incorrectly associated with cereal measures, had either not changed or increased between 2005 and 2010.

- National payment agencies, following a period of upheaval in implementing the new procedures, now believe that the system has been simplified and the costs of administering cereal-specific measures at the farm level have declined.

- Cross compliance measures are often perceived as the most problematic element of the administrative system. This is a counter-intuitive finding as cross compliance measures have not become more onerous. It appears that the shift to allowing the Commission to audit the measure has resulted in heightened concern over sanctions and has been associated with a greater administrative burden. This is despite the fact that actions required under cross compliance represent a minimum environmental standard, which was thought to have been enforced previously by payment agencies in individual MS.

Chapter 8: Evaluation Questions 8 & 9

Evaluation Question 8*: To what extent have the CAP measures applicable to the cereals sector contributed to fostering innovation in cereal production?*

Evaluation Question 9*: To what extent have the CAP measures applicable to the cereals sector contributed to fostering innovation in cereal use?*

8.1 Interpretation of the questions

Our discussion of innovation combines our answers to EQ8 and EQ9. At its most basic, innovation in production may occur when producers specifically target their output decisions to supply new or niche markets, a facet of increased market orientation discussed under EQ4. Innovation may also encompass the development of new cereal varieties to ensure that a larger proportion of supplies meets end-user needs or new varieties with higher yields, improved disease resistance or lower input requirements. While the development of new varieties is a continual activity, there are other factors which foster innovation. We review briefly the issue of GM to assess whether barriers to the cultivation of GM crops have had a discernible effect upon the seed sector, such as enabling the EU to develop a niche in the production and export of non-GM varieties. A further factor is the way in which national governments encourage innovation, with silage maize in Germany for biogas providing a good example. In terms of farming practices, the impact of both cross compliance and the drive to improve sustainability are measured by the application of inputs. Attention is paid to unintended changes that cross compliance may have had on farming activities.

Table 8.1 presents the main judgement criteria, indicators and evaluation tools used to address EQ8 and EQ9.

Table 8.1: Judgement criteria, indicators and data sources (EQ8 and EQ9)

Judgement Criteria	Indicators	Data Sources
Evidence of cereal output meeting end-user needs, in terms of new and niche uses	Processor and seed company statements Changes in the choice of crops planted, by variety	Trade association interviews Processor interviews Reference is made to analysis under EQ3
Evidence of increased farm productivity	Rate of change in yields Rate of change in factor use	Reference is made to analysis under EQ4
Evidence of change in farm practices	Change in production technology	Reference is made to analysis under EQ10
Evidence of change in input use	Change in production technology	Reference is made to analysis under EQ10
Innovation in cereal use	Proportion of cereals for non-food uses	Trade association interviews Processor interviews
Increased end-uses for renewable purposes	Proportion of cereals for non-food uses	Trade association interviews Processor interviews

8.2 Our hypotheses

We hypothesise that the decoupling of aids which removed possible biases in crop choice may have encouraged specialisation, with producers targeting new or niche markets. Reforms in coupled supports, particularly for durum wheat[1], provide a good indication of whether changes in measures affected the balance of output between certified and non-certified varieties. An increased willingness to buy certified seeds would be interpreted as an indicator that the reforms had encouraged greater considerations of quality. In terms of niche markets, we review developments in organic farming.

We hypothesise that cross compliance, through increased producer awareness of scrutiny of farm practices, indirectly encouraged innovation in their practices. This will be assessed by analysis of changes in input use. We also consider how other relevant CAP measures, such as Articles 69/68 or agri-environmental schemes, have influenced this trend.

In terms of innovative uses, the energy crop payment and broader (non-CAP) policies to promote biofuel output gave a strong stimulus to the use of cereals in novel energy uses. National schemes, such as German government support for biogas, have induced substantial innovation in cereal output. The development of biopolymers is another potentially major innovation in end-uses.

Finally, measures that have affected innovation in cereal production, but are not solely part of the CAP, need to be considered. We hypothesise that measures limiting the cultivation of GM crops encouraged the EU to develop a niche in the production and export of non-GM varieties to other markets that favour non-GM crops.

8.3 GM maize and seed cultivation

Interviews with processors revealed that the breeding sector had also undergone a process of consolidation. Discussions with seed companies, summarised in Chapter 4 (EQ1), suggested that barriers to the planting of GM crops affected the development of new varieties. While this is only relevant to maize at present, it means that research by maize seed companies worldwide has been weighted heavily towards new GM events. Of the GM maize events that are available commercially, only two are permitted for cultivation in the EU. It was also noted that, since EU maize production is relatively small on a global scale, seed development specifically for the EU market is a lower priority and therefore EU producers do not get the benefit of input cost reductions, notably from herbicide resistance and the yield increases associated with new GM maize seeds.

8.4 The development of certified cereal seed production

A specific issue mentioned in the fieldwork regarding durum wheat was the requirement in traditional regions to use only certified seeds in order to receive the higher quality premium. No such requirement applied to growers in non-traditional regions and, for them, retained seeds from their own crops represented a sizeable proportion of plantings.

Table 8.2 presents European Seed Certification Agencies' Association data on certified seed production in 2000, 2005 and 2010 for common, durum and spelt wheat, although the data are patchy. For some MS, data on areas are more comprehensive than those on seed sales. We have assumed that changes in seed output are proportional to changes in areas (italicised), assuming that yields of cereals for seed per hectare do not change between the periods being compared.

To allow for gaps in the data, we have computed two EU totals at the bottom of each column; one sums the entries in the column; the other is the sum for a constant sample, which represents the largest possible sample of MS with entries for output every year in the table. The

[1] Chapter 3, Section 3.9.4 describes changes made to the durum wheat quality premium under the MTR.

seeds/area figure divides the EU constant sample seed quantity by the planted area in those MS that comprise the constant sample to obtain an estimate of the 'seeds/area'. To indicate the degree to which the constant sample is representative of the EU as a whole, we list in the bottom row the combined share of those MS that appear in the constant sample in the total EU planted area of the same cereal. (Thus, 91.5% at the bottom of the first column, for example, means that the constant sample of MS accounted for 91.5% of the total 2000 EU area planted to common wheat).

We observe there was a decline in certified seed production per area for common wheat, and a more dramatic one for durum wheat, whose certified seed output per hectare almost halved over the decade (unfortunately, no comparable data are available for Greece, a major durum wheat producer).

Table 8.2: EU certified wheat seed output ('000 tonnes)

	Common wheat			Durum wheat			Spelt wheat		
	2000	2005	2010	2000	2005	2010	2000	2005	2010
Austria		34.2	38.9		4.3	4.7	0.1	0.5	0.8
Belgium	23.9	24.1	25.3		0.6	0.8	2.8	1.5	1.5
Bulgaria		122.0	54.2						
Cyprus				0.9	0.8	0.6			
Czech Republic	74.1	104.8	100.1		0.0	0.0		0.0	0.0
Denmark	108.2	97.6	92.0					0.1	0.0
Estonia	1.9	8.1	6.4						
Finland	5.7	11.9	13.9						
France	450.0	353.7	365.8	51.3	59.0	47.7	0.0	0.2	0.3
Germany	*294.1*	*278.9*	*220.0*	*1.9*	*1.7*	*3.2*	3.7	3.0	*4.5*
Hungary	188.8	87.0	62.7	1.7	2.2	2.0	0.8	0.0	0.2
Ireland	11.7	16.8	11.5						
Italy	100.5	112.5	111.0	395.9	230.5	147.3	*0.0*		0.0
Latvia	*45.8*	12.4	6.0						
Lithuania	13.5		*18.3*						*0.0*
Luxembourg	2.6	2.4	2.1				0.0	0.0	*0.0*
Netherlands	19.0	18.7	20.7					*0.0*	
Poland	138.0	44.3	105.9			0.1			
Portugal	0.0	1.7	0.8	3.1	0.1	0.4			
Romania	333.1	435.6	*318.8*	0.5	0.9	*2.5*			
Slovakia	63.1	49.2	26.5	1.4	0.5	1.5		0.0	0.1
Slovenia		5.3	3.7						
Spain	56.8	74.7	65.3	185.6	127.7	55.8			
Sweden	*61.9*	53.7	67.2		0.1	0.0			
UK	191.2	162.9	200.2	1.0	0.4				0.0
EU	**2,184.1**	**2,112.5**	**1,937.4**	**643.4**	**428.7**	**266.6**	**7.5**	**5.4**	**7.5**
EU constant sample	*2,170.6*	*1,951.1*	*1,822.4*	*642.4*	*423.2*	*261.0*	*7.5*	*5.3*	*7.3*
Seeds/area, kgs/ha	103.5	93.2	84.6	211.1	147.0	112.1			
Area of constant sample, ha	*20,978*	*20,936*	*21,530*	*3,043*	*2,878*	*2,328*			
% coverage of total area	91.5%	91.9%	91.5%	81.2%	78.6%	82.1%			

Source: European Seed Certification Agencies' Association and LMC estimates derived using DG Agri area statistics.
Notes: Figures in italics are estimated assuming reported certified seed area changes are reflected *pro rata* in output. % coverage of the total area measures the planted area of the relevant cereals in the MS in the constant sample as a % of the total planted area of the relevant cereals in the EU-27.

The corresponding analysis for seed maize and barley is presented in Table 8.3. We discover that, contrary to the hypothesis outlined above, namely that we postulated that the barriers to the growing of GM seeds in the EU is discouraging the production of certified non-GM maize seed, in practice, certified maize seeds were the sole seed sector in which seed production per hectare of the crop actually rose between 2000 and 2010.

This is especially significant because maize producers do not retain seeds for on-farm use. Instead, F1 hybrids, always purchased from seed suppliers, are used. Therefore, the certified seed data for maize should be comprehensive for the MS included in Table 8.3. For the other cereal crops, certified seeds represent only a fraction of total seed use, with retained seeds an important proportion of seed supply, which benefits less immediately from innovation (as the innovation is provided to the producer only when new certified seeds are purchased). Furthermore, the evidence from field interviews and the data on declining non-maize certified seed use per hectare in Tables 8.2 and 8.3 is that the proportion of retained (as opposed to new certified) seeds in total seed use has increased for cereals other than maize since the MTR.

Since the data in the tables refer to output, we have checked whether these contrasting trends are the result of major differences in foreign trade flows for these seeds and focus on maize in Table 8.4, as the sole cereal the external trade in certified seeds is of importance.

Table 8.3: EU certified maize and barley seed output ('000 tonnes)

	Maize			Barley		
	2000	2005	2010	2000	2005	2010
Austria	6.3	17.4	16.1		29.0	26.6
Belgium	5.8	3.6	1.7	4.7	6.3	4.6
Bulgaria					5.4	8.0
Cyprus				1.8	6.4	1.6
Czech Republic	0.4	1.5	1.0	44.3	68.5	45.6
Denmark				138.5	110.8	95.7
Estonia				5.2	7.8	3.9
Finland				27.9	47.2	28.9
France	144.6	134.9	179.2	196.7	156.2	140.4
Germany	5.0	*8.9*	*10.1*	*256.3*	*188.9*	*135.7*
Hungary	79.5	78.5	94.3	39.2	24.2	13.7
Ireland				30.0	30.0	32.8
Italy	23.1	25.4	28.0	29.8	44.3	25.7
Latvia				*19.9*	4.8	1.4
Lithuania				6.0		*2.1*
Luxembourg				2.8	3.0	2.8
Netherlands	1.4	0.7	*3.8*	7.4	5.5	4.3
Poland	3.6	5.3	8.1	49.5	23.5	44.4
Portugal					1.7	0.9
Romania	16.9	29.3	*41.2*	40.4	27.9	*36.9*
Slovakia	3.2	9.9	6.9	25.6	29.7	11.2
Slovenia	0.2	0.3	1.6		1.8	2.2
Spain	2.7	1.6	7.8	79.9	94.9	64.4
Sweden				*57.4*	49.0	50.5
UK				158.1	100.4	*74.2*
EU	**292.8**	**317.1**	**399.7**	**1,221.4**	**1,067.1**	**858.5**
EU constant sample	292.8	317.1	399.7	1,215.4	1,029.3	818.6
Seeds/area, kgs/ha	39.4	44.2	59.8	92.0	79.9	70.9
Area of the constant sample, ha	7,425.6	7,181.8	6,686.0	13,214.3	12,881.8	11,552.0
% coverage of total area	*78.8%*	*80.2%*	*81.6%*	*93.4%*	*93.2%*	*93.8%*

Source: European Seed Certification Agencies' Association and LMC estimates derived using DG Agri area statistics.
Notes: Figures in italics are estimated assuming reported certified seed area changes are reflected *pro rata* in output. % coverage of the total area measures the planted area of the relevant cereals in the MS in the constant sample as a % of the total planted area of the relevant cereals in the EU-27.

Table 8.4 analyses certified maize seed trade into and out of the EU, using COMEXT data. It reveals that net trade volumes in certified maize seed represent a comparatively small proportion of the total EU market (net imports of certified maize seeds represented only 0.3% of domestic output in 2007-2010). The trends identified for certified maize seed output in Table 8.3 therefore provide a good indication of actual certified seed use by EU producers. Since foreign trade in certified seed is more important for maize than the other cereals, we believe that the changes described in certified seed output in Tables 8.2 and 8.3 are a fair reflection of the trend in certified seed demand in those cereal sectors.

It is also evident that the barriers to the importation and use of GM maize seeds have, far from worsening the trade balance in certified maize seeds, greatly improved it instead. More important, however, is that in the latest full year, 2011, which lies outside the period covered by this evaluation, the EU became a net exporter of 48,000 tonnes of seeds, a quantity which we estimate represented over 10% of the production of the sector.

A result of CAP policy, therefore, has been the improved situation of the certified maize seed sector. Maize cannot be saved for on-farm use; therefore local demand is certain to follow the changes in areas, with a boost from the cultivation of green maize for biogas. We have found that the barriers to GM maize varieties have not only reduced the flow of imported seeds into the EU, but have also allowed the EU to develop a significant export trade and become the main supplier of non-GM seeds worldwide.

Table 8.4: EU-27 exports of certified maize seeds (tonnes)

Exports	2000-2003	2004-2006	2007-2010	2011
Extra-EU-27	**31,183**	**30,826**	**48,893**	**80,157**
of which				
France	7,182	7,879	15,607	15,149
Hungary	11,429	12,179	18,600	31,445
Romania	1,562	1,710	4,079	22,573
Others	11,010	9,057	10,606	10,991
Net exports				
Extra-EU-27	**-19,451**	**-26,911**	**-1,102**	**47,961**
of which				
France	-11,758	-12,057	4,697	11,370
Hungary	9,981	8,312	14,316	29,296
Romania	1,063	1,375	1,922	20,921
Others	-18,737	-24,541	-22,037	-13,627

Source: Derived from COMEXT trade data.

Overall, we have three main conclusions from this review of seed production. First, barriers to entry for GM maize varieties have, counter-intuitively, enabled the EU to develop a trade in seeds. Second, CAP Reforms in the durum wheat sector have reduced the demand for certified durum wheat seed in the EU, with farmers opting to increase the proportion of seed retained for planting in the next crop year. Finally, for the other major cereal crops the evidence is that the production and use of certified seeds has fallen and farmers have retained more seed for on-farm use.

8.5 Meeting the needs of end-users

Our discussion of EQ2 and EQ3 concluded that supplies from EU-27 production were generally felt to be sufficient for their needs. This was certainly true for the malting barley sector and, with additional higher quality supplies accessible through import arrangements, is partly true for the milling wheat sector.

It can be said that while a wide variety of innovative schemes is occurring further up the chain (with increased output of local, craft or artisan food), domestic production has generally been able to keep pace. This supports the view commonly stated in interviews that the evolution of CAP measures towards a more liberalised framework has encouraged producers to adopt a more market-orientated approach.

Chapter 2 revealed that feed is the most important single end-use of cereals, and that cereals have increased their share of compound feed ingredients. This largely reflected the problems associated with the importation of by-products from processing GM maize, notably maize gluten feed and meal and distillers' dried grains. The advances made by feed cereals were also achieved through price competitiveness, rather than the development of novel uses.

Chapter 2 reviewed the growth in cereal use in industrial applications and bioenergy. Table 2.6 demonstrated an overall, though patchy, decline in the use of cereals in industrial applications. This was led by declining demand for starch products and for malting for beer manufacture. Comparing the pre- and post-reform periods, the demand for common wheat and durum wheat rose, while the use of barley, maize and other cereals fell. Prior to 2006 demand for maize rose. As explained in Chapter 2, the imminent accession of the EU-12 MS, many landlocked with local maize surpluses, encouraged investment in local processing, while capacities declined in the EU-15 MS, which favoured wheat as a feedstock. After accession, the economics of processing in many of these EU-12 MS moved in favour of wheat, and this is reflected in the data in Table 2.6.

In the potato starch and sugar sectors, CAP reforms had an important impact on the cereal starch sector. The reforms created opportunities for cereal starches to capture markets in the modified starch and paper starch sector from potato starch. In the latter case, the reforms to the sugar regime were viewed as a threat, by lowering a price umbrella for starch syrup producers.

In the biofuel sector, the CAP measures, as well as national and EU-wide measures in the energy sector, have been important in the development of novel uses for cereal products. The best example is the rapid growth in biogas production, which has grown to the point where silage maize now represents 11% of the total UAA within Germany. This is discussed in Section 8.9.

Besides silage maize, the main point of note in cereal-based biofuel has been the rapid development of both common wheat and maize use in ethanol output. The sector has faced substantial competition from imported ethanol in blends with gasoline, which enter at much lower import tariffs than pure ethanol, but EU output has continued to grow rapidly. The main technological constraint noted by biofuel companies is the difficulty of being limited to one end-product if they use dry milling processes. As a result, some companies are switching ethanol plants to wet milling, which gives them the flexibility to switch between starch products and ethanol, according to market circumstances.

8.6 Yields

Our discussion of EQ4 reviewed innovation in productivity, using growth in EU yields vis-à-vis the increase in major non-EU producers of the same crops as an indicator. We concluded that, because of the return of some lower yielding set-aside land to cereal farming, the EU fared relatively poorly in most comparisons, apart from common wheat. In terms of volatility, the EU has performed better and recorded among the lowest volatilities of yields among the leading cereal producing nations.

8.7 Innovation in farm practices

8.7.1 Input and factor intensities

Fieldwork revealed that producers have applied new technologies on-farm. This was driven partly by farmers' fear of sanctions following tighter enforcement of cross compliance requirements. Our analysis of input use in terms of sustainability points to increased interest in environmental improvements. However as we concluded in Chapter 9 (EQ10), this is largely attributable to other CAP measures, notably Rural Development agri-environmental schemes.

A further indicator is how factor intensity has changed. Overall, there has been a decrease in labour inputs, although the EU-15 and EU-10 have followed different trends. The FADN database reveals a steady reduction in the use of labour per hectare in both the EU-15 and EU-10, but the balance between paid and unpaid labour is markedly different, as Table 8.5 reveals.

For the EU-15, unpaid labour in 2000 contributed roughly double the input of paid labour, but the use of unpaid labour fell almost one-third by 2009, while paid labour employment rose nearly 13%.

For the EU-10, FADN data are available only from 2004. Paid labour employment per hectare was over four times as large as unpaid labour use in 2004. By 2009, it had fallen by almost 30%, while unpaid labour use rose slightly, reflecting an increase in independent farmers.

Table 8.5: Labour by type by year (annual work units per '000 hectares)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
EU-15										
Unpaid Labour	14.1	14.2	13.0	11.9	11.6	11.3	10.6	10.4	9.8	9.4
Paid Labour	7.0	6.9	7.0	7.6	7.7	7.8	8.0	8.3	7.9	7.9
Total	21.1	21.0	20.0	19.5	19.3	19.1	18.5	18.7	17.7	17.3
EU-10										
Unpaid Labour	:	:	:	:	6.2	6.0	6.7	6.7	6.4	6.5
Paid Labour	:	:	:	:	25.0	23.8	22.0	20.4	19.2	18.8
Total	:	:	:	:	31.2	29.8	28.8	27.0	25.6	25.3

Source: Derived from analysis of the FADN database.
Notes: Data include all regions in the FADN sample, but for only the three focus farming types of TF14 codes 13,14 and 80 (COP Specialist, General Field Cropping and Mixed Crop and Livestock).

While the argument can be made that the CAP measures have linked the cereals sector more closely to world market developments, encouraging greater efficiency and innovation in labour use in cereal farming, it seems that the reduction in labour intensity represents a long run trend. There is little indication that the rate of labour saving has changed as a result of CAP reforms.

8.7.2 Collaborative farming

The interviews revealed several innovative developments in the organisation of cereal farming in a number of MS. First, producers stated that they were using contractors more heavily, and a recent study reported a reliance on their services[2]. Case study fieldwork for France, Germany and the UK also indicated a significant reliance on the use of contracted labour. To a lesser extent, the case study research in Poland and Hungary (notably on farms operating as companies) showed some use of contractors for harvesting and straw operations, often supplementing family labour, and in Poland this trend was reported to have been increasing.

In France, Germany and the UK, it was reported that on a significant minority of holdings, whose owners value the decoupled payments as a stable and secure form of payments per hectare, most farm operations are now undertaken by contractors who operate several holdings as a large block with the benefit of economies of scale. It is also clear that there has emerged a system of informal arrangements, particularly in France, under which the payments have facilitated the retirement of older farmers who allow neighbouring farmers to take on a greater role on their land without giving up ownership. Since these arrangements are largely unofficial, they cannot readily be confirmed through FADN or national farm accounting data.

[2] Use of contractors for cultivation and harvesting services is significant in France, Denmark and Germany and is evident in Poland (though data are more limited), *Employment and industrial relations in the agricultural and rural contractor (ARC) sector*, European Foundation for the Improvement of Living and Working Conditions (2012).

The FADN database provides information on nominal expenditures on contractors. Table 8.6 summarises our estimates, derived from the FADN database, of the changes in the real costs of contractors per holding for the three types of holdings that are the major cereal producers, alongside data on the share of total direct costs that is accounted for by contractors. The deflator we have used for the nominal costs when converting contractor costs into real terms was an average of all the farm input price series that related to maintenance and capital items. This was on the assumption that contractors provide mainly capital intensive services.

Table 8.6: Real expenditures per holding on contractors and contractor costs as a % share of total direct costs, 2000-2009 (in 2009 €)

		2000-2003	% share of direct costs	2004-2006	% share of direct costs	2007-2010	% share of direct costs
EU-15	COP specialist	6,708	*11.6%*	7,081	*11.5%*	7,888	*11.1%*
	Mixed crop & livestock	10,528	*11.8%*	12,230	*10.8%*	14,398	*10.3%*
	General field cropping	7,573	*10.2%*	8,364	*10.2%*	9,115	*10.0%*
EU-10	COP specialist			10,053	*8.2%*	9,643	*7.7%*
	Mixed crop & livestock			9,702	*7.0%*	9,702	*6.6%*
	General field cropping			8,457	*9.1%*	7,708	*8.1%*
EU-2	COP specialist					14,750	*10.7%*
	Mixed crop & livestock					2,768	*10.2%*
	General field cropping					10,423	*7.2%*
	Deflator	*75.7*		*85.8*		*97.3*	

Sources: Analysis of the FADN database.

Notes:
1. Data include all MS in the FADN sample for the three focus farming types of TF14 codes 13, 14 and 80 (COP Specialist, General Field Cropping and Mixed Crop and Livestock).
2. The % share refers to contractor costs as a proportion of direct costs, including all variable inputs, such as fertilisers, chemicals, seeds, fuel, contractors and irrigation, but does not include labour or capital costs.
3. The deflator is the average of the farm input price indices for tool maintenance, building maintenance, construction and machinery.

We see from the table that, for the EU-15 MS as a group, there was a fairly steady increase per annum in the real annual outlays on contractors in all three types of holding, with COP specialists spending, on average, the smallest sums per holding on such services. For the EU-10 MS, FADN data are available only since 2004. However, in their case, real spending per holding on contractors was flat or fell between 2004-2006 and 2007-2010.

The share of contractor costs in total direct costs per holding yields a different conclusion for the EU-15. In spite of interview evidence that the use of contractors has risen in recent years, the proportion of total direct costs that was accounted for by contractors declined over the period under review. This was undoubtedly partly because the costs of other direct inputs, notably fertilisers, increased rapidly in the post-reform period, but these data from the FADN database cast doubt on the hypothesis that there has been a significant increase in the use of contractors.

This is a surprising conclusion. It may be simply that EU-15 producers, facing a tighter farm labour supply than those in the EU-12, have taken the lead in increasing the use of contractors, but economies of scale in contractor services alongside a growing size of EU-15 holdings may explain why the real sum per holding has risen, but not the share of overall direct costs.

Interviews also revealed a growth in collaborative arrangements to pool capital, employ more efficient farm mechanisation and apply crop sprays more selectively. This included investment in GPS spraying and using satellite data to target chemical applications, with costs shared among neighbouring farms. Several producers stated that cost savings were a major driver, reinforcing efforts to improve fuel efficiency and work rates. Such trends are evident in France and the UK.

8.8 Diversification

8.8.1 Zero grazing

The European Food Safety Authority[3] reported that zero grazing occurred in Austria (varying from 4% to 55% according to the farming system), Germany (ranging from 2% in Niederrhein to 99% in parts of Bavaria), as well as in Denmark, England, France, Italy and the Netherlands. Statistics Netherlands report that zero grazing for dairy cattle rose from 10% in 2001 to 24% in 2009 across the country. In the southern region, the share rose from 11% to 38%.

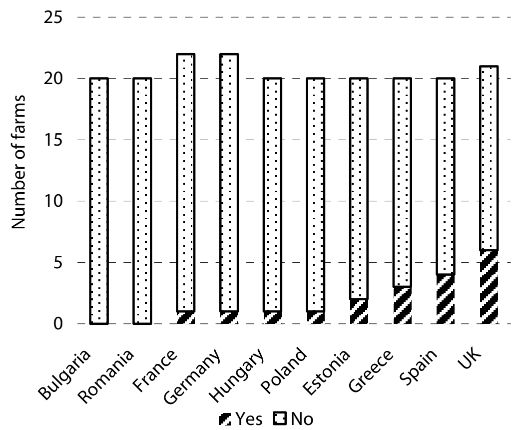
The fieldwork revealed that producers viewed zero grazing as a means of reducing the range of operations they undertake on the farm by integrating on-farm cereal and fodder cropping, including regular grass harvesting, with indoor management of dairy cattle. This in turn was believed to reduce the likelihood of being fined for breaches of the cross compliance rules. Chapter 9 places this in the context of sustainable practices but it is also relevant in terms of improving the management of cattle effluent and manure, facilitating biogas production for heat on the farm, grass utilisation and higher liveweight gains per hectare[4].

8.8.2 Non-farm activities

Diagram 8.1 presents the results from the producer questionnaire to assess the number of farms, by MS, that have diversified part of their farm to non-agricultural activities, from 2005 to 2010. Such activities may include tourism, the production of handicrafts or renewable energy. It provides a good indicator of broader changes in practices on a farm as a whole enterprise, rather than specifically in the cereals sector.

The diagram reveals that novel uses for farm properties comprise a small proportion of the farm's activities for the samples surveyed. However, interviews with cereal producers and producer associations revealed that diversification became an increasingly important aspect in the overall commercial decisions being made on-farm over the period under review.

Diagram 8.1: Farms that have diversified into non-agricultural activities



Source: LMC Producer Questionnaire, 205 respondents, with a minimum of 20 per MS.

8.9 Silage / Biogas

One of the best documented changes in cropping patterns is the development of silage, notably maize silage (also known as green maize) for biogas. Table 8.7 reveals how the silage maize area for biogas output grew 60% from 2000 to 2010, rising to over 11% of the UAA for the entire MS.

This silage maize area is not farmed solely for biogas; there remains a large volume of silage maize still produced for the traditional end-use of on-farm feed, but it is reasonable to suppose that the growth of over 700,000 hectares since the early 2000s was primarily for biogas output.

---

[3] 'Effects of farming systems on dairy cow welfare and disease', European Food Safety Authority, Scientific Report 2008.

[4] Technical Note 16, Dairy, Department of Agriculture and Rural Development, *op. cit*.

Silage maize for biogas is a distinctly German initiative. Table 8.8 lists the patchy data on silage maize areas for all MS. No other MS matches Germany's expansion, but areas in Denmark and Poland have grown significantly since 2002. It was reported in interviews that both these MS have seen increased cross-border trade in silage maize for biogas production in Germany.

Table 8.7: German area for silage maize production, 2000-2010 ('000 hectares and percent)

	UAA (1000 ha)	Cereals area	Cereals share (%)	Silage maize area (1000 ha)	Silage maize share (%)
2000	17,067	6,902	40.4	1,154	6.8
2001	17,042	7,011	41.1	1,132	6.6
2002	16,974	6,941	40.9	1,119	6.6
2003	17,008	6,839	40.2	1,173	6.6
2004	17,020	6,947	40.8	1,249	6.9
2005	17,035	6,840	40.2	1,263	7.4
2006	16,951	6,702	39.5	1,346	7.9
2007	16,954	6,572	38.8	1,471	8.7
2008	16,926	7,038	41.6	1,567	9.3
2009	16,890	6,908	40.9	1,647	9.7
2010	16,704	6,637	39.7	1,846	11.1

Source: Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten.

Table 8.8: EU silage maize areas by Member State, 2002-2010 ('000 hectares)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	170	171	167	164	161	164	177		176
Bulgaria	50	59	30			80		24	20
Czech Republic	205	207	214					180	179
Denmark	96	118	129	135	136	145	159	172	174
Germany	1,119	1,173	1,249	1,263	1,348	1,471	1,567	1,647	1,829
Estonia	0	1	1						2
Ireland	0	0	0	15	20	21	21	21	
Greece	6	6							
Spain	76	85	87	88	95				97
France	1,410	1,583	1,406	1,384	1,371	1,332			
Italy	274	282	280	271	276	275			283
Cyprus						0			0
Latvia	1	2	3	3	4				7
Lithuania	14	13	15	14	20	22	22		18
Luxembourg	11	11	12	12	11				13
Hungary	121	133	108	93	91	141	94	87	85
Malta	0	0							
Netherlands	214	217	225	235	218	222	242	240	229
Austria	74	72	76	77	79	80	81	80	81
Poland	196	239	290	326	356	368	416	420	
Portugal	114	117	117	0	106	103	92	103	92
Romania	48	39	33	24	27	46	40	33	31
Slovenia	24	30	27	32	27	26	27	26	26
Slovakia	97	99	92	87	85	79	76	77	76
Finland	0	0	0	0		0			
Sweden									15
United Kingdom	121	119	118						164

Source: Eurostat CROP_PRO, by NUTS2 region.

The special nature of German cultivation of energy crops for biogas is demonstrated in Table 8.9. Silage cereal output (dominated by silage maize) for biogas grew fast from 2005 to 2009; the other cereals areas receiving energy crop payments, including German areas, grew more erratically, and in 2009, represented less than half the total area of cereals in receipt of energy crop payments.

Table 8.9: EU areas of cereal crops receiving energy crop payments (hectares)

	2005	2006	2007	2008	2009
EU grain cereals	106,936	231,174	408,223	127,547	239,945
German silage maize	43,545	119,021	187,107	194,638	254,258
Other German silage cereals	6,274	14,146	27,597	28,708	37,501
Total area	**156,754**	**364,341**	**622,927**	**350,893**	**531,705**

Source: DG Agri, budget data.

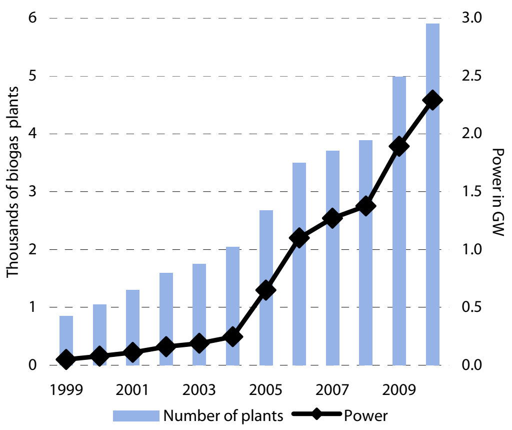
8.9.1 German national initiatives for biogas

Diagram 8.2 illustrates the evolution of biogas plants and their power output. Biogas plants first emerged in Germany in response to the oil price shock of the 1970s and were based on small farms.

From 1991, the *Stromeinspeisungsgesetz* provided support for minimum prices as well as additional government funds for the development of biogas, and by 1999 there were approximately 850 biogas plants.

The majority of these plants used manure as their feedstock, encouraged by the spread of environmental laws designed to limit the over-application of manure on German farms to avoid nitrate leaching.

Diagram 8.2: Number of biogas plants and power output in Germany



Source: Fachagentur Nachwachsende Rohstoffe e.V. (FNR).

Biogas plants were initially restricted by the availability of manure; however, the introduction in 2000 of the *Erneuerbare Energien Gesetz* (EEG) provided the basis for the growth of renewable energy in Germany through a system of feed-in-tariffs. The crucial development in the growth of biogas came with the 2004 EEG which retained a similar structure to the 2000 EEG but added extra revenues for producers.

The 2004 EEG introduced a bonus for biogas from renewable resources, with bonuses varying according to plant size, the cogeneration of heat and electricity and technological innovation.

By 2008, the number of biogas plants had almost doubled to around 3,900 and the contribution of these plants to total electrical output increased by more than 550%. The 2009 EEG provided additional support and by 2010, there were almost 6,000 biogas plants.

As a result of these changes, new plants increasingly used renewable resources. Diagram 8.3 reproduces the results of a 2010 survey, showing how maize silage came to dominate biogas output. Of the plants using renewable resources, 78% used silage maize as a feedstock. The popularity of silage maize over alternative crop feedstocks is partially explained by the high volumes of gas that it produces per tonne of biomass.

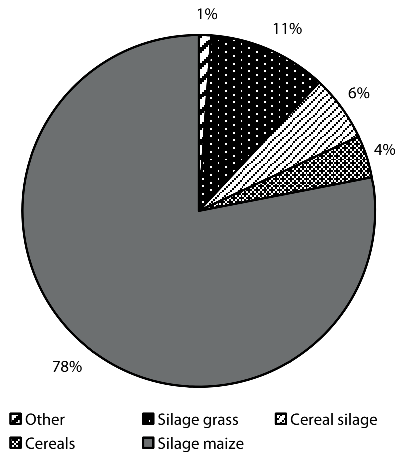
In 2000-2010, the number of bio-plants grew rapidly, while their potential electrical output has grown faster. The origins of this growth are the generous EEG feed-in-tariffs, where were mentioned above.

The evolution of the sector towards a reliance on renewable resources was the specific result of bonus payments introduced in the 2004 EEG.

The development of maize silage as a feedstock was, at least partially, the result of its high biogas yield.

Table 8.10 compares the gas yield per tonne of maize silage with its main substitutes.

Diagram 8.3: Renewable resources in biogas production by volume (2010)



Source: Deutsche Biomasseforschungszentrum (DBFZ) based on a questionnaire (n=420).

Table 8.10: Biogas yields by feedstock

`	Cubic metres of biogas per tonne
Cattle slurry	25
Pig slurry	28
DDGs	40
Cattle manure	45
Pig manure	60
Sugar beet pulp	67
Biowaste	100
Sudan grass	128
Grass silage	172
Maize silage	202

Source: Fachagentur Nachwachsende Rohstoffe e.V. (2010) Biogas basisdaten Deutschland.

8.10 Innovation in use of biopolymers

Biopolymers are seen as a big growth area, which has only developed significantly after the period covered by this evaluation. Most of the production facilities that have been established are in a pilot phase and hence data on production volumes are limited. A further difficulty is that the feedstock for a plant is often classed merely as being carbohydrate-based and so could be either sugar or cereals; thus, the exact volume attributable to cereals is difficult to gauge.

We estimate that by the end of the evaluation period (2010), the capacity to process cereals into biopolymers in the EU-27 was in the region of 175,000-200,000 tonnes of cereals per annum. The biggest area within this biopolymer capacity is that of bioplastics. The next largest capacity, though much smaller at under 10,000 tonnes, is in succinic acid, which is highly valued as a platform chemical.

Most of the European bio-plastics are derived from maize-based starch and the largest production facilities are presently located in Italy and France. Furthermore, although data are not readily available yet for this emerging industry as a whole, one of the largest processors in bio-plastics cites the importance of locally sourced raw materials and collaborative arrangements with local producers in meeting its needs. In 2011, 84,000 tonnes of bio-based products derived from carbohydrates were estimated to have been manufactured in the EU.

8.11 Organic cereal production

Table 8.11 summarises data by MS on the areas devoted to organic crops. It reveals:

- The total area sown to organic crops increased between the pre- and post-reform period by over 3.1 million hectares.
- The only MS in which areas classified as organic declined is Italy. Interestingly, prior to this decline, had the largest area of organic farming in the EU-27. Post-reform period it now has the second largest area, with Spain's 1.4 million hectares, the largest organic land area.
- The EU-12 MS have been increasing their organic area faster than the EU-15. Post-reform, they accounted for 19% of the EU-27's total organic area, compared to 10% pre-reform.

The growth of organic areas in EU-12 MS at first appears counter-intuitive. Organic farming is generally associated with MS such as Germany, with well-established markets for organic food, but field interviews revealed that national and Article 68 measures to support organic crop output explain this trend among the EU-12 MS. The growth in Estonian organic crop areas, for example, from 25,000 to just under 100,000 hectares in Table 8.11 reflects these changes.

Table 8.11: EU-27 supported organic and in conversion land areas ('000 hectares)

	2000-2003	2004-2006	2007-2010
Austria	294	473	510
Belgium	23	25	38
Bulgaria	1	4	17
Czech Republic	218	257	357
Cyprus	0	2	3
Denmark	171	142	151
Estonia	25	61	98
Finland	154	151	159
France	464	546	666
Germany	652	800	928
Greece	81	280	308
Hungary	92	128	124
Ireland	30	34	45
Italy	1,123	1,057	1,093
Latvia	18	107	159
Lithuania	12	66	129
Luxembourg	2	3	4
Malta	0	0	0
Netherlands	38	48	48
Poland	43	136	373
Portugal	82	239	215
Romania	27	97	156
Slovakia	55	87	137
Slovenia	12	24	30
Spain	564	822	1,381
Sweden	251	223	369
UK	650	635	702
EU-15	4,579	5,481	6,616
EU-12	503	969	1,582
EU-27	5,081	6,450	8,199

Source: Agriculture in the EU, DG Agri, various issues, DG Agri.

8.12 The scope for developing the processing of cereal straw

Agricultural residues and by-products represent a significant and readily available source of biomass. In the EU, cereal straw is the most common source, although small amounts of oilseed straw are also available. Cereal straw typically comes from maize cobs or husks, as well as from wheat, barley or other cereals. It is commonly used for animal feed or bedding, but surpluses are available for biomass and other uses.

The quantities of cereal straw that are associated with the production of one tonne of grain (the unit of primary product) vary between the different cereals. The method for calculating potential straw availability is, however, consistent. Cereal straw can be split between maize stover (the stalk, leaves, cob or husks) and other cereal straw. Table 8.12 describes the normal technical coefficients applied within the biomass sector for the production of straw from different crops. Maize produces more residue than other cereals per tonne of grain, and this is reflected in the higher co-efficient.

The theoretical supply potential of straw may be derived directly from EU cereal production by applying the technical coefficients, as is done in Table 8.13. Straw output in the third column of the table simply applies the technical coefficients to cereal production. However, within this total a sizeable proportion is used on-farm in animal feed or bedding. This proportion is put at 30% for straw from maize and 65% for other cereals. Once this quantity has been deducted, the remainder is defined as the technical availability of straw, which indicates the potential supply for other uses, among which the most important is as renewable biomass.

Out of actual cereal straw output of roughly 259 million and 251 million tonnes, respectively, in 2005 and 2010, the technically available surpluses were estimated to have been over 119 million tonnes in 2005 and 114 million tonnes in 2010, with nearly half supplied as maize straw. The decline was driven, in particular, by the reduction in the output of maize with its high coefficient.

Table 8.12: A comparison of crop to straw conversion rates

Cereal straw	**Straw to grain ratio**
Maize	1.3
Other cereals	0.8

Source: LMC, derived from interviews with biomass users and suppliers.
Note: The 'other cereals' category includes common wheat and barley, as well as other minor cereals.

Table 8.13: Estimates of straw output from EU-27 cereal crops (million tonnes)

	Area *Million hectares*	Production *Million tonnes*	Straw output *Million tonnes*	Technical availability *Million tonnes*
In 2005:				
Maize (including cobs)	8.95	62.80	81.63	57.14
Barley	13.82	54.67	43.73	15.31
Wheat	26.36	135.18	108.14	37.85
Other cereals	9.94	31.70	25.36	8.88
Total	59.07	284.34	258.87	119.18
In 2010:				
Maize (including cobs)	8.18	57.40	74.62	52.23
Barley	12.31	53.17	42.54	14.89
Wheat	25.84	136.45	109.16	38.21
Other cereals	9.86	30.86	24.69	8.64
Total	56.20	277.88	251.00	113.97

Sources: LMC estimates from DG Agri, Prospects for Agricultural Markets and Income, December 2011.

The biggest barrier to the development of straw processing as a source of biomass is the cost of transporting this low density product to processors. So far, the main end-use outside livestock farming is as a renewable fuel. One tonne of cereal straw typically has the same energy value as just over 400 kgs of petroleum (thus the tonnes of oil equivalent of straw are normally stated to be 0.40-0.42). However, in the future, straw is seen as a potential feedstock for ethanol and organic chemicals.

The most competitive current technologies for extracting sugars from straw use well established enzymes to break down the hemicellulose, which represents, on average, just over 30% by weight of corn stover and close to 25% by weight of other cereal straw. Roughly 40% by weight of cereal straw comprises cellulose and lignin, both of which, at present, are costly to break down into sugars using the enzymes commercially available, and therefore, these two components tend to be used as boiler fuel in plants that process the sugars from hemicellulose.

The scope for a breakthrough in the use of straw off-farm, other than as a source of power for renewable power generation, depends upon the development of cheaper enzymes to process cellulose, leaving the lignin to be the fuel for the subsequent processing.

8.13 Key conclusions on innovation

Three main areas of innovation stand out: the developments in the seed sector; changes in farming practices; and the influence of biofuels policy.

From our analysis of the certified seed sector we concluded that cereal producers in the EU as a whole are turning away from certified seeds towards the use of on-farm retained seeds. (For maize, the reliance upon hybrid seeds means this is not a viable option). The shift is most evident for durum wheat. Reductions made to supplementary payments in the MTR cut the use of certified seeds. Unexpectedly it was found that the barriers to GM varieties have allowed the EU to develop a significant export trade in non-GM varieties of maize. The trade statistics imply that among the cereal crops the most important, in terms of external seed trade volumes, is maize.

Changes in farming practices were difficult to relate to specific CAP reforms. Section 9.6, Chapter 9, describes how producer questionnaires revealed a tendency among EU-15 producers to reduce their use of chemical inputs, while EU-12 producers increased their use of these inputs. This could not be traced to CAP measures. One change in farming practice, namely an increase in the zero grazing of cattle, was attributed in part to farmers' concerns about stricter enforcement of cross compliance conditions and the risk that they could jeopardise their decoupled SPS payments if they were found to be at fault in their management of cattle in open pasture.

The interviews, however, revealed several innovative developments in the organisation of cereal farming in a number of MS. Some producers cited a greater reliance on the use of contractors or as farming as a large block with the benefit of economies of scale. There was also a growing trend towards collaborative arrangements to pool capital resources together or apply spraying in a more selective manner, with cost considered a primary driver behind these developments.

By far, the most important innovation promoting novel uses of cereals has been the policies to promote the development of biofuel crops. The clearest consequence of this policy has been the growth in bioethanol output. A less well understood development has been the expansion in German silage maize output for biogas. Silage maize now occupies 11% of the entire German UAA, but this includes areas cultivated for traditional on-farm feed use.

Biopolymers are expected to be the next important novel end-use for cereals, but so far the use of cereals in these products is very limited.

Chapter 9: Evaluation Questions 10 & 11

***Evaluation Question 10**: To what extent have the CAP measures applicable to the cereals sector contributed to encouraging environmentally sustainable production methods in the cereals sector?*

***Evaluation Question 11**: To what extent has the suspension and subsequently the abolition in the health check reform of the set-aside obligation influenced the area of land left uncropped by cereal producers?*

9.1 Interpretation of the question

The focus of the CAP has increasingly shifted towards the encouragement of sustainable farming practices. Major concerns include the ways nitrates, pesticides and water are used and the risks posed to soil quality and biodiversity. The integration of environmental concerns into an increasingly holistic policy approach has been a key objective in the orientation of payments from product-specific to producer income support (described in Chapter 3).

We interpret environmentally sustainable production methods as those reducing input intensities. A further aspect is the prevention of negative externalities from farming. While cross compliance[1] provides for a minimum set of environmental standards, the CAP's Pillar II (Rural Development) agri-environmental schemes aim to ensure that a higher level of environmental management is attained, above baseline requirements. It is important also to consider external factors that impinge on farm practices. National governments are responsible for the interpretation of EU-wide regulations; thus implementation may vary by MS. Commercially, high input prices discourage intensive farming unless commodity prices are high enough to provide an incentive to apply more inputs. Our consideration of land use trends examines the impact of former set-aside land in terms of uncropped land in the analysis prepared for EQ11. These land use changes also have implications for our discussion of sustainability. Table 9.1 presents the main judgement criteria, indicators and evaluation tools that will be used to address these two EQs.

Table 9.1: Judgement criteria, indicators and data sources (EQ10 and EQ11)

Judgement Criteria	Indicators	Data Sources
Intensity of cereal production	Trends in yields Trends in input use Level of specialisation Trends in soil nitrogen balance	Eurostat Case studies Producer questionnaire Producer association interviews FADN data
Changes in land use	Area changes in cereals	Eurostat Case studies Producer questionnaire Producer association interviews
Crop rotation patterns	Area changes in cereals vs oilseeds	Eurostat

9.2 Our hypotheses

Our hypothesis is that decoupling would encourage a more rational use of inputs and hence reduce the intensity of production. Input use among different cereals is generally very similar[2]; thus the shift from one cereal to another would generally be expected to be environmentally neutral. Exceptions include durum wheat farming in traditional areas, where intensity is low;

---

[1] Cross compliance is described in Chapter 3, section 3.9.2.
[2] LMC Evaluation of the Durum Wheat CMO *op. cit.*, page 133.

irrigated maize, whose intensity is higher than average; or where the decoupling of aids has resulted in shorter rotations of cereal crops, which require more use of chemical sprays.

Cross compliance should not, in practice, have affected the area under crops, the intensity of production or the sustainability of rotations. This is because it provides a baseline set of standards which farmers have always been obliged to follow; but producer fears of sanctions, if they fail to meet these standards, have risen now that the Commission audits enforcement.

With the removal of set-aside, we hypothesise that high commodity prices would encourage a larger proportion of formerly set-aside land to have been returned to production, increasing input use and reducing biodiversity. Less productive land would have been left fallow, but maintained in good condition under cross compliance requirements. Fallow land allows for the soil to regenerate and reduces overall fertiliser and pesticide intensity, supports habitats and may provide buffers against nitrate-leaching into the water supply. Unfortunately, data are limited on the use of former set-aside land, making the environmental impact of the removal of set-aside unclear.

Other factors of relevance for land use and input intensity include the rapid expansion of the oilseeds sector helped by a growing bioenergy market and other CAP support to energy crops[3]. Growing feedstocks for biofuels creates Indirect Land Use Changes (ILUC) which can result in additional greenhouse gas emissions, particularly, if the biofuel crops are grown on virgin land and produce emissions related to removing the original habitat[4]. Our hypothesis is that the rapid expansion of oilseeds areas will have increased input use and pushed the boundaries of recommended rotation practices, with adverse environmental consequences.

Agri-environmental schemes, under Rural Development, provide incentives for a stricter land and environmental management. Our hypothesis is that it is these schemes, rather than cereals measures, having a greater impact in encouraging environmentally sustainable production. The impact of these schemes is covered very briefly here although rural development is outside the scope of this evaluation.

9.3 Changes in land use

To assess the impact of decoupling on the cereals sector in environmental terms, Table 4.2 in EQ1 describes the distribution of EU-27 areas among the major COP crops and provides an assessment of changes on an opportunity cost basis. The highest environmental opportunity cost is from switching fallow land to crop production. This is also the focus of EQ11. Moreover, the data reveal that, while there is, in general, little environmental cost in input use when farmers switch between cereal crops, durum wheat applies lower than average input use in traditional areas, while irrigated maize is more intensive than average.

- Table 9.2 reveals that the uncultivated land area in the EU contracted across all periods and was lowest in 2008, reflecting the period of extremely high cereal prices. This implies a high environmental opportunity cost of switching from fallow land to crop production in terms of both input use and habitats.
- The rapid expansion in the oilseeds area, at the expense of cereals and proteins, indicate a shift from lower to higher input reliant crops. The area under oilseeds grew by 2.2 million hectares from the pre-reform era. This development is the result of other CAP measures, such as industrial set-aside and energy crop incentives, as well as the growth of the bioenergy market, underpinning the growth of rapeseed in particular.

[3] The energy crops supplement and industrial set-aside are described in Chapter 3, Sections 3.9.4 and 3.11.
[4] The Commission has recently published GHG emissions from ILUC for different biofuel feedstocks but, as the research is still being agreed and continuing, these ILUC factors are not covered in this evaluation.

- Table 2.13 of Chapter 2 revealed that decoupling resulted in a strong decline in traditional durum wheat areas. This has particular environmental relevance as most durum wheat production *"is non-irrigated, as water requirements are generally low. Likewise fertiliser and pesticide requirements are relatively low"*[5].

Chapters 7 and 8 described the emergence of zero grazing. This is the system whereby dairy cattle, which are often managed intensively, are kept indoors in tightly-packed, warm barns. While zero grazing was already underway before the latest reforms, interviews revealed that concerns over cross compliance were adding to this trend. However, the environmental impact of this shift is unclear and difficult to measure. While it is a more intensive form of farming, the effluent and manure from the cattle can be better managed, including biogas production to provide heat on the farm, and damage to grass topsoil from pasture grazing is minimised[6]. On the other hand, if grazing is held at the right level, it has positive impacts such as creating habitats and improving biodiversity.

We conclude that cross compliance has not changed producer environmental practices; but concerns over penalties in the livestock sector have encouraged the rise of zero grazing, with unclear implications for sustainability. Decoupling has generally not led to environmentally damaging practices, since changes in inputs between the different cereal crops are neutral in environmental terms. The main exceptions are the declines in durum wheat production in traditional areas, which have lower application rates of fertilisers, pesticides and irrigation, and in irrigated maize farming, which has higher than average levels of input use.

It is clear that oilseeds have been supported by external factors and have expanded at the expense of protein crops. This has implications for both input use and production intensity.

9.4 Set-aside land

The decline in uncultivated area is linked to the end of set-aside. Some of this land may have been returned to arable farming, while other land was left fallow, retaining the environmental benefits of set-aside. Unfortunately, there are no indicators available specifically on the use of former set-aside land. Table 9.2 displays data we have been able to collate; it reveals that in 2007, the last year of a non-zero set-aside rate, around 8.2 million hectares were set-aside and the total fallow area was 10.2 million[7]. From 2007 to 2008, fallow land declined from 10.2 to 8.1 million hectares. If the total decline of 2.1 million hectares from 2007 to 2008 all occurred in set-aside land, a quarter of former set-aside land would have returned to production. Interestingly, by 2010, the area left fallow had increased to almost 9.5 million hectares. The relatively low proportion of former set-aside land entering production is supported by the finding that the total utilised agricultural area also declined over the period.

Table 9.2: EU-27 fallow land and set-aside land ('000 hectares)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fallow	11,631	11,672	11,624	11,725	10,619	10,598	11,097	10,228	8,142	8,670	9,476
Set-aside	5,683			6,310		5,996		8,157			

Source: Eurostat [ef_lu_ofsetasid] fallow land and set-aside land.

[5] LMC Evaluation of the Durum Wheat CMO, *op. cit*., page 133.
[6] *Technical Note 16, Dairy, Department of Agriculture and Rural Development, Greenmount College, Northern Ireland* states that 30% better grass utilisation and 20% higher liveweight gain may be achieved.
[7] Note: set-aside areas were not all left fallow. Industrial crops were grown on it, notably for bioenergy.

Table 9.3 presents the differences in set-aside (both voluntary and, for the EU-15 MS, obligatory) across MS. In 2007, around half of all set-aside land was located in France, Spain and Germany. Some additional information is available for the UK where the Secretary of State commissioned a report into the destination of former set-aside land[8]. Their 2007 study, using both telephone and postal surveys, estimated that 63%-70% of former set-aside land would enter production in 2008. This example illustrates the potential for inter-country differences in the use of former set-aside area.

Table 9.3: Area under set-aside by country in 2007 ('000 hectares and percent)

	Set-aside area ('000 hectares)	Percent of total
France	1,638	20%
Spain	1,410	17%
Germany	1,042	13%
Romania	818	10%
UK	433	5%
Italy	423	5%
Poland	367	4%
Sweden	322	4%
Finland	261	3%
Lithuania	257	3%
All others	1,187	15%
EU-27	8,157	-

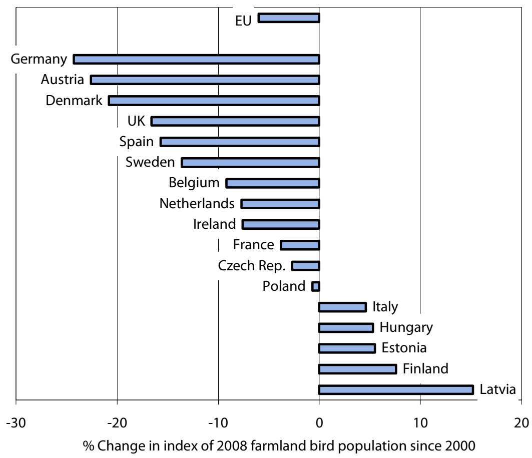
Source: Eurostat [ef_lu_ofsetasid] fallow land and set-aside land.

The reduction in fallow land brought about by the end of set-aside is primarily of interest for its potential effect on biodiversity. Bird populations are a good indicator of this effect and we have presented changes in indices of populations in 2008 for EU MS vs. 2000 in Diagram 9.1.

The EU-wide farmland bird index reveals a decline of 6.0% from 2000 to 2008. However, many of the largest cereal producing MS, including Germany, the UK and Spain, recorded sharper declines.

France, the Czech Republic and Poland were other sizable cereal producers which suffered declines in their farmland bird populations, but Italy and Hungary were both recorded as experiencing rise in their bird populations.

Diagram 9.1: Farmland bird population index in 2008 by MS (2000 = 100)



Source: Eurostat Pan-European Common Bird Monitoring Estonia data are for 2006; the Italian data are for 2007.

The causes of declines were found to be complex and the field work, while only available for the UK, revealed a strong correlation between falling bird populations and the intensification of farming practices (which include changes to the landscape, the structure of farmland and increased use of agri-chemicals)[9]. The evidence reveals that, after the removal of set-aside there was a 20% decline in the fallow area between 2007 and 2008. However, this may have

[8] *Farming and the Environment, July 2008*. Sir Don Curry's High Level Set-Aside Group, DEFRA, 22 July 2008.
[9] These were examined in a wide range of Defra-funded and other research, including studies by the British Trust for Ornithology, the Game Conservancy Trust and the Royal Society for the Protection of Birds.

been the result of high cereal prices encouraging land back into production. We cannot show conclusive evidence of an impact on biodiversity for all MS given the limited availability of indicators on land use after the ending of set-aside.

9.5 Other factors (agri-environmental schemes)

Table 9.4 reveals that the number of beneficiaries participating in agri-environmental schemes steadily increased across the EU-27. Official data on take-up is patchy and for the earlier period, contains inconsistencies for certain MS; hence we have concentrated on 2007-2010.

Table 9.4: EU-27 take-up of agri-environmental schemes (number of beneficiaries)

	2007	2008	2009	2010
EU-12	:	377,232	401,499	425,895
EU-15	871,634	919,916	873,318	888,012
EU-27	1,043,816	1,297,148	1,274,817	1,313,907

Source: DG Agriculture - Annual Activity Reports (various issues).

The interviews with producers and producer associations revealed that agri-environmental payments, rather than other CAP measures, are viewed as having a significant impact on the application of sustainable practices on farms, over and above the baseline required with cross compliance. Tables 9.5 and 9.6 describe the impact of environmental payments on farm net value added (FNVA) for EU-15 MS (2000-2009) and EU-10 MS (2004-2009) by farm type.

Table 9.5: Environmental payments as a share of FNVA by size/type, EU-15

Size		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Small	General Field Crop	2%	1%	1%	1%	1%	1%	1%	1%	1%	3%
	Mixed Crop & Livestock	4%	3%	3%	4%	3%	4%	4%	2%	1%	1%
	Specialist COP	6%	4%	2%	1%	1%	1%	2%	1%	2%	1%
Medium	General Field Crop	3%	3%	3%	3%	3%	3%	5%	4%	5%	6%
	Mixed Crop & Livestock	7%	7%	8%	8%	9%	10%	9%	9%	12%	14%
	Specialist COP	6%	6%	7%	7%	8%	10%	8%	5%	6%	11%
Large	General Field Crop	2%	2%	2%	2%	2%	3%	2%	2%	3%	3%
	Mixed Crop & Livestock	3%	4%	4%	4%	4%	4%	4%	3%	4%	4%
	Specialist COP	2%	3%	3%	4%	4%	5%	5%	3%	3%	4%

Source: Derived from analysis of environmental payments (JC800 and JC 810) as a share of Farm Net Value Added (SE415) on the FADN database.

Table 9.6: Environmental payments as a share of FNVA by size/type, EU-10

Size		2004	2005	2006	2007	2008	2009
Small	General Field Crop	1%	1%	2%	1%	3%	3%
	Mixed Crop & Livestock	2%	4%	5%	7%	12%	11%
	Specialist COP	3%	3%	6%	6%	10%	13%
Medium	General Field Crop	0%	2%	2%	2%	3%	4%
	Mixed Crop & Livestock	1%	3%	5%	4%	7%	8%
	Specialist COP	1%	4%	7%	5%	7%	11%
Large	General Field Crop	1%	2%	3%	2%	5%	5%
	Mixed Crop & Livestock	2%	5%	8%	7%	9%	12%
	Specialist COP	1%	6%	8%	5%	6%	12%

Source: Derived from analysis of environmental payments (JC800 and JC 810) as a share of Farm Net Value Added (SE415) on the FADN database.

We conclude from these tables that environmental payments generally declined as a share of FNVA for small EU-15 holdings between 2000 and 2009, rose slightly for large holdings and increased most sharply for medium sized holdings, for which their contribution to income was highest. For the EU-10, the contributions of environmental payments to income rose for every size and type of producer between 2004 and 2009, and were over 10% in 2009 for COP specialist holdings in all three size categories.

9.6 Intensity of production

Chapter 2 presented evidence of changes in the intensity of production through the trend in yields. The data revealed a rise in cereal yields, but these depend on soil quality and weather conditions. A more precise measure of the change in intensity can be found by examining trends in the use of inputs themselves. Unfortunately, it is difficult to establish a direct correlation between CAP measures and input usage, as a number of external factors also influence the intensity of production, particularly changing input prices.

Our producer questionnaire included a number of questions designed to explore the shifts in production practices, from 2005 to 2010. The questions that were most relevant for the intensity of production related to chemical and organic fertilisers, pesticides, herbicides and water use. As Table 9.7 demonstrates, in most cases the 'no change' category had the greatest number of respondents. However, there were strong differences in responses to some questions between the EU-15 and EU-12 producers.

Over half of the sample interviewed in EU-15 MS had decreased their use of chemical fertilisers, while a quarter had increased their use of organic fertilisers. One-third had reduced their use of pesticides, insecticides and fungicides, along with herbicides, while the majority of producers had not changed their water use (however this may be a reflection of local conditions in many areas, which do not make irrigation feasible or necessary).

For EU-12 producers, the balance of responses was different. Over a third of the 100 producers interviewed had increased their use of chemical fertilisers and one-fifth their use of organic manure. For pesticides, insecticides, fungicides and herbicides, around a quarter of the producers interviewed had expanded their use. Again with irrigation, there was no such clear-cut conclusion.

Table 9.7: Number of questionnaire responses to input use from 2005 to 2010

	Chemical Fertilisers		Organic Fertilisers		Pesticides, Insecticides & Fungicides		Herbicide		Water	
	EU-12	EU-15	EU-12	EU-15	EU-12	EU-15	EU-12	EU-15	EU-12	EU-15
Decrease	22	53	10	4	13	30	11	29	7	14
No Change	45	45	70	75	62	69	65	73	84	83
Increase	33	7	20	26	25	6	24	3	9	8

Source: Analysis of LMC producer questionnaires.

We have supplemented these findings with estimates of the inputs used in COP farming derived from analysis of the FADN database. The results are listed in Table 9.8. The first section presents expenditure in nominal terms. In both the EU-15 and the EU-10, expenditure increased, with the EU-10 growing faster. To convert these sums into real terms, we have deflated the nominal expenditures by the Eurostat index of farm fertiliser input prices, with the value in 2009, the base year of the index, set equal to 100. Fertiliser prices increased throughout the period. By correcting nominal outlays for this inflation, we deduce that the real (physical) application of fertilisers declined in the EU-15, but it rose in the EU-10.

Table 9.8: Nominal and real fertiliser expenditures by COP specialists, € per hectare

Valued at		Fertiliser expenditures, € per hectare 2000-2003	2004-2006	2007-2009	% Change 2000-2003 to 2004-2006	% Change 2004-2006 to 2007-2009
Nominal prices	EU-15	93	103	151	10%	47%
	EU-10		75	122		63%
	EU-2			60		
Real (2009) prices	EU-15	178	171	161	-4%	-5%
	EU-10		124	130		5%
	EU-2			64		
Fertiliser price index	All EU	52	60	95	15%	58%

Sources: LMC estimates derived from FADN database and DG AGRI price data. The fertiliser price index = 100 in 2009.

Our analysis reveals that real fertiliser expenditures by COP specialist producers declined per hectare in the EU-15. Real consumption has moved in the opposite direction to nominal fertiliser prices, suggesting that input prices, rather than policy changes lay behind the drop in fertiliser use. In the EU-10, real expenditures per hectare rose slightly, although from a lower base. For the EU-2, no earlier data is available. Bulgaria and Romania's costs per hectare are the two lowest in the sample of MS for every input apart from seeds.

Table 9.9: Gross nutrient balance on arable land (kg of nitrogen per hectare)

	2000-2003	2004-2006	2007-2008
Belgium	154	124	117
Bulgaria	31	25	31
Czech Republic	79	79	89
Denmark	113	104	97
Germany	107	95	89
Estonia	:	20	22
Ireland	64	61	50
Greece	30	25	25
Spain	40	40	34
France	63	52	50
Italy	37	23	32
Latvia	24	22	18
Lithuania	35	39	35
Luxembourg	101	88	76
Hungary	16	-12	4
Malta	137	198	157
Netherlands	246	224	196
Austria	45	31	34
Poland	47	52	59
Portugal	34	18	15
Romania	-1	-6	16
Slovenia	88	58	56
Slovakia	46	37	39
Finland	62	57	51
Sweden	53	48	50
United Kingdom	118	107	98
EU-15	**68**	**59**	**56**
EU-10	**:**	**43**	**47**
EU-2	**8**	**2**	**20**

Source: Eurostat Gross Nutrient Balance dataset [aei_pr_gnb].

The fieldwork revealed that producers have increasingly sought to apply new technologies on their farms to reduce their expenditure on fertilisers through more efficient mechanisation on farms and targeted crop spraying. This included investment in GPS spraying, using satellite data to target chemical applications. While several producers reported that cost was a key aspect, targeted applications of phosphates and potash through GPS mapping in some MS, were increasingly driven by sustainability requirements. The interviews revealed anecdotal findings that new technologies were more widely adopted on the larger farms and were usually accompanied by a strong interest in additional sources of funding through national and agri-environmental channels.

Table 9.9 describes changes in the gross nutrient balance in kgs of nitrogen per hectare in the EU-15, EU-10 and EU-2. This is one of the best indicators of agricultural pressures on water quality. A high balance increases the risk of nitrates leaching into groundwater. The table demonstrates that nitrogen loadings have been coming down across the EU-15 supporting the proposition that input intensity declined in those MS, but the loadings increased in the EU-10 and EU-2. Land abandonment is particularly a problem when agricultural productivity is low, which is revealed by negative nitrogen balances. Both Hungary and Romania had negative nutrient balances from 2004 to 2006. Since then, the nutrient balance has again become positive.

Crop protection chemicals are a further input whose intensity of use could have been affected by environmental measures. Table 9.10 indicates that, despite a rise in chemical prices, the use of these products has increased in real terms. This indicates that CAP measures have not had a positive influence. It should be noted, however, that results from the producer questionnaires implied a decline in agri-chemical use in the EU-15 from 2005 to 2010.

Our hypotheses as to the potential impact of cross compliance and decoupling on reduced input use cannot be demonstrated, as the period under review experienced very high input and commodity prices. In the case of chemical use, the increase in application rates, despite higher input prices, suggests that it was the high cereal prices of the period that had an effect, rather than CAP measures. Our evidence also revealed differences between EU-12 and EU-15 MS that imply some convergence in the use of inputs per hectare.

Table 9.10: Real agri-chemical use per hectare by COP specialists (2009 Euros/hectare)

	2000-2003	2004-2006	2007-2009	% Change 2000-2003 to 2004-2006	% Change 2004-2006 to 2007-2009
EU-15	91	99	108	9%	9%
EU-10		61	76		24%
EU-2			33		

Sources: LMC estimates derived from FADN database and DG AGRI price data. Prices are measured in constant, 2009, values to ensure that they are comparable.

We conclude that the evidence points to a decline in fertiliser use. However, we deduced that the cause of this shift was high prices, rather than the CAP measures.

In the case of agri-chemicals, real expenditures per hectare rose over the period under review, notwithstanding the rise in chemical input prices from 2000 to 2009, although the rise was much more modest than that for fertilisers, at 12% over the full nine years, as against a rise of 103% for the fertilisers.

9.7 Crop rotation

We hypothesise that crop rotations have been influenced by the improved prospects for the oilseeds sector. Interviews with agronomists and agricultural extension officers in different MS have indicated that a build-up of pests and diseases in the soil and declines in soil fertility caused them to recommend that rapeseed should not be planted more than one year in four when in a rotation with cereals. Where these frequencies are exceeded, higher agri-chemical costs and higher fertiliser use are required to off-set the effects of loss of oilseed yields. We prepared Table 9.11, describing the rising rapeseed shares of the combined cereal and rapeseed areas by MS and for selected regions to demonstrate that the 25% limit was frequently exceeded.

This was true of Estonia (in 2010), Lorraine in France (in 2007), Mecklenberg-Vorpommern in Germany, which twice recorded a share above 30%, and Východné Slovensko in Slovakia. Many other regions were close to the 25% agronomically sound threshold in recent years.

We conclude that the trend seems to have been towards less sustainable rotation practices. The evidence from analysis of crop areas by NUTS 2 region is that there are now several EU regions where the frequency with which the oilseed crops feature in the rotation is too high.

Table 9.11: Rapeseed area as % of MS combined areas of cereals and rapeseed

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	6.2%	5.0%	4.0%	4.1%	5.0%	5.5%	6.1%	6.2%	6.0%
Belgium	1.6%	1.5%	1.7%	1.7%	2.8%	3.2%	2.3%		3.2%
Bulgaria	0.3%	0.6%	0.5%			2.5%		4.1%	7.8%
Czech Republic	16.5%	14.3%	13.6%					18.6%	19.8%
Denmark	5.2%	6.7%	7.6%	6.9%	7.7%	11.0%	10.3%	9.9%	10.1%
Estonia	11.0%	15.0%	16.2%						26.3%
Finland	5.3%	5.9%	5.7%	6.1%	8.5%	7.3%	4.9%	6.3%	14.2%
France	**9.5%**	**10.1%**	**10.2%**	**11.2%**	**12.7%**	**14.4%**	:	:	:
Centre	*15.3%*	*16.0%*	*16.6%*	*17.8%*	*18.9%*	*20.0%*	:	:	:
Bourgogne	*18.1%*	*18.9%*	*18.5%*	*19.4%*	*20.2%*	*22.0%*	:	:	:
Lorraine	*23.0%*	*22.3%*	*22.3%*	*23.0%*	*24.7%*	*25.8%*	:	:	:
Germany	**15.7%**	**15.5%**	**15.5%**				**16.3%**	**17.5%**	**18.1%**
Mecklenburg-Vorpommern	*28.7%*	*27.8%*	*28.2%*	*28.4%*	*29.9%*	*32.1%*	*27.1%*	*29.4%*	*31.1%*
Schleswig-Holstein	*24.4%*	*23.9%*	*26.4%*	*24.1%*	*26.3%*	*28.5%*	*21.7%*	*26.9%*	*27.7%*
Hungary	3.7%	2.0%	2.9%	3.4%	4.0%	6.4%	6.7%	7.1%	7.7%
Ireland				1.3%	1.8%	2.9%	2.1%	2.2%	
Italy	0.2%	0.1%	0.1%	0.1%	0.1%	0.2%			0.6%
Latvia	4.2%	5.8%	11.2%	13.2%	14.0%				17.0%
Lithuania	6.1%	7.2%	10.3%	10.3%	13.5%	14.8%	13.7%		19.9%
Luxembourg	10.6%	10.6%	13.1%	12.6%	14.3%				13.7%
Netherlands	0.2%	0.4%	0.7%	0.9%	1.5%	1.5%	1.0%	1.1%	1.2%
Poland	**5.0%**	**5.0%**	**6.0%**	**6.2%**	**6.9%**	**8.7%**	**8.2%**	**8.6%**	
Poludniowo-Zachodni	*9.4%*	*9.1%*	*10.7%*	*12.5%*	*14.1%*	*17.5%*	*17.3%*	*16.7%*	:
Pólnocny	*7.8%*	*7.5%*	*9.5%*	*9.3%*	*11.1%*	*13.3%*	*12.4%*	*13.3%*	:
Romania	1.1%	0.3%	0.7%	1.3%	1.8%	5.8%	5.7%	6.5%	8.3%
Slovakia	12.3%	5.3%	9.1%	10.8%	12.7%	15.3%	15.7%	16.4%	17.6%
Východné Slovensko	15.8%	5.8%	17.2%	18.8%	19.4%	21.1%	21.1%	23.3%	25.6%
Slovenia	2.4%	2.6%	1.9%	2.4%	2.8%	5.2%	4.0%	4.2%	5.3%
Spain	0.1%	0.1%	0.1%	0.1%	0.1%				0.3%
Sweden	4.5%	4.2%	6.2%		8.6%	8.2%	8.4%	8.8%	10.4%
UK	9.9%	13.1%	13.7%						17.6%
North East	*13.0%*	*16.2%*	*17.8%*	*18.2%*	*17.5%*	*19.7%*	*18.0%*	:	:
East Midlands	*14.1%*	*18.1%*	*18.2%*	*21.4%*	*20.9%*	*24.5%*	*22.1%*	:	:
South East	*13.2%*	*18.0%*	*19.4%*	*20.6%*	*20.0%*	*22.7%*	*19.9%*	:	:

Source: Derived from the Eurostat (agr_r_crops) database.
Note: No data are shown for Cyprus, Greece, Malta and Portugal. These countries have no rapeseed area reported.

The driver behind these patterns has been support from a growing bioenergy market. Many regions of the EU that are well placed for rapeseed cultivation are close to biodiesel factories and rapeseed plantings have grown to the point where they exceed the normal agronomic recommendations.

We conclude that the link between changes in crop rotations and the CAP cereal measures are weak. Rather, it is the growth in biofuel demand in response to support for energy crops that has been the primary driver for the rapid expansion of oilseeds.

9.8 Key conclusions on sustainability and set-aside

- It is evident that cross compliance has not changed producers' environmental practices significantly. However concerns over possible cross compliance penalties regarding practices in the livestock sector when cattle are put out on pasture have encouraged the rise of zero grazing, with unclear implications for sustainability.

- Decoupling had a generally neutral environmental impact, in view of the changes in area under different cereals. The beneficial effects of the decline in durum wheat plantings in traditional areas, which use lower fertilisers, pesticides and irrigation, was off-set by the declines in irrigated maize areas, which are more intensive in inputs.

- Oilseed plantings were supported by external factors and their expansion often pushed the level of rapeseed plantings above the recommended one in four year rotation. The expansion was driven by a growing bioenergy market, rather than CAP measures.

- After the removal of set-aside, there was a 20% decline in the fallow area between 2007 and 2008. However, this may have been because high cereal prices encouraged land back into production.

- The evidence of farmland bird populations indicates that biodiversity deteriorated in the EU after 2000, with the populations declining overall by 6% from 2000 to 2008. It is not possible to relate this specifically to CAP measures in the cereal sector.

- The evidence suggests that it is agri-environmental payments, under the CAP's Pillar II (Rural Development), rather than other cereal-specific CAP measures, which had the greater impact on encouraging sustainable practices on farms.

- Expenditures per hectare on crop protection chemicals increased in real terms between 2000 and 2009, despite rising prices for these inputs. This suggests that environmental measures did not have a positive influence, and that high cereal prices in the later years encouraged more intensive methods of cultivation.

- Real expenditures per hectare on fertilisers declined over the same period, but the shift was caused by very high fertiliser prices, rather than the CAP measures.

Chapter 10: Efficiency, Coherence and Relevance

Evaluation Question 12: *To what extent are the CAP measures applicable to the cereals sector after the 2003 reform efficient in achieving the objectives of these measures?*

Evaluation Question 13*: To what extent are the CAP measures applicable to the cereals sector after the 2003 changes coherent with the overall concept and principles of the 2003 reform of the CAP and with the overall EU objectives?*

Evaluation Question 14*: How far do the objectives aimed at correspond to the needs of the cereal producers and to those of the cereal users?*

Evaluation Question 15*: To what extent does the implementation at EU level of the CAP measures applicable to the cereals sector provide added value given the objectives of the policy and the reform?*

10.1 Interpretation of the questions

The principle of efficiency is defined as the best relationship between resources employed and results achieved[1]. Overall, CAP policy objectives have remained fairly consistent over the years although, as Chapter 3 described, the balance of emphasis has shifted since the 2003 MTR and subsequent reforms away from market support towards supporting producer incomes and sustainability objectives. In assessing whether the measures have been efficient in achieving their goals, there is a strong overlap with a discussion of coherence and hence the analysis also addresses the extent to which the measures have been coherent with the guiding principles of reforms since 2003, including changes made under the Health Check and overall EU objectives.

Coherence is defined as the extent to which complementarity or synergy can be found within a programme and in relation to other programmes[2] and we assess whether measures applied in the cereals sector have been synergistic between the different policy objectives, drawing heavily upon the conclusions of earlier chapters. These refer back to the global objectives since the 2003 reform of the CAP outlined in Chapter 3. These are described in the next section, but may be summarised as follows: the promotion of market orientation, increased competitiveness, maintaining fair producer incomes, enhancing the sustainability of agriculture and simplification.

We consider, as relevant, the degree to which these objectives correspond to producer needs, which we interpret first and foremost as the provision of a safety net to support their incomes. For end-users, we refer back to earlier chapters where needs are assessed directly in relation to EQ2 and EQ3 on consistency and the stability of supplies. A further aspect in interpreting end-user needs is in terms of operating in a liberalised and demanding environment.

We conclude with analysis of the extent to which the CAP measures in the cereals sector add value to the EU as a whole, focusing upon the externalities in other agricultural sectors and in downstream processing. Table 10.1 below presents the main judgement criteria, indicators and data sources relevant to EQ12-EQ15.

Table 10.1: Judgement criteria, indicators and data sources (EQ12 to EQ15)

Judgement Criteria	Indicators	Data Sources
The extent to which the objectives were achieved with a reasonable use of resources	Changes in budgetary expenditure allocated to the measures	DG Agri budgetary data
Stabilisation of the market (availability of supplies)	Reference is made to analysis under EQ1-EQ3	Reference is made to analysis under EQ1-EQ3
Promotion of market-orientated agriculture	Comparison of internal market prices with international prices	Answers to EQ1-EQ3

[1] Council Regulation (EC) No 1605/2002 of 25 June 2002 (OJ L 248 16.09.1999 p. 1).
[2] Guidance note N – Glossary of terms in 'Common monitoring and evaluation framework'

Fair incomes for producers	Incomes, pre- and post-reform	Answers to EQ6
Simplification of administration of the measures	Statements made by the relevant representatives from across the cereals supply chain	Producer association interviews Producer questionnaires Interviews with official agencies
Externalities with other sectors	Comparative advantage revealed Processing is stimulated	Processor questionnaires DG Agri; Eurostat

10.2 Relevant CAP measures

The main CAP measures relevant to this chapter may be summarised as follows:

The original objectives of the CAP (Title II, Art. 39, TFUE, 2010, ex- Art. 33 of the Treaty of Rome) were "(a) to increase agricultural productivity […] by ensuring the rational development of agricultural production […]; (b) to ensure a fair standard of living for the agricultural community; (c) to stabilise markets; (d) to assure the availability of supplies; and (e) to ensure that supplies reach consumers at reasonable prices."

The MTR, Council Regulation (EC) No. 1782/2003, introduced decoupling, combining payments made through many coupled aids. It stressed the promotion of food quality and enhancement of competitiveness, and made the decoupled payments conditional upon cross compliance. Among the products for which coupled aids were maintained was durum wheat, for which a specific supplement was paid for the cultivation of good quality output in traditional production areas.

The Health Check, Council Regulation (EC) No 72/2009, continued the simplification of policy intervention in the cereal sector. A particular focus was the system of public intervention buying, which had been reformed for maize under Council Regulation (EC) No 735/2007 through the introduction of limits to maize intervention stock purchases. The Health Check set intervention stock purchases at zero for other feed grains (barley and sorghum) and durum wheat to facilitate farmers' responses to market conditions, while retaining intervention as a safety net. It also abolished the starch production refund to reflect the changes in cereal markets.

10.3 Our hypotheses

In terms of the optimal use of resources, we assess how budgetary expenditure has evolved across the cereals sector and the implications from the perspective of cost- and time-efficiency. In addressing whether changes to measures are coherent with the aims and principles of the reform, this analysis also highlights any areas of policy inefficiency, namely in the form of deadweight effects[3] and unintended side effects.

We first focus on the effect of decoupling, where the transition from coupled aids to the decoupled SPS reduced cereals-specific expenditure. As part of this analysis, the case of durum wheat support is particularly instructive, as durum wheat was distinct from the other cereals in that it experienced a larger reduction in specific support over the period under review. The case of maize farming is also assessed in view of differences in coupled payments across MS over the same period. Both examples serve to illustrate how far policy aims and principles were met.

We then assess expenditure on intervention and export refunds in terms of cost efficiency and policy effectiveness. Both instruments are assessed as to whether the reforms were consistent

[3] Deadweight is defined as effects which would have arisen even if the intervention had not taken place. Deadweight usually arises as a result of inadequate delivery mechanisms, which fail to target the intervention's intended beneficiaries sufficiently well. 'Evaluating EU Activities, A practical guide for the Commission services', DG Budget, July 2004.

with the objective of achieving a safety net. Our hypothesis regarding the decision not to offer export refunds is that EU cereal producers are no longer constrained by WTO limits imposed on subsidised exports, thereby implying opportunities to exploit comparative advantage.

It should be noted that our discussion frequently refers to Article 68/69 measures (described in Chapter 3). We hypothesise that they have increased the perceived complexity of CAP measures and their administration, offsetting some of these gains made in terms of overall efficiency.

10.3 Efficiency of the measures

10.3.1 Decoupling and the relevance for cereals

Table 10.2 presents financial report data, published annually by the European Agricultural Guarantee Fund (EAGF) and its predecessor, the EAGGF Guarantee Section. From 2006-2010, the data allows us to distinguish between annual expenditure on direct aids and the amount allocated to cereals, and these are shown in relation to total agricultural spending.

The data reveal that the introduction of decoupling had cut expenditure on crop area payments (made to cereals, oilseeds and protein crops) from €25.8 billion in absolute terms in 2000 to €2.8 billion in 2010. Decoupled expenditure on the SPS scheme, meanwhile, had doubled from the time of its introduction in 2006, rising from €14.5 billion to reach €29.1 billion by 2010. The data are on total expenditure and imply a clear cost-reduction in the administration of cereal-specific measures. The table also provides annual spending on rural development to put in context the shift in expenditure towards sustainability objectives over the period.

Table 10.2: Evolution of EAGGF/EAGF direct aids and cereal items (billion Euros, percentage of EAGF spending)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Single Payment Scheme	:	:	:	:	:	:	14,542	28,119	28,234	28,806	29,071
Single Area Payment scheme	:	:	:	:	:	1,449	1,721	2,083	2,974	3,723	4,461
Crops area payments	25,812	26,714	27,686	25,748	26,081	27,421	18,113	2,917	2,675	2,772	2,805
of which arable	*16,663*	*17,466*	*18,590*	*16,809*	*17,297*	*17,770*	*8,737*	*1,923*	*1,855*	*1,672*	*1,679*
of which cereals	:	:	:	:	:	:	*7,233*	*1,489*	*1,432*	*1,449*	*1,435*
Arable as % of EAGF spending	41.2%	41.5%	43.0%	37.8%	38.6%	36.3%	17.5%	4.6%	4.4%	3.8%	3.8%
Cereal as % of EAGF spending	:	:	:	:	:	:	14.5%	3.5%	3.4%	3.3%	3.3%
SPS/SAPS as % of EAGF	:	:	:	:	:	3.0%	32.6%	71.7%	74.0%	74.9%	76.1%

Source: LMC Durum Wheat Evaluation (2009) and the European Agricultural Guarantee Fund (EAGF) annual reports.
Note: The crops area payments are for cereals, oilseeds, protein crops, grass silage and set-aside.
: - Not applicable

In EQ1 (Chapter 4), we hypothesised that the transition from coupled to decoupled payments and the reduction in the remaining coupled aids altered the relative profitability of alternative crops, which would have been reflected in changes in the choice of crop and greater specialisation. Consequently, planting decisions should give a greater weight to market-based influences. Further, we examine the objective of maintaining producer incomes. Our analysis for EQ6 (Chapter 6) concluded that the reforms have been coherent with maintaining producer incomes per hectare in nominal terms via a stable level of coupled *plus* decoupled aids per hectare, but coupled *plus* decoupled aids per hectare fell slightly in real terms. However, the "*favourable world market price environment*", specifically mentioned in the recital to the Health Check reform, meant that total incomes per hectare increased in real terms in most MS. Thus, external factors, rather than policy reforms allowed this objective to be realised.

In the recital to the MTR, it was stated that the objective of "*Enhancing the competitiveness of Community agriculture and promoting food quality and environment standards [would] necessarily entail […] an increase in the costs of production for agricultural holdings in the Community*". The discussion of direct production costs in Chapter 6 reveals that the measures were successful in enhancing competitiveness. It should be noted that for the three main cereal crops, average direct costs per tonne generally fell in real terms between 2001 and 2010 in the 10 case study MS.

10.3.2 Durum wheat support

Among cereal crops with specific coupled supports, the reforms should have led to a fall in their areas as the aids were lowered. The reduction in such aids was greatest for durum wheat in EU-15 MS, and its area did decline. However, this conclusion has to be tempered by some MS' retention of coupled supports via the application of Articles 69 and 68.

Table 10.3 reveals that expenditure for durum wheat measures (excluding Article 69/68 aids) fell 87% from €1,006 million in 2000 to €128 million in 2010; of which support for high quality output (via the durum wheat quality premium) comprised the largest remaining single payment totalling €81 million. Production support was cut substantially, declining from over €1 billion, on average, from 2000 to 2005, to €47.5 million by 2010, but some specific payments continued to be paid from 2006 to 2010 in recognition of the role of production in traditional areas. From 2006 onwards, there were no payments made to producers in non-traditional areas.

Table 10.3: Evolution of EAGF/EAGGF expenditure on durum wheat measures (€ million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Non-traditional areas	2.0	9.3	8.4	8.4	9.4	6.1	2.3	:	:	:	:
Traditional areas	1,004.2	1,014.7	1,191.5	852.5	1,103.6	977.5	396.0	55.8	46.1	49.1	47.5
Quality premium	:	:	:	:	:	125.9	102.5	82.3	79.2	87.7	80.7
Total	1,006.2	1,024.0	1,199.9	860.8	1,113.0	1,109.5	500.8	138.1	125.3	136.7	128.1

Source: LMC *Durum Wheat Evaluation* (2009) and European Agricultural Guarantee Fund (EAGF) annual financial reports.

Impact on areas: Table 2.13 of Chapter 2 revealed a 22.2% decline in the EU-27 total durum wheat area between 2000-2003 and 2007-2010. This resulted entirely from a fall from 3.68 to 2.74 million hectares in traditional production areas, while non-traditional areas rose from 0.15 to 0.24 million hectares. Thus, the MTR reform in specific aids failed to meet its objective of "*maintain(ing) the role of durum wheat production in traditional production areas while strengthening the granting of the aid to durum wheat respecting certain minimum quality requirements*".

In Chapter 6, we found that the counterfactual of full decoupling of the coupled aids would have had the greatest proportional effect on durum wheat areas among cereals (Section 6.8). Moreover, our analysis in Chapter 5 found increasing evidence of consolidation, implying greater efficiencies in production. The contrast between the rise in non-traditional areas, without coupled aids since 2007, and the fall in traditional areas, which continued to receive some coupled aids, suggests that the previous CAP measures supporting durum wheat in traditional areas did not suffer from deadweight, but did encourage inefficient production in these traditional areas.

Impact on quality: Our analysis for EQ2 also demonstrated that, at an EU-27 level, processors in the durum wheat sector relied increasingly upon high quality imports to supplement domestic output. This was particularly true in Italy. LMC's *Evaluation of the durum wheat CMO* concluded that the objective of improving quality was not met for the EU-27 as a whole. Processors stated that quality had either not changed or deteriorated in the main producing MS, despite the durum wheat quality payment. This suggests inefficiency in the measures to improve quality via the quality premium. This was a deadweight effect, in that the costs of purchasing and auditing certified seed use approximately matched the value of the supplement, and hence the measures had no appreciable impact on trends in crop quality. Nevertheless, it should be recalled that quality is a function of many variables (weather, crop management and variety choice, etc.). Furthermore, the *Evaluation of the durum wheat CMO* revealed that the quality premium is implemented differently by national payment agencies in MS, in the number of qualifying varieties and quantity of certified seed[4].

10.3.3 Maize farming

In Table 6.2 (Chapter 6) we analysed the impact of the move from coupled to decoupled aids on maize areas. We found that France, Spain and Italy, which had provided higher coupled area payments for maize[5], recorded a 12.4% reduction in maize areas after decoupling was introduced under the MTR. France and Spain continued coupled payments under the MTR at 25% of previous rates, and so did not end totally the bias in favour of maize plantings; yet their maize areas fell by 8.8% and 25.2%, respectively. In the MS that did not have this bias in their maize area payments, total maize areas rose 3.1%. Two of this latter group of MS (Germany and Greece) saw their areas decline (by 4.9% and 5.0%), but these falls were below those reported by France, Spain or Italy.

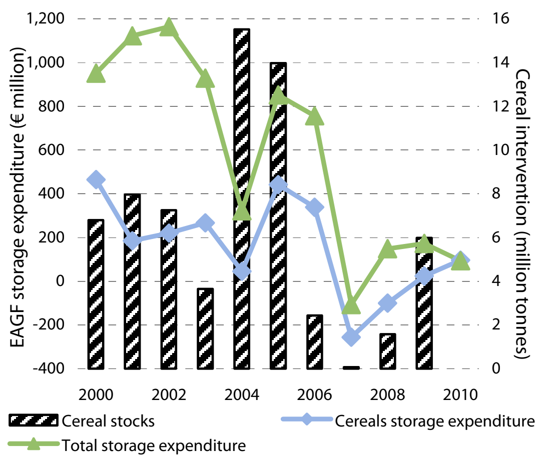
In terms of the efficiency of the MTR in boosting competitiveness and market orientation, we conclude that decoupling met the objective as regards maize farming in the EU-27. Maize cultivation declined in MS that had provided higher coupled payments to maize areas pre-reform, while maize areas were in general maintained in MS that did not have this bias.

10.3.4 Intervention as a safety net

Diagram 10.1 reveals a strong correlation between changes in end-of-year cereal stocks and the amount spent on cereal intervention storage. The diagram plots the evolution of expenditure on the intervention stock scheme and, within the total, the expenditure that is specifically allocated to cereals intervention. Negative sums indicate that the revenues from the sale of intervention stocks exceed the costs of managing the stocks.

The removal of rye from intervention in 2003 and changes to maize intervention from 2007[6] were specific policy responses to tackle burdensome stocks and increasing costs associated with the administration of intervention.

Diagram 10.1: Cereal intervention & outlays



Source: DG Agri and EAGF annual financial reports.

The diagram reveals that expenditures on storage increased in 2008 and 2009, but the changes made to the scope of intervention meant that, by 2010, total expenditure on intervention was significantly lower than it was when the Commission actively used intervention as a market management tool in the mid-2000s. We conclude that the reforms made to intervention were both effective and efficient. Total expenditure on cereals intervention fell sharply by 2010 and cereal intervention stocks were progressively reduced to zero. Higher expenditure in 2008 and 2009 occurred at a time when the cereal market experienced great price volatility and intervention stocks provided a safety net for domestic prices.

[4] Evaluation of the durum wheat CMO, 2009 *op. cit*. p.128.
[5] The calculations were a function of higher historical reference yields.
[6] These developments are described in Section 3.4 of Chapter 3.

Impact on areas: Our analysis in Section 4.5 (Chapter 4) revealed that the removal of intervention support for rye reduced the rye share of total cereal areas. In the EU-15, this resulted in a modest decline in areas, falling by 0.1% between the pre- and post-reform periods, but the effect was more pronounced in the EU-12, declining from 9.2% to 7.7%. We concluded that the EU-15 MS on balance suffered little from the ending of rye sales into intervention, probably because feed rye traded at a comparatively stable relativity to feed barley prices and thus rye benefited indirectly from supports for other feed cereals. For the EU-12 MS, our interpretation is that the decline in rye areas was largely linked to a shift towards 'other cereals' used in on-farm livestock feed.

The phasing out of intervention support for maize from 2007 onwards should have had some impact upon the attractions of maize plantings. However, stronger world market cereal prices in 2010, when maize intervention purchases were limited to zero, meant that the impact of this reform would be muted. The maize share of cereal areas fell from 11.9% to 11.2% and from 21.9% to 19.5% in the EU-15 and EU-12, respectively. This is consistent with our hypothesis, but probably reflects, to a larger extent, the ending of higher coupled aids paid for maize than other cereals in some MS under Agenda 2000 discussed in Section 10.3.3.

We conclude from this analysis that the objective of ensuring that intervention operates as a safety net at times of market need has been effective and has achieved greater cost efficiency. It is also coherent with the broader objective of promoting market orientation.

10.3.5 Export refunds

Table 10.4 describes expenditures on cereal and rice product export refunds from 2000 to 2010. The decline in these expenditures to zero reflects the decreasing relevance of such refunds, described in Section 3.7 of Chapter 3.

Table 10.4: Evolution of EAGF expenditure on export refunds (million Euros)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cereals and rice	862	299	140	214	95	131	129	42	10	1	0
Non-Annex I products	572	436	414	433	380	335	274	185	118	90	51
Other products	4,212	2,667	2,878	3,083	2,909	2,586	2,091	1,218	798	559	334
Total Export Refund Expenditure	**5,646**	**3,401**	**3,432**	**3,730**	**3,384**	**3,052**	**2,494**	**1,445**	**925**	**650**	**385**

Source: The European Agricultural Guarantee Fund (EAGF) annual financial reports.

Interviews with EU-wide and national trade associations revealed that this change was viewed as positive, by removing a layer of red tape associated with export trade. This finding might appear counter-intuitive, since the logic of export refunds was to bridge the gap between high prices on the internal market and lower world prices, so as to aid the competitiveness of EU cereal exports. However, our interviews revealed that the processing and trading sectors found the export refund system requirements unduly cumbersome. Furthermore, our analysis in Chapter 6, demonstrated that the decision not to offer export refunds helped to overcome the limits on subsidised exports under the WTO and helped to raise the share of EU net exports in total world exports between 2000-2003 and 2007-2010, reflecting a comparative advantage in common wheat.

The decision not to offer export refunds has proved particularly important in meeting several key objectives. It helped to ensure that supplies reach consumers at reasonable prices by reducing the gap between internal and external prices. Just as significant, by removing the constraints on subsidised export volumes, which were managed in part via the application of set-aside, it has allowed coherence across the entire agricultural sector, and not solely the cereal sector, to be achieved with the original Treaty of Rome objective of the rational development of agricultural production, as well as the Health Check objective of competitiveness and market orientation.

The indirect consequences (via set-aside) of the application of cereal export refunds affected the whole of arable agriculture and led to limits, that were not market-based, on planting decisions, with an associated loss of competitiveness, in terms of the application of comparative advantage in crop choice, and reduction in market orientation. This had repercussions upon other crop sectors, and indirectly upon downstream processing. Therefore, the absence of export refunds has provided value added at an EU level beyond the boundaries of the cereal sector.

From the perspective of the national payment agencies, which are responsible for administering export refunds, the retention of the refund system in the legislative framework require systems of implementation to be maintained. This not only implies a continuing financial cost, but also a requirement to conduct regular procedural reviews and manpower. This is a clear inefficiency for MS payment agencies and one that will become evident if cereal product export refunds are eliminated entirely (rather than being set at zero, as they have been since 2007).

10.4 Meeting the needs of producers

Producer needs may be interpreted as requiring both income stability and a safety net to support their incomes in the event of low prices. Our analysis in Section 10.3.4 revealed that the reforms made to intervention had, by 2010, ensured it was applied in a largely discretionary manner. This also coincided with a period of considerable price volatility where the provision of a safety net function was even more important, from the perspective of producers. Yet, as we described in Chapter 6, an unexpected empirical finding has been that price volatility in 2007-2010 was higher in the internal market than it was in the external market.

Taken as a whole, the reforms allowed producer decisions to respond to market-based signals, in line with the broad objective of improving market orientation. Decoupling and tonnage limits applied to certain cereals on sales into intervention stocks ensured that producer decisions were increasingly market-based.

The reforms encouraged producers to specialise in crops, and not solely cereal crops, in which they have a comparative advantage, with value added benefits for the wider EU economy. As a result, we hypothesised that this would have improved the competitiveness of cereal producers. Furthermore, the compulsory set-aside obligation had been established to limit EU production in anticipation of avoiding problems with the limits imposed on subsidised exports under the GATT Uruguay Round, as mentioned above. These limits restricted the ability of producers to compete in the international arena; with its removal, the export performance of EU cereal producers improved significantly, particularly (as we demonstrated in EQ4) in the common wheat sector.

The reforms have been consistent with the objective of maintaining producer incomes. When contrasted with the counterfactuals of no coupled or no decoupled payments, we found that CAP measures were crucial in maintaining producers' incomes. Hence, a more market-orientated and competitive agricultural system has been coherent with continued support to cereal producers.

For both EU-15 and EU-10 MS, real farm net incomes per family work unit (FWU) increased in most MS. However, combined nominal coupled and decoupled aids per FWU were barely changed after the reform; thus, the real value of the supports from these measures declined and rising incomes were the result of higher market prices, rather than the CAP measures.

A further aspect of producer needs is to scale back the administrative burdens associated with the cereal measures that they face. In Chapter 7, we demonstrated that the expenditure allocated to cereal-specific measures had declined significantly. Yet, from statements made by producers and their associations in the producer questionnaire and fieldwork, it emerged that they consider that little has changed in the overall administrative burden; indeed, several asserted that the administrative burden had increased, since the MTR reform.

We concluded that this reflected administrative requirements outside the EU-wide cereal-specific CAP measures. In particular, they are a consequence of the increased complexity of Article 69/68 measures, some of which are linked to cereal production. As such, these national measures run counter to the "*benefits in terms of administrative simplification*" that are an objective of the MTR. A further increase in administrative burdens was linked by producers to the need to demonstrate cross compliance, and a growing trend cited by producers and end-users was a request for the certification of fully traceable supply chains. This last trend is not a direct consequence of the CAP measures, but is viewed by producers as having been encouraged by cross compliance.

10.5 Meeting the needs of end-users

In Chapter 5 (EQ2 and EQ3), our analysis revealed that processors in the milling and malting sectors reported that their needs for high quality cereals were well met, both in the volume and quality of supplies on the local market. This implies that, following changes in the CAP measures, domestic cereal producers have maintained consistent supplies to the downstream sectors.

This was particularly the case in the high quality malting barley sector, where processors reported their needs were being well met. For the common wheat milling sector, it was found that internal supplies were often supplemented with higher quality wheat imports and CAP TRQ arrangements for low to medium wheat were often used to secure supplies as end-user needs required. In other sectors, particularly in the compound feed industry, the zero tolerance policy towards unauthorised GM events, rather than specific CAP measures in the cereal sector, posed the greatest challenge to securing supplies of cereal substitutes such as distillers' dried grains.

In an environment of increased price volatility and a more liberalised market after the MTR reform, we demonstrated in Chapter 6 that processors, as well as traders and producers, found it easier to manage price risk. There is evidence of the increased use of futures and options contracts in the EU, most significantly in 2010, when compared to 2008 which, with hindsight, was a time when market conditions should have encouraged the use of these instruments before prices slumped.

Indirectly related to end-user needs, we note that increased consolidation has been evident across all of the processing sectors. While this has largely been a response to external factors, the interviews revealed that the reforms scaled back former constraints inherent in the measures governing their ability to trade competitively. This was particularly the case with the suspension of export refunds, whose absence was viewed as a positive factor facilitating export trade.

10.6 Added value

The CAP reforms have greatly reduced the scope of the measures applicable specifically to the cereals sector. Since the application of the Health Check and the phasing out of coupled aids, the most clear-cut example of CAP measures, which are not cereal-specific but can be used to support the cereals sector, are those under Article 68, which provide MS with scope to target supports, directly or indirectly (e.g. via the livestock sector), to cereal production. In assessing the addition of value by CAP measures in the cereals sector, we include consideration of the wider context, and notably the role of cereals as the major arable crop in the EU in relation to the global objectives of the CAP, notably market stabilisation, maintaining producer incomes, sustainability and enhancing market orientation.

In judging added value, we need a benchmark against which to judge outcomes. The one that we adopt is full market liberalisation. There are four main respects in which the CAP measures diverge from full liberalisation: in the application of environmental conditions for income support; in the provision of a safety net for prices; in the promotion of particular end-use applications, such as bioenergy; and progressivity in the provision of decoupled aids.

The retention of border measures and intervention stock purchases, as policies that could be applied if world prices fall below a safety net level, would add value, vis-à-vis the outcome under full liberalisation, via both market stabilisation and the maintenance of producer incomes. It was an unexpected result, therefore, to discover (in Chapter 6, Section 6.12) that price volatility was typically higher in the internal cereal market than in the world market, which casts doubt on the success of the measures in achieving the market stabilisation objective after the MTR.

Producer incomes were maintained partly as a result of CAP measures, but largely as a result of higher market prices, as Chapter 6, Section 6.15, demonstrates. We conclude, therefore, that the reforms added value (when compared with full market liberalisation) in this respect.

Considering market orientation, the decoupling of aids and the reductions in the levels of obligatory intervention stock purchases and easing of border measures definitely achieved higher correlations between internal and external market prices for most cereal crops, apart from maize. However, it should be remembered that there are other aspects of EU policy (non cereal-specific and outside of the CAP) that conflict with the objective to promote market orientation. In the bioenergy sector, the non-CAP measures, notably the Renewable Energy Directive, provide additional coupled incentives. We demonstrated in Chapter 9 that this gave rise to specific national policies that generated a sharp increase in the silage maize share of the total Utilisable Agricultural Area in Germany, which appears excessive and thus does not add value to the cereals sector as a whole from the perspective of meeting the objectives of market orientation.

The respect in which the reforms add greatest value is in the sustainability of production. The environmental benefits of sustainable forms of cereal production are, under a fully liberalised market system, externalities, which are not captured by producers. Hence, a free market will lead to sub-optimal levels of sustainable agricultural activities. Our analysis revealed that cross compliance might have encouraged some producers to adopt minimal sustainable and innovative production practices. Incentives provided under agri-environmental schemes were more effective than cross compliance in encouraging sustainable practices, thereby adding value.

We conclude, therefore, that the CAP measures have added value in meeting the objectives of the sustainability of cereal production and helping to maintain producers' incomes. In respect of market stabilisation the empirical evidence does not imply that the reforms have added value for producers. Regarding market orientation, the measures have, in general moved in that direction, but there are examples, notably in the application of Article 68 to durum wheat output, where the CAP reforms have not added value. The same is also true of some non-CAP measures affecting cereal production in individual MS, exemplified by the silage maize biogas incentives in Germany.

10.7 Key conclusions regarding efficiency, coherence and relevance

Taken as a whole, the reforms have encouraged an increasingly free market approach to cereal growing, without reducing support to producers, endangering the supply for users, or placing an increased burden on the environment. The reforms have been relatively efficient, in that the cost has declined and national payment agencies and, to a lesser extent, producers see the administrative burden as manageable. While, as a whole, the reforms have therefore added value, it must be stressed that in the process, cereal-specific measures have become less important. Increasingly, the support for producers and protection of the environment is driven by Pillar II schemes, which are outside the direct scope of this evaluation.

Regarding outcomes, the measures have promoted the development of cereal crops and end-uses in which the EU-27 has a comparative advantage. Common wheat is the cereal in which the comparative advantage, judged by international cost competitiveness, is greatest. The reforms included the decision not to grant export refunds, which meant that WTO Uruguay Round limits upon subsidised exports were not effective and facilitated the abolition of set-aside.

Following these reforms, average real common wheat cereal direct costs fell in the ten selected case study MS between 2001 and 2010. The EU-27 share of world common wheat exports rose; and, despite greater competition from Ukraine, Russia and Kazakhstan, the EU maintained its common wheat and barley exports to those regional markets which are closest to the EU. Within the domestic market, the reforms to intervention stock purchasing promoted the development of processing, notably for starch and biofuels, in land-locked cereal surplus MS, where investors took advantage of lower cost cereals than in deficit MS and in coastal regions. The greater competitiveness of local feed cereals was also reflected in an increase in the cereal share of industrial feed ingredients within the EU.

In these respects, the reforms promoted efficiency and the outcomes were both coherent and relevant. The exceptions tended to be in sectors where measures worked against the emergence of comparative advantage. As noted above, the retention of some durum wheat coupled aids, including those via Article 68 payments, created deadweight and failed to prevent a substantial decline in output in traditional areas. The other notable exception affecting cereal production was the consequence of non-CAP measures, namely the excessive promotion of silage maize cultivation in Germany in response to national incentives and the Renewable Energy Directive.

Chapter 11: Conclusions and Recommendations

The period reviewed in this evaluation was one in which many measures that were linked to cereal production under the Agenda 2000 reform, such as coupled arable aids or supplementary payments for durum wheat, were phased out and replaced by decoupled payments, reducing possible biases favouring the production of one crop over another.

Reforms over the period of the MTR and under the Health Check also reduced the impact of measures that caused internal market prices to diverge from world market levels. Lowering border protection, most notably via the decision to grant no export refunds on cereals since 2006, and reducing the tonnages entitled to be sold into intervention stocks were important elements in this process. In both these cases, the measures (export refunds, intervention buying), unlike set-aside, have not been removed entirely. Thus they remain available as safety nets for use if market circumstances change dramatically for the worse.

As a result of these reforms, the CAP measures are now targeted towards producer incomes and output decisions over agriculture as a whole, rather than specifically towards the cereal sector. This change in focus was reflected in the field research undertaken for this report. With the exception of the durum wheat sector, producers in interviews typically had few cereal-specific issues regarding the application of the CAP measures. Instead, their concerns related to meeting tighter cross compliance requirements.

This report provides evidence of the effectiveness of the reforms in helping comparative advantage to emerge in the choice of crops within the cereal sector. For example, common wheat, in which the EU is cost competitive in an international context, has increased its share in the EU and also raised the EU share of world trade of this cereal.

In this respect, it is striking that the EU has broadly maintained its share of its traditional cereal export markets (including those for barley, as well as common wheat) in North Africa, the Near East and Sub-Saharan Africa, despite the emergence as competitors of Ukraine, Russia and Kazakhstan and despite the lack of export refunds in the cereals sector since 2006. Moreover, MS with outlets along the Danube for export have increased their export volumes despite direct competition with the so-called Black Sea exporters. For maize, by contrast, the lack of cost-competitiveness in most MS is reflected in a continuing EU supply deficit in most years.

Another indication of greater liberalisation is the increase in cereal starch processing in land-locked regions in Central and Eastern MS. This is the result of the weakening of intervention buying, which previously prevented processors in land-locked cereal surplus regions from profiting at times of low world market prices from freight-determined price discounts for the cereal inputs. Another example of the greater competitiveness of the domestic cereal sector is the increase in the cereal proportion of compound feed ingredients, the largest end-use, from 41% in 2000 to 47-48% in 2007-2010, helped in part by barriers to GM feed.

This evaluation has uncovered some unexpected developments. The most surprising is that regarding price volatility in the internal market. With the intervention price providing a price floor, we expected price volatility to have been lower in the internal than the export market, but the opposite was the case. The reasons for this higher volatility are unclear, since price transmission from the world market to local prices and inside the EU appears to be good.

Another not quite so unexpected development is the evidence that, even though commodity prices have been relatively high in recent years, there are still MS in which COP producers, on average, would have earned very low incomes if coupled and decoupled aids had not been provided. These aids were vital in enabling such producers to maintain their incomes in real terms in most MS and undoubtedly slowed the development of an internationally more cost-competitive cereal sector.

An additional unexpected development is the increase in the use of zero grazing in dairy farming. In several MS, instead of putting cows out to pasture, more intensive systems that include both grain and green cereal farming to provide feed are increasing in importance.

The higher price volatility has encouraged interest in price risk management, but so far only wheat futures have generated sufficient trading volume to create enough liquidity to handle large volumes of trading without causing prices to become distorted. This is a respect in which a shifting of the responsibility for price insurance, e.g. via CAP measures such as the safety net provided by intervention stocks, import arrangements and the possible resumption of export refunds, from official agencies to private institutions via market mechanisms is to be encouraged, but it is unclear how the Commission could assist in this process.

Within the EU COP sector, two of the most clear-cut examples of existing policy measures that are creating shifts in the choice of crops are the continuing growth in oilseed areas, in response to biofuel demand, and the emergence of green silage maize as a major crop in Germany, in response to national incentives for biogas production.

In the case of rapeseed, the area expansion has now reached a point where several EU regions are planting the crop at a greater frequency than is normally recommended on agronomic grounds in a rotation. A further example of impact of policy measures is evidence that, encouraged by biogas incentives, silage maize now occupies 11% of total German UAA. Some producers are reportedly growing the crop as a monoculture, and silage maize areas have also expanded in border regions of Poland and Denmark, in part to meet German demand.

These two examples highlight a deficiency that presently exists in measures relating to good agronomic standards. There are no specific guidelines regarding crop rotation practices, even though these are an important aspect of good agronomy. *We would recommend, therefore, that on environmental grounds, the cross compliance requirements should include specific minimum rotational standards*.

The cereal sub-sector that has faced the biggest challenge in adapting to the reform has been durum wheat. The sharp declines in durum wheat plantings in many traditional areas confirm that significant areas were cultivated only because of high specific coupled aids for the crop. Individual MS' application of Article 69 and 68 measures to durum wheat output was clearly intended to allow some flexibility to compensate for the loss of the coupled aids, but in terms of the longer term objective of creating a more market-based sector, *we would recommend that a time limit is attached to the provision of these sector-specific aids to make them transitional in nature*.