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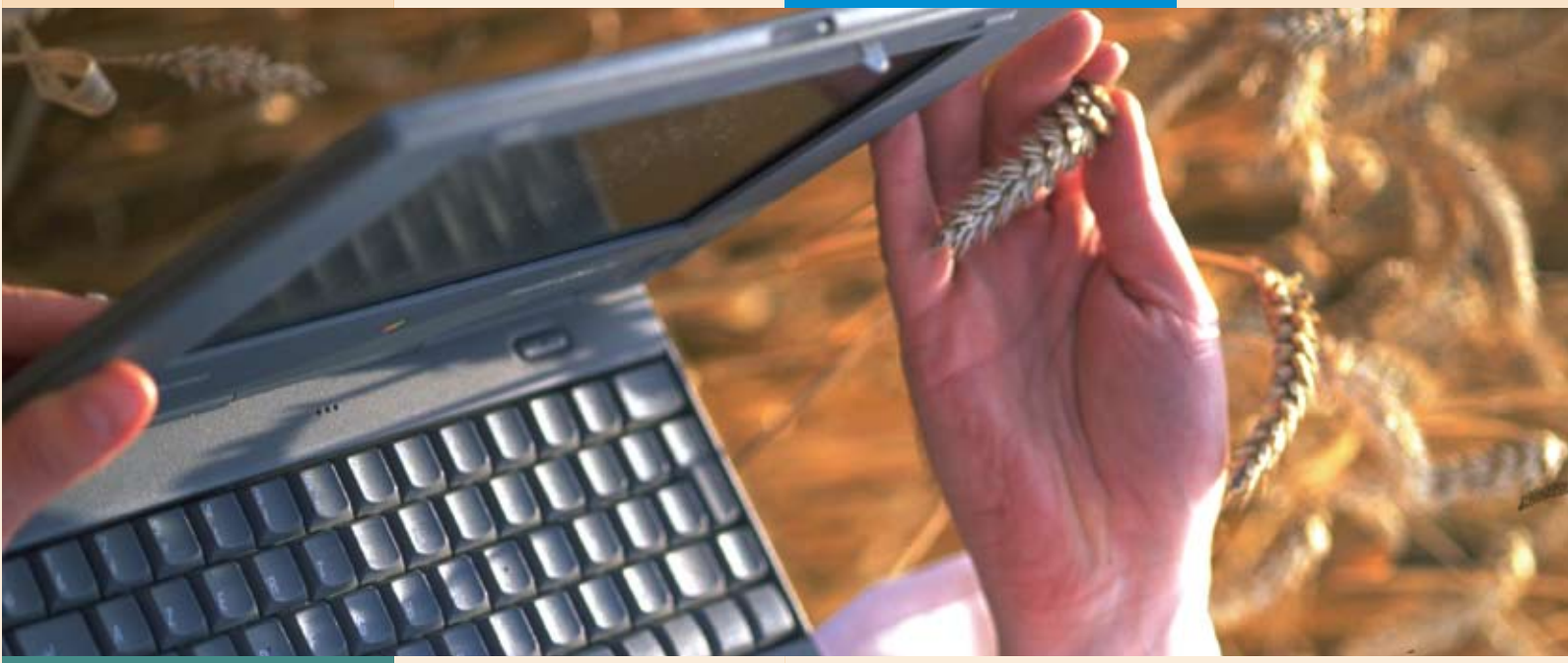

SCENAR 2020

Scenario study on agriculture and the rural world

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SCENAR 2020

Scenario study on agriculture and the rural world

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G.4 Evaluation of measures applicable to agriculture; studies

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Acronyms

ACP	African, Caribbean and Pacific countries
AMS	Aggregate Measure of Support
ARTS	Actions on the integration of Rural Transport Services
AWU	Annual Work Unit
BAP	Biodiversity Action Plan
BG	Bulgaria
BSE	Bovine Spongiform Encephalopathy
CAFE	Clean Air For Europe
cap	Capita
CAP	Common Agricultural Policy (EU)
CAPRI	Common Agricultural Policy Regional Impact Analysis model
CBD	Convention on Biological Diversity
CD	Compact Disk
CEE	Central and Eastern Europe
CEEC	Central and Eastern European Countries
CEEC-10	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Bulgaria and Romania
CLC	Corine Land Cover
CLUE-s	Conversion of Land use and its Effects model
cm	Centimetre
CO_2	Carbon dioxide
COP	Cereals, Oilseeds and Pulses
EAFRD	European Agricultural Fund for Rural Development
EAGGF	European Agricultural Guidance and Guarantee Fund
EAP	Environmental Action Plan
EBA	Everything-But-Arms Initiative (EU)
EEA	European Environment Agency
EEC	European Economic Community
ESIM	European SImulation Model
ESPON	European Spatial Planning Observation Network
ETC	European Travel Commission
EU	European Union
EU-3	EU applicant countries (Romania, Bulgaria and Turkey)
EU-10	Ten new Member States of the European Union from May 2004
EU-12	EU-10 plus Bulgaria and Romania
EU-15	Fifteen Member States of the European Union before May 2004
EU-25	Twenty-five Member States of the European Union from May 2004
EU-27	EU-25 plus Accession countries (Romania and Bulgaria)
EUFIC	European Food Information Council
EUR	Euro
EUROSTAT	Statistical Office of the European Communities
FAO	Food and Agriculture Organisation of the United Nations
FAPRI	Food and Agricultural Policy Research Institute
FDI	Foreign Direct Investment
FSS	Farm Structure Survey
G20	Group of 20; bloc of developing nations established before the WTO ministerial at Cancún, Mexico
G90	Group of 90; least developed countries (LDCs) with other countries from Africa, the Caribbean and Pacific
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GHG	Green House Gases
GM	Genetically Modified
GMO	Genetically Modified Organism
GPS	Global Positioning System
GTAP	Global Trade Analysis Project
GVA	Gross Value Added
ha	hectare
HARM	Harmonised system of regions
ICT	Information and Communication Technology
IFPRI	International Food Policy Research Institute
ILO	International Labour Organisation

IPPC	Integrated Pollution Prevention and Control (Directive)
IPPC	International Plant Protection Convention
IMAGE	Integrated Model to Assess the Global Environment
ISMEA	International Food and Agribusiness Management Association
kg	Kilogram
km	Kilometre
km^2	Square kilometre
LDC	Least developed countries
LEITAP	Extended GTAP version implemented by LEI (Landbouw Economisch Instituut)
LFA	Less Favoured Area
m	Metre
m^3	Cubic metre
mio	Million
MO	Market Organisation
MS	Member State (of the EU)
MTR	Mid-Term Review (2003)
MW	Mega-Watt
NO_3	Nitrogen Trioxide
NO_x	Nitrogen Oxides
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health (Office International des Epizooties)
p.a.	per annum
p.c.	per capita
PDO	Protected Designation of Origin
PEM	Policy Evaluation Model
PGI	Protected Geographical Indication
ppm	parts per million
pps	purchasing power parities
PRISMA	Providing Innovative Service Models and Assessment
R&D	Research and Development
RD	Rural Development
RDP	Rural Development Plan
RICS	Royal Institute of Chartered Surveyors
RO	Romania
SAPARD	Special Accession Programme for Agriculture and Rural Development
SAPS	Single Area Payment Scheme
SERA	Study on Employment in Rural Areas project
SFP	Single Farm Payment
SMP	Skimmed Milk Powder
SO_2	Sulphur Dioxide
SPS	Sanitary and Phytosanitary measures
Sq km	Square kilometre
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
t	Tonne
TBT	Technical Barriers to Trade
TRIPs	Trade-related Intellectual Property Rights
TRQ	Tariff Rate Quota
TSA	Time Series Analysis
TSG	Traditional Specialty Guaranteed
UAA	Utilised Agricultural Area
UAW	Unit of Agricultural Work
UK	United Kingdom
UNEP	United Nations Environment Programme
UPOV	Union International pour la Protection des Obtentions Végétales
URAA	Uruguay Round Agreement on Agriculture
USA / US	United States of America / United States
VWA	Food and Consumer Product Safety Authority
WFD	Water Framework Directive (EU)
WHO	World Health Organisation
WMP	Whole milk powder
WTO	World Trade Organisation
ZUMA	Zentrum für Umfragen, Methoden und Analysen

1 – Objectives and Conclusions of Scenar 2020

1.1 The future of agriculture and the rural world: the challenge for Scenar 2020

The intended result of the Scenar 2020 study is the identification of future trends and driving forces that will be the framework for the European agricultural and rural economy on the horizon of 2020. The method used is to build a reference scenario ('baseline') that is based on an analysis of trends from 1990 to 2005, which is projected forward to 2020; the trend analysis provides a substantiated basis for determining the long-term driving forces that is reflected in the reference scenario. It is assumed that economic, agricultural and environmental policy may cause an inflection in these trends, so these are studied as a second level set of driving forces, also to be taken into account in the scenario exercise. The relative importance between various policy frameworks is understood by comparing two alternative – or 'counterfactual' – scenarios ('liberalisation' and 'regionalisation') to the reference scenario.

The comparison between scenarios occurs in two steps: the first is a modelling exercise that analyses the likely outcome of each scenario using simulation models and other quantitative analyses. Where appropriate and necessary, these in-depth scenario analyses are complemented by qualitative analyses and expert judgement. The result is a description about how each scenario is expressed in spatial terms, across the EU-27, and in some cases extended to the candidate countries for accession. The second step is a SWOT analysis, which is applied to each scenario in order to understand the implications in the following domains: demographic developments, dynamics of rural economies, and the future of the agricultural economy (specifically in terms of farm structures, production systems, and farm population demography). This occurs through the definition of 'typical' regions; such 'typical' regions are characterised by similar responses to the simulated factors.

The tender specifications that accompany the Invitation to Tender AGRI/2005/G4/02 establish the purpose of "Scenar 2020 – Scenario study on agriculture and the rural world" in the following terms:

> The objective of the study is to identify major future trends and driving factors and perspectives and challenges resulting from them for European agriculture and rural regions until the year 2020. The focus of the study will be an analysis of key driving forces and the provision of a well developed reference scenario under the assumption of continued CAP reform (…) and taking into account the framework discussions in the Doha Development Round. The study will also examine alternative relevant and consistent scenarios.

The European Union Agricultural Council meeting of 1997 stated that "European agriculture as an economic sector must be versatile, sustainable, competitive and spread throughout Europe (including the less favoured and mountainous regions). It must be capable of maintaining the countryside, conserving nature and making a key contribution to the vitality of rural life, and must be able to respond to consumer concerns and demands regarding food quality and safety, environmental protection and the safeguarding of animal welfare." Since this statement was made, however, it has become

increasingly apparent that agriculture in many rural regions is not the principal economic driver.

In the keynote address at the OECD conference on *New Approaches to Rural Policy* (25-26 March 2004), Donald Johnston, OECD Secretary General, stressed that 'contrary to widely held assumptions, "rural" is not synonymous with agriculture or at least not any more' (OECD, 2005a: 15). Other speakers elaborated on this by indicating that rural and agricultural policies have to be distinct, as agriculture is not the principal economic driver in the rural economy. The critical factors are rather: the impact of technology; the evolution of domestic and export markets; the advance in communication and logistic management; and finally the fundamental reality that people move toward economic opportunity.

Rural out-migration is not everywhere a dominant trend; on the contrary, it is a fact that urban regions are losing population in many countries, and the migratory balance is positive not only in predominantly rural regions but even in significantly rural ones. It is true that the situation is complex, nevertheless, for the southern and eastern parts of Europe have experienced, and are likely to continue to experience, relatively high levels of population decline[3]. In these circumstances, future changes in agricultural markets and agricultural practice will have repercussions throughout the rural economy and employment, both directly and indirectly.

"Scenar 2020 – Scenario study on agriculture and the rural world" intends to take stock of the current hypotheses as to the future of agriculture markets in the expanding European Union and the likely development of the rural economic and social framework in which agriculture is practiced. If it is true that *rural* and *agricultural* policies need to be distinct, then the interplay between them should take into account the long-term trends in demography, technology and markets that shape the opportunities in which these policies can provide a useful orientation to maximise the opportunities for social welfare and environmental benefits.

In addition, *environmental* policy also provides guidance and constraints in the location and exercise of human activities. Both soil and water of good quality and sufficient quantity are becoming rare resources. The disappearance of the habitats important for wild flora and fauna are reducing the levels of biodiversity. Social demand exists for aesthetically pleasing, "traditional" landscapes. Consumer requirement for choice of food applies not only to the variety but also to the origin and mode of production of agricultural commodities. The evolution of trade and consequently of markets determines whether these commodities are sourced locally or by suppliers outside of EU borders. The combination of agricultural technology and markets frame the production possibilities, and evidently directly determine how the land is used, and – by extension – if it will come out of production. Finally, both employment opportunities and life-style choices are jointly having a profound effect on the migratory movements that are occurring, with the added dimension that communication and transport technology gives additional scope for the individual freedom to choose where to live.

The apparent complexity of the emerging patterns of rural livelihoods and agricultural production are perhaps becoming increasingly independent of the effect that policy has on ordering social, economic and environmental welfare. A plurality of policy responsibilities also exists, and coherence requires a degree of coordination that is

[3] A significant decrease of the rural population in Poland, for example, is to be expected.

creating new challenges to political bodies for achieving integration of policy objectives at every territorial level. Meeting this challenge depends on an understanding of what are the independent and the dependent variables in social, economic and environmental change, and how these variables relate to each other, that is, whether the linkages are weak or strong, structural or incidental.

Scenar 2020 provides a systematic review of the primary variables that rural and agricultural policies have to take into account. These are (a) the rural demographic patterns, (b) the agricultural technology, (c) the agricultural markets, and (d) the natural and social constraints on land use that are likely to exist in 2020. Social and economic factors, both conditioned by technology, have a bearing on these primary variables, and these factors are both endogenous and exogenous. Technology determines what is possible in every domain, and social (consumer) demand determines what is economically viable. Social demand – as it effects the agricultural sector – does not only reflect consumer preferences in terms of food, but also environmental and health concerns, including the commitment by society as a whole to the wise use of natural resources (water, soil) and biodiversity preservation. It is these environmental and health concerns that define the natural and social constraints on land use. World markets and local production costs – including compensation measures that may offset operating charges – will inevitably both determine what is economically feasible in the EU and direct agricultural production to the geographical locations worldwide that provide sustainable livelihoods for farmers, or the greatest return on investment for agro-industrial enterprises.

1.2 Method of work

The project has been organised in two phases. Figure 1.1 sets out the structure of the study.

The first phase established the basic data set, in terms of trends in drivers and their likely projection into the future. On the basis of this data, a baseline scenario was established that highlights what impact these trends will have on the rural world and the agricultural economy. Furthermore, two other scenarios were established to highlight the impact of different policy frameworks that differ in the degree of support for the agricultural sector.

The analysis of the state of agriculture practice and the rural economy within the EU on the horizon of 2020 is within a 30-year framework. The first period, 1990-2005, is the benchmark for the second period, 2005-2020. Trends in drivers have been verified according to a review of primary data; the purpose is to distinguish long-term tendencies that are for the most part a reflection of driving forces that are independent of policy influence, on the one hand, and the driving forces for shaping the rural world that are directly associated with agricultural and environmental policies, on the other.

The analysis of the trends and drivers were reviewed by a group of internal experts to advise the Project Team. A proposal for a principal baseline scenario and a few alternative policy frameworks were established. These scenario assumptions were then examined by a Steering Group of Commission services, their invited experts and the Project Team to jointly agree on the scenarios to be tested.

The second phase of the work began by a simulation of the likely effects of assumptions on the agricultural markets and on the rural economy. A methodological challenge was the

connection of the agricultural commodity focus – which is the field of the various well established general and partial equilibrium models – and the regional/territorial focus in which quantitative data and models are scarce and not heavily exploited. Indicators in the field of the rural population and economy and the agricultural sector were generated at the global, national and at a sub-national territorial level (a combination of NUTS3/2 and HARM2 regions). As can be seen from Figure 1.1, a series of interdependent factors was analysed in each area, in some cases requiring several iterations of simulation.

The purpose of the simulation has been to create a possible development of the agricultural markets and rural areas and to permit an identification of clusters of regions having a similar evolution over time, in reference to each scenario. Once this clustering took place, a SWOT analysis was carried out with regard to each scenario. Conclusions were then developed as to the possible situation across the EU, on the horizon of 2020, with regard to demographic developments, the dynamics of rural economies and the future of the rural economy. These initial conclusions were reviewed by the Steering Group of Commission services and the Project Team.

The reader is invited to consider that this scenario study on the future of agriculture and the rural world is not a 'crystal ball' for forecasting the future with exactitude. Rather, it provides a set of reasonable assumptions to help thinking about the future before having to decide upon appropriate courses of action and their accompanying policy framework. The reader is also reminded that the scenarios chosen for elaboration have characteristics that could have been different … certain choices were made through consultation, but some readers would perhaps have preferred other orientations to have been taken, even if only in details; such a possible shortcoming is an inherent feature of any scenario study.

What this scenario study is intended to do that will be useful to all readers, however, is to highlight the impact of exogenous drivers and policy frameworks on the development of agricultural markets and the rural world. Furthermore, the relationships between the different land uses were studied. The scenario study examines the contrary tendencies and the synergistic ones, and therefore should be useful in thinking about decisions that concern real or potential conflicts of interest in various social demands upon policy makers. As an example, the reader may wish to reflect upon the often-evoked apparent dilemma between policies that favour the sound management of natural resources (and nature conservation), which can be a positive externality of agricultural land use, and the necessity to reduce production costs in order to be competitive in an increasingly global market place, which can lead to environmental disturbance that is associated with certain forms of agricultural practice. Sometimes a good presentation of an issue can facilitate its resolution in a win-win manner, and certainly this is the ultimately satisfying use of a scenario study.

With all the *caveats* taken into account, it is hoped that the reader will find personal utility in referring to the contents of Scenar 2020 – a scenario study on the future of agriculture and the rural world.

1.3 Agriculture and the rural world on the horizon 2020

As stated in the introduction, the purpose of the Scenar 2020 study is to identify the future trends and driving forces that will be the framework for the European agricultural and rural economy on the horizon of 2020. A reference scenario ('baseline') is based on an analysis of trends from 1990 to 2005, and these trends are projected forward to 2020. This trend analysis provides a substantiated basis for determining the long-term driving forces ('exogenous drivers') that is reflected in the reference scenario. Under the assumption that agricultural, rural and environmental policies are able to inflect these trends, these policies are studied as a second-level set of driving forces ('endogenous drivers'). Two counter-factual scenarios to the baseline scenario are defined ('regionalisation' and 'liberalisation'), and these are intended to demonstrate two reasonable variations in policy during the coming fifteen years. The general context for agriculture and the rural world on the horizon of 2020 that is provided by the analysis of the three scenarios studied is as follows.

The strongest driver for the future of the rural world is demography, and the trends observed are largely independent of the evolution of the agricultural economy. There is significant out-migration of young people from certain regions in the southern, northern and eastern rural areas of the European Union, and their destination is not only the urban centres at the national level, but also the major financial and service sector centres of the EU as a whole. Many rural areas elsewhere are, nevertheless, in a healthy state, both keeping and receiving population; some of the new population is the residential relocation of persons with generally higher incomes moving out of urban centres in contrast to a contrary migration by younger persons seeking work or higher education. This seems to be a general trend of social mobility, which is picked up in inter-regional migration statistics. This trend is associated with an increasing mobility in the sources of employment, and the possibility for tele-working.

Agricultural production will remain concentrated in the central regions of the EU, both in terms of gross yields and net returns; the growth in yields will increase rapidly in the eastern part of the EU, however. The relative importance among agricultural commodities will increasingly depend on factor markets at the world level. Beef and dairy herds are most likely to decrease in function of shifts in demand, price squeeze, and increases in production per unit of livestock; this will have an incidence in land area devoted to fodder crops and to extensive grazing, with a possibly significant regional impact in terms of land coming out of agriculture altogether.

Methodology, Scenarios and Modelling

The general methodology of Scenar 2020 is reflected in Figure 1.1. It is based upon:

- the establishment of an extensive database covering the period 1990-2005 to identify drivers and corresponding trends on the global, national and regional level.
- the elaboration of indicators to interpret the data in order to formulate assumptions for the elaboration of a baseline scenario and two policy framework scenarios up to the horizon of 2020
- the quantification of changes in agricultural and rural economy and land-use where this is possible through modelling
- the extrapolation and downscaling of trends for some parameters where modelling is not possible
- the interpretation of the information gained above through a SWOT analysis within the context of the scenario framework.

An assumption that has guided the preparation of the scenario study is that there are two levels of drivers that will influence scenario building. The first level is a set of *exogenous* drivers; these are drivers that are not directly influenced by policies, or at least not in the Scenar time horizon (that is, up to 2020). As presented in Table 2.13, they are population growth, macro-economic growth, consumer preferences, agri-technology, environmental conditions and world markets. The second level is a set of *policy-related* drivers, and these will certainly have a discernable effect within the Scenar time horizon. They are EU agricultural policies, enlargement decisions and implementation, WTO and other international agreements and environmental policy.

In terms of generating scenario outcomes, a suite of indicators has been developed within the Scenar 2020 work programme. These provide a basis by which to understand the likely evolution of the exogenous drivers that provide the context for policy-related decisions, and also to formulate the variation in the endogenous drivers that are providing the impetus for the changes in the economy and land-use that are being tested for through this scenario study.

The extensive database, which has been collected for the drivers and indicators, makes it possible for the modelling and trends analysis to provide the first step in the impact analysis of the three scenarios retained, according to the subjects schematically grouped by theme in Figure 1.1. The work involved is both simulation at the global, national and regional level and mapping within HARM2 and NUTS2 regions used for territorial analysis in Scenar 2020. The second step is the SWOT analysis, which proceeds with a clustering of regions into groups having similar characteristics in terms of their social and agricultural characteristics, as projected by the simulation exercise. It is then possible to compare outcomes for each scenario within a regionalised framework, and according to three areas of interest: (a) demographic developments, (b) the dynamics of rural economies and (c) the future of the rural economy.

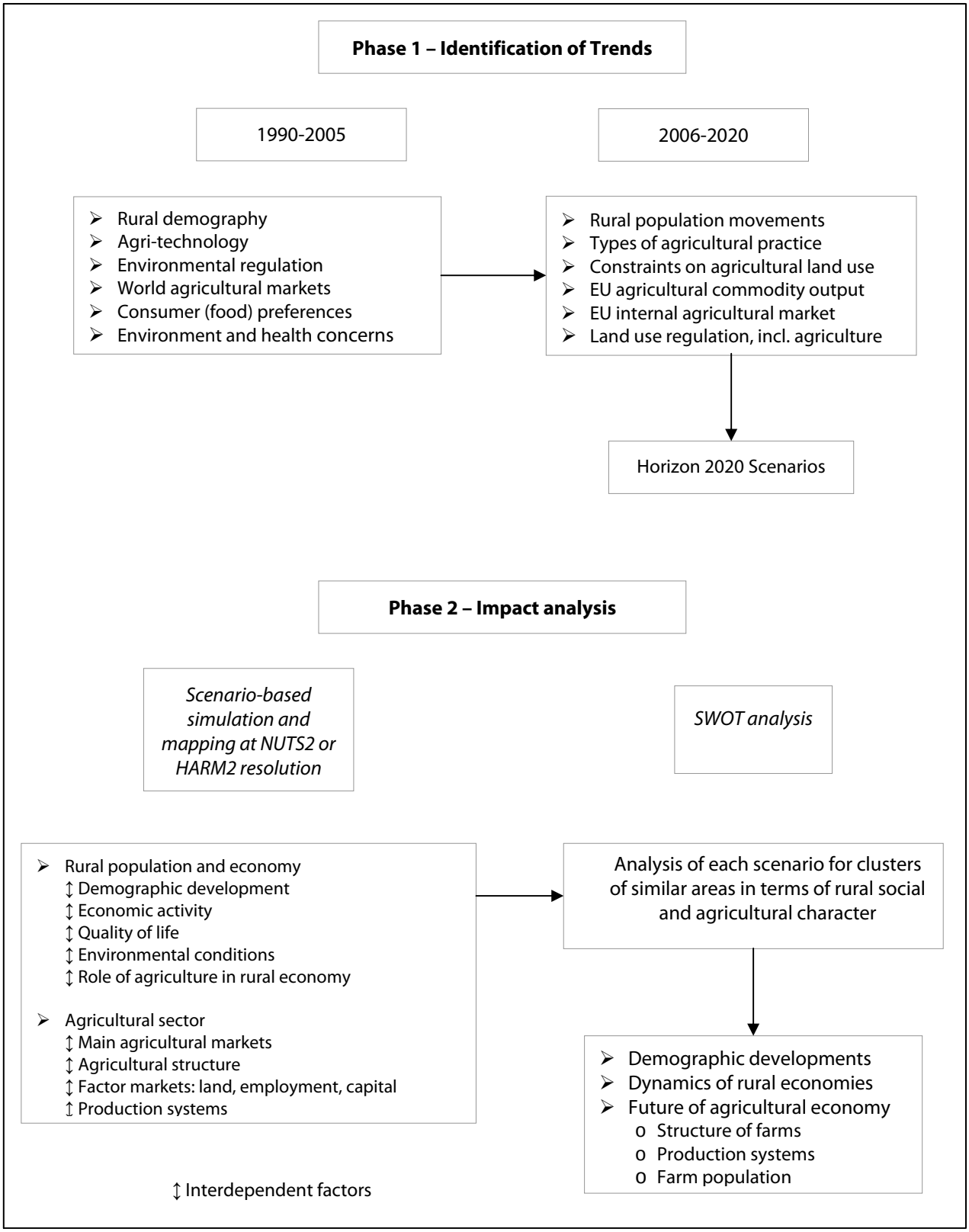
Scenarios

Three scenarios have been retained, identified by the terms *baseline*, *regionalisation* and *liberalisation*. The **Baseline** situation is based on the continuation of the trends in exogenous drivers, and assumes the development of agricultural and rural policy according to current policy objectives, including the successful outcome of the Doha Round negotiations. **Regionalisation** is a policy framework which refers to the possibility that, in the absence of a successful conclusion of the Doha Round, then not only will further bilateral and multi-lateral negotiations will continue but also at the same time more encouragement will be given to promoting the production of commodities in the internal market. **Liberalisation** – also a policy framework – implies that the current context of moving towards more open markets at the international level will be strengthened. In this scenario, all forms of market and trade policies and income support – that are related to agricultural commodity production – will be abolished in the EU and the rest of the world. Table 1.1 describes these scenarios, as does Chapter 3 in greater detail.

Modelling outcomes

Three economic models (LEITAP, ESIM, CAPRI) and one land-use simulation model (CLUE-s) are used, and further information on their operation is found in Section 4.1. The economic models differ in approach (one general (LEITAP) and two partial equilibrium models (ESIM and CAPRI)) and scope (from global to regional level), and therefore also in outcomes. The range of outcomes provides a kind of sensitivity analyses of the robustness of the results. The relationship between the models depends on a coupling – or transfers of information – that will always carry some risk of generating an error, and which may escape detection in the analysis of results. But careful analyses over the repeated application of models provides a guarantee that no truly significant errors are likely to occur in any particular study, and the minor ones are normally detected and rectified. No modelling exercise, however, will predict the future with 100% accuracy, because it is not possible to completely model the way the economy operates and land-use change occurs.

Figure 1.1: Structure of Scenar 2020 work programme.



Environmental pressure from agriculture will continue to lessen because of new technology (precision farming), driven by two incentives for a more exact use of inputs: compliance with environmental regulations and cost savings. Farm units will increase in size and decrease in number. An increase in organic agriculture will continue, in response to consumer demand and national and EU policy encouragement, although it is possible that demand will arrive at a ceiling.

With regard to long-term patterns, both the agricultural labour force will continue to decline by 2.5% in EU-15 and by 4% in EU-12 per year and at the same time productivity will increase. With the advent of a technological shift in horticulture to green house production systems, the UAA will continue to decrease within the European Union. Even though it is probable that increased demand for biologically derived molecules for industrial use will occur, the capacity to progressively implement technologies that require only undifferentiated biomass and organic residues as a source of fuel and heat means that the agricultural sector *per se* will not necessarily be the major source of biofuels feedstocks over the long-term. Also, there are already – and will continue to be – competing land uses that have their origin in improved transportation and increased leisure time, resulting in a progressive urbanisation of rural areas (in terms of residential patterns and economic activity) and the enhancement of the 'natural' features of landscapes for the benefit of recreational activities occurring either in proximity to metropolitan centres or further away for longer holiday periods.

In general, although agriculture remains a significant land use, with an increasing role to manage externalities such as landscape and biodiversity, its economic importance at the regional level will continue to decline. The added value that is generated by agriculture will be increasingly captured elsewhere in the commodity supply chain, a reality of vertical integration within the agro-industry, and the localisation of the financial benefits will be distributed both in rural and urban areas, according to the industry's logic concerning the purchase and transformation of primary commodities.

Within the general context for the future of agriculture, it should nevertheless be remarked that the current policy of making the agricultural economy more responsive to market forces will strengthen the viability of the agricultural enterprises that will be present in 2020. However, this will not stop the structural change process of a continuing decline in farms that has been going on since the past half-century. There will be less farms than at present, their productivity will be higher, and also the average incomes of farmers as well. The restructuring of the agricultural sector that accompanies enlargement will stimulate the competitiveness of farmers throughout the European Union, and therefore will result in increased market opportunities at the global scale. The one factor that may influence agricultural land use to continue to decline in specific EU regions would be substantial out-migration from them, particularly along the eastern border.

Table 1.1: Main scenarios – baseline, regionalisation and liberalisation.

(a) Level 1: Assumptions on the exogenous drivers

Assumptions	**Demographics**	**Macro-economic growth**	**Consumer preferences**	**Agri-technology**	**"World Markets"***
Baseline	Major population trends as observed in the past	Moderate growth as seen in the trends; Increasing trend for labour market liberalisation	More demand for value added and increasing absolute spending per capita; Consumption of organic and regional food as observed in the past	Continuous trends in cost saving technical progress; Biotechnology; GMO	Trends in agric-markets as observed in OECD/FAPRI studies adjusted for differences in macro-economic and population growth as well as for changes in consumer preferences and agri-technology
Regionalisation	Trends according to baseline	Trends according to baseline	Trends according to baseline	Trends according to baseline	Trends according to baseline, endogenously adjusted for changes in policy related second level drivers (see following table).
Liberalisation	Trends according to baseline	Trends according to baseline	Trends according to baseline	Trends according to baseline	Trends according to baseline, endogenously adjusted for changes in policy related second level drivers (see following table).

* partly endogenous in the study and determined by changes in global macro-economic and population growth, consumer preferences and agri-technology.

(b) Level 2: Assumptions on the policy-related drivers

Assumptions	CAP			Biofuels	Enlargement	WTO and other international agreements	Environmental policies impact on agriculture
	Market policies	Direct payments	Rural development policy				
Baseline	Balanced markets, i.e. keeping public stocks at 1 to 2% of domestic consumption	Financial discipline and 25% modulation	Taking into account the new financial perspective	Continuation of EU Biofuels Strategy	EU-27 plus the accession of Turkey and the Western Balkans	EU offer	Continuation of existing environmental legislation
Regionalisation	Existing CAP	Financial discipline and 5% modulation	Significant increase in funding of rural development through all EAFRD axes	Higher policy support to produce biofuels	Baseline	No WTO agreement / bilateral approach	Reinforcement of environmental legislation
Liberalisation	No internal support policies	Removing direct agricultural payments	Rural development is funded according to EAFRD provisions: decrease in funding of all EAFRD axes	No per hectare subsidies for biofuels	Baseline	Removing import tariffs	Partial withdrawal of environmental legislation

1.4 Conclusions of Scenar 2020

1. Rural areas are not stable:

   - Most rural areas are driven by urban economies rather than rural economies, therefore an on-going shift in rural activities is taking place. Urbanisation is spreading into rural areas around the metropolitan centres where in-migration is occurring, and the service sector develops as the principal economic vector; where transportation and telecommunications infrastructures are well developed, the functional urban hinterland can cover a considerable area even at relatively low levels of residential density.

   - Rural activity can exist without agriculture: rural dynamic is not equivalent to strong agriculture, and strong agriculture can exist where rural dynamic is limited. The importance of agriculture in rural activity differs between regions.

   - Land use in rural areas changes rapidly … between commodities within the agricultural sector; between productive land and fallow land; and between sectors. In the period from 2000 to 2020, arable land will decrease by 5%, grassland by 1%, and permanent crops by 1%; forest will increase in land cover by 1%, other natural vegetation by 2%, recently abandoned land by 3% and urban land by 1%. The individual regional changes in land cover will be between 4-10% of their territory.

   → Marginalisation of rural areas is more than just one problem. It is a combination of employment potential in all sectors, specific to each region, in a context where the employment rate in both agriculture and industry is declining throughout Europe; there are also very strong migratory currents, with out-migration affecting all of the three OECD regional types[4], with some zones in a critical population situation (especially along the eastern border of the EU).

   → In most areas where agricultural land use is decreasing, forestry is increasing, and the opposite situation is also the case; there are also some regions in which both types of land use are in decline (Figures 1.4 and 1.5).

   → Structural adjustment of agriculture is taking place within a context in which the EU internal market is expanding, but the relative competitive advantage in certain commodity markets develops unevenly; for example, the rate of growth in crop production will be slightly higher in the EU-10 than in EU-15, but on the contrary, the rate of growth of livestock production will be almost twice as high in the EU-15 than in EU-10. With regard to the influence of international trade agreements in terms of real farm income growth, the EU-15 is far more vulnerable to the effect of liberalisation than the EU-10 with regard to both the crop sectors and the livestock sectors; this situation changes the distribution of commodity production at the EU-25 level, with Bulgaria and Romania being closer to the degree of the EU-15 response with regard to certain arable crops, such as oilseeds, and to livestock production. The evolution in regional response to commodity markets will inflect the general trends in the rate of decrease of farm units (a 25% decline in the number of farms between 2003 and 2020 is differentiated at around -2% p.a. in EU-15 and -4% p.a. in EU-10) and the degree of their expansion in average size.

[4] These are adapted in the Scenar 2020 in a typology of most urban, intermediate rural and most rural.

2. Agriculture in rural areas within the EU-27 is very diverse.

   - Share of agricultural employment in regions is very different. In general the share is much higher in EU-10 (12%) than in the EU-15 (4%). The same is true for industry (31% in EU-10 and 26% in EU-15).

   - Wide diversity in the size of holdings. Within EU-15 average size ranges from 4 ha in Greece to 67 ha in the UK. Within the EU-12, individual farm sizes will range from under a hectare (barely at subsistence level for a family) to well over a thousand (the former state farms now managed as cooperatives); agriculture is in some circumstances a social buffer.

   - The family farm is no longer the typical institutional unit carrying out farming activity, although it is the most prevalent. Business, demographic and socio-economic issues are interlinked at the household level in traditional family farms, which distinguishes them from farming units managed as agro-industrial enterprises. But as both the size and adaptability of these family units are regionally quite differentiated, policy requirements for addressing the needs of family farms should likewise be regionally targeted to cope with changes in institutional organisation as the agricultural sector becomes more vertically integrated and farm management increasingly passes into the hands of multiple-farm enterprises.

   - An increasingly important feature of agriculture as an industry is that the production of agricultural commodities on family farms takes place in units that are operated by people who also engage in other activities (part-time farming). This differs among Member States from 40% in Belgium, Ireland, Luxembourg and the Netherlands to about 80% in Greece, Spain, Italy and Portugal.

3. Growth rate in world agricultural markets will slow down.

   - Population growth will no longer be the major driver of agricultural demand in the future. Developments in income per capita will become more important.

   - Future world population growth will be lower. Population growth will occur mainly in low and middle income countries.

   - Robust economic growth is expected in almost all regions in the world. Growth will be considerably higher for developing and transition countries.

   - Expansion in global consumption will occur, in particular due to economic performance and population growth in developing countries.

   - Income growth, urbanisation and dietary diversification not only lead to additional demand but also to changes in the composition of food consumption, with a fast growing share of animal products.

- In developed countries food consumption growth is limited. Product and process attributes (food safety, quality, environment, animal welfare, etc.) become more important.

- Production and exports increase especially in low cost producing developing countries (e.g. Brazil). An increasing share of agricultural trade becomes South-South trade between developing countries.

- Agricultural trade is still impeded by high trade barriers as compared to other sectors.

- World prices will continue to decline in real terms, due to high productivity growth and a rather inelastic demand.

4. There are several key trends in EU commodity markets up to the horizon of 2020 as:

   → Increasing segmentation of EU market will take place because of the growing relative importance of transportation costs, which is enhanced by further trade liberalisation and enlargement.

   → Main developments in cereals: Although production will increase, area requirements will diminish because of technical productivity improvement. This trend is in continuity with past experience, and demonstrates that a balanced market approach leads to successive declines in cereal prices, in which a reduced nominal rent value of land and lower feed costs for the livestock sector enter into the progressive adjustment of cereal prices and production.

   → Main developments in livestock: The livestock market will undergo important restructuring, with a concentration on dairy production, poultry meat and pork meat output. The decline in beef production is a partial reflection of consumer consumption preferences, and partially the result of trade factors. The changes in milk output productivity will reinforce the shrinking of the cattle herd, and this will be reflected in the reduction of fodder production. Full liberalisation will radically reinforce this general structural evolution. In any case, the output of higher value added food commodities, such as cheese, will increase.

   → Main developments in oilseeds: Because of the policy promotion of biofuels, independently of the external market, there will be a shift in oilseed production towards the requirements of industrial use quality as opposed to food consumption quality. The area devoted to oilseeds in general will increase, following a substantial increase in production. This is a first indication of a potential competition between food, fuel and fibre that may develop over time, at least in terms of producer output choice if not in terms of land availability.

5. Structural change process in agriculture is a long-term process that continues ***with or without*** policy changes. This structural change process includes:

   - Declining share of agriculture and industry in GDP.

- Declining number of people working in agriculture, both in absolute terms and as a proportion of the total workforce.

- Decrease in the number of farm units, with an increase in the average size. Productivity per hectare and per UAW increases, so the income effect per farm unit is positive.

- Increase in diversification of farm households (e.g. part-time farming).

- Enlargement has brought into the EU a wider variety of farm units, in terms of both size and capacity to relate to a rapidly evolving market economy. This means that the adjustment of the EU-12 to commodity markets, although following the same trends as in EU-15, will not always display the same strengths and weaknesses. The adaptation of Bulgaria and Romania is again distinct from both EU-15 and EU-10 in some market areas.

→ Structural change will continue to be especially acute in EU-12, because of the high share of agriculture in GDP and employment and the high number of small farm units.

→ The surplus agricultural labour in EU-12 may not be easily absorbed because of a parallel decline in manufacturing employment. There are also areas in EU-15 with a similar structural linkage between agricultural and industrial decline. The end result is to perpetuate sub-optimal employment and investment levels in agriculture, which can be a factor for deterioration of environmental conditions as well as of social welfare. Under these adverse circumstances structural change in these regions leads to lower income and "hidden unemployment". Out-migration is another option to sub-optimal employment within rural areas generally.

→ Out-migration from peripheral areas (particularly on the eastern EU frontier and in the north-west corner of the Iberian peninsula) will cause a labour deficit that will be compounded by the current difficulty of access to markets, thus having as a net result of:

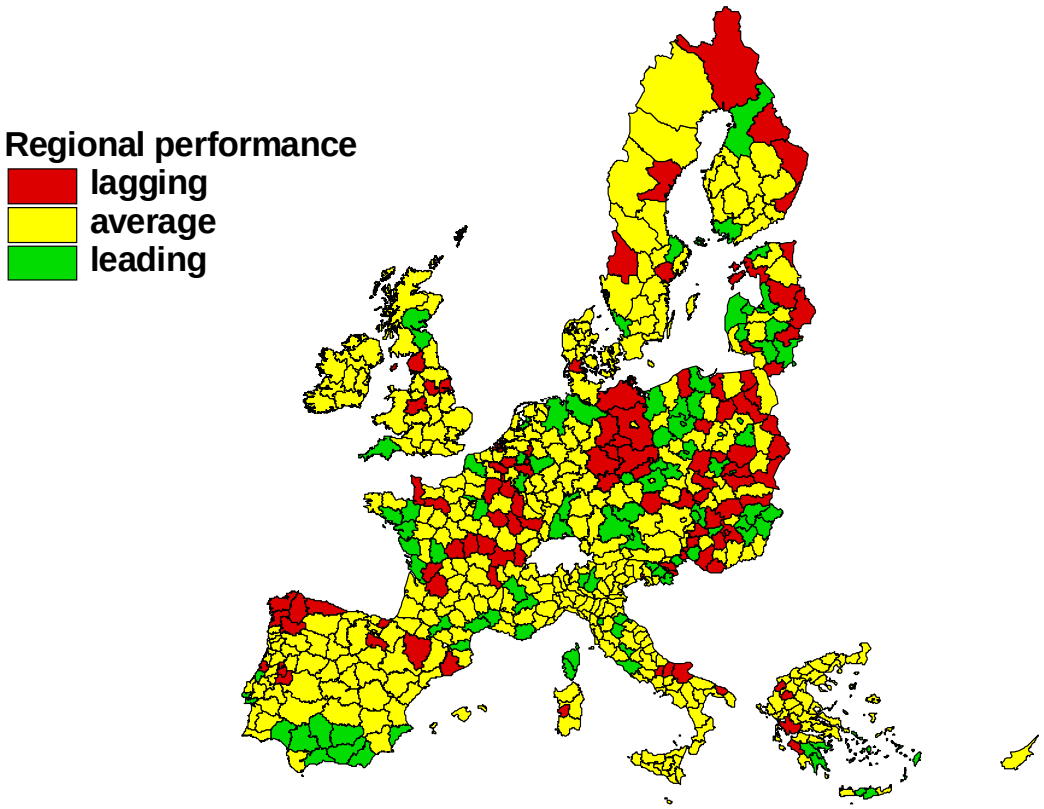
(a) increasing the existing regional segmentation within the EU, and

(b) encouraging the rationalisation of farm structures, therefore leading to an acceleration of the shedding of labour in the agricultural sector in these areas by accentuating the motivation to migrate; another possible outcome is land abandonment.

- Important characteristics of agriculture behind the structural change process are (a) the fact that people do not eat much more as their income grows and (b) the high rate of technical progress. Both characteristics lead to a decline in the real price of agricultural commodities and therefore income. To obtain a market conform real wage in the long run farmers have to increase the scale of production, increase the quality of their products or engage in other activities (e.g., part-time farming, tourism).

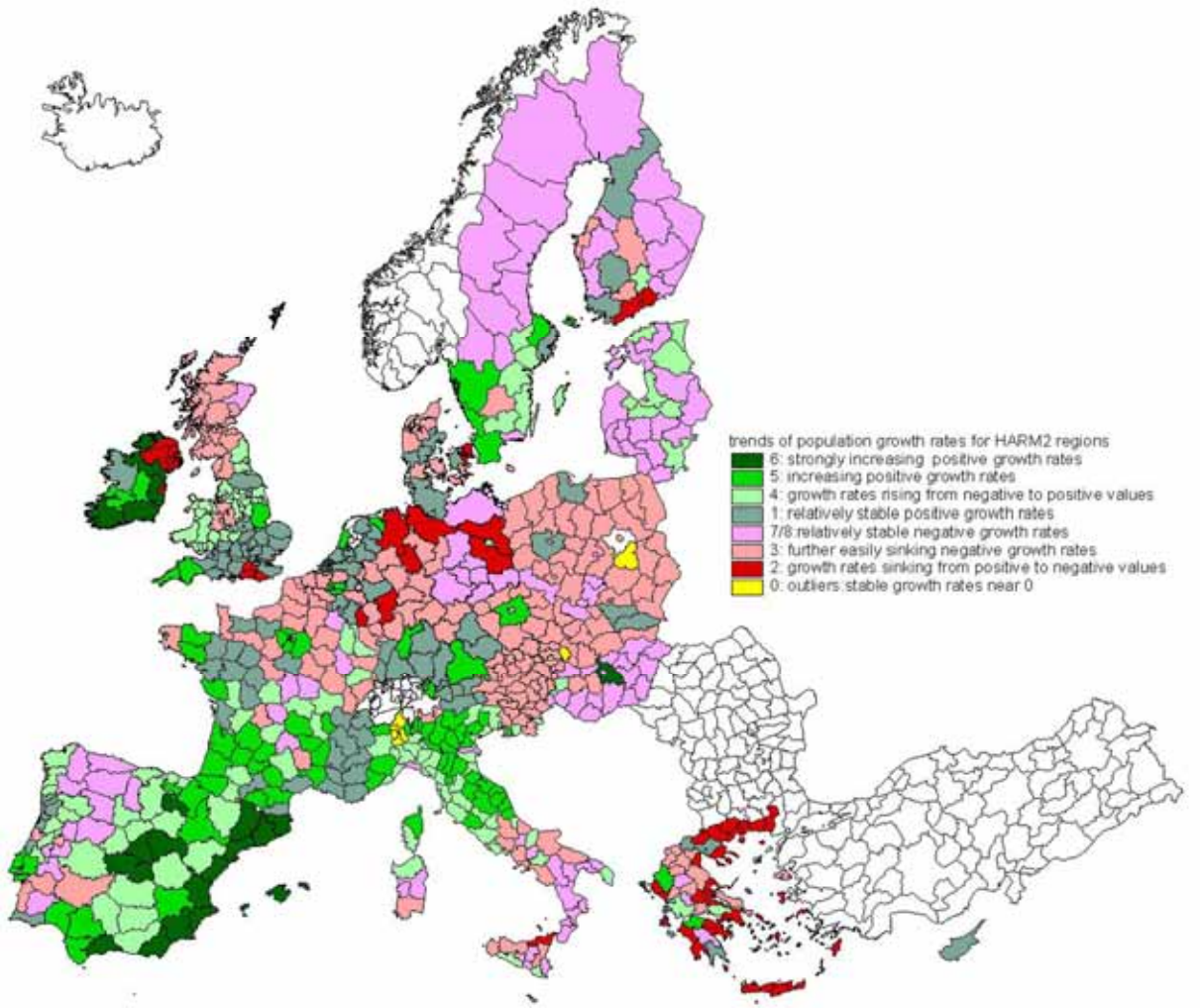
- There is a similarity in the direction of structural change everywhere, although regions differ widely in their agricultural characteristics.

Figure 1.2: Projection of relative employment growth in EU 25 regions, 2004-2020[5].



[5] *Relative* to the national average.

Figure 1.3: European regions with a similar behaviour of population growth rates (long term trends).



growth rate values	development and trend of growth rates from 1990 to 2020				
	strong increase	increase	stable	decrease	strong decrease
strong positive				**Flevoland**	
positive	**cluster 6**	**cluster 5**	**Cluster 1**		
negative to positive		**cluster 4**			
near 0		**Midlands**	**Bratislavský, Radomski, Novara, Vercelli**		
positive to negative				**cluster 3**	**cluster 2**
negative			**cluster 7+8**		
strong negative				**Warszawski**	

6. Policy change produces differentiated impact.

   - The reduction of border support (import tariffs and export subsidies) has a higher impact on agricultural production than the reduction of domestic income support. On the other hand, reducing domestic income support has a larger impact on farm income than the reduction of border support. This supports the view that a shift from border to income support is less production distorting from a production / trade point of view and is better in terms of preserving a stable income for farmers.

   - The process of liberalisation has a greater impact on agricultural income than on agricultural production and land use; this fact consolidates the structural pressure throughout Europe to decrease labour in farming and to increase the average farm size.

   → The most obvious effect of liberalisation will be the augmentation of the rate of decline in the number of farms in the EU, and to a lesser degree in the area of land under agriculture; overall production will in general also decrease. In the case of beef and poultry, the decrease will be substantial. Some sub-sectors of agricultural production, such as cheese and pork, would nevertheless increase. The regionalisation scenario, on the contrary, shows an increase (sometimes strong) in all sub-sectors, except oilseeds and pork.

   → The general trends in factor markets are a decrease in agricultural labour and an increase in the capital intensity of agricultural production. On average the income of agricultural activity is increasing continuously but it still lags behind other economic sectors. The wage differentials between agriculture and non-agriculture can be sustained in many countries through limited off-farm labour migration. There is evidence that individuals' schooling plays a very important role in occupational choice (increasing the probability in developed countries to work outside agriculture), migration (more educated individuals have greater geographic mobility out of rural areas), and part-time farming (the probability of off-farm work by those remain in farming increases), which are all important in reallocating human resources among sectors and closing the wage gap between agricultural and other sectors.

   → Factor markets have general trends that are somewhat independent of policy, except for agricultural land prices, which decrease in the context of liberalization. Declining prices of agricultural land imply lower asset values for the landowners. This might affect the viability of landowners that are heavily indebted. Depending on whether land owners are farmers and whether they live in rural areas, this might create adjustment costs in rural areas which might justify adjustment policies.

7. Within the limits of the foreseeable budget, the total amount of EU Rural Development support per farmer or per agricultural area is small in comparison to the regional GVA in the agricultural sector in most EU regions. Specific targeted policies might be effective to achieve the foreseen objectives in certain areas. Nevertheless, other drivers have far greater impact on GVA, and will also influence the agricultural sector. For memory, these are demography, the general restructuring of regional economies in several sectors (manufacturing, tourism, residential development and associated services, for example), and the influence of environmental considerations (these range

from the sustainable management of environmental resources to the direct influence of climate change on land use).

8. Productivity increase derived from technological innovation is an exogenous factor, from which new opportunities can be promoted through policy, but which will in any case evolve independently of policy. The case of biofuels is a opportune example. Current policy support will enhance the commercial viability of transforming certain arable crops into bio-ethanol, giving the development of the first generation technology an advantage of economy of scale. But the second generation technology will be able to use any biomass as a feedstock, and then the commercial interest in using arable crops will disappear. This will leave arable crop producers without this specific market opportunity and in a very short period of time (perhaps by 2015).

9. Major uncertainty with regard to all conclusions concerning the future of biofuels is the tightness of oil/energy markets. Impact of biofuels may be under-estimated:

    - Meeting 10% of EU energy requirements for transport in 2010 could take up 43% of current land use for cereals, oilseeds, set aside and sugar beet.

    - The 5.75% objective for 2010 in itself will require 15.03 mio tonnes of biofuels. If the feedstocks are all grown domestically, this would be equivalent to 12.02 mio ha, or 9.4% of EU-25 agricultural land demand. It is projected, however, that in 2010 there will be only 6.98 mio ha of agricultural land used to produce biofuels feedstocks, which is equivalent to (a) 8.74 mio tonnes of biofuels, (b) 58% of total biofuels used and (c) 5.5% of total agricultural land demand.

    - A corollary of the increased demand for biofuels is the increased resort to bio-based materials (partially motivated to replace plastics, a petroleum derivative); the conjunction between the demand for biofuels and the demand for biobased materials is likely to create competition with other demands for agricultural commodities.

    - The demand for biofuels derived from agricultural commodities could be rapidly offset by biomass, using second-generation bio-energy production technology, as a substitution feedstock for the bio-ethanol fraction that would be fully operational on an industrial scale as early as 2015.

        a. The second generation of biofuels is currently considered to be more beneficial because the reduction of greenhouse gas emissions is larger and it is (perhaps) less land intensive.

    - Non-food demand of agricultural products (e.g. energy) competes with food demand. This implies:
        a. increasing food prices with possible adverse effects on food importing (developing) countries;

        b. land expansion with implications for the environment. A trade-off between lower greenhouse gas emissions and adverse effects of this expansion and intensification in terms of for example biodiversity.

- Energy demand causes major uncertainty. It is now too early to deal with it fully, however, given the uncertainties with regard to oil prices[6].

10. Role of forestry in rural areas is not given enough attention. A long-term trend in afforestation is witnessed within several countries of the EU. This occurs to an extreme in some of the Nordic countries: loss of 'open' agricultural areas leads to a socially perceived monotonous 'closed' forested landscape.

11. Environmental issues linked to land use are with regard to:

    - Green House Gas emissions: the agricultural part has been declining and will continue to do so; with the decrease in beef and dairy herds, further methane reductions may be on the order of 5%.

    - Nitrate concentrations in rivers: the greater part of trends in all countries is either downward or remaining stable, and the situation should improve as the forecasted nitrogen surplus will decline in comparison to present conditions.

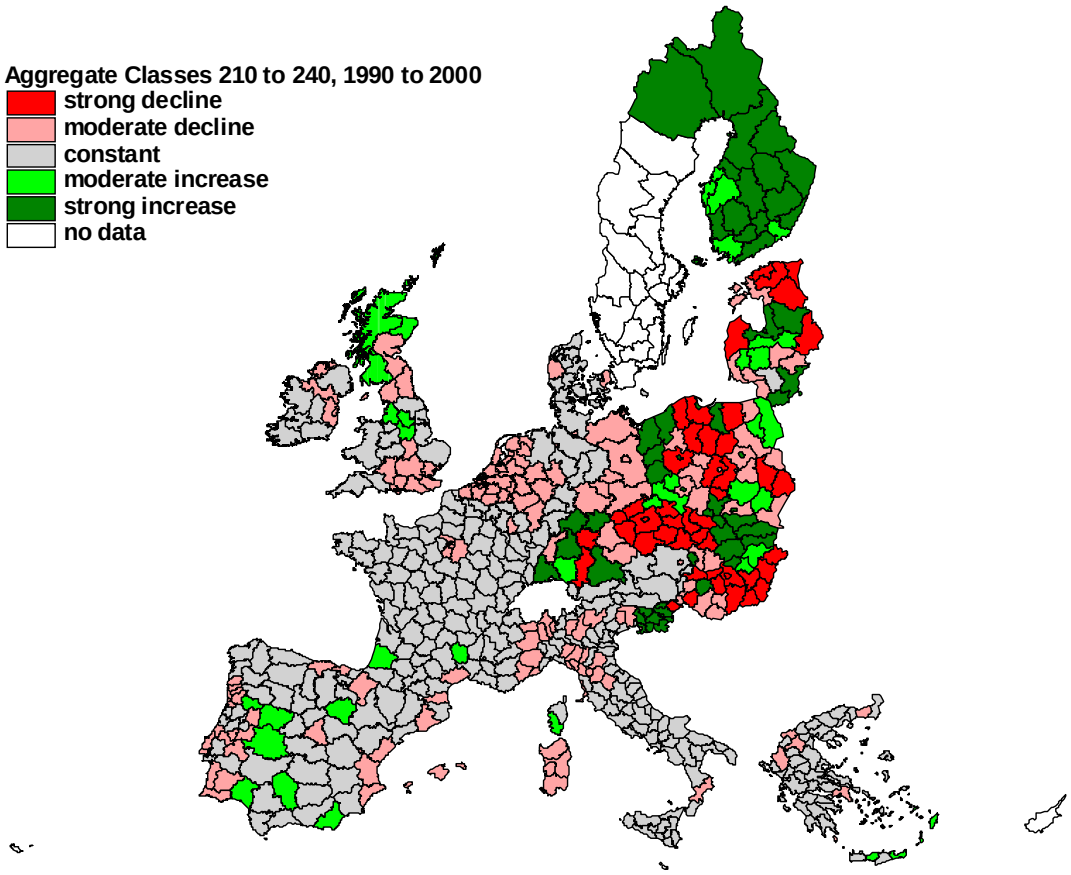
    - Fertilizer use is predicted to decrease in the EU-15, but the possibility of new demand for biofuels might change this trend; on the other hand, for the EU-12, an increase from the current low levels will be substantial.

    - Set aside land is a prime area for expansion of biofuels feedstocks production; set aside areas occur throughout Europe, but are particularly concentrated in a few regions; these regions do not correspond to major concentrations of Natura 2000 sites, so although there may be an impact on soil and water quality from increased arable activity, areas of faunal and floral Community interest may not be particularly threatened.

    - The highest concentration of organic farming does not necessarily take place in areas having the highest concentration of arable land, which may be a reflection of Member State priorities, of consumer interest or of producer attitudes.

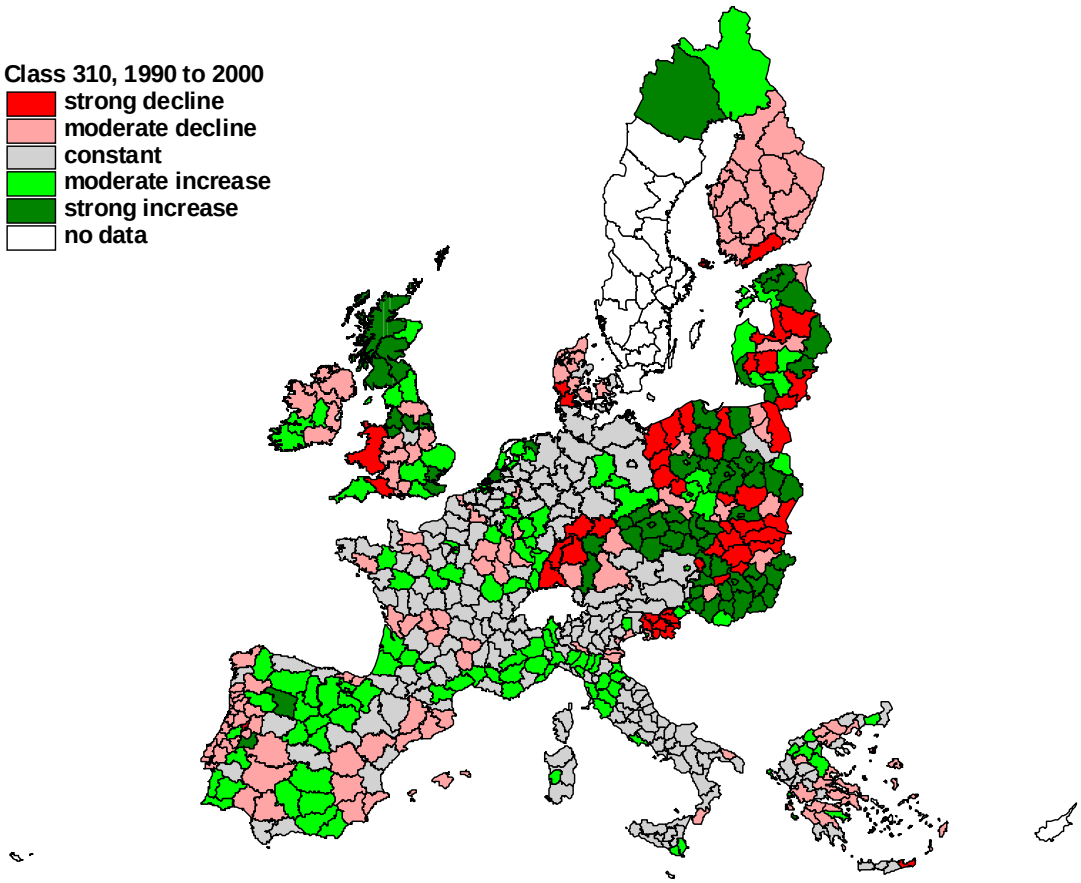
[6] For a discussion of this point, see *OECD-FAO Outlook 2006-2015*; Box 1.2 (OECD 2006, pp. 32-33).

Figure 1.4: Trends in agricultural land cover, 1990 to 2000 (Corine Land Cover).



Strong decline: > -20%
Slight decline: -20% to -1%
Constant: -1% to 1%
Slight increase: 1% to 20%
Strong increase: > 20%

Figure 1.5: Trends in forest land cover, 1990 to 2000 (Corine Land Cover).



Strong decline: > -20%
Slight decline: -20% to -1%
Constant: -1% to 1%
Slight increase: 1% to 20%
Strong increase: > 20%

- There is no particular correlation between the location of Natura 2000 sites and the particular concentration of agricultural or forestry land cover classes, but there is a significant correlation with regard to the 'diverse natural areas' and 'wetlands' classes; this suggests that (a) Member States are probably trying to avoid land use conflicts and (b) that there is a great harmony of interests in the protection of remaining wetlands.

12. The effects of global warming will be increasingly evident in the period leading up to 2020, with direct consequences to the management of natural resources and for agricultural production.

    - Environmental concerns that are associated with climate change (seasonal temperature variations, precipitation cycle pattern disruption…) are already leading to entrenched phenomenon such as water shortages in southern Europe which will have long term consequences on agriculture; most of the impacts become identifiable in spatial terms after the 2020 time horizon[7].

    - There will be many examples of adjustment of floral and faunal species to the evolution of their 'climate space' in territorial terms[8,9].

    - Climate change will lead to a corresponding change in cropping patterns. Two examples:

        - Warmer and wetter climate conditions in Northern Europe will progressively result in a longer growing season conducive to the continuing northward expansion of maize cropping (Figure 1.6). Increasing average annual temperatures and recurrent draught will result in the reduction of yields in the southern range of wheat (Figure 1.7).

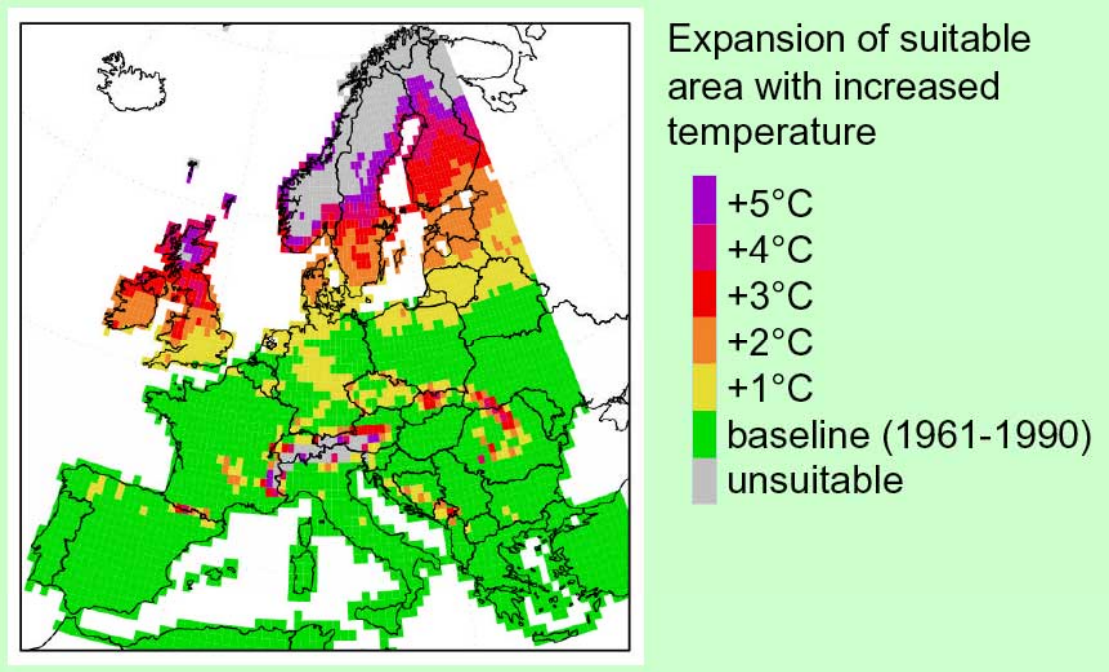
        - With the increasing social competition for water supplies in Mediterranean countries, even on the horizon of 2020 there could be a reduction in irrigation; an additional reason is the already depleted state of fresh water aquifers after years of extraction for agricultural use.

[7] Recent research by the Poznan Institute for Climate Impact Research (Potsdam, Germany) – which could not be integrated into the Scenar 2020 study because of the timing of the availability of the results – seems to indicate that territorially definable impacts of climate change will occur before 2020.

[8] The implications for spatial planning in rural areas are being studied by current modelling research, such as the Branch project: www.branchproject.org.

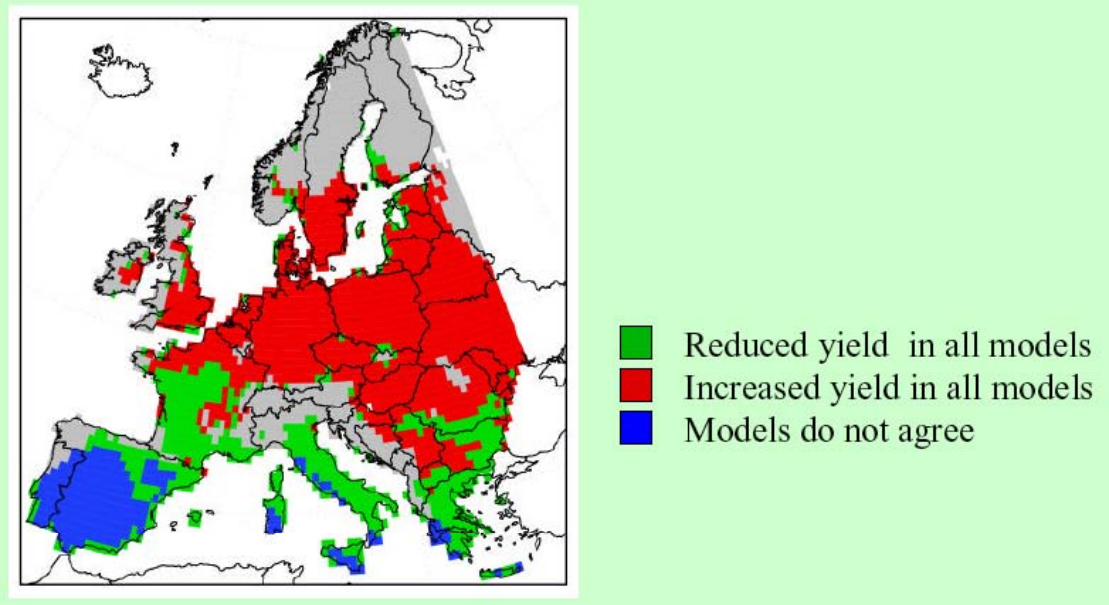
[9] In terms of the management of natural resources in rural areas, already the Office National des Forêts of France has discontinued the planting of pedunculate oak in the forest of Orléans, because it is at the sourthern limit of its range.

Figure 1.6: Suitability for maize cultivation with increasing temperature.



Source: Martin Parry, 'Impacts of Climate Change on Agriculture in Europe' (slide 9), Informal Meeting of EU Agriculture and Environment Ministers, 11 September 2005, London.

Figure 1.7: Changes in wheat yield, 2080 (amount of agreement between 9 regional models).



Source: Martin Parry, 'Impacts of Climate Change on Agriculture in Europe' (slide 15), Informal Meeting of EU Agriculture and Environment Ministers, 11 September 2005, London

Postscript

The conclusions presented are a brief, and consequently incomplete, summary of the information contained in this report; there is equally a more substantial version that has been compiled as the original technical study from which the present document is constructed. The reader will find much more ample information in the following sections of this report, as well as in the original technical study, and thus is invited to further investigate the points which the present section will have touched upon. Other subjects are also presented and elaborated upon.

Scenar 2020 is intended to be a transparent, well-documented and policy neutral study; that is, the remit is not to make policy recommendations, but to inform policy-makers and other interested parties about the possible consequences of policy decisions. The reader is reminded that no scenario study can claim to present what *will* happen, but merely can portray what *may* happen. What is important afterwards is that these eventualities are debated, and that the necessary choices concerning the future of agriculture and the rural world are as fully informed as possible. This is the mission of Scenar 2020.

2 – Drivers and Corresponding Trends

A fundamental objective has been to identify what are, in fact, the long-term drivers that the Scenar 2020 study must work with in developing a vision for the future of agriculture and the rural world in the European Union. Some of these are largely independent of policy influence, but others can be oriented by policy intervention. It is this possibility to inflect the course of reality that gives sense to the study of alternative scenarios that accompany the formulation of the baseline, or reference, scenario for 2020 that the Scenar study elaborated upon during the second phase of the project work programme.

2.1 Exogenous drivers to the EU policy-making system

2.1.1 Demography

2.1.1.1 Demography in the European Union

The major drivers in demography in the EU are natural population growth (i.e., the ratio of births and deaths) and migration (i.e., the difference of arrivals and departures). The components of these drivers have been analysed for all selected HARM2 regions in connection with Scenar 2020 as a whole and separately for each group of regions based on the OECD's classification of most urban, intermediate rural and most rural (for definition see Section 2.3.1) and, in addition, for Bulgaria and Romania where the baseline data to apply the OECD classification was not available. Therefore, data given in the following tables refers to both countries taken together.

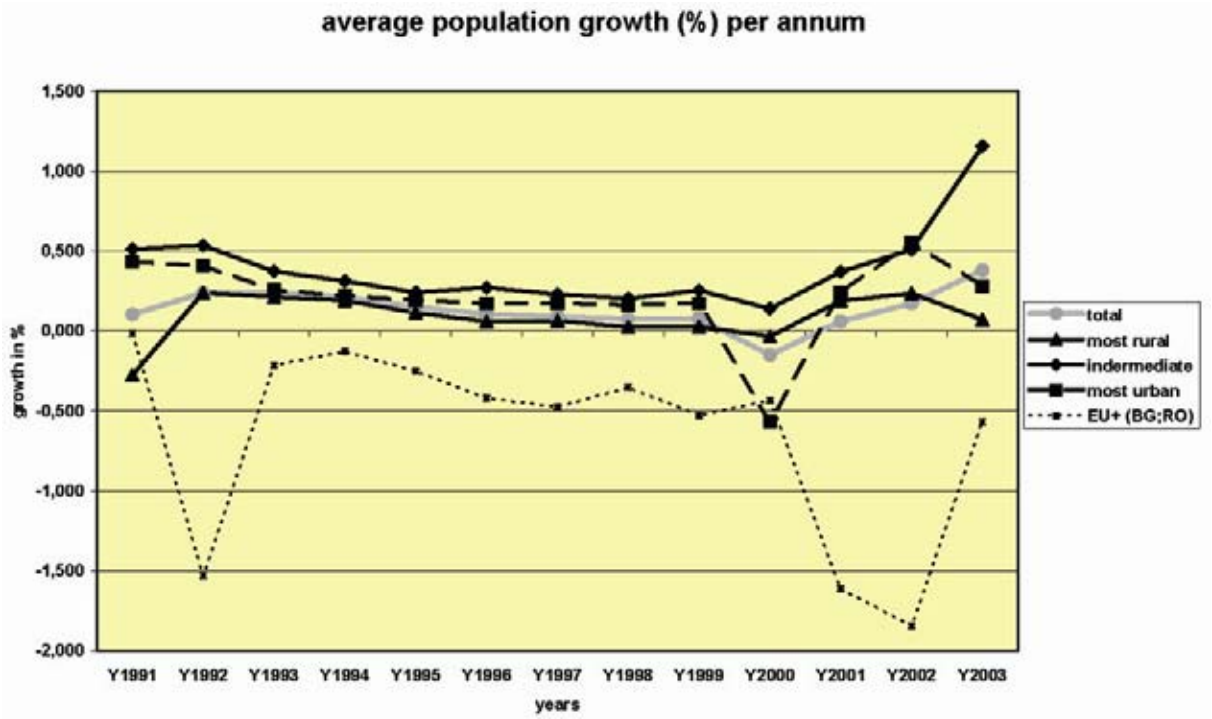
Total population development

In relation to the gross population development, the time series suggests a slight modification in the general trend, i.e. after a period of reduced increase between 1995 and 1999 one can notice an enhancement in growth from the year 2000 onwards, although on a noticeably lower level in the most rural and most urban regions (Table 2.1). The slight modification is mainly due to the intermediate rural regions (Figure 2.1), so it would be premature to state a reversal of trend.

Table 2.1: Total population development in % per 5-year-period.

Scenar Regions (HARM2)	1990-1994	1995-1999	2000-2003
All regions	1.02	0.27	0.69
Most rural	0.61	0.24	0.55
Intermediate rural	2.10	1.19	2.00
Most urban	1.41	0.14	1.10
BG, RO	-2.08	-2.18	-3.98

Figure 2.1: Average total population growth per annum.



Natural Population development and Migration development

The downward trend in natural reproduction continues (Figure 2.2). Since 2000 the negative rate of reproduction is not only registered in the most rural but also in the intermediate rural and in the total of all regions. Only the most urban regions show a small surplus. On widening the perspective from annual to 5-year steps, one has to state that the birth-death-ratio is constantly sinking towards 1.0 in all types of regions (Table 2.2, column B/D), while in the most rural regions it had sunk below 1.0 before 1990, i.e. there is a natural decline as the number of deaths exceeds the number of births.

Figure 2.2: Average natural population growth per annum.

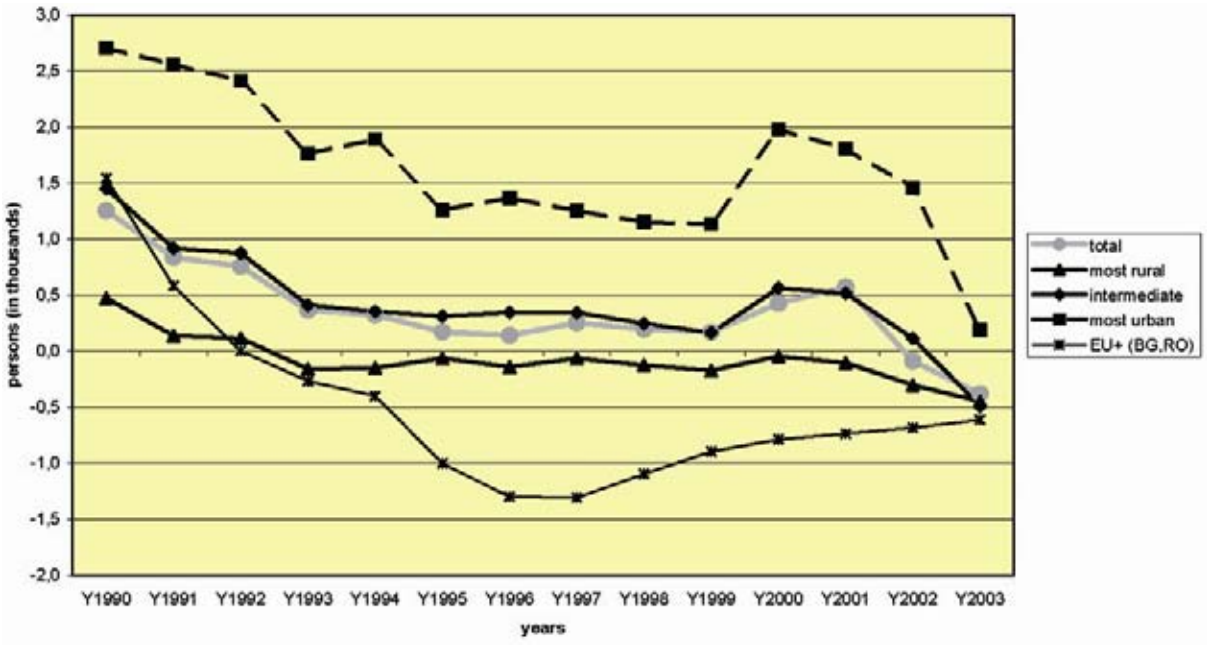


Table 2.2: Average natural population growth in thousands and in births-deaths ratios (B/D), 1990-2003.

Scenar regions (HARM2)	1990-1994		1995-1999		2000-2003	
	x1000	B/D	x1000	B/D	x1000	B/D
All regions	4.1	1.08	1.1	1.02	0.7	1.01
Most rural	1.5	1.02	-0.5	0.97	-0.7	0.94
Intermediate rural	4.5	1.11	1.4	1.04	0.7	1.04
Most urban	10.5	1.15	5.7	1.14	4.7	1.14
BG, RO	1.5	1.071	-5.6	0.82	-2.1	0.96

These findings show that the small population growth must mainly be the result of a surplus in migration. After a relatively stable phase between 1993 and 1999 the migration pattern changed noticeably (Figure 2.3). There is a steady increase in the absolute average numbers of migrations in intermediate rural areas whereas in predominantly rural and urban areas the average of net-migration per annum regresses since 2003. If one smoothes this comparison by analysing 5-year-periods (Table 2.3), the following trend arises. After differentiation, the regions' migration trends are, to some extent, counter-rotating: while the most rural regions showed higher gains in the 1995-1999 period, the other regions had lower gains through migration and vice versa for the other periods. As intermediate rural regions profit most from migration, one can conclude that sub-urbanisation and counter-urbanisation are still very strong drivers for population development in rural regions.

Migration statistics also clarify why Bulgaria and Romania have a negative population trend in general (Tables 2.1 and 2.2).

Figure 2.3: Average net-migration per annum.

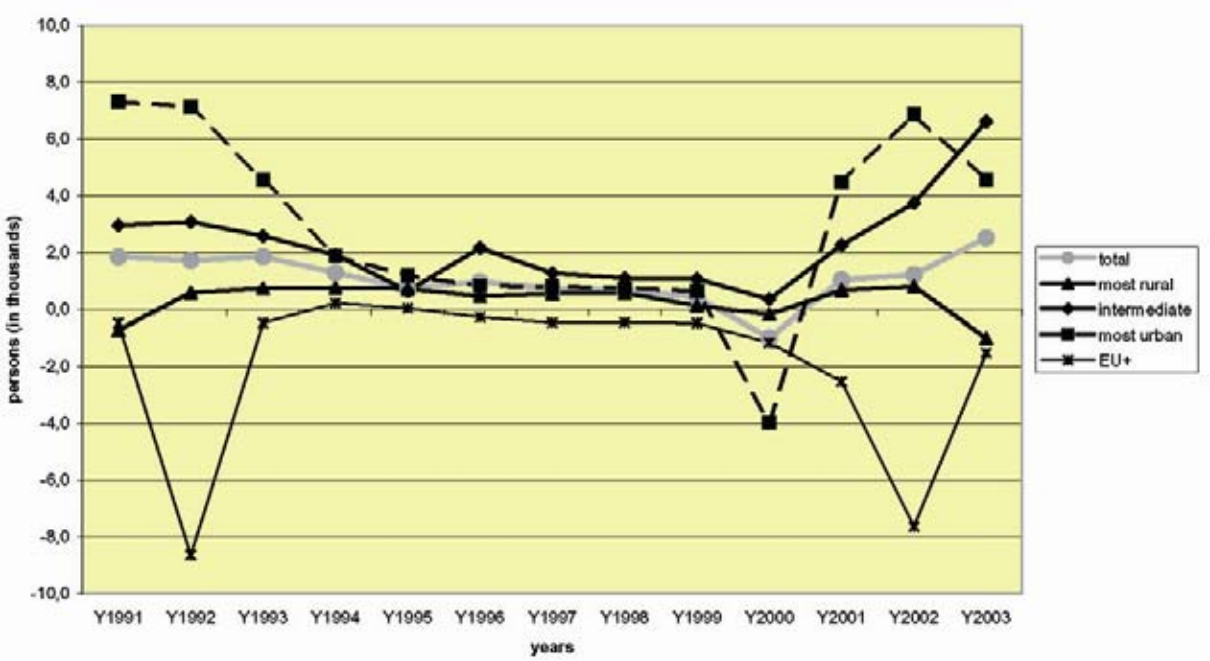


Table 2.3: Average net-migration in thousands per 5-year period.

Scenar regions (HARM2)	1990-1994	1995-1999	2000-2003
All regions	5.1	3.1	5.2
Most rural	0.8	2.1	1.5
Intermediate rural	8.9	5.7	11.5
Most urban	17.1	2.7	8.9
BG, RO	-12.3	-0.1	-9.6

Typology of population development

In order to discover the reasoning behind the general population development, it is possible to use a typology in which the combination of positive and negative natural population development and migration are compiled (Table 2.4). The result is that there are three types of population growth (Figure 2.4). Type 1 is characterised by a natural increase as well as an overspill of in-migration. This represents the most sustainable kind of population development, especially if there is an in-migration of young people, which will positively affect the regional birth rate.

In Type 2 a positive migration balance can compensate for a negative natural population development. In the long run a regional development that solely depends on in-migration is not sustainable, as an unfavourable age structure or a low fertility rate weakens the region's reproduction potential. Regions where a natural increase due to high fertility and a young population outweighs out-migration are pooled in Type 3. In the long term however, out-migration may lead to a lopsided age structure that might endanger the birth surplus.

Table 2.4: Typology of population change with regard to natural population change and net-migration.

Type	Positive			Negative		
	1	2	3	4	5	6
PT: total growth	>0	>0	>0	<0	<0	<0
PM: net-migration	>0	>0	<0	<0	>0	<0
PN: natural population growth	>0	<0	>0	<0	<0	>0

Positive Population Development

Type 1: Natural growth plus in-migration
Sustainable

Type 2: Natural decline compensated by in-migration
Weak natural reproduction potential

Type 3: Natural growth but with out-migration
Potential lopsided age structure

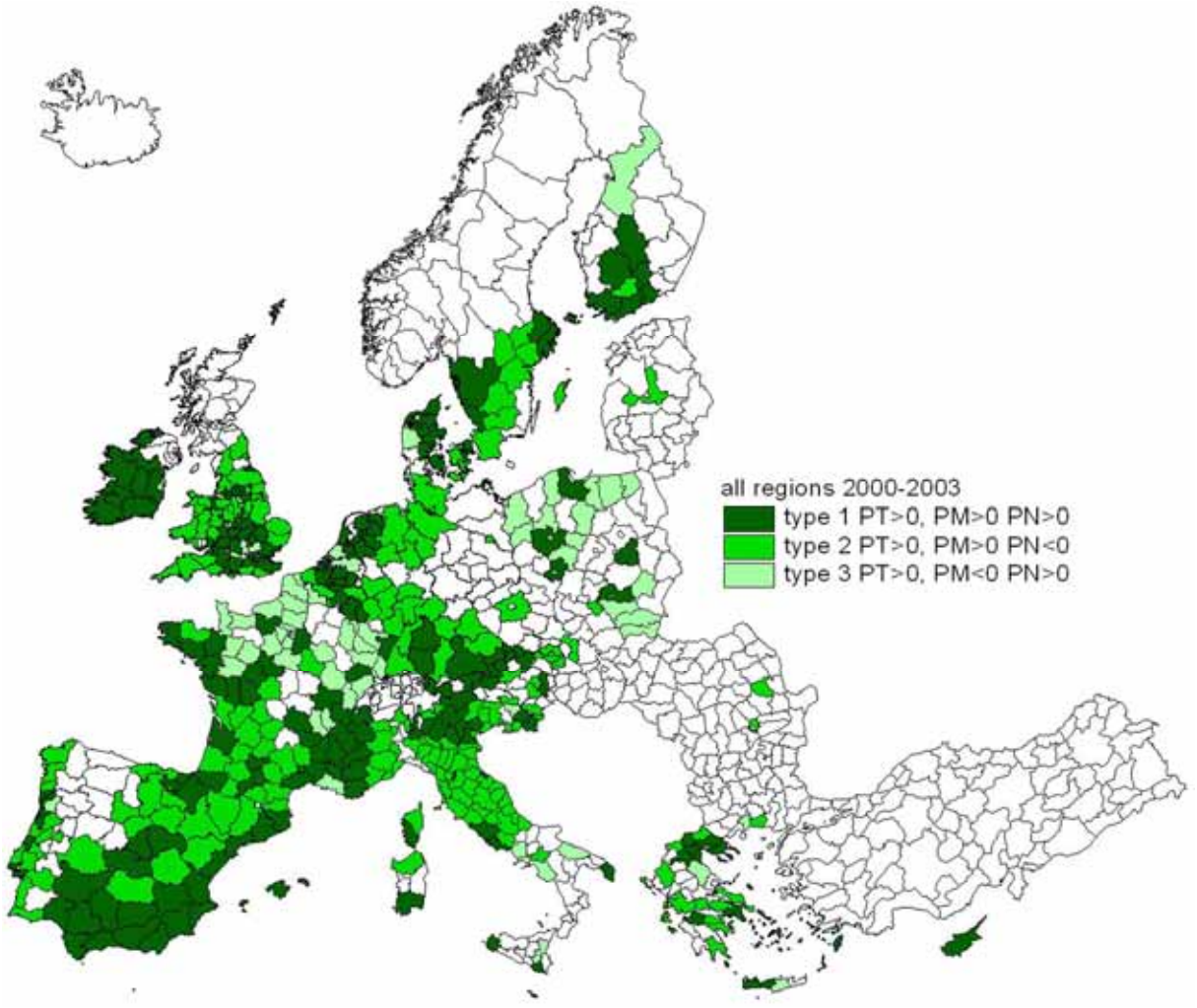
Negative Population Development

Type 4: Natural decline plus out-migration
Least sustainable situation

Type 5: Natural decline greater than in-migration
Long-term decline

Type 6: Natural growth less than out-migration
Long-term decline

Figure 2.4: All types of regions with a positive population development.



The share of regions with a positive population development sank from about 65% in 1990-1994 to about 55% in the next period. From the year 2000 onwards, the share again rose to approximately 65%. This trend can be seen in all the OECD types. Overall there is an increase of Type 2 regions (total growth, migration gains, and negative natural development), which means that more regions can compensate for their negative population development with a positive migration balance. On the other hand the share of Type 3 regions is diminishing, i.e., fewer regions have a negative migration balance and can compensate for this with a natural population increase. In 2000-2003 the share of regions with a generally positive population development almost reached the values of 1990-1995 again. This trend was supported by an increase of regions that have a natural population increase and a positive migration balance (Type 1).

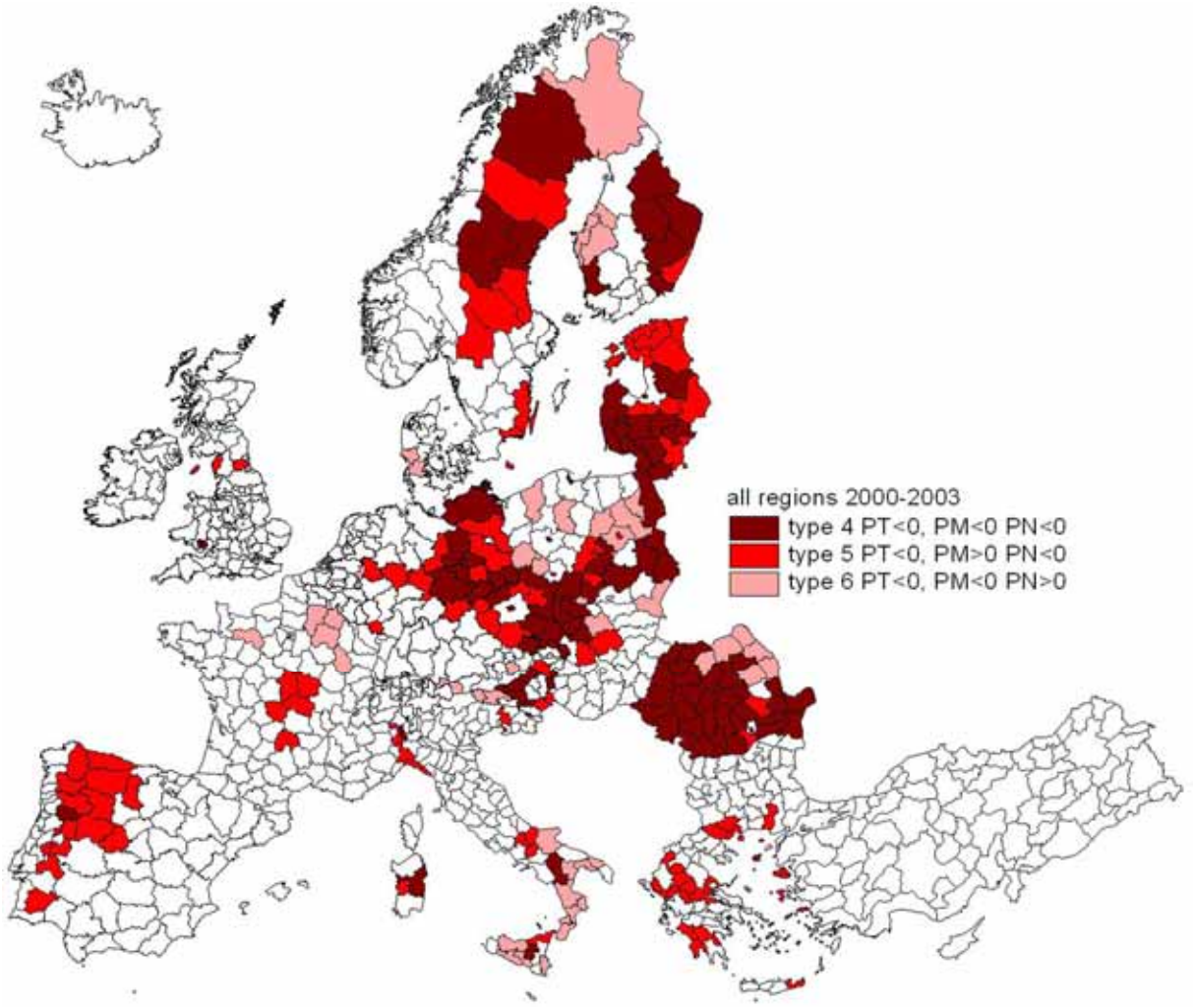
The proportion of regions that can compensate for a natural population decrease with a surplus of in-migration grows, while on the other hand the share of regions where out-migration is counterbalanced by a positive natural population development diminishes. This indicates a trend that regions with population growth might run the risk of having a negative population development in the future. This trend is confirmed with the analysis of the most rural and the intermediate rural regions. Only in the most urban regions there is a constant share of Type 3 regions.

In Figure 2.5, three types of population decrease are depicted. Type 4 is characterised by both a natural decline and a negative migration balance. This represents the least sustainable case of population development as out-migration aggravates the negative effects of an old population on the birth rate. The regions pooled in Type 5 show a positive migration balance, while type 6 regions are characterised by a positive natural population development. In both cases, however, the negative aspect of population development surmounts the positive one, so below the line, the population diminishes.

In regard to the development of the proportions of regions in Types 4 and 5, one realises, on the one hand, that the share of regions characterised by a negative natural population development as well as a surplus of out-migration decreases. On the other hand, the share of regions that contrast a negative natural population development with a positive migration balance grows, even if the overall negative trend cannot yet be compensated for.

A tendency, maybe even a trend, appears that might allow rural regions with a declining population to have a positive demographic development in the future. These findings refer to the outward-migration from the cities and agglomerations, i.e., to the ongoing processes of suburbanisation and counter-urbanisation. They are countered by the age-specific migrations of young adults to the cities in search of work or higher education. The conclusion from the growing share of most rural and intermediate rural regions with migration surpluses must be that suburbanisation and counter-urbanisation increasingly affect the “rural world”.

Figure 2.5: All types of regions with a negative population development.



2.1.1.2 DEMOGRAPHIC DEVELOPMENTS IN RURAL REGIONS

Over half of the EU-25 population lives in most and intermediate rural regions

Within the EU-25, almost half of the regions are classified as most rural, over one-third as intermediate rural and over one fifth as most urban (Table 2.5). About one fifth of the EU population resides in the most rural regions and one third in the intermediate rural regions. Together they live on nearly 90% of the land area of the EU, leaving just over 10% of the land area for the population in the most urban regions. This pattern varies among Member States. In the EU-15 Member States Denmark, France, Ireland, Austria, Finland and Sweden over two thirds of the population lives in rural regions[10], whereas Belgium, The Netherlands and the UK are rather urbanised by having over two thirds of the population residing in the most urban regions. In the new Member States, the share of population in most urban regions is on average about one third or less, with the exception of Estonia and Malta. From this it could be concluded that highly urbanised countries are not common among the new Member States and that most of them tend to have a rather rural nature.

[10] When we use the term 'rural regions' in this study, we refer to the whole of intermediate rural and most rural regions.

Table 2.5: Classification of EU-25 regions to the degree of rurality, share of population and land area in the three rurality groups, 2003.

Degree of rurality	Number of regions		% population	% land area
	total	as %		
Most rural regions	262	44	20	54
Intermediate rural regions	208	35	34	33
Most urban regions	124	21	46	13
Total	594	100	100	100

Source: Scenar 2020 project

Over 80% of EU-25 population lives in the EU-15

Total population in the EU-25 amounts to over 440 million, of which over 80% lives in the EU-15 (Table 2.6). It can be said that the extension of the EU with ten new Member States in 2004 resulted only in a relatively moderate population increase. Over two thirds of this new population (52 million) live in most rural and intermediate rural regions, whereas in the EU-15 about half of the population lives in most rural and intermediate rural regions. So the extension of the EU implied a relative increase in the share of population residing in most rural and intermediate rural regions.

Table 2.6: Population in the EU, 2003.

	Most rural	Intermediate rural	Most urban	Total
Population (million)				
European Union 15	70	126	198	394
New Member States	22	30	21	73
European Union 25	92	156	219	467
Share in EU-25 population (%)				
European Union 15	15	27	42	84
European Union 10	5	6	4	16
European Union 25	20	34	46	100
Share in EU-15/10/25 population (%)				
European Union 15	18	32	50	100
European Union 10	30	41	29	100
European Union 25	20	34	46	100

Source: Own calculations based on Eurostat

Population dynamics in EU-15 and EU-12 differ

During the second half of the 1990s and first half of the 21st century, population in the EU-15 tended to increase whereas population in the new Member States showed a decline. On the whole, population growth in the most rural regions in the EU-15 was slightly below that in intermediate rural and most urban regions. Only in most rural regions in Sweden, there was an absolute decline in population. In the group of most rural regions in Denmark, Greece, Spain, Italy, Portugal, Finland and Sweden population growth lagged behind that in most urban regions. Cyprus, Malta and Slovenia were the only new Member States that were not confronted by population decline between 1998 and 2003. In most of the other new Member States, population decline in most urban and most rural regions exceeded that in intermediate rural regions. Compared to population growth in the 1980s, the average population growth in the EU-15 (0.4% p.a.) and that of most rural regions (0.3% p.a.) remained unchanged. However, population growth in the intermediate rural regions slowed down a little, whereas that in most urban regions slightly increased.

On the whole it appears that within the EU-15 one out of four most rural regions had a population growth above the national average and that about half of the intermediate rural and most urban regions performed above the national average population growth. In the EU-10 most urban regions more often experienced a population growth below the national average compared to most rural and intermediate rural regions.

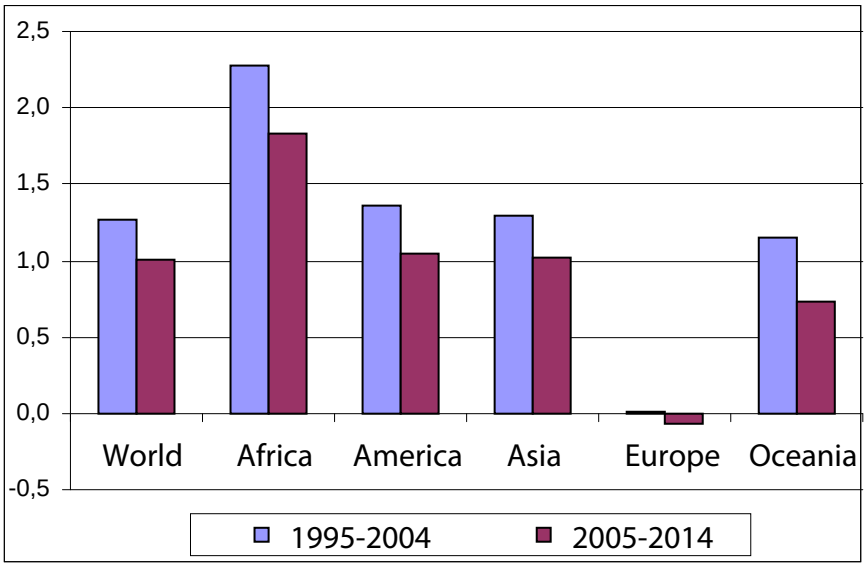
2.1.1.3 WORLDWIDE TRENDS IN GLOBAL POPULATION GROWTH

Population and macro-economic growth are important drivers of demand for agricultural products. In past years, rapid population growth has accounted for the bulk of the increase in food demand for agricultural products, with a smaller effect from income changes and other factors (OECD, 2005). The world's population growth will fall to about 1% in the coming ten years.

Expected population developments in the period 2005-2020:

- Future world population growth is mainly determined by the developments in birth and death rates. At the regional or national level net migration is an additional factor.
- The world's population growth will fall to about 1% in the coming ten years. This is mainly due to births or fertility rates which decline and are expected to continue to do so.
- Between 2000 and 2030, almost 100 percent of annual population growth will occur in low and middle income countries, whose population growth rates are much higher than those in high income countries.
- The populations in the less developed regions will most likely continue to command a larger proportion of the world total. As a consequence, the share of world population accounted for by the developing countries, which is now more than 75 percent will continue to increase over the next decades. Asia's share of world population may continue to be around 55 percent through the next century.
- Population growth in Europe is expected to become slightly negative (-0.7%)
- Europe's share in world population has declined sharply and is projected to decline during the 21st century.
- The uncertainty with regard to birth and death rates at world or regional level is not too large. However, migration flows between countries and regions are much more uncertain.

Figure 2.6: World population growth (annual growth %).



Source: OECD (2006)

2.1.2 Macro-economic growth

Trends in population growth

Macro economic and population growth are important drivers of demand for agricultural products. In past years, rapid population growth has accounted for the bulk of the increase in food demand for agricultural products, with a smaller effect from income changes and other factors (OECD, 2005a). The world's population growth will fall to about 1% in the coming ten years.

Trends in the evolution of GDP

The global demand for food will be determined more and more by the development of incomes per capita and less by the growth in the population.

World

- World GDP is growing with 2.6 percent a year over the 1990-2003 period.
- The GDP growth rate of the high-income countries 2.3% is lower than for the world (2.6%) in this period.
- GDP growth is higher for the middle-income countries (3.5%) and highest for the low-income countries (4.5 %) in the period 1990-2003.
- In general there is a process of catching up: the income growth rate is higher for countries with a lower initial GDP level. An exception to this rule is the lower income growth of the least developed countries relative to the low income countries.

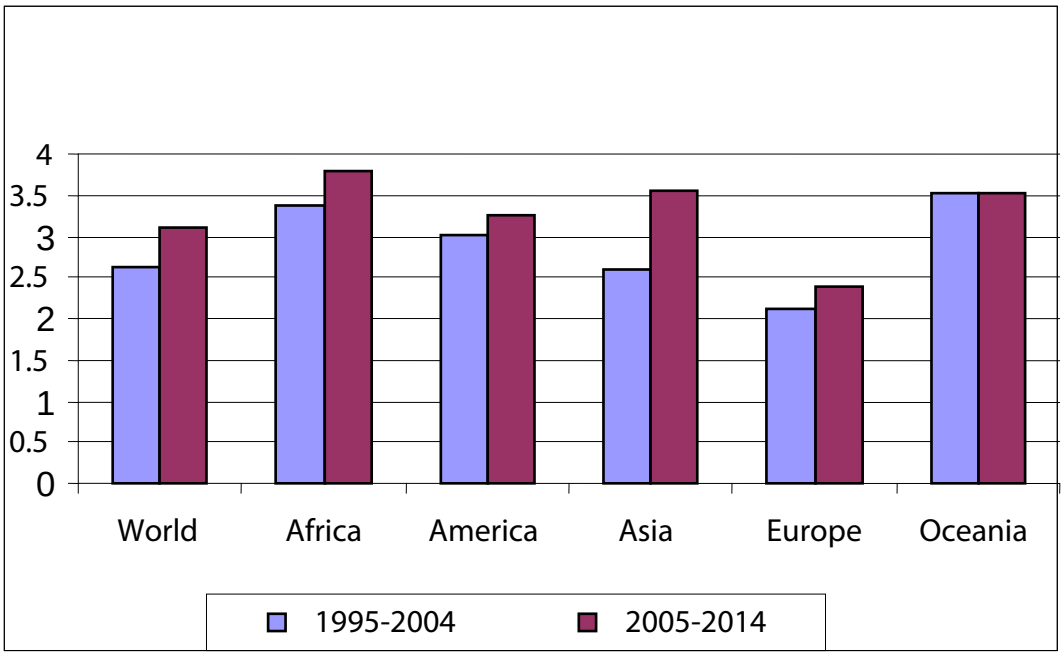
European Union

- GDP growth in the EU-27 is about 2% per year. This is lower than the growth in other high-income countries.
- GDP growth in the EU-12 was lower over the 1990-2003 period than in the EU-15 countries. However, in the recent 1998-2003 period EU-12 GDP growth (3.2%) is substantially higher than EU-15 GDP growth (2.0%). The new Member States are catching up in the most recent period.

Expected economic growth 2005-2020

Continued economic growth is expected over the coming period in almost all regions of the world. This growth will be considerably higher for most of the transitional and developing countries than for the EU-15, the United States and Japan, in particular for Brazil, China, India and the new EU Member States. Incomes in Europe are expected to increase slightly over the coming years.

Figure 2.7: World income growth (annual growth %).



Source: OECD 2005b

- Future world income growth is determined by the growth in production factors (labour, capital, land) and the productivity growth of these factors. Productivity growth is determined among others by public and private R&D investments, investments in human capital, learning and scale effects, and flexibility of factor markets.
- Robust economic growth is expected over the coming period in almost all regions of the world (Figure 2.6). OECD and World Bank expect World economic growth to increase from 2.6 percent annually to 3.1 percent annually.
- Economic growth will be considerably higher for most of the transitional and developing countries than for the EU-15, the United States and Japan, in particular for Brazil, China,

India and the new EU Member States. Incomes in Europe are expected to increase slightly over the coming years.

- World and EU economic growth in the future stays uncertain and dependent on the amount of investments in education and research, technological opportunities, participation rates, and the liberalisation of world commodity and factor markets.

2.1.3 World agricultural markets

Macroeconomic and population growth are important drivers of demand for agricultural products. The world's population growth will fall to about 1% in the coming ten years. The global demand for food will be increasingly determined by the development of incomes per capita and less by population growth.

During the last thirty years a billion people were added every decade. This led to major shifts in food production and consumption, including a surge in grain production, a spectacular rise in meat production and consumption and an increasing role of international trade.

General trends (based on OECD-FAO Outlook and own calculations)

- World agricultural production is increasing at a slower pace than in the previous decade. This is due to a lower growth in cereals; growth in meat demand remains high. The rate of expansion of production is higher in developing countries.
- Production growth is driven by productivity growth in all countries. In developing countries area expansion is an additional factor.
- Expansion in global consumption, in particular due to economic performance and population growth in developing countries.
- Income growth, urbanisation and dietary diversification not only lead to additional demand but also to changes in the composition of food consumption, with a fast growing share of animal products.
- In developed countries food consumption growth is limited. Product and process attributes (food safety, quality, environment, animal welfare, etc) become more important.
- Production and exports increase especially in low cost producing developing countries (e.g. Brazil). An increasing share of agricultural trade becomes South-South trade between developing countries.
- Agricultural trade is still impeded by high trade barriers.
- World prices declined in real terms, due to high productivity growth and a rather inelastic demand.

In addition to these general trends we describe some trends in the main agricultural commodities: cereals, meat, dairy and oilseeds.

Cereals

- Over the last 25 years cereal production rose substantially in the context of rapidly increasing cereal yields and a slightly declining area.

- World cereal production and yield growth are slowing down.
- Production growth is slowing down especially in developed countries. Growth is still high in Latin America (Argentina and especially Brazil) and Africa.
- Many countries became cereal importers because domestic production growth was too low or because income growth was high which lead to increased demand for food and especially feed grain.
- World wheat exports increase slightly over time. The main exporters are USA, Canada, Australia and to a lesser extent Argentina. The EU was in the early nineties the second net-exporter, but the net exports are almost reduced to zero in most recent periods due to the CAP reforms.

Meat

- Demand: Still a livestock revolution with an annual growth of 2.75% per year in the last two decades?
- Rising incomes in many developing countries fuelled meat consumption, especially poultry.
- The absolute level of meat consumption per capita in developing countries is still low compared with developing countries, despite the high growth in consumption in recent decades - they started from a very low level of consumption per head.
- A critical question in the meat market is whether China and India can domestically produce the increased demand for meat products and the cereals needed to produce the meat.

Dairy

- Cheese is the most important dairy product, accounting for 40% of processed milk worldwide. World production grows by more than 2% per year.
- World production growth of butter was 1.3% a year while growth of WMP and SMP was close to zero.
- The EU, India, US, Russia, Pakistan, Brazil and China account for two thirds of total milk output.
- About 40% of world cheese production takes place in EU-15. The EU is still the largest exporter although New Zealand is catching up quickly. This is cause by milk quota in the EU.

Oilseeds

- World production and demand is growing fast with 3.2% each year. Area expansion and yield growth contribute both equally to the production growth.
- Developed countries accounts for a significant but declining share of world oilseed production.
- Production is especially growing very fast in Latin America (Brazil 8% yearly, Argentina 7% yearly).

- A striking feature of this enormous production growth is that area expansion continues with 5.5% a year in Latin America while yield growth is much lower (2% in Brazil and 1% in Argentina).
- China consumption share is 20% in the world and a demand growth is very high in China with 7% each year.
- Developments in China will be critical for the developments of global oilseed markets
- The US remains the largest exporter of oilseeds although Brazil is catching up rapidly.

China: the market of the future?

With a population of 1.3 billion, the People's Republic of China had an average economic growth rate of 8% per year between 1990 and 2003. The OECD is assuming a continued high growth rate of 7 to 8% per year until 2014. Amongst other things, this will result in a strongly increasing demand for grain, particularly feed grain and oilseed. The expectation is that the stocks built up in China during the 1990s will have been depleted by 2005. On these grounds, the OECD has based its calculations on rising world market prices in nominal terms. China could also become a net importer of poultry meat if production growth lags behind consumption. In the field of dairy products, both production and consumption are still very low in China, although rapid growth is predicted. The non-agricultural sectors will profit the most from a successful conclusion of the Doha round, such as labour-intensive branches of industry. Consequently, the demand for agricultural products will increase even further. Moreover, the increased demand for labour in industry and in the service sector will bring about structural changes in agriculture. A favourable development in exports of industrial products could lead to strong growth in imports of agricultural products, yet China is not expected to allow a significant reduction in self-sufficiency. Technological developments will probably equip the country to continue to feed its own population itself to a great extent using its relatively limited area of fertile land. A rise in purchasing power will direct demand more towards meat, dairy and horticultural products and away from rice (Tongeren and Huang, 2004).

2.1.4 Consumer (food) preferences

Consumer preferences in terms of food cannot be understood or predicted by simple models: food preferences arise from a combination of different factors and drivers such as economic (e.g. income), demographic (e.g. household size, age), social (e.g. fashion), emotional (e.g. ethics such as animal welfare), political (influence of policies) or even others such as lifestyle or concerns for health or environment.

Changes in food consumption can be assessed over the years using the following indicators:

- Budget spent on food
- Volume of food consumed
- Categories of foodstuffs - quantities and relative proportions
- Home or out-of-home consumption
- Home-made or already-prepared meals
- Quality of food products

Trends in driving forces

The following driving forces have influenced food consumption in the recent years: growing incomes, reduction in household size, increasing number of women in the workforce, changes in lifestyle (time pressure), food scares, growing concerns for health and well-being and ethics.

We are providing here with further details on the evolution of these driving forces and the consequent changes in food consumption over the last 15 years (1990-2005). We are also presenting some projections of food consumption patterns in Europe according to literature.

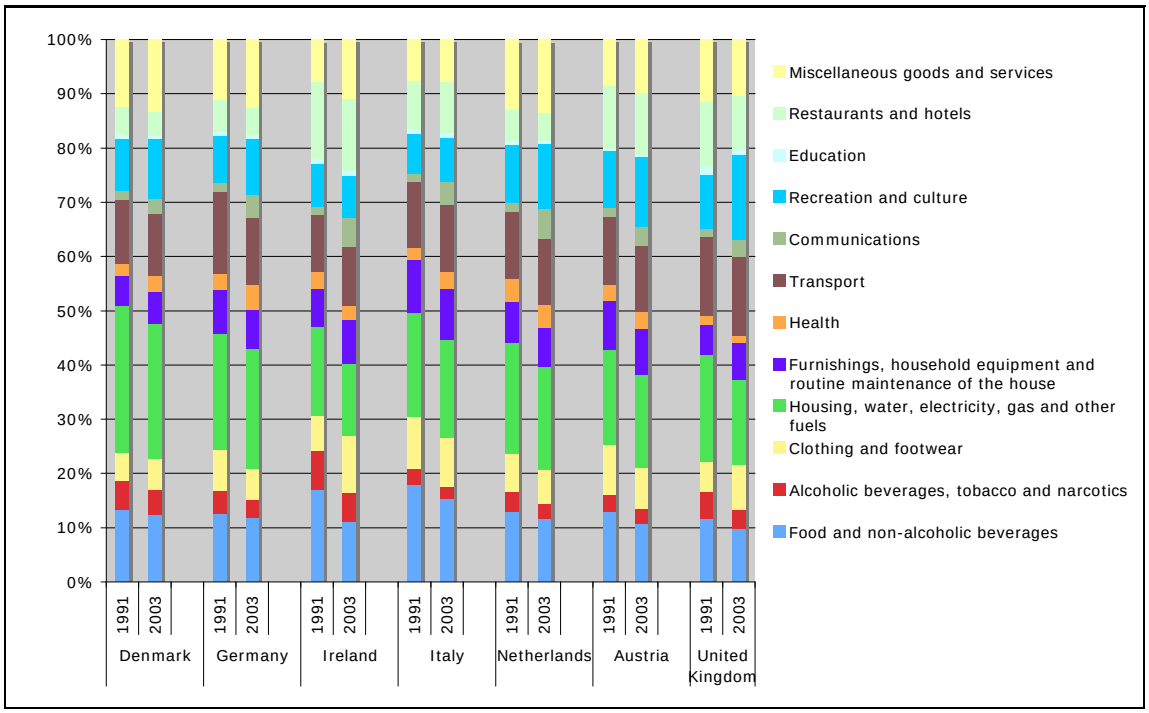
CHANGES IN HOUSEHOLD BUDGET

With growing incomes, household total expenditures increased during the 1990s in most EU countries[11]. The share of expenditure on food and non-alcoholic beverages in total expenditure is inversely related to income (Eurostat, 2005). Over the same period, household expenditures on food increased, yet not as much as the total budget. Consequently, the share of household budget spent on food consumption decreased. As an average, the share spent on food and beverage in the EU-15 decreased from 14.7% in 1993 to 12.4% in 2004[12]. Household expenditures shifted from basic needs such as food and clothing to other consumption categories such as leisure, transport, tourism or communications (Figure 2.8). According to ISMEA (1999), the increase in food expenditures is due to a shift to quality ("luxury") and convenient products (e.g. ready-meals), therefore an increase in value, rather than an increase in the volume of food consumed.

Households on low incomes spend a higher share of their budget on food. Income and prices strongly influence their choices in terms of food and diet (Michaelis and Lorek, 2004). Expenditures on food have increased in many EU-25 countries, yet the share of budget spent on food and drink is still higher in the new Member States, with 30% in 2000 compared to a range of 10-15% for the EU-15 (EEA, 2005e). According to the World Health Organization (2002), low-income households may spend less on foods that protect health such as fruit and vegetables and relatively more on energy-dense foods (with ingredients including fats and oils, white bread, sugar, soft drinks and fatty meat products) than higher-income households. According to Michaelis and Lorek (2004), the variability in calorie intake in the lower-incomes households is almost entirely due to differences in animal product consumption, which increases with growing incomes.

[11] Eurostat (2003) NewChronos in Michaelis and Lorek (2004)
[12] Eurostat data (2004)

Figure 2.8. Annual spending on different expenditure categories, selected countries (% total household budget).



Source data: Eurostat data (2004)

Projections:

The trend in decreasing share of household budget spent on food is projected to continue in the future. In quantitative terms, here are some projections from literature:

- EEA (2005e): Household expenditure would increase by 57% between 2000 and 2020 in the EU-15. In the same period, the share of consumers' total expenditure on food would continue decreasingly: food consumption would increase by only 17%. At EU-25 level, total household expenditure would double by 2030. There would be a particular growth of consumption levels in new Member States to reach levels of EU-15 countries.
- OECD (2001b) projects a decline in the share of food and beverages in household expenditure between 1995 and 2020. Most spending categories (energy, services, motor vehicles and dwellings) would grow by 150% in Central and Eastern Europe and 60% in Western Europe. Food and beverages expenditure would increase by only 70% in Central and Eastern Europe and less than 10% in Western Europe.

REDUCTION IN HOUSEHOLD SIZE

Households have reduced in size between 1990 and 2005:

- The average number of persons per private household reduced throughout Europe between 1993 and 2003, according to Eurostat[13]. In 2003, it varied from 2.1 in Germany to 3.1 in Poland and Slovakia.
- The number of one-person households increased. (See Table 2.7 for the evolution in some selected countries.)
- The percentage of households with only one person is now over 30% in most EU-15 countries. It remains lower in the EU-10.

Table 2.7: Percentage of private households made up of one person. Selected countries.

	1991	2001
Austria	29.7	31.7
Germany	33.6	36.6
The Netherlands	29.9	33.6
Poland	13.8	17.1

Source: ZUMA (2006)

During the same period, the number of large families (4 or more people) decreased (Table 2.8).

Table 2.8: Percentage of private households made up of more than four persons. Selected countries.

	1991	2001
Austria	9.9	7.8
Germany	5.0	4.3
The Netherlands	7.0	6.5
Poland	15.4	9.5

Source: ZUMA (2006)

Consequences on food consumption as recognised in EU-15 countries:

- The increase in single-households and the general trend to individualisation have led to a higher demand for convenient products (ready-to-cook or ready-to-heat) and other out-of-home solutions such as take-aways.
- The ratio of children per household has reduced. Parents have a bigger budget to spend for fewer children, and their preferences go towards higher quality products often combined with convenient solutions.

[13] Data available on Eurostat Website under "population and social conditions" theme

Projections:
The size of households is projected to continue to decrease in the future, with increasing numbers of single-person households and mono-parental homes and fewer children per family. In quantitative terms, OECD (2001b) projects that the share of single-person households would increase from 30% to 36% by 2015.

MORE WOMEN AT WORK

With an increasing number of women in the workforce, the number of double-income households has risen (Michaelis and Lorek, 2004). In the EU-15, the average rate of women between 25 and 54 years old in employment has grown from 60.4% in 1992 to 68.8% in 2004. The same figure was approximately 67% in the EU-10[14]. With women in employment, time spent on cooking is reduced, as they are still the ones traditionally cooking in the household. Preferences have therefore shifted towards quick and convenient food solutions. With fewer children at charge, women also compensate the lack of time by buying higher quality products (Payer *et al.*, 2000).

CHANGES IN LIFESTYLES

Changing lifestyles have become a factor influencing consumption patterns in the EU-15.

Time has become a critical factor: time spent on shopping or cooking has decreased (EEA, 2005e), as consumers have been prioritising other activities (e.g. leisure) or spending more time in transport for example. In the UK, the trends for convenience are illustrated by the search for "20-minute meal solutions" (Arundel, 2005). This, together with increasing household budgets, has led to a shift to convenient, easy and quick-to-make meal solutions.

Supermarkets have helped change shopping and consumption behaviours (Buller and Hoggart, 2001), by decreasing the number of shopping trips, reducing shopping time (one single shop provides everything) and changing shopping hours. They also provide the wide range of convenient solutions that consumers increasingly buy.

A new habit has also developed in recent years: the so-called **"flexi-eating"** [15] behaviour, which describes less regular mealtimes, skipped meals or the propensity for snacking (more frequent but smaller quantities eaten). This is due largely to people spending increasing periods of time "in transit" (e.g. between home and the workplace), and to decreasing times being available for cooking and proper meals.

Out-of-home products and consumption have developed, following fashion and new lifestyles:

- Eating at restaurants has become popular and more accessible for consumers. In addition, consumers eat more frequently in cafeterias at school or work.
- Take-aways and delivery services facilitate the new trend for individualised behaviour ("single life") and meal improvisation.

[14] Eurostat data (2004)
[15] Datamonitor in Food Navigator Europe

According to Michaelis and Lorek (2004), 25% of total household food expenditures in the EU-15 go to out-of-home food sources, illustrating that out-of-home consumption accounts for a significant and growing proportion of European food intake.

Changing lifestyles are also affecting consumption in the EU-10, even if the trend is not as marked as in EU-15 countries. For example, the trend for convenient products is increasing in the EU-10 too, despite much lower rates than in the EU-15. In Poland, 10% of total food expenditure goes toward food for out-of-home consumption[16].

Growing numbers of overweight and obese Europeans can be associated with changing lifestyles, with a combination of social trends such as increased sedentary activities and use of motorised transports, consumption of energy dense foods, growing use of snack foods and manufactured foods as well as restaurants and fast food stores, increased frequency of eating occasions (International Obesity Taskforce, 2002). As a result, total calorie intake has increased within the EU, while physical activity is insufficient.

- Increasing obesity and overweight affect particularly women and children of the Mediterranean countries and of Central and Eastern Europe. Obesity is not evenly distributed in Society and greatly affects the less socio-economic favoured (Ibid.).
- Childhood obesity and overweight has increased steadily over the past decades, with rates in southern European countries such as Italy, Portugal, Greece or Spain between 20 to 35% compared to 10-20% in northern European countries (International Obesity Taskforce, 2003).

Projections:
Lifestyle driving forces are predicted to carry on in the same directions: reduced time budget, more individualised behaviour, increasing flexi-eating and snacking, and strong social influences such as the popularity of eating out or trying new foods. This will be associated with – and probably amplified by – modern ways of shopping: supermarkets, home delivery, e-shopping. These factors will continue the trend towards convenient solutions and out-of-home consumption. For example, Michaelis and Lorek (2004) expect meals and snacks eaten away from home to grow from 24.4% in 2002 to 27% by 2007 in EU-15 countries.

DEMANDS FOR QUALITY IN FOOD PRODUCTS

According to Buller and Hoggart (2001), health and food safety are "food characteristics that have gained enormous relevance in last decade".

Food scares have caused an increase in consumer awareness in terms of food safety and health. Consumption of some foodstuffs has consequently changed:

- Beef meat has seen its popularity decrease: in 1990, 26.2% of meat consumed was bovine, and this percentage decreased to 21.5% by 2003 (FAO, 2005).
- New labels have been created as consumers are expecting quality, information and traceability, such as the European quality labels PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication)[17]. At the same time, the Eurobarometer (2004) *European Union citizens and agriculture from 1995 to 2003* showed that most European consumers are not aware of these EU quality labels or are confused.

[16] Euromonitor (2005) in Agri-food Trade Service (2005)
[17] Created under Council Regulation (EC) No 2081/92 of 14 July 1992

- Organic production has increased in importance in Europe, driven by food scares, health and environmental concerns (EEA, 2005e).

The area of organic production in the European Union increased at a rate of about 21% per year between 1998 and 2002 (Eurostat, 2005). The European Commission report (2005b) *Organic farming in the European Union – Facts and figures* provides the following figures:

- At EU-25 level, certified organic and in-conversion area represents 3.6 % of the UAA, 4.0% in EU-15 and 1.9% in EU-10 certified.
- Certified total livestock was about 2.3% of the total EU-25 livestock in 2003, and 2.5% for the EU-15 livestock.
- The share of organic products in total turnover of food products was about 1% on EU-15 average in 2001, with significant differences between countries and products.

The market for organic products has developed significantly since 1990s and it represents "the fastest growing areas within food and drink sales in Europe as a whole" (EEA, 2005e). It is however anticipated that this market will remain as a niche. According to the CONDOR project findings, the high prices of organic products could compromise the further development of the organic market in the future.

Genetically modified products are still under debate in Europe, as consumers are concerned about the potential consequences on health and the environment. According to the Eurobarometer (2002) on *Europeans and Biotechnologies*[18], between 30% and 65% of the EU-25 citizens interviewed rejected all the reasons for buying GM foods – including the following hypothesis: less pesticide residues, more environmentally friendly, tasted better, containing less fat, cheaper, or offered in a restaurant. The most persuasive reason for buying GM foods was the health benefit of lower pesticide residues, closely followed by an environmental benefit. In the recent Eurobarometer (2006) on *Risk issues*, 25% of EU citizens answered "very worried" and 37% "fairly worried" when asked to what extent they are worried about genetically modified products in food or drinks.

Growing **concerns for health and well-being** have influenced consumers' choices in terms of food.

- Consumers are increasingly looking for healthy food and "natural" products, which are often associated with organic production *(see above for trends)*.
- Consumers are also looking for food that provides other benefits than just basic needs: they want quality and health in addition to convenience. Such products are called "functional". According to the European Food Information Council (EUFIC), functional foods are "foods which are intended to be consumed as part of the normal diet and that contain biologically active components which offer the potential of enhanced health or reduced risk of disease. Examples of functional foods include foods that contain specific minerals, vitamins, fatty acids or dietary fibre, foods with added biologically active substances such as phytochemicals or other antioxidants and probiotics that have live beneficial cultures." [19]
- Growing concerns about overweight and dieting have led to an increase in the market share for diet products (fat-reduced, light).

[18] Cited in Eurostat (2005)
[19] Data available on EUFIC Website

- There has also been a shift towards the purchase of fresh food all year round from all over the world (EEA, 2005e), but with a tendency to buy pre-cut and washed products (convenience).
- Consumers have increasingly switched to chilled prepared meals, which use fresh ingredients and have therefore more health benefits potential, as opposed to similar frozen products. Between 1996 and 2001, chilled products sales rose by 45%[20].
- The ageing population is contributing strongly to the trend in healthy products, for older adults have higher concerns for health and well-being and are looking for healthier options. With more time available, they prefer buying fresh ingredients that they then cook.

Consequences on food consumption

The amount of meat eaten per capita has decreased – especially red meat – as a result of health and food safety concerns. At the same time, meat consumption shifted towards poultry and pork, supposedly healthier. They are also more frequently used in frozen and ready meals (Michaelis and Lorek, 2004). According to the *Network of Independent Agricultural Experts in the CEE Candidate Countries* (European Commission, 2004d) a similar trend was observed in EU-15 and in the new Member States. Additionally, a trend for a higher quality in meat "cuts" developed.

According to Datamonitor (2002)[21], the number of vegetarian consumers has not increased significantly since the 1990s, but there has been a new trend for "meat-reducers" behaviours: an increasing number of people choose to reduce their meat consumption, without becoming "full-time vegetarians". In 2002, 46% of UK population and 46% of Germany population were "meat-reducers", the highest rates in Europe.

Projections:
Demands for quality are expected to grow in the future.

- EEA (2005e) foresees a greater focus on food safety concerns (including microbial pathogens, pesticides and other toxic residues, food additives, diseases (animal to human).
- Datamonitor projects that the number of vegetarians will stabilise, while the number of "meat-reducers" will continue to increase all over Europe.

FOOD ETHICS

Ethics is another driving force influencing consumer food consumption. Many products are now labelled environmentally-friendly (Michaelis and Lorek, 2004), including non-food products. The EU has for example introduced the eco-label[22] in 1992 to promote products – but not foodstuffs – with a reduced environmental impact. In the food sector, there is a growing interest for organic products, driven by concerns in terms of health, quality and also environment *(see above)*.

Ethics have started influencing consumers' choice for foodstuffs, yet their effect on the actual choice has still been limited. For example, the Eurobarometer survey (2005) *Attitudes of consumers towards the welfare of farmed animals* found the following trends:

- 52 per cent of EU-25 citizens did not take animal welfare considerations into account when buying meat.

[20] RTS (2003) in Michaelis and Lorek (2004)
[21] Data available on Food Navigator Europe Website
[22] Created under Council Regulation (EC) N°880/92

- 74% considered they could influence animal welfare for the better by their purchasing behaviour.
- 57% were willing to pay more for animal welfare-friendly food products.

According to Datamonitor[23] (2002), the individual benefit is still the main criterion. Once this is fulfilled though, consumers are increasingly looking for secondary benefits ("The majority of consumers want something that "does me good" but also "does good for someone or something else".").

Projections:

- The share of organic and natural products is expected to increase. *See above.*
- Trends for increasing concerns such as animal welfare are expected to continue. On 23rd January 2006, the European Commission introduced an "Action Plan on the Protection and Welfare of Animals" for the period 2006 – 2010, including the option of introducing a label on animal welfare[24].
- An increase in the number of labels is expected in the future as consumers are expecting quality, information and traceability.

Illustrations of changes in some indicators of food preferences and expected trends for the future

CONVENIENCE AS A MAIN TREND

As we have examined above, convenience has become a high priority for consumers and this trend has been driven by many different factors. Today, many EU-15 consumers buy pre-prepared meals (frozen or chilled), pre-cut vegetables or take-aways. According to Michaelis and Lorek (2004), consumption of already prepared meals increased by 8.8% from 1996 to 2001 in the EU-15. In the UK, the trends for ready meals and home meal replacements (Arundel, 2005) are illustrated by the following figures:

- Expenditure on chilled ready meals increased by 93% between 1999 and 2002;
- Frozen ready meal expenditure increased by 22% in the same period.

Convenience, including pre-prepared meals, is also a growing trend in the EU-10.

Projections:
EEA (2005e) expects the current trends regarding prepared food and convenience to continue. The demands for pre-prepared and processed food would continue to increase, driven partly by the trend to individualism, smaller households and more double-income households.

CHANGES IN FOOD CONSUMPTION (GENERAL)

The consumption of potatoes, milk, and red meat in the EU-15 decreased while at the same time the consumption of fruits, vegetables, pork meat, poultry meat, fish and seafood, cream increased. (Table 2.9)

[23] Data available on Food Navigator Website
[24] Press release IP/06/64 (23/01/2006)

Table 2.9: Per capita supply (kg/year) of selected food categories, EU-15 average.

	1990	2003
Cereals	109.0	121.3
Potatoes	82.9	76.5
Vegetables	123.0	125.6
Fruits	107.3	117.4
Meat	87.3	91.5
Butter	4.8	4.5
Cream	3.0	3.9
Milk	236.6	255.1
Fish and seafood	24.3	26.2

Source: FAO data, 2005

According to the *Network of Independent Agricultural Experts in the CEE Candidate Countries* (European Commission, 2004d), milk consumption declined sharply during the 1990s in most of the CEEC-10 (8 of the 10 countries of the EU-10, plus Romania and Bulgaria), and was under EU-15 levels at the end of that period. In most CEEC-10 countries, butter and cream consumption decreased in the same period, while cheese consumption increased.

The average EU-15 citizen eats twice as much fruit, red meat, fish, seafood and cheese as an Eastern European citizen (EEA, 2005e). The average daily calorie supply has increased in a lot of European countries since 1990. This figure is still generally higher in EU-15 countries, in comparison to the CEEC-10. The main disparity in nutrient intake relates to the proportion of animal products, which is lower in the CEEC-10 (Petrovici *et al.*, 2005).

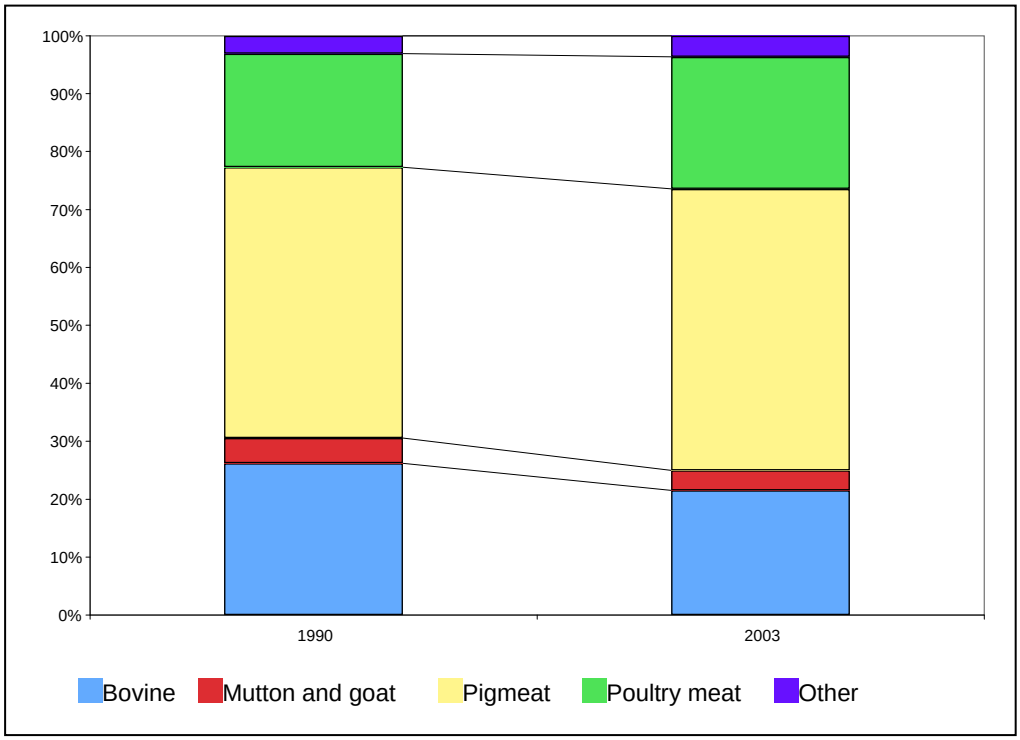
Projections:

- In the EU-15, according to EEA (2005e), consumption of fish, dairy products and meat is expected to increase more than total food expenditure, while the consumption of bread, cereals, fats and oils is likely to increase to a lesser extent.
- In the EU-10, according to European Commission (2004d), meat consumption is expected to rise slightly by 2008, while dairy consumption is likely to decline slightly.

CHANGES IN MEAT CONSUMPTION

In the EU-15 as a whole, per capita consumption of meat has increased since 1990, growing from 87.3 kg / year to reach 91.5 kg / year in 2003 (FAO data, 2005). During that period, the proportions of the different origins of meat changed: the consumption of red meat decreased while at the same time there was a growing interest for poultry and pork meat (Figure 2.9).

Figure 2.9: Changes in the proportion of the different types of meat, EU-15 average.



Source: FAO data, 2005

The European Commission (2004d) report by the *Network of Independent Agricultural Experts in the CEE Candidate Countries* provides a complete analysis of the changes in meat consumption in the CEEC-10, as well as some projections:

- Meat consumption sharply decreased during the 1990s, with great differences between the countries (e.g. –49% in Latvia, -6% in Poland). At the end of the 1990s, meat consumption had recovered in some countries, without reaching again the levels of the early 1990s.
- Bovine and ovine meat consumption declined sharply. Pig meat consumption declined as well but to a lesser extent, and recovered in some countries at the end of the 1990s. Poultry meat consumption increased in most countries.

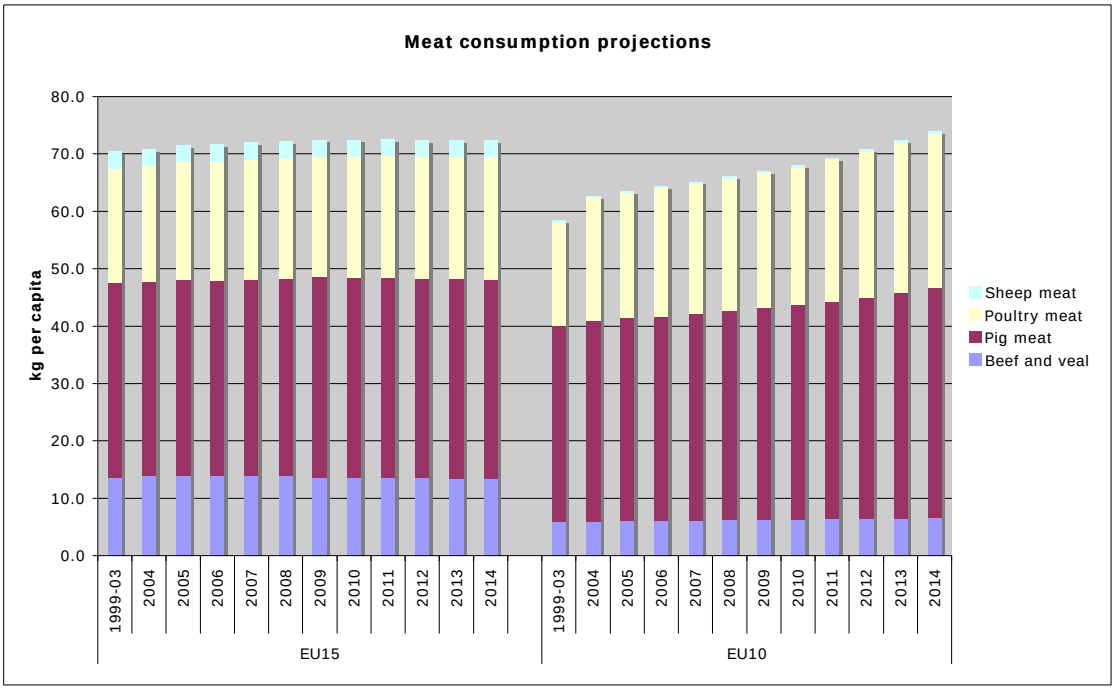
Projections:

- The International Food Policy Research Institute (IFPRI, 2001)[25] projects a continuation of recent trends in the EU-15: meat consumption would grow slowly, with still a shift from red meat to poultry, although pork consumption would also increase.
- The OECD - FAO report *Agricultural Outlook 2005-2014* (2005) provides some projected figures for meat consumption to 2014 (see Figure 2.10 for a visual illustration in the EU-15 and EU-10).
- The *Network of Independent Agricultural Experts in the CEE Candidate Countries* predicts that in the CEEC-10, beef consumption would increase only slightly. In most countries, high

[25] In Michaelis and Lorek (2004)

quality pig meat cuts would be on the increase, while low quality would decrease. Poultry meat is expected to continue increasing.

Figure 2.10: Meat per capita in EU-10 and EU-15.



Source data: OECD / FAO (2005)

Conclusion: a global picture of food preferences in Europe

This section shows a global picture of food preferences in Europe. It does not discuss the diversity of situations, as European countries still have specificities in terms of food consumption. At the same time, there is a growing homogenisation within EU countries in food consumption[26]. Even the differences between "old" and "new" Member States are reducing, and we see some similar trends appear, such as convenience, out-of-home consumption, health and environmental consciousness[27].

[26] Rosa (1998) in Buller and Hoggart (2001)
[27] E.g. driving forces for meat and dairy consumption, see European Commission (2004)

Table 2.10: Drivers that have influenced consumer food consumption in the period 1990 – 2005.

	Drivers
Demographics	Income, number of double-income households Households size (single and number of children) Number of women at work
Lifestyle	Time factor Social behaviour, fashion Values – individualisation Mealtimes and snacking Supermarkets
Quality	Concerns for health Food scares
Ethics	Concerns for animal welfare Environmental concerns

Here is a summary of the main trends expected for the driving forces affecting food consumption:

- Demographics drivers such as income, double-income households, and household size will keep the same trends, influencing food consumption towards a search for convenience, pre-prepared and processed food, and quality / luxury products. This could be combined with a "democratisation" of luxury, with premium products more affordable even for low-income households.
- Lifestyle drivers will continue in the same directions: reduced time budget, more individualised behaviour, increasing flexi-eating and snacking, and strong social influences such as the popularity of eating out or trying new foods. This will be associated with – and probably amplified by – modern ways of shopping: supermarkets, home delivery, e-shopping. These factors will continue the trend towards convenient solutions and out-of-home consumption.
- Concerns for health will go increasingly, with a growing number of Europeans being overweight or obese and looking for health and well-being (also part of the individualised behaviour).
- Concerns for food safety will still be present in consumers' minds, with an increasing demand for labelling, traceability and information.
- Concerns for animal welfare and the environment will also continue increasingly.

There is not a general consensus over the consequences of these concerns in all the studies. Some predict a significant increasing trend towards natural, organic products and meat consumption reduction – sometimes associated with the projection of an increase in vegetarianism, while some other put limits to this increase. Yet, they all share the perspective of an increase – slightly or significant – in this direction.

The trends in driving forces we just examined are the ones that will affect food consumption in European countries in the future, particularly in the EU-15. Some of these driving forces have also influenced food consumption in the EU-10 in the past – often to a lesser extent – and will continue in the future.

The future of food consumption in Europe depends on outcomes of the wide range of factors and trends we have just examined. Other factors that shape food consumption include age group, education, rural or urban residence, cultural values, technology and innovation.

Differences remain among European countries and their regions, even if there is an increasing homogenisation of consumption patterns. Yet, there are uncertainties in the extent that this homogenisation of food preferences will reach in the future throughout Europe. There is particularly a questioning about the future consumption in the EU-10.

2.1.5 Quality of life and social well-being

The term 'quality of life' refers to the overall well-being of individuals (European Foundation for the Improvement of Living and Working Conditions, 2003). It is a multi-dimensional concept that includes measurable criteria such as housing, income, deprivation, access to public services (health, education, local government), as well as some more subjective factors relating to an individual – satisfaction, happiness, safety, family life and social connections.

Findings from the European Foundation for the Improvement of Living and Working Conditions (European Quality of Life Survey, 2004) show that quality of life in Europe remains very varied across European regions, with the New Member States and the Accession Countries being less favoured. There are also some differences between rural and urban areas, sometimes significant. The regional disparities are stronger in the Central and Eastern Europe Member States, with e.g. poverty and unemployment levels significantly higher in rural areas (European Commission, 2004c) compared to urban areas.

In the future, quality of life in Europe will depend on the outcomes of many different factors, some of which are discussed in other sections of this report (income, environmental conditions, etc.). The concept of general life satisfaction, also defined as subjective well-being by Christoph and Noll (2003), is not examined in this report.

The 12 quality of life domains[28] recognised by the European Foundation for the Improvement of Living and Working Conditions (2003) are essential to quality of life in both urban and rural areas (Anderson, 2004). We discuss here some of the main driving forces and critical factors that could potentially have an impact on quality of life in rural areas in the future – some may also affect urban areas, to a greater or lesser extend, but the focus here is on rural areas.

[28] Listed as follows: "health and health care; employment and working conditions; economic resources; knowledge, education and training; families and households; community life and social participation; housing; local environment and amenities; transport; public safety and crime; recreation and leisure activities; culture and identity; political resources and human rights, including the European dimension."

Driving forces influencing the quality of life in rural areas[29]:

PRESSURES ON HOUSING AND LAND:

- Changes in family structures have increased the pressure on housing in the past and are predicted to continue: growing numbers of single-person households and reduced families increase the demand for all forms of housing, including social provision. Increasing prices have forced more people to move farther away from urban centres.
- Many older people (55–70 years old) choose to move to rural areas for a better quality of life. The current trend of an ageing population is predicted to continue increasing the pressure on housing in some rural areas and prevent more young rural people from finding affordable accommodation.
- The increasing trend for second home ownership – usually associated with leisure and located in the countryside or in coastal areas – is also adding pressure on the housing market, and is expected to continue (RICS, 2005).
- There is a growing competition between different land uses, e.g. housing, recreation, agriculture, especially in suburban and peri-urban locations (ESPON, 2005).

ACCESS TO SERVICES (PRIVATE AND PUBLIC):

- One of the main challenges for some rural areas is the proximity and access to services, due to low density and scattered populations. The maintenance of services is a critical issue as suppliers are facing low frequency of use, isolation and sometimes competition from urban areas (LEADER European Observatory, 1999).
- Public transport is essential (ARTS Consortium, 2002) if travelling to service centres is required e.g. for work or school. People who cannot afford or use a private car (such as schoolchildren) are penalised if transport facilities are not available.
- Home services (e.g. supply of electricity, water and gas, home medical care) make it possible to access services that are not nearby. Such services have, however, extra costs for the supplier (investment in equipment, running and maintenance) and consequently often higher prices at the consumer level (LEADER European Observatory, 1999). Information and communication are also critical to ensure accessibility (to find a service, contact an emergency help service…), especially when access to services is difficult.
- Funding of public services will be a critical issue in the future. Privatisation could reinforce the disparities between the different income-classes, but at the same time, it could help with waiting lists (e.g. health services) (PRISMA, 2002).

[29] For this section, we are considering rural *areas* and not rural *regions* i.e. administrative units as defined earlier in this report. Rural *areas* can be situated within urban *regions*, e.g. at the periphery of urban centres. The limit between rural and urban is not always easy to define. See also Espon project 1.1.2 "Urban-rural relations in Europe" (2005) for a discussion about the definition of rural and urban.

POPULATION MOVEMENTS

Population movements in rural areas (in- or out-migration) are strongly influenced by the economic development and level of services available in a region, and inversely, as illustrated here:

- Proximity to urban areas can encourage the migration of some urban dwellers to the peripheral rural areas. On the other hand, urban centres can also compete with rural areas by providing services often considered of better quality (e.g. better schools) (LEADER European Observatory, 1999).
- Growing populations increase the demands for public and private services in rural areas. Inversely, the departure of part of a population of an area can lead to the decrease in the availability of services (not viable anymore), which can start a vicious circle of depopulation.
- Employment opportunities are another critical factor to ensure the dynamics of rural areas by preventing out-migration and also encouraging newcomers.

SOCIO-ECONOMIC CONTEXT

- Living in rural areas in urban proximity has become an attractive option for part of the urban population. There is a risk, though, that some peripheries will develop into dormitory or commuter environments[30] with the following issues: low level of local services, very few new employment opportunities, lack of social interactions among local residents. These factors can strongly contribute to a decrease in the quality of life.
- Living or moving farther away from urban centres can result from financial constraints, rural areas being usually more affordable. It can also be due to a search for a better quality of life, especially in the case of more affluent people. These two diverging reasons to move or live in more rural areas could lead in the future to social tensions between the most disfavoured and the most affluent residents (ESPON, 2005).

Factors that could also influence the dynamism and quality of life in rural areas:

DEVELOPMENT OF TOURISM AND LEISURE ACTIVITIES

Consumers, including the healthier ageing population, are giving an increasing emphasis on leisure and tourism (World Tourism Organisation, 2000). Rural tourism could potentially help rural regions by attracting tourists in search of authenticity and contact with nature (European Commission, 2000),[31] and retain some farming activities. Farming businesses could indeed provide new leisure activities, amenities while at the same time keeping the attractiveness of the countryside. These prospects could happen in the EU-15 countries as well as the Central and Eastern Europe Member States (European Commission, 2004c), but their developments are likely to stay limited.

Some current trends in tourism may continue in the future:

- The massive movement of the urban population to the countryside on weekends and during the holidays could carry on.

[30] One of the best illustrations is the recent development of the South-East of England with the proximity of London - *see Institute for Alternative Futures and The Institute for Innovation Research (2004)*
[31] See Dwyer *et al* (2002) for the potential of rural tourism in the CEEC

- With a growing search for more personalised experiences, increasing demands for smaller accommodation units such as authentic family hotels and tourist farms (ETC, 2004) could continue in the future.
- The development of new leisure facilities such as artificial environments could be an opportunity for rural areas economic developments, but could also conflict in terms of environmental protection and growing demands for sustainable tourism. The World Tourism Organisation (2000) predicts that theme parks will be increasingly popular in the future. They respond well to both the increasing needs for leisure activities and the stagnating leisure time ("offering visitors a wide range of activities and experiences all condensed into a relatively small area").
- Increasing demands for international short breaks in cities and city regions are likely to carry on in the future, and to the detriment of rural areas (ibid.).

E-TECHNOLOGIES AND INFORMATION TECHNOLOGIES

According to some studies, information technologies – especially access to broadband connections – could have a great impact on the development of rural areas and help increase the quality of life and attractiveness of these regions:

- A development of e-services including "e-government services", tele-administration, on-line medical services and on-line education could indeed benefit rural areas which experience difficult access to these services (remoteness). According to PRISMA (2002), Information Technologies could offer great opportunities to improve health care – with some issues to be examined: database to manage waiting lists better – "linking supply to demand, telemedicine to improve access to health services to people in remote areas…
- Information Technologies could assist with the further development of tele-work. This would in return imply a concurrent need for more services. With better communications and information infrastructures, more people will indeed see a benefit in working from home in rural areas. Some also suggest the further development of "tele-cottages"[32] where people could tele-work from.

Yet, there are still huge differences between and within the Member States in the use of personal computers and access to the Internet. Could this potentially discriminate against part of the population in the future?

The reasons behind the differential between rural areas in terms of dynamics and attractiveness are not always clear. With so many different factors affecting quality of life – especially subjective ones – in rural environments it is difficult to predict a general trend for rural areas over Europe.

[32] The concept of tele-cottage was first developed in Sweden. (European Commission 1998)

2.1.6 Human and animal health concerns

It is difficult to trace direct links between agricultural practices and human health using general statistical indicators. Links may appear very weak unless targeted studies are provided.

There are several ways agriculture can affect health. An obvious way is through the quality of food products (for example fruits and vegetables containing residual amounts of nitrates or pesticides, meat with bacterial contamination or high concentration of hormones, etc.). Threats to human health may also arise through contacts with agricultural chemicals, for example toxic pesticides, especially when there are improperly stored or implemented, (which was often the case in some poor East European countries).

Food safety regulations and relevant services are usually well established throughout the EU. Food safety remains as mostly potential, not actual health danger in Europe, adequate food safety regulations and medical services do not allow major outbreaks of diseases to occur. At the same time the occurrence of animal diseases may take dramatic forms. Past examples are associated with the spread of mad cow disease or foot-and-mouth disease. The most recent example is bird flu, which may have potentially devastating consequences for European poultry industry (like mad cow and foot-and-mouth had for beef industry).

Improvements in food technology may theoretically give products longer shelf-life, but at the same time there is a certain risk that – under badly controlled situations – micro-organisms may re-contaminate food and multiply during storage.

There are therefore many factors such as changing of eating habits, changes in food technology, importation of unusual products, together with changes in human mobility and population sensitivity to diseases, which may contribute to the constant threat of spread of food borne diseases. As many of these issues are difficult to quantify, few relevant statistical data are available.

2.1.7 Agri-technology

European agriculture (EU-15) is characterised by high productivity levels i.e. a relatively high production level per production factor unit. This is a continuous development fed by new technical knowledge. Transfer of technical capacity to EU-10 is expected.

There are three important aspects attached to the process of technical development: the development of knowledge, the dissemination of that knowledge and its application. The development of new knowledge takes place in universities, research institutes and within industry. This can also include knowledge of a more general nature: the development of knowledge in the field of motors, materials, robots, ICT and biotechnology, for example, may not be specific to agriculture, but it is of great importance to the sector. The agricultural cluster has always been good at quickly absorbing new knowledge and adapting it so as to apply it throughout the sector.

Technical innovations are divided into process innovations and product innovations. Product innovations focus on the improvement of existing products and the development of new ones. With process innovations, the production method occupies the central position. Within the agricultural sector, the process innovations have always had the upper hand, often resulting from product innovations in the supplying industry. For example, artificial fertiliser, new machinery and new greenhouse and stall systems have made new production methods possible. These examples indicate that there is a strong interaction between both types of innovation. One could also say that a product innovation such as a new type of stall comes into being as a result of the need for a different production method (such as low-emission production methods).

Increase in productivity

Productivity can be increased by producing more with the same means of production and/or by economising on the production factors. In the past, the emphasis was placed mainly on achieving more physical returns per hectare or per animal. More productive initial materials, better feed conversion, more manure, new and more effective pesticides, etc. The focus was therefore more on the use of more external inputs per hectare. For example:

- Growth rates in yields in cereals declined from 1.6% in the 1980-1992 period to 0.8% in the period 1992-2004
- Growth rates in yields in oilseeds increased from 0.2% in the 1980-1992 period to 2.8% in the period 1992-2004

Table 2.11: Development of crop yields, 1980-2004.

	Value	1980-1992	1992-2004	1980-2004
Cereals	5.16	1.62	0.81	1.23
Oilseeds	2.93	0.21	2.83	1.51

Partly in response to the environmental impact, there has been a reduction in some countries in this trend over the last few years: the focus has shifted more towards economising on inputs.

A lot of technological innovation is also aimed at reducing the labour costs per product unit, through mechanisation and these days particularly through automation. This is true for the entire industrial column, for example in the distribution and processing industries (slaughterhouses). In many greenhouses and pig and poultry accommodation, the growth conditions are these days completely computer controlled. Only the care of the crops and the harvesting in the greenhouses still require a lot of labour. The next step would appear to be towards autonomisation and robotisation: the development of machines that can carry out numerous crop-related tasks independently.

Two types of robots could be expected within the near future:

- Large robots (the size of tractors or combine harvesters) that can carry out numerous crop-related tasks independently. These will in many cases be

machines that already exist but that are able to find their way around when weeding, spraying or harvesting with the help of a Global Positioning System (GPS).

- Small robots (ranging in size from large shoe-box size to small refrigerator size), able to carry out crop-related tasks very selectively and in particular patches. With the aid of sensors, these robots are able to make observations and take measurements independently (relating to the soil and the crop) and to interpret this data (with the aid of the necessary software such as crop growth models). On this basis, the robot 'knows' what it has to do to deal with a disease, infestation or weed or to help the crop in the correct manner. For the time being, such 'precision agriculture' will only be of commercial interest for crops with a very high added value.

It goes without saying that the abovementioned technologies will also be combined. For example, the large robots could also make use of plot information collected by satellite. In this way, it becomes possible to observe the state of the crop from space – including certain diseases and infestations. In response to such information, the robot can take the appropriate measures.

In greenhouse horticulture in particular, thought is turning towards intelligent 'greenhouse-chain concepts.' With virtually no labour, the growth of the crop is controlled, right down to the last detail (climate, growth medium, etc.), and in such a way that the result – in terms of quantity, quality and moment of harvesting – meets the wishes of the customer.

Automation and robotisation are also the order of the day in livestock production. In cattle farming, for example, the automated milking system has been in use for several years (and mobile versions of the system may also be available soon), and pig farming is expecting an automated weighing and selection system for pigs in the near future.

Environmental technology

The application of technology can result in environmental problems, but technology can also offer the key to the resolution of those problems. After a period of 'cleaning up afterwards,' these days there is a much greater focus on technology that can prevent environmental problems. Economics and ecology can go hand in hand, for example regarding economising on scarce resources such as energy and artificial fertiliser. There are three types of environment-technological solutions:

- 'End-of-pipe' solutions. Negative effects of the production process are corrected afterwards: discharge water is purified, the air is filtered (or 'washed'), and the soil is steamed.
- Process-integrated solutions. The occurrence of pollution is prevented or reduced. Examples include biological pest control, precision fertilisation and tailoring the composition of animal feed in order to influence the quantity and composition of the manure.
- System innovations. This involves taking an integrated look at the organisation of production. This can take place at chain level or in combination with other agricultural or non-agricultural sectors. A simple example is the closure of cycles through the mutual use of residual products: making use of waste from the food

industry as pig feed; using industrial residual heat and CO_2 from oil refineries in greenhouse horticulture.

Saving energy is important both from an environmental perspective and an economic perspective. Within agriculture and horticulture, greenhouse horticulture accounts for around 90% of the total energy consumption. Solutions are sought in new greenhouse covering materials, for example, which can convert some or all of the incoming sunlight into energy. This can lead to greenhouses becoming a type of energy supply.

Making good use of biomass – an important source of sustainable energy – will grow in importance over the coming years. In France and Germany, for example, this has also taken on major proportions, partly influenced by the EU Directive on compulsory mixing. In quantitative terms, wind energy makes only a modest contribution, although there was impressive growth in the 1990s. Wind energy remains of interest with regards to the achievement of the national target of 12% sustainable energy resources in 2010.

In environmental terms, there are high expectations for biotechnology; for example, more efficient plants that require less in the way of inputs or that are optimally suited to specific circumstances; clean plants, of which all the waste is useable; 'resistant plants,' resistant to diseases and infestations, thus removing the need for chemical or other forms of pest control. One particularly interesting innovation is the idea to produce vegetable food proteins directly using algae and solar energy (so-called blue biotechnology).

Other innovations with such perspective include:

- Bioremediation: the biological breakdown of environmentally harmful substances using bacteria, algae, fungi and yeasts or higher plants, for example. Bacteria have been used in this way for many years in the purification of waste water and in dealing with oil disasters.
- Technology to add value to residual and waste flows.
- Technology (including ICT) to optimise agrologistics.
- Ecogenomics: working towards healthier soil life.

Product innovations

A number of technological developments are a source of concern for consumers. Biotechnology is a salient example of this. In broader terms, people are concerned about food safety and there is a greater demand for quality guarantees and information regarding production methods. These are therefore important themes where the future prospects of the sector are concerned.

Product innovations take place on a regular basis in horticulture, such as the vine tomato, new colours of sweet peppers, and countless varieties of plants and flowers. In arable farming and livestock production, new products emerge much less frequently, although maize is an interesting example from the not-too-distant past. All sectors strive for improvements in quality. The post-harvest process is also important in this:

storage conditions, the effective monitoring of micro-organisms that can cause food to perish and/or give rise to toxicity, and transportation conditions, for example.

The development of new products for the consumer generally takes place in the foodstuffs industry. Such products are generally aimed at consumers with greater purchasing power. The processing industry has a need for good quality starting materials (standard quality), and then wishes to create the added value itself by making specific products and supporting those products with a whole range of marketing techniques. The strategy currently predominating is one of more advertising and an emotion-focused approach. However, another trend can be seen, towards products promoting health (functional foods): products with functional advantages such as probiotics, fat-substitutes, sweeteners and high-fibre products. These are products that are truly distinctive: a shift from 'emotional' to 'functional benefits.'

Developments in the field of preserving foodstuffs (heating, drying, deep freezing, etc.) make it possible to supply high quality products that are highly nutritious, and have a short preparation time. New freeze-drying technology also makes it possible to combine convenience and authentic aromas. This is important for the growing market for convenience food, ready meals and meals consumed outside the home.

Research is also being done on new applications for existing products, such as the processing of starch potatoes into non-food products. Examples include the substitution of products that are based on petroleum (such as bioplastics), and other new 'bio-based' materials and products may also appear on the market. The question is whether crops will come into being that are specifically intended for non-food products and energy, or whether it will turn out to be economically more important to use crops partly as food and partly for non-food products: so-called bio-refining.

Conclusions

Technology is continually offering new opportunities for responding to changing scarcity ratios, to environmental problems (such as problems associated with pesticides, greenhouse gases, minerals, ammonia and odours) and to existing and new consumer needs. There is far-reaching automation evident in all sectors, with heavy use of ICT as well as measuring and regulating technology. It is possible that more biotechnological innovations can also be expected over the next decade.

2.1.8 Environmental trends (impact on agriculture)

Climate change

The EEA report (2004) "Impact of Europe's changing climate; an indicator based assessment" addresses the complex issue of climatic change in the following manner:

> Anthropogenic emissions have increased the atmospheric concentration of CO_2 from 280 ppm (before about 1750) to 375 ppm at present. This already has led to an increase of the average temperature in Europe of 0.95 °C. Annual precipitation trends in Europe for the period 1900-2000 show a contrasting picture between northern Europe (10-40% wetter) and southern Europe (up to 20% drier). Changes have been greatest in winter in most parts of Europe. Annual river discharge has changed over the past few decades across Europe. In some regions, including eastern Europe, it has increased, while it has fallen in others, including southern Europe. Some of these changes can be attributed to observed changes in precipitation.
>
> In the coming decade, the CO_2 level will further increase, leading to climate change. The extent of future climate change cannot be known with certainty, since the scientific knowledge of various climate processes is incomplete and socio-economic development, which determines the magnitude of greenhouse gas emissions, is uncertain. From 1990 to 2100, the average temperature in Europe is projected to increase by 2.0-6.3 °C. Projections for Europe show a 1-2% increase per decade in annual precipitation in northern Europe and an up to 1% per decade decrease in southern Europe (in summer, decreases of 5% per decade may occur). The reduction in southern Europe is expected to have severe effects, e.g. more frequent droughts, with considerable impacts on agriculture and water resources. Annual discharge is projected to decline strongly in southern and South-eastern Europe but to increase in almost all parts of northern and North-eastern Europe, with consequences for water availability. The combined effect of projected changes in precipitation and temperature will in most cases amplify the changes in annual river discharge.

Impact of climate change on agriculture

The impact of climate change on agriculture can roughly be divided into three components: a yield increase effect because of increased CO_2 concentrations, a temperature effect (leading to a yield increase in most European regions) and a water availability effect (leading to a yield decrease in some European regions).

Because of the first two effects, climate change is expected to lead to a yield increase for most crops in most parts of Europe over the coming decades. The magnitude of this effect is still uncertain and depends on the climate scenario and how agriculture adapts to climate change. Estimations show yield increases of 9% to 35% for wheat by 2050 (Hulme *et al.*, 1999). The largest increases in yield could occur in southern Europe, but relatively large yield increases (3-4 t/ha) may also occur in Scandinavia. In the rest of Europe, cereal yields could be 1-3 t/ha greater than at present. However, a critical factor is water supply and the uncertainty in projections of regional precipitation. As happened during the heat wave in 2003, a lack of precipitation could convert the positive effect of climate change (stimulated plant growth) into a negative effect (decrease in yield due to water stress). This threatens particularly the southern and eastern parts of Europe (Spain, Greece).

Over the next 15 years, the actual effect of climate change on European agriculture is probably more determined by the occurrence of extreme weather events (droughts, floods, storms, hail), and pests and diseases, than by the underlying trend of increased yields.

Policies to mitigate climate change might also have a significant effect on Europe's rural areas. The production of biofuels for heating, electricity production and transport could lead to significant changes in land use and could generate many jobs as well. Forestry could contribute to long-term carbon sequestration. Short rotation stands of eucalyptus and softwood (generally for paper or the building industry) immobilises less carbon than hardwood production (typically associated with high-quality finishing in buildings or furniture) on a tonne/ha basis.

Effects of changes in natural resources on agriculture

Information of the effects of changes in natural resources on agriculture is not readily available. Expert judgement indicates that water availability and soil degradation (namely soil erosion) are the main factors determining agricultural potential. Erosion is a specific problem where it occurs on steep slopes with fragile soils when there is a pattern of long dry periods followed by heavy bursts of rain (EEA, 2005d). The northern loess zone shows moderate rates of water erosion (ibid.). It is unknown to which extent erosion will affect possible crop yields at a European scale. Most areas with high erosion risk, however, have already been so for the last decades (at least), and current yields already reflect in most cases the long-term effects of soil erosion. There were no readily available data on soil salinisation either. In some areas this is an old phenomenon; most new problems will probably occur in areas that have recently (during the last decades) become irrigated by surface water. This is the case in parts of Spain, Italy and Greece. Crop yields there might drop over the next decades, especially if less water is available for agriculture (see next paragraph).

Water availability

Agriculture is an important sector in terms of total water usage in Europe. In many regions in Southern Europe, yields have been boosted over the last decades by newly established irrigation schemes. Increasing water abstraction rates may give rise to environmental problems such as lowered water tables, salinisation and damage to terrestrial and aquatic habitats due to the installation of dams and reservoirs. In some regions in Southern Europe, this has led to overexploitation of surface and groundwater resources. This has already led, or may lead in the future to restriction for agriculture concerning water use, and thus to lower yields. This development is enhanced by climatic changes, which already have lead to severe droughts in Southern Europe.

2.2 Endogenous drivers to the EU policy-making system

2.2.1 Trade policy and agricultural policy

EU agriculture and the agricultural sector (the 'agro-complex') are greatly influenced by international policy developments. After World War II the EU established a Common Agricultural Policy (CAP) that kept stable prices above world market levels. This policy led to a significant increase of productivity and Europe turned into a major exporting region. Surpluses, progressively increasing budget costs as well as problems with other exporting nations led to several reforms of the CAP as described in Section 2.2.2. Another obvious domestic change has been the EU's enlargement from the original 6 countries to 25 members with very diverse agricultural sectors and large differences in the relative economic importance of these sectors – with more members on the way. The recent and future enlargements of the EU increase the scale of this internal market. In addition, the markets outside Europe must not be forgotten, even if only because the population size and the purchasing power will grow fastest there. However, access to those markets is determined to a great extent by trade policy instruments: import duties, non-tariff import rules and export subsidies. Multilateral agreements have been made within the framework of GATT/WTO regarding these trade policy instruments since 1994[33]. The EU concluded a number of bilateral trade agreements with neighbouring countries as well as with developing countries, most notably the ACP. These bilateral and multilateral agreements had important consequences and challenges for the CAP. The current WTO negotiations, as well as the increasing moves to bilateral trade liberalisation in the framework of MERCOSUR and other Latin American countries, EUROMED, ACP and also South Africa, as well as the further enlargement process, might lead to further challenges for the CAP.

2.2.2 EU agricultural policy

To see the CAP of today in perspective, we have to understand its history and the context in which it was created. In legal terms, that history goes back to the Treaty of Rome – the founding document of what has become the European Union, signed in 1957 by France, West Germany, Italy, the Netherlands, Belgium and Luxembourg. Among other objectives, the Treaty sets out that agricultural policy in the signatory countries should aim at:

- increasing agricultural productivity;
- ensuring a secure food supply at reasonable prices; and
- providing the agricultural community a fair income.

These aims were to be achieved through a free internal market with stable high domestic prices. The insulation of EU markets from world markets can only be achieved by restricting imports. In the past, the main instruments for achieving this goal were variable import levies that bridge the gap between fluctuating world prices and fixed domestic prices. In addition, export subsidies were used to enable excess supplies to be disposed on world markets, and intervention purchases were used to remove further excess supplies from the internal market.

However, this system of high internal prices led to overproduction, and the associated level of public spending became a problem. The EU had to respond to these problems several times in the

[33] GATT = General Agreement on Tariffs and Trade; WTO = World Trade Organisation, the successor to GATT as of 1995.

last two decades of the 20th century. In the eighties production quotas for milk were established. The MacSharry reform in 1992 was the first reform that implemented a shift from market price support to direct payments in the CAP. Intervention prices for wheat and beef were reduced by respectively 30% and 15% (Table 2.12). Farmers were partly compensated by area and animal premiums. These premiums were less production-distorting than market price support and more effective in achieving income effects (OECD, 2001a). Furthermore, set aside of arable land was introduced to reduce production.

The Agenda 2000 reforms continued along the same lines as the MacSharry reforms with reductions in the intervention prices for wheat and beef. These reforms were prompted by the following factors: the proposed enlargement of the EU to include Central and Eastern European Countries (CEEC) and the anticipation of a new WTO round.

Table 2.12: EU decisions and world market prices.

Product	MacSharry price reduction (1993-1996)	Agenda 2000 price reduction (2000-2002)	Mid Term Review price reduction (2004-2007)	EU price 2004 (€ per tonne)	World market price (€ per tonne)
Wheat	30%	15%	0%	100	100 [d]
Beef	15%	20%	0%	1,560 [b]	1,500- 2,000 [e]
Butter	0	0	25%	2,464 as at 1/7/2007 [c]	1,400 [d]
Skimmed milk powder			15%	1,747 as at 1/7/2006 [c]	1,700 [d]
Sugar	0	0	33% [a]	632; 421 in 2007/2008	250 [f]

Source: Silvis and de Bont (2006)

a) The proposal dated July 2004 led to a reduction in the current intervention price from €632 to €421 per tonne of white sugar in 2007/2008; the market price in the EU is still over €700;
b) Intervention price; basic price in the EU regulations is €2,224; the European market price in 2004 was approx. €2,800 per tonne of carcass;
c) Intervention price set by decisions taken in 2003;
d) Expectations of the European CIE and OECD are given in dollars; in € depending on the exchange rate (currently approximately €/$: 1.3/1);
e) FAO; Annual Averages, Beef (Australian, cow beef, boneless, cif, USA) Year 2003 US$/tonne 2,110;
f) The average export price of white EU sugar is €223 per tonne in 2002/03 and €280 in 2001/02.

The recent CAP reform of 2003 reduced especially the intervention prices of dairy products (Table 2.12). Income supplements were used for partial compensation for the reduction in the guaranteed prices. Up until the 2003 Review decisions, these were linked with the number of hectares used for cereals, oilseeds and protein crops and the number of beef and sheep animals kept. Partly due to progress at the WTO, the direct payments were further decoupled from production by the introduction of a single farm payment.
A single farm payment (SFP) will replace most of the existing premia under different common market organisations. Farmers will be allotted payment entitlements based on historical reference amounts received during the period 2000-02. The payment can be established:

- at the farm level. The entitlement will be calculated by dividing the reference amount of the payment by the number of eligible hectares (including for forage area, which is the basis for the granting of livestock and sheep and goat premia) in the reference year.
- at the regional level as follows: calculate and allocate a uniform payment entitlement per hectare within a region, rather than calculate a single payment individually for each farmer; vary payment levels between arable land and grassland; make different sectors contribute to different degrees to the redistributed regional envelope while allocating some payments or a given share of payments on the basis of individual reference amounts; and redistribute funds between regions when the regional financial envelopes are defined.

Eligible hectares for the SFP include any type of land except land used for growing permanent crops. Set-aside payments will be included, based on historical set-aside obligations, but can be activated only by an eligible hectare put into set-aside (excluding permanent pasture). Farmers receiving the new SFP will have the flexibility to produce any commodity on their land, except fruit and vegetables and table potatoes. In addition, they will be obliged to keep their land in 'good agricultural and environmental condition' (see below).

In order to limit the dereliction of agricultural land as well as take into consideration the concerns over land management of some Member States, the agreement allows part of the direct aids to farmers to remain coupled. The level at which these aids can be coupled is determined for each sector as follows:

- Up to 25% of the current per hectare payments in the arable sector may remain linked to production. Alternatively, up to 40% of the supplementary durum wheat premium may continue to be tied to production.
- For the beef sector, Member States may retain up to 100% of the slaughter premium for calves and up to 100% of the present suckler cow premium and up to 40% of the slaughter premium, or up to 100% of the slaughter premium, or alternatively up to 75% of the special male premium.
- A maximum of 50% of the sheep and goat premia, including the supplementary premium in less favoured areas, can remain linked to production.

The wide range of options for implementing the SFP in the Member States illustrates the importance of national decisions for the impact of the reform on agriculture. The different implementations will tie the payments to a varying degree to the factor markets in particular the land market. This might have long-term effects on the adjustment of agriculture and its competitiveness in the EU.

Compulsory cross-compliance

The full granting of the SFP and other direct payments will be linked to the respect of a certain number of statutory environmental, food safety, animal and plant health, as well as animal welfare standards. In the case of non-respect of cross-compliance requirements, direct payments will be reduced in proportion to the risk or damage concerned.

Sector reforms

In February 2006 EU agricultural ministers formally adopted a reform of the EU sugar sector. This reform brings this sector into line with the rest of the reformed CAP. This year, the Commission is

working on proposals to reform the common market organisations of fruit and vegetables, and wine. Furthermore, the EU offered to phase out export refunds within the Doha Round, provided that others undertake reciprocal measures.

Still after all these reforms the ratio between the current European prices and the world market prices varies greatly per product (Table 2.12). For grain, the EU is already competing at more or less the same level. Generally speaking, this means that exports without refunds are possible. For beef, the current internal EU prices are higher than the world market price. A direct comparison is difficult in view of the differences in quality. Incidentally, the EU's self-sufficiency for beef has fallen below 100%, due to the decline in the number of dairy cattle (due to milk quotas). The abolition (decoupling) of the beef premiums could result in a further reduction in production. The internal butter price is currently still too high for exports without refunds to be possible; the difference between internal and world market prices is smaller for skimmed milk powder. For sugar, the proposed price reduction by no means ensures a bridging of the difference with the world market. Account must be taken of the interests of imports from developing countries (EBA, ACP) and the Balkan region, as well as the isoglucose scheme (a grain-based sugar substitute).

The reform process since 1992 has shown an increasing reduction of support to production in favour of less and minimal trade distortive forms of income support. European agriculture significantly improved its competitiveness *vis-à-vis* world markets in a number of products. In course of the developments the rural development policy gained importance.

Rural policy

The European Union's rural policy forms the 'second pillar' of the agricultural policy and has the following objectives:

- the reinforcement of the competitiveness of agriculture (and forestry),
- the sustainable management of rural areas,
- the diversification of agricultural activity and the rural economy, and
- the improvement of the quality of life in rural areas.

On the basis of European rural policy, countries formulate domestic programmes, the so-called rural development plans (RDPs). For the joint financing of the first and second pillars, the EU has created the European Agricultural Fund for Rural Development (EAFRD) to unify and revise all the other EU financial instruments concerning the agricultural sector. An increasing amount is transferred from the first pillar to the second pillar by means of gradual cuts (modulation). In the old Member States about 10% of the total CAP budget is for RD funds and in the new Member States it is over 40%. The recent conclusions of the European Council on the Financial Perspectives 2007-2013 (April 2006) resulted in a share of RD funds of 19% of the CAP budget. This is more or less a doubling of the share compared to the period 2000-2006.

Environment, welfare, health and food safety

Within the framework of the European integration process, more and more government policy matters have been transferred to Brussels over recent decades, thus making national governments primarily responsible for the implementation of that European policy. In the field of the environment, the policies concerned are the Nitrates Directive, the Directive establishing a framework for Community action in the field of water policy and – for the larger intensive livestock

farms – the Integrated Pollution Prevention and Control Directive (IPPC). The authorisation of the use of pesticides is increasingly becoming harmonised within a European context.

With regard to veterinary controls, stricter European rules on matters like the transportation of animals and the use of meat meal have been put in place since the BSE (mad cow disease), swine fever and foot-and-mouth disease crises. A number of regulations have also been introduced regarding animal welfare. For example, since 2004, there has been a ban on individual box stalls for veal calves, and the keeping of laying hens in battery cages will be banned as of 2012. With regard to food safety, the EU has designed a new legislation: the General Food Law. Within the Member States, the implementation of this leads to changes in the control over the chains and new organisational and financial relationships (the Food and Consumer Product Safety Authority (VWA)).

Quality policy

The European Union is essentially trying to make agriculture demand-driven through the policy changes described above. This also includes the improvement of the quality of the product and the production process. Matters such as cross compliance, the abovementioned measures for the environment, animal welfare and food safety, and the stimuli for organic farming fit into this framework. In addition, the EU offers opportunities for national quality labels and regional products (with geographical specifications).

National implementation is more important

Now that the centrally regulated European market and pricing policy is gradually changing into rural policy and 'decoupled' payments, the importance of national implementation is increasing. That implementation must of course fulfil a whole range of European regulations, yet there is scope here and there for differences in national implementation.

Countries can therefore make a choice regarding the basis for the SFP payments (historical reference, flat rate, or a mix of the two) or regarding the extent of 'decoupling' of the beef premiums, for example. Similarly, Member States can use the resources earmarked for rural policy for regions (infrastructural facilities) and for agriculture or broader rural development.

Concluding remarks

The philosophy of the CAP changed fundamentally since 1992 due to internal policy and budgetary reasons as well as international pressure. The most fundamental changes are:

- shift from market price support to income support, and
- income support becomes more decoupled from production and coupled to public goods such as environmentally friendly land management, and human and animal health.

While the reform process brought about a significant reduction of export refunds and public intervention as compared to the earlier years of the CAP, there are still a number of markets that rely on these forms of support. Import tariffs still play an important role in supporting agricultural prices. A conclusion of the Doha Round, which foresees the phasing out of export refunds, a reduction of import tariffs and increasing market access, might well lead to necessary adjustments of a number of market organisations, in particular as regards cereals and dairy.

2.2.3 Environmental Policy (Impact on Agriculture)

Biodiversity

On 21 December 1993, the Community ratified the Convention on Biological Diversity (CBD). Specific measures have been taken following ratification. In this regard, Article 6 of the CBD specifically requests each party to:

- "develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- "integrate as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies."

The EU approach to the CBD is two tiered: a European Community Biodiversity Strategy (COM(1998) 42) as a framework and four complementary Biodiversity Action Plans (BAPs) for specific sector integration of measures favourable for biodiversity, including a specific BAP for agriculture[34]. Both the Biodiversity Strategy and the Biodiversity Action Plans are under a review process. The effort to respect the CBD has also been carried forward in the 6th Environmental Action Plan[35], 2002-2012, with emphasis given to (1) climate change, (2) nature and biodiversity[36], (3) environment and health and quality of life, and (4) natural resources and waste. The 6th EAP has resulted in the current drafting of seven Thematic Strategies, three of which have direct relevance for agriculture, i.e.:

- Thematic Strategy for Soil Protection[37]
- Thematic Strategy on Air Pollution
- Thematic Strategy on the Sustainable Use of Pesticides

According to the principle of subsidiarity, the EU Member States also have undertaken to implement the CBD in terms of local objectives and actions. The EU policy has an influence upon EU programmes that will affect particular circumstances on the ground. In this regard, three sectors having the greatest integrative potential across MS boundaries have been the object of the BAPs (2001): natural resources, agriculture and fisheries.

Practical implementation of the spirit of the CBD at the EU and MS levels even preceded its ratification. This evolution in policy began with the MS ratification of specific instruments, notably the Ramsar (1971) and Bern (1982) Conventions. The Community has been progressively organising its strategy for the conservation of species and their habitats into a comprehensive strategy to promote biodiversity, building upon the Birds (1979) and Habitats (1992) Directives, in particular through the *Natura 2000* network (within which 33% is agricultural land), and the enactment of other sectoral legislation. In the agricultural sector, as a well known example, the

[34] COM(2001) 162, volume III.
[35] Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002.
[36] Preamble consideration 21: "There is considerable pressure from human activity on nature and biodiversity. Action is necessary to counteract pressures notably from pollution, the introduction of non-native species, potential risks from releasing genetically modified organisms and the way in which the land and the sea are exploited."
[37] Adopted by the Commission on 20 September 2006.

agri-environmental measures of 1992 first appeared in the Environmentally Sensitive Areas that originated in Article 19 of Regulation (EEC) No 797/85.

Changing land use in agriculture and forestry sectors: the principal threat to biodiversity

> "There are many threats to Europe's biological diversity, which vary in intensity and relevance across regions, ecosystems and species. These threats include changing land use, land fragmentation and degradation, freshwater shortages, watercourse modifications, invasive alien species, over-harvesting, pollution, stratospheric ozone depletion, and climate change. Many of these threats are inter-connected." (EEA, 2004: State of Biological Diversity in the European Union, p.13)

The EU has an increasingly proactive engagement with the management of natural resources, as will be discussed following with regard to the Water Framework Directive, and is also illustrated amply in other enacted and proposed legislation.

Agricultural and forestry activity concerns nearly two thirds of the European terrestrial area, and changes in land use practice has wide spread influence: FAO data[38] shows a steady decrease since 1961 in agricultural area (from 51% to 45%), in favour of afforestation and other land use, but an increase of fertilisation, mechanisation and livestock charge per hectare on the area remaining in the period up to 1991, with a decrease thereafter. This more intensive use of land corresponds to the drop in the populations of field birds, because of food chain disruption and habitat disturbance. Shifts in agricultural production strategies, coupled with an increase in organic agriculture, may lessen the negative influence of agriculture on biodiversity. What remains to be seen is the future influence upon biodiversity of the introduction of genetically modified plants among the varieties of crops being planted; these have been introduced on a controlled basis since 1991 (the deliberate release of GMO material into the environment is currently regulated by Directive 2001/18/EC[39]).

The production of biofuels, as a replacement for petroleum products used to power vehicles or to provide heat, shows the ambivalent nature of technological progress on the preservation of biodiversity. There is a European policy to encourage the use of biofuels, structured around the EU Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport; some European countries have also encouraged the practice of woodland coppicing, through EU CAP co-financed agri-environmental measures, to produce wood-chips to be used in furnaces for domestic and district water and space heating units. The production of biofuels corresponds to a mono-cultural production pattern; the economic incentives involved are sufficient to bring land out of set-aside, and these set-aside areas often have a targeted biodiversity function. As with any other intensively cultivated crop, bio-fuels create pressure on the aquatic environment through the leaching of nitrogen, phosphorus and pesticides, and also result in increased ammonia emissions into the atmosphere.

[38] FAO electronic database, 2004; 21 EU countries had national frontiers that were consistent at the three points in time noted (1961, 1991, 2001): AT, BE, BG, CH, DK, ES, FI, FR, GR, HU, IRL, IT, MT, NL, NO, PL, PT, RO, SE, UK.

[39] The first directive regulating the use of GMOs in agriculture dates to 1990. Given the widespread public concern about the health and larger environmental consequences of the introduction of GMOs, a moratorium was established in 1998. In May 2004 the Community lifted the 6-year moratorium on approving GMOs. A month later, a panel of national experts failed to approve or refuse the import and processing of a genetically modified oilseed rape, relegating the decision to the political level at the EU ministerial level. Thus the effect of GMOs on humans and the environment remains a highly contentious political and scientific issue.

Maintaining Soil Biodiversity

The Commission has tabled a Communication (COM(2002) 179 final), *Towards a Thematic Strategy for Soil Protection*, that has a specific focus on soil biodiversity:

> To protect soil biodiversity, the Commission could consider the extension of the annexes of the Habitats Directive to complete the so far limited list of soil-based habitats requiring special protection should it be shown that existing designation is insufficient. Complementarily, the importance of soil in the management plans for designated Natural 2000 sites will be increased. (p. 30)

Soils are a precious substratum to terrestrial life: natural and domesticated vegetation are the structuring elements of natural habitats and arable lands, with all the other species – from insects to wildlife – dependent on the association between plants and soils. Soils evolve over long periods of time, the result of the weathering of bedrock, and soil particles are sometimes transported and deposited over hundreds of kilometres. The loss of soil is the loss of natural capital, yet good soil in terms of structure and depth to bedrock is coveted by agriculture and forestry, residential / commercial building sites and transportation infrastructure. Poorly managed soils disappear through the erosive force of wind, rain and floods. Soil pollution occurs through the spreading of sewage sludge, especially because of the presence of heavy metals and organic substances. The use of sewage sludge in agriculture is important in many Member States, but it is also becoming a very controversial issue. The Community policy in this field (as set out in the Urban Wastewater Treatment Directive 91/271/EEC and the Sewage Sludge Directive 86/278/EEC) is to promote the use of sludge in agriculture, provided that it complies with the applicable requirements in terms of monitoring, treatment and quality.

A report of the Swedish Environmental Protection Agency (Eriksson, 2001) studied the concentrations of 61 trace elements in sewage sludge, farmyard manure, mineral fertiliser, precipitation and in oil and crops. As noted in the foreword to the report, "Contamination of soils by trace elements is as good as irreversible because the amount of many elements, especially metals, lost by leaching and removal by crops is small." Therefore there is no means to reverse the contamination of soil by trace elements, and continuous application of the sources of trace elements only leads to their accumulation, "and these higher concentrations will continue to exist for hundreds and thousands of years" (ibid.) Given the complexity of the issue to preserve soil functions and biodiversity, the current review of the Sludge Directive is associated with the preparation of a Biowaste Directive, especially considering the increasing interest for composting as a way of channelling organic waste into the preparation of a useful derived product for horticulture and gardening.

The issue of adverse disruption of soil functions by contamination include possible effects on seed germination and the maintenance of the micro-organisms in the soil, which in turn have a regulatory effect on soil functions that includes nutrient cycling. For this reason the EU supervises the types of chemicals and biocides and their application procedures that are applied to soils through the Plant Protection Products Directive (91/414/EEC). Member States must ensure that plant protection products do not affect the abundance and diversity of non-target species, the communities they are associated with and the ecological processes they contribute to; assessment

must not only evaluate impact upon soil organisms, but above ground and foliar life forms as well (Ahlers and Martin, 2003).

The effects on metabolic processes are the biodiversity-related concern with regard to air pollution, through the phenomenon of soil deposition of incriminated substances, which in turn are assimilated by plants and animals. In addition to a legislative programme of a series of directives[40], the European Commission has launched the Clean Air for Europe (CAFE) programme in 2001; the aim is to develop a long-term, strategic and integrated policy advice to protect against significant negative effects of air pollution on human health and the environment. Based on the output of the CAFE programme, the Commission is scheduled to introduce a Thematic Strategy on Air Pollution in 2005.

Green House Gases (GHG) and climate change

The triangular relationship between green house gases, climate change and biodiversity loss is increasingly understood to be a tightly structured relationship. The pace of change is faster than the capacity of most species to adapt locally (and some species are basically immobile) or to shift their population range accordingly. Because species are linked together in communities, or guilds, an unequal rate of change in spatial distribution means that the relationship between species can become stretched to the point of rupture ... and then entire ecosystems run the risk of collapse. Individual species response to changes in weather patterns – be it in terms of shifts in temperature ranges, annual periods of rainfall or variations in rainfall intensity – may effect a species' capacity to feed, to reproduce, and even to achieve sexual differentiation ... for example, the sex of baby painted turtles is linked to the average temperature in July, and even a small temperature increase can threaten the production of male turtles. Other attributes of species behaviour, such as migration periods, are also becoming modified, and temporal synergies between species at particular locations are therefore in jeopardy.

Among atmospheric emissions that are classified as 'green house gases', up to now the most intractable to emission controls has been carbon dioxide. An EU-wide emissions trading scheme for carbon dioxide emissions is due to come into effect as of 2005. With regard to carbon dioxide control, the primary sectoral interests to be concerned are coal fired electricity generation, and transportation based on the use of internal combustion motors. The attempt to control atmospheric emissions dates to the Air Quality Directive (96/62/EC) that along with derived legislation has set limit values to sulphur dioxide, nitrogen oxides, and particles. EU and MS programmes have achieved reductions for particulates, carbon monoxide, nitrogen oxides, volatile organic compounds and lead; and although there has been success in the reduction of sulphur

[40] Soil pollution can occur through air-borne contamination, and this eventuality is addressed in the Large Combustion Plants Directive (2001/80/EC). SO_2 and NO_X emissions coming from large combustion plants contribute significantly to acid deposition, thus acidifying soil and water bodies, therefore damaging plants and aquatic habitats. NO_X reacts with volatile organic compounds in the presence of sunlight to form ozone that can adversely affect human health and ecosystems. Emissions from combustion plants can travel long distances from their sources. The types of combustion plants (having a thermal output greater than 50 MW) that are the object of this Directive are also subject to compliance with the Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC), which requires the use of Best Available Technology on a wide range of industrial installations that have for effect to reduce emissions resulting in aquatic and atmospheric pollution. Atmospheric emission levels are in some cases specifically regulated by Directive 2001/81/EC on national emission ceilings, which sets a 2010 target level for several atmospheric pollutants.

dioxide from road transport emissions, this has been offset by a corresponding increase in emissions from international maritime transport (EEA Signals 2004).

The influence of GHG on agriculture is widespread, going beyond the matter of temperature change to include the acidification of soil and water. In terms of sectoral impact, agro-ecosystems are directly involved. First, GHG have an effect on the health of crops and animals. Second, agriculture has a role for carbon sequestration in soils: more extensive land-use, associated with long-term grazing patterns, creates a carbon trap. The use of industrial agricultural techniques to produce energy crops, however, has a neutral result unless accompanied by cross compliance measures such as long-term set-aside. A similar situation applies to forestry: atmospheric acidification has resulted in forest crown dieback, associated with disturbance of the ecology of soil micro-organisms that influence the vitality of root systems. In terms of long-term carbon sequestration, short rotation stands of eucalyptus and softwood (generally for paper or the building industry) immobilises less carbon than hardwood production (typically associated with high-quality finishing in buildings or furniture) on a tonne/ha basis.

Certification as a means for protecting the environment

Another aspect of reinforcing land management decisions that are beneficial for biodiversity is certification of agricultural and forestry products. Certification processes officially regulated by the EU only deal with agricultural products, and are related to place or related to process, and both forms are intended to preserve the quality of the goods concerned. The certification associated with place, or 'origin', is covered by two regulations. Regulation 2081/92 is on the protection of geographical indications and designations of origin for agricultural products and foodstuffs. That is, the name associated with a product is limited for use by a certain group of producers. Their collective interest is that the quality of what they offer remains recognisable over time, and that the added value to their products because of this quality is not deceitfully presented to a potential consumer through a counterfeit product bearing the same (or similar) name. Regulation 2082/92 is on certificates of specific character of agricultural products and foodstuffs. This regulation concerns the place where a product comes from, and it also denotes the process by which it has been derived, essentially referring to traditional recipes. Again, the intention is to guarantee authenticity.

The benefit for the environment of protected designations of origin (PDO), protected geographical indications (PGI) and traditional specialties guaranteed (TSG) is dependent upon the specific circumstances regarding each product. As one of many possible examples from across the European Union, the labelling system used by a Parc Naturel Régional in the north of France for promoting a land race (local breed) of cattle known as 'Bleue du Nord' is associated with land management specifications to maintain a hedgerow landscape (under an agri-environment programme), and is registered as a PGI (PNR Nord-Pas de Calais, 1996). But this association of product and environmental quality is not necessarily systematic. Only in the case of the separate labelling system for organic agriculture can a direct relationship to the conservation of biodiversity be guaranteed.

Definition of organic agriculture

FAO WHO *Codex Alimentarius* definition of 'organic' agriculture refers to "a holistic production management system which promotes and enhances agro-system health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system."

The EU first established a policy for 'organic' agriculture in 1991 through Regulation 2091/91 for arable produce, amended in 1999 to include livestock production. Because of the biodiversity support function, explicitly recognised in the FAO/WHO definition (see box above), there is a 'public goods' characteristic appertaining to 'organic' products. As is typical of 'public goods' this type of added value is not 'internalised' in (or "attached" to) the market value of the product; this value is therefore an 'externality' (see OECD, 2001c, for an ample discussion). The problem confronting the producer of an organic good is that although the consumer will recognise the added value of organic production in terms of health, and will pay a price premium for this individual benefit, he/she will not at the same time accept the responsibility to remunerate the farmer for the collective benefit to all fellow citizens for the conservation of biodiversity. Because the reward (the price paid by the consumer) to the farmer is not necessarily sufficient to cover costs or income foregone in production (normally accruing to additional labour required and possibly to lower growth rates / higher loss to parasites in the field, or to decreased body weight for an animal), the argument is that public financial support for organic farming is necessary in order to ensure a fair standard of living for the farmer, commensurate to that of a non-organic producer.

Although the argument for compensation has long been accepted, the Commission has noted that a general reinforcement of the market position of organic produce is desirable; the current national part of agricultural land for organic production varies greatly across the EU-25. The Commission therefore proposes a European Action Plan for Organic Food and Farming (COM(2004) 415 final), with the objectives to reinforce consumer interest in organic produce through adequate information concerning its full added value (including for biodiversity conservation), to encourage national commitment for institutional research and farmer training that will facilitate production (and therefore lower costs to the farmer), and to harmonise standards for 'organic' products across the EU market area. The existing logo will be given greater exposure by the proposed public awareness campaign, so as to become the unique consumer reference for product quality.

Water as a vital ecological resource for agriculture

Water is a natural resource conditioning all of life as well as underpinning the economic stability of society. The use of water is ubiquitous to virtually every human activity, and concerns human health, manufacturing processes and agricultural production. Water is a medium in which many life forms exist, and water quality is critical to biodiversity. Yet water is very easy to pollute. Urban and industrial waste discharges have often occurred directly into waterways, and ground-flow of water carries organic compounds to waterways and water bodies. Thus the attention given to the influence of the use of fertilisers in agriculture has existed for quite some time, in particular with regard to nitrogen in terms of its effects on the human organism and with regard to phosphorous in terms of eutrophication of standing waters. One tactic adopted has been to identify zones that are vulnerable to pollution by nitrogen, in particular aquifer recharge areas that are the natural ground water reservoirs for human drinking water supplies. Through the Nitrates Directive (91/676/EEC), vulnerable zones are identified at the Member State level, and controls on the application of nitrogen and also on manure storage and spreading are enforced so as to maintain a nutrient balance that has no risk of excessive NO_3 concentrations. It is also expected that codes of good agricultural practice will be adopted, which concern crop rotations, soil winter cover and catch crops, in order to limit nitrate leaching during the wet seasons. Appropriate timing of nitrogen application is also called for, so that nitrogen is available in the soil when crops need it. Lastly, management of agricultural practice should restrict cultivation of steep slopes (susceptible to rain water run-off), limit the amount of irrigation (which ultimately engenders salinisation of soils) and encourage the 'buffering' of watercourse and drainage ditches by the presence of non-fertilised grass strips.

The importance of water management has been elevated to a comprehensive strategy, in the Water Framework Directive (2000/60/EC), to expand the scope of water protection to all waters – surface water and ground water – to meet a requirement for "good chemical status" and "good ecological status". 'Good ecological status' is a variable quality across the EU, but the criteria agreed to in the application of the Directive (WFD) are stipulated in terms of the quality of the biological community, the hydrological characteristics and the chemical characteristics. The purpose is that water quality and quantity throughout the EU will be satisfactory to sustain biodiversity, to insure that adequate supplies of water are available, and to provide water that is safe for human consumption. A river basin approach is adopted so that a functionally coherent spatial context is used in planning for the implementation of the WFD, specifically in the designation of special protection zones, but more generally in the organisation of land use, including agriculture, so that safeguards against both pollution and undue water use exist. Maintaining sufficient water flow and reserves in aquifers is of primary importance for biodiversity. The WFD sets forth the principle that only the portion of the overall recharge not needed for the ecology of the watershed can be abstracted.

Challenge of the integration of environment into agriculture

Integration of environment into agriculture is very much about resolving conflicts between land use and the conservation of biodiversity (Young *et al*., 2003). The EU has been adapting its policies to meet the challenge of the 2010 deadline for halting the loss of biodiversity. Ever since The

European Council launched the Cardiff Process in June 1998, the Spring Council examines how environmental concerns are fully considered in the decisions and activities of other sectors, in terms of EU policy, thereby putting article 6 of the EC Treaty into practice. This has led to the review of the EU Biodiversity Strategy as a major orientation during the Irish Presidency (January-June 2004), cumulating in a Stakeholder Conference hosted by the Irish Government at Malahide in May: *Biodiversity and the EU – Sustaining Life, Sustaining Livelihoods*. The "Final Message from Malahide" presented 18 priority objectives for halting the loss of biodiversity, and formulated a series of targets associated with a first set headline indicators – based on CBD decision and focal areas[41] – to monitor progress in meeting the 2010 deadline. Objective 5 specifically addresses agriculture. As a continuation of the development of EU biodiversity policy post-Malahide, the Commission has issued a Communication on Biodiversity in 2006 that gives updated orientations for sectoral integration.

The challenge of sectoral integration has already brought changes to the Common Agricultural Policy. One highlight concerning the current evolution of CAP is the *Thematic Strategy on the Sustainable Use of Pesticides* (COM(2002) 349). Except in organic agriculture, plant protection products are widely applied, and therefore there is an on-going examination of the implications for human health and undesired side effects on other life forms. Although authorisation is required for the use of the active chemical substances involved, the EU proposes to give further general guidance on how to minimise risk and improve controls, including the more rapid substitution of new active ingredients that are more 'environmentally friendly' and the encouragement to reduce dependence on chemical substances the Integrated Pest Management and Good Farming Practices.

At the same time that policy orientations promote the integration of environmental considerations into agriculture practice, technology itself is evolving in an 'environmentally friendly' manner; precision farming is treated at several places in this report, and is one example where mastering inputs results in less environmental disturbance by the agricultural sector. Technological development is often a reflection of, or reinforced by, market forces; in the case of agriculture, there is a price squeeze phenomenon in agricultural commodity prices that encourages farmers to reduce inputs – in particular fertilisers and phyto-sanitary products – in order to increase their net returns.

[41] UNEP/CBD/COP/7/L.27

2.2.4 Enlargement

The European Union has been extended in several steps to its current size of 27 Member States. With previous rounds of enlargement the EU integrated developed market-oriented economies in which (with some exemptions) agricultural contribution to total income and employment was only small. The enlargement in May 2004 was different where eight countries became EU members which were still on the transition path from centrally planned to market oriented economies.

The agricultural sector in the new Member States (EU-12) significantly contributes to household income and employment in rural areas. Nevertheless there are large differences between individual countries. In rural areas, however, which are relatively high industrialised (e.g. in the Czech Republic, Hungary and Slovakia), agriculture is less important in terms of employment. In contrast, agriculture is far more important and the main employment sector in Bulgaria and the rural areas of Romania, Lithuania, Poland, Slovenia and Estonia.

Agricultural policies in the EU-12 have gone through several phases since 1989. In the first phase agricultural policy regimes were liberalised and subsidies abolished. Consumer prices dramatically increased, while real incomes often declined, and domestic demand fell. Foreign market access deteriorated as the traditional agricultural export markets in the former Soviet Union dwindled. Farm input prices increased strongly relative to producer prices, causing a decline in agricultural terms of trade and renewed demands for government support.

A second phase introduced or reintroduced policy interventions in the agricultural sector to protect consumers and producers against negative real income effects of agricultural and macroeconomic reforms. Due to a lack of experience governments reacted to unanticipated policy effects by sudden and frequent policy changes, thereby adding to the uncertainty induced by general economic reforms.

In a third phase, governments in most applicant countries started to install 'Common Agricultural Policy (CAP)-style' agricultural policy instruments, such as guaranteed prices, production quotas, export subsidies, and (variable) import levies. However, the introduction of these CAP-style policies has taken place in a somewhat independent approach. In some cases governments intervened in markets where the EU provides only limited support to EU farmers, such as with regard to pork in Poland.

Before accession and the installation of the CAP took place, agricultural policies in the EU- 12 underwent various degrees of modifications, the purpose has been both to comply with international agreements and to bring the level and kind of intervention more in line with those of the EU. Most of the EU-12 countries changed their policy mix to include more direct payments and other subsidies with somewhat less reliance on market price support. However, this adaptation of CAP-style policies did not take place systematically. This contributed to highly volatile agricultural markets bearing high market and policy risks. Consequently, due to the unstable political environment, the long-term structural change towards more competitive farm structures slowed down before accession.

Structural and regional development policies in the EU-12 were supported by the EU SAPARD programmes which had to be co-financed by national governments in the

candidate countries. After the accreditation of SAPARD agencies several programmes were implemented in the EU-12, which aim at improving farm businesses, the processing and marketing of agricultural and food products as well as infrastructure in rural areas.

One of the most important issues in the installation of the CAP was the introduction of direct payment. As an alternative to the Single Farm Payment system applied in the old EU-15 Member States, the EU-12 countries can opt for a simplified Single Area Payment Scheme (SAPS) until the end of 2008. Apart from Malta and Slovenia, all of the EU-12 countries have chosen to operate the SAPS. In case of an application of the SAPS farmers receive a uniform regionalised premium per hectare, which also includes fruits and vegetables, and potatoes. Not later than 2009, EU-12 countries that have opted for SAPS have to change their system and are obliged to adopt the regionalised version under the SFP. Just as the members of the EU-15, the EU-12 countries are allowed to couple a part of their payments to production from 2009 onwards. Bulgaria and Romania are allowed to apply the SAPS until 2012.

The level of decoupled payments in the EU-12 is phased-in stepwise over a period of ten years to the level prevailing in the old member sates starting with a level of payments financed by the EU budget of 25 % of the EU-15 level in the first year of membership. In addition, it was also agreed that the EU-12 can grant their farmers an additional "top-up" payment equivalent to 30 % of the full EU rate.

For all scenarios in this study it is assumed that Turkey will join the EU in 2015. All measures implemented for the accession of the EU-10 and Bulgaria and Romania are also applied to Turkey, e.g. phasing-in of direct payments, introduction of quotas, etc.

With the accession of Turkey the total agricultural area will increase in terms of population by more than 76 mio people and in terms of utilized agricultural area by more than 39 mio ha. In 2000, around 12.5 mio people were actively involved in agricultural activities, i.e. 48 percent of economically active population had been involved part-time or full-time in Turkish agriculture, see Turkish Statistical Yearbook, 2005. According to the Turkish Agricultural Census of 2001, 3.07 mio agricultural holdings are involved in agricultural activities. However, 1.06 mio agricultural holdings have an average farm size of less than 2 ha. These figures show the high contribution of Turkish agriculture to total employment and the relevance of subsistence production in small agricultural farm holdings which dominate the performance of Turkish agriculture. With the total size of the Turkish agricultural sector the Turkish accession can be compared with the enlargement of the EU-10.[42]

While market price support for those commodities covered in ESIM is assumed to be higher in Turkey than in the EU, Turkish producer prices for traditional northern agricultural products such as cereals and meats tends to decline after accession. This decline leads to lower agricultural productions and to an increase in domestic consumption, i.e. Turkey's net-imports (net-exports) tends shows a tendency to increase (decline). For those products the increase in demand on Turkish might provide opportunities for EU Member States such as Bulgaria, Hungary and Romania. However, other studies (Burrell and Oskam et al. 2005) indicate that for products (not covered in ESIM) – like fruits and vegetables – Turkey has comparative advantages, and the Single European Market will lead to an increase in Turkish fruit and vegetable export to northern European markets.

[42] These numbers are based on ERS/USDA baseline projections. The EU-10 contributed 74.7 mio people and around 38.6 mio ha of utilized agricultural area to the EU-15.

Nevertheless, the ESIM results indicate that the structural change in Turkish agriculture will intensify after EU-accession and subsistence agriculture, which plays an important role in Turkish rural areas, will have a key function in terms of a social buffer. For Turkey, CAP instruments which support this process, such as Axis 3 of the 2nd Pillar, will become very important.

2.2.5 WTO and other international agreements

With the 1994 Uruguay Round Agreement on Agriculture (URAA), domestic farm policies have become subject to international governance through the GATT (Josling and Tangermann, 1999). The set of rules established under the GATT limits the scope for domestic agricultural and trade policies. Specifically, the agreement has implications in three areas: market access, export competition and domestic support.

In the end, a number of agreements were reached, including:

- A reduction of import tariffs by an average of 36%, and only fixed levies would be permitted. (The EU had applied variable levies in order to fully protect the internal market from fluctuations in the world market prices).
- The obligation to open tariff rate quotas (TRQs) equivalent to 5% of internal consumption.
- A reduction of export subsidies, both in terms of quantity (-21%) and in terms of subsidy budget (-36%).
- Reduced internal support (through the AMS formula), in particular less product-linked, trade-distorting support (in the so-called yellow or amber box).[43]

These agreements have been implemented since 1995. Of these, the constraints on the value of export subsidy expenditure and on the volume of subsidised exports have turned out to be the most pressing (Weyerbrock, 1998, Swinbank, 1999, Meijl and Tongeren, 2002). Binding constraints on export subsidies imply that insulation of EU markets from world markets is more difficult because some excess supply cannot be disposed of on world markets at reduced prices. The reduction of intervention prices under the MacSharry, Agenda 2000 and the 2003 reforms taken together allow the EU to meet the export constraints more easily.

Expectations of the Doha round

An agreement was made in Uruguay that negotiations on further liberalisation would take place immediately after the implementation period. The Millennium Round faced a long series of launch-delays and a spectacular launch-failure in Seattle in 1999. While the talks did take off in 2001 in Doha, the negotiating agenda is still ambiguous in a number of crucial areas. The discussions, in this so-called Doha Development Round, turned out to be very complex, concerning a great diversity of topics, and the number of participating countries has grown to approximately 150. Moreover, more countries are grouping together, such as the 'rising' countries (the G20 including China, Brazil and

[43] Decoupled support as well as, for instance, for education, research and quality policy (the green box) is exempt. Income payments (the blue box), such as the European MacSharry payments, are exempt for the time being on the condition that production is limited (by means of fallow land and quotas etc.).

India) and the smaller developing countries (G90). This means that the US and the EU no longer have the same level of control. The hope is that the negotiations will resume after 2006.

In the field of agriculture, the focal points are once again export support, internal support and market access. With regard to export support, the aim appears to be complete dismantlement. The EU submitted proposals in this regard back in 2004, albeit under the express condition that the US also give up its export credit programmes. The Hong Kong ministerial meeting in December 2005 agreed on the phase out of all export subsidies and disciplines are introduced on other export competition practises to ensure parallel elimination of all forms of export subsidies and disciplines on export measures with equivalent effects. This should be completed by the end of 2013.

There also appears to be a need to radically reduce internal support, at least insofar as such support distorts trade. The EU considers that its farm payments introduced in 2003 are in compliance with the green box rules for decoupled income support (see Section 2.2.2). However, Swinbank and Tranter (2005) suggest that the EU's new SFP possibly does not fit within the green box of the existing URAA. First, land on which fruit and vegetables are grown cannot be used to claim an SFP payment, suggesting that payment is linked to production. Second, payments are directly related to farmland kept in good agricultural and environmental condition.

Market access will be increased through the further reduction of import tariffs, for example. The extent of tariff reduction (speed and period) will be partly dependent on the agreements on non-agricultural products. The impact of the tariffs reduction on production and trade depends on the formulas or modalities to be chosen. With regard to the future development of EU agriculture and rural areas the market access agreement will be crucial.

Other conditions for trade

Where the liberalisation of trade is concerned, the conditions that countries impose on each other are also important, for example in the field of food safety and animal or plant diseases. The so-called SPS agreement[44] was entered into this framework. The essence of this agreement is that trade restrictions must be based on objective scientific principles and that the aim should be international harmonisation of the rules in this area. An important role in this is assigned to the so-called standard setting bodies like the Codex Alimentarius (Codex) for the protection of public health, the International Plant Protection Convention (IPPC) for products with plant-based origins and the Organisation for Animal Health (OIE) for animal products (Meester *et al.*, 2005).

Agreements within the framework of the OIE (*Office International des Epizooties*) apply to the fight against contagious animal diseases (such as the recent outbreak of fowl plague in Asia). Countries not fulfilling these agreements should not be permitted to export

[44] Sanitary and Phytosanitary (SPS). This covers the fields of food safety, animal health, plant diseases and infestations. The following are also of importance:

- Technical Barriers to Trade (TBT). This comprise matters like technical specifications (labels, packaging etc.) that could obstruct free trade;
- Trade-Related Intellectual Property Rights (TRIPs). This agreement was designed to take care of intellectual property rights. An example for the plant-based sector is UPOV (*Union International pour la Protection des obtentions Végétales*).

animal products. However, the problem is that this agreement is not binding, meaning that some countries can make additional veterinary demands. In this way, the Dutch dairy sector encountered difficulties in its exports for a long time following the outbreak of foot-and-mouth disease in 2001, whereas the OIE agreements had been complied with a long time previously.

It is important that a binding 'Dispute Settlement Understanding' is provided for within the WTO with – if necessary – a panel and appeal procedure. Judgements within this context can have far-reaching consequences. This was the case for the European sugar policy in 2005, and the EU was urged to permit imports of 'hormone meat' from the United States.

Consumer concerns

'Non trade issues' or 'consumer concerns' can also become issues within WTO negotiations, such as rules regarding working conditions, the environment and animal-welfare. Although the EU has raised this topic, it is doubtful whether this will lead to concrete agreements because not many countries support this position. Within this framework, the WTO could ask the United Nations to further elaborate UN agreements within the context of the UNEP (environment) and the ILO (labour), for example. One problem with this is that not all WTO members have recognised and ratified the agreements concerned.

EU trade preferences

Alongside the multilateral trade agreements within the GATT/WTO context, the EU has various trade agreements with individual countries or groups of countries. In such cases, there are usually special advantages (preferences) for the countries concerned with regard to their exports to the EU market. Such agreements include the Cotonou Convention with around 75 ACP countries (African, Caribbean and Pacific countries) as well as agreements with a number of Balkan countries and Mediterranean countries. A few years ago, duty and quota free access was also given to the 49 poorest developing countries within the framework of the Everything-But-Arms initiative (EBA). Generally preferences relate to all products. The most sensitive and potentially most impacting domestic markets in the EU are sugar, beef and a number of horticultural products, including tomatoes. Imports of cut flowers from Kenya and Columbia are thus exempted from import duty and the EBA countries will be given free access to the European sugar market as of 2009. According to the European Commission, this could lead to considerable growth in sugar imports: an "extra" reason to reform the sugar market regime. In November 2005, with the framework, the Council of Ministers concluded a radical modification of the sugar policy in order to make the sector more competitive in preparation for increased market access. This reform is implemented from July 2006.

Some of the trade preference policy was partly a consequence of the enlargement of the EU. For example, upon the accession of the United Kingdom, New Zealand gained the opportunity to continue exporting over 100,000 tonnes of butter to Europe. When the ten Central and Eastern European countries acceded to the EU in 2004, the EU also took on certain existing agreements. The main trade preferences result out of the long-term relations with the African, Caribbean and Pacific countries as well as in the future with the least developed countries.

In the future, the significance of the preference system will gradually decline as the EU's import barriers (tariffs) are lowered due to new WTO agreements. For this reason, not all developing countries are happy with the idea of fast liberalisation, as demonstrated by the discussions regarding sugar. Moreover, a number of preference countries (such as certain Balkan countries, with regard to beef and sugar) could form part of the EU themselves in the future. The mutually granted preferences will then be fully symmetric.

2.2.6 Conclusions

EU agriculture policies and the agricultural sector are influenced by international policy developments. The WTO is particularly important with regard to EU policy. Agreements were made for the first time during the Uruguay round regarding the liberalisation of the markets for agricultural products. This means reduced export support and more conditions attached to internal support for agricultural production. Improvements in market access are an important issue for the coming years. The significance of trade preferences for particular countries or groups of countries will decline due to global liberalisation.

The philosophy of the CAP changed fundamentally due to international pressure and internal policy and budgetary reasons. The most fundamental changes are:

- Shift from market price support to income support, and
- Income support becomes more decoupled from production and coupled to public goods such as environmentally friendly land management, and public and animal health.
- With the reform of 2003, Member States have a much wider choice of implementation of direct payments in addition to their competencies in establishing the programmes for rural development.

2.3 Summary of drivers shaping agriculture and the rural world

Chapter 2 has reviewed the major drivers regarding agriculture and the rural world and that have been reflected in the trends during the period 1990-2005. The situation is complex, and there are both patterns and discontinuities. As an aid to postulating scenarios in Chapter 3, a summary table is presented of the major drivers (Table 2.13). For each indicator used as a reference in the Scenar 2020 study, there are often several measurements. With regard to each measurement, a very schematic recapitulation of the trends between 1990 and 2005 is given, followed by a brief explanation concerning the nature of the driver, that tries to discern what is the causal relationship involved. Moving forward to scenario assumptions, however, requires additional information, namely the uncertainties about what is likely to happen.

The drivers are presented according to the underlying logic adopted in Scenar, which is that they can be separated into two categories. The first level of drivers are those which impose themselves upon systems of governance; the second level of drivers are those that reflect the response of governments to adapt society and guide it within a reality where 'change is the only changeless' feature of social endeavour to secure security and

prosperity. Level 1 drivers are distinguished according to three characteristics: whether they are demand driven, whether they reflect the supply side aspect of agricultural or rural activities, or whether they are the outcomes of the interplay between demand and supply dynamics.

Table 2.13: Exogenous drivers (level 1) and policy-related drivers (level 2).

LEVEL 1: EXOGENOUS DRIVERS

Indicator / measurement	Trend 90-05: what happened	Why: the nature of the driver (causality)	Uncertainties about what is likely to happen
DEMAND DRIVEN			
Population growth			
Global	• World-wide increase 1.25% p.a. • Highest growth rates in developing countries • Growth rates in LDC	• Decreasing fertility rates (caused by increasing income?)	• Slowing down growth rates to 1% p.a.
Europe	• Constant population in EU-15 • Decline in EU-12	• Aging population • Decreasing fertility rates • In EU-12: socio-economic crisis due to transition	• Decline in population in Europe
Macro-economic growth			
Global	• Steady growth of 2.6% p.a. • General trend catching up • Low-income: 4.5% p.a. • Exception: LDC (3.7%)	• Productivity growth • (Labour-saving technology change induced by increases in real wage rate) • Growth in capital/labour ratio	• Constant productivity growth rates • Increase in productivity growth rates due to: • Take-off of productivity benefits of ICT • Increase in FDI into LDCs
Europe	• EU-27 2% p.a. • 1998-2003: EU-12 (3.2% p.a.) • EU-12 catching up	• Postponed structural reforms (social security system, factor markets) • EU-12 catching up: knowledge spill-over, FDI	• Implementation of Lisbon strategy (increase R&D investments, more liberalised labour markets) • Increasing participation rates, especially women
Consumer preferences			
Global	• Increase in world average food consumption (calorie intake) • Increase in meat consumption, especially poultry • Increase in cereals consumption	• Food availability and prices • Income growth / poverty • Urbanisation • Globalisation • Influence of Northern America and Europe on	• Evolution of meat consumption, especially in countries like China • Consumer concerns for food safety and ethics influencing legislation, production of quality products (including organic)

Indicator / measurement	Trend 90-05: what happened	Why: the nature of the driver (causality)	Uncertainties about what is likely to happen
	• Increase in dairy products consumption • Consumption patterns becoming more similar throughout world • Under nutrition declined but still persisting in some developing countries	diets	• Extent of poverty alleviation
Europe	• Increase in consumption of convenient meal solutions • Increase in demands for quality, including labels and organic products. • Resistance to GMOs • Increase in diet products market • Shifts in meat consumption towards poultry and pork meats • Increase in consumption of fresh food, associated with convenience • Development of functional foods • Growing interest for ethical products • Increase in total calorie intake • Homogenisation within Europe	• Demographic and economic factors: growing incomes, double-income households, reduction in household size • Changing lifestyles: time constraint, individualisation, out-of-home consumption, use of supermarkets and e-shopping • Food scares • Concerns about health and well-being • Ethical concerns for animal welfare and the environment	• Evolution of organic market: niche market? • Meat consumption reduction/shifts • Development of ethical products • Extent of homogenisation within Europe • Situation in new Member States • Impact of consumer campaigns in changing consumption patterns (concerns about obesity) • Attitude towards GMOs
SUPPLY SIDE			
Agri-technology			

Global	• Slow down of yield growth (cereals)	• Limited availability of land → intensification
		• Slow down:
		  • Closer to the frontier
		  • Frontier is not moving due to limited technological opportunities
		  • Limited availability of water
			• 'New' green revolution through GMO could lead to increased yield growth

Europe	• High initial yield level at production maximum
	• Slow down of yield growth of cereal
		• Land is scarce production factor
		• Decline in intensity because of:
		  • Environmental constraints
		  • Reduced price support
			• Future changes in environmental legislation
			• Future changes in agricultural support
			• Acceptance of new technologies, e.g. GMOs

Indicator / measurement	Trend 90-05: what happened	Why: the nature of the driver (causality)	Uncertainties about what is likely to happen
Environmental conditions			
Global	• Increased magnitude and frequency of extreme events (hurricanes, floods, etc) • Continuing draughts in parts of Africa	• Climate change – either natural or induced by humans	• Major climate change events may occur with even larger magnitudes. New patterns in distribution of temperature regimes and precipitation may appear with unpredicted consequences for agricultural production
Europe	• Abnormal weather events, increased frequency of extreme floods, land abandonment, deforestation in parts of Eastern Europe, less water pollution	• Climate change, depopulation of rural areas, inability to maintain agriculture on marginal lands, land privatisation in Eastern Europe causing deforestation, decreased application of fertilisers and pesticides	• Major climate change may continue as Arctic is warming up rapidly, range of uncertainty is very high. • Land abandonment may increase dramatically due to demographic changes in rural areas.
OUTCOME			
World markets			
World market prices	• World prices decline in real terms	• High productivity growth in combination with low income elasticity of demand	• Adjustment of the meat consumption pattern of developing countries to consumption levels in developed countries (especially China) • Ability of China to feed itself versus the possibility that it will become dependent on world markets

LEVEL 2: POLICY-RELATED DRIVERS

Indicator / measurement	Trend 90-05: what happened	Why: the nature of the driver (causality)	Uncertainties about what is likely to happen
EU Agricultural Policies			

	• Shift from market price support to income support
	• Income support becomes more decoupled from production and coupled to public goods (environment, health)
	• Elements of "old" CAP is still alive, e.g. sugar, dairy
		• Internal policy and budgetary reasons
		• International pressures, e.g. WTO
		  • Less distortive
		  • Justification
			• Outcome of current and future WTO negotiations

Enlargement			
	• Accession of 10 new Member States in 2004, (Bulgaria and Romania in 2007) • Introduction of CAP with phasing in of direct payments • Differentiation / dualisation of the agricultural sector within EU-12 (income, farm structure) • Restricted EU-wide labour legislation • Massive internal out-migration in EU-12 from rural areas	• Socio-economic transition • Political and economic stabilisation of transition process • International competition	• Catch-up in productivity growth in agri-food sectors • Liberalisation of internal EU labour markets • Permanent or temporary labour migration from EU-12 towards EU-15 • Large unutilised supply potential in agriculture • Long-term national objectives for rural areas • Weak institutional conditions in some of EU-12 • Importance of subsistence and part-time farming
WTO and other international agreements			
	• With URAA agricultural policies subject to GATT/WTO rules for the areas of market access, export competition and domestic support • Doha Round (2001) continuation of liberalisation process in agriculture and other sectors • Trade regulations through standards (SPS agreement, Codex, IPPC and OIE) • Increase of bilateral (preferential) trade agreements	• Integration of agriculture in the WTO framework • Reduction of trade distorting policies in agriculture • Binding dispute settlement for conflicts about trade policy measures	• Outcome of current and future WTO negotiations • Willingness to ratify international agreements on product standards • Erosion of preferential trade agreement as an outcome of further trade liberalisation

Indicator / measurement	Trend 90-05: what happened	Why: the nature of the driver (causality)	Uncertainties about what is likely to happen
Environmental Policy			

	• Regulations (2080/92) & Directives (Birds, Habitats, Nitrates, etc.).
	  • agri-environment measures
	  • Natura 2000 sites
		• Understanding of negative environmental externalities of CAP (air, water, soil)
		• Willingness to protect environment and especially biodiversity, to diminish pressure on intensive lands and preserve biodiversity on abandoned lands
			• Willingness to continue with further environmental legislation in face of Lisbon Agenda
			• All existing nature-protection initiatives need substantial financing and success of their implementation will depend on amount of compensation the farmers can get

3 – Scenar 2020 Baseline (Reference) Scenario and Alternative Scenarios

The number of scenarios is limited to three: baseline (the reference scenario), liberalisation and regionalisation (schematically presented in Table 3.1). Section 3.1 specifies the assumptions used for scenario building. Section 3.2 presents the baseline (reference) scenario and the two alternative scenarios. The two counterfactual scenarios provide a contrast in order to evaluate the range of possible consequences associated with policy options likely to be considered over the coming years. Section 3.3 discusses some uncertainties with regard to the scenario assumptions.

3.1 Assumptions for scenario building

An assumption that has guided the preparation of the scenario study is that there are two levels of drivers that will influence scenario building. The first level is a set of *exogenous* drivers; these are drivers that are not directly influenced by policies, or at least not in the Scenar time horizon (that is, up to 2020). As presented in Table 2.13, they are population growth, macro-economic growth, consumer preferences, agri-technology, environmental conditions and world markets[45]. The second level is a set of *policy-related* drivers, and these will certainly have a discernable effect within the Scenar time horizon. They are EU agricultural policies, enlargement decisions and implementation, WTO and other international agreements and environmental policy.

Several choices have been made for the development and analysis of scenarios. The first is to have a baseline scenario that is based on the exogenous drivers. The second is that the policy-related drivers are then coupled to the baseline scenario in three iterations. The first iteration is the *baseline (reference) scenario*, in which current policies are considered to continue into the future, with modifications over time that are reasonably certain to happen according to the current political situation. The second iteration is a *regionalisation scenario*, in which there is a sustained policy preference to promote regional economic strength and social welfare; to some extent this is also an emphasis on the maximum degree of support for agricultural supply that is possible under the current, and likely, WTO framework. The third iteration is a *liberalisation scenario*, in which policy intervention in the economy – and in social welfare, including environmental protection – is reduced to the minimum that would be socially acceptable.

These three scenarios are not innovative, but they have two merits. The first is that, because of the substantial database that has been established, they are very thoroughly examined through the modelling and subsequent SWOT analysis. Therefore, the effects of a plausible range of policy options can be well documented. The second follows from the first, and that is the capacity to do a sensitivity analysis with regard to very precise policy modifications. In this regard, a third choice with regard to scenario development and analysis is that sensitivity analysis takes place with regard to manipulation of the first level, or exogenous, drivers. The intention of Scenar 2020 is to demonstrate possible effects of policy responses, not to propose policy modifications or to suggest new policies. As a consequence, counterfactual situations are tested through the types of policy decisions that are incorporated within the sensitivity analyses.

[45] World markets are partly endogenous in this study as we use a global economy-wide model in which world markets are dependent on macro-economic and population developments, preferences shifts, technological change and policy changes.

3.2 Overview of the scenarios

This section describes the scenario assumptions of the three scenarios: baseline (reference), regionalisation and liberalisation. A summary of the basic scenario assumptions with regard to the exogenous drivers and policy related drivers is found in Table 3.1. The general outline of the policy measures for the Common Agricultural Policy (CAP) retained in the scenario building is given in Table 3.2.

BASELINE SCENARIO

General approach

It has been stated several times in this study that the fundamental assumption made in Scenar 2020 is that there are two types of drivers governing the development of the economic, social and environmental conditions in Europe, and elsewhere in the world. The first are those drivers that operate basically independently of policy-making, or over which policy-making will have an influence on fairly long time scales. Two examples are population growth and climate change. This is not to say that policy-making will not have an impact, but the impact will not take place in an immediate manner. The second type of drivers are those which are the instruments of policy-making, and which will have immediate or medium term implementation effects (on a 5-10 year horizon), and which of course may set in motion derived effects that will last for quite some time. The farm-level structural change induced by the Guidance measures of the Common Agricultural Policy have led to land re-allocation and field drainage on an immense scale, and this has altered the landscape and the biodiversity over large areas of rural Europe.

In order to highlight the possible impact of policy decisions, the general approach to constructing scenarios in Scenar 2020 has been to keep *constant* all exogenous drivers or assumptions *except* those relating to policy-making. So the world-view portrayed for the baseline scenario is the same which applies to the regionalisation and the liberalisation scenarios. The policy measures, once again, are what are modified in the regionalisation and the liberalisation scenarios. These are placed within a global context which gives them their sense.

Table 3.1: Scenario assumptions.

(a) Based on the exogenous drivers

Assumptions	Demographics	Macro-economic growth	Consumer preferences	Agri-technology	World Markets
Baseline	Major population trends as observed in the past	Moderate growth as seen in the trends; Increasing trend for labour market liberalisation	More demand for value added and increasing absolute spending per capita; Consumption of organic and regional food as observed in the past	Continuous trends in cost saving technical progress; Biotechnology; GMO	Outcome depends on other exogenous drivers. Trends in agri-markets, generally, as observed in OECD/FAPRI studies. Change from these trends due to different assumptions on exogenous and policy-related drivers.

(b) Based on the policy-related drivers

Assumptions	CAP			Biofuels	Enlargement	WTO and other international agreements	Environmental policies impact on agriculture
	Market policies	Direct payments	Rural development policy				
Baseline	Balanced markets, i.e. keeping public intervention stocks at 1 to 2% of domestic consumption; if stocks are too high support prices will be decreased	Financial discipline and 25% modulation	Taking into account the new financial perspective	Continuation of EU Biofuels Strategy	EU-25 plus the accession of Bulgaria, Romania, Turkey and the Western Balkans	EU offer	Continuation of existing environmental legislation
Regionalisation	Existing CAP	Financial discipline and 5% modulation	Significant increase in funding of rural development through all EAFRD axes	Higher policy support to produce biofuels	Baseline	No WTO agreement / bilateral approach	Reinforcement of environmental legislation
Liberalisation	No internal support policies	Removing direct agricultural payments	Rural development is funded according to EAFRD provisions: decrease in funding of all EAFRD axes	No per hectare subsidies for biofuels	Baseline	Removing import tariffs	Partial withdrawal of environmental legislation

Table 3.2: Policy Measures for the CAP.

(a) Details about Market Policies

	Baseline	Regionalisation	Liberalisation
• Phasing out of intervention	Current system of intervention	Current system of intervention	No more intervention
• Level of intervention price	Adjustment to balance markets	Current level	No intervention
• Regulations for quota products (milk, sugar)	Reform of the sugar MO Further reforms which might results in non-binding quotas	Current quota regulations	No quota regulations
• Cut of quota, reduction of support prices, compensation through direct payments	With partial compensation	No cut in quota	No compensation
• Quota level for new members (Turkey, Croatia)	Introduction of quotas Reference period: 2010-12	Introduction of quotas	No quota regulations
• Changes in consumption subsidies (skimmed milk powder (SMP), Butter)	Reduction of consumption subsidies	Consumption subsidies constant at current level	No consumption subsidies
• Changes in the per hectare support for biofuels	Constant current level of support	Higher per hectare support (+ 50%)	No per hectare support

(b) Details about Trade Policies

	Baseline	Regionalisation	Liberalisation
• ad valorem tariffs	EU offer, see also Table 3.3.	Constant level (No WTO agreement)	Removing of tariffs
• Specific tariffs	EU offer see also Table 3.3.	Constant level (No WTO agreement)	Removing of tariffs
• Export subsidies	EU offer see also Table 3.3.	Constant level (No WTO agreement)	Phasing out export subsidies
• Increase in existing TRQs	Constant level of current TRQ	Increase in TRQ	No TRQ due to full liberalisation
• Introduction of new TRQs	No new TRQ	Introduction of new TRQs under Mercosur, ACP and Euromed	No TRQ due to full liberalisation

(c) Details about direct payments:

	Baseline	Regionalisation	Liberalisation
• Development of national envelopes	Constant in nominal terms	Constant in nominal terms	Complete reduction
• Modulation rates	Increased to 25%	5%, as decided in 2003	-
• Distribution of funds from modulation	50% within the MS 50% reallocation among MS	50% within the MS 50% reallocation among MS	-
• Full decoupling for all partial decoupled payments	Full decoupling	Maximum amount of coupling	-
• Application of the Single Farm Payment 1. EU-10: 2009 2. BG&RO: 2012	As planned	SAPS with some 'recoupling' options	-
• Development of obligatory set aside rates	Current situation	Increase to max. 15% dependent on results	No obligatory Set aside
• Direct payment in Turkey and Western Balkans	As in EU-12	See baseline	No introduction of direct payments
• Phasing-in of direct payments in Turkey and Western Balkans	As in EU-12	See baseline	No introduction of direct payments
• National top-ups in Turkey and Western Balkans	As in EU-12	See baseline	No introduction of direct payments

(d) Details about rural development policies:

	Baseline	Regionalisation	Liberalisation
• 2nd pillar measures	New financial perspective	Increase in funds for rural development	Rural development funded as per EAFRD provisions

Global developments

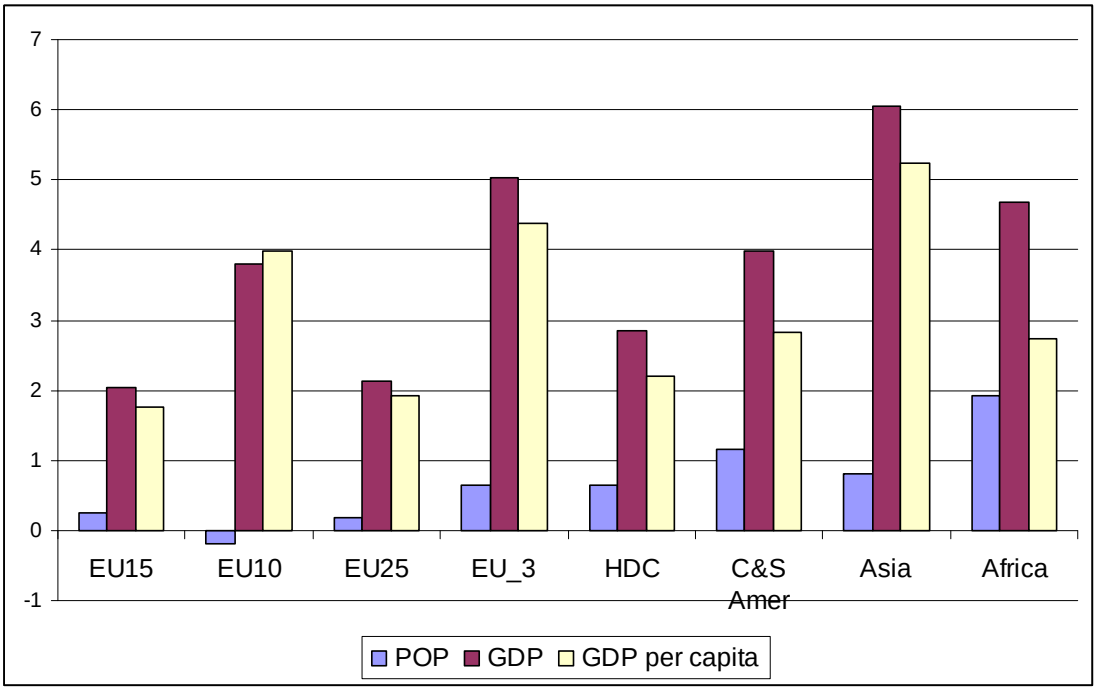
Macro economic and demographic growth are important drivers of demand for agricultural products. Projections for population and GDP for the EU Member States are taken from a study of the Economic Policy Committee of the European Commission called "The 2005 EPC projection of age-related expenditure: agreed underlying assumptions and projections methodologies, 2005". The projections for the rest of the world are based on assumptions used in the OECD and USDA agricultural Outlooks.

Global demographic trends

Expected population developments in period 2005-2020:

- The world's population growth will fall from 1.4% in the 1990-2003 period to about 1% in the coming ten years. This is mainly due to births or fertility rates, which decline and are expected to continue to do so.
- Almost all annual population growth will occur in low and middle income countries, whose population growth rates are much higher than those in high income countries.
- Europe's share in world population has declined sharply and is projected to decline during the 21st century.
- Population growth in Europe is very low (0.3% yearly for EU-15) or slightly negative (-0.2% for EU-10)

Figure 3.1: Population, GDP and GDP per capita yearly growth rates (2005-2020).



Global GDP and GDP per capita (endogenous)

- Robust economic growth is expected over the coming period in almost all regions of the world in the baseline scenario (see Figure 3.1).
- Economic growth will be considerably higher for most of the transitional and developing countries than for the EU-15, the United States and Japan, in particular for Brazil, China, India and the new EU Member States. Incomes in Europe are expected to increase slightly over the coming years.
- Income growth in Europe is about 2% yearly for EU-15 and 3.8% yearly for EU-10
- The process of transition continues in the accession countries (EU-10). Income growth is high (about 2 times that of the EU-15). The level of income is less than 50% of that of the EU-15 and there is ongoing structural change in their economies and especially in agriculture. Economic growth accelerates in the EU-10 after accession. Structural change will be supported by structural funds

An exchange rate of $1.20 to the Euro is maintained over the long-term.

Consumer preferences

Due to higher income levels in formerly low and middle-income countries, more money is spent on purchasing food. This not only leads to a higher consumption of meat, dairy products, fish, vegetables and fruit. It also boosts the demand for processed food, convenience products, etc., as well as for regional food (like PDA and PDO). In the richer countries, the demand for regional and organic food grows significantly.

Agricultural technology

Due to climatic change, crop yields increase in many European areas, but water scarcity causes significant problems in southern Europe. This leads to reductions in crop yield, decreases in irrigated areas and accelerated land abandonment. Projections for yield developments are taken from the EU, OECD and USDA agricultural Outlooks.

Global polices

A WTO agreement is achieved according to the EU proposal. It is important to notice that the WTO agreements (EU proposal in baseline) are implemented for all regions in the world (multilaterally) and for all products (agriculture, industrial and services). Therefore also other regions than only the EU lower their tariffs and export subsidies.

Table 3.3: EU proposal in Doha Development Round.

Export competition	- 100 % reduction of export subsidies by 2013 - parallel elimination of all other forms of trade distorting export support
Domestic support	- a three band reduction for AMS (amber box support) under which the EU (and possibly Japan) would fall into the upper tier (committing it to a 70 % reduction in AMS), the U.S would fall into the second (requiring it to cut its AMS by 60 %), and the remainder of WTO members into a third band that would be subject to a 50% reduction. - an 80 % reduction in *de minimis* support for all developed countries (in both product and non-product specific support) from the 5 % level of production value currently allowed.
Market access	- reduction of agricultural import tariff: On the basis of ad valorem equivalents (AVEs), the EU proposes an approach under which tariffs would be cut on the basis of the number of thresholds (30, 60, 90). Four different bands with linear cuts of 35%, 45%, 50% and 60% apply to both developed and developing countries; the latter apply 2/3 the level of linear tariff cuts and thresholds. - treatment of sensitive products to provide access consistent with FA - a limited number of products be treated as "sensitive," which it proposes achieving, in line with the FA, by combining the effect of an expanded tariff rate quota (TRQ) with a lower tariff cut, the objective being to offer substantial market access for a limited number of products, but at a lower rate than the full tariff cut would imply.

EU policies

The EU-27 will be extended with the accession of Turkey and the Western Balkans.

The CAP undergoes a number of changes but the CAP is kept in place as an instrument to accompany rural development, although somewhat restricted because of financial discipline. Because of the WTO agreement, EU trade policies are altered in line with the EU offer. The direct payments are continued, but are gradually reduced in line with the financial discipline and a modulation rate of 25%. As for market policies, 1-2% of domestic consumption is kept in stocks in order to maintain balanced markets.

The EU Biofuels Strategy will be continued and it stimulates demand for bio-ethanol and bio-diesel, and as transformation capacity develops in Europe so does demand in native, rather than imported, biofuels.

The environmental legislation, as developed in the EU between 1985 and 2005 (i.e., Nitrate Directive, Water Framework Directive, Bird and Habitat Directives, National Emission

Ceilings Directive, pesticide policy, etc.) is kept in place and refined, and a Soils Directive is introduced. Some difficulty is experienced from 2010 in maintaining the Natura 2000 network in face of set-aside conversion to biofuels, and later on by general harvesting of biomass for transformation into energy.

REGIONALISATION SCENARIO

Regionalisation is a policy framework which refers to the possibility that, in the absence of a successful conclusion of the Doha Round, then not only will further bilateral and multi-lateral negotiations will continue but also at the same time more encouragement will be given to promoting the production of commodities in the internal market.

Global policies

No WTO agreement is reached, neither for agriculture nor for other trade aspects.

EU policies

The EU-27 will be extended with the accession of Turkey and the Western Balkans.

The CAP is largely kept in place. In the period 2007-2013 the direct payments are reduced by 5% because of modulation, and the money is shifted to rural development. The funds allocated for the RDP are mainly spent in axes 1 and 2.

As there is no WTO agreement import tariffs are kept in place. In stead of multilateral agreements a few bilateral agreements will be established based on on-going negotiations. Considering that these negotiations are already underway, with stated deadlines in some cases, they could have been integrated into the reference scenario. However, for didactic reasons, we assess the impact of enhanced regional trade agreements under the regional scenario, to show the difference with the reference scenario (where multilateral trade effects dominate) and the "across the board" liberalisation in the liberalisation scenario. In the regionalisation scenario we assume that bilateral agreements will be reached with Mercosur, Mediterranean countries, Africa, Caribbean and the Pacific and South Africa.

The EU Biofuels Strategy strongly encourages demand for bio-ethanol and bio-diesel, and the transformation capacity is encouraged in Europe by fiscal measures; this sharply accelerates demand in native, rather than imported, biofuels. Land originally in set-aside begins to be allocated to maize and oilseeds, but resistance occurred in areas having high landscape value – therefore important for other sectors, notably tourism. Bio-chemistry makes substantial progress in relation to petro-chemistry, as bio-based materials are substituted in numerous applications.

The environmental legislation, as developed in the EU between 1985 and 2005 (i.e., Nitrate Directive, Water Framework Directive, Bird and Habitat Directives, National Emissions

Ceilings Directive, pesticide policy, etc.) is kept in place and reinforced, and a Soils Directive is introduced.

LIBERALISATION SCENARIO

Liberalisation – also a policy framework – implies that the current context of moving towards more open markets at the international level will be strengthened. In this scenario, all forms of market and trade policies and income support will be abolished in the EU and the rest of the world.

Global policies

World trade in agriculture, manufacturing and services will be fully liberalised by the abolitions of all export subsidies and import tariffs.

EU policies

The EU-27 will be extended with the accession of Turkey and the Western Balkans.

After 2013, the 1st Pillar of the CAP is completely dismantled in a couple of years. By 2018 the agricultural markets are fully liberalised and all internal support policies and direct payments are removed.

The EU Biofuels Strategy is reduced and there will be less support for biofuels. All per hectare subsidies for biofuels will be abolished.

The environmental legislation, as developed in the EU between 1985 and 2005 (i.e., Nitrates Directive, Water Framework Directive, Bird and Habitat Directives, National Emissions Ceiling Directive, pesticide policy, etc.), is partly withdrawn or modified in order to keep Europe's agriculture competitive in the world market.

The rural development policies are funded according to EAFRD provisions: leading to a decrease in funding of all EAFRD axes.

3.3 Specific variable considerations for scenarios

There are several possibilities for pronounced deviations from the baseline scenario; these are drivers that have already been recognised: biofuels, water supply, demography, agro-technology, world markets for agricultural commodities, animal disease and, of course, the public financial support given to the agricultural sector.

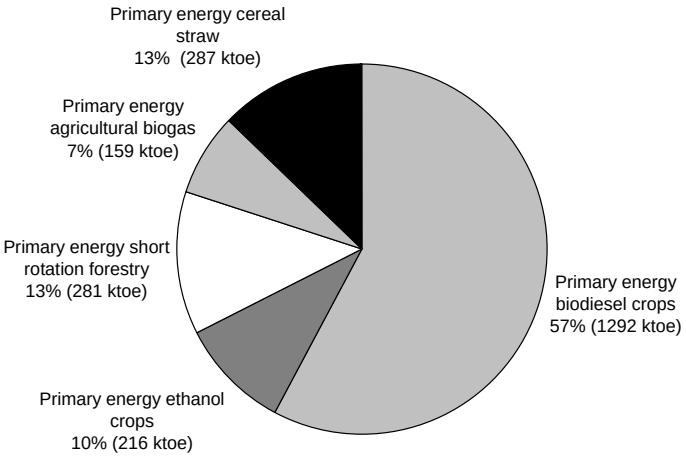
BIOENERGY

The development of bioenergy is underpinned both by the increasingly tight supply of crude oil and, as a consequence, by EU policy[46]. According to the OECD (2006), meeting only 10% of current EU energy requirements for transport through biofuels that are sourced domestically would be equivalent to the use of 43% of the actual EU production of appropriate feedstocks: cereals, oilseeds and sugar beet. The implications for the world and domestic market have not yet been modelled, and possible consequences would include a shift in allocation for arable land use from others, such as set aside or fallow land areas and forest. There is an additional complication, which is the development of lignocellulosic technology. Once this technology is being used on a commercial scale, then the price advantage of alternative feedstocks – grasses, coppiced wood, biodegradable wastes of all sorts – will shift the sourcing away from the feedstocks mentioned previously. The shift is likely to be rapid, as of 2015, and therefore the implications of such a movement on markets and land allocations need to be taken into account when planning for the initial development of current feedstocks (cereals, oilseeds and sugar beet). An additional way of using biomass is as source of thermal energy, applied to electricity generation and heating, or indirectly as biogas. There is, therefore, a substantial potential for using crops of biomass derived from crops that can have an influence on land use, and the implications of this may be an inflection in the rate of decline of land area devoted to agriculture, or a reversal of this tendency altogether. Figure 3.1 illustrates the possible variety of agricultural source material and use as renewable energy[47].

[46] This latter aspect is presented in sub-section 3.1.2.

[47] Two recent EEA reports concerning bioenergy and biofuels are of relevance to Scenar2020:
- European Environment Outlook (http://reports.eea.europa.eu/eea_report_2005_4/en; http://scenarios.ewindows.eu.org/reports/fol949029). It provided the forward-looking component to *The European Environment - State and Outlook 2005*, and gives much more details on agricultural projections done with the CAPSIM model, including the share of biofuels in the agricultural sector.
- How much bioenergy can Europe produce without harming the environment? (http://reports.eea.europa.eu/eea_report_2006_7/en; (http://reports.eea.europa.eu/briefing_2005_2/en). This study made use of the EFI and Green-X models.

Figure 3.1: Production of renewable energy type from agricultural sources in 2003 (EU-15).



Source: IRENA (2004)

WATER SUPPLY

The major natural resource parameters conditioning agricultural land use are soil quality and water supply, which – in addition to climatic factors such as temperature, rain fall and storm patterns – determine the agricultural potential of a region. The soil quality issue is not as volatile as the water supply issue, and can be managed by good agricultural practice; there is ample encouragement possible through the cross-compliance principle associated with the Single Farm Payment system now in place. Although water use can also be managed through cross-compliance requirements, the basic resource itself is perhaps more vulnerable than previously considered, precisely because of a change in climatic factors. Another aspect is water resource exhaustion that has its origin in expanding irrigation within historically arid areas; because of climate change, arid zones are also in expansion. In order to assess the resiliency of agricultural commodity production capacity, it is logical to model the consequences of extreme and prolonged drought, along with the effects of permanent depletion (at least, within the current historical framework) of ground water resources, in the more vulnerable areas of the EU with regard to this eventuality.

DEMOGRAPHY

The current expectation with regard to population movements is that the eastern edge of EU-27 will be subject to a massive exodus of younger persons towards their national urban centres and onwards to the major European metropolitan areas. This impact of this expectation on agricultural production capacity has not been fully modelled. Under certain conditions of rapid capitalisation it would be possible to maintain the current area under production; there would be a definite shift in farm structure and a probable change in the quantities of agricultural commodities coming from this area. It is also possible to test a variant of this population dynamic, as a counterfactual situation. The assumption would be that this pattern of out-migration does not occur and, in addition, that because of increased prosperity, the population growth rate rises by 2015 to that of Western Europe. The premise would be that instead of a population decline, the residential population would stabilise where it is located now, and this supposes that the economic vitality of rural areas would increase. The effects in terms of farm structure, localisation and

quantity of agriculture output, and ultimately land allocation between residential and other uses – such as forestry – would be considerably modified.

AGRICULTURAL TECHNOLOGY

Yield increases for agricultural commodities are projected to continue in a somewhat linear fashion. In face of projected demand, future yields can be translated into declining requirements for land, according to the commodity. This applies both to arable land used to satisfy human consumption, permanent crop area and land devoted to fodder and pasture. There is, as mentioned above, an uncertainty on true demand, when taking into account the level of commodity production required for providing feedstocks for biofuels. On the other hand, there may be a technological divide appearing on the horizon, which will be more fully appreciated by 2010. Agricultural technology may be proposing a fully operational alternative to traditional cultivation practices for a number of crops having high added value: primarily vegetables, but also soft or 'exotic' fruits. Green house technology will become more pervasive, especially around urban centres, with controlled environmental conditions, reduced footprint (that is a bonus around urban areas), and extremely high yields per ha and per AWU. In addition the possibilities for better input management and higher yield that is associated with precision farming also means that more conventional agricultural practice will require less space to meet demand. The implications of agricultural technology for land values and on land allocation may be quite different than currently assumed, with the territorial effects in terms of farm structure, agricultural employment and overall land allocation.

INSTABILITY OF WORLD MARKETS

What if world demand for agricultural commodities would literally explode, causing turmoil in world markets and rapidly oscillating commodity prices as iterative adjustment occurs between demand and supply? This prospect becomes a distinct possibility as both China and India are entering commercial and industrial markets at the world scale, in which they are able to compete for agricultural commodities in a world market, and are therefore no longer dependent on internal supply capacities. Given the environmental disruption caused within these two rapidly expanding economies, internal supplies may indeed fail. How will commodity shortages be reflected in the markets for capital, land and employment within the agricultural sector? Can Europe serve as a breadbasket for the world? What will happen if energy through biofuels comes into competition for food? Will increased prices for food have a deflationary effect throughout the economy?

ANIMAL DISEASE

The blight in the beef market caused by the BSE may pale in comparison to the potential damage to world chicken supplies that may be caused by avian influenza. One disease after another becomes a focus of preoccupation and potential market disruption, as was the case following the outbreak of swine fever in the Netherlands and of foot and mouth disease in the UK a few years ago. Considering the rapidity with which disease spreads, either by animal transport or migratory vectors, veterinary pandemics are likely to occur with increasing frequency. This eventuality is impossible to predict in its exact nature, but the effects within the agricultural economy are possible to model, in function of the presumptions that are employed. The interest of such modelling is to see the way in which the balance of agricultural commodity demand may be influenced, and also the way in which the spatial repercussions are expressed.

FREE MARKETS AND CAP PILLAR 2

Progressive liberalisation of trade will mean rising prices for many agricultural commodities in the world market, but also a better distribution of market access by farmers across the world; demand would be stimulated by rising incomes, partially resulting from the growth in trade generally and partially resulting from tax savings to consumers when export subsidies will cease and increased earnings to producers who will not have to lower prices in order for their produce to enter into markets across tariff barriers. Agriculture in the markets that were formerly protected will reorganise production output in face of world competition; the net effect will be a more robust agricultural economy, but with significant shifts in what, and how much, is produced where. Agricultural employment will decline, but the average income of farmers will rise. Within the European Union, the implication for the CAP is that the market measures of 'Pillar 1' will no longer be applied, which will leave the focus of CAP on 'Pillar 2' as part of a structural policy for rural development from the perspective of the agricultural (and forestry) sector. The impact of a shift in emphasis from Pillar 1 to Pillar 2 will have significant impacts in the employment of the factors of production – capital, labour and land – that are related to agriculture and to the rural economy as a whole.

4 – Modelling the Future of European Union Agriculture and Rural Land Use in 2020

4.1 General overview

In the Scenar 2020 project the commodity focus and regional / territorial focus have to be connected[48].

The global economy-wide dimension is covered by the economic LEITAP model and the biophysical IMAGE model (Table 4.1). ESIM is providing more agricultural detail for the EU-25 countries and CAPRI is distributing this impact to the regional (NUTS2) level. The gap in our (and the EU research community) modelling framework is what happens with the other sectors (i.e. rest of the economy) at the regional level. This is important for rural development because an agricultural decline in a region is only causing problems when there is no absorption capacity in the other sectors of the economy for the redundant agricultural labour. In this project we attempt to fill this gap by combining empirical information on the regional (NUTS2/3 & HARM2) level from the past with projections at the national level produced by the modelling framework. We use time series analyses to identify relations in the past and to identify relations between the national and the regional level.

Table 4.1: Schematic overview of the models: geographical and sectoral coverage.

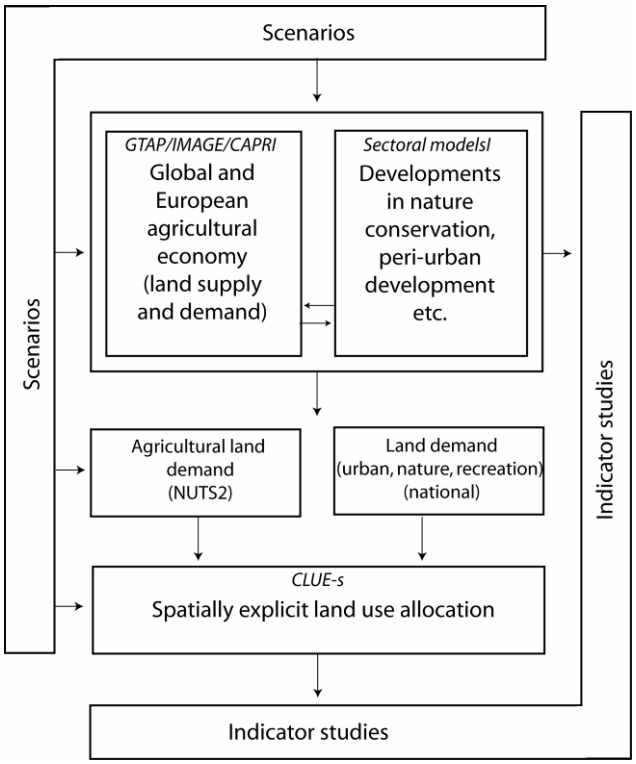
	Agricultural	Rest of economy
Global	LEITAP-IMAGE	
EU/national	ESIM	LEITAP
NUTS2	CAPRI	TSA* or downscaling
Grid	CLUE-s	

* TSA: Time series analysis

[48] Complete sets of detailed regional data were not available for the two new Member States, Bulgaria and Romania, during the period of preparing data for use in the modelling exercise, and the results presented in Chapter 4 reflect this fact; thus these two countries are presented separately when the data for them have been available for analysis.

Description of the chain of models: LEITAP/IMAGE – ESIM – CAPRI –– CLUE-s

Figure 4.1: Models linkages within Scenar 2020.



To perform the analysis, a modelling framework is constructed, existing of three economic models (LEITAP, ESIM, and CAPRI), a more ecological-environmental based model framework (IMAGE) and a land use allocation model (CLUE-s) to disaggregate the outcomes to the landscape level. In this modelling framework the long-term economic and environmental consequences of different scenarios are quantified and analysed, starting from 2005 up to 2020, for several regions in the world and all 25 EU countries. ESIM's main contribution is the projection of developments in EU agricultural markets into the future. ESIM is also the only model that is used to model the production of biofuels. CAPRI's main contribution is modelling changes in CAP policies and their regional impact (NUTS2 level). The LEITAP main contribution is in the WTO policies (affects all sectors not only agriculture) and the interaction with the rest of the economy (other industries and factor markets).

The ESIM and CAPRI models are EU-25 partial equilibrium models for the agricultural sector at respectively country and NUTS2 level with a strong focus on EU common agricultural policies. LEITAP is a global computable general equilibrium model that covers the whole economy including factor markets and is often used in WTO analyses (Francois *et al.*, 2005) and CAP analyses (Meijl and Tongeren, 2002). More specifically, LEITAP is a modified version of the global general equilibrium Global Trade Analysis Project (GTAP) model. Agricultural policies are treated explicitly (e.g. production quotas, intervention prices, tariff rate quotas, (de)coupled payments). Information is used from the OECD's Policy Evaluation Model (PEM) to improve the production structure (Hertel and Keening, 2003) and a new land allocation method, that takes into account the variation of

substitutability between different types of land (Huang *et al.*, 2004), as well as a new land supply curve are introduced (Meijl *et al.*, 2006b; Eickhout *et al.*, 2006).

In addition, the adapted economic model is linked to the ecological-environmental modelling framework IMAGE (Integrated Model to Assess the Global Environment - Alcamo *et al.*, 1998; IMAGE Team, 2001) through for example yields and feed efficiency rates changes. Another role of IMAGE in the model chain is to translate the sectoral land demand in the LEITAP model to the land use claims used in CLUE-s for arable and pasture land. IMAGE is a dynamic integrated assessment modelling framework for global change. The main objective of IMAGE is to support decision-making by quantifying the relative importance of major processes and interactions in the society-biosphere-climate system. Therefore, IMAGE can be used to assess the importance of major uncertainties in the earth system (Leemans *et al.*, 2002) and for assessing the environmental consequences of future changes (Leemans and Eickhout, 2004).

In the final modelling stage the spatially explicit land use model CLUE-s (Conversion of Land Use and its Effects; Verburg *et al.*, 2002) is used. The CLUE-s model disaggregates the outcomes of the ESIM-CAPRI-LEITAP/IMAGE suite of models to a temporal resolution of two years and a spatial resolution of 1 km. CLUE-s provides a cross-sectoral approach that includes all land use relevant sectors, while the ESIM, CAPRI and LEITAP/IMAGE models mainly address the land use of agricultural sectors. To provide a comprehensive analysis of land use dynamics it is important to include all land use relevant sectors because the future of Europe's rural areas is dependent on the combined effect of various developments like agricultural shifts, nature conservation, peri-urban development, recreation, multi-functionality etc. The CLUE-s model uses land claims of the different sectors at the national level provided by the economic models and allocates these claims over the land area according to location suitability, spatial policies (LFA, Natura 2000) and transition rules. In the location suitability, environmental (biophysical) driving forces, which determine the allocation of land use, are explicitly accounted for. In the economic model chain these factors are not taken into account. A number of the factors that determine the land use allocation change in time (e.g. population and climate) are provided by the IMAGE model.

4.2 Results from the economic modelling

4.2.1 National level

The results indicate that the structural changes, i.e. decline of agricultural contribution to total income and employment, will continue at national level. The following Figure 4.2 shows that even in the baseline scenario the process of structural change continues in the near future in the EU-25. The share of agriculture and food processing industries in total income continues to fall until 2020. Compared to the EU-15, the macro-economic significance of primary agriculture is higher in the EU-10 in the baseline situation (Figure 4.3). Therefore, the structural change process is more severe in the EU-10 than in the EU-15 countries. The strong decline in contribution of agro-food industries in the EU-10 implies that more labour will be released from the agri-food sectors in these countries (given the assumption that in the longer run labour will earn equal wages in both the agricultural and non-agricultural sectors).

Regions with high shares of agriculture and industries may be vulnerable to this process with regard to employment and income growth, as the structural change process is often characterised by adjustment processes and related costs.

Figure 4.2: Sectoral structure of the economy in the EU-25 in 2005 and 2020, in percent.

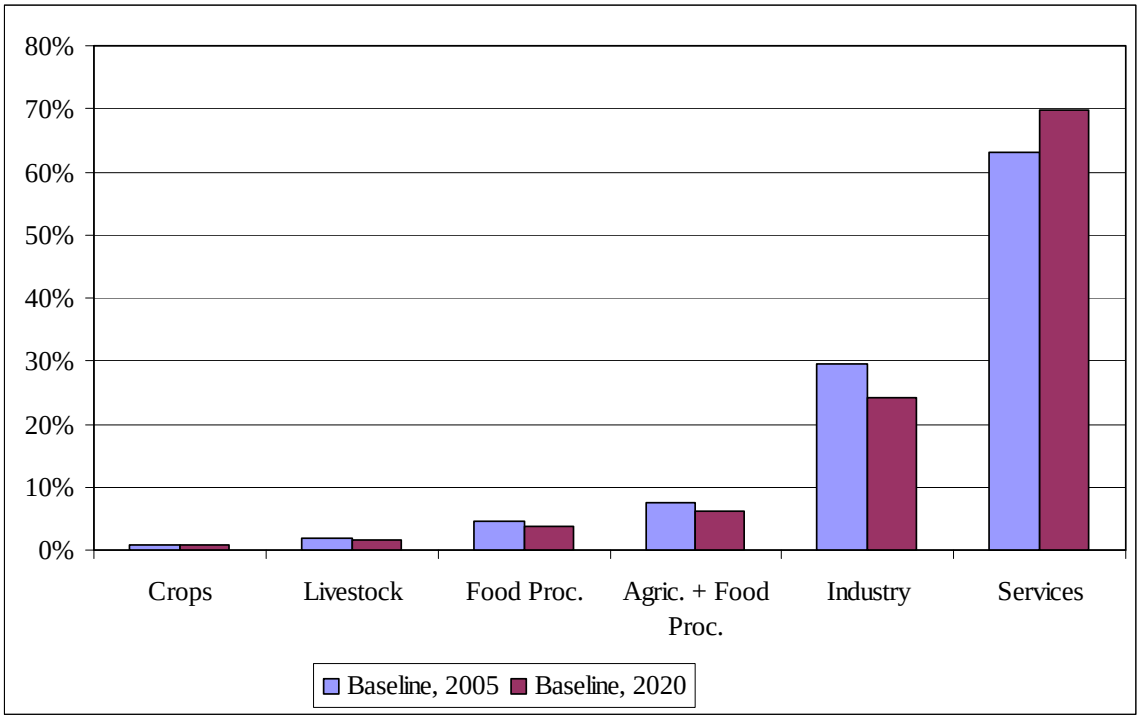
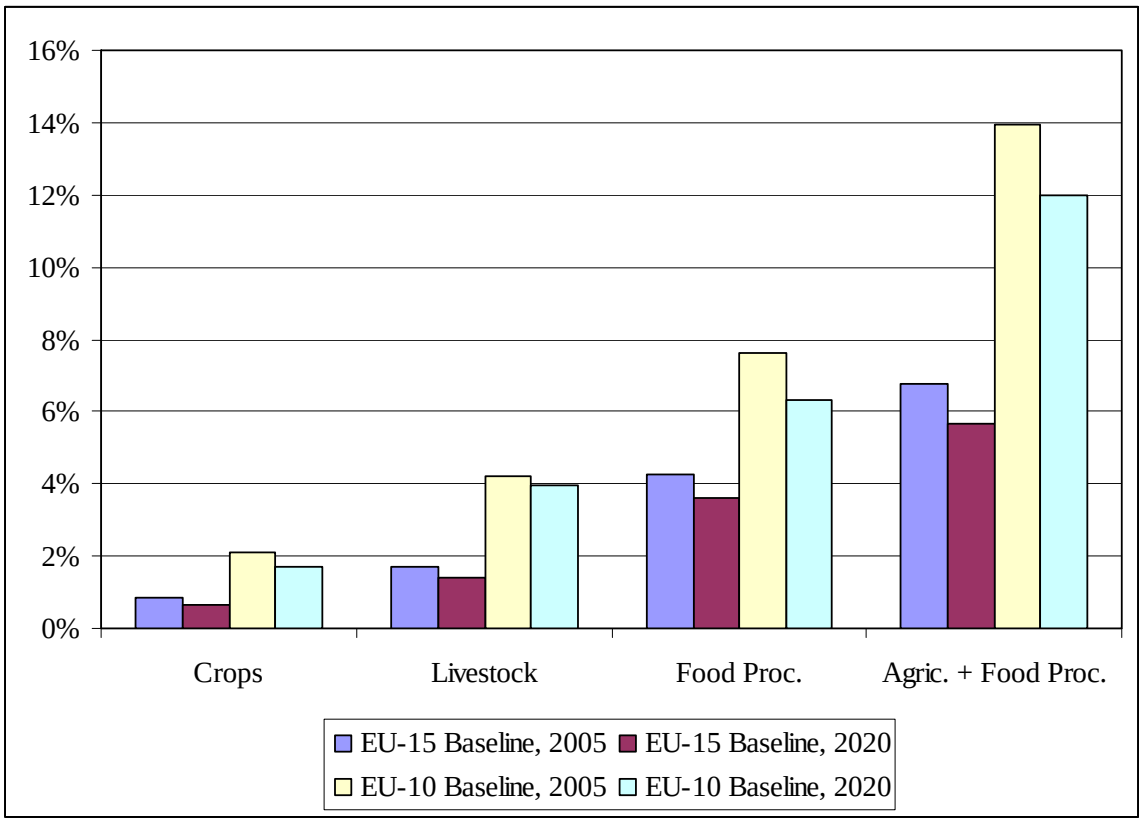
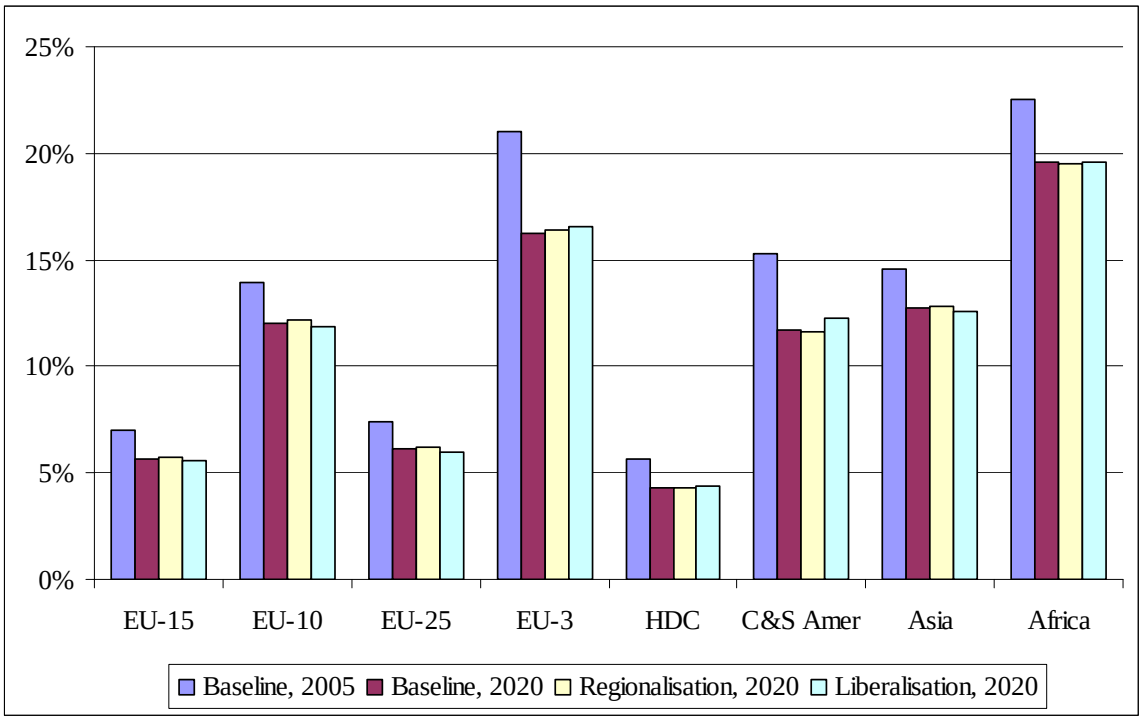


Figure 4.3: Share of Agriculture and Food Processing Industries in the EU-15 and EU-10 in Gross Value Added, 2005 and 2020, in percent.



The development in the EU-15 and EU-10 demonstrates that the historic trend continues: The contribution of primary agriculture and food processing industry keeps on falling, see Figure 4.3. This tendency is explained by two main factors, firstly low income elasticities of demand for food products leads to decreasing shares of expenditures spend on food products. Secondly, productivity growth rates in agriculture are high relative to other sectors. This effect causes agricultural prices to decline relatively to the general price index. People do not buy much more food if it gets cheaper (a low price elasticity of demand). All in all, the value share of agriculture will decline. In principle, the same is true in the manufacturing sector. However, for manufacturing commodities the income elasticity is higher than for agricultural commodities.

Figure 4.4: Share of Agriculture and Food Processing in the Economy, in percent.



The policy impact seems limited, in as much as the differences between the regionalisation and liberalisation scenarios with the baseline scenario are limited (see Figure 4.4). In general, the share of the agri-food industries in the overall economy stays highest in the regionalisation scenario. This is especially true for the EU applicant countries (EU-3) as they get preferential access to the other EU-25 countries, and this preferential access is not eroded by trade liberalisation. The opposite is true for Central and South America (e.g. Brazil), where the contribution of primary agriculture and food processing is lowest in the regionalisation scenario because these countries cannot benefit from trade liberalisation.

4.2.2 Sectoral level

To explain the development of prospects of agriculture at sectoral level, it is important to analyse the price changes at EU market level. The changes in real prices at wholesale level are presented in the following Table 4.2 These results are derived from ESIM. As the scenarios 'regionalisation' and 'liberalisation' focus on more or less liberalisation, price changes at EU market level also reflect the degree of protection in the EU-25 compared to the rest of the world in the baseline scenario. Therefore, under the regionalisation scenario EU prices of primary agricultural and processed products increase compared to the baseline scenario.

The impact of policy change in the baseline scenario leads to a decrease of prices to a different degree. The further liberalisation leads to a decrease of prices particularly for meats as well as for dairy products and milk. Cereal prices in the regionalisation scenario as well as in the baseline decrease in order to stabilise public stocks at a level of 2% of domestic consumption.

Prices decrease compared to the baseline in the liberalisation scenario. Large price decreases are expected for other arable field crops, vegetables and permanent crops, cow and buffalo milk and dairy products. Price changes range from more than -25% for beef and milk to almost constant prices for rapeseed. The latter shows that there are sectors which are not affected from liberalisation. Price changes at the EU market level form the background of quantity changes at the national level. Quantity changes reflect the competitiveness or comparative advantages of individual countries to produce different commodities, given more or less border protection.

Table 4.2: Nominal Producer Prices for Agricultural and Food Products in the EU under different Scenarios, Baseline in 2020 = 100.

	Baseline	Regionalisation	Liberalisation
Common wheat	100.0	100.2	98.8
Barley	100.0	100.4	93.0
Rapeseed	100.0	100.0	99.9
Beef	100.0	106.5	65.5
Pork meat	100.0	106.6	98.1
Sheep meat	100.0	108.9	74.5
Poultry meat	100.0	111.7	74.6
Milk	100.0	109.8	63.7
Butter	100.0	107.2	77.5
SMP	100.0	109.7	79.5
Cheese	100.0	104.1	78.5

These price changes are also mirrored in the analysis of crop and livestock production in the LEITAP model. As presented in Figure 4.5 and Figure 4.6, growth of crop and livestock production is relatively low in the EU-25 countries in all scenarios. In general growth rates in crop production is highest in the baseline scenario and lowest in the liberalisation scenario. However, the impact of liberalisation on production is only one factor that contributes to this decline. Lower economic growth in the agricultural sector in combination with low income elasticity is also important in this respect.

Figure 4.5: Growth of Crop Production 2005-2020, Annual Growth Rates (%).

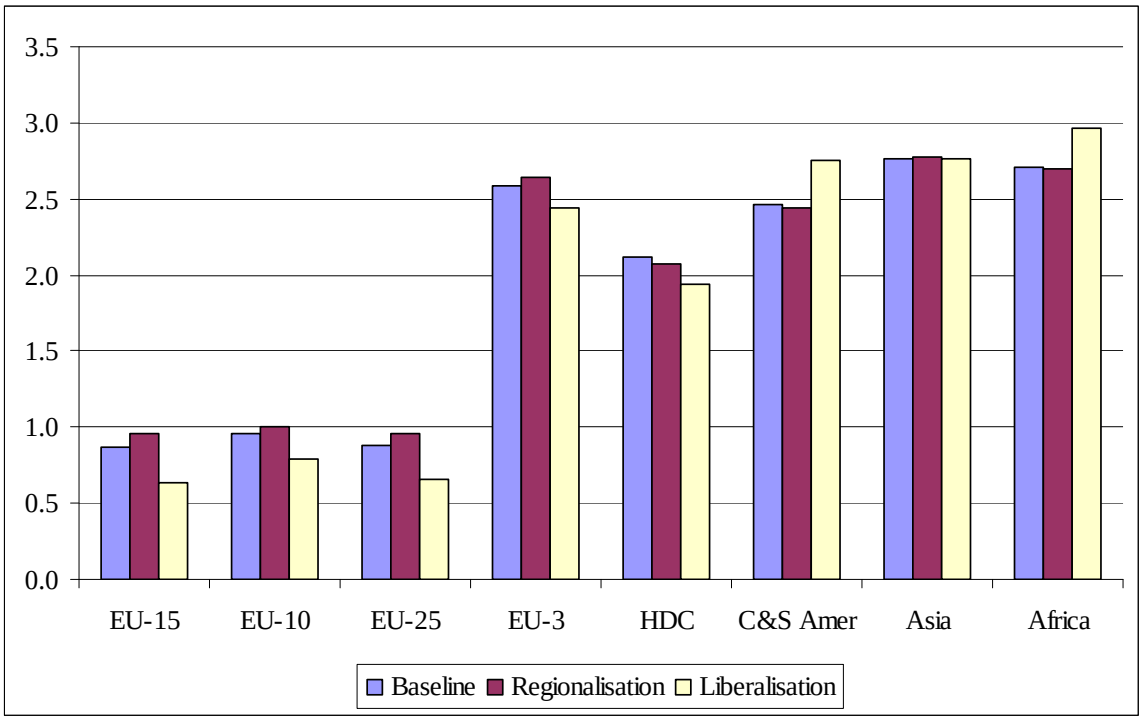
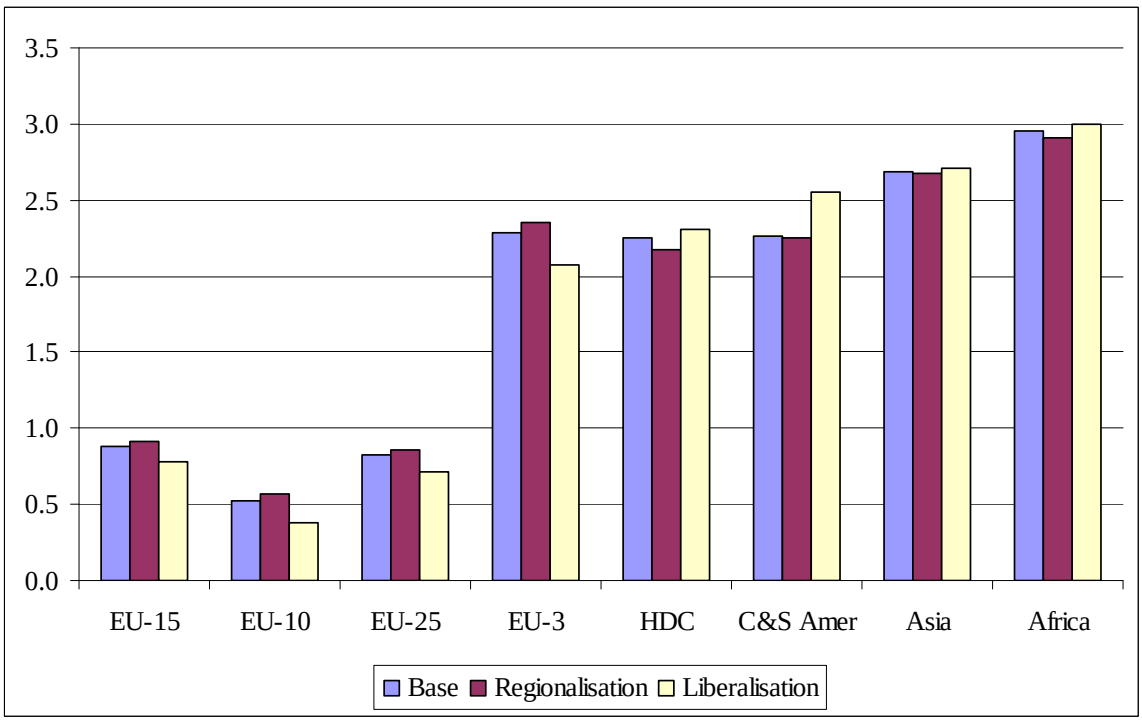


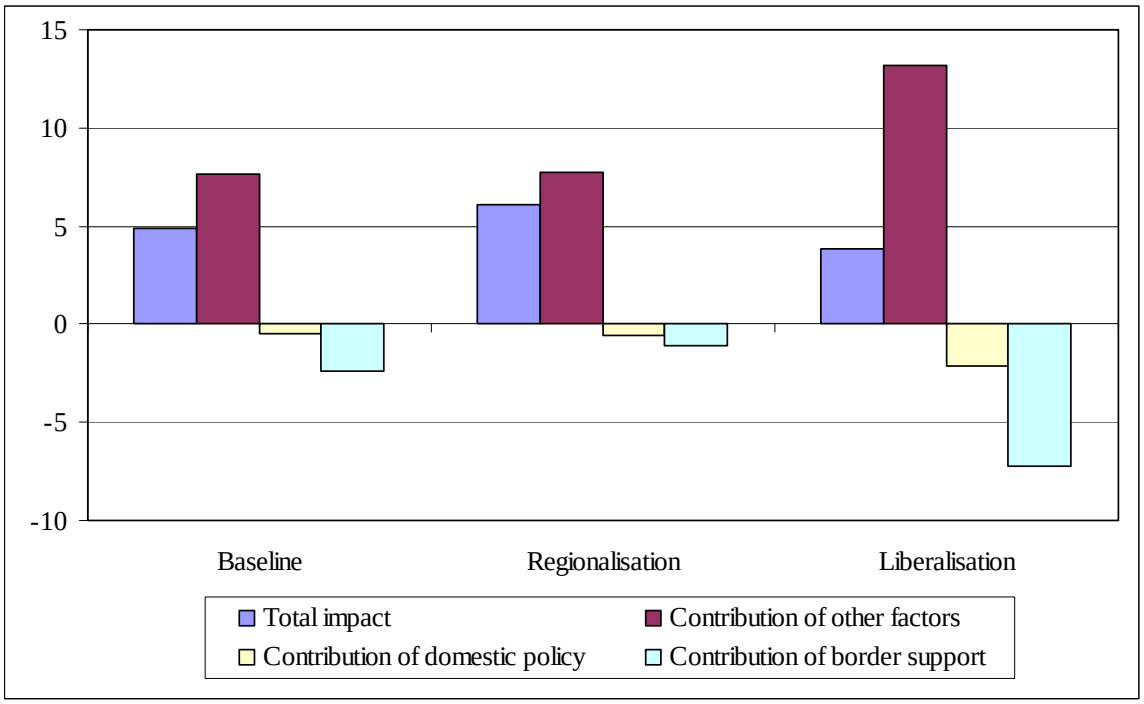
Figure 4.6: Growth of Livestock Production 2005-2020, Annual Growth Rates (%).



The following figure presents the results of the decomposition of the production growth for two groups of agricultural products: those with relatively high, and those with relatively low, market price protection.

The decomposition method enables the identification of the impact of changes in specific assumptions. For this analysis the focus is on the impact of changes in domestic and border support on production while all the other assumptions are aggregated in a third category. In Figure 4.7 production growth of protected products (grains, oilseeds, sugar, beef and dairy) is 4.9% in the baseline scenario. The contribution of domestic policies is -0.5% and of border policies is -2.4%. The contribution of the changes in all other assumptions (e.g. macro shocks such as growth in technological change and production factors) is 7.7%.

Figure 4.7: Decomposition of production growth of protected agricultural products, EU-15, 2005-2020, in percent.



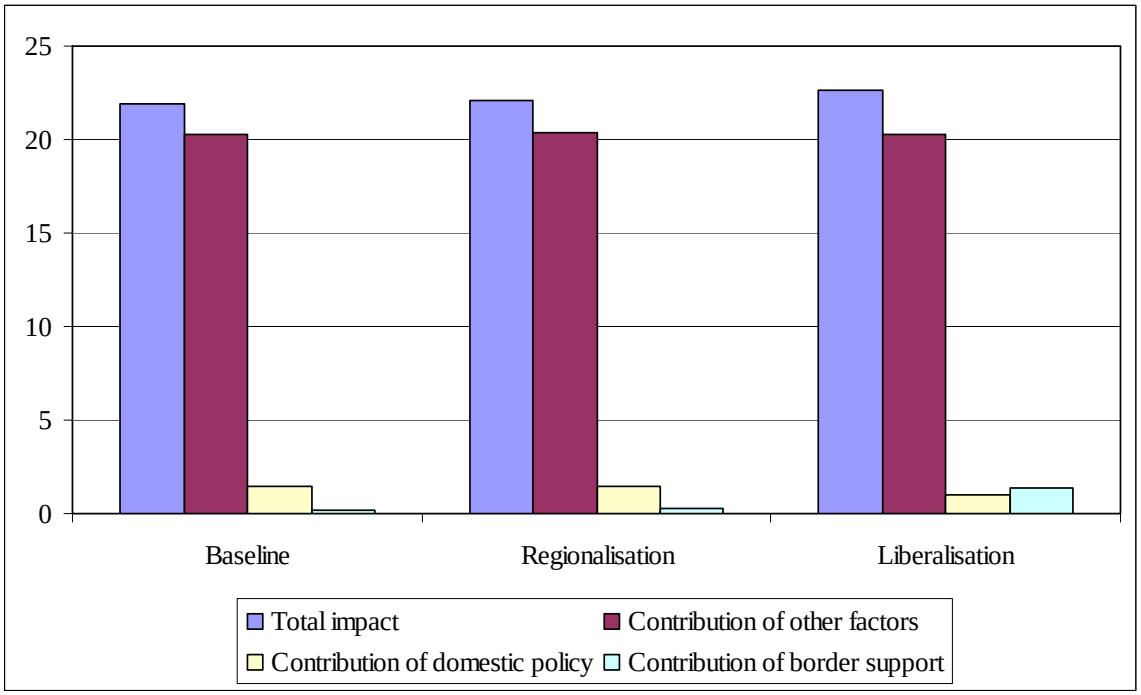
In general, EU-15 production growth of products with protection is low in all three scenarios. This is mainly due to the low income elasticity of demand. The production growth of protected products is highest in the regionalisation scenario and rather small in the liberalisation scenario.

The contribution of changes in domestic support is negative in all scenarios. In the baseline and regionalisation scenario this is due to decoupling that partly redistributes payments from protected commodities to less protected commodities and enlargement impacts that provide income payments to the EU-10 and applicant countries and give them a competitive advantage. In the liberalisation scenario the negative impact is even higher due the complete withdrawal of all domestic support.

The contribution of changes in border support (export subsidies and import tariffs) is negative in all three scenarios. The impact is limited in the regionalisation scenario for the EU-15 countries because the only change in border support is due to the 2003 CAP reform and the sugar reform. In the baseline and liberalisation scenario the impact is more pronounced due to global liberalisation agreements. In the baseline scenario border

support is reduced according to the EU WTO offer and in the liberalisation scenario all border support is abolished. The latter has a severe negative impact for the production of protected commodities. The decomposition of these effects clearly identifies that the abolition of border support has a higher impact on production than the abolition of domestic or income support.

Figure 4.8: Decomposition of production growth of less protected agricultural products, EU-15, 2005-2020, in percent.



Comparing Figure 4.7 and Figure 4.8 shows that in the EU-15 countries production growth of less protected products such as horticulture, pork and poultry is higher than for protected agricultural products. This is explained by, firstly higher income elasticity of demand for the group of less protected products. Secondly, by a positive impact of liberalisation on less protected agricultural products. This positive policy impact is due to the decoupling effects of domestic support (not only protected commodities but all agricultural products get support, except horticulture) and due to fact that protected products become relatively less attractive under liberalisation relative to less protected products.

The decomposition of production growth for the EU-10 gives similar results for the group of protected products. However, the negative impact of the reduction in border support becomes more important, i.e. the total impact under the liberalisation scenario becomes negative.

For the group of the less protected production the contribution of the other factors (increase in total GDP, productivity growth etc.) is even higher than in the EU-15 and completely dominates the positive growth in production.

4.2.3 Agricultural markets

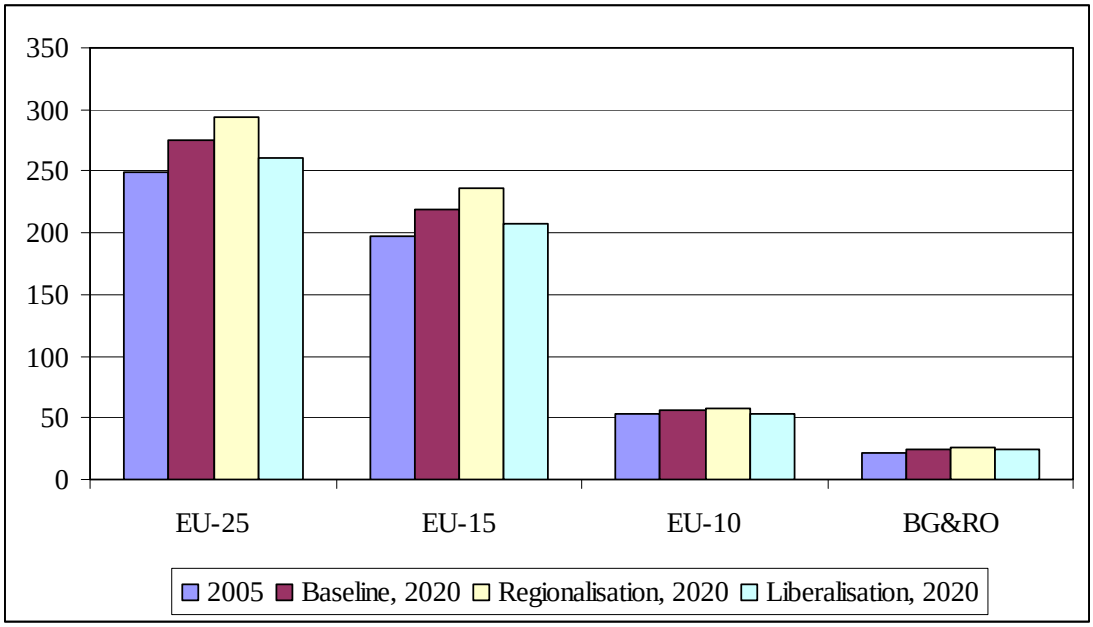
The results presented at market level mainly illustrate the consequences of the implementation of the EU October 2005 offer for the Baseline scenario. Decoupling of direct payments is assumed to be already implemented in the year 2005. Therefore, the impact of decoupling of direct payments is not presented here. Moreover, it is assumed that only the remaining coupled element of direct payments, which differs between member countries, affects production. The decoupled part of direct payments is not directly implemented in the ESIM[49]. The following graphs illustrate the results of the three scenarios (Baseline, Regionalisation and Liberalisation) for the EU-15, the EU-10 and Bulgaria and Romania (BG&RO), in aggregated form for production and area use of cereals with details for common wheat, coarse grains and maize. The results for the other arable crops are presented for oilseeds, other crops (including sugar, fodder production, silage maize and potatoes) as well as energy crop production. Livestock production is presented for beef, poultry and cheese. The results are presented for the initial baseline situation, which is 2005 and 2020.

The results of the regionalisation scenario reflect the consequences of a continuation of EU agricultural trade policies at current levels without a WTO agreement, i.e. higher border protection compared to the baseline scenario. However, bilateral trade agreements become important under the regionalisation scenario. Therefore, TRQs expand for all cereal products as well as for livestock products (dairy products, beef, pork, poultry meat and eggs). Under this scenario, the rate of modulation is assumed to be lower. Therefore, the commodities whose direct payments are still coupled to production will gain relatively to those whose direct payments are (almost) fully decoupled under the 2003 reform. A third difference compared to the baseline is the assumption on set-aside: under the regionalisation scenario obligatory set-aside increases by 50% compared to the level of the baseline scenario.

Under the liberalisation scenario, all supporting as well as restrictive measures are withdrawn, both within domestic markets (subsidies, direct payments, quotas and set-aside requirements) as well as at the border (import tariffs and TRQs). Under this scenario the quantitative restrictions on production for the two quota products become non-binding with different consequences. In general, milk production shows a tendency to increase in most Member States, while in the others sugar production continues to decline after the first reform, which was already implemented in the baseline scenario.

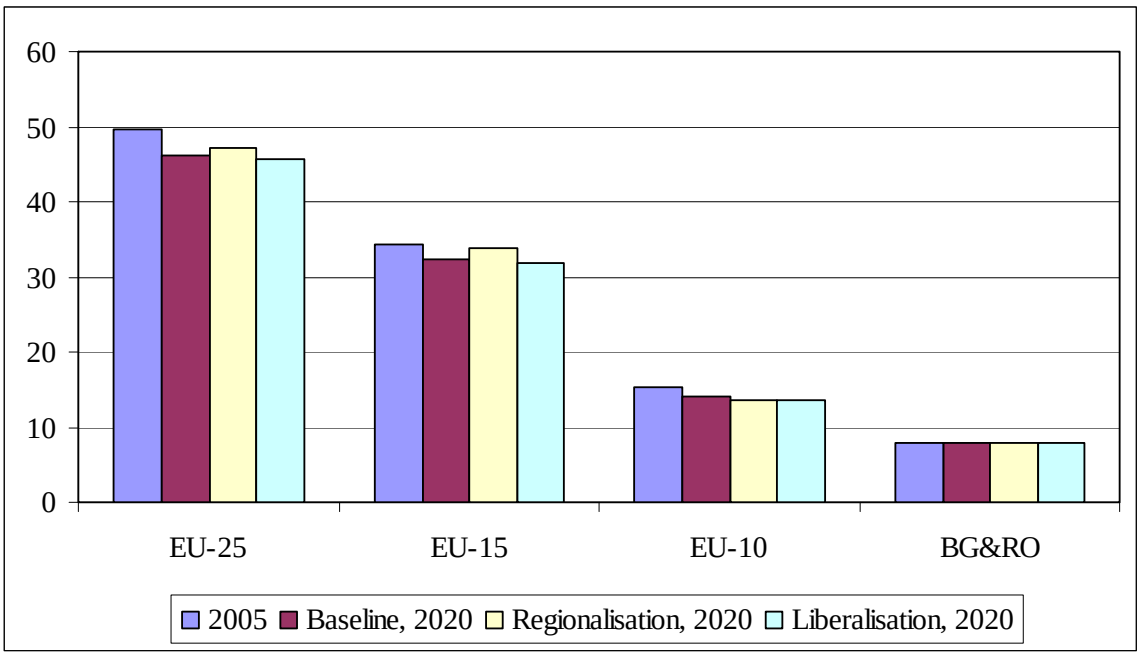
[49] For further details, see Deliverable 4 of the Scenar 2020 project.

Figure 4.9: Production of cereals under the different scenarios in the EU, 2005 and 2020, in mio t.



Between 2005 and 2020, cereal production in the EU-25 increases by over 10 percent, which is equivalent to 25 mio t. Within cereals, wheat production grows by over 13 percent (equivalent to 14 mio t). For the cereal market the implementation of the EU October 2005 offer leads to a further reduction in price, which predominantly affects coarse grain production, e.g., barley and rye. In order to balance domestic markets, the level of intervention prices for barley is reduced under the baseline scenario. However, the consequence of trade liberalisation is not a decline in coarse grain production but a constant production level. Here, technical progress compensates for reduced market prices for coarse grains. The increase in total cereal production is dominated by the impact of technical progress. Total area used for cereal production declines by 3.4 mio ha, which is mainly due to the decline in area sown with coarse grains.

Figure 4.10: Area sown with cereals under the different scenarios in the EU, 2005 and 2020, in mio ha.



Under the regionalisation scenario, cereal production is about 7 percent higher compared to the baseline scenario, which is mainly due to an increase in wheat and maize productions. Coarse grain production is only 4.5 percent higher compared to the baseline scenario. This smaller increase in coarse grain production relative to other cereals indicates that coarse grains are more affected by an increase in obligatory set-aside than the other cereals.

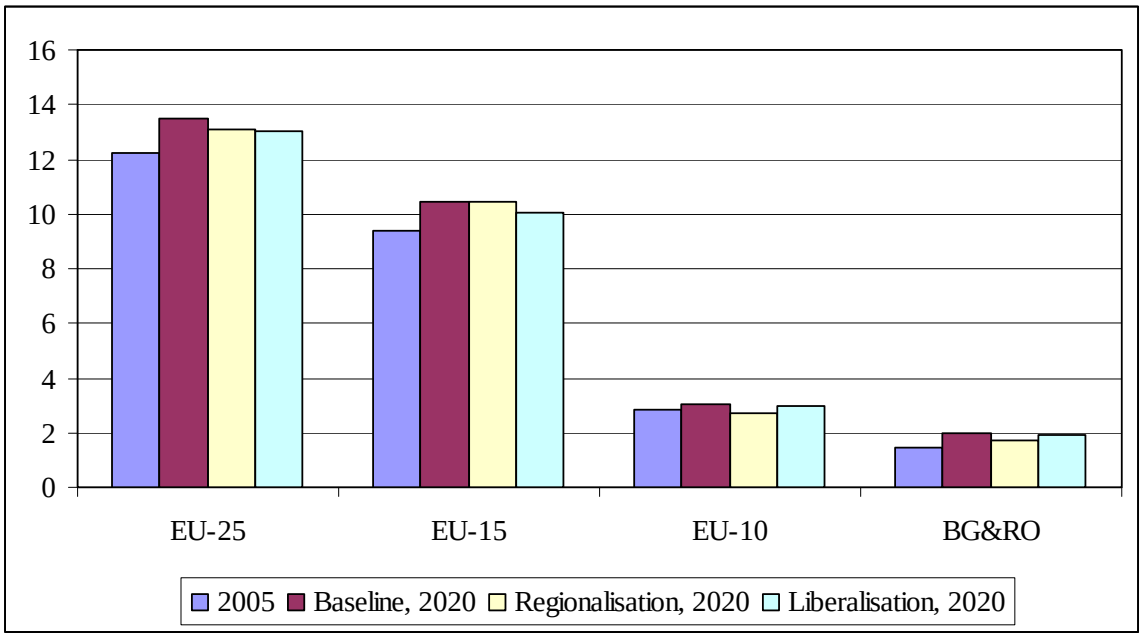
Under liberalisation, cereal production declines, mainly because of the withdrawal of decoupled direct payments and the complete reduction of trade policy measures. Amongst the cereal products, coarse grain shows the strongest decline relative to the baseline scenario. This is due to the high protection through import tariffs, which are reduced only partly under the baseline. The decline in wheat and maize productions – relative to the baseline – is mainly due to the (exogenously implemented) impact of the withdrawal of decoupled direct payments.

In the EU-15, cereal production increases by almost 11 percent between 2005 and 2020. While the area for cereal production declines, the increase in production is due to technical progress. The model results indicate a loss of relative profitability of coarse grain production, mainly barley and other grain. Wheat production increases by 14.3 percent, while coarse grain production increases only slightly, by 2 percent.

Similarly to the development in the EU-15, cereal production in the EU-10 expands by almost 8 percent between 2005 and 2020, which is equivalent to 3.5 mio t. The high increase in maize production (17 percent) is due to high rates of technical progress. Coarse grain production remains stable at 22.2 mio t. However, total area used for cereal production decreases by 1.4 mio ha (-9%). Most of this decline in area takes place for coarse grain production.

For Bulgaria and Romania the change in production also mirrors the impact of EU-accession. Total cereal production increases by almost 16 percent, and the area used for cereal production slightly increases. This expansion is mainly caused by an increase in wheat area by over 5 percent.

Figure 4.11: Production of oilseeds under the different scenarios in the EU, 2005 and 2020, in mio t.



The increase in oilseed production is mainly explained by technical progress, because the area used for oilseeds declines by over 10 percent. The area used for energy crop expands by 44 percent, which is due to an increase in demand for biofuels.

The results for the EU-15 are almost in line with the development described for the EU-25. Oilseed production increases by over 11 percent in the EU-15 and energy crop production almost doubles between 2005 and 2020. During that period of time, the area used for energy crop expands by 1.5 mio ha, i.e. almost 50 percent. As a consequence of this large increase in area used for energy crops, the share in total area used for cereals, oilseeds and energy crops increases from 7.8 percent in 2005 to 11.7 percent in 2020.

Figure 4.12: Area sown with oilseeds under the different scenarios in the EU, 2005 and 2020, in mio ha.

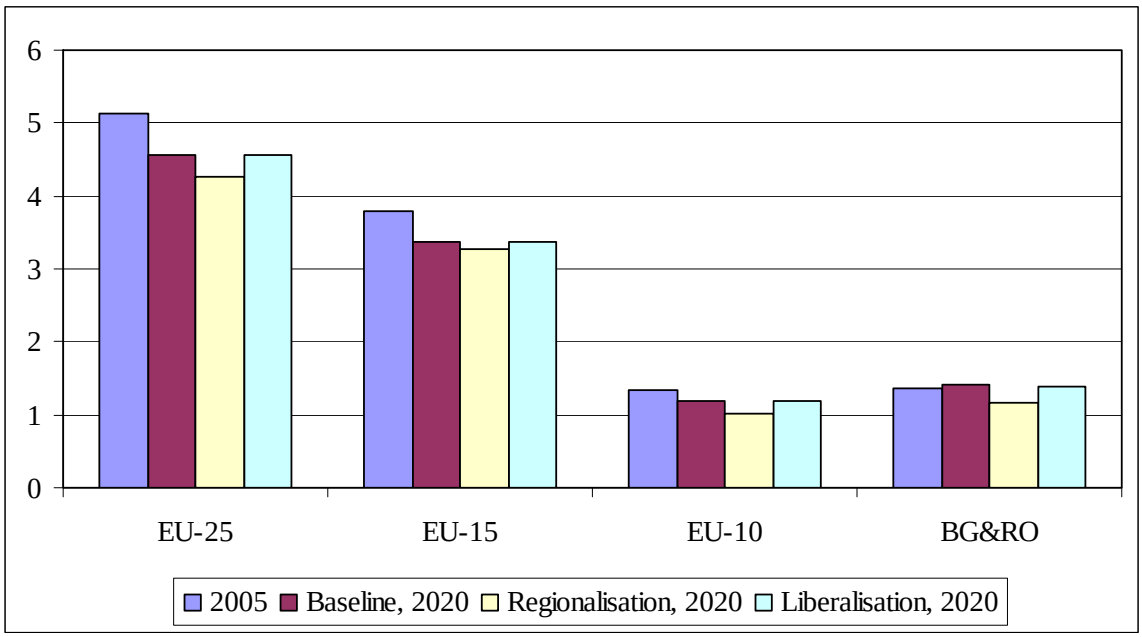


Figure 4.13 illustrates a similar picture for the EU-10 as for the EU-15. Under the baseline scenario oilseed and energy crop production also expands in the EU-10. However, the total area used for both types of crops remains almost constant. The share of area used for energy crop remains relatively small (3.5 percent) and increases only a little between 2005 and 2020. Compared to the EU-15 the small share in energy crop area is also reflected by a small share for oilseed area in total area used for oilseeds and cereals. Like in the EU-15, the model results indicate a strong decline in area used for other crops (-24 percent).

Figure 4.13: Production of energy crops under the different scenarios in the EU, 2005 and 2020, in mio t.

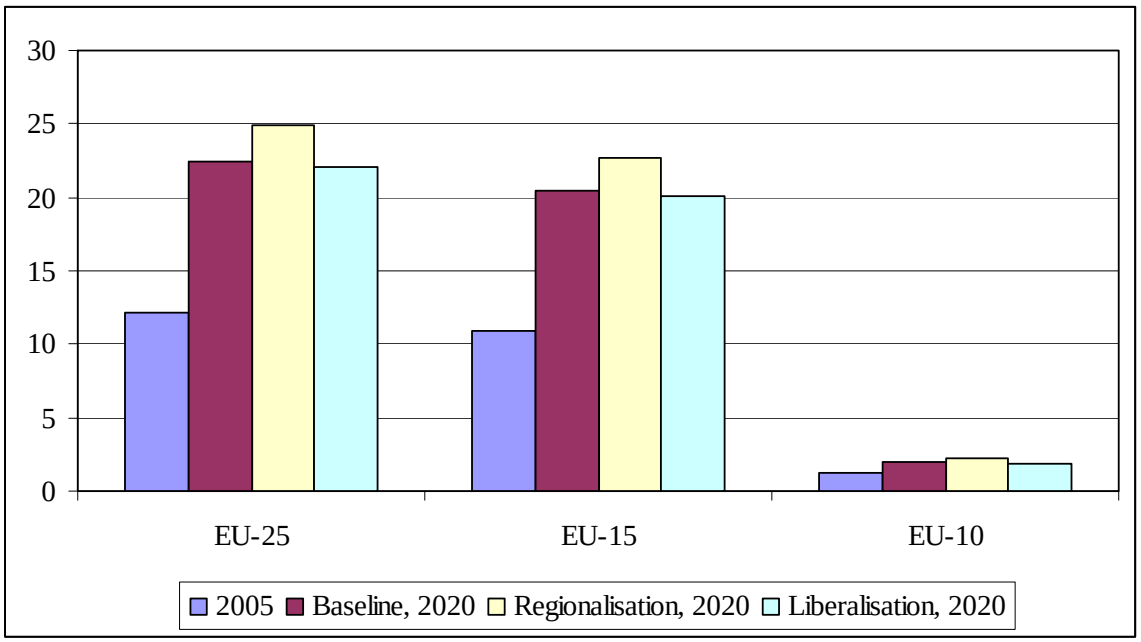
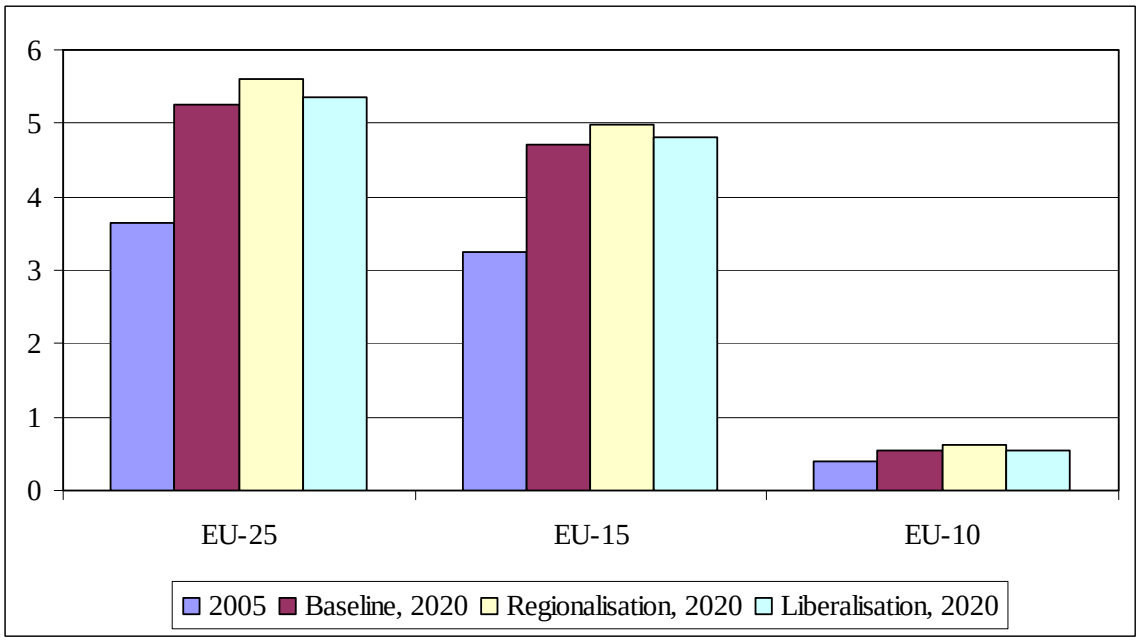


Figure 4.14: Area sown with energy crops under the different scenarios in the EU, 2005 and 2020, in mio t.

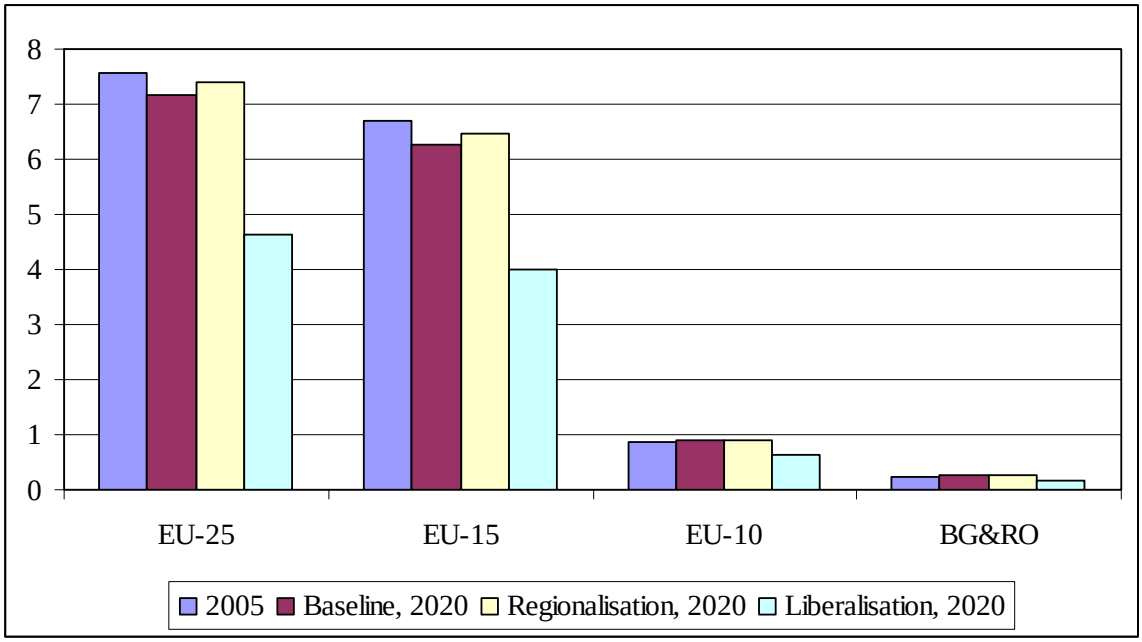


Under the baseline scenario, beef production at EU-25 level declines by over 5 percent. The past trend of a decline in per capita consumption continues under the baseline scenario. However, the resulting decline of beef consumption per capita of 8.4 percent between 2005 and 2020 is smaller due to price effects as a consequence of lower tariff barriers. Total per capita meat consumption increases from 83 kg p.c. in 2005 to 87 kg p.c.

in 2020, i.e. by 4.5 percent. However, the model results describe a shift in the structure of meat consumption from beef meat to pork and poultry meat.

EU-25 poultry meat and cheese production increases slightly, while butter production declines. The p.c. consumption for cheese and poultry meat increases until 2020, by 2 percent and 6.4 percent respectively. These relative changes in consumption, which exceed the relative increase in production, indicate an increase in imports or a decline in exports. As a consequence of higher tariff rate quotas and reduced import tariffs, the EU has higher net-imports or lower net-exports for all livestock products under the baseline scenario. This is also the case for pork production: production expands by 4 percent while total consumption increases by almost 6 percent.

Figure 4.15: Production of beef under the different scenarios in the EU, 2005 and 2020, in mio t.



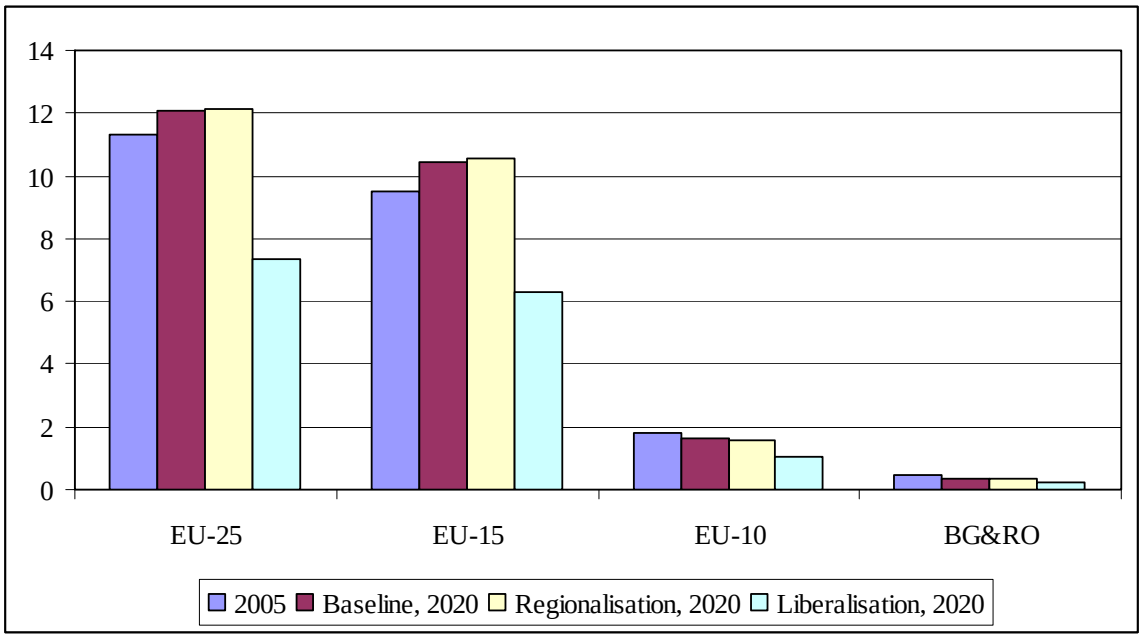
The general trends in livestock market in the EU-15 are similar to those at EU-25 level. Beef production declines slightly between 2005 and 2020. In total, beef production declines by 0.4 mio t, i.e. 7 percent. The projection indicates a slight increase in cheese production by 0.2 mio t. EU-15 poultry production increases by almost 10 percent and pork production expands by only 4 percent compared to the year 2005. On the consumption side, total meat consumption per capita increases by almost 3 percent in the EU-15; but the share of beef decreases relative to pork and poultry, which is consistent with an observed shift in consumer preference.

The production results indicate similar results in the EU-10 for cheese production as in the EU-15. However, beef production is relatively constant at 0.9 mio t and poultry production declines by 0.2 mio t, i.e. 12 percent. This different development in the EU-10 compared to

the EU-15 is due to different assumptions on the rate of technical progress and on different reactions to cross price effects.

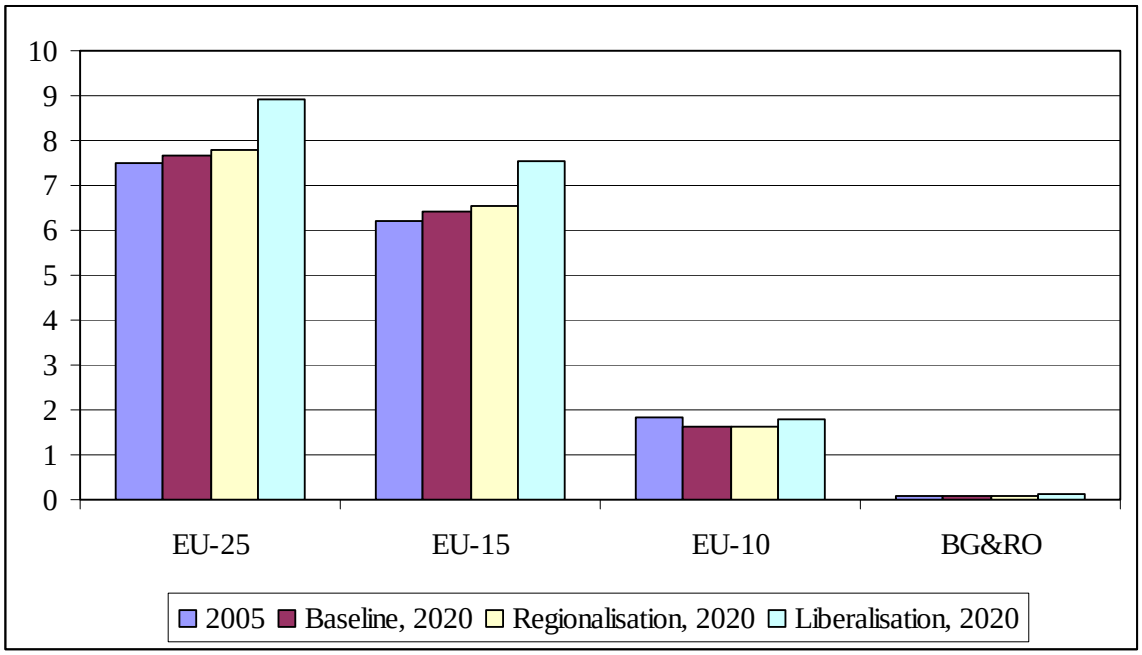
These differences between the EU-15 and the EU-10 are also reflected in the development on the consumption side. While total per capita meat consumption increases slightly in the EU-15, per capita meat consumption increases in the EU-10 by over 14 percent between 2005 and 2020.

Figure 4.16: Production of poultry meat under the different scenarios in the EU, 2005 and 2020, in mio t.



Full liberalisation with no distorting trade policy measures and a phasing out of quota restrictions leads to a significant reduction in beef and poultry meat production. Beef production is almost 35 percent less than under the baseline scenario. The reduction in poultry meat production of over 37 percent is even more severe than under the baseline. The phasing out of quota regulation in combination with a cut in import tariffs and TRQs results in an increase in cheese production of over 15 percent. Milk production in the EU-25 is around 12 percent higher than in the baseline, where milk quota is binding. With the increase in milk production, the production of dairy products also increases. However, cheese production expands further than butter and SMP.

Figure 4.17: Production of cheese under the different scenarios in the EU, 2005 and 2020, in mio t.

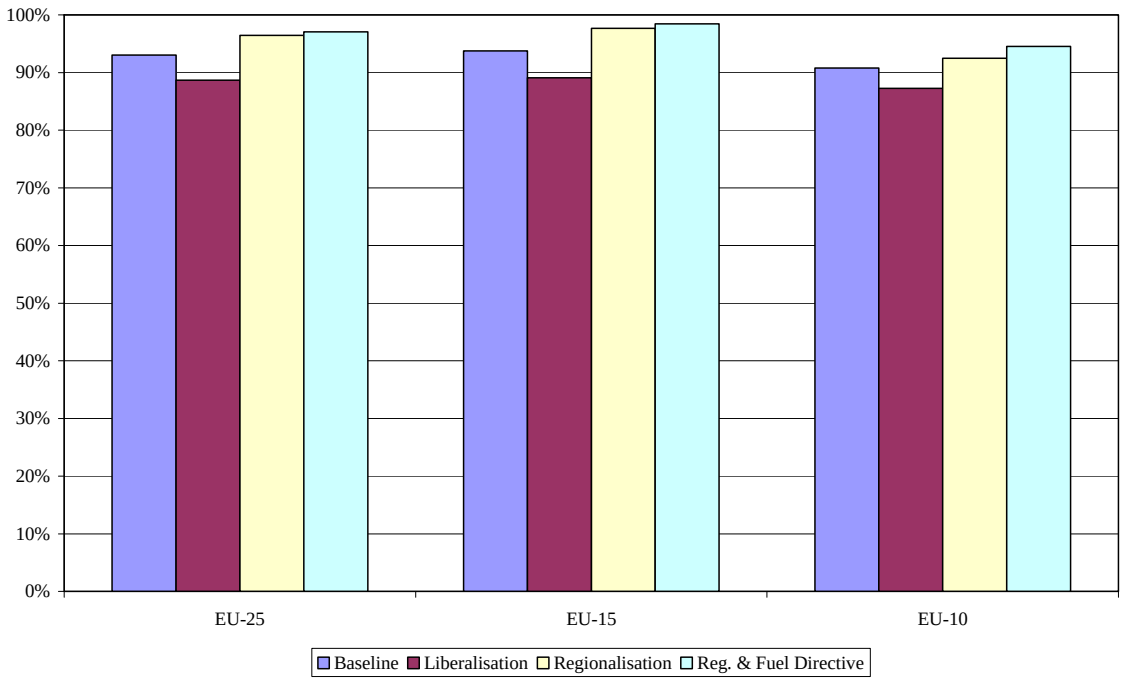


4.2.4 Land use under different scenarios

The following figure illustrates the consequences on the land use in the European Union under the different scenarios. For all scenarios it is assumed that total utilized agricultural area (UAA) is constant at the average of 2000-2002 level which is 137 mio ha for the EU-15 and 58.9 mio for the EU-12. Total land available for agricultural production is equal to total UAA reduced by the area of obligatory set-aside. So, if set-aside requirements decline, area which can be used for agricultural production increases. For this study a version of the ESIM is applied where total land demand for agricultural activities can be less than total land available for agricultural activities, i.e. an excess supply of agricultural land.

Under the baseline scenario more than 91 percent of total agricultural land available for agricultural production is used. In the year 2020 almost 11.4 mio ha of agricultural land will be abandoned under the baseline. Even under full liberalisation 86 percent of total land available for agricultural production remains under cultivation. Under the regionalisation scenario the share of abandoned land declines and almost 96 percent of land available for agriculture is used.

Figure 4.18: Shares of land use in total land supply under different scenarios in EU-25, EU-15 and EU-10, 2020.



An enforced production of energy crops with an implementation of the EU Biofuels Directive, as modelled in the next Section, results in the share of abandoned agricultural land being reduced to 3 percent. The other assumptions for analysing the impact of the Biofuels Directive are based on the regionalisation scenario (see below).

4.2.5 Implementing the EU Biofuels Directive

The following table presents the impact of the introduction of the EU Biofuels Directive. The target of 5.75% share of biofuels in domestic fuel consumption is introduced under the settings of the regionalisation scenario by shifting the demand in the individual EU Member States, starting from their level in the year 2005 to the target of 5.75% in 2010. As in the previous figures, the results are also presented for the years 2005 and 2020.

Table 4.3: Production of crops used for biofuels production and consumption and imports of biofuels in EU-25 and EU-15, 2005, 2010 and 2020, in mio t.

	2005	2010	2020
EU-25			
Biofuels crops			
- Production	12.12	27.66	39.89
- Area (in mio ha)	3.65	6.98	8.62
Biofuels			
- domestically produced	3.79	8.74	12.60
- (net)-imported	0.81	6.30	8.40
EU-15			
Biofuels crops			
- Production	10.91	25.06	36.33
- Area (in mio ha)	3.25	6.23	7.72
Biofuels			
- domestically produced	3.42	7.92	11.49
- (net)-imported	1.02	5.76	7.49

With the introduction of the Biofuels Directive, production of biofuels crops expands from 12.1 mio t in 2005 to 27.6 mio t in 2010, to 40.0 mio t in 2020. The main source of this increase is cereals (75%) and oilseeds. In total, after implementing the Biofuels Directive with the 5.75% target in 2010, about 15 mio t of biofuels are consumed in the EU-25. 58% of this comes from domestically produced feedstocks and 42% from imports. However, the consumption of 21 mio t of biofuels in the year 2020 accounts for 7.4 percent of total fuel consumption if projected fuel consumption increases by 0.8 percent p.a. as observed in the period between 2000 and 2004.

In case the Biofuels Directive is not implemented, which contains a mandatory blending obligation, the production of biofuels crops (and the imports of biofuels) contributes to only 3.6 percent of total fuel consumption in 2020 (and just under 3% in 2010).

In any case, this picture might change under a different trade policy setting. For the regionalisation scenario, it is assumed that no WTO agreement is implemented. Lower import tariffs for ethanol and oilseed oil induce a higher share in imported biofuels.

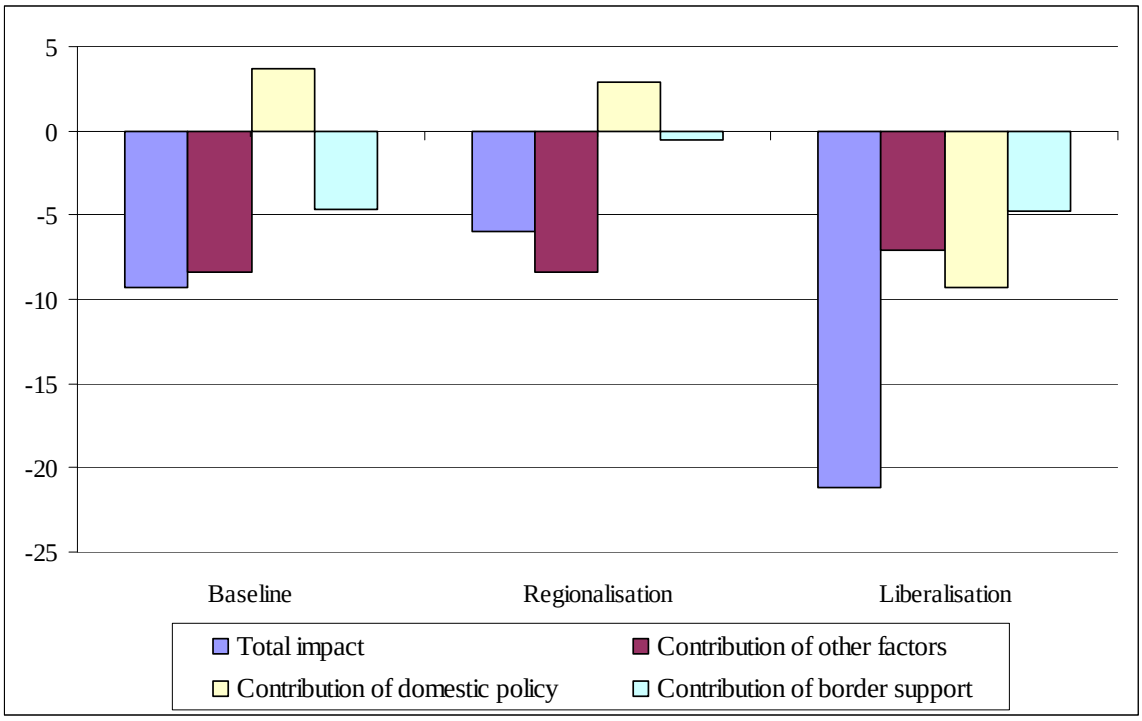
4.2.6 Agricultural income and employment

This section analyses the impact of the different policy scenarios on agricultural income and employment. The results presented here stem from two different modelling approaches that have been applied to this study. On the one hand the general equilibrium model LEITAP, which analyses consequences of different policy options at national level, endogenously takes all economy-wide repercussions of changes in policies into account. On the other hand, the regional model CAPRI is a partial equilibrium model that takes the macro-economic conditions as given.

Before discussing the results at the regional level, the results of LEITAP are presented at the national level for the crop and livestock sectors in the EU-15 and EU-10.

In the EU-15 income growth in the crop sectors is negative within the period 2005 to 2020. This development is mainly determined by policy changes and other factors such as technical progress. The decline in real prices is caused by a relatively high rate of technical progress and by an inelastic demand for these commodities. The strong decline in farm income under the liberalisation scenario is mainly caused by the withdrawal of income support.

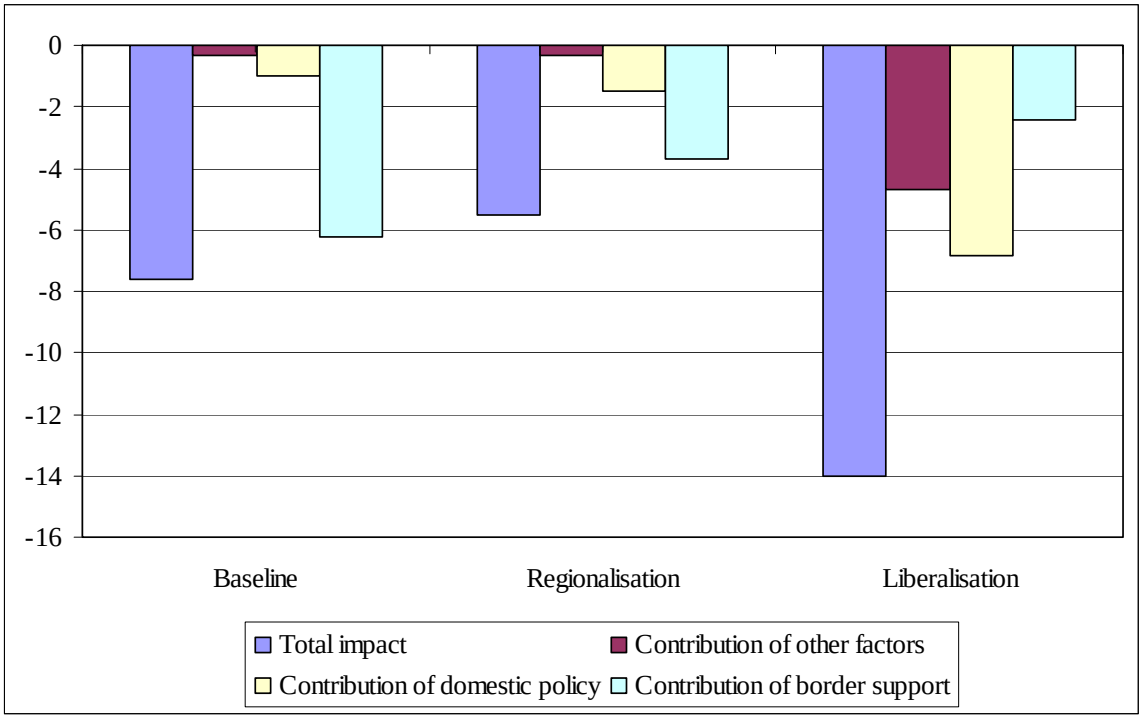
Figure 4.19: Sector income growth for crop sectors in EU-15, 2005-2020.



In the baseline and regionalisation scenarios, the impact of domestic support is limited to the continued income support in these two scenarios (this is the case although modulation occurs in the baseline scenario, as it is assumed that second pillar payments continue to be distributed within the agricultural sector). The positive impact is caused by the introduction of dairy and sugar payments and decoupling.

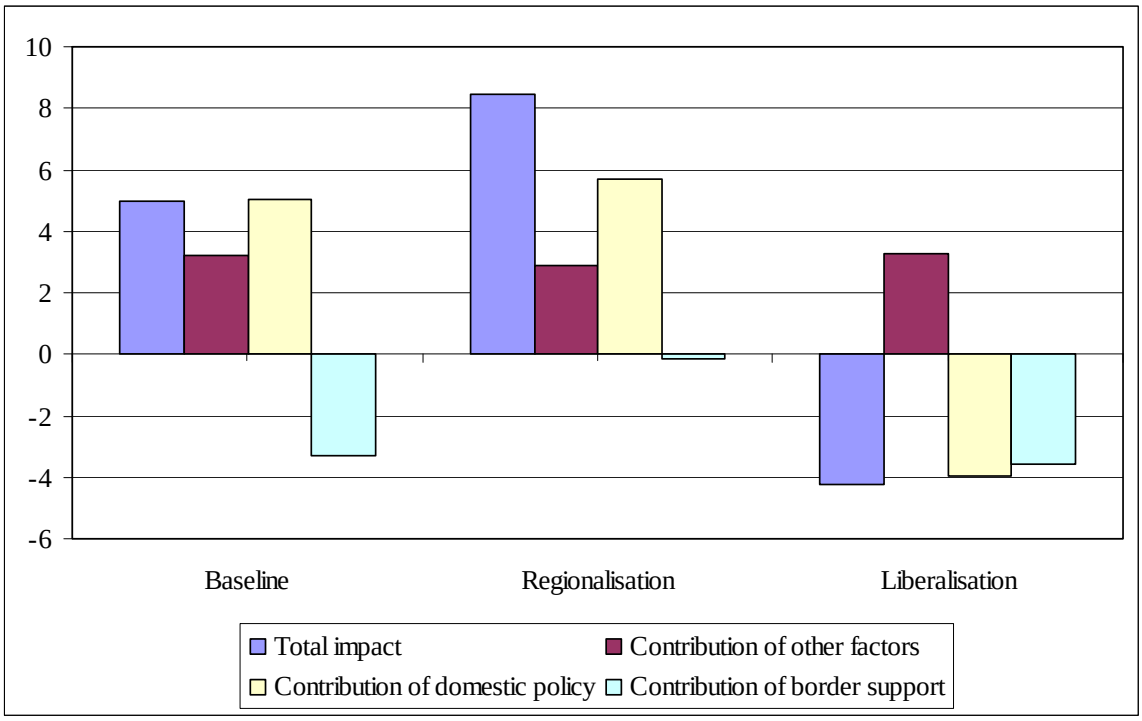
Similar to the development in the crops sectors, income from livestock production declines in all scenarios in the EU-15. Under the baseline scenario the decline in income for livestock products in the EU-15 is due to the cut in border support. Other factors and domestic policy measures have only a limited impact on the development of income for the livestock sector in the EU-15. The higher border protection assumed under the regionalisation scenario contributes to a smaller decline in income from livestock. The abolishment of direct payment under the liberalisation scenario contributes significantly to the decline in income for this commodity group.

Figure 4.20: Sector income growth for livestock sectors in EU-15, 2005-2020.



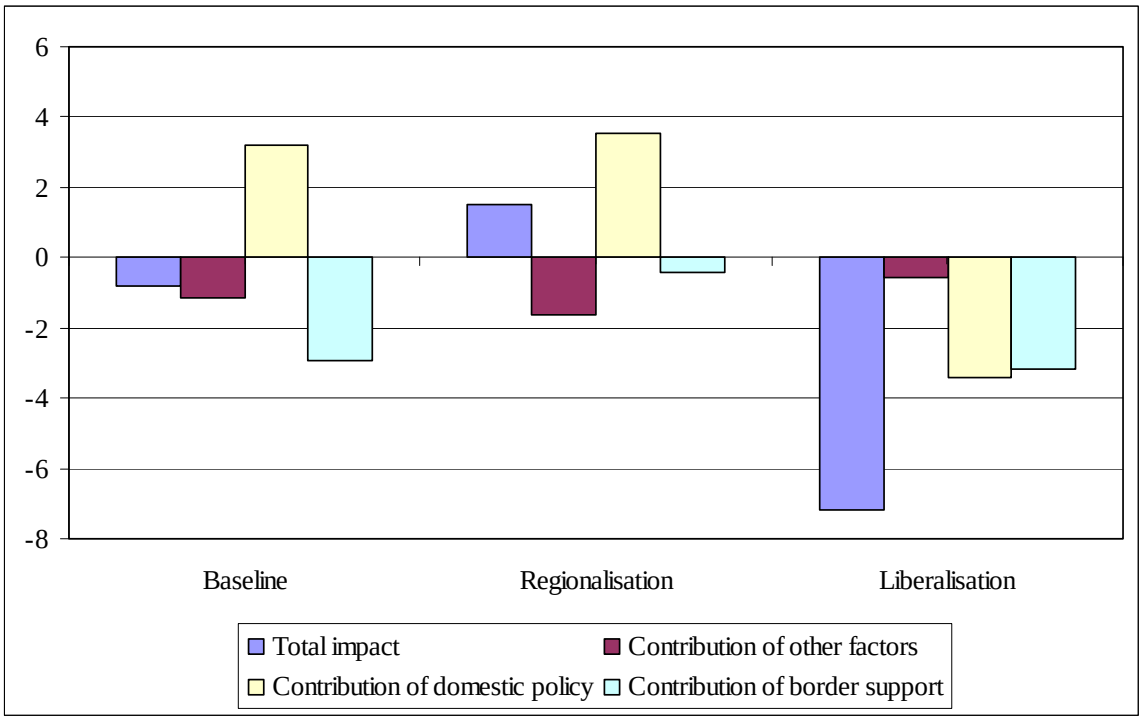
A comparison of the sections on production and income demonstrate that, as expected, the reduction of border support has a larger impact on production than domestic income support; and that with regard to income, the impact of reducing domestic income support is larger than reducing border support.

Figure 4.21: Sector income growth for crop sectors in EU-10, 2005-2020.



In contrast to the EU-15, farm income in the EU-10 increases in the baseline and the regionalisation scenario. In the baseline and regionalisation scenarios the phasing in of the remaining 45% of the direct payments has a positive impact on farm income in the crop and livestock sectors (55% was already assigned in 2004 with the accession). This impact is negative in the liberalisation scenario as these income payments are abolished.

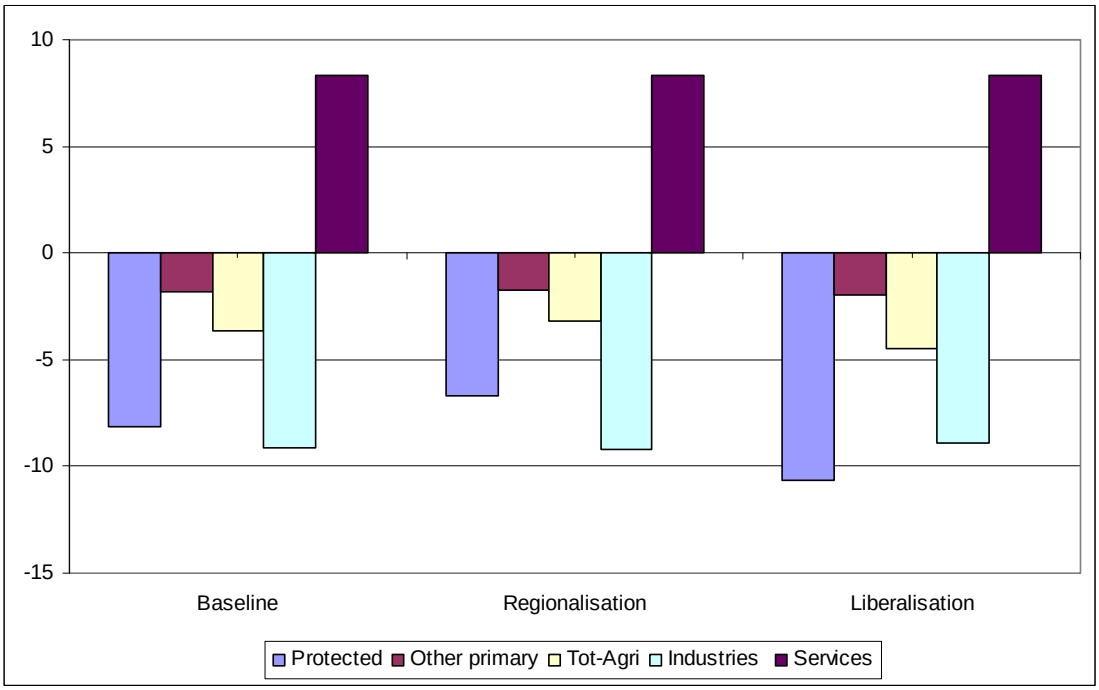
Figure 4.22: Sector income growth for livestock sectors in EU-10, 2005-2020.



4.2.7 Employment effects

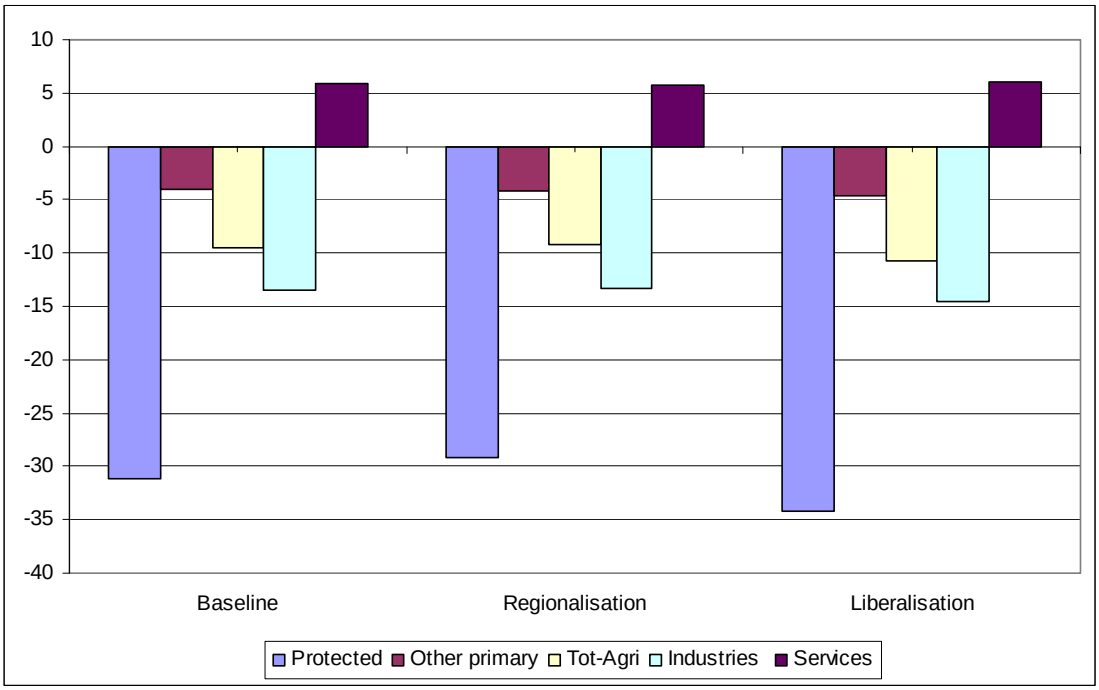
This analysis of changing policies for employment is based a several assumptions with respect to the functioning of the labour markets. The most important assumption for the employment results is that labour markets clear to a natural rate of unemployment, which is assumed to remain constant.

Figure 4.23: Sectoral employment growth in the EU-15, 2005-2020.



The employment figures are in line with the structural change process. Employment in the agri-food and manufacturing industries decreases whereas it increases in the service sector. Figure 4.24 shows that employment effects in protected sectors are more pronounced in the EU-10 countries because the higher rate of structural changes due to the enlargement and a process of catching up which leads to higher GDP growth rates and related structural change. The impact of liberalisation is negative on employment, especially in the protected sectors.

Figure 4.24: Sectoral employment growth in the EU-10, 2005-2020.



The development of factor prices in Figure 4.25 shows that, in line with historical trends, the wages of skilled labour increase more than the wage of unskilled labour and the wages in general increase relative to the rental rate of land and especially capital. The rental rate of capital does not rise as quickly, as the capital stock will be augmented with investments (it will not become as scarce as labour). Increase in wages is a bit higher in the liberalisation scenario and lower in the regionalisation scenario relative to the baseline scenario. Increase in wages is higher in EU-10 than EU-15 due to the process of catching up.

The land price is very dependent on the policy scenario. The direct payments and profitability of agriculture accrue partly in the price of the fixed factor land. In the regionalisation scenario direct payments stay highest and agriculture is more profitable relative to the other scenarios: land prices are highest. In the liberalisation scenario land prices decline fast as all direct payments are abolished and profitability in agriculture is low.

Figure 4.25: Development real factor prices in the EU-15, 2005-2020.

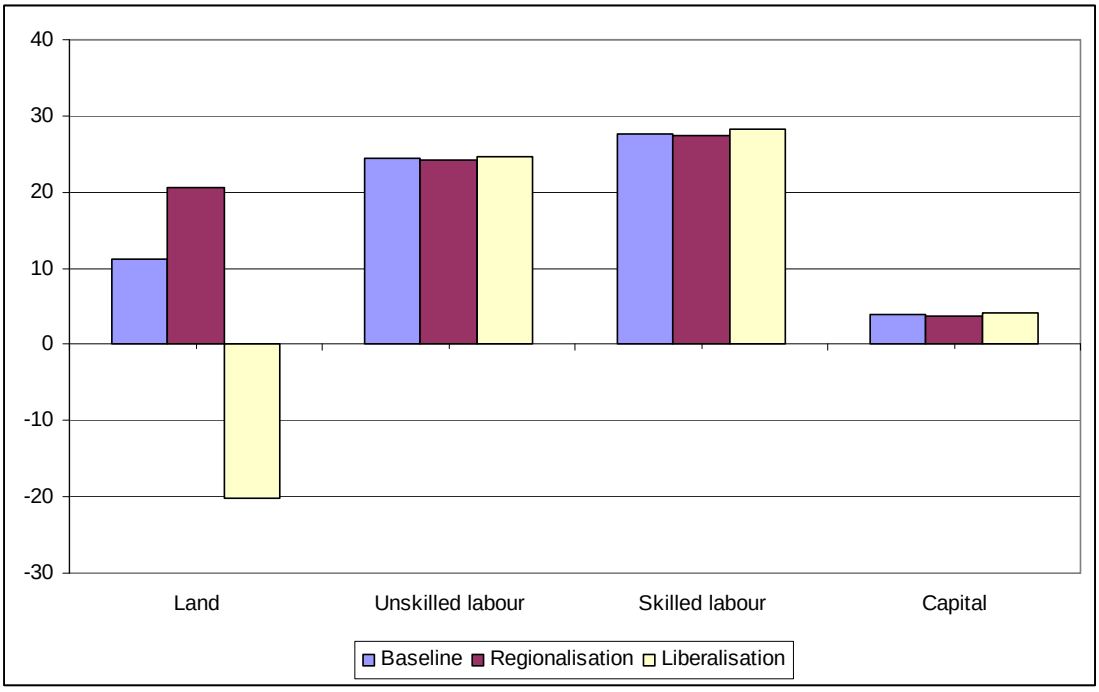
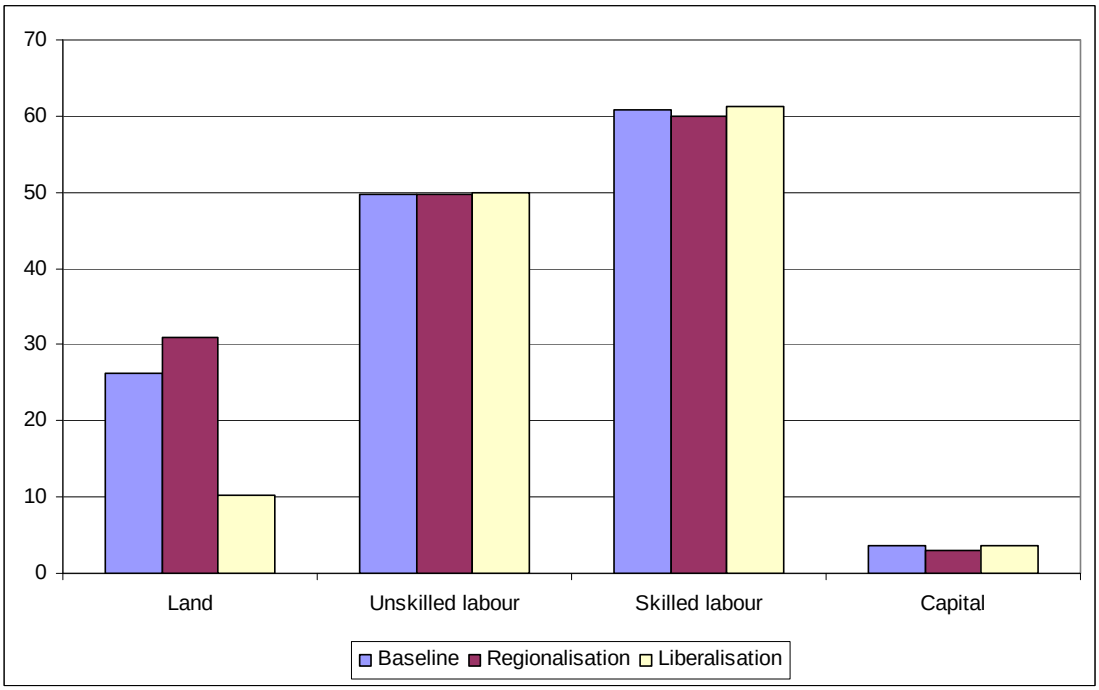


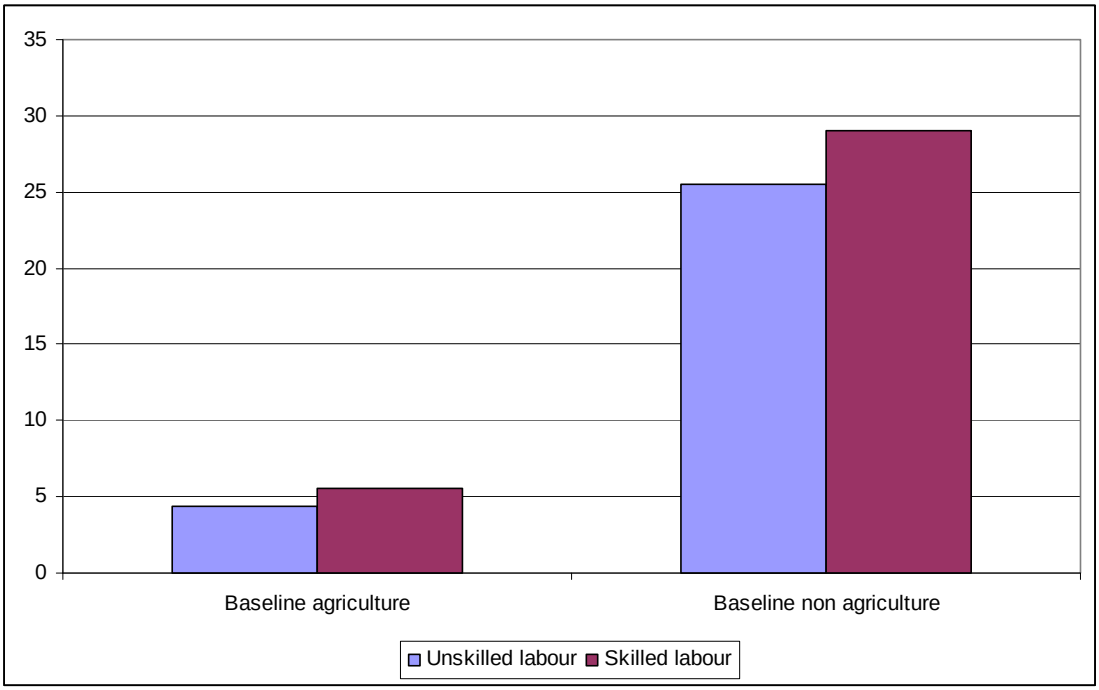
Figure 4.26: Development real factor prices in the EU-10, 2005-2020.



An important observation in the section on factor markets is that wage differentials between agriculture and non-agriculture can be maintained in many countries through limited off-farm labour migration (De Janvry, 1991). Returns to assets invested in agriculture also tend to diverge from returns of investment in other activities. In the methodological part we incorporated this feature by a segmentation of the capital and

labour factor markets between agriculture and non-agriculture. Figure 4.27 shows that this assumption implies that the wage differential between agricultural and non-agricultural sectors will continue to exist as wages in agricultural sectors increase at a rate less than those in non-agricultural sectors. This implies that the agricultural sector conserves more labour when there is a wage differential than when employees in the agricultural sector earn the same wage as in other sectors. The ease with which agricultural labour can move out of the agricultural sector and can find a job outside agriculture is critical with regard to the wage developments within the sector. This is dependent, *inter alia*, on the human capital of the farmers and the growth of the other sectors. The higher the mobility of agricultural workers to other sectors, the closer the wage rate will be to the wage rate of other sectors.

Figure 4.27: Development agricultural and non-agricultural wages in baseline scenario in EU-15 (market prices, 2005-2020).



4.2.8 Farm income at Member State and regional levels

The following results describe the results of the analysis at Member State and at regional level based on the CAPRI model. Before presenting the results, the possible differences between the general equilibrium approach presented already in the previous graphs and the CAPRI results will be explained.

While general equilibrium models take factor markets into account, factor demand and supply as well as factor prices are modelled endogenously. Therefore changes in policies which have an impact on the level of sectoral production will also result in changes in demand for factors with consequences on the level of factor income in that particular sector. However these adjustments always take time, and therefore the results of general equilibrium models are more focused on long-term consequences of policy changes than

on short- to medium-term effects. If factor prices are given, which is plausible in the short- to medium-term, changes in policies (like the withdrawal of direct income support) can have dramatic consequences. Therefore, results from the CAPRI model should be taken as short- to medium-term results, while the results presented above are more descriptive of the long-term impact of policy reforms after adjustment at the economy-wide level have taken place.

CAPRI results

The income effect of different policy scenarios at Member State and at regional level is a combined effect of changes in income per agricultural activity and the mix of agricultural activities. Therefore, the following table first shows the average effects on income per activity in the EU-25. It is clear that in the regionalisation scenario there is a strong increase in income, especially from cattle activities and vegetables and permanent crops. In the liberalisation scenario there is a strong decrease in income, especially from cereals, oilseeds, other arable crops and all cattle activities. Within the group of cattle activities there is a relative income switch from beef cattle activities to dairy cow activities. The decrease in income in the crop production sectors results to a large degree from the abolition of farm payments under the liberalisation scenario. Due to higher prices for pork, income in the other animal sector increases in the EU-25. Moreover, income decreases in the vegetables and permanent crops sector are also limited, relatively to other sectors. This is also explained by the fact that large parts of the vegetables and permanent crop sector in CAPRI are unaffected by the different policies.

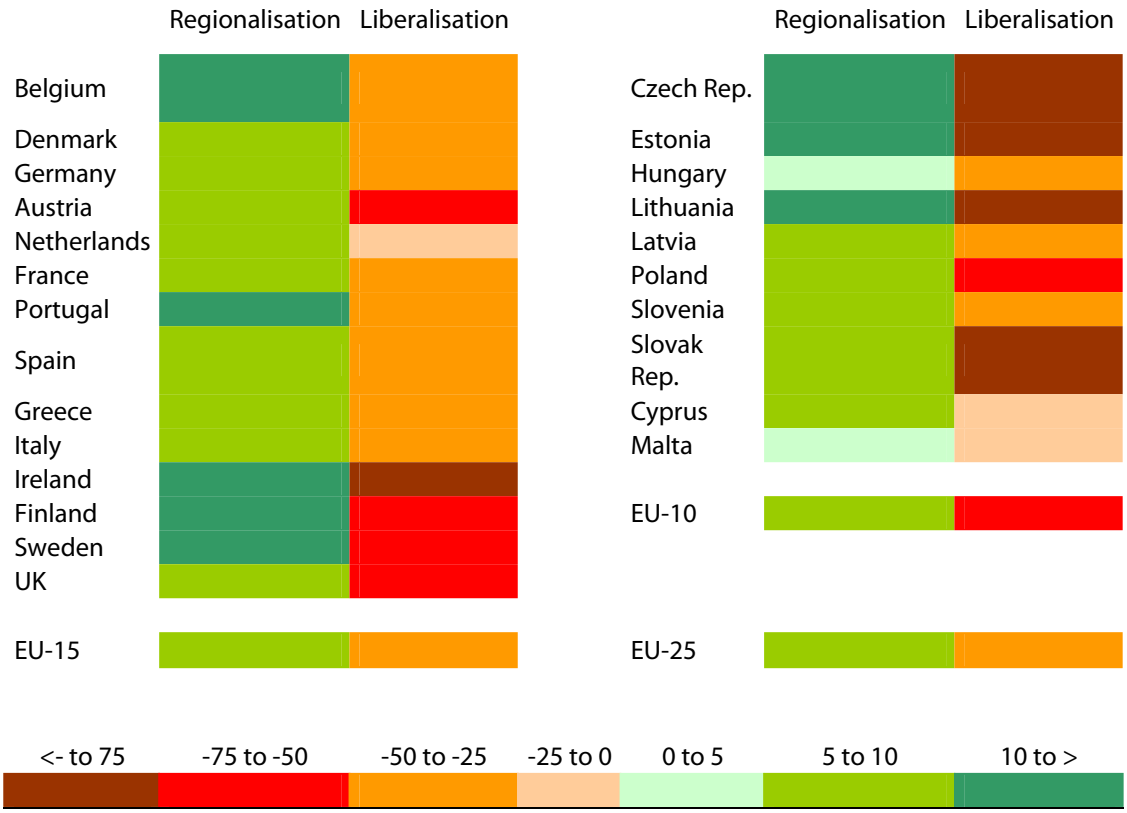
Table 4.4: Farm Income per Activity Group, EU-25[50].

	Baseline				Regionalisation				Liberalisation			
					percent deviation to : Baseline				percent deviation to : Baseline			
	Revenues	Total cost	Premiums	Income	Revenues	Total cost	Premiums	Income	Revenues	Total cost	Premiums	Income
	Euro /ha or head				Euro /ha or head				Euro /ha or head			
Cereals	662	532	270	399	677	533	275	419	606	539	0	67
					2.3%	0.2%	2.1%	5.0%	-8.4%	1.3%	-100.0%	-83.2%
Oilseeds	658	459	271	470	674	458	274	490	650	463	0	187
					2.3%	-0.1%	1.4%	4.2%	-1.3%	0.9%	-100.0%	-60.2%
Other arable crops	2098	1421	199	876	2141	1429	203	914	1789	1420	0	368
					2.0%	0.6%	1.9%	4.3%	-14.7%	0.0%	-100.0%	-58.0%
Vegetables and Permanent crops	7378	2184	130	5324	7949	2184	129	5893	6592	2162	0	4431
					7.7%	0.0%	-0.7%	10.7%	-10.7%	-1.0%	-100.0%	-16.8%
Fodder activities	236	296	216	156	237	297	223	163	231	291	0	-60
					0.3%	0.3%	3.4%	4.7%	-2.1%	-1.6%	-100.0%	< -90%
Set aside and fallow land	83	66	189	206	86	67	193	212	83	58	0	24
					2.8%	0.4%	2.4%	3.2%	-0.9%	-12.4%	-100.0%	-88.2%
All cattle activities	903	652	23	275	966	665	23	324	717	604	0	113
					7.0%	2.0%	-0.5%	18.1%	-20.7%	-7.4%	-100.0%	-58.8%
Other animals	213	144	1	70	212	145	1	69	214	143	0	71
					-0.3%	0.2%	0.8%	-1.1%	0.4%	-1.2%	-100.0%	1.9%

Table 4.5 shows that in the regionalisation scenario income increases in all countries. Largest increases are found in Belgium, the Czech Republic, Lithuania and Estonia.

Smallest increases are found in Hungary, Malta, Cyprus, Denmark, the Netherlands, Poland and Slovenia. The reasons for these differences are diverse. Shares in total agricultural income from vegetables and permanent crops and beef cattle in Belgium are relatively high. The results show that the latter sectors experience relatively large increases in income in the regionalisation scenario. In Hungary, Poland and Denmark the largest part of income is earned by arable and fodder crops and by other animals. The Netherlands also experience a relatively limited increase in income in the regionalisation scenario. The reason for this is different however. The Netherlands is characterised by high income from nursery crops and flowers, which are hardly affected in the different scenarios.

Table 4.5: Agricultural income per country, 2020, relative to Baseline in percent[50].



Income decreases in all countries in the liberalisation scenario. The largest decreases are found in the Eastern European countries (Czech Republic, Estonia, Lithuania, Slovak Republic, Latvia), but also in Ireland, Sweden and Finland. This is explained by the abolition of the farm payments and the limited competitiveness with the rest of the world. Abolition of farm payments and increased competition in the liberalisation scenario especially affect income in the crop and beef cattle sectors, which are imported in the above-mentioned countries. The lowest impact is found in countries of the EU-15. The reasons are the specialisation in vegetables and permanent crops, other animals and to a lesser extent dairy cow activities. For the Netherlands, again, the relatively large share of income from nursery crops and flowers, which are not affected by the scenarios, can be mentioned. At

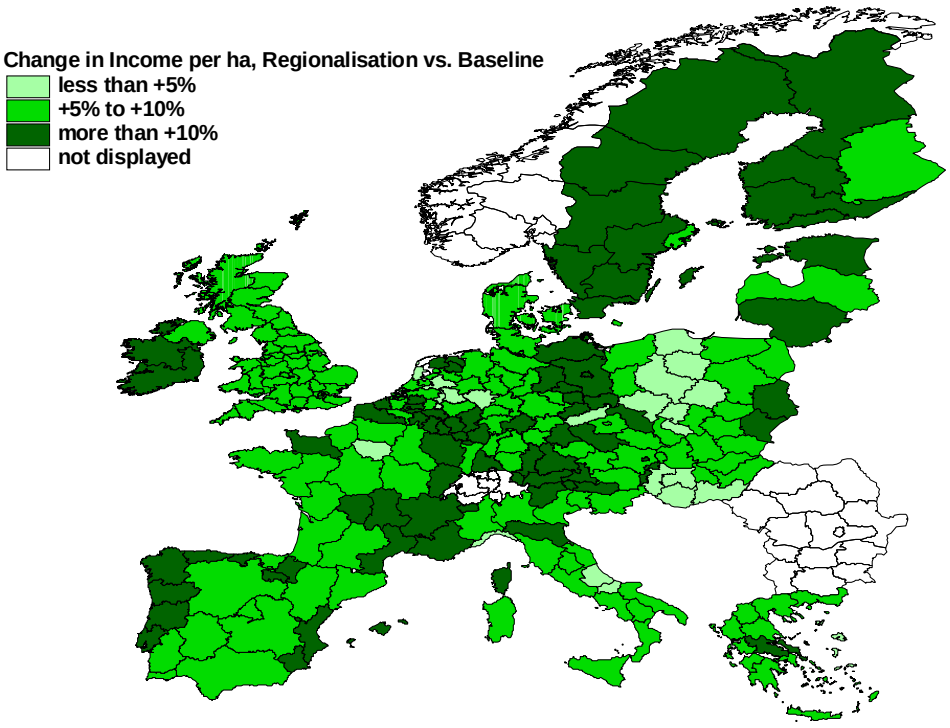
[50] Table 4.4 & Table 4.5: Income (Gross margins or revenue minus variable costs) is calculated ex-post from the model results. Income can be negative as it does not include all the revenue and cost components included in the objective function of CAPRI.

this point it is also important to note that within countries and regions there are certainly large differences per farm type specialising in different types of agricultural activities.

Regional Income from agriculture

The following Figure 4.28 presents the effect on regional income measured in € per ha in the regionalisation scenario. Regional income effects can be very diverse, depending on the income effect per activity and the share of agricultural activities in the total number of agricultural activities. Income effects are relatively positive for regions with a high share of income from dairy cows and beef cattle. Income effects are relatively limited for regions with a high share of income from arable crops and intensive livestock production. In the Netherlands there is a clear difference between some NUTS2 regions in the north and the rest of the country. In the north of the Netherlands income is mainly determined by income from dairy cattle whereas in the rest of the country income shares from intensive livestock production and vegetables and permanent crops are relatively high.

Figure 4.28: Changes in farm income per ha: regionalisation versus baseline scenario.

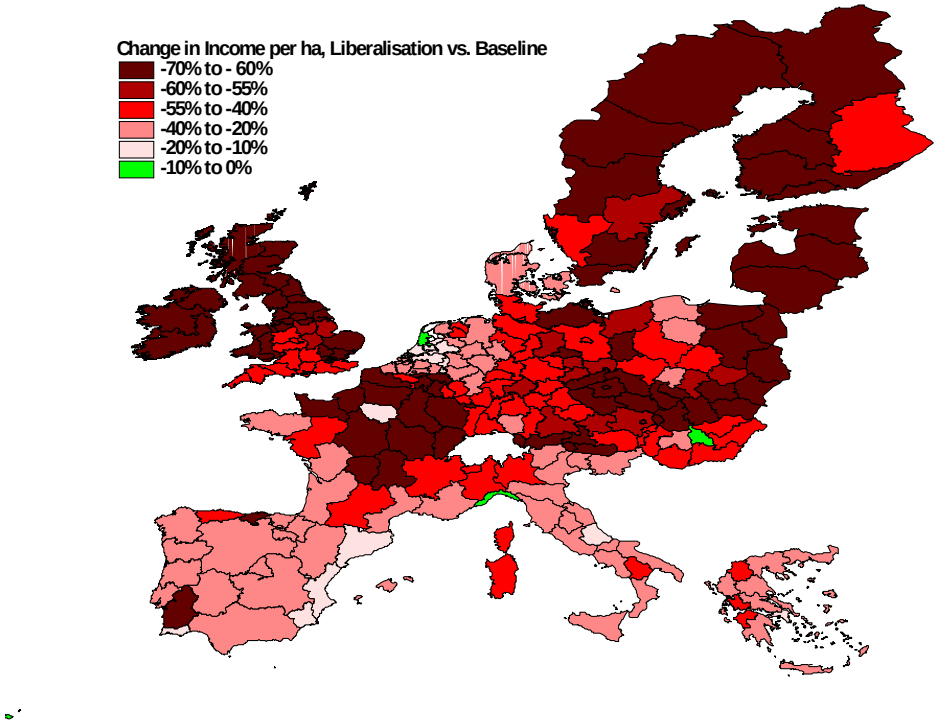


The following Figure 4.29 presents the results of the liberalisation scenario relative to the baseline scenario. Regions with high shares of beef cattle and arable crops will lose most from liberalisation. These are especially regions in France, eastern Germany and in the new Member States. Regions with a relative high share of income coming from other animals, dairy cows and vegetables and permanent crops lose relatively less. These sectors are

characterised by relative high gross margins. As a result price changes have relative little effect on gross margins. Moreover, the effect on farm family income per farm per sector might differ from the effect on gross margins per sector. This is due to differences in paid capital, land and labour costs per sector and per farm.

In the northern part of Portugal the income effect is much less negative than in the rest of the country. This is due to high income shares from intensive livestock activities and vegetables and permanent crops in this region.

Figure 4.29: Changes in farm income per ha: liberalisation versus baseline scenario.



DEVELOPMENT OF THE NUMBER OF FARMS PER SUB-SECTOR IN EU-25

The following Table 4.6 shows the results with respect to the number of farms per sub-sector for the EU-25. In the baseline the number of farms is based on extrapolation of adjusted yearly trends per country and aggregation over all countries. The number of farms in the EU-25 per sub-sector in the liberalisation scenario is ultimately based on the number of farms per country in the baseline 2020 as well as the differences between gross value added per sub-sector per country in the liberalisation scenario compared to the baseline in 2020. The EU-25 results are derived by the aggregation of all the country-level results.

Table 4.6 shows that in 2003 there are about 10 mio farms in the EU-25. More than 50% of these farms are classified as arable or vegetables and crop farms, in other words belonging to the arable or vegetables and crop sub-sector.

Table 4.6 also shows that in the baseline the number of farms will decrease in all sub-sectors. The only exception is the other animals sub-sector. The later is especially explained by the increase in the EU-10. In the baseline the decrease in the number of farms is especially strong in the mixed livestock and the mixed crop sub-sectors. This could be explained by the tendency to specialise in a limited number of production lines as showed, for example, by the increase in the number of other animal farms. In the baseline the total number of farms in the EU-25 decreases by about 25%. Again, the number of farms per sub-sector in the baseline is the result of extrapolation of trends as observed in the data. In some cases these trends are adjusted to avoid unrealistic results in the baseline in 2020.

Table 4.6: Number of farms per sub-sector in 2003 and in 2020 in different scenarios (in mio farms).

Sub-sector	2003	2020		Difference (%)		
		Baseline	Liberalisation	Baseline vs. 2003	Liberalisation vs. baseline	Liberalisation vs. 2003
Arable crops	2.3	1.4	0.9	-37.4	-35.4	-59.6
Vegetables and permanent crops	2.8	2.6	2.1	-7.9	-19.1	-25.4
Cattle activities	1.8	1.5	0.7	-19.6	-53.0	-62.2
Other animals	0.4	0.6	0.7	74.3	15.5	101.3
Mixed livestock farms	0.7	0.2	0.2	-64.4	-30.4	-75.2
Mixed crop farms	0.8	0.1	0.1	-88.1	-18.8	-90.3
Other livestock and crop farms	1.2	1.0	0.6	-15.3	-39.9	-49.1
Total	10.0	7.5	5.3	-25.4	-29.1	-47.1

As could be expected, liberalisation of agricultural markets has a large effect on the number of farms. Compared to the baseline the number of farms decreases by almost 30%. Here again, it is expected that liberalisation results into a further increase in the number of farms specialising in the other animals sub-sector. The largest decreases in the number of farms are found in the cattle activities and especially in the mixed livestock and crop sub-sectors. In the liberalisation scenario the number of farms in 2020 will be about 50% lower compared to the number of farms in 2003.

DEVELOPMENT OF TOTAL NUMBER OF FARMS PER REGION

Regional results are presented in the following figures. These figures show the yearly changes in the number of farms in the period 2003 to 2020 in the baseline and in the liberalisation scenario respectively.

Figure 6.29 shows that in the baseline the decrease in the number of farms, measured in percentages per year, is largest in regions in the south of Finland, France, Germany and the north of Italy. In most regions the number of farms decreases by maximum 5% per year.

Figure 6.30 shows that in the liberalisation scenario the decrease in the number of farms per region accelerates. The number of regions with a red colour increases and the number of regions with a green colour decreases. There are quite some regions that switch from a small increase in the total number of farms in the baseline scenario to a decline in the liberalisation scenario, e.g. regions in the middle of Sweden and in Germany.

Figure 4.30: Changes in the number of farms per region in the period 2003-2020 in the baseline (% per year).

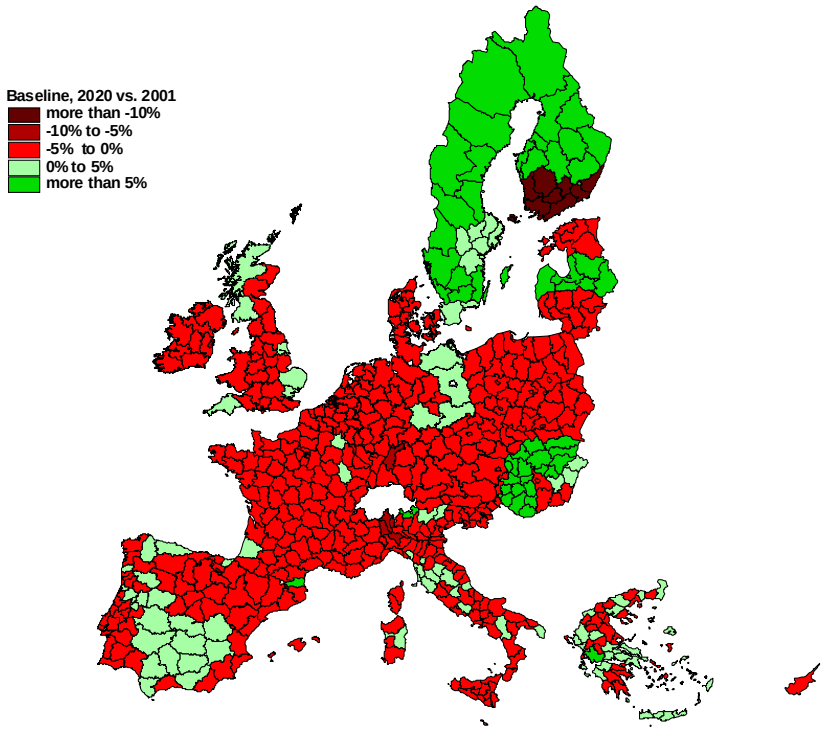
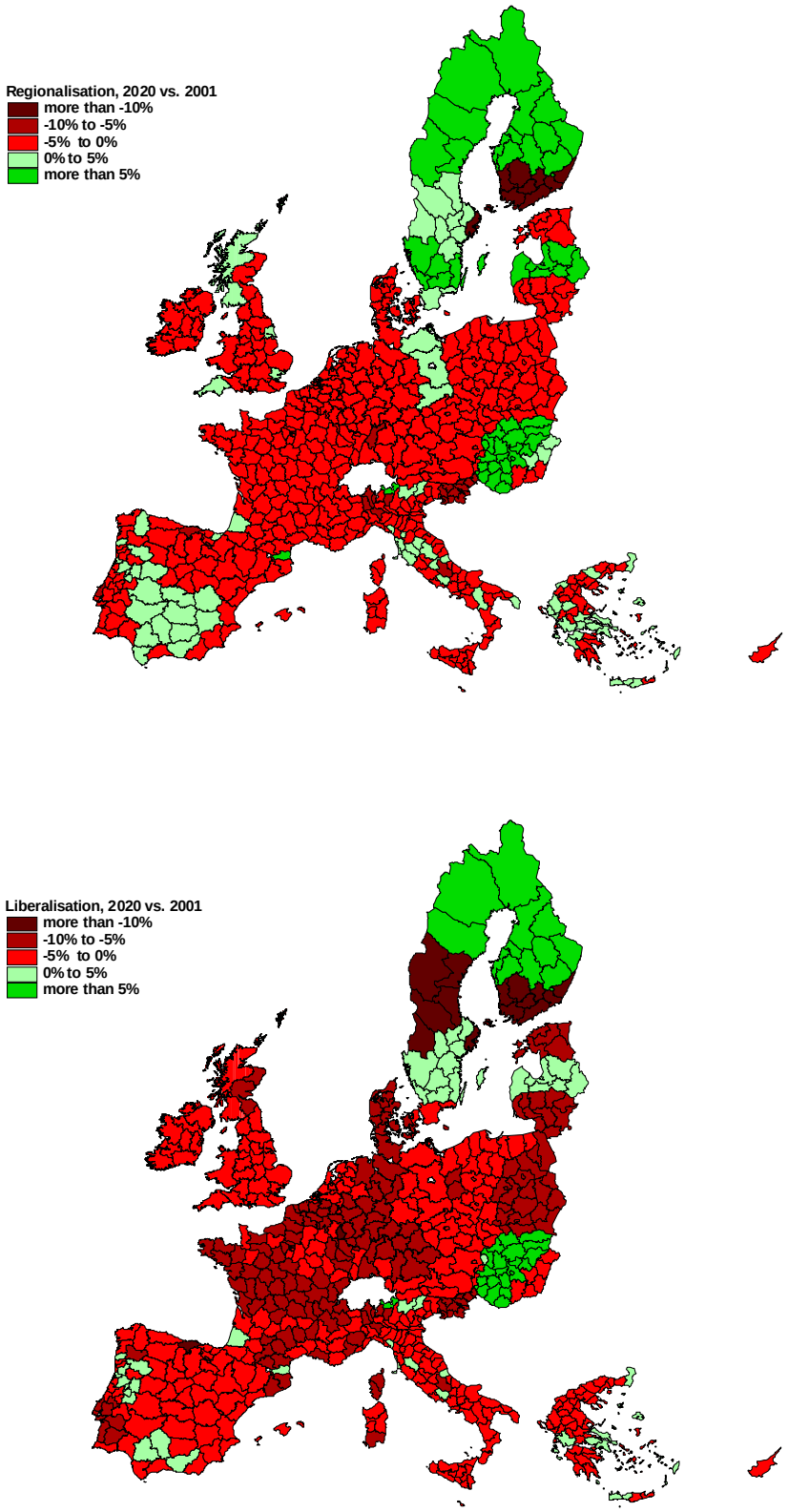


Figure 4.31: Changes in the number of farms per region in the period 2003-2020 in the regionalisation and the liberalisation scenarios (% per year).



4.2.9 Environmental indicators per region

Table 4.7 shows the effect of the scenarios on the nitrate balance as compared to the baseline. It appears that, averaged at the EU-25 level, the effect on the different components is negligible. The average environmental effects of the liberalisation scenario exceed the average environmental effects of the regionalisation scenario. Regional effects can be very different from the average effects. This is illustrated in Figures 4.32 and 4.33.

Table 4.7: Selected elements of nitrate balance (N). Percentage changes compared to baseline.

Region : European Union 25	Baseline	Regionalisation	Liberalisation
		percent deviation to : Baseline	percent deviation to : Baseline
	Ammount per ha	Ammount per ha	Ammount per ha
Import by anorganic fertilizer	43.88	44.04	43.25
		0.36%	-1.44%
Import by manure	80.82	80.82	80.81
		0.00%	-0.01%
Nutrient retention by crops	90.59	90.8	89.86
		0.23%	-0.81%
Ammonia loss organic fertilizer	21.71	21.66	21.84
		-0.23%	0.60%
Ammonia loss manure application	9.04	9.02	9.09
		-0.22%	0.55%
Ammonia loss anorganic fertilizer	1.82	1.82	1.8
		0.00%	-1.10%
Surplus	33.58	33.56	33.45
		-0.06%	-0.39%

Figure 4.32 shows the effect of the regionalisation scenario on nitrate surplus (kg N per ha) relative to the baseline. A (limited) decrease in nitrate surplus per hectare is expected for the northern part of Europe, except Finland. A limited increase in nitrate surplus (kg N per ha) is expected for the southern part of Europe. The increase results from a switch from low input crops (e.g. cereals, extensive grassland) to high input crops (e.g. intensive grassland, vegetables and permanent crops, other arable crops). This increases the application of nutrients from animal manure and mineral fertilisers per hectare, which is not offset by the increased uptake of nutrients by the crops.

Figure 4.32: Changes in nitrate surplus (kg per ha): regionalisation vs. baseline.

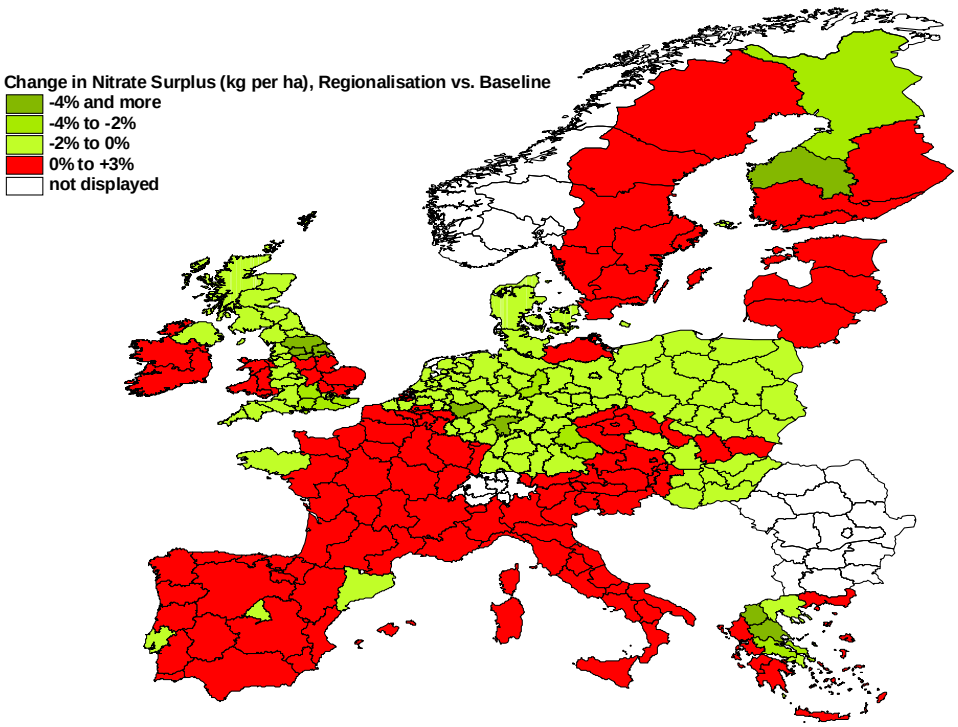
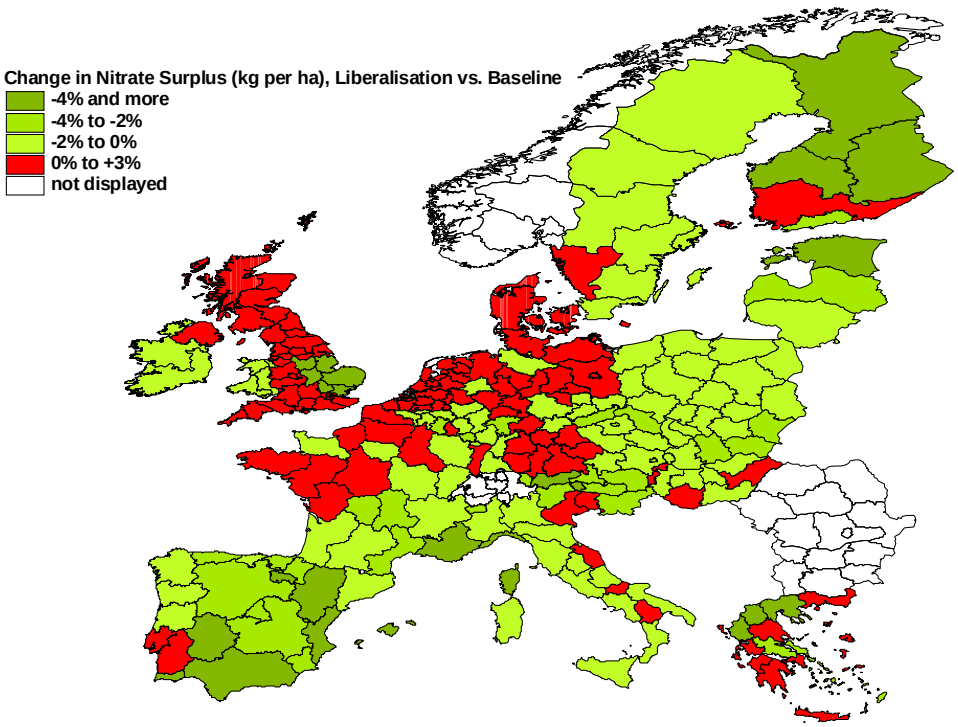


Figure 4.33 shows the effects of the liberalisation scenario. Here the picture is more complicated. An increase is expected in northwest Europe, including the Netherlands, Belgium, parts of Sweden and parts of France and United Kingdom. Also in parts of Italy, a limited increase in nitrate surplus per ha is expected. In general the explanation is the increased application of nutrients from animal manure and mineral fertiliser. Increased application of nutrients from animal manure follows the increased livestock densities regionally (other animals, dairy cows due to quota abolition). In the Netherlands, East Anglia (United Kingdom) and Norra Mellansverige (Sweden) the application of nutrients is further stimulated by a technology switch from extensive grassland to intensive grassland.

In the rest of Europe a decrease in nitrate surplus per ha is expected. Here the application of nutrients from animal manure decreases as the decrease in the number of beef cattle outweighs the increase in the number of other animals and possibly dairy cows. Moreover, regions with decreasing nitrate surpluses per ha experience a relative large increase in low input crops, including fallow land.

Figure 4.33: Changes in nitrate surplus (kg per ha): liberalisation vs. baseline.



4.3 Land use analysis (spatial modelling)

4.3.1 Introduction

In this section the results of the spatially explicit land use change modelling are presented and analysed.[51] The results of the land use change modelling add two elements to the other modelling approaches within the project. Firstly, land use and landscape changes in Europe are visualised with a detailed resolution of 1 by 1 km. Secondly, the approach is multi-sectoral and therefore addresses the whole land area, which is classified in 15 land use types (Table 4.8). Therefore the model can simulate the competition between agriculture, nature, built-up area, and other uses over the limited amount of (suitable) land in Europe. The results are analysed spatially and temporally.

[51] Included in this report is a CD with land use movies showing land use change per year for 20 years in Europe (pocket fixed upon the inside of the back cover).

Table 4.8: Land use classification used in CLUE-s.

Land use class:
Built-up area
Arable land (non-irrigated)
Grassland
(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)**
Inland wetlands*
Glaciers and snow*
Irrigated arable land
Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
Permanent crops
Forest
Sparsely vegetated areas*
Beaches, dunes and sands*
Salines*
Water and coastal flats*
Heather and moor lands*
Recently abandoned grassland (includes very extensive grassland not reported in agricultural statistics, grasses and shrubs below 30cm)

* These land use types are assumed to be constant during simulations with CLUE-s. These areas are assumed to be unsuitable for agriculture or urban expansion. This assumption is based on the adverse environmental conditions at these locations. Natural succession is assumed to be slowed down by environmental conditions.

** This class is considered to be an intermediate stage in the natural succession from recently abandoned farmland to forest. Under certain conditions succession will be so slow that the vegetation will remain in the abandoned farmland class for a long period.

4.3.2 Model settings

The modelling approach used in this analysis combines several elements that determine the spatial distribution of land use over time. In this section the model elements that are most important in this application are described: the land use claim and the scenario specification with varying spatial allocation policies.

Land area claims at national level

The first step in the modelling process is to calculate a land use claim for the three scenarios based on the results of LEITAP/IMAGE calculations at national level. In order to convert the production areas from LEITAP/IMAGE to actual areas that are used for agriculture and are in line with the land use classification, some additional conversions were carried out. Firstly, inefficiency of land was taken into account. The final land use maps have a grid size of 1 km^2. This area is totally represented by a dominant land use type, e.g., arable agriculture. Even if within this km^2 unit part of the area is not effectively in agricultural production (ditches, roads, etc.), this is compensated for in the model by a correction factor. Secondly, set-aside land was taken into account. As indicated, the LEITAP/IMAGE outputs providing the demand for agricultural area only include the area necessary for production. However, part of the farmers' land is set-aside area. This is taken

into account in the calculation of the demand for land area in CLUE-s. The amount of set-aside land was considered to vary between the scenarios. For the baseline scenario no changes in set-aside policy were included; the area set aside will remain at the level of the starting year throughout the modelling period (up to 2020). In the regionalisation scenario every country will receive an increase in set-aside area of 1% of the arable area in 2000 every year from 2014 to 2018 (5 years). In the liberalisation scenario the set-aside is abolished from 2014 to 2018 in equal steps.

Scenario settings for spatial policies

Several policies are included that influence the allocation of land use. The policies included are LFA, Natura 2000 and Urban planning policies. Table 4.9 presents the different model settings for the three scenarios in relation to these three policies.

Table 4.9: Specification of spatial policy scenario settings.

Policy	Baseline	Regionalisation	Liberalisation
LFA	Moderate LFA support: In LFA areas the suitability of arable and grassland is increased in order to represent the compensation of farmers to adverse conditions.	High LFA support: In LFA areas the suitability of arable land and grassland is strongly increased in order to represent the compensation of farmers to adverse conditions	No LFA support: No LFA compensation implemented.
Urban planning policies	New built-up area is considered to arise close to existing built-up area, but spill-over sprawl in rural areas is possible as well. This measure favours both provincial towns and bigger cities.	New built-up area is considered to arise close to existing built-up area. This measure favours both provincial towns and bigger cities.	New built-up area is considered to arise close to existing built-up area, grasslands and nature. This measure favours growth in existing urban areas and sprawl in rural/ natural area, which reflects a more liberal housing policy.
Natura 2000	All conversions from nature (forest and (semi-) natural vegetation) to other land uses are only allowed outside the Natura 2000 areas.	All conversions from nature (forest and (semi-) natural vegetation) to other land uses are only allowed outside the Natura 2000 areas. Agriculture is supported in Natura 2000 areas: In Natura 2000 areas the suitability of arable and grassland is increased. This reflects the implementation of second pillar/second axis policies in this scenario that aim to compensate farmers for unfavourable conditions in these areas.	No strict application of the Natura 2000 policy.

4.3.3 Results at European, national and HARM2 levels for EU-25

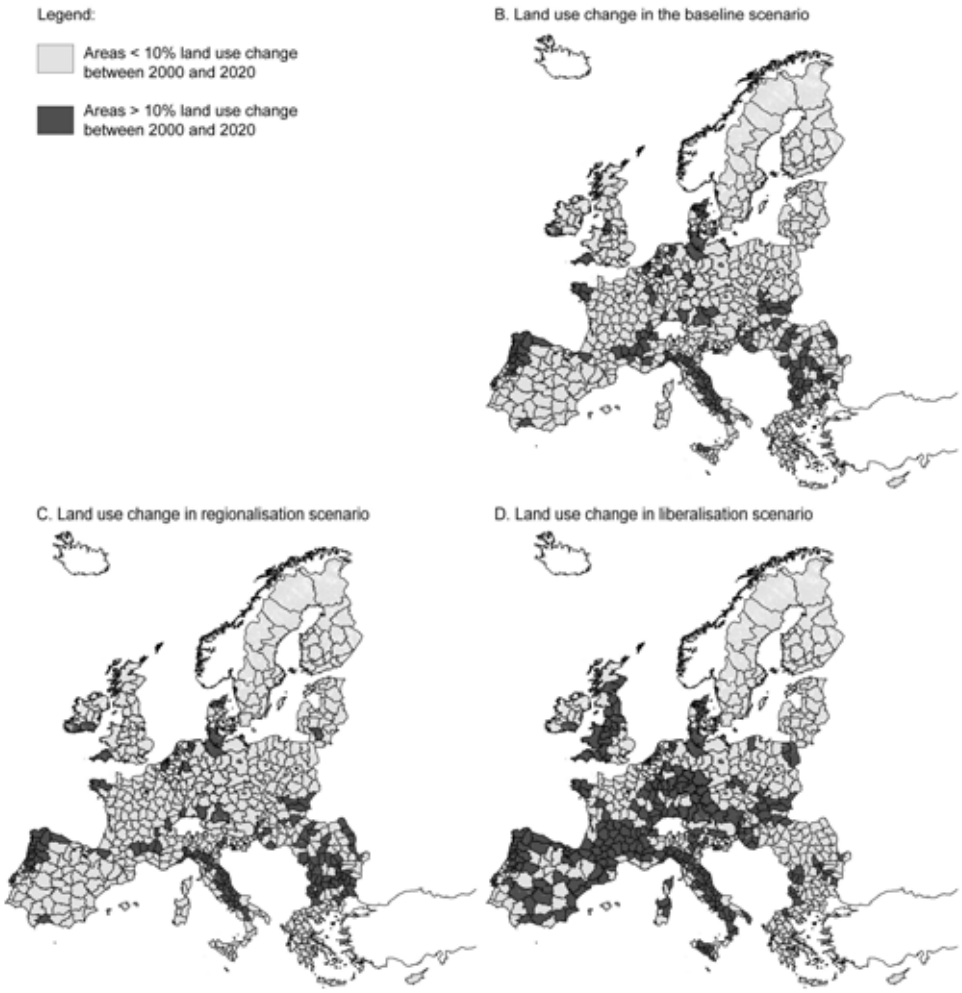
Table 4.10 shows the total area per scenario that faces a change in land use between 2000 and 2020. These transitions are the results of changes in land claim due to economic changes, but can also be the result of changes in location without a change in demand. For example, a change may occur by abandonment of arable land because of economic changes, but additionally grassland may shift to this former arable land without a change in land claim for grassland. The amount of change is highly variable between the scenarios. The liberalisation scenario affects more than 9 percent of the total land area, the baseline scenario 5.1 percent and the regionalisation scenario only 4.3 percent.

Figure 4.34 depicts regions that are projected to have more than ten percent land use change of the total area of the region between 2000 and 2020. These changes include all possible land use transitions. In the remainder of this section these changes will be split into specific transitions such as urbanisation, land abandonment and increase of nature areas. Figure 4.34 shows that the amount of land use change is different per scenario and different between regions. It is clear that not all regions in Europe are affected in the same way. Finland and Sweden are hardly affected in any of the scenarios. Italy and the northern part of Portugal show large land use changes in all scenarios. France, Germany and England show significant land use changes in the liberalisation scenario, but less change in the other two scenarios, whereas Bulgaria and Romania show the opposite. Most land use change occurs in the baseline and regionalisation scenarios. Figure 4.34 gives an overview of areas that will face large changes. This is explained thematically in more detail in the next paragraphs. The spatial and temporal changes can be viewed in more detail in the CD (Pocket).

Table 4.10: Area changed in the whole of Europe per scenario.

Scenario	Unchanged (sq km)	Changed (sq km)	Total area (sq km)	% change
Baseline	3594799	194706	3789505	5.1
Liberalisation	3440759	348746	3789505	9.2
Regionalisation	3625938	163567	3789505	4.3

Figure 4.34: Areas with over 10 % land use change (in all land use categories).



In Tables A.1, A.2, A.3 and A.4 (in Annex) the land use changes per land use type are presented per country as percentage of total land area. These results are calculated based on LEITAP/IMAGE results including the translation from pure production area to actual land areas, as explained above.

In Figures 4.35, 4.36, 4.37 and 4.38 the allocations of these land use claims are presented at the HARM2 level for respectively arable (including permanent and irrigated crops), grassland, built-up area and forest. All changes presented are relative to the area of the specific land use type in the year 2000. By comparing the changes with the maps of the situation in 2000 (maps 'A' in Figures 4.35, 4.36, 4.37 and 4.38) it is possible to see if the change involves a large area. For example, the northern part of Sweden and Finland show large changes in arable area for the liberalisation scenario. The total amount of area, however, is not very large since in this part of Europe hardly any arable area is present. The impact on the landscape is therefore small. The impact on the sector (as small as this sector is) in that area is relatively large.

For arable land the general trend indicates a decline in area except for Romania and Bulgaria (all scenarios), the Baltic States (baseline and regionalisation scenarios), Poland and Czech Republic (regionalisation scenario). The decrease in arable land is largest in the liberalisation scenario and smallest in the regionalisation scenario (Table 4.10). This is

reflected in the maps of Figure 4.35, where the regionalisation scenario has less reddish colours and the liberalisation scenario has more reddish colours as compared to the baseline scenario. For arable land we see that if the national land use claim is negative none of the HARM2 regions show an increase (which could have been the case due to relocation). However, the rate of decrease is different per HARM2 area within countries. An example of this is in Great Britain, where a relatively large decrease occurs in the western part, while in the east hardly anything changes. These changes are due to differences in suitability of the areas and competition with other land use types. In the case of arable land, large declines in arable areas are mainly found in areas where already little area was occupied by arable land. In general these are the marginal areas, and further decline may reinforce itself due to lack of facilities and market conditions. This effect is less pronounced in the baseline and regionalisation scenarios because of the support in LFA areas that was assumed as part of the scenarios. The liberalisation scenario does not include any support for the LFA areas and therefore the effect of abandonment of marginal areas is more pronounced. These results indicate that without policies such as LFA the agricultural sector will face a stronger decline in these regions.

The changes in grassland area show more spatial diversity as compared to the changes in arable land. At the country level some of the countries show an increase while others show a decrease (Table A.2). Moreover, within countries the HARM2 areas may show both an increase and a decrease of grassland areas. This effect is caused by relocation of grassland areas to replace arable land or permanent crops which are abandoned. Since in most countries the area of arable land (and permanent crops) is decreasing, the grassland areas move to the more suitable areas that were previously used to cultivate arable crops. Grassland is also relocated due to urbanisation pressure. The results of this modelling approach do not indicate if these changes occur as changes in farming system or by relocation of farms.

The built-up area is constant or increasing in all scenarios in all countries. This is because in the model it is assumed that built-up area is not converted back to another land use type even though the population is decreasing, which is the case for the Czech Republic, Hungary, Poland and Slovakia. The changes in built-up area per country are projected to be the same in all scenarios[52] (Table A.1). The model settings (urban planning policies) and differences in the competition with other land use types cause differences in the spatial allocation of the built-up area.

Forest areas are determined by the current pattern of forest and will change as result of deforestation and natural succession of abandoned farmland and scrubland into forest. Succession is determined by the time it takes for a forest to grow from (semi-) natural vegetation. The land available for forest re-growth is determined by the current quantity of semi-natural vegetation and changes in the amount of agricultural land. The scenarios projections for 2020 do not show much difference regarding forest growth since forest needs some time to grow and is therefore less susceptible to differences in scenario settings. Decrease in forest is dependent on expansion in the other land use sectors and does react to the differences between scenarios. For all scenarios southern France, Italy and the northwest of the Iberian Peninsula show an increase in forested area, which is mainly determined by succession from areas that are currently under semi-natural vegetation (mostly scrubland on formerly abandoned farmlands). In all scenarios Bulgaria and Romania show a decline in forest due to agricultural expansion. The flatter and more accessible areas in Bulgaria and Romania are projected to be deforested first to make room

[52] Small differences occur due to model settings that allow small deviations from the projected land use claim in order to get the model runs to converge.

for agriculture. Forest will remain on the higher and steeper slopes of the mountains. In the baseline and regionalisation scenarios Latvia and Lithuania show a decrease in forest because of the increase in arable land. For the liberalisation scenario the decline in forested area in Ireland is due to conversions into grassland.

Figure 4.35: Changes in arable land (including permanent crops) between 2000 and 2020.

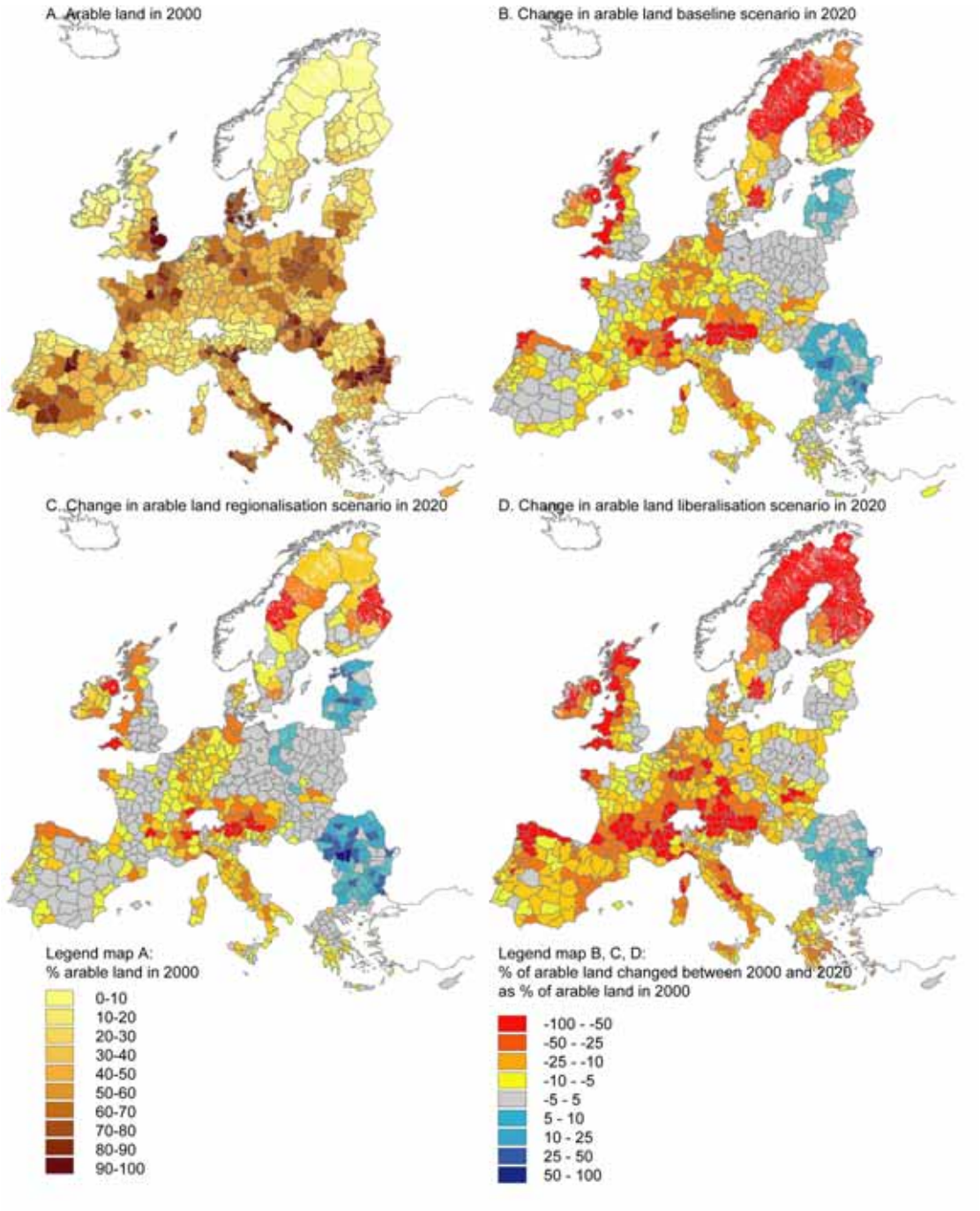


Figure 4.36: Changes in grassland between 2000 and 2020.

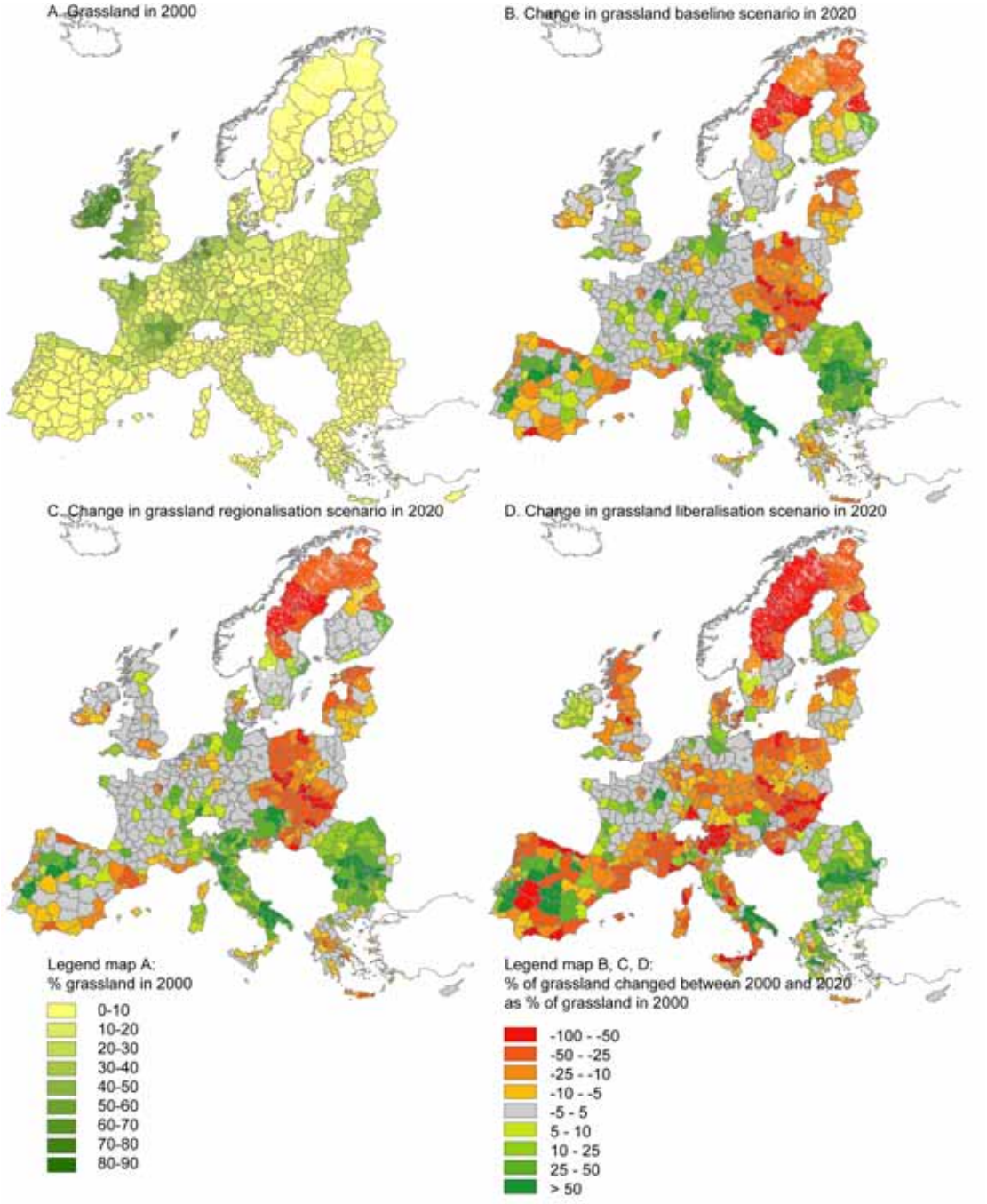


Figure 4.37: Changes in built-up area between 2000 and 2020.

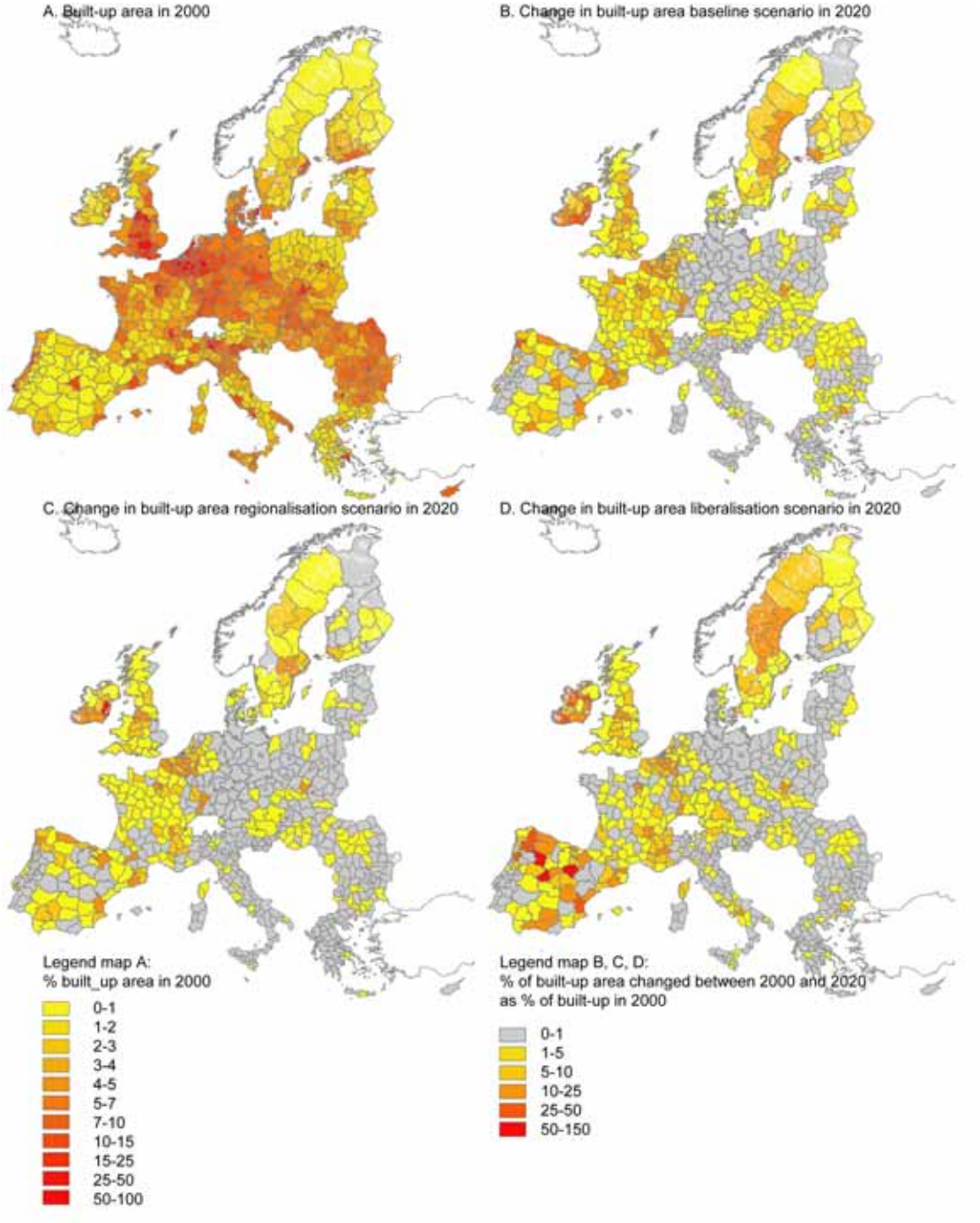
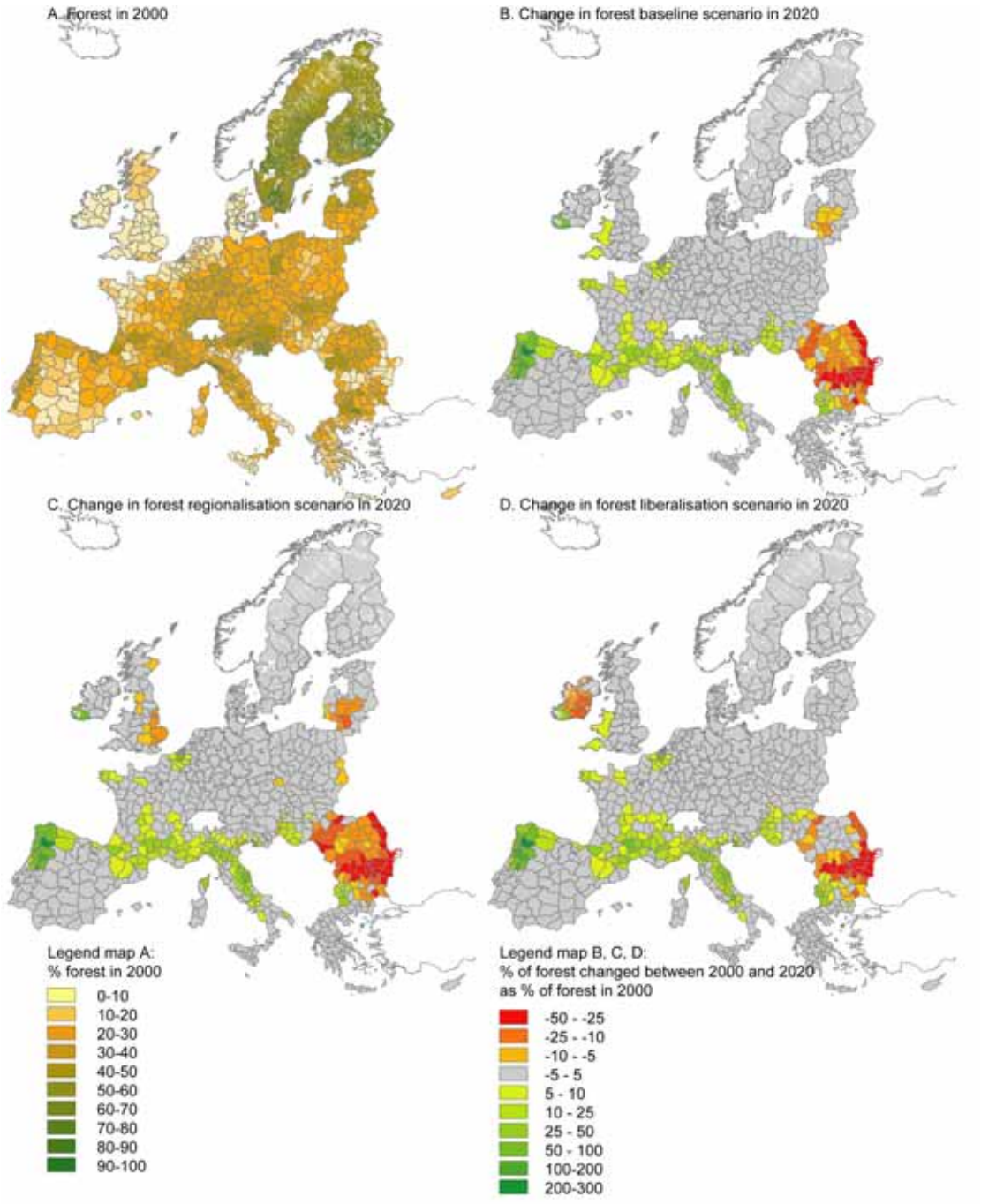


Figure 4.38: Changes in forest area between 2000 and 2020.



4.3.4 Changes in landscape pattern and characterisation of specific processes in the scenarios

In this section some examples of the land use changes observed in the simulation results described above are presented in detail. Most of these processes occur in all scenarios; however, their intensity and spatial extent are different between the scenarios.

Agricultural abandonment

Figure 4.39 shows locations where agricultural land (arable land, permanent crops and grassland) has been completely abandoned (irrigated land is considered to be stable). This analysis excludes transitions from agriculture to built area and the transitions between different agricultural land use types, such as conversions from arable to grassland. This map is based on the simulation at a spatial resolution of 1 by 1 km and gives an indication of the effects of abandonment on the landscape. The abandoned areas will gradually change into (semi-) natural vegetation (natural grasslands, herbs, shrubs) and after that into forest. These transitions depend on a succession time, which is dependent on bio-physical conditions. In areas that currently have a diverse landscape with patches of agricultural land use and natural areas, these changes often result in a more homogeneous landscape dominated by natural vegetation types.

Land abandonment has the largest extent in the liberalisation scenario, where it occurs in almost all countries in multiple hotspots. Land abandonment is less present in the baseline and regionalisation scenarios. From this high-resolution visualisation (Figure 4.39) it is clear that significant variation within HARM2 regions also exists. So, even within a HARM2 region, some areas face large changes in agrarian structure and landscape, while other areas are relatively stable. The hotspots (in red) are predominantly located in the marginal agricultural areas. For the baseline and regionalisation scenarios this effect is dampened by support from the LFA policy. In the liberalisation scenario more land is abandoned and the marginal areas are not supported by the LFA areas, which results in larger and more pronounced hotspots of abandonment. For example, due to the LFA policy, France does not show as many hotspots of abandonment in the baseline and regionalisation scenarios as it does in the liberalisation scenario. The large hotspot of land abandonment in southern Germany that occurs in all three scenarios is due to a combination of low suitability (it is a relatively marginal agricultural area) and no LFA support in any of the scenarios.

Figure 4.40 summarises the effects of abandonment combined for the three scenarios. Coloured regions indicate areas that are projected to have abandonment on more than 20% of the agricultural area in 2020 in one or more of the scenarios. Yellow indicates areas where this occurs in only one scenario, orange in two and red in three scenarios. Similarly to the figures above, the calculation of the percentages is relative to the current agricultural area. The figure indicates the effect on the agricultural sector within the region, whether the sector is large or not. For example, the Scandinavian regions will face agricultural abandonment, but only a very small proportion of the region is under agriculture in the current situation (see map 'A' of Figure 4.35). The impact on the landscape will therefore be rather small. The impact for the current agricultural sector, however, can be large.

Transition of arable land to grassland

A second process that alters the structure of the agrarian landscape is the replacement of arable land by grassland. Grassland can replace the land use in areas that are currently under arable agriculture. Areas with arable land are in general more suitable for production, though arable land out-competed grassland in the past as being most profitable in these areas. In case the land use claim (demand) for arable land decreases, the grasslands may shift to these locations. An example of replacement of arable land by grassland is in Figure 4.41. This process is projected to occur in the Netherlands, Germany, Denmark, United Kingdom France, Austria and Italy.

Figure 4.39: Detailed (1 x 1 km) map of agricultural abandonment for the three scenarios.

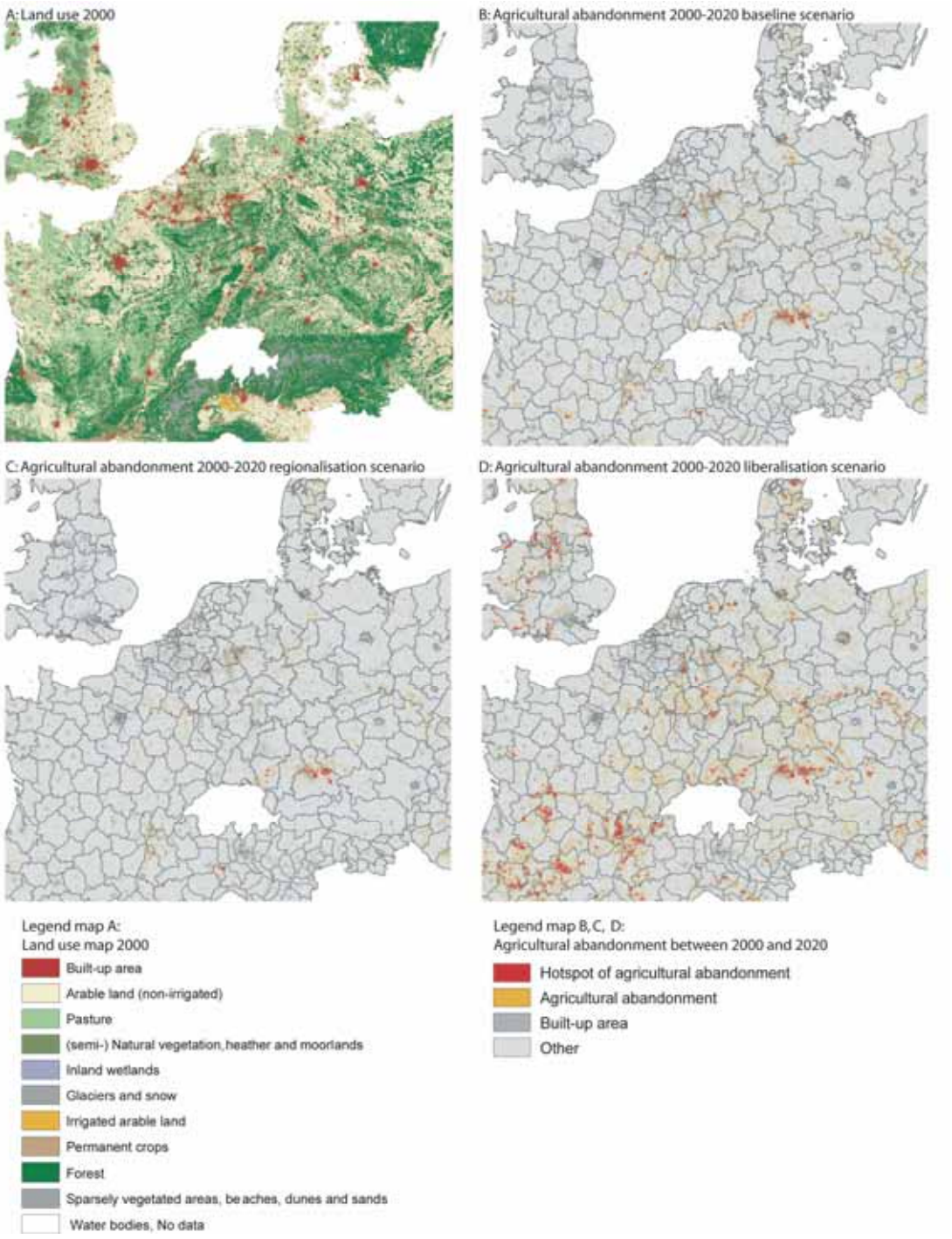


Figure 4.40: Summary of regions mostly affected by agriculture abandonment.

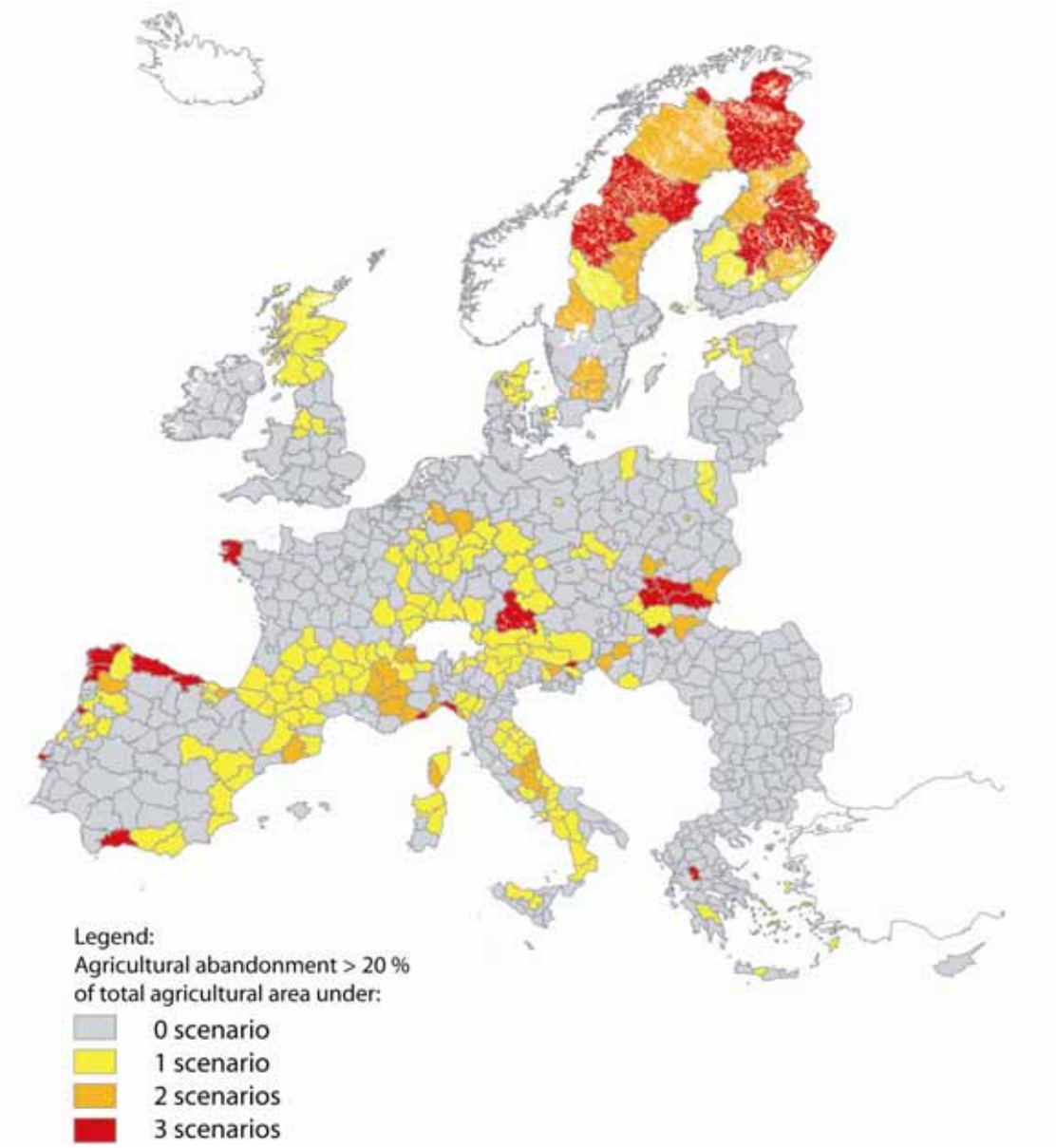
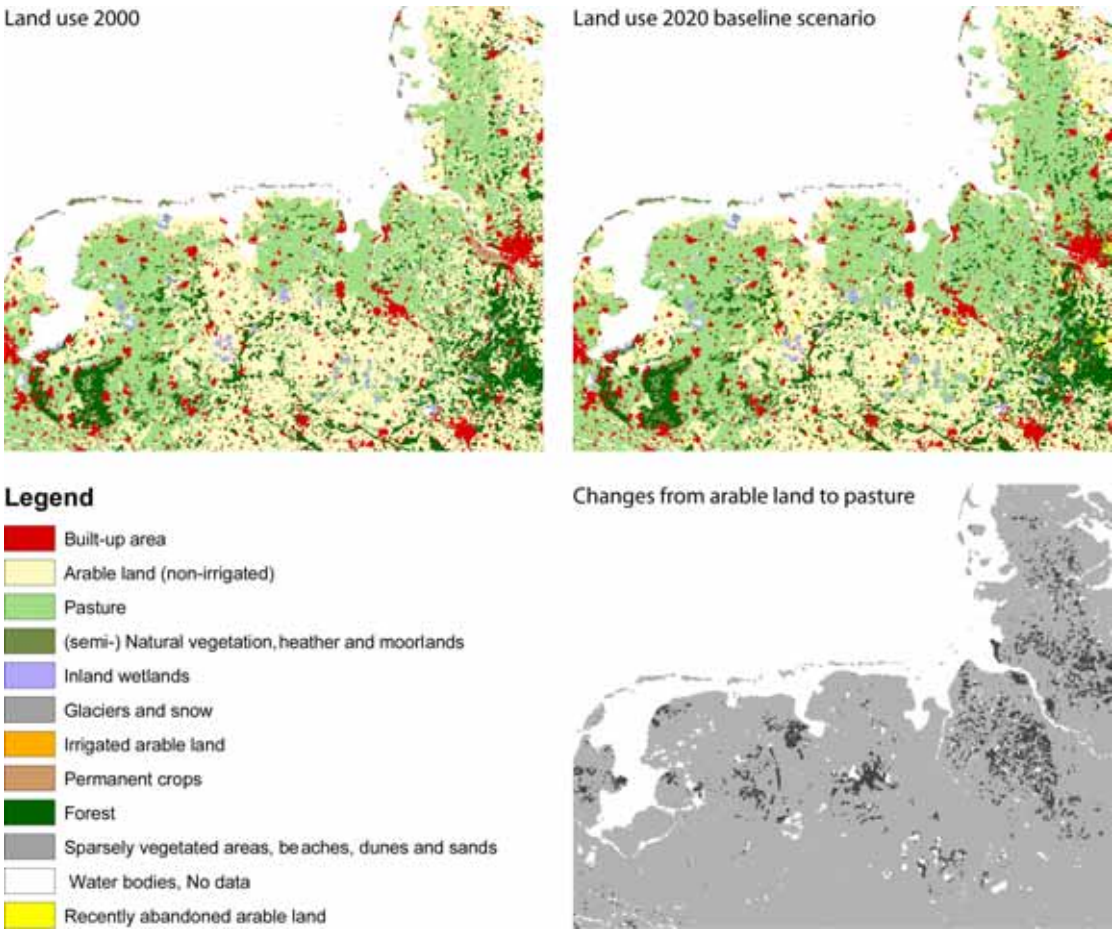


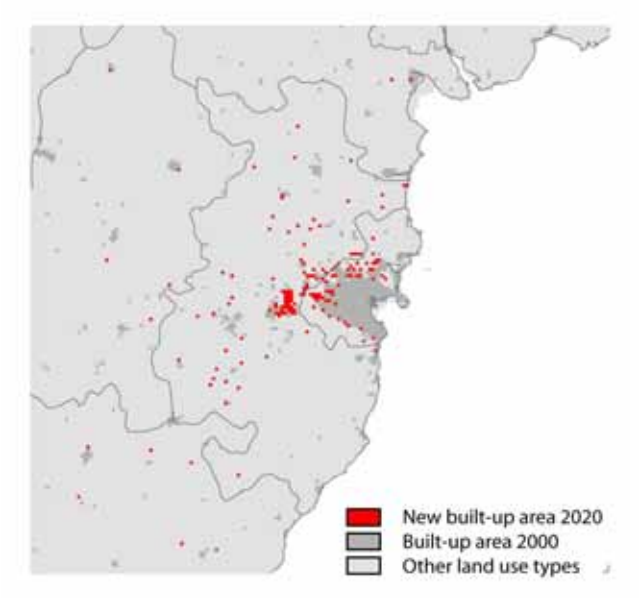
Figure 4.41: Example of arable to grassland conversion in the northern part of the Netherlands and Germany, and southern Denmark for the baseline scenario.



Urbanisation

The maps in Figure 4.37 give a general overview of the trend in built-up area per HARM2 region. Most of the changes involve a relatively small area since built-up areas do not occupy a very large area compared to agriculture in most parts of Europe. However, changes in built-up areas can have a large effect on the landscape and the surrounding functionality of the agricultural, natural and abandoned areas to meet recreational demands. To give an indication of the pattern of changes in built-up area, Figure 4.42 presents the change around the city of Dublin for the regionalisation scenario. As indicated in Figure 4.37, this is an area with large (relative to the 2000 built-up) changes compared to the other HARM2 regions.

Figure 4.42: Changes in built-up area around the city of Dublin (regionalisation scenario).



4.3.5 Concluding remarks

The results clearly indicate that land use change, and its associated effects, shows large differences across Europe. On the average, between 4 and 10 percent of the European Union's land area is likely to face changes. However, differences are large between the different Member States, between different regions within the Member States, and also within the HARM2 regions. Large areas of Europe will hardly face any change in land use or landscape. At the same time, however, some regions will face major changes with large impacts on landscape and the agricultural sector. Regional differences between scenarios are, to some extent, a result of specific policies, such as the LFA policies, but the local socio-economic and environmental conditions are also a main determinant of the patterns, in each location and region in its own specific combination.

The results at HARM2 level are aggregations of a 1 by 1 level grid, which was the level at which the calculations were performed. So local processes and local differences are incorporated in determining the changes at regional level. This is of great importance since many processes and relations between land use and their explanatory factors are scale dependent. Relations between variables that are averaged over the national or HARM2 regions can be completely different than the relation at a detailed level.

The detailed results enable a close-up interpretation of the changes to be expected, and may be a start for detailed enquiries into specific processes: e.g., what are the implications of the widespread conversion of arable agriculture into permanent grassland for farm structure and landscape? What are the consequences of abandonment for natural areas and agro-biodiversity? The results show the regions where such processes are dominant. In the aggregated results at national or HARM2 level this would not be possible. Additionally, the detailed results can be

used to obtain insight in the landscape structure, which is of great importance for many landscape services (biodiversity, recreation, etc.).

5 – SWOT Analysis on the Regional Level

The presentation of the SWOT analysis for the regional reactions in 2020 is structured into four sections:

- First, the dynamics of the rural economies are described and assessed. The economic changes that occur at regional level in the frame of the different scenario settings are considered to be the core determinative factors for the regions' strengths and weaknesses. Their general performance is assessed with regard to the baseline 2020.
- As structural adjustments in the economic world usually happen faster than changes in population development, the demographic situation of the regions in 2020 is presented and analysed with one data set in the second section.
- In the third section, a combined analysis of the demographic and the economic dynamics is undertaken and the focus is directed to those regions that negatively or positively stand out in their performance in both economic dynamics and demographic development. The employment reactions of these regions under the conditions of the regionalisation and the liberalisation scenarios are briefly described.
- Finally, the future perspectives of the agricultural sector are discussed with regard to the farm structures and the land use systems that will regionally dominate and thus shape the regional landscape.

Throughout the whole chapter, anchor points for rural development intervention needs are highlighted on the basis of the regional strengths and weaknesses[53].

As a general key note, valid for the whole chapter, it has to be emphasised that the data presented for the regions' reactions in the future stems from expert projections and simulation modelling. The assembled figures, although sound because they are based on a broad set of sources that are each solid, do not necessarily match because of differences in methodological assumptions. Hence, all figures have to be taken with care: they stand for general trends and directions of development. In particular, isolated figures should not be used as prognoses for single regions.

5.1 The dynamics of rural economies in 2020

The assessment of the regional economic dynamics between the years 2005 to 2020 is centred around the appraisal of the development of employment prospects. In a first step, the baseline 2020 situation is analysed in terms of general employment growth and the contribution of the agricultural sector to the overall employment prospects, and the strengths and weaknesses of the regions' reactions are assessed. The analysis is complemented by the discussion of selected economic key characteristics at regional level

[53] Detailed regional data were not available for the two new Member States, Bulgaria and Romania, during the period of preparing data for use in the SWOT analysis, and the analysis presented in Chapter 5 is limited to EU-25; the general conclusions made for EU-10, however, can normally be extended to these two countries.

in the years 2002/2004. Finally, the baseline 2020 situation for a selection of the weakest regions is looked at in detail.

Description of the indicators

For the analysis of the baseline situation in 2020, employment growth has been chosen as the main economic indicator, differentiated in three reaction groups:

- employment decline (<0 growth: e_decl),
- employment low growth (0 – 0.5% growth: e_lowgrow),
- and employment growth (>0.5% growth: e_grow).

As a means to integrate the contribution of the agricultural sector to the regional economy, the projected share of agricultural employment in 2020 is used as second indicator in combination with the employment growth rate. For the differentiation between regions with a low, a high and a very high share of agricultural employment, the median and the 75 percentile have been chosen as dividing figures (2.8%; 6.7%); the groups with an above median and above 75% share of the primary sector are indicated by the extension of **_agri+** and **_agri++**, and the group below the median is indicated by the extension **_agri-**.

Three types of economic reactions

The overall picture for the baseline 2020 shows that regions with declining (**e_decl**), slightly growing (**e_lowgrow**) and distinctly increasing (**e_grow**) employment are fairly spread over Europe (Figure 5.1). Overall, the positive trend predominates: 476 regions out of 596 show a low or a clear increase in employment. A few countries show no decreasing regions at all, e.g. Spain, Ireland and the Netherlands. Also Italy, Greece, Portugal, and the UK have only a few regions in which the general employment trend is negative. In contrast, decreasing types of regions are more frequent in Germany, Denmark and France and in all of the EU-10 countries.

Two types of agricultural contribution to the economy

The importance of the agricultural sector for the regional economy is displayed in two variations: Figure 5.1 splits all employment groups between the regions below and above (shaded) the median of agricultural employment (agri- and agri+). Regions with an above median share of agricultural employment are more frequent in North-Eastern Europe, Greece, Portugal and France than in Germany, the Czech Republic, Slovakia, the UK and Sweden. However, the median of 2.8% for the EU-25 regions is already quite low compared to the share of agricultural employment in total employment in EU-15 in 2002, which is 3.8%. Considerable structural changes will take place in this sector within the next 15 years.
While the sector's projected employment share in the regions below the median (i.e. 'agri-') varies between 0.01 and 2.799%, the range in the upper half stretches up to 35% and more in some Spanish, Greek and Lithuanian regions. A strong agricultural sector employment is regionally localised in Southern and Eastern Europe – Latvia, Lithuania, Poland, Slovenia, Greece and Portugal – while they are more sparsely spread in Estonia, Hungary, Spain, Italy, France and Denmark. Throughout this chapter, the differentiation of

the agricultural sector employment in low and high shares is maintained (indicated through agri- and agri+). Occasionally a closer inspection of the regions with a very high share of employment in the primary sector is added.

Strengths and weaknesses of the baseline reaction types

Analysing the distribution of the regions with a high agricultural employment share over the different employment reaction groups, Table 5.1 shows that this is not balanced: there are more high-share regions (agri+) in the e_decl group (75:45) than in the e_lowgrow (173:171) and in the e_grow group (54:78). And in contrast, in the group of regions with a positive economic trend, the majority has only a below average share of agricultural employment. In the lower part, Table 5.1 shows the distribution of the OECD type regions among the economic reaction types. Generally, there is no clear-cut distinction that intermediate rural (IN) or most urban (MU) regions have better economic perspectives than most rural ones (MR): most rural regions are represented in each of the positive e_lowgrow and e_grow groups. However, focusing on the negative trend, then most rural regions make up more than the majority of the overall e_decl group, while intermediate rural and most urban have a significantly smaller share in this group. Hence, a high share of agricultural employment tends to be related with economic weakness rather than with economic strengths. Most urban regions are clearly concentrated in the e_lowgrow and e_grow groups with low agricultural employment.

Table 5.1: Baseline economic reaction types combined with OECD rurality types.

	e_decl (Economic decline)		e_lowgrow (Slight economic growth)		e_grow (Strong economic growth)		
Base_Typ	agri-	agri+	agri-	agri+	agri-	agri+	total
total	45	75	171	173	78	54	596
OECD Typ:							
MU	10	2	70	7	29	6	124
IN	22	11	70	56	33	17	209
MR	13	62	31	110	16	31	263

The regional distribution of the economic baseline types in the old and the new Member States shows that although all baseline types comprise old and new Member States regions, there is a clear imbalance. While in the EU-15, the economic low-growing regions (e_lowgrow_agri- and e_lowgrow_agri+) make up 64% of all EU-15 regions, in the EU-10 this group comprises only 33% of the EU-10 regions. The positively developing regions make up about 20% in both groups, the EU-15 and the EU-10. In contrast, the declining regions have a share of roughly 45% in the EU-10 regions against 16% of the EU-15 regions (Table 5.2). It is evident that the EU-10 comprises many more regions with a difficult economic perspective than the EU-15.

Table 5.2: Baseline reaction types in the EU-15 and EU-10.

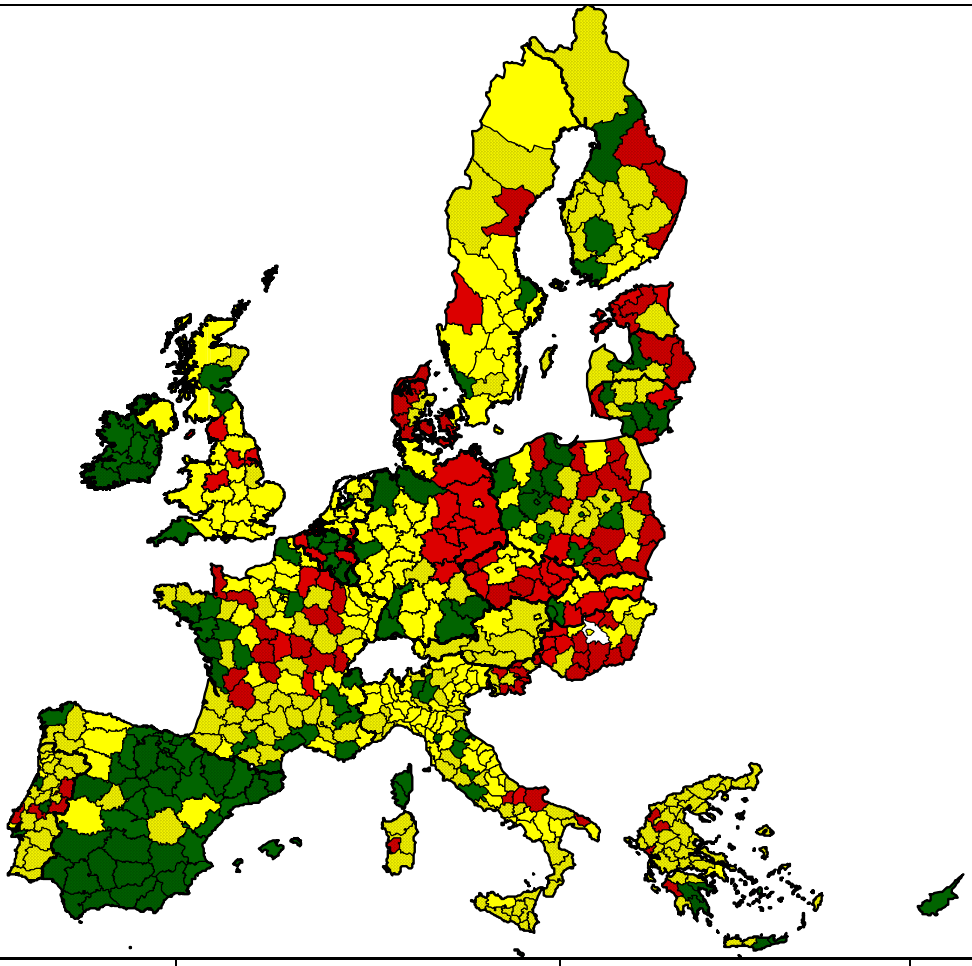
	e_decl_agri- (Economic decline / low % agriculture)	e_decl_agri+ (Economic decline / high % agriculture)	e_lowgrow_agri- (Low economic growth / low % agriculture)	e_lowgrow_agri+ (Low economic growth / high % agriculture)	e_grow_agri- (Economic growth / low % agriculture)	e_grow_agri+ (Economic growth / low % agriculture)	total
EU-15	24	39	151	154	62	45	475
EU-10	21	36	20	19	16	9	121
Total	45	75	171	173	78	54	596

In terms of regional **strengths and weaknesses**, an employment decrease is considered as a clear weak reaction, an employment increase is typically a strong reaction. Stagnation, as described by the indicator 0 – 0.5% growth rate, is seen as a moderate strength or as a positive potential that has to be carefully checked in the context of other regional characteristics. **In this respect, the large share of 476 regions shows a moderate to substantial economic strength** (Table 5.3). Potential labour force in agriculture can boost economic growth once there are employment opportunities in industry and services. This specific strength can possibly be used in the 54 regions (nearly 10% of all regions) that have a high share in agricultural employment and that are in the high growth group. Decline in employment is considered as a sign for regional weakness, as is the case for altogether 120 regions. Here, a high share of the agricultural sector can be an additional risk factor, because of potentially hidden unemployment in this sector.

Table 5.3: Strengths and weaknesses of the baseline reaction types.

Basetyp	N	Typical reaction	Strength / Weakness	Appraisal
1. e_decl_agri-	45	Employment decrease	Strong weakness	Critical
2. e_decl_agri+	75	Employment decrease and high share in agriculture	Strong weakness, vulnerable to structural changes in agriculture	Critical
3. e_lowgrow_agri-	171	Stagnation / low increase	Moderate strength	Not critical
4. e_lowgrow_agri+	173	Stagnation / low increase / high share in agriculture	Moderate strength, vulnerable to structural changes in agriculture	To be observed
5. e_grow_agri-	78	Increase	Strength	Not critical
6. e_grow_agri+	54	Increase and high share in agriculture	Strength	Not critical

Figure 5.1: Baseline employment reaction types in 2020[54].



	Employment growth per year (%) (prognosis for 2020)	Share of agricultural employment (%) (prognosis for 2020)	Basetyp
1. Red	< 0	< 2.8	e_decl_agri-
2. Red with black points	< 0	> 2.8	e_decl_agri+
3. Yellow	0 – 0.5	< 2.8	e_lowgrow_agri-
4. Yellow with black points	0 – 0.5	> 2.8	e_lowgrow_agri+
5. Green	> 0.5	< 2.8	e_grow_agri-
6. Green with black points	> 0.5	> 2.8	e_grow_agri+

Structural and socio-economic characterisation of the baseline 2020 reaction types

It is not within the scope of the study to consistently explain the regions' behaviour under the baseline scenario. However, in order to back up the appraisal of the perceived strengths and weaknesses of the regions' reactions and with the objective to identify possible anchor points for policy measures, a brief analysis of the regions' key characteristics in 2002/2004 is presented in the following, as far as figures are available area-wide.

[54] Based on absolute growth rates.

Sectoral employment situation for the EU-25 regions in 2002

As described in Section 4.2.1 (and see also Section 4.2.7), the sectoral distribution of employment differs considerably between the EU-10 and the EU-15. In general, the service sector is the most important in terms of employment and GVA. On the average, 63% (median) of the labour force is engaged in this sector, and the share of employment corresponds largely to the share of GVA of the service sector with regard to the total GVA. The service sector is currently the sector increasing the most within Europe. Regions with a dominant service sector share are mainly located in North-Western Europe and along the French and Italian Mediterranean coast. The industry sector is the second most important sector. Basically, the employment in the industrial sector tends to have a stable towards declining trend (with some regional exceptions). During the last decades, a restructuring of the manufacturing sector has taken place and is still going on in the EU-10, in which large standardised production is dislocated to low wage countries; and more niche products or products relying on flexible production technologies are, on the contrary, developing (SERA study, 2006:85). Slovakia, the Czech Republic as well as wide parts of Hungary and regions in other new Member States stand out by the relatively high importance of industrial employment. The importance of the primary sector increases towards the borders of Europe. For Portugal, South-West Spain, Southern Italy and Greece as well as for great parts of Slovenia and Hungary, Poland, Lithuania, Latvia and Estonia, the primary sector has a relatively high importance for the employment situation. More than 13.4% of the labour force is engaged there. This group of new Member States tends to reveal a below-the-average productivity. The UK, Germany, the main parts of Sweden, Belgium, the Netherlands, Denmark, northern Italy and eastern France are European zones with a below-the-average importance in the primary sector.

The sectoral employment structure in the year 2002 of the baseline types reflects clearly the difference of the regions with or without a higher employment share of the agricultural sector (see below Table 5.4, column **av. empl agri**). With regard to the other sectors, it is obvious that the 'strong' reaction types (e_lowgrow and e_grow) have a higher share of the service sector than the e_decl group. Hence, in 2002 the better performing regions already disposed of a structural advantage compared to the declining regions.

Table 5.4: Average sectoral employment structure of baseline types in 2002.

BaseTyp	N	avg empl agriculture	standard deviation	avg empl industry	standard deviation	avg empl services	standard deviation
e_decl_agri-	45	4.9	3.8	32.5	9.0	62.66	10.23
e_decl_agri+	75	16.3	11.9	28.9	8.5	54.74	11.00
e_logro_agri-	171	3.7	3.3	28.8	8.7	67.49	9.94
e_logro_agri+	173	16.1	11.4	24.5	7.9	59.39	10.98
e_grow_agri-	78	4.4	3.8	28.1	8.4	67.55	10.06
e_grow_agri+	54	14.9	10.8	27.4	7.8	57.76	9.34

Material quality of life situation in the EU-25 regions in 2002/2004

As thoroughly discussed in Section 2.1.5, the concept 'quality of life' designates the general well-being of individuals, which depends on the availability of tangible and intangible goods and on personal capacities, rights and values that can or cannot be realised in one's private living sphere and under one's working conditions. From the literature survey it became obvious that there is ample discussion on the range of welfare related issues and items which generally allows the identification of indicators that can be used to describe structural conditions (such as access to education and health services). However, it is also acknowledged that the concept also integrates the subjectively perceived aspects of life quality, like satisfaction, happiness, safety, etc., that cannot be grasped by objective indicators in a quantitative way. Hence, it goes without saying that this aspect cannot directly be taken into account within the regional SWOT analysis.

Within this context, material key indicators for quality of life (QoL) in 2002/2004 have been chosen that serve as a proxy for the regional wealth and material life quality and can be related to the indicators and trends that change in the course of the scenarios. These key indicators are:

- **GDP/capita** measured in Purchasing Power Parities (pps) as an expression of the regional material wealth and individual options to satisfy material needs in the broadest sense. A growing GDP/cap also gives a hint for changing preferences in (food) consumption towards health and well-being concerns and an increasing demand for quality products (cf. Section 2.1.5). However, as GDP/cap reflects the average regional income, it is only a rough proxy of the collective individual material wealth and thus provides a limited estimation of overall social well-being.
- **The unemployment rate** as an indicator for the possibilities and limits to find work within the regions. The unemployment rate is here considered as both an economic and a socio-psychological indicator that represents the existing work options for a region's inhabitants. That is, this indicator is used here to represent, *grosso modo*, the general subjective ambiance of a region in terms of looking more optimistically or pessimistically into the (economic) future.

A general look at the distribution of the average GDP/cap and the unemployment rate between the regions in the EU-15 and the EU-10 shows that everywhere the GDP/cap is higher in the most urban (MU) regions than in the intermediate (IN) and the most rural (MR) regions (Table 5.5) The differences between these OECD types are clearly stronger in the EU-10 than in the EU-15. With regard to the unemployment rate, the situation is different: while in the EU-15 the unemployment rate in rural and intermediate rural areas is distinctly higher than in the urban regions, it is the contrary in the EU-10 where intermediate and most rural areas have the lower unemployment rates. Hence, the consideration of unemployment has to take this general difference into account.

Table 5.5: Economic status of the different regional types (2002/2004).

	EU-15			EU-10		
	MU	IN	MR	MU	IN	MR
GDP/capita (%)	100	82	72	100	69	57
Unemployment rate (%)	100	129	127	100	87	93

The material life conditions of the EU-25 regions in the year 2002 as expressed in average GDP/cap show two clear tendencies (Table 5.6): (1) all declining employment types have an average GDP/cap that lies below the overall EU-25 average of 18,430 EUR and (2) all the base types with a very high share of agricultural employment comprise mostly regions with a below average GDP/cap. The differences between the low-growing and the growing employment types are less pronounced here than those between the declining types and the others.

Table 5.6: Average GDP/cap (pps) in the year 2002 for baseline types.

BaseTyp	N	Average GDP/cap	standard deviation	Minimum GDP/cap	Maximum GDP/cap	% EU avg GDP
e_decl_agri-	45	15,787	9,097	5,801	67,136	86
e_decl_agri+	38	16,213	5,931	5,777	26,042	88
e_decl_agri++	37	11,457	4,956	3,990	23,790	62
e_lowgrow_agri-	171	22,060	7,116	6,655	66,852	120
e_lowgrow_agri+	86	19,667	5,364	6,591	41,885	107
e_lowgrow_agri++	87	14,222	4,568	4,594	27,304	77
e_grow_agri-	78	21,083	6,464	6,943	45,026	114
e_grow_agri+	29	17,798	5,720	7,288	32,593	97
e_grow_agri++	25	14,923	4,616	5,416	22,748	81

From this highly aggregated picture, it cannot be deduced that regions with a low average GDP/cap have generally less potentials in employment creation than 'wealthy' regions: e.g. the column with the minimal GDP/cap shows that regions with an average GDP/cap below 8000 (pps) are represented in all baseline types. However, it seems that 'money helps' – because on the whole, the regions with a positive reaction in the baseline scenario (e_lowgrow and e_grow) have generally higher averages. This is especially valid for the baseline types e_lowgrow_agri-/+ and e_grow_agri-/+. Here, higher averages in the GDP/cap stand for better possibilities to achieve a good standard in health and education services, infrastructures and other public services. High GDP/cap is equally an indicator for changing consumer preferences towards more quality consumption in food and other goods as well as for changing lifestyles (for change of lifestyles, values and preferences see Inglehart and Welzel, 2005).

The unemployment rate in 2004 at regional level is taken as an indicator for the lack of job opportunities and, hence, the regional weakness for offering to people a good livelihood perspective (Table 5.7). For the baseline types that have a small agricultural employment

share (_agri-), the differences are striking: the average unemployment rate for the e_decl_agri- region is 12.2%. Unemployment rates have been nationalised (in % of the national average), and column 5 of Table 5.7 shows that the regions of the economically declining baseline types all have an average unemployment rate that outreaches the standard, especially in the case of the e_decl_agr- Basetyp. The unemployment rates in the low-growing (e_lowgrow_agri-) and in the growing (e_grow_agri-) baseline types are comparatively low at 7.8 and 9.3%, and these baseline types comprise regions that are more than 10-12% below their national averages.

Table 5.7: Average unemployment rate in the year 2004.

BaseTyp	N	Average unemployment	Standard deviation	% national unemployment	Standard deviation
e_decl_agri-	45	12.2	6.7	127.8	47.5
e_decl_agri+	38	10.1	5.7	103.7	32.0
e_decl_agri++	37	10.8	6.4	109.5	39.8
e_lowgrow_agri-	171	7.8	4.6	90.7	35.5
e_lowgrow_agri+	86	8.2	3.7	97.5	35.9
e_lowgrow_agri++	87	10.9	5.1	111.2	51.4
e_grow_agri-	78	9.3	4.9	88.2	25.3
e_grow_agri+	29	11.2	6.0	101.8	33.2
e_grow_agri++	25	10.3	4.5	96.4	38.9

Summarising the findings on GDP/cap and unemployment rates (2002/2004) for the baseline 2020 types, it can be maintained that:

- There are large differences between the EU-15 and the EU-10 regions.
- A regional strength in economic growth is not directly linked to above average GDP/cap, as can be seen by a large number of regions with a relatively low GDP/cap that are represented in the positively performing baseline types.
- High unemployment rates, which are similarly clearly above the respective national average, can mostly be found for those baseline types that have a weakness in economic growth. For the economically growing baseline types, even higher unemployment rates tend to be around the national average.
- A high share of agricultural employment in 2020 is mostly observed for regions that come from rather unfavourable socio-economic conditions in 2002/2004: the baseline types with an above 75 percentile agricultural employment have below average GDP/cap and elevated unemployment rates. This does not mean that within this type of regions positive employment development is not possible, as there is a group of 25 regions with such a high agri-employment share (e_grow_agri++) that displays a clear positive reaction in terms of employment creation.

Selected examples for economically declining reaction types

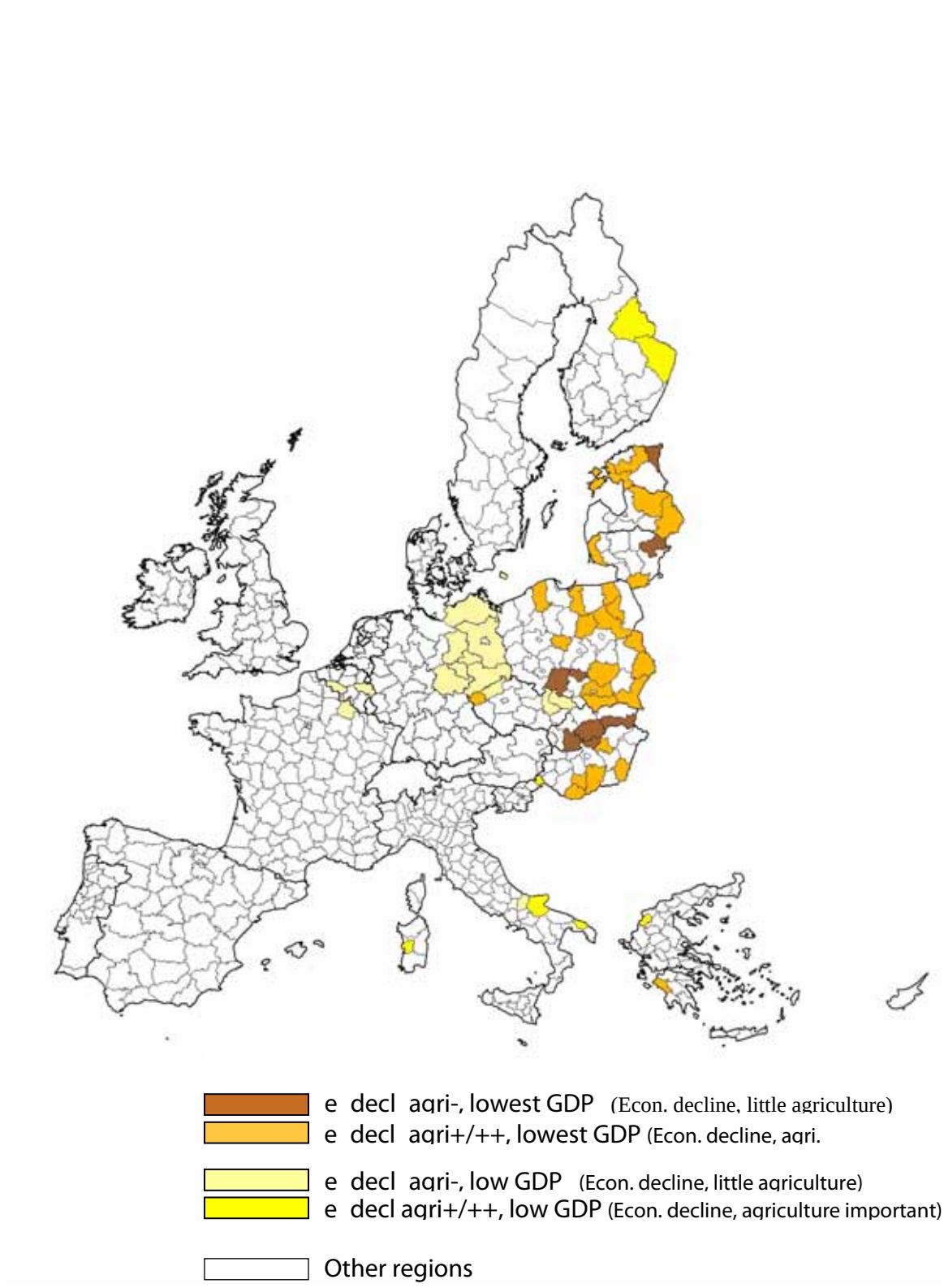
As has been emphasised, 476 out of 596 regions of the EU-25 show a positive reaction in employment growth under the conditions of the baseline scenario, and this reaction is frequent for all rurality types, hence there is generally a positive future for both rural and

urban regions. However, one-fifth of the regions show a negative trend, of which a majority is located in the EU-10. In order to focus more in detail the variety of regions that react with declining employment rates in the baseline scenario (e_decl), a selection of four different groups is presented in Figure 5.2 and discussed in the following.

Regions with weak economic reactions in the EU-10

The selected economically declining regions in the EU-10 have a low material wealth situation in 2002 (GDP/cap in 2002 below 10,000 euros with two exceptions) and high unemployment rates around 15%. Their economies mostly remain under a strong agricultural orientation: 26 of these 34 regions have a projected high share in agricultural employment and of these, 17 even have a very high share (> 6.7%). From the map it can be seen that regions with a low share of agricultural employment (coloured in ochre) are most numerous in Poland, and here they even form a connected structure all along Eastern Poland.

Figure 5.2: Four different groups of economically decreasing regions.



Besides Poland, the Baltic States, Slovakia and Hungary are concerned with grouped regions of this type while in the Czech Republic and Greece, there is only one in each country. The fact that there are several regions of a similar type close to each other is considered as reinforcing the weakness, because people have to move farther away for working opportunities. The low material wealth can constitute an advantage when it is reflected in regional wages and costs. In this case, the agricultural sector that has a considerable size might still act as a buffer for low paid, unskilled labour force. Therefore, the competitiveness of the agricultural sector and the enhancement of labour intensive innovations in the sector and in related fields like food processing manufactories could be an objective of political decision making.

The second group of economically declining regions in the EU-10, which combines a high unemployment with a very low GDP/cap, dominates in Southern Slovakia and Southern Poland and comprises two regions in Estonia and Lithuania (coloured in brown). These regions have (had) a more industrial vocation in the past that offers no pathways for a positive economic turn towards 2020. Especially in Slovakia, where these regions form quite a large block, a political reaction to this structural challenge is important. Rural development measures towards economic diversification can be an accompanying means to more general structural interventions.

Regions in the EU-15 with a weak economic reaction and weak starting conditions

In a similar situation, but on a higher economic level, are the third and fourth groups of regions, which are displayed in light yellow and yellow in Figure 5.2. Just as the brown regions in EU-10, the light yellow regions comprise mostly old industrial areas in the EU-10 with a low share of agricultural employment, which have already undergone important structural changes of the industrial sectors and are marked by a relatively high unemployment rate together with a low GDP/cap in the EU-15 comparison in 2002/2004 (average 15,000 EUR). The new German *länder* serve as an example for this group of regions, where the structural changes of economic adjustment in the 1990s were so severe that massive financial transfers could not prevent the continuity of a general declining trend. Hence, the expectation for these regions under the baseline 2020 scenario is still that employment continues to decline. However, this example shows also that the level of analysis is still very aggregated: there are (smaller) regions within the new *länder* that have stabilised economically and attract industrial and service sector investments, such as computer industries in Saxonia or the tourism sector in Mecklenburg-Western Pomerania. Hence, ideally the analysis of regions' strengths and weaknesses has to be downscaled to identify potential nuclei of new economic development and to adjust political intervention accordingly.

The last group of economically declining regions is characterised by a projected high agricultural employment share and combines a low GDP/cap with a high unemployment rate in 2002/2004. In this group there are only a few regions that are in the remotest areas of Greece, Italy and Finland (yellow in Figure 5.2). Although they constitute the regions that will undergo the most accentuated economic difficulties within their countries under the baseline scenario, the phenomenon is not a widespread occurrence. Hence, the necessity for specific political measures has to be checked carefully.

5.2 Typical reactions of regions: demographic developments

Summarising the current situation (referring to Section 2.1.1)

The analysis of the current demographic trends highlighted that natural population growth (birth/death ratio) and migration are the drivers for the total demographic development. It was observed that in the EU-25 the birth/death ratio is constantly sinking towards 1 in all regional types (Table 2.2). This means that if substantial population growth happens then this must mainly be the result of a surplus in-migration.

Migration and out-migration are considered as an important characteristic of the regions, thus representing strengths or weaknesses of a region. Frequently population growth goes together with a positive economic development. However, it cannot *a priori* be defined whether in-migration is **a result** of the economic strength of a location or if it is **the cause**. For example, economically prospering regions, like in Spain and Ireland since the late 1990s, attract a considerable number of worker migrants who move in for a certain length of time or even permanently. In the case of Poland, it is reported that between 250,000 and 500,000 Polish citizens are at work in the UK and Ireland in 2005 (Sueddeutsche 26/27 Sept. 06). However, rural regions with a good life quality in terms of natural beauty and relatively low prices for housing, etc., can also exert attraction for in-migration of well-off people who have those preferences. This is the case, for example, in some regions in South-West France and along the Spanish Mediterranean coast where in-migration is a result of the natural conditions. Both forms of migration have in some regions already reached such a considerable number that this actually makes a difference for the total population development. A third form of migration occurring is the sub-urbanisation and counter-urbanisation movements that happen around urban and metropolitan areas. In these cases, mostly young families are seeking more space for family life and playing area for children. Obviously, these different forms of migration are also typical for certain periods in human life and hence correspond with age groups (that of course have to be characterised by further socio-economic characteristics such as material wealth and lifestyle preferences, etc.).

As a general tendency between 1990 to 2004, it was observed that the share of regions with a positive demographic development, comprising both natural population growth and/or in-migration, decreased from 65% to 56% in the first half of the 1990s and then rose again back to roughly 65%. While in most urban regions natural population growth was highest, intermediate regions profited especially from in-migration, a phenomenon that is explained with sub-urbanisation and counter-urbanisation trends.

Analysis of the projected situation

The projected figures for 2020 reveal as a general trend the decline in the number of regions with a positive demographic development: only 292 out of 598 regions (49%) belong to a cluster with a positive or stable growth rate. The reactions differ quite distinctly between the regions in the EU-15 and in the EU-10. While in the EU-15 approximately 50% of all regions belong to clusters with an increasing or a stable positive growth rate, we find more than 80% of EU-10 regions in a decreasing or a stable negative growth rate cluster (Table 5.8 below). Based on the observations made during the 1990s and in the early years of the first decade of the 21st century, it seems likely that people continue to move to the EU-15 regions. However, a certain counter-moving trend might

occur, in the sense that working migrants will return to their home countries for social and life quality reasons within the considered time frame of 15 years. There is anecdotal evidence that already today private construction in Eastern Europe is frequently financed by people working abroad.

Regrouping the regions according to the OECD typology shows that 63% of the MU regions and 55% of the IN regions belong to an increasing or stable positive cluster, while only 39% of all MR regions belong to these two clusters. Also, it is mostly the MR regions in the EU-15 that are characterised by this advantageous situation, while in the EU-10, MR regions with a positive demographic development make up only 10%. Here, the MU and the IN regions tend to have a more favourable demographic situation in 19% and 18% of the regions, respectively.

Table 5.8: Share of regions per demographic cluster and OECD type (%).

	EU-25			EU-15			EU-10		
PT-Type	MU	IN	MR	MU	IN	MR	MU	IN	MR
increasing	43	37	30	49	45	36	14	11	6
stab pos	20	18	9	23	21	10	5	7	4
stab neg	9	13	25	4	9	21	33	24	41
decreasing	28	32	36	25	25	33	48	59	49
	100	100	100	100	100	100	100	100	100

The relatively good expectations for the intermediate and most rural regions in the EU-15 compared to those in the EU-10 are also confirmed in Table 5.9, by comparing the number of inhabitants in 2000 and 2020 per rurality type. Nevertheless, most rural regions have a distinctly lower positive change rate than intermediate rural ones. Intermediate rural regions also have the best perspectives in the EU-10 with only a small decrease of -1% on the average.

Table 5.9: Number of habitants in OECD types 2000 to 2020 (in 1,000).

		EU-25			EU-15			EU-10		
		MU	IN	MR	MU	IN	MR	MU	IN	MR
2000	Average	1689	716	343	1845	741	321	965	627	433
	StDev	1474	578	337	1560	630	346	590	332	281
2020	Average	1905	801	342	2124	852	340	887	623	350
	StDev	1892	678	355	2008	738	340	504	361	414
Change avg (%)		10	12	2	14	16	5	-6	-1	-11
Chan. StDev. (%)		22	29	25	22	30	21	9	19	34

Summarising the cluster analysis and projection calculations for the rural demographics, seven different typical reactions of regions have been identified (cf. Section 2.1.1) that can be regrouped into four groups (Table 5.8). These characteristic reactions are briefly described and assessed for their strengths or weaknesses in the following.

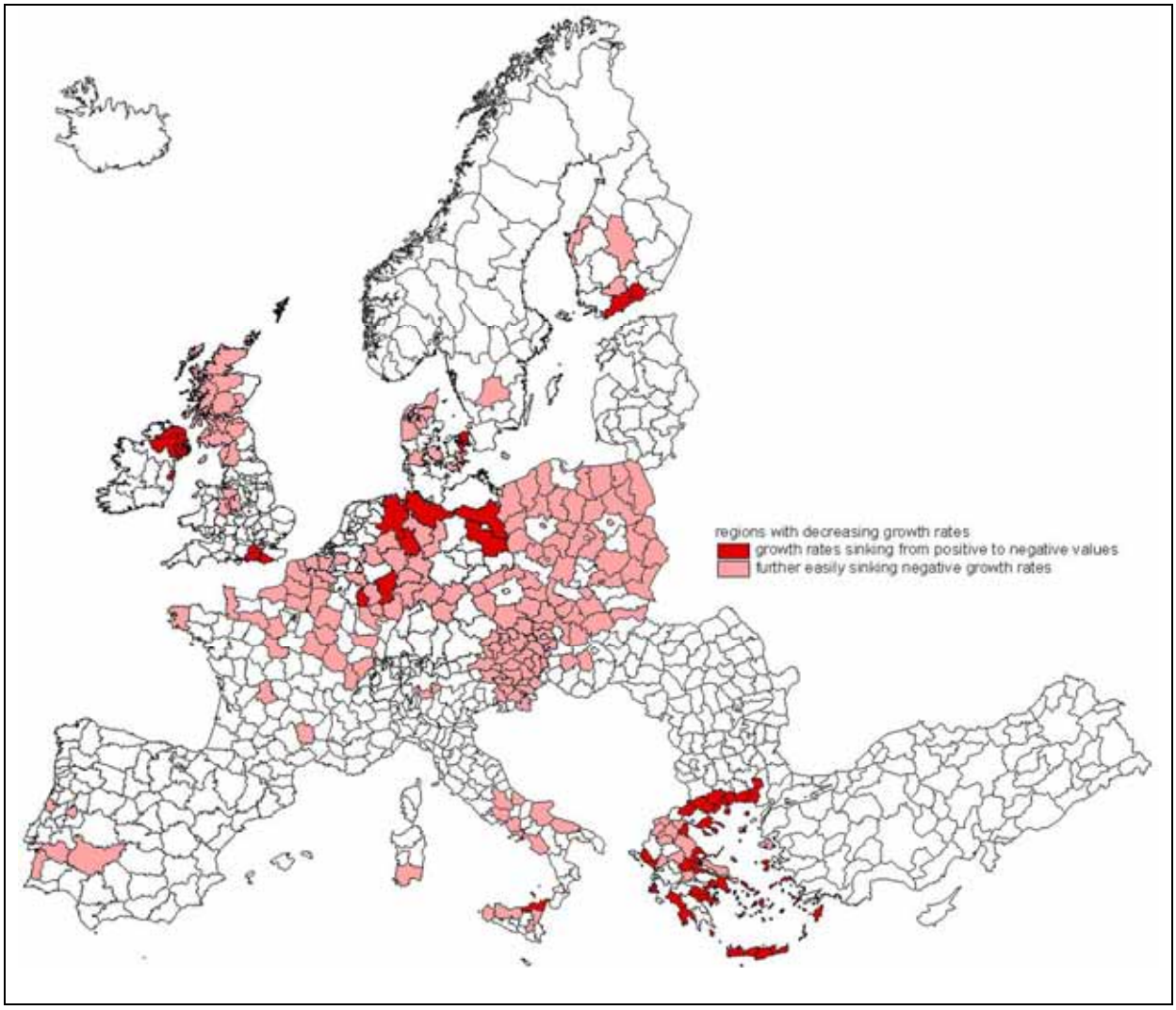
Regions with a **decreasing demographic development** are comprised in clusters 2, strong decline, and 3, continuous decline (Table 5.10 and Figure 5.3). Regions of the **strong_decline** cluster have had positive demographic developments in the past but the growth rates are sinking and take the most negative down-turn of all clusters until 2020. These regions are located in the EU-15 only and comprise mainly most rural regions (dark red in Figure 5.3). Some are located near to important urban areas (e.g. in Germany, the UK and Finland) that might have profited from sub-urbanisation – a trend that for instance came to a stop in the first years of the 21st century around Berlin, Germany. It is in these regions that the original life quality assets of rurality might be threatened through fast sub-urbanisation and area-consuming construction. In contrast, a continuous decreasing trend is presented by the regions of cluster **cont_decl** that is at the same time the largest group with 157 regions (light red in Figure 5.3). These regions, where the population decline already started in the 1990s, are spread over Western and Eastern Europe, with a specific concentration in Poland, the Czech Republic and Slovakia, Austria, Germany and Belgium. Among the regions within cluster 3, there is a dominant group of most rural regions in the EU-15. Also in the EU-10, the intermediate and the most rural regions dominate by far (Table 5.11). This cluster seems to comprise regions that presumably cannot easily counterbalance the weakness of demographic decline, especially in the situation where several regions are connected. Both clusters with a decreasing development are therefore considered as 'critical' (Table 5.10).

Table 5.10: Typical demographic reactions revealing regional strengths or weaknesses.

N°	Cluster name	Typical reaction	Comment	Appraisal
39	Strong decline (strong_decl)	Weakness: Strong negative from positive	Former gain from sub-urbanisation, possibly future loss of life quality	Critical
157	Continuous decline (cont_decl)	Weakness: Decline from slight negative	Some old industrial areas in EU-15, large areas in Poland, Czech Rep., Slovakia, Slovenia	Critical
102	Stable negative (stab_neg)	Moderate Weak.: Stable negative dev.	Scarcely populated areas	To be observed
84	Stable positive (stab_pos)	Strength: Stable positive development	Economically strong regions mostly in EU-15	Not critical
103	Future increase (future_incr)	Mod. strength: From negative to positive	Southern Europe, UK, South Sweden, some Baltic regions	Not critical, To be observed
82	Positive increase (pos_incr)	Strength: Increasing positive growth	Continuity in growth since the 1990s	Not critical
23	Western increase (west_incr)	Strength: Strongly increasing positive growth	Mainly Ireland and Spain, growth induced by economic expansion	Not critical

Two clusters show a **stable demographic development** over the considered time span, cluster **stab_neg** on a negative level (around -0.6/-0.8) and cluster **stab_pos** on a positive level (around 0.6). Regions in the cluster stab_neg comprise mainly the scarcely populated rural areas – roughly 20% of the EU-15 MR and 41% of the EU-10 MR. These regions have already gathered experience with negative population development in the past and in some countries, such as in Scandinavia, pro-active strategies to counterbalance infrastructural difficulties, etc., have already been developed (violet regions in Figure 5.4). Although a negative growth rate is clearly considered as an unsustainable phenomenon (Section 2.1.1), the fact that the regional demographic situation is more stable than in the previous clusters is considered as a positive factor that attenuates the general weakness.

Figure 5.3: Regions with decreasing population growth rates.

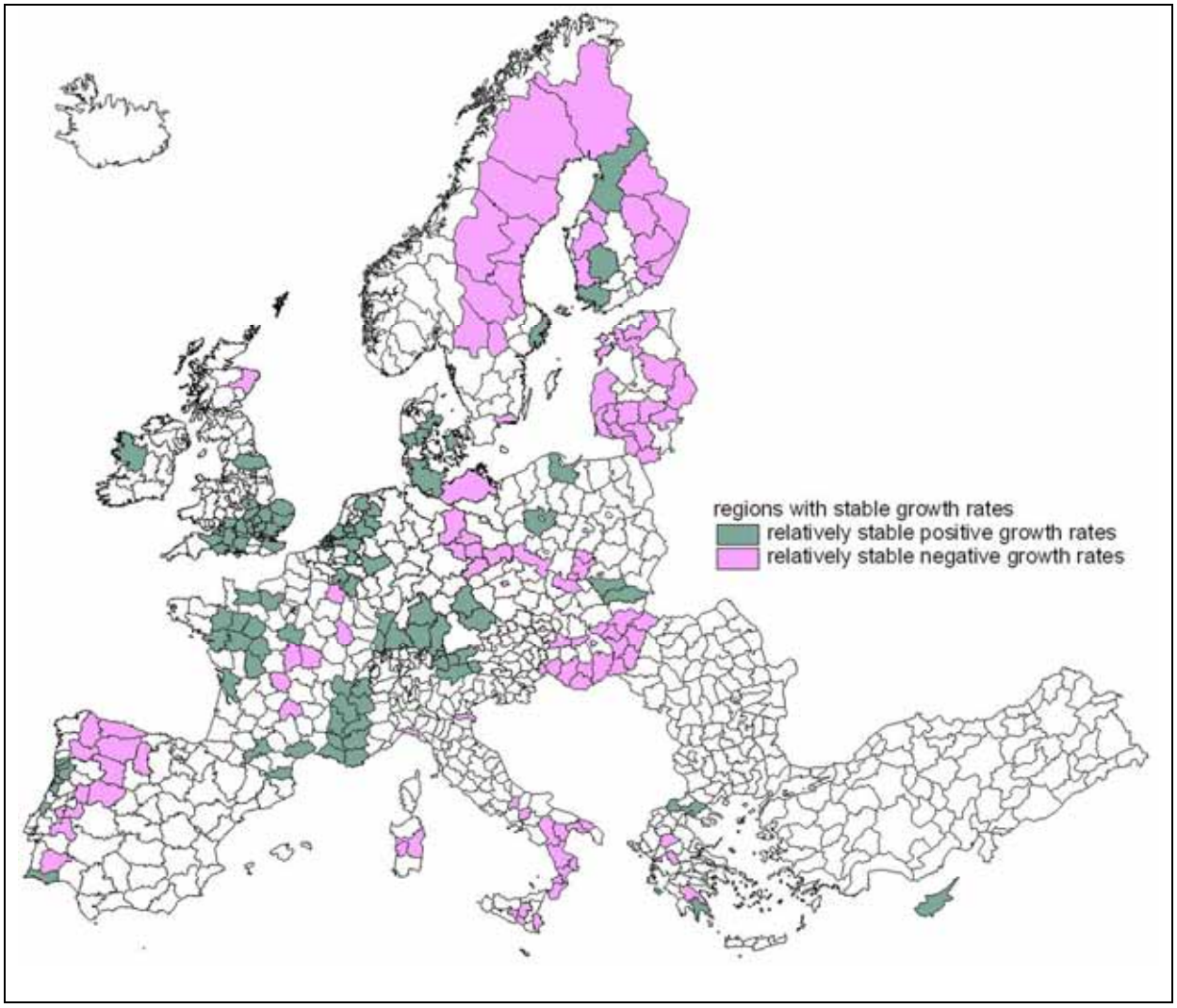


A slight but stable positive population growth is characteristic for the regions in the stable positive cluster (blue regions in Figure 5.4) that comprises predominantly EU-15 regions of all OECD types (Table 5.11). These regions comprise successful economic centres, such as the Rhone Valley in France, the southern regions in Germany and in the UK, but also the Polish regions around Poznan and Gdansk and the coastal zones in Portugal and the Netherlands. For these regions, it can be assumed that a certain balance of economic and life quality aspects has been reached already, so that a relative stability of demographic development seems probable for the future. Such a balance clearly constitutes a strength.

The clusters **future_incr**, **pos_incr** and **west_incr** are characterised by **increasing population developments**. The regions of these clusters are concentrated in South-Western Europe, and in Ireland, the UK, Southern Sweden and the Baltic countries (mainly Estonia and Latvia) (Figure 5.5). Given the overall trend of population stagnation in Europe (Section 2.1.1), it is assumed that a clear positive demographic development is a consequence of in-migration. In-migration can be caused either through a certain economic performance of a region that leads to employment growth and thus attracts labour, by sub- and counter-urbanisation movements around urban agglomerations or by

a good regional life quality that is high enough to attract the economically well-off people to settle down.

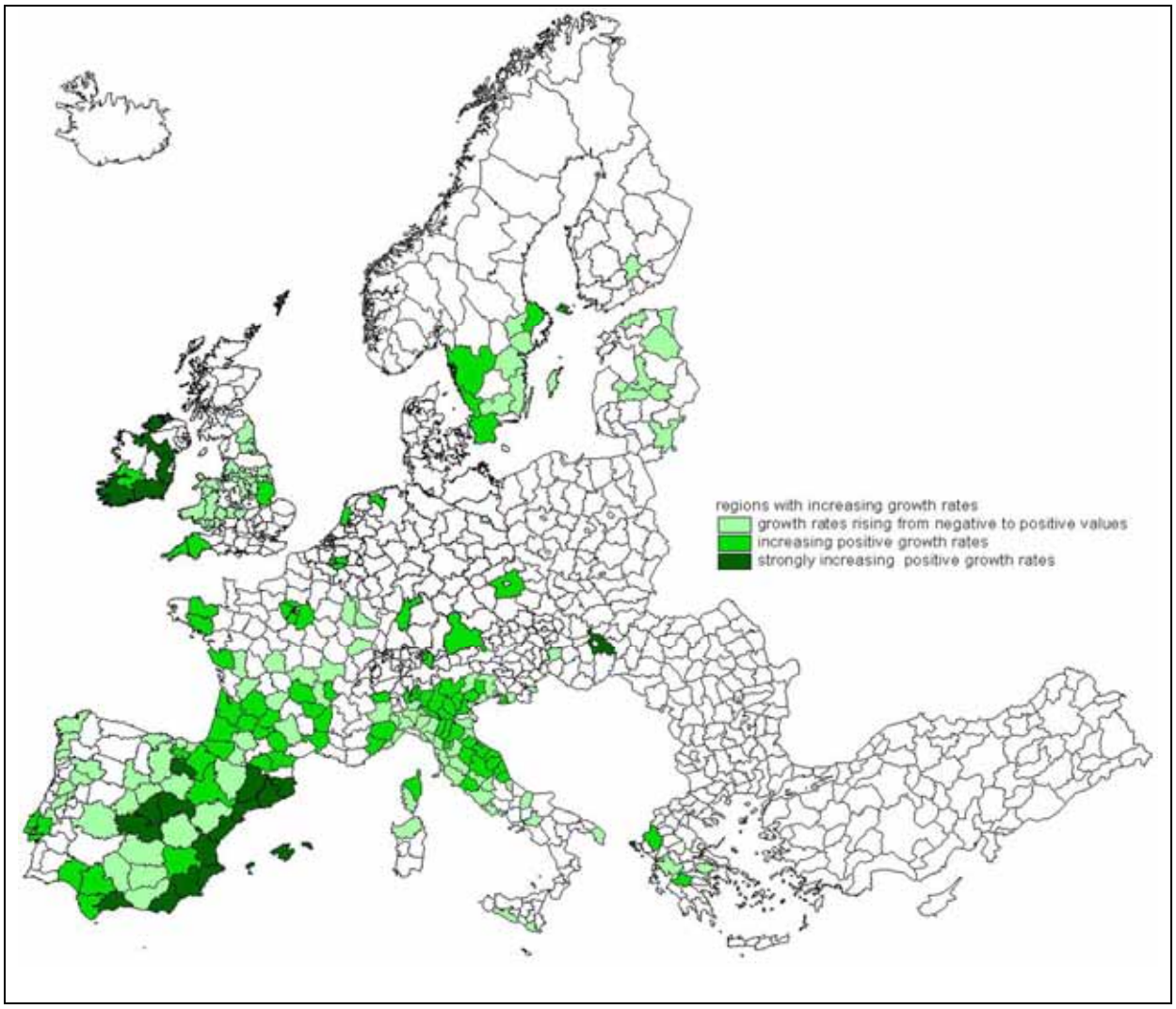
Figure 5.4: Regions with stable population trends.



A clear positive demographic trend is given for the regions in the clusters pos_incr and west_incr (green and dark green in Figure 5.5) because they already experienced positive increasing growth rates in the past. The strongest increase is expected for selected regions in Spain and Ireland (cluster west_incr), which have had a very strong economic development in the 1990s. Most regions belong to the intermediate rural group and it can be assumed that in-migration has economic reasons rather than life quality reasons. A more moderate, although considerable increase of 1.7% is projected for the cluster pos_incr in which in-migration for life quality aspects is probably another important driving factor. Attractive rural areas in South-Western France, Northern and Southern Spain and Northern Italy and on the West coast of Sweden belong to this group. Regions within the cluster future_incr also display an increasing trend towards positive growth rates; these regions are coming, however, from a negative situation in the past. The share of the most rural regions in this cluster is clearly higher than in cluster pos_incr; most of the future_incr regions are neighbouring to regions belonging to the strong clusters

west_inc or pos_incr, and it is likely that there is a gain from commuters and counter-urbanisation movements. Altogether, the positive reactions of regions within these three clusters are clearly considered as strengths, although it has to be carefully observed whether the projected development for the future_incr cluster will actually take place.

Figure 5.5: Regions with increasing population growth rates.



Considering this analysis of strengths and weaknesses in demographic developments, we see that the two clusters **strong_decl** and **cont_decl** with 196 regions show a clear weakness, and this reaction is considered critical for the general regional development. In this group are 50% of all EU-10 regions, which demonstrates that – under the assumptions inherent in the trend projections – the EU-10 has to face the prospect of severe area-wide demographic decline. Together with another 30% of regions with a stable negative population trend, these figures clearly indicate the size of challenges that have to be mastered in the maintenance of infrastructure and public services in the rural areas. In the same three clusters there are 42% of all EU-15 regions, a figure that is not negligible, because it is regionally concentrated in the North-Western EU; in this area, however, the situation will probably be easier to rectify in the future.

As can be seen in Table 5.11, there is no easy interpretation of the clusters according to the rurality of the regions: in all clusters regions from all three types are represented. However, in the EU-15, most rural regions are more frequent in the clusters that have a weak performance compared to the most urban and the intermediate rural regions.

Table 5.11: Total population clusters and OECD types.

	Regional types (Number of regions)								
	EU-25			EU-15			EU-10		
PT cluster	MU	IN	MR	MU	IN	MR	MU	IN	MR
Strong_decl	6	9	24	6	9	24			
Cont_decl	29	57	71	19	30	46	10	27	25
Stab_neg	11	26	65	4	15	44	7	11	22
Stab_pos	24	36	23	23	33	21	1	3	2
Future_incr	26	31	46	23	28	43	3	3	3
Pos_incr	23	32	27	23	30	27		2	
West_incr	4	13	5	4	13	5			
Sum	123	204	261	102	158	210	21	46	51
		588			470			118	
	Regional types (Share of regions)								
	EU-25			EU-15			EU-10		
PT cluster	MU	IN	MR	MU	IN	MR	MU	IN	MR
Strong_decl	5	4	9	6	6	11	0	0	0
Cont_decl	24	28	27	19	19	22	48	59	49
Stab_neg	9	13	25	4	9	21	33	24	41
Stab_pos	20	18	9	23	21	10	5	7	4
Future_incr	21	15	18	23	18	20	14	7	6
Pos_incr	19	16	10	23	19	13	0	4	0
West_incr	3	6	2	4	8	2	0	0	0
Sum	100	100	100	100	100	100	100	100	100

5.3 Assessing the interplay of the regions' demographic and economic strengths and weaknesses

In the following, the interplay between the demographic and the economic trends of the baseline 2020 scenario are investigated and assessed at regional level in terms of strengths and weaknesses. To do so, the economic baseline types and the grouped population clusters are combined into 8 groups as presented in Table 5.12. The intertwining of the weak economic baseline types with the demographic development groups results in two groups that show negative tendencies in both directions and that are separated by the importance of the share of agricultural employment (**general weak_agri** and **general weak_agri-**) and in a third group, which combines negative economic employment trends with a positive population development (**PT_pos e_decl**). This latter group comprises both types of regions with regard to the agricultural employment. The intertwining of the economically slightly growing regions with the different demographic development groups again results in three groups, and again the general positive trends are found within one group that is not differentiated according to the agricultural employment share. The economically growing regions are aggregated into two groups, one with respect to negative population development and the other with respect to positive population development. The stronger split of groups that have a relatively weak reaction corresponds to the assumption that for these groups a more differentiated analysis is necessary.

Table 5.12: Combination of demographic development and economic baseline types.

Base types PT groups	e_decl_agri-	e_decl_agri+	e_lowgrow _agri-	e_lowgrow _agri+	e_grow_agri-	e_grow_agri+	total
Outliers	1		2	1	4		8
Decreasing	22	38	47	65	15	9	196
stab neg	14	25	21	32	4	6	102
stab pos		3	35	17	19	9	83
Increasing	8	9	66	58	36	30	207
Total	45	75	171	173	78	54	596

The four population development groups (PT groups), presented in Table 5.12 – not including the outliers – differ clearly in the socio-economic figures in the years 2002/2004. For the PT groups with a declining or negative demographic situation the average GDP/cap (pps) is low and below the EU-wide averages and the unemployment rate clearly above this standard level. In contrast, the PT groups with a positive performance are also starting from a higher GDP/cap (pps) and a lower unemployment rate (Table 5.13).

Table 5.13: Socio-economic key indicators (2002/2004) for the PT (population) groups.

	GDP/capita		Share of EU avg GDP/capita		Unemployment rate		Share of national unemployment rate	
PT groups	Average	StDev	Average	StDev	Average	StDev	Average	StDev
decreasing	16830	7424	91	40	11	6	105	40
stab neg	14588	5897	79	32	11	5	122	46
stab pos	20633	5739	112	31	7	4	88	21
increasing	20975	6739	114	37	8	4	89	36

Within this context, the interplay between the regions' characteristics that arise from the demographic and the economic reactions are presented in the following sections.

Negative demographic perspectives meeting employment decrease

The most difficult perspectives for 2020 are for those regions where a negative employment growth rate comes together with a decreasing population situation. This is the case for 99 regions in the baseline 2020 scenario, of which 36 have a low share (general weak agri-) and 63 have an above average share of agricultural employment (general weak agri+).

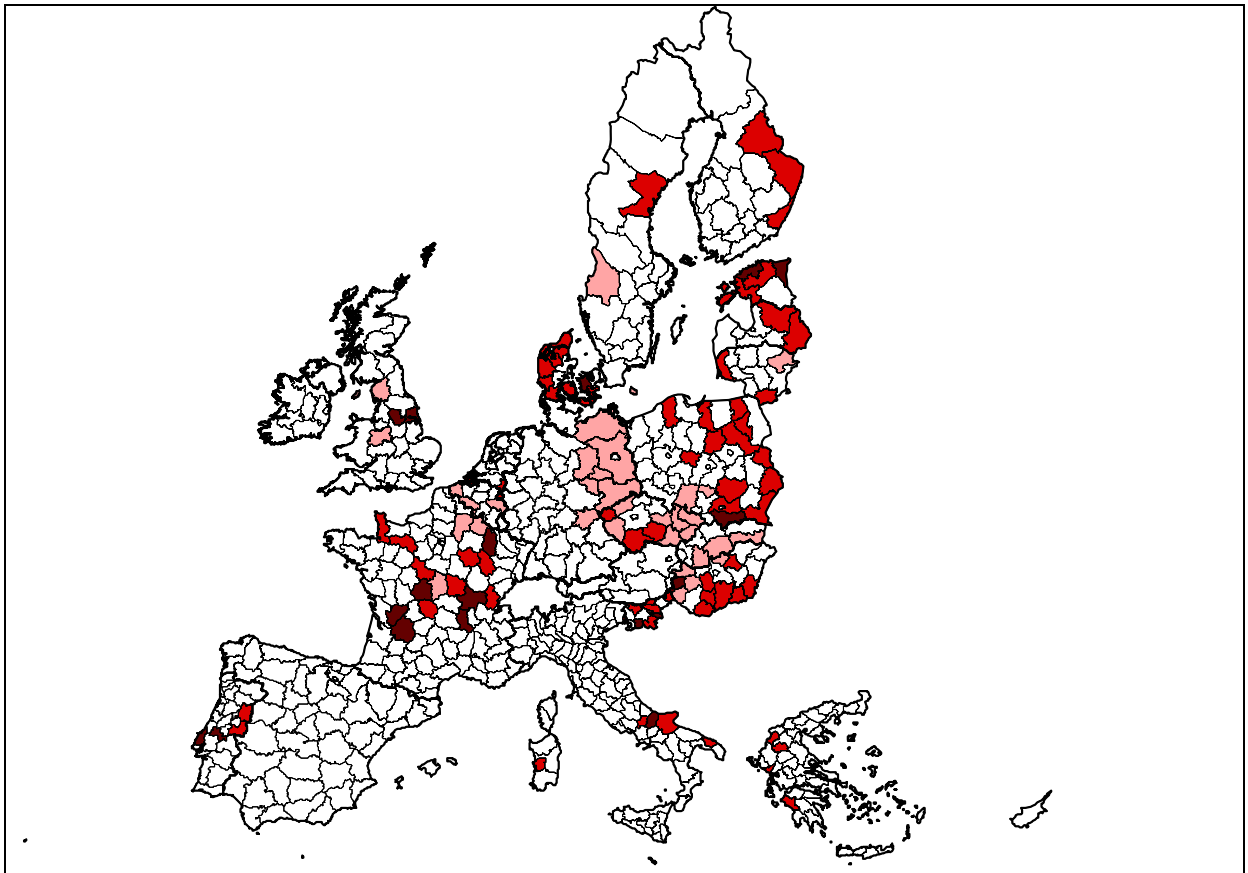
The **general weak agri-** group (Figure 5.6, regions in light red) comprises regions in both EU-15 and EU-10 countries: they are spatially grouped in France, Belgium, Germany (all Eastern *länder*, one West German region), the Czech Republic, Slovakia and Hungary. Single regions lie in the UK, Denmark, Sweden, Slovenia and Poland. From their reactions, these regions have neither distinctive potential for economic development nor do they attract immigrants that might create a demand for work in the service sector. Hence, for these regions the crucial challenge is to maintain the necessary infrastructure that makes it still attractive for people to stay. In particular, where these regions form a larger area, like in Eastern Germany, a 'domino-effect' of decreasing economic potentials reducing the regions' attractiveness for investors that in turn shapes people's pessimistic attitudes towards future perspectives might occur. In cases where the economic differences (income, productivity) between regions are smaller than in Germany between East and West, the regional labour costs might adjust in the long term. Regions of the general weak_agri- type will most likely need specific political attention on the maintenance and, if necessary, reorganisation of infrastructures and public services. Of course, for large regions as, for example, in Germany or Belgium (here: NUTS2) the assessment of strengths and weaknesses presented here has to be broken down to a lower level. Then most probably, anchor points for stabilising and positive regional developments can be identified, like the tourism sector in Mecklenburg – Western Pomerania, Germany.

Under the regionalisation scenario, 34 out of the 36 **general weak agri-** regions show a better performance in terms of employment than in the baseline and frequently this is due to employment in the agricultural sector. Only one region has a negative employment effect and another 5 do not change employment in the primary sector. In contrast, 9 out of the 36 regions show a positive total employment development in the liberalisation scenario; all regions drastically decrease the employment in the primary sector under liberalised circumstances. These figures – although to be taken with care because

stemming from different methodological approaches – underline the general economic vulnerability of this type of region under liberalisation.

The **general weak agri+** group is larger with 63 members (red regions in Figure 5.6). More regions in the EU-10 are contained herein and they cover large shares of the country as in Poland, Slovenia and Hungary. However, also in the EU-15, this type of region can be frequent, as for example in Denmark and in France. These regions combine three weaknesses under the baseline scenario: a negative population development, decrease of employment and a large share of employment in the agricultural sector. However, these weaknesses have to be looked at more in detail: a negative demographic trend can be a result either of a low natural population development or of out-migration. While out-migration can happen over the short term and as a reaction to economic perspectives, a low natural population development is more a long-term phenomenon, and structural adjustments and political reactions are possible if recognised in time. Regions which have a stable negative growth rate under declining economic conditions, like in the Baltic States (Estonia and Latvia), Hungary and Portugal, have therefore a greater margin of manoeuvre than regions where a decreasing demographic development is projected, like most of the regions in Poland, Denmark and the Czech Republic. The share of the projected agricultural employment varies between 3% (in France) and 41% (in Greece); the average for these 63 regions is 10%. Hence, the role of the agricultural sector for the regional employment perspectives is not negligible, and structural adjustments might increase the negative employment trend. Policies addressing rural development in these areas should therefore base the intervention on a detailed analysis of whether the agricultural sector can be one starting point for a stabilisation of declining economic trends. Hence, not only the competitiveness of the agricultural sector and of food processing enterprises has to be investigated carefully, but also the possible diversification of the agricultural sector.

Figure 5.6: Regions with economically weak reactions.



		Econ. Baseline type	Pop. develop. type	Name
Light red	36	E_decl_agri-	Decrease & stab neg	General weak agri-
Red	63	E_decl_agri+	Decrease & stab neg	General weak agri+
Dark red	20	E_decl_agri-/+	Increase & stab pos	PT_pos e_decl

Under the regionalisation scenario, 8 out of 63 regions show a decrease of the total employment, while in the remaining 55 regions the employment effect is a positive one compared to the baseline 2020. In contrast, under a liberalised world scenario, 51 regions decrease in the overall employment rate and only 9 regions – 4 of which are in France – gain in total employment. Again, these figures should be considered with care, but they tend to emphasise the generally difficult perspectives of this type of regions under more liberalised market and policy conditions.

Positive demographic perspectives meeting employment decrease

The last group of the economically declining baseline types is the smallest one: only 20 regions combine a positive demographic perspective with a weak economic trend (**PT_pos e_decl)** (Table 5.12). 14 regions are located in the EU-15, and the largest group of 6 regions can be found in France (Figure 5.6, regions in dark red). With respect to the French and British regions of this group, this positive population development can be linked to the attractiveness of the areas, so the life quality factor might be a driver for the positive demographic development. However, this assumption has to be checked over the

course of time, because these regions belong to the population development cluster **future_growth** that is characterised by growth rates rising from negative to positive values. In contrast, the Polish, the Dutch and the Danish regions belong to the stable population development cluster. Here it will be decisive whether the positive population development can become a potential for more economic activities or whether it will result in out-migration of young people looking for jobs. Hence, the demographic development in these regions has to be monitored very carefully in order to identify potential drivers for economic stabilisation or to react with structural adjustments as soon as necessary.

Like the other regions with a generally weak economic performance, the PT_pos e_decl regions have a better overall employment performance under the conditions of a 'regionalised' scenario. This is most generally due to a higher employment share in the primary sector. In a short-term perspective, such a scenario might be favourable for the regions if a positive population development is actually taking place. On the other hand, under a 'liberalised' scenario, all but one region have a smaller total employment figure, although employment in the service and industry sectors is higher in most regions compared to the baseline, while agriculture is drastically decreasing. Such a structural change might be more advantageous in the long term, because it strengthens the regions' options to profit from opportunities in the more productive secondary and tertiary sectors. The question whether and how such a structural transformation could be politically supported should only be answered after a thorough analysis of the regions' sub-sector level strengths and weaknesses and endogenous potentials in terms of innovative actors and enterprises, networks and institutions.

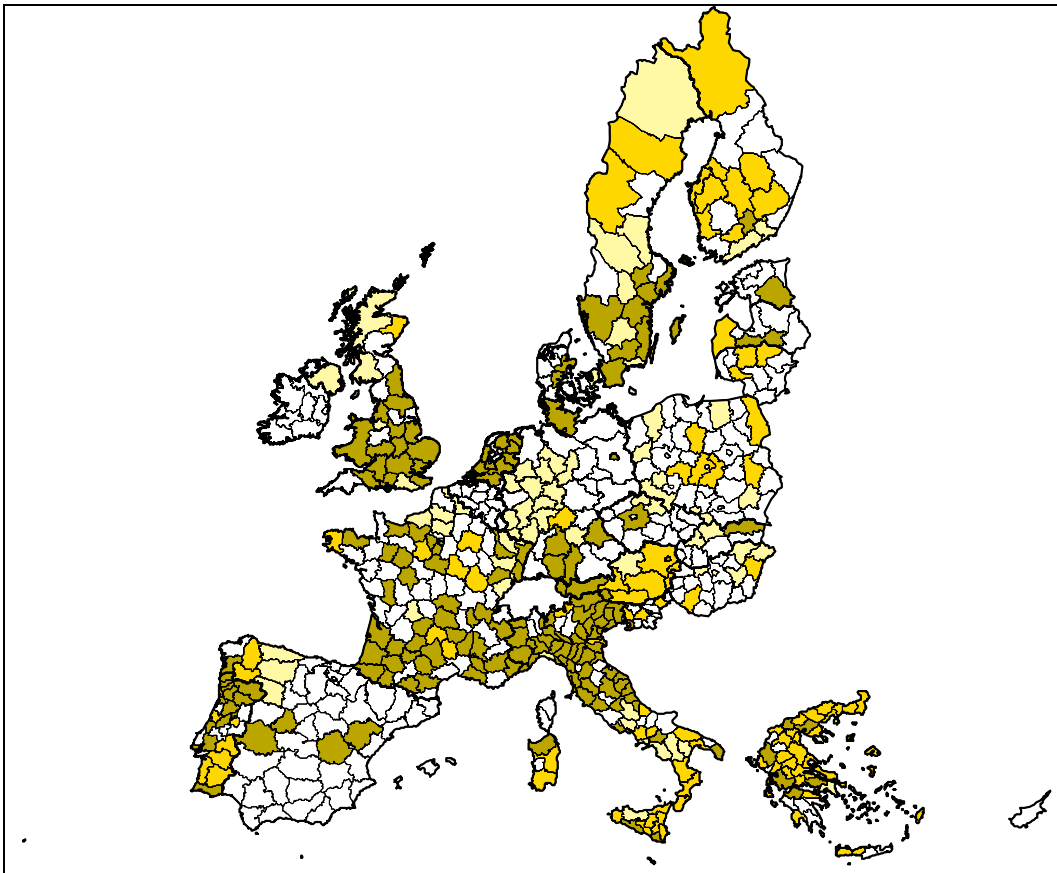
Moderate economic strengths combined with critical demographic trends

In most regions in the EU-25 the economic dynamics have a moderate character and the employment growth rates range between 0 and 0.5% annually. Combining this employment growth type with the demographic developments and the importance of the primary sector, three groups have been determined that make up the mainstream regions of the EU-25 (Table 5.11). In the following, the combined strengths and weaknesses are assessed for each of them.

Of the 68 **E_lowgrow PT_neg agri-** regions that have a low share of agricultural employment, 50 are located in the EU-15 and 18 in the EU-10 (Figure 5.7, regions in light yellow), a distribution that largely corresponds to the overall relation of the regions in this study (476:122). With 14 regions, Western Germany makes up 20% of this whole group. The strengths of these regions are a relatively high degree of industrialisation, investments in infrastructures and a mostly dense settlement in the beginning of the 21st century. However, these regions cannot or only to a limited degree participate in the economic opportunities of the baseline scenario which lie mainly in the expansion of the service sector. The stable negative trend in 21 regions and the more dramatic decreasing demographic development in 47 regions have to be carefully counterbalanced by prospective structural adjustments in order to prevent negative impacts on the regional economies. Innovative concepts for regional development might nevertheless be implemented at lower scales (e.g. Wolfsburg, the VW city in the region of Braunschweig, Germany, developed in the early 2000 a strategy that led the city from its former strictly industrial basis towards a broader knowledge and research based economic development).

The second group among the regions that have a moderate economic growth but no demographic strengths is characterised by a high share of agricultural employment. The **E_lowgrow PT_neg agri+** type comprises 97 regions which are predominantly located in Southern Europe (Figure 5.7, regions in yellow): 31 Greek regions, 21 Italian regions and 6 regions in Portugal make up the majority of the regions. Another large group is in Finland (9 regions) and smaller ones are in Poland, Slovenia and Lithuania. Obviously, this cluster unites regions that still have an agricultural vocation in the early years of the 21st century; however, the rural economies already experience changes. In the economic sector there are some positive signals – such as opportunities from tourism and structural diversification in Southern Europe. With regard to the primary sector, structural adjustments might be necessary, so that external support might be directed towards the acquisition of new knowledge and skills and the experimentation with and implementation of technological innovations. However, the negative population development, which most probably stands for out-migration rather than for decreasing natural population growth, can weaken the regions' economic strength in the long run. Especially as this reaction type is regionally concentrated in some countries, appropriate national strategies might be developed that react with a combination of rural development and sector-oriented interventions in order to maintain the attractiveness of the regions even under difficult demographic circumstances.

Figure 5.7: Regions with generally stagnating to small positive economic reactions.



		Econ. Baseline type	Pop. develop. Type	
Light yellow	68	E_lowgrow_agri-	Decrease & stab neg	E_lowgrow PT_neg agri-
Yellow	97	E_lowgrow_agri+	Decrease & stab neg	E_lowgrow PT_neg agri+
Ochre	176	E_lowgrow_agri-/+	Increase & stable pos	General moderate strength

Under the framework of the regionalisation scenario, 48 out of 68 regions have a better overall employment situation – and this is mostly due to higher shares in agricultural employment. The regions that have a lower overall employment rate in a regionally focused world mainly lose employment in the industrial sector. In the liberalisation scenario, 53 out of 68 regions have a lower employment rate and only 15 make a net gain.

76 out of 97 regions from the **E_lowgrow PT_neg agri+** group reveal a higher overall employment under the regionalisation scenario conditions compared to the baseline situation. Highest employment increases happen in the primary sector which in a 'regionalised' world profits from the border protection, reduced imports and a high level of subsidies. In contrast, the liberalisation scenario brings about regional employment decreases for 81 regions, while 16 regions in 8 countries of the EU-25 experience a more favourable employment situation.

Moderate economic strengths combined with positive demographic trends

The largest group with generally positive situation in the baseline 2020 conditions regroups all regions with a moderate employment development that have a stable positive or even positive increasing demographic situation (**E_lowgrow PT_pos**). Both regions with a lower and a higher share of agricultural employment are included, as it is assumed that in the 'general strength' situation, this characteristic specifies the regional feature but does not constitute a fundamental (dis-)advantage.

The 176 regions of this group cover almost exclusively large areas in the EU-15, and only 5 regions belong to Estonia, Latvia, the Czech Republic, Slovakia and Slovenia (Figure 5.7, regions in ochre). The largest national shares in this group are held by France (42 regions), Italy (53 regions), Portugal (16 regions), the UK (15 regions) and the Netherlands and Sweden (9 regions each). This group represents the Western European mainstream under the baseline 2020 scenario: a small but positive economic development in combination with a stable or positive demographic trend. It corresponds well with the overall picture from the LEITAP simulation, that Europe in general profits from an ongoing moderate liberalisation – however, not as much as other continents in the world.

The overall employment situation differs considerably between the baseline 2020 world and the regionalisation scenario: 100 regions out of 170 have better overall employment figures in a regional focus world. However, investigating the figures more closely, the increase in employment is mainly driven by the protected agricultural sector, while a positive employment situation due to the industrial sector only occurs in 17 cases and the gains in the service sector that lead to a positive employment concern only 35 regions. Under the liberalisation scenario, 46 regions show a better employment performance as compared to the baseline scenario.

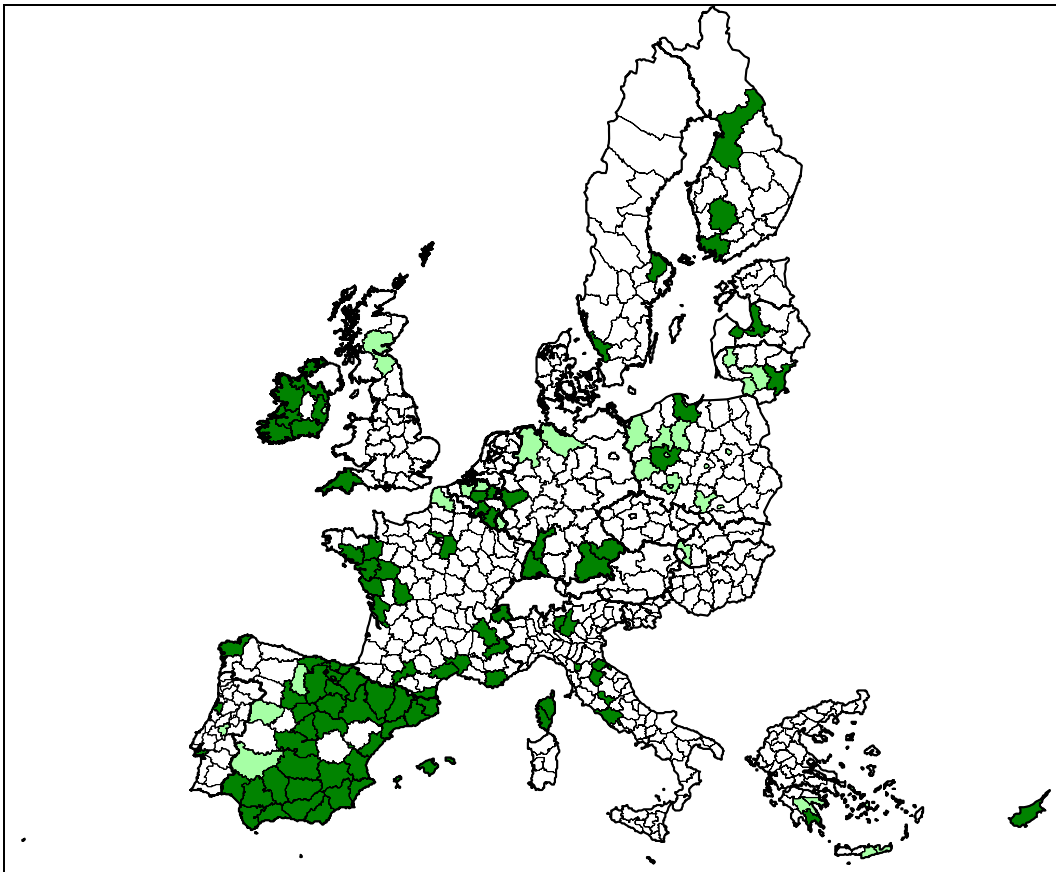
Economically strong regions combined with negative population development

34 regions that have a strong economic reaction under the baseline 2020 scenario are similarly marked by a decrease in population development (**E_grow PT_neg**). The regions of this group are spread over the EU-15 and the EU-10 with a regional concentration in Poland (12 regions) and Greece (5 regions) (Figure 5.8, light green). The character of these regions is not uniform. In Western Europe, urbanised regions dominate (Antwerpen, Luxembourg, Dublin, etc.), while in Southern Europe the regions have a more rural vocation or are even remote areas like Badajoz in Spain and the Aegean islands in Greece; and in Poland, the regions comprise both urbanised centres and peri-urban belts of major towns like Poznan, Gdansk, Wroclaw and Sczcezin.

The coincidence of the two diverging trends under the baseline 2020 scenario – employment increase and demographic decline – is contradictory at first sight: either employment increase happens, a situation that would induce a demographic stabilisation or even in-migration rather than a decrease, or a demographic decrease takes place, a situation that tends to induce shrinking economic effects (Kaufmann, 2005). Hence, with regard to the E_grow PT_neg type regions, the crucial question in the course of the years to come is which of the two trends will be dominating. Political intervention has to carefully check what sub-sectors and economic branches have the potential to lead to an economic take-off.

Under the regionalisation scenario, 26 regions out of the total 34 have a higher overall employment. The drivers of a liberalised world would lead to a more favourable overall employment situation in only 5 out of 34 regions.

Figure 5.8: Regions with generally positive economic reactions.



		Econ. Baseline type	Pop. develop. Type	Name
Light green	34	E_grow_agri-/+	Decrease & stab neg	E_grow PT_neg
Dark green	88	E_grow_agri-/+	Increase & stab pos	General strength

The **general strength** group, with those regions that combine employment growth with a positive and/or increasing demographic development, is larger than the former one (the generally stagnating group) and has 94 regions (Figure 5.8, dark green). 88 regions are located in the EU-15, forming dominant groups in South-Western France, North and Central Italy, Spain and Ireland. While in South-Western France and along the Spanish coast, the demographic increase can be related to in-migration from within the country and from abroad for quality of life reasons, the more general trend in Spain and Ireland is in-migration for economic reasons. However, especially in these two countries, the general strength trend is a direct continuation of the situation in 2005 – a projection that could be too optimistic within the overall assumptions.

5.4 The future perspectives of agriculture

While it is commonly understood that agriculture has only a small role within the overall EU regional economies, both in terms of production values as well as of employment (with the exception of the some regions in South and Central Europe), its role for the viability of the rural economy is not so easy to determine. Within the EU, agriculture is no longer seen as only producing food and fibres (and perhaps increasingly fuels as well) but as contributing to the richness and diversity of landscapes and to cultural and natural heritage simultaneously; the concept of a 'multifunctional agriculture' has been adopted politically (COM(2006) 144). The question arising, which is relevant to the Scenar study, is how this perceived and politically desired multifunctionality can be measured and assessed and the linkages between agriculture and overall rural development be made explicit.

Research on multifunctionality of agriculture and rural areas shows that there exist various epistemic approaches to understand and analyse multifunctionality within the scientific and political communities in Europe. There is a broad array of quantitative approaches to assess the supply of, and the demand for, various agricultural non-commodity outputs, namely bio-economic modelling and direct valuation methods through stated preference surveys (Zander *et al.*, 2005). However, indicators that reliably demonstrate the relatedness of the multifunctionality of agriculture with other economic sectors are scarce, and they mostly exist as qualitative statements and frequently at a local to regional level rather than on higher scales or in an aggregated state. As an example, the evaluation of LEADER projects makes the manifold interrelations between agriculture and other economic activities in the rural areas vividly transparent – however, not with quantifiable data (Knickel *et al.*, 2005).

In summary, the EU's differentiated concept of a multifunctional agriculture, embedded and interlinked within the rural economies, cannot yet be grasped by the existing modelling tools and statistical data analysis. Therefore, the understanding of the complex interrelationships between the agricultural economy and other rural economic activities still has to be based on plausibility reasoning and careful argumentation. In the following, the future perspectives of agriculture in the European regions in 2020 is described with regard to farm structures (density and change rates of selected farm types per region) and to the agricultural land use at regional level. These virtual 'land use systems' are derived from the CAPRI simulation calculations, and the farm structure development is calculated on the basis of farm structure survey (FSS) data in combination with the product-related income development of the farm sectors.

The assessment of the future perspectives made here is oriented by the political objectives that have been formulated for the European agricultural and rural development policies in the years of 2003 and 2005 (COM 1782/03; COM 1698/05). Under the overall aim to promote a sustainable development of rural areas and the agricultural sector, the objectives cover three specific fields of targets:

- to improve **the competitiveness of the sector** with measures that enhance farm adjustments to the market requirements both in terms of physical restructuring as well as of human capital development and the continuous introduction of innovations,
- to maintain and enhance the environmental conditions and the amenities of rural landscapes through **land management** measures, and

- to support the **quality of rural livelihoods** by the enhancement of economic diversification in rural areas.

The figures that are available to assess the regions' reactions in the agricultural sector in 2020 with respect to these three objectives are derived from two scenarios: the regionalisation and the liberalisation scenarios. The assessment of the changes, e.g. in the regions' land use systems between the regionalisation scenario and the baseline 2020 situation, showed that the differences are very small. Although the political framework conditions (second level drivers) are quite different in these two scenarios (cf. Chapter 3), the regional results for the agricultural land use do not show large differences. Hence, in order to visualise and assess the regions' typical 'behaviour', the regionalisation scenario is used as a bottom line to which the liberalisation scenario is compared as producing strong reactions under clearly differing political and macro-economic conditions.

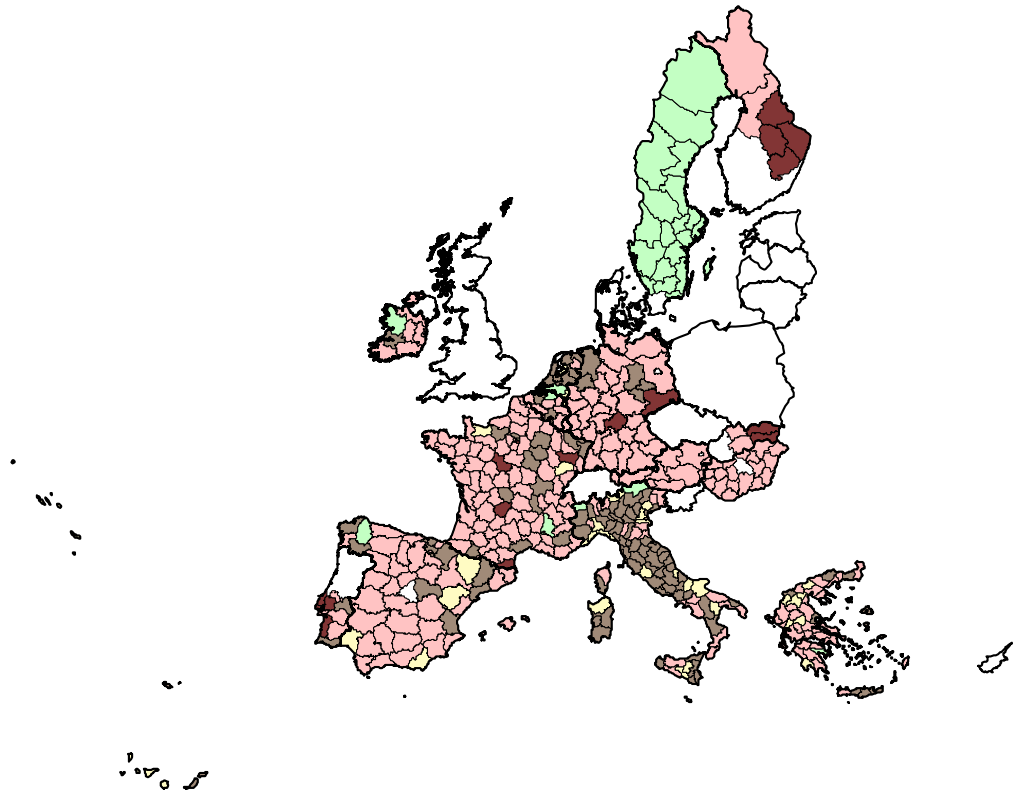
5.4.1 Farm structural adjustments

As outlined in Section 4.2.8, the general decrease in farm numbers between 2003 and 2020 in the baseline scenario is roughly 25%. [55] The analysis of these figures showed that the yearly change rates range between -5 and 0% in the baseline scenario for the large majority of regions (Figure 4.30). Regions that have a stronger decline than 10% are concentrated in Southern Finland, Central and Southern Germany, and Slovenia. They are less numerous in France, Italy, Denmark, Spain and Portugal. Under the liberalisation scenario, the decline reaction is generally more drastic and most regions belong to the class with a yearly change rate between -5 and -10%. Even stronger reactions can be observed for Central Sweden and Southern Finland, Estonia and Lithuania and, again, Slovenia. In contrast, a small decline (-5% to 0%) or even an increase in farm numbers is derived for regions in Southern Spain, in Greece and in Italy, Hungary, Slovakia, Latvia, Finland and Northern and Southern Sweden (Figure 4.31) The differences between the regional farm structure situation under the regionalisation and the liberalisation scenarios are shown in Figure 5.9 in terms of % changes between the number of the overall holdings. As can be seen, differences between 20 and 40% dominate in most countries. Only in Italy and the Benelux do most regions have a lower change rate and hence are regions with generally more competitive structures. Regions with dramatic structural adjustments under a 'liberalised' scenario form larger groups in Finland, Slovakia and Portugal, while there are only isolated regions in Germany and France.

As there is a broad range in the farm structure changes varying among the sub-sectors, the investigation of regional reactions is differentiated in the following. The reactions of the three most numerous sub-sectors are analysed more closely: the arable crop ('arable crops') farms (2.3 mio. in 2003), the vegetable and permanent crop ('veg. & perm') farms (2.8 mio in 2003) and the beef and dairy ('cattle') farms (1.8 mio in 2003). Reliable figures for the number of sub-sector farm types at regional level are only available for the EU-15 in the year 2000.

[55] The calculations of the yearly changes between 2000 and 2020 refer to the figures from the baseline scenario. Therefore, differences can be observed with the CAPRI data.

Figure 5.9: Difference in number of holdings (%) between regionalisation and liberalisation.

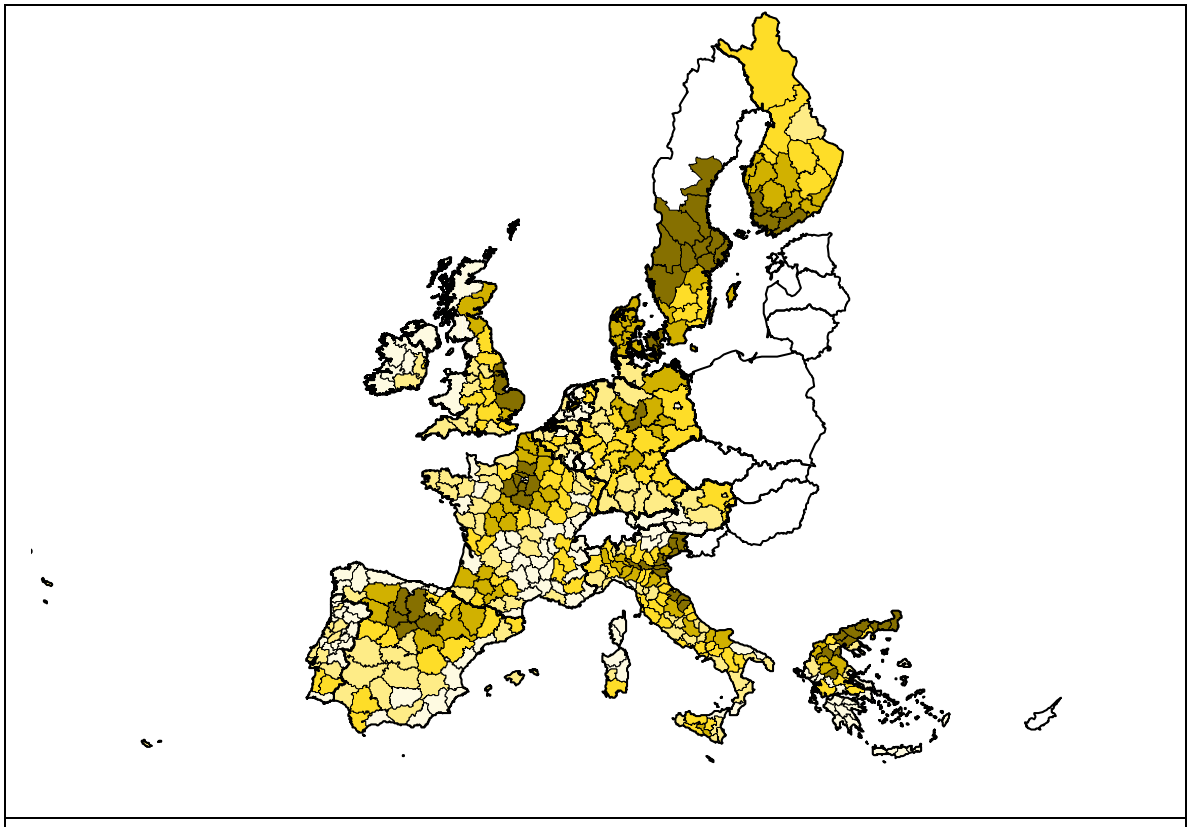


Change of holdings (%) under the liberalisation scenario vs. the regionalisation scenario

Red	-80 – -40
Light red	-40 – -20
Brown	-20 – -10
Yellow	-10 – 0
Light green	0 – 20

Figure 5.10 shows the regional density of the arable crop farms in the year 2000 in 5 groups. High shares of this farm type are concentrated in Central Sweden and Finland and Denmark, Eastern UK, North-Western France and Spain, Northern and Central Italy and Greece. The differentiation of the average yearly change rates (2000 to 2020) after the density classes shows considerable differences between the single classes under the baseline 2020 scenario (Table 5.14). The strongest adjustment reaction in terms of yearly change rates happens in the 48 regions that have an arable crop farm share of more than 55% of all farms. Also, in these regions the adjustment reactions from the baseline to the liberalisation conditions are strongest. This reaction can be interpreted as a regional strength in terms of realising increasing competitiveness in the agricultural sector. However, for the rural development perspectives, especially in remote areas such as in the Scandinavian countries or in Greece, the decrease of farm holdings might also constitute a weakness for the maintenance of infrastructures, etc., and diversification incentives might be considered as an appropriate intervention measure.

Figure 5.10: Density of arable crop farms per region (2000).



From light yellow to ochre:
0-9; 9-21; 21-37; 37-55; 55-80% of **arable crop** farms within the total number of farms

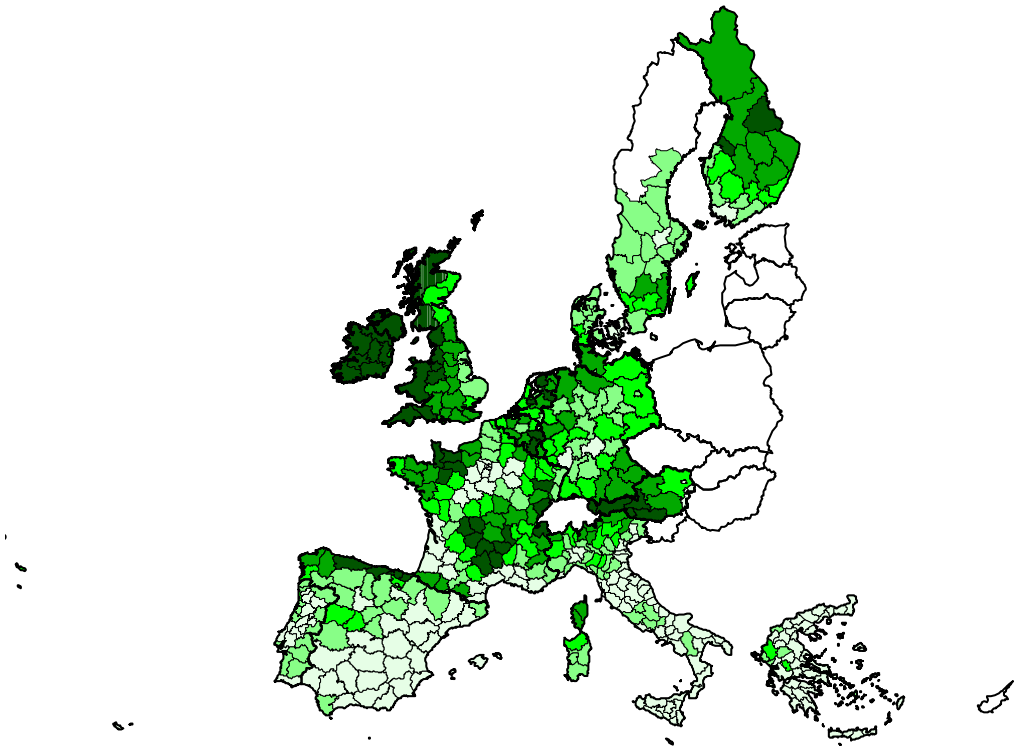
Table 5.14: Yearly change rate of arable crop farms in the baseline 2020 scenario and difference in farm number between baseline and liberalisation.

Arable farms		Yearly			
% per region	Number	avg chg 00-20	stnd dev	lib to baseline	stnd dev
<37	299	-2.7	4	-28.6	30.5
37-55	45	-3.5	2.8	-31	22
>55	48	-4.2	4.65	36	29
Total	421				

In the cattle farm sub-sector, the higher share classes (44-66 and >66%) are concentrated in the Northern and Western regions of the EU-15 (Figure 5.11). The yearly change rates in the baseline scenario in the higher share classes are clearly higher than those of the arable farm sector (Table 5.15). Similarly, the adjustment reactions under a liberalisation scenario are strongest in the regions that have a cattle farm share of more than 26% of all farms. Regions with strong reactions in the baseline 2020 scenario are concentrated in the UK

and Ireland, in the French 'Midi' and in Austria. Especially in Southern European regions, the difference between the number of cattle farm holdings under the regionalisation and the liberalisation scenario is smallest with 34%, for the rest of the classes it is around 43% on the average (Table 5.15).

Figure 5.11: Density of cattle farms per region (2000).



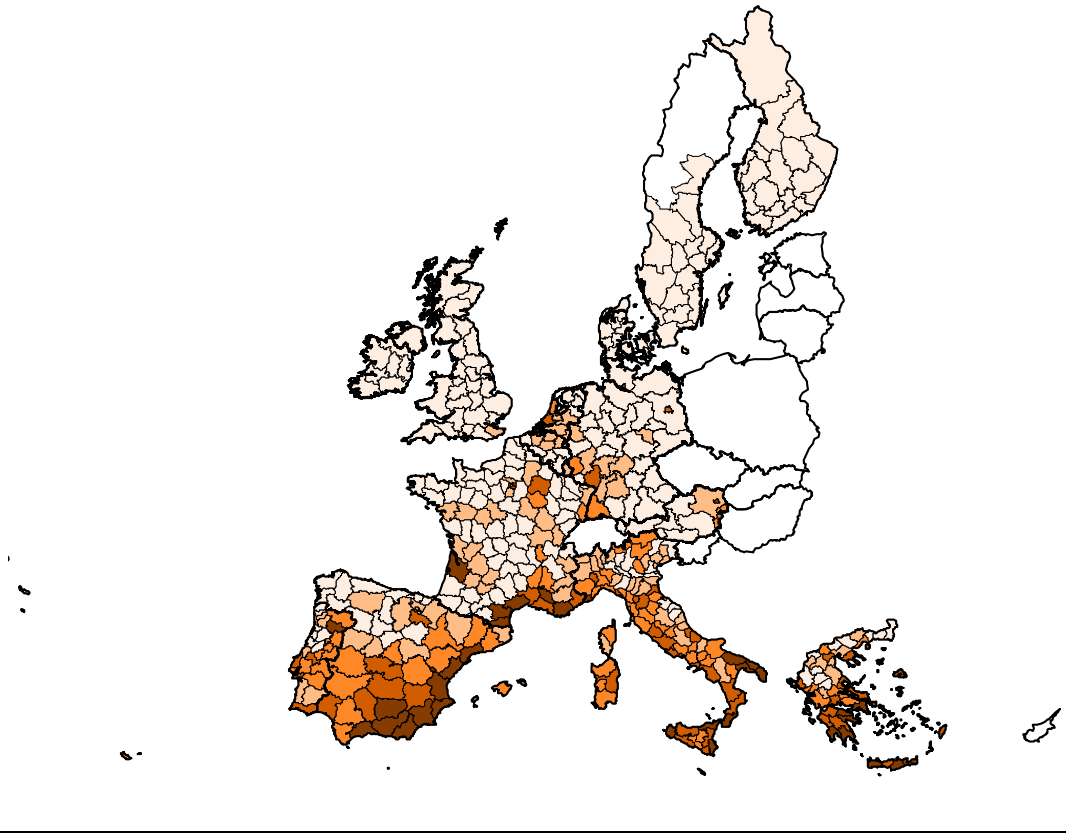
Five classes from light to dark green:
0-12; 12-26; 26-44; 44-66; 66-99% **cattle** farms within the total number of farms

Table 5.15: Yearly change rate of cattle farms in the baseline 2020 scenario and difference in number of cattle farms between baseline and liberalisation.

Cattle farms		Yearly			
% per region	Number	avg chg 00-20	stnd dev	lib to baseline	stnd dev
< 26	251	-2.8	8.5	-33.9	31.6
26 – 44	59	-3.9	3.3	-43.5	24.0
44 – 66	55	-4.6	2.2	-42.6	21.0
> 66	39	-8.8	1.8	-43.2	13.3
Total	404				

As shown in Figure 5.12, there are more regions with a high concentration of vegetable and permanent crop farm types than for the other considered sub-sectors. The regional distribution of the >74% veg & perm farm type class is clearly concentrated in the coastal regions of South-Eastern Spain, Southern France, South-Eastern Italy and Greece. The difficulty for the assessment of the sub-sector's reactions is that it combines such different commodities as permanent crops, which include wine and olive oil production, and horticulture, where the production conditions and hence the farm organisation differ substantially from the permanent crop sub-sector. With considerable care the adjustment figures as shown in Table 5.16, can be interpreted as follows: regions with a high share of veg & perm farms (54-74% and >74%) that show relatively low yearly adjustment rates in the baseline scenario have a horticultural vocation where competition is already high in the baseline situation of 2000 and where subsidies are generally very low. Hence, also the difference between the farm number under the regionalisation and the liberalisation scenarios is not as high as for instance in the cattle and the arable crop sub-sectors. However, the classes of regions below the threshold of 32% of veg & perm farms possibly contains more farms with permanent crops or those horticultural farms that do not have a strong regional competition in 2000. Hence, the yearly structural adjustments in the baseline 2020 scenario are stronger.

Figure 5.12: Density of veg & perm farms per region (2000).



Five classes from light orange to brown:
0-12.5; 12.5-32; 32-54; 54-74; 74-100% of **veg & perm** farms within the total number of farms

Table 5.16: Yearly change rate of veg & perm farms in the baseline 2020 scenario and difference in number of veg & perm farms between baseline and liberalisation.

Veg & perm		Yearly			
% per region	Number	avg chg 00-20	stnd dev	lib to baseline	stnd dev
>32	249	-3.2	6.7	-17.1	15.0
32 - 54	66	-1.8	3.2	-25.1	11.6
54 - 74	51	-1.1	2.4	-19.4	12.0
> 74	39	-1.0	2.1	-18.7	9.2
Total	405				

Summarising the regions' reactions with regard to the farm structures of selected farm types, it is evident that:

- For commodity groups like arable crops or cattle products, the most pronounced reactions, both in the course of time and as differences between the socio-economic scenario conditions, happen throughout those regions where the farm type is already concentrated. This reaction is a regional strength in terms of the sub-sector's competitiveness. It can become a weakness, for example, if the

regions' landscapes get a more mono-cultural character and lose scenery attractiveness. Overall, it has to be carefully monitored whether the structural changes have an impact on the rural economies in terms of the general employment situation, the land markets and the maintenance of rural infrastructures and assets.

- For the vegetable and permanent crop sub-sector, the adaptation to external drivers happens more smoothly or does not affect the rural landscapes to such a high degree. Nevertheless, this general trend has to be checked and monitored carefully at a regional level.

5.4.2 Land use adjustments

The adjustments of the agricultural land use at regional level are assessed in terms of commodity areas (ha) per overall agricultural area (UAA) and for the livestock in heads per agricultural area. This combination of commodity-per area shares and the livestock population in animal units is considered as a region's 'land use system', which is, of course, an artificial construction. However, in this way an impression of a region's major orientation in the agricultural land use is conveyed.

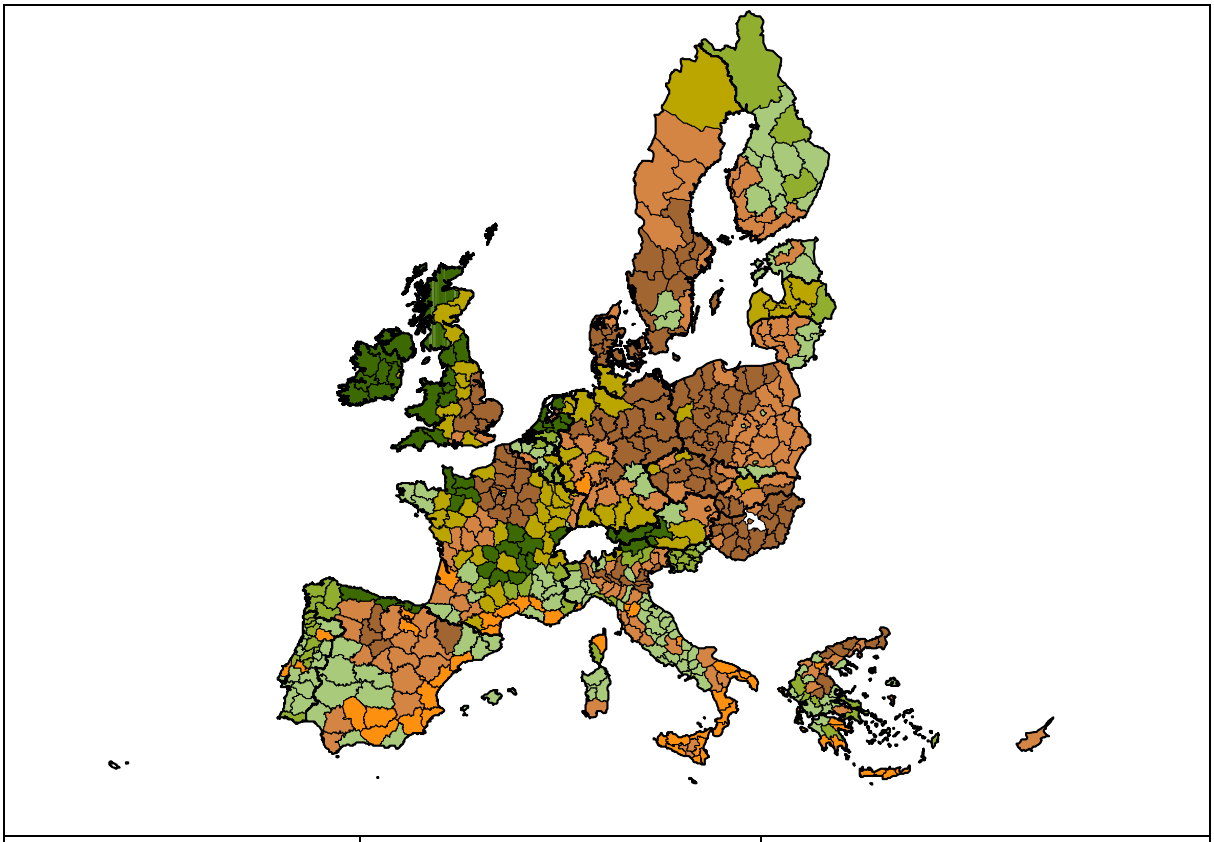
Agricultural land use in 2000

The general assessment of the regions' reactions shows that there is a certain coherence between the land use situation in 2000 and the regionalisation scenario in 2020. As can be seen in Figure 5.13 and in Table 5.17, the agricultural land use types in 2000 as derived from Corine Land Cover Data (four classes of agricultural land use) can be regrouped to 7 meaningful groups (clusters) which describe the typical agricultural land use system for each region.

Table 5.17: Agricultural land use classes in 2000.

			Average (% share)			
Name	CLUSTER	Number	arable	horticulture	pasture	hetero
Strong arable	3	127	82	1	7	9
Arable	1	127	64	3	9	24
Arable/pasture	4	60	44	1	34	20
Arable/hetero	7	123	39	7	5	48
Horticulture	6	54	22	40	2	35
Pasture	5	45	14	1	69	16
Heterogeneous	2	57	7	5	12	75
		Total	48	7	15	31

Figure 5.13: Agricultural land use types (status quo).



			Average				StDev			
	CLUSTER	Number	arable	horticulture	pasture	hetero	arable	horticulture	pasture	Hetero
Dark brown	3	127	82	1	7	9	6	2	6	5
Light brown	1	127	64	3	9	24	6	4	8	6
Olive	4	60	44	1	34	20	13	2	7	11
Light green	7	123	39	7	5	48	12	8	7	10
Orange	6	54	22	40	2	35	19	14	4	16
Dark green	5	45	14	1	69	16	14	4	16	12
Green	2	57	7	5	12	75	6	6	15	15
		Total	48	7	15	31	27	13	20	22

Source: CLC classes 210 – 240, own clusters

Agricultural land use in the regionalisation scenario

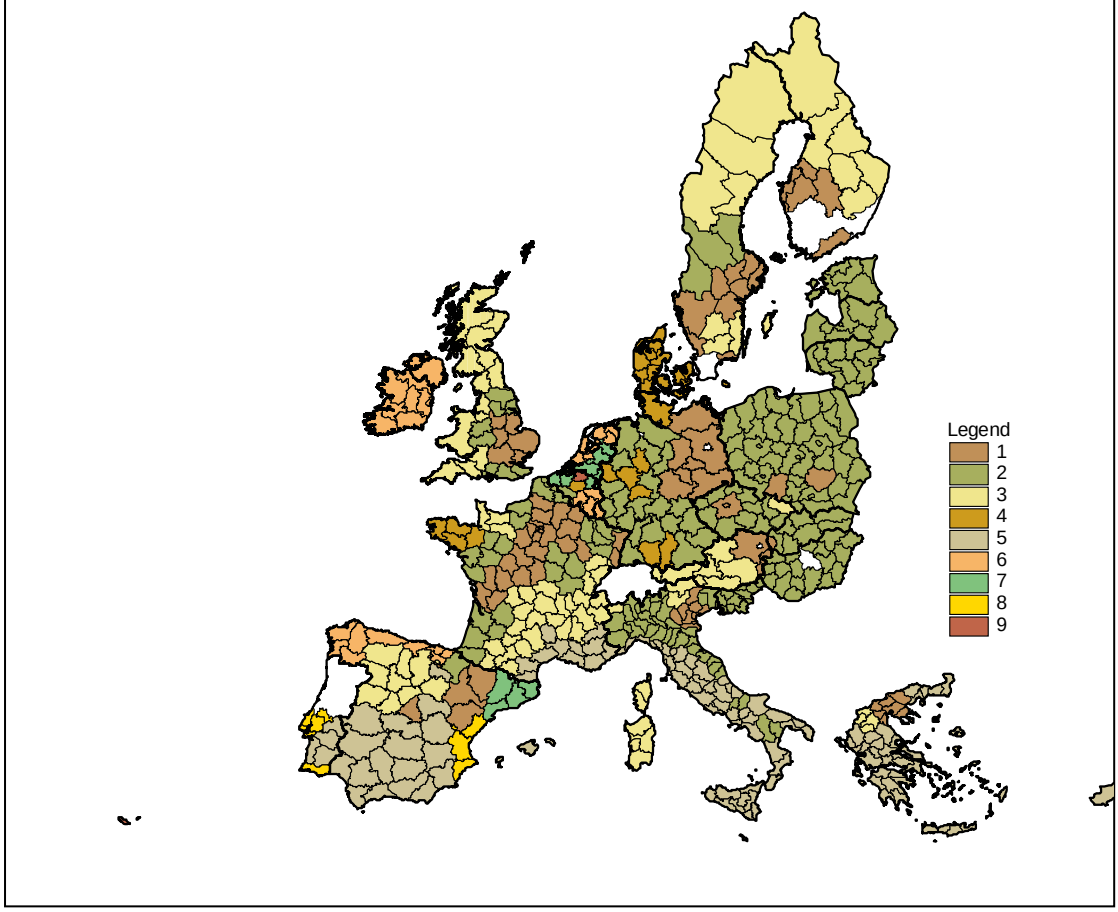
In the 'regionalised' world in 2020, the overall averages for the EU-25 show that in this situation the highest land use share is that of fodder crop areas with an average of 42% of the total UAA. Cereals make up nearly 30% and vegetables and permanent crops constitute roughly 11%. Cattle have an overall average of 0.6 units per ha, pork is at 1.9 and poultry is at 0.06 units per ha (Table 5.18). The general importance of the fodder production might be explained by the fact that these crops (protein crops) still receive coupled payments in the regionalisation scenario.

Table 5.18: Indicators characterising the regionalisation scenario.

Variable	N	Average	Stand. Deviation	Minimum	Maximum
share_cereals	567	29.2310406	14.1756232	0	64.0000000
share_fodder	567	42.0423280	18.8768084	3.0000000	99.0000000
sh_veg_perm	567	11.2698413	14.4039228	0	82.0000000
cattle_ha	567	61.8430335	46.9834387	3.0000000	564.0000000
pork_ha	567	195.4003527	376.0757247	0	4406.00
poultry_ha	567	6.1922399	21.6487396	0	366.0000000

The regional typical reactions in the regionalisation scenario are assessed on the basis of a cluster analysis that aggregates regions with similar land use patterns. The analysis has been broken down to 9 clusters, of which 3 are of only minimal importance (Table 5.19 and Figure 5.14). In order to link the results from the regionalisation scenario to the situation in 2004, the indicators for the clusters are compared to the average of the sub-sector farm structure density for the respective cluster. The six clusters of major importance can be fairly well distinguished among the different commodities.

Figure 5.14: Nine reaction types in the regionalisation scenario.



Description of the clusters 1-9 in the text and in Table 5.19

The first cluster, **cereal+** (79 regions), is characterised by a very high share of cereals (average 50% of UAA) and the regions comprise typical arable crop production areas in Europe: Northern and Central France, Eastern Germany, Western UK, Central Sweden, etc. Obviously, these regions use the opportunities of technological progress and the relatively high internal demand for meat (cf. Section 4.2.2). There is a high coincidence between the overall share of cereal areas and the average figures of specialist crop holdings in these regions in 2004 (FSS[56]), which is 43.8%. The regions in this cluster are characterised by an average of 3.54% of agricultural employment share, which is rather low compared to the overall regional average of 6.1%, a characteristic that is in line with a predominant production orientation in market crops (Tables 5.19 and 5.20).

The second cluster, **mixed_system**, is the largest one (205 regions), in which all averages are fairly near to the overall averages except the vegetables and permanent crops. Hence, this cluster represents the mixed production system. As can be seen in Table 5.20, the farm structure (FSS in 2004) related to this cluster is much more diverse than that reported for the cereal+ cluster and equally, the projected employment share is closer to the overall average. Regions within this cluster cover most parts of Eastern Europe and they also frequently occur in Germany, Italy, France and Benelux.

The third cluster, **cattle_ext** (84 regions), has the highest share of fodder crops within the total UAA (average 68%). However, the average in cattle heads/ha (0.5808) is still below the overall average (0.618) so that here the livestock production is extensive. Fodder areas are in use because of the specific subsidies accorded (cf. Section 4.2.2). Geographically, this cluster covers hilly and remote areas throughout Europe, where agri-environmental measures contribute substantially to the maintenance of land use. The average farm structure of these regions in 2004 was characterised by a high share of grazing livestock (50%) and a low share of specialised field crops holdings.

Table 5.19: Averages of indicators per cluster (in % of UAA and livestock units/ha).

Cluster	Number of reg.	Cereals (% UAA)	Fodder (% UAA)	Veg & Perm (%)	Cattle (units/ha)	Pork (u/ha)	Poultry (u/ha)
1. Cereal+	79	**49.709**	21.506	3.620	0.381	0.889	0.025
2. Mix_sys	205	34.352	41.195	6.424	0.615	1.630	0.043
3. Catt_ext	84	19.512	**68.405**	1.904	0.581	0.697	0.022
4. Granivo	24	**47.625**	36.083	1.500	0.890	**8.038**	0.108
5. Ve_per.I	123	18.081	33.772	**29.252**	0.384	0.767	0.026
6. Catt_int	29	9.621	**75.103**	3.793	**1.574**	1.985	0.074
7. Livest.I	12	17.083	50.000	17.333	1.538	17.993	0.683
8. Ve_pe.II	9	11.333	5.667	72.333	0.383	1.870	0.033
9. Livest.II	2	6.500	49.500	12.000	4.780	33.730	2.955
Total	567	29.231	42.042	11.270	0.618	1.954	0.062

[56] Figures for the farm structure in 2004 are only available for the EU-15.

The fourth cluster, **granivores** (24 regions), combines an elevated share in cereals with an elevated number in pork units per ha (8.00), which indicates the dominance of specialised livestock production that is coupled to the arable area. Regionally, a concentration of these production systems can be noted for Denmark (complete), and for some regions in Central and Southern Germany and Western France. Like regions from the cereal+ cluster (and even to a higher degree), these regions profit from the regionalisation in the trade and agricultural policies. The 2004 farm structure of these regions is characterised by a distinctively high share of granivore livestock holdings together with a general mixture and relatively few horticulture holdings. The agricultural employment share is comparatively low (Table 5.20).

The second largest cluster, **veg & perm crops**, is characterised by a low cereal and fodder share and a high portion of vegetable and permanent crop production in combination with low livestock figures. These regions have a clear regional location along the Mediterranean coast, where permanent crops, such as wine grapes, citrus fruits and olive trees, dominate together with specialised vegetable production. However, a differentiation between these crops is not possible on the basis of the given data, so that environmentally relevant information (e.g. share of irrigated agricultural production) cannot be discerned. The characterisation of shares is fully in line with the situation in 2004, as it is represented by the shares of the different holdings (Table 5.20). The share of agricultural employment is very high (double the average), which stands for labour intensive agriculture as, for instance, in vegetable production.

The cluster **cattle_ int** is small (29 regions) and unites the regions with a low share in cereals, a high share in fodder areas and a high number of cattle (1.6 heads/ha). Obviously, dairy production on grassland regions in Ireland dominates here, and also the Benelux and Northern Spain have a similar pattern here. From the farm structure survey, a concentration of grazing livestock holdings in 2004 is confirmed for these regions (Table 5.20).

The very small clusters livestock I, veg_perm II and livestock II are each characterised by some very high figures: livestock I contains some extreme 'pork regions' in Benelux and Spain (12), veg_perm II encompasses 9 extreme 'vegetable and permanent crop' regions in Portugal and Spain, and the cluster livestock II regions comprise the highest total livestock figures, one in Belgium and one in Portugal.

Table 5.20: Characterisation of selected regionalisation clusters by farm structure (2004).

Cluster	Agri empl _20	Field cr	Horticul	Grazing	Granivor	Mix cro	Mix ani	Mix all
Cereal+	3.54	**43.83**	18.18	19.35	1.55	4.78	1.62	10.69
Mix_sys	5.10	31.05	16.93	29.28	1.67	6.69	3.08	11.31
Catt_ext	4.14	21.52	11.37	**49.93**	1.67	3.51	3.39	8.61
Granivo	3.35	35.88	4.50	30.63	**5.08**	3.05	4.18	16.68
Ve_per.I	12.34	16.82	**57.84**	8.75	0.67	9.64	1.84	4.46
Catt_int	4.11	10.44	8.57	**65.93**	1.50	3.38	3.96	6.23

This comparison of the regionalisation scenario with the farm structure survey (FSS) data in the EU-15 shows a good general coincidence, and confirms the assumptions that the maintenance of the actual socio-economic drivers might not induce much change in the agricultural land use systems, at least in the EU-15. Further specialisation and simplification strategies are likely as indicated by the typical reactions that take place in the cereal+, the granivores and the cattle_intensive regions. However, in more than one-third of the regions, a mixed land use system will be maintained under the regionalisation scenario, conditions that are today characteristic for many European cultural landscapes.

In the following (Table 5.21) an appraisal of the regional land use reactions is presented in terms of strengths and weaknesses. However, as the data for the 2020 regionalisation scenario is not directly derived from the situation in 2004, we cannot consider the clusters as 'reaction types' *strictu sensu*. Hence the appraisal of the clusters is rather a general discussion of the regional characteristics than a clear definition of strengths and weaknesses of reactions.

Table 5.21: Strengths and weaknesses of regionalisation scenario clusters.

Clu name / n°	Typical characteristics	Comment	Strength/weakness
Cereal+ / 79	High share of cereals	Further intensification probable	Relative competitiveness / poss. narrow crop rotation
Mix_sys / 205	Mixed prod. structure	'Average farm': structural changes probable	'Balanced' land use system / weak competitiveness
Catt_ext / 84	High share fodder & low cattle	Hilly and remote areas – *relevant for RD agri-environmental measures*	Environmentally positive / weak competitiveness
Granivo / 24	High share cereals and pork	Further intensification probable	Good competitiveness / environmentally intensive
Ve_per.I / 123	High share perm./veg.	Dependency on subsidies or intensification probable	Relative competitiveness / environmentally intensive (water!)
Catt_int / 29	High share fodder & high cattle	Intensive dairy regions	Relative competitiveness
Livest.I / 12	Very high share pork	Further intensification probable	Like cluster 4 -
Ve_pe.II / 9	Very high share perm./veg.	Environmental problems?	Like cluster 5 –
Livest.II / 2	Very high total livestock	Absolute outliers	

A relative specialisation, and hence a certain competitiveness, can be accorded to clusters **cereals+** and **granivore** in crop production, to **granivore**, **cattle_int** and **livestock I** and **II** in livestock production and to **veg_perm I** and **II** in the field of permanent crops and vegetables (although cluster **veg_perm I** might hide a considerable number of small-scale permanent crop farms). Clusters **mixed_system** and **cattle_ext** encompass less specialised production systems with probably relatively smaller structural units. With 289 regions, they represent half of the regions in the EU-25 under consideration in this study.

Typical reactions of selected regions under the liberalisation scenario

As described in Sections 4.2.2 and 4.2.3, the general opportunities under the liberalisation scenario lie in an increase of demand for dairy products and pork and poultry that can – at least partly – be satisfied by EU internal production. This is not the case for vegetables and permanent crops: although demand increases by 30%, the domestic supply (in tonnes) decreases by 8% due to reduced competitiveness. The average reactions of the regions under the liberalisation scenario are presented in Table 5.22. While oilseed areas and pork and poultry production are increased under the liberalisation scenario as compared to the regionalisation scenario, all other commodities decrease in their average regional production. Within the overall fodder area that decreases slightly, the share of grasslands (here extensive grasslands) that is part of the fodder area increases.

Again, the reactions have been regrouped according to the differences that regions display between the regionalisation and the liberalisation scenario, and eight significant groups can be differentiated.

Table 5.22: % changes in the shares per region and commodity under the liberalisation scenario.

Com.	Cereals	Oilsd.	o. ar. Cr.	Fodder	Grass ext.	Veg & Perm	Cattle	Pork	Poultry
Change shares	-3.414	4.945	-2.208	-0.254	11.512	-3.896	-4.468	5.121	4.696

Intensification of crop production

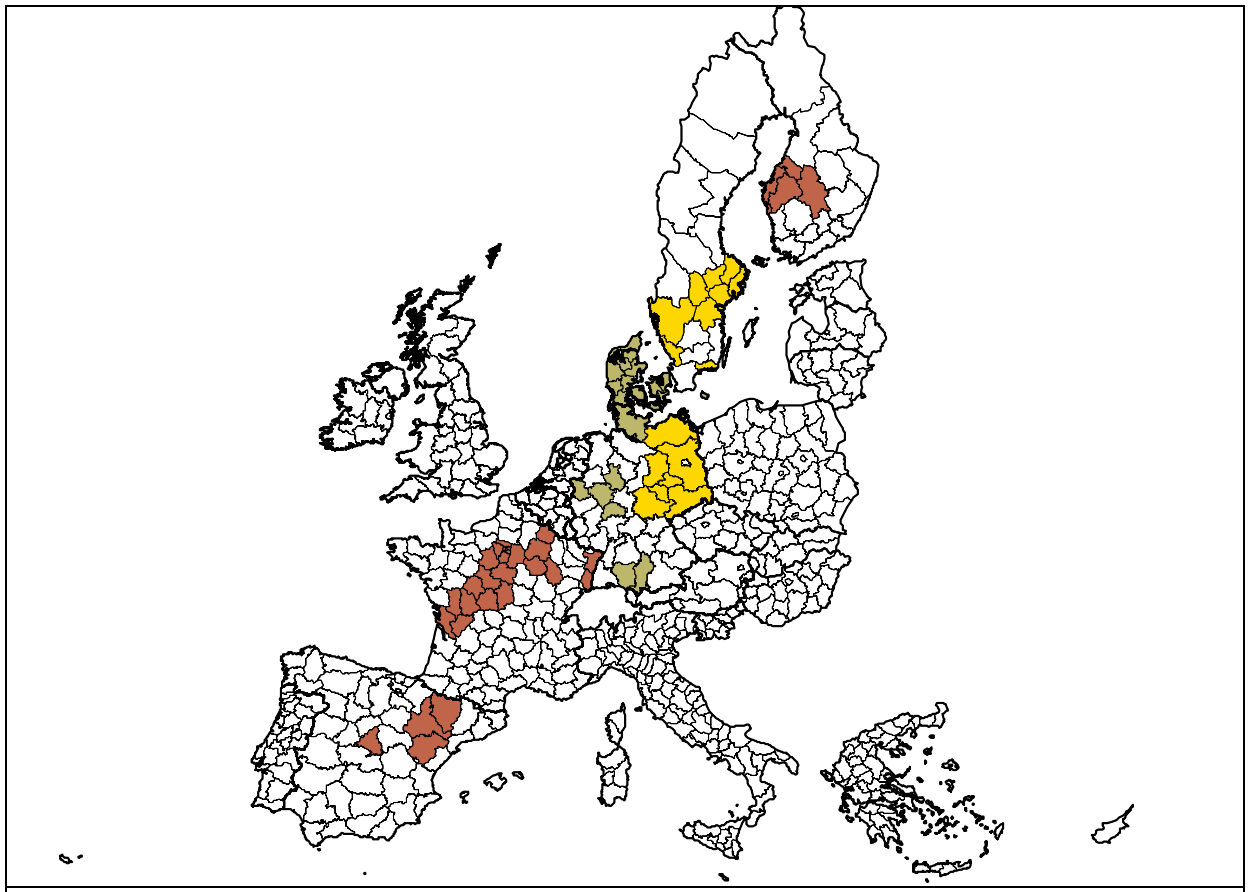
In the regionalisation scenario, there are two clusters revealing a considerable share of cereal area, cluster **cereal+** with 79 regions and cluster **granivores** with 24 regions. Both groups show reactions, which are contrary to the total average (Table 5.22): an increase in cereals of 0.9% while the total average is a decrease of 3.4% and an increase in oilseeds area of 8.8% while the total average increase is only 4.9%. Under the liberalisation scenario different types of regional reactions have been differentiated.[57] The most typical reactions shown by the **cereal+** and the **granivores** clusters are a dominating increase of arable areas (32 regions) or a special increase of the oilseeds area beside a strong orientation to arable crops (35 areas) (Table 5.23). Where these regions form connected larger areas as in France, Denmark and Eastern and Western Germany, landscape adjustments towards more uniform rural landscapes are possible and possible negative impacts on the regional biodiversity have to be monitored carefully (Figure 5.15).

[57] A detailed description of the analysis of the regions' reactions in the liberalisation scenario is given in annex, in Figure A4.2 and Table A4.11.

Table 5.23: Typical reactions of regions with a specialisation in cereals under liberalisation conditions.

	lib reaction				
reg cluster	incr arab	incr oilseeds	little reac	other	
cereal+	32	16	21	10	79
granivores		19	1	4	24
	32	35	22	14	103

Figure 5.15: Selected land use reactions of regions specialised in arable crops.



	Regionalisation cluster	Reaction under liberalisation
Brown	cereal +	Increase arable crops
Yellow	cereal +	Increase oilseeds
Green	granivores	Increase oilseeds

Dominant horticulture and permanent crop regions under the liberalisation scenario

The regions that show a strong land use orientation towards vegetable and permanent crops under the regionalisation scenario mostly tend to maintain or even increase this specialisation under the conditions of a liberalised world. Against the overall average (a

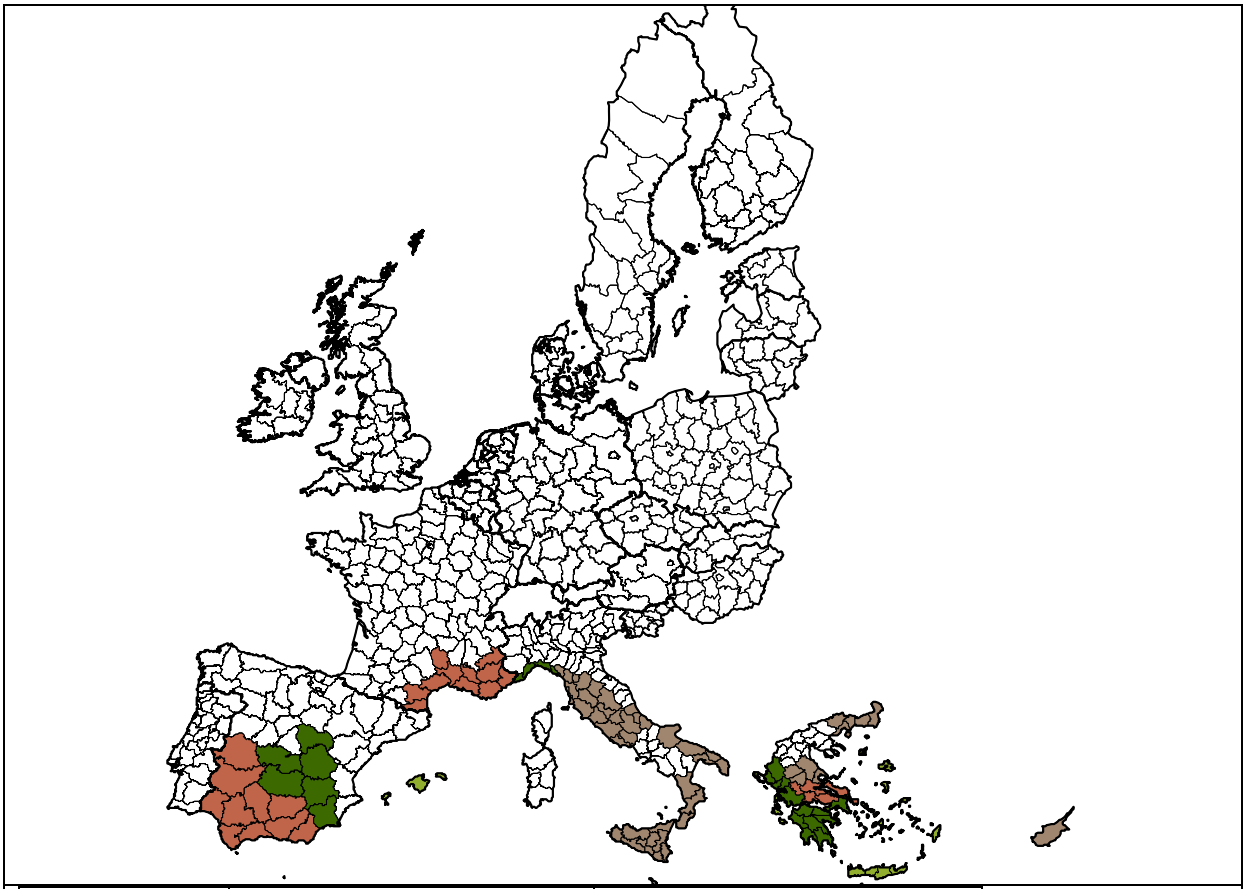
decrease of 3.9% of the veg & perm area, Table 5.22), these 123 regions show in the total average a small increase in the veg & perm area of 0.5%. In contrast, the decline of cattle and of cereal area is outstanding with -7.9% in the number of cattle per area and -8.7% change in the cereal area (Table 5.24).

Table 5.24: Typical reactions of regions with a specialisation in cereals under liberalisation conditions.

Reg cluster	Lib reaction	number	veg_per_lib	fod_lib	catt_lib	cer_lib	oil_lib
Veg & perm	Incr arable	26	0.3	0.0	-10.9	1.2	1.6
Veg & perm	Small chang	47	0.5	0.9	-4.2	0.1	2.8
Veg & perm	Decr arable	23	0.2	-3.0	-9.2	-14.7	-1.7
Veg & perm	Str decr agri	14	0.7	-5.4	-13.7	-47.9	-3.7
avg total		110	0.5	-2.0	-7.9	-8.7	3.6

The regions belonging to the veg & perm cluster are exclusively located in the Mediterranean countries Spain, France, Italy and Greece (Figure 5.16). Four types of reactions under the liberalisation scenario can be distinguished: in Spain and France, large groups of regions tend to increase both the arable crop production and the vegetable and permanent crop production. These regions obviously continue to specialise in crop production, while decreasing in cattle, and thus a strong performance in the agricultural sector can be attributed to them (coloured red-brown in Figure 5.16). Similarly, many Italian regions, some in North-Eastern Greece and Cyprus react towards the maintenance of agriculture in general while the veg & perm areas increase (brown coloured regions in Figure 5.16). In contrast, two smaller groups of regions in Spain and Greece (green and light green in Figure 5.16) show a strong and a very strong decrease of cattle and crop area used under the liberalisation scenario. Although the veg & perm production is stable and even increases in Crete and on the Baleares (light green regions), the general performance of the agricultural sector is weak in comparison. Here, it is more likely that agricultural land will be abandoned and rural landscapes lose their attractiveness.

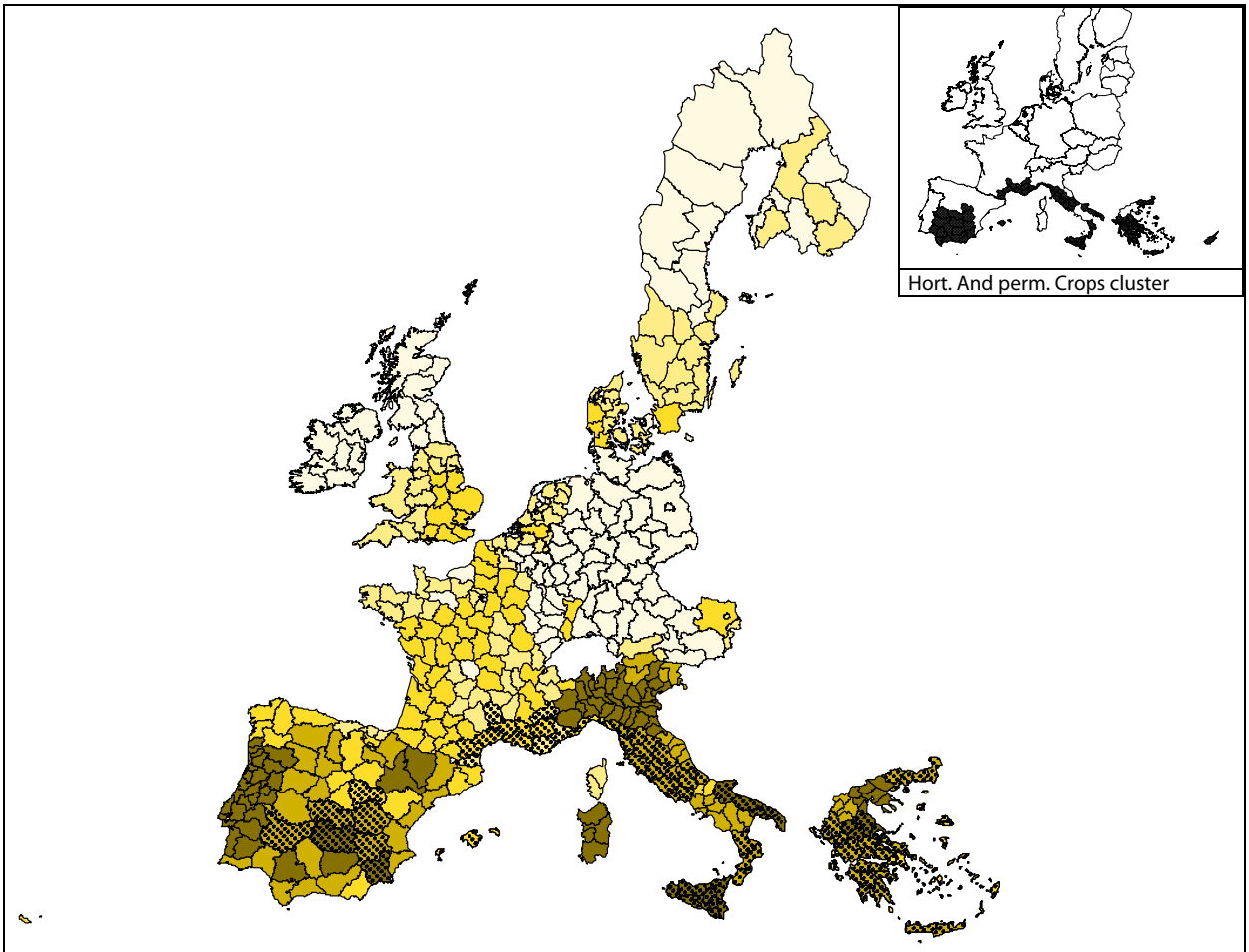
Figure 5.16: Selected land use reactions of vegetable and permanent crop regions.



	Regionalisation cluster	Liberalisation cluster
Red-brown	Veg & perm	Increase arable crops
Brown	Veg & perm	Small changes
Dark green	Veg & perm	Decrease arable
Light green	Veg & perm	Strong decrease of agriculture

In vegetable and permanent crop production, the availability of water is of special importance as legumes and fruits are frequently irrigated. Further intensification in this sub-sector will possibly lead to technological progress towards improved water conserving application technologies. Nevertheless, as of today (2006) many regions have already reached the limits of water availability, such as in Southern and Central Spain where sectoral conflicts between agriculture and tourism can be observed. In order to recognise those regions where a high water abstraction rate (today) falls together with regional strengths in the veg & perm sub-sector, Figure 5.17 presents regional water abstraction rates in 5 classes that are combined with the regions from the veg & perm cluster. It is obvious that the classes with higher water abstraction rate are all located in the South of the EU-15. While the Italian and Greek regions have predominantly high water abstraction in general, the picture is less uniform in Spain and water abstraction is even comparatively low in France. As can be seen, veg & perm regions do not necessarily coincide with the regions of highest water abstraction. This should not be read as a sign that water might not be a restricting resource for veg & perm production in the future, but rather that there are still other factors to be taken into account that determine use of water, like the industrial sector and tourism.

Figure 5.17: Water abstraction combined with vegetable and permanent crop regions.



Agricultural use of water combined with the prognosis about increasing horticulture and permanent crops

	Agri water use*
From light to dark ↓	0 – 1.3
	1.3 – 20.3
	20.3 – 222.1
	222.1 – 1084.2
	>1084.2

*Quantile

5.5 Conclusions on the SWOT analysis

1) A SWOT analysis of projected data is a challenge with regard to the original meaning of the instrument that aims at (self-)evaluation of organisations and enterprises. Hence, the identification of strengths and weaknesses usually relies on the combination of insider and outsider perspectives. However, in Scenar 2020 insider perspectives from the regions' point of view were not obtainable under the given restrictions of time and resources. Therefore, the results of the Scenar 2020 SWOT analysis demonstrate a top-down appraisal of possible future developments. In this context, the **results** constitute a useful **basis for discussion**. They should not be read as a comprehensive assessment of the regions' assembled development potentials.

2) The results of the SWOT analysis show that there is **a considerable regional diversity within all EU-25 countries** with regard to economic and demographic dynamics and to the reactions in the agricultural sector. That can be understood as the challenges for the Member States to face future opportunities and to mitigate threats among the regions. However, the analysis also makes a strong cleavage between the EU-15 and the EU-10 countries visible: difficulties in both economic and population development terms, which concern some regions in the EU-15, strike larger groups of regions in the EU-10. Mitigation of wider, cross-regional negative impacts and the handling of spatially connected regional weaknesses might demand more than national efforts.

3) **Most rural regions** are represented among (almost) all types of reactions that have been inspected in the SWOT analysis, in those revealing strengths as well as in those demonstrating weaknesses. Nevertheless, most rural regions tend to be more numerous in the weaker reaction types than intermediate rural or most urban regions (see Table 5.1 and Table 5.8). Hence, rurality is not a weakness as such, but it should be addressed as a specific structural feature when related to weakness.

4) In the picture of the EU-25 regions, those with **a positive performance** dominate. 270 regions show strengths in both the economic developments and the demographic dynamics (see Table 5.12) and another 54 regions show a good feature in at least one of the two determinative fields. While it can be assumed that a stable to positive population growth and a positive economic development are mutually reinforcing, regions that react positively in only one field have to be analysed in more detail as to whether and how the existing or possible strengths can be realised and consolidated. Here, the insider appraisal and the identification of specific regional characteristics should be considered as a solid basis.

5) In general, the SWOT analysis had no indicators to describe the **interrelation between the agricultural sector and future rural development** perspectives in terms of the endogenous specificities. Regional potentials like typical labels and quality products, characteristics like agro-tourism or natural assets and the degree of regional cooperation and networks, etc., could not be integrated into the

analysis because of the lack of meaningful data on the level considered. However, it is in these fields that both agriculturally based diversification activities and the development of rural regions are connected and frequently enhance each other (Kinsella *et al.*, 2006). Hence, the SWOT analysis through the identification of general strengths and weaknesses gives only very rough hints for possible anchor points of rural development measures.

6) In **the agricultural sector** the overall trend that the sector **loses importance** in terms of employment options is confirmed at the regional level. The average diminution of holdings is less pronounced in the baseline 2020 scenario than under the conditions of a liberalisation (see Figures 4.30 and 4.31) and only a few countries show little regional changes. These structural adjustments constitute strengths in terms of farm competitiveness; however, they can add to regional weaknesses in cases where unemployment is already a difficulty that is increased by the lay-off of agricultural labour forces. Especially those types of regions, which have developed a specialised sub-sector farm structure, have a stronger decrease of holdings both in the baseline scenario between 2005 and 2020 and in the difference between the regionalisation and the liberalisation settings (see Tables 5.14 and 5.15). Possible impacts of such a reaction on the rural landscapes are simplification of ecological structures and more monotonous sceneries. Possible effects on the rural development perspectives are likely in cases where the agricultural sector contributes to the maintenance of rural infrastructures and institutions. While the SWOT analysis presented here can outline these possible interrelations, their actual relevance in terms of combined strengths or weaknesses has to be determined at a regional level.

7) The Scenar 2020 SWOT analysis concentrates on the regions' typical reactions in the future under different socio-economic conditions. Its specific value lies in the systematisation and interrelated discussion of major trends in the field of demographic developments, economic activities and agricultural perspectives. In this manner, possible futures become more concrete and hence recognisable in their regional relevance. The reaction types as presented in Section 5.3 will serve as points of reference in this regard. It might be considered as a deficit of the Scenar 2020 SWOT analysis that the typical reaction types cannot be linked to homogeneous groups of regions in the present … a situation that would have given the diagnosed strengths and weaknesses a stronger reliability. However, the elaboration of a consistent argumentation that bases the projected data in a cause-effect related way to the situation today would need more resources in terms of time for communication, theoretical convergences and methodological adjustments.

Annex: Land cover tables

Table A.1: Land cover in 2000 and 2020 for the three scenarios for built-up and arable as a percentage of total land area.

	Built-up				Arable			
	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation
Austria	0.042	0.044	0.043	0.043	0.174	0.126	0.135	0.108
Belgium/Luxembourg	0.196	0.217	0.217	0.217	0.318	0.271	0.284	0.260
Bulgaria	0.050	0.050	0.050	0.050	0.387	0.425	0.445	0.411
Cyprus	0.075	0.075	0.075	0.075	0.314	0.293	0.311	0.301
Czech Republic	0.061	0.062	0.062	0.062	0.441	0.428	0.445	0.405
Denmark	0.075	0.077	0.077	0.077	0.701	0.629	0.649	0.590
Estonia	0.022	0.023	0.022	0.023	0.205	0.224	0.239	0.182
Finland	0.016	0.017	0.017	0.017	0.068	0.053	0.059	0.045
France	0.049	0.052	0.051	0.051	0.343	0.298	0.315	0.256
Germany	0.082	0.083	0.083	0.083	0.424	0.361	0.382	0.322
Greece	0.022	0.022	0.022	0.022	0.176	0.164	0.168	0.140
Hungary	0.059	0.060	0.060	0.060	0.571	0.542	0.566	0.504
Ireland	0.024	0.029	0.028	0.029	0.125	0.098	0.101	0.081
Italy	0.048	0.049	0.049	0.049	0.321	0.271	0.280	0.253
Latvia	0.014	0.014	0.014	0.014	0.210	0.232	0.245	0.204
Lithuania	0.034	0.034	0.034	0.034	0.436	0.456	0.476	0.429
Malta	0.280	0.283	0.283	0.283	0.135	0.091	0.116	0.110
Netherlands	0.135	0.143	0.143	0.142	0.320	0.254	0.268	0.241
Poland	0.034	0.035	0.035	0.035	0.496	0.486	0.503	0.460
Portugal	0.027	0.028	0.028	0.028	0.179	0.162	0.166	0.140
Romania	0.065	0.066	0.066	0.066	0.384	0.422	0.440	0.408
Slovakia	0.057	0.057	0.057	0.057	0.366	0.345	0.360	0.321
Slovenia	0.027	0.027	0.027	0.027	0.147	0.135	0.141	0.131
Spain	0.016	0.018	0.017	0.018	0.252	0.235	0.239	0.199
Sweden	0.016	0.017	0.017	0.017	0.084	0.071	0.078	0.067
United Kingdom	0.077	0.081	0.081	0.080	0.282	0.254	0.269	0.222
Grand Total	0.044	0.045	0.045	0.045	0.298	0.275	0.288	0.250

Table A.2: Land cover in 2000 and 2020 for the three scenarios for grassland and (semi-) natural vegetation as a percentage of total land area.

	Grassland				**(semi-) Natural vegetation**			
	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation
Austria	0.143	0.183	0.186	0.146	0.071	0.077	0.072	0.098
Belgium/Luxembourg	0.238	0.239	0.238	0.200	0.026	0.032	0.028	0.053
Bulgaria	0.087	0.118	0.118	0.105	0.130	0.077	0.072	0.085
Cyprus	0.058	0.057	0.057	0.057	0.252	0.252	0.247	0.252
Czech Republic	0.110	0.088	0.089	0.082	0.055	0.069	0.065	0.083
Denmark	0.066	0.064	0.064	0.048	0.051	0.087	0.085	0.103
Estonia	0.124	0.098	0.096	0.095	0.134	0.140	0.138	0.161
Finland	0.021	0.021	0.021	0.021	0.184	0.189	0.187	0.191
France	0.226	0.235	0.233	0.215	0.061	0.063	0.058	0.088
Germany	0.169	0.182	0.180	0.162	0.018	0.046	0.040	0.069
Greece	0.084	0.080	0.079	0.098	0.398	0.402	0.402	0.408
Hungary	0.100	0.079	0.078	0.075	0.055	0.064	0.054	0.085
Ireland	0.681	0.631	0.631	0.748	0.099	0.121	0.122	0.076
Italy	0.081	0.108	0.106	0.078	0.134	0.128	0.127	0.146
Latvia	0.226	0.198	0.196	0.212	0.111	0.116	0.115	0.117
Lithuania	0.169	0.160	0.159	0.162	0.060	0.060	0.057	0.067
Malta	0.214	0.214	0.211	0.211	0.324	0.324	0.324	0.324
Netherlands	0.413	0.441	0.440	0.412	0.020	0.035	0.032	0.054
Poland	0.141	0.113	0.113	0.108	0.024	0.040	0.038	0.055
Portugal	0.075	0.088	0.085	0.104	0.176	0.127	0.126	0.139
Romania	0.150	0.194	0.194	0.176	0.057	0.037	0.035	0.039
Slovakia	0.102	0.064	0.063	0.057	0.065	0.087	0.085	0.102
Slovenia	0.167	0.147	0.145	0.142	0.059	0.038	0.039	0.041
Spain	0.074	0.070	0.070	0.068	0.260	0.251	0.250	0.267
Sweden	0.015	0.015	0.015	0.013	0.124	0.130	0.127	0.131
United Kingdom	0.315	0.330	0.325	0.280	0.100	0.101	0.098	0.132
Grand Total	0.137	0.141	0.140	0.131	0.117	0.118	0.116	0.132

Table A.3: Land cover in 2000 and 2020 for the three scenarios for recently abandoned arable land and permanent crops as a percentage of total land area.

	Recently abandoned arable land				Permanent crops			
	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation
Austria	0.000	0.002	0.000	0.021	0.008	0.006	0.007	0.006
Belgium/Luxembourg	0.000	0.013	0.004	0.022	0.003	0.003	0.003	0.003
Bulgaria	0.000	0.000	0.000	0.000	0.019	0.021	0.022	0.020
Cyprus	0.000	0.021	0.007	0.013	0.075	0.070	0.074	0.072
Czech Republic	0.000	0.006	0.002	0.016	0.006	0.006	0.006	0.006
Denmark	0.000	0.035	0.017	0.064	0.000	0.000	0.000	0.000
Estonia	0.000	0.000	0.000	0.009	0.001	0.001	0.002	0.001
Finland	0.000	0.008	0.004	0.014	0.000	0.000	0.000	0.000
France	0.000	0.016	0.006	0.043	0.026	0.023	0.024	0.020
Germany	0.000	0.022	0.008	0.049	0.007	0.006	0.007	0.006
Greece	0.000	0.008	0.005	0.020	0.064	0.060	0.062	0.051
Hungary	0.000	0.012	0.003	0.028	0.022	0.022	0.022	0.020
Ireland	0.000	0.013	0.010	0.000	0.000	0.000	0.000	0.000
Italy	0.000	0.019	0.011	0.037	0.092	0.078	0.080	0.074
Latvia	0.000	0.000	0.000	0.003	0.001	0.001	0.001	0.001
Lithuania	0.000	0.000	0.000	0.003	0.002	0.001	0.001	0.002
Malta	0.000	0.035	0.013	0.016	0.006	0.003	0.006	0.003
Netherlands	0.000	0.015	0.006	0.034	0.002	0.003	0.002	0.003
Poland	0.000	0.004	0.001	0.017	0.003	0.003	0.003	0.003
Portugal	0.000	0.008	0.004	0.020	0.180	0.164	0.167	0.141
Romania	0.000	0.000	0.000	0.000	0.034	0.037	0.039	0.035
Slovakia	0.000	0.010	0.002	0.020	0.007	0.007	0.007	0.007
Slovenia	0.000	0.005	0.001	0.007	0.010	0.009	0.010	0.009
Spain	0.000	0.010	0.006	0.036	0.122	0.113	0.116	0.098
Sweden	0.000	0.007	0.002	0.010	0.000	0.000	0.000	0.000
United Kingdom	0.000	0.004	0.000	0.031	0.001	0.001	0.001	0.001
Grand Total	0.000	0.010	0.004	0.026	0.035	0.032	0.033	0.029

Table A.4: Land cover in 2000 and 2020 for the three scenarios for forest and recently abandoned grassland as a percentage of total land area.

	Forest				Recently abandoned grassland			
	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation	2000	2020 Baseline	2020 Regionalisation	2020 Liberalisation
Austria	0.453	0.454	0.450	0.454	0.000	0.000	0.000	0.016
Belgium/Luxembourg	0.213	0.220	0.220	0.221	0.000	0.000	0.000	0.019
Bulgaria	0.317	0.298	0.284	0.320	0.000	0.000	0.000	0.000
Cyprus	0.170	0.170	0.169	0.170	0.000	0.005	0.003	0.004
Czech Republic	0.327	0.327	0.322	0.328	0.000	0.013	0.009	0.017
Denmark	0.092	0.092	0.092	0.092	0.000	0.002	0.001	0.012
Estonia	0.507	0.504	0.494	0.507	0.000	0.004	0.002	0.016
Finland	0.692	0.692	0.692	0.692	0.000	0.001	0.001	0.002
France	0.267	0.285	0.285	0.289	0.000	0.001	0.000	0.010
Germany	0.295	0.296	0.296	0.296	0.000	0.001	0.001	0.009
Greece	0.183	0.183	0.183	0.183	0.000	0.006	0.005	0.004
Hungary	0.192	0.209	0.204	0.212	0.000	0.012	0.012	0.015
Ireland	0.052	0.059	0.059	0.047	0.000	0.030	0.030	0.000
Italy	0.265	0.289	0.289	0.291	0.000	0.000	0.001	0.014
Latvia	0.438	0.432	0.425	0.438	0.000	0.005	0.002	0.010
Lithuania	0.298	0.286	0.270	0.298	0.000	0.002	0.001	0.004
Malta	0.009	0.009	0.009	0.009	0.000	0.009	0.006	0.013
Netherlands	0.093	0.094	0.094	0.094	0.000	0.000	0.000	0.004
Poland	0.301	0.301	0.296	0.301	0.000	0.017	0.009	0.020
Portugal	0.277	0.336	0.335	0.337	0.000	0.001	0.002	0.005
Romania	0.304	0.238	0.221	0.271	0.000	0.000	0.000	0.000
Slovakia	0.398	0.401	0.398	0.402	0.000	0.023	0.022	0.028
Slovenia	0.565	0.600	0.598	0.601	0.000	0.013	0.013	0.015
Spain	0.186	0.206	0.207	0.207	0.000	0.007	0.005	0.018
Sweden	0.660	0.659	0.659	0.659	0.000	0.000	0.001	0.002
United Kingdom	0.084	0.086	0.084	0.086	0.000	0.000	0.000	0.025
Grand Total	0.323	0.328	0.325	0.331	0.000	0.004	0.003	0.011

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