

The 21st Century Land Use Challenge



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Foreword

For the first half century of its existence the CAP proved to be a robust, and highly adaptable, policy for European agriculture. Since the late 1960s it has adjusted to successive enlargements, fantastic technical and structural change in farming, large swings in economic fortunes, commodity markets and exchange rates, and numerous challenges of plant and animal disease, flood, fire and storms. This period has seen enormous changes in social structures and the shopping and consumption habits of citizens, and a corresponding transformation in food processing and distribution. These sectors are now amongst the most innovative and dynamic in our economies. Europe now has a highly sophisticated food chain offering an unprecedented range of food and drink of the highest quality and produced to top standards of food safety, environment and animal welfare protection.

The policy has never stood still, and the process of constant adaptation to changing circumstances must continue. However, given that farming, forestry and environmental land management are long-term, and the private businesses conducting these activities have to think in intergenerational terms, the CAP also has responsibility to try and maintain some degree of stability for these activities. This is a tough balance to strike.

It is right of the present Commissioner to signal that a period of relative stability is required and to task the Health Check to tidy up, streamline and simplify aspects of the recent reforms. However, it is right also to lift our heads and consider the kind of policy needed for the next half century. This requires us to be clear about the challenges we face in this period and therefore the legitimate objectives of rural policy which will be relevant to help the farming and other land management sectors adjust to these challenges. Indeed we have been mandated by the European Council to conduct a thorough review of the CAP in the context of the review of the EU budget and own resources. It is therefore right first to ask what are the objectives of European policies? Second, we must justify that dealing with these objectives is best discharged at EU level, and only then, third, can we judge the scale of resources required for the policy compared to current expenditures. Identifying the specific measures required to implement agreed objectives is for future discussion.

The essence of this paper is that the world faces two challenges, for food and for the environment. These challenges will be tougher in the next half century than in the last. Globally, we have to repeat the trick performed in the 20th Century of feeding a doubled population, of richer, longer-living people. Yet, this Century, we have to do it with a dramatically lower negative impact on the environment, especially water and atmospheric pollution, and probably provide a significant share of renewable energy from land based resources too. As living standards rise so too do public expectations about the quality of food, how it is produced and the state of environment.

These are plainly international challenges, but for which developed blocs must lead the way in providing the technology and institutional and governance structures and policies. In particular, because of its sheer size and economic position, the EU has responsibility to help meet these challenges. Food, agriculture and environment are core EU competences. This has been necessary within the European single market and there is no reason to change now. There is much work to be done to find the mix of freely operating market signals which can guide and reward an internationally competitive, profitable farming industry, with the frameworks, incentives, regulations, and public payments to bring about the delivery of improved natural resource management, biodiversity protection, and delivery of landscape services in diversified and vibrant rural economies.

THE 21st CENTURY LAND USE CHALLENGE

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THE 21ST CENTURY LAND USE CHALLENGE

Executive Summary

1. Following extensive discussions to finalise the European budget for the period 2007 to 2012, in December 2005 the European Council called for a fundamental review of the EU budget, including the CAP, to be completed by 2008/9. They said:

“Europeans are living through an era of accelerating change and upheaval. The increasing pace of globalisation and rapid technological change continues to offer new opportunities and present new challenges. Against this background, the European Council agrees that the EU should carry out a comprehensive reassessment of the financial framework, covering both revenue and expenditure, to sustain modernisation and to enhance it, on an ongoing basis.

The European Council therefore invites the Commission to undertake a full, wide ranging review covering all aspects of EU spending, including the CAP, and of resource, including the UK rebate, to report in 2008/9. On the basis of such a review, the European Council can take decisions on all subjects covered by the review. The review will also be taken into account in the preparatory work on the following Financial Perspective.”¹

2. This review is expected to set the basis for the further development of the CAP after 2013.
3. In our view, it stands to reason that Europe must first agree the challenges that European agriculture, farmers and land managers and the rural environment will face over the coming years, and then the tools needed to meet those challenges. Only after that has been done should we debate the size and distribution of the budgetary resources required.
4. Of all the great challenges facing Europe, notably its farmers and land managers, as well as the world as a whole over the coming years arguably the most important will be food security and environmental security. When we speak of food security, we do not mean European, but global food security, and the practical as well as moral need for Europe to make a contribution commensurate with its ability to do so. When we speak of environmental security we mean both European and world environmental security.
5. “Agriculture in Europe is at the heart of the main challenges we face in the Twenty-first Century”(Sarkozy). Farmers and land managers are expected to cater for our food, and contribute to our energy requirements, materials needs and water resources management, and more generally to climate change mitigation. At the same time, farmers and land managers are expected to deliver improved levels of ecosystem stewardship and services, and provide the facilities needed to meet the ever increasing demand for recreation. The contribution of Europe’s farmers, foresters and other land managers to meeting these challenges is crucial.
6. Improving productivity to meet all these demands and, at the same time, improving the condition of the natural environment is the Great 21st Century Land Challenge. It calls for a new and different ambition and for better conditions for

¹ Council of the European Union, “Final Comprehensive Proposal from the Presidency on the Financial Perspective 2007-2013, Brussels, 19 December 2005, paragraphs 79 and 80.

agricultural, and even a broader land management, policy in Europe as well as elsewhere.

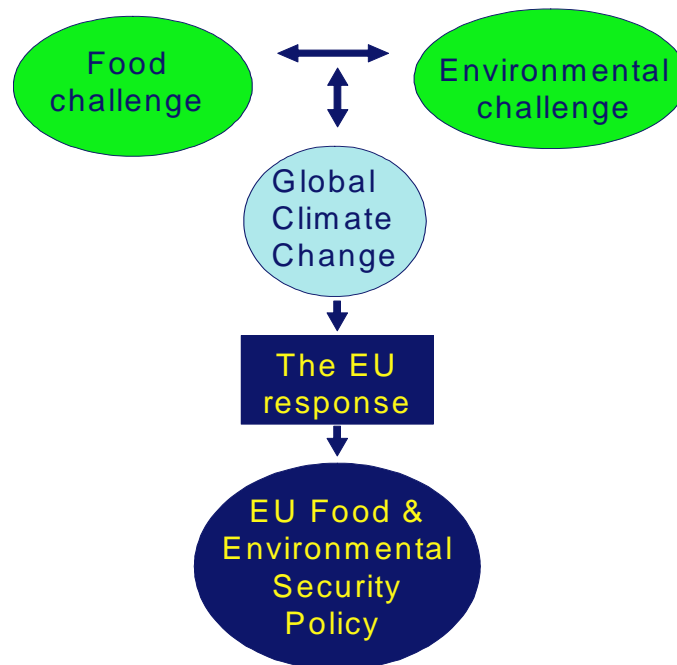
7. Land resources must be preserved and improved. Farm and other land management businesses must be viable. Forests and aquatic resources must be maintained in a healthy and productive condition. Farmers and the other managers of those resources must be able to adapt and respond to existing and new markets. In other words, farm and other land-based rural businesses must be environmentally, as well as socially and economically sustainable. It is only profitable and sustainable businesses that have the capacity to adapt and respond positively to market signals and meet food and natural resource security concerns.
8. The goods and services delivered by land managers are an amalgam of private goods and services delivered through the market, and public goods and services the value of which is not reflected in market prices. If land managers are expected to work in an increasingly liberalised business environment, they should not be expected to cross-subsidise the delivery of environmental public goods and services from their market returns. It is therefore necessary to ensure that proper public payment for the value of public goods and services delivered is guaranteed.
9. Unfortunately some EU member states, argue that the CAP budget should first be cut – perhaps by 25-30% - and only then should the discussion about the future of agricultural and land management payments begin. This is deeply misguided; it is crucial that the policy objectives and future purpose of such payments must be decided before the budget is agreed. Only when the policy objectives for the “new CAP” have been agreed can we know what budgetary resources are appropriate to the task. This means that we must raise our eyes from the old disputes and concerns about the CAP as it developed over the last half of the 20th century, and we must look forward to understand clearly the key issues that will have to be met by farmers and land managers during the first half of the 21st century.
10. In a nutshell, our argument is this. During the next half Century the world faces fundamentally two challenges – to produce enough food for the growing numbers of, on average, better-off and longer-living people, and at the same time to preserve natural resources and the environment. The two challenges are closely interrelated, and each is heightened by climate change. The EU is of such a scale that we must play a responsible role in rising to these two challenges. Furthermore, food and environment are core competences of the European Union.
11. The policies within EU Budget Heading 2, Management and Protection of Natural Resources, offer vehicles through which the Union can address these issues to rise to the food and environmental challenges. This will require further evolution of the Common Agricultural Policy. The questions are how can this be done? Does it imply a completely new structuring of agricultural policy? How does agriculture rise to the challenges it faces? How will we integrate the food production challenge with the need for rural development, i.e. to diversify and regenerate rural communities? And how too will we integrate the environmental considerations of: water and soil protection; reducing greenhouse gas emissions; halting biodiversity decline; maintaining traditional farmed landscapes; and contributing to renewable energy production?

THE 21st CENTURY LAND USE CHALLENGE

Part 1: Understanding the 21st Century Land Challenge.

1. This paper takes a broad look at the challenges we face this century and considers some of the policies to deal with these challenges. It does this **starting from a global perspective** with two challenges – a food challenge and an environmental challenge. We then explore how these challenges are closely interrelated and how they are affected by global climate change. Given this context, we bring the story back to Europe and pose questions about the European Union response to these challenges. This leads us to the future of EU rural and environmental policy. This structure is illustrated in figure 1 below.

Figure 1 The thread of the argument



2. The food challenge is simple to state: it is to feed the human population, and preferably better than we are currently achieving. We have learned in the last century that feeding the human population is very much more complicated than simply the global quantum of food production: access to food for the world's poor, agricultural systems, farm policy, international trade policy, food costs, variety and safety, food chains and distribution systems, nutrition and health are far from simple matters.
3. The environmental challenge is perhaps even more complex. It is to preserve biodiversity, cultural landscape, and to both exploit and also to protect the vital natural resources of soil, air, water and energy. There is of course a strong interrelationship between the two. Food production depends critically on the state of nature; but nature, in most countries especially in Europe, depends largely on land managers, especially farmers and foresters.

The Food Challenge



4. The most important underlying factor in the food challenge is population growth. The world's population is predicted to rise from its current 6.6 billion to 9.4 billion by 2050. Each year it is growing by nearly 80 million, the population of Germany. Half of the increase will be in Asia where it is also expected that there will continue to be strong economic growth. We hope there will be also be strong economic growth in Africa, but it is hard to be optimistic about this. There are important demographic changes taking place within the overall growth – aging in the developed world; youth in the developing world; gender balance in China – and migration.
5. Total world grain production is still growing. However grain production per person peaked in 1985 and has been slowly declining since. Also, as countries get richer they consume more livestock products, eggs, dairy produce, and meat and demand for grain tends to grow even faster.
6. Future growth of food output depends on the cropland available and the yields per hectare of crops. The global area of agricultural land is 4.9 billion hectares, accounting for about 37% of the world land area. There are significant areas of unused agricultural land and production potential in parts of Eastern Europe and the former Soviet Union. However estimates of how much more land could be brought into cultivation vary widely from 0.5 billion hectares to 1.8 billion hectares, and most of this is in Africa and S America. Much of this land would have lower productivity, and most of it will come from forest and savannah, and much would involve significant negative climatic and biodiversity effects. There is a range of estimates of how much agricultural land will be lost to urbanisation. But generally the area projected to be lost to the towns and cities is much less than the potential new agricultural land. Therefore analysts do not see the sheer area of land for agriculture as the most important issue; the more challenging problem is how much we can grow on it and the environmental problems that ensue.
7. Within total agricultural land, arable land per capita is steadily declining, e.g. from 0.35 ha/head in 1970 to 0.24 ha/head in 1994. Exacerbating this trend, by 2025 the population of the countries around the world that are net food importers, as a result of insufficient cropland per capita, will rise to over 1 billion, from the current estimated 420 million. *This all implies that the intensity of that land use; crops harvested per year, and its productivity, yields per hectare, will have to rise.* Intensity and yields have been rising, but the bad news is that with a few exceptions the growth of yields has been slowing since 1982. Grain yields worldwide grew at an average of 2.1% p.a. from 1950 to 1990 but growth dropped to just under one percent between 1990 and 1997. The reasons are complex. In N America and Europe this has mostly been because policies changed in order to reduce the growth in production. In the territories formerly part of the Soviet Union it is the result of the collapse of the planned production system. In Asia it is because of the high level of land intensity and input use already achieved. There is also evidence that a slow down in public investment in research and irrigation infrastructure has slowed yield growth.
8. Two of the critical factors that affect productivity are soil loss and water availability.

9. There is much debate about the extent of soil losses due to wind and water erosion and loss of organic matter, partly consequences of deforestation and pollution. The data worldwide on this is not adequate. The debate is not whether soil is being lost and that this is reducing yields, but at what rate this damage is being done. A recent USDA study based on detailed data from 179 studies in 37 countries, for 38 crops on 9 soil types estimated mean losses of soil of between 8 and 15 tonnes per hectare per year. This is undoubtedly an important factor in the reduced yield growth.
10. However most analysts of the global food situation agree that even more critical than the availability of land and soil loss is the availability of water. When the world population more than doubled during the last half of the 20th century, to achieve the staggering feat of increasing living standards of a large part of that population and keeping grain production growth just nudging ahead of consumption growth, a massive strain was put on the availability of fresh water.
11. We are now at a stage where, globally, 70% of water pumped from underground or diverted from rivers is used for agriculture, 20% for industry and 10% for domestic use. Water stress is indicated by falling water tables, and low flow in rivers. Water is being pumped from aquifers in major grain producing regions of the world at rates in excess of their recharge rate so the water table drops. The fall in river flow in some systems is frightening, for example in the Yellow River in China which now regularly fails to reach the sea for a large part of the year. Crop production is highly demanding of water; 1000 to 3000 litres of water to produce 1 Kg rice, and maybe six times this to produce a kilo of grain-fed beef. With economic development, agriculture will find it harder to compete for water with urban & industrial demand because the value produced is so much lower. Many arid countries, e.g. in the middle East, are therefore importing their water by importing their food.
12. The FAO's Director General said in 2007 that water scarcity already affects every continent. He estimated that by 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be living under water stressed conditions." Increasing efficiency of water use in agriculture is therefore critically important – and in addition we have to deal with the fact that more of the water we have is polluted.

The Environmental Challenge



13. The success of economic development in the last two centuries in raising living standards, health and longevity for a rapidly growing population has come at considerable environmental cost.
14. The expansion of urban areas and the transport infrastructure which connects them; the exploitation of forests, then coal, oil, gas and minerals; together with the increase of the cultivated and grazed areas and the changes in agricultural technology substituting mechanisation, fertilisers and crop protection products for labour, have all, literally, dug into natural habitats and brought about a significant fall in biodiversity.
15. Butterfly and bird species, for example, occurring in different habitat types across Europe, show population declines of between -2% and -37% since the early 1970s. Similar trends can be observed in the land-cover change for related habitats between 1990 and 2000, especially for heaths and scrubs as well as mires, bogs and fens, which are specific wetland habitats. These are illustrated for the EU in the two figures below.
16. There is little merit in debating whether we could have achieved our current living standards with considerably less habitat and biodiversity loss. We are where we are, and there is now in place international action in the form of the Convention on Biodiversity which seeks to halt this loss by 2010. The EU is taking this extremely seriously with its Habitats and Birds Directives and a range of policy measures, including some under the Common Agricultural Policy are in place or in prospect to try and achieve this ambitious objective.
17. Organic matter in most of our farmed areas is poor. This exacerbates soil losses from erosion, and there are indications of loss of vital trace elements in soils with implications for crop productivity and, perhaps, human health. Water quality is also suffering from the impacts of human activity. In parts of the developed world we made great strides in the 19th and 20th Centuries in dealing first, with preventing human faecal waste contaminating fresh water; and then by reducing point source pollution of water from industrial activity. However for the last two decades we seem intent on exporting our manufacturing industry, and thereby much pollution with it, to Asia as we increasingly import manufactured products from this region. Is this their problem, or a shared problem?
18. The domestic focus of the developed world now is on diffuse pollution – much of it from agriculture. As we sought to solve the food challenge by dramatically increasing productivity, we discovered this creates an environmental challenge: eroded soil, together with residues of fertilisers and crop protection and animal health products do reach our rivers and ground water. Europe now has in place the highly ambitious, and no doubt laudable, objective of bringing all its water bodies into good ecological status.

Figure 2 Decline in birds (1980-2002) and butterflies (1972-1997) EU25

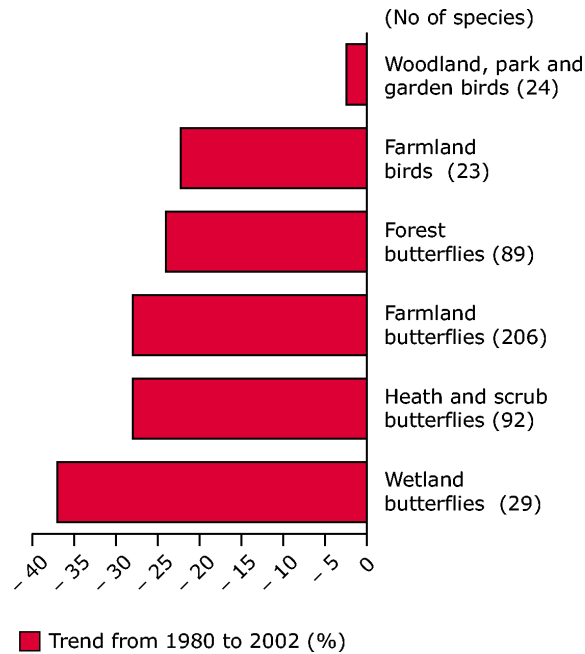
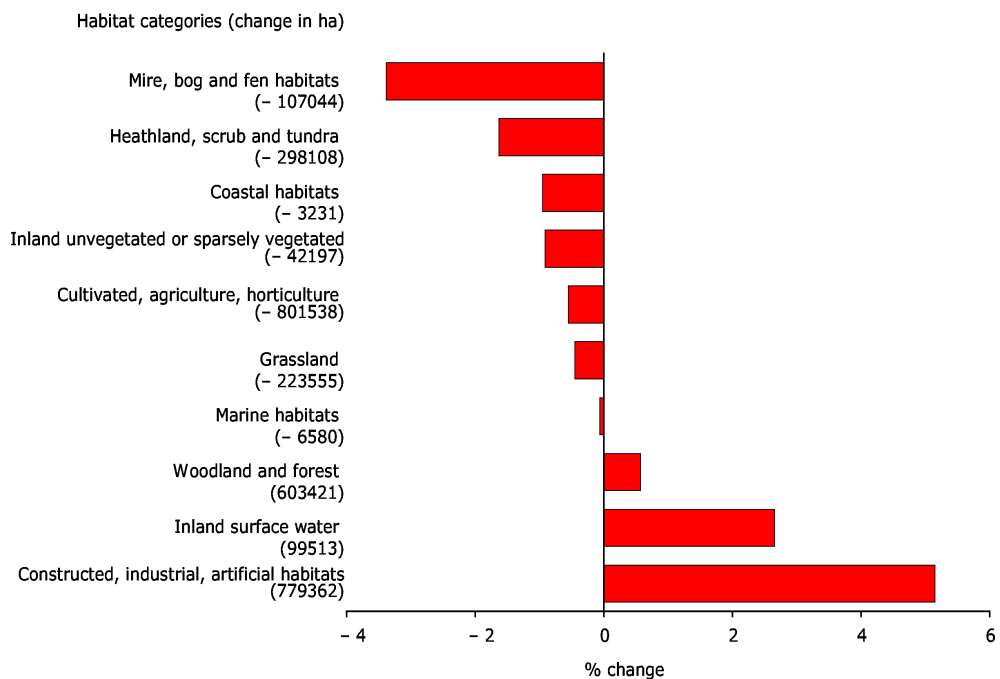


Figure 3 Habitat change in the EU15 1990-2000

Changes in coverage of EUNIS 10 main habitat types from 1990 to 2000



19. Not only is mankind reducing genetic diversity on land and in the oceans, but we are also damaging the soil, water and air. There is undoubtedly a depletion of soil quantity.
20. At the development levels we have achieved in Europe, and also considering our history, what we mean by 'the environment' is more than the natural environment (biodiversity, habitats, and resource protection). It also embraces what we nowadays refer to as the cultural landscape. This refers to the aesthetic and heritage aspects of the countryside. It partly refers to topography, but also to field patterns and their changes through the seasons, the mix of farms, forests, ponds and other water features, moor lands, and importantly the man-made features the banks, hedgerows, copses, stonewalls and dykes and the farm and village buildings and the many other historical features. This cultural landscape is also threatened by general economic development and the necessary changes in technology and scale of farming. The particular landscapes and landscape features societies treasure are of course very different in different parts of the world, but they exist in all societies.
21. Because of their magnitude and special significance in land management and the environment, special reference is made to forests. Globally, there are some 4 billion hectares of forests that store an estimated 283 giga-tonnes of carbon in their biomass alone. Together with the deadwood, litter and soil, they contain about 50% more carbon than is in the atmosphere. Yet we are losing over 7 million ha. of forest each year – mainly in Africa and South America. According to the Stern report, even with the projected growth in air travel, carbon emissions from deforestation between 2008 and 2012 are expected to exceed all the emissions from aviation from the invention of the flying machine to at least 2025. Of course, forests are much more than carbon stores. They also serve a wide variety of important ecosystem functions, including soil stabilisation, water management, and providing a home for a wide range of bio-diversity. Tropical rain forest canopies, for example, sustain about 40% of all life on earth.
22. Europe's forests, unlike forests in most other parts of the world, are expanding – by over 500,000 ha. per year. With an average forest cover of 36%, the EU25 have some 150 million ha. of forest. Unlike most of the world's forests, which are about 84% public owned, 70% of the EU's forests are privately owned. Moreover, of the 180 million ha. of forests around the world that are certified as being sustainably managed, some 42% - about 75 million ha. – are in the EU25.
23. These forests serve a variety of important functions including contributing to landscape, nature conservation, preservation of biodiversity, climate regulation, recreation, carbon sequestration, and commercial wood production. The EU25 forest industry not only generates a total output valued at some €165 billion and employs over 2.6 million people, it also contains an estimated 9.5 billion tonnes of carbon (increasing by nearly 116 million tonnes each year).

The interaction between the Challenges



24. The quality of the environment is closely related to the state of our farm land and forests. Before the agricultural and industrial revolutions, and given the far lower population pressure at that time, what we might call “first generation” or pre-industrial, agriculture” was not intrusive on nature. The next, “second generation agriculture” turned to science and technology to increase productivity and output massively, to cope with soaring population, but we discovered, at significant environmental cost. The challenge we now face is to find a “third generation agriculture” to address the global food security challenge; to enable us to keep pace with the still growing population worldwide by *maintaining and increasing productivity*, and yet to do so *in a dramatically less environmentally intrusive way*.
25. This is a very tall order. But we don’t have a choice about which challenge has to be met. We have to rise to *both*. It places a huge responsibility on land managers and those who influence the conditions in which they operate by determining policies and regulations. Meeting these twin challenges will require the very best of science and technology; of research and development; of the diffusion of innovation based on private incentive; of far-sighted and wise government; and of co-operation between private sector land managers and environmental NGOs. We are all in this boat together and so we must work together to find appropriate solutions.
26. The global and EU focus on getting a more market oriented agriculture, which is being pursued through the WTO and through reforms to protectionist agricultural policies in the developed world, is necessary, *but it is not sufficient*, to deal with these historic challenges. Of course markets can better deal with marketed produce; but markets alone will simply not deal with the pervasive environmental market failures surrounding food production. Added to these market failures is the extraordinary volatility of food markets exposed to weather, climate, pests and diseases. The sector trying to deal with this is the highly fragmented farming industry. In turn this industry finds itself in a situation of extreme imbalance in market power, squeezed as it is between the powerful upstream input supply industries and the even more powerful downstream food processing and retailing sector. The enormity of the task we face is apparent.
27. Globalisation adds yet further dimensions to the challenges. Both plant and animal disease transmission is facilitated by growing international trade and economic integration. New and improved technology has a critical role to play in confronting these challenges. We have no choice but to develop ways of satisfying human needs while making least demands on natural resources and with least impact on the natural environment. This is what sustainable development means. It would be astonishing if European agricultural and environmental science did not play a major role in the required future developments – as it has done in the past. It will be equally astonishing if Europe continued to turn its back on safe applications of biotechnology. Transgenics, for example, offer scope for yield improvement, disease and drought resistance, but

there are public and private disagreements, in Europe on this, which might be reduced by the next generation of transgenics.

28. Precisely how we will meet the environment and global food security challenges is not yet clear. It is suggested that the best insurance against future food security problems is to foster a profitable, dynamic and adaptable rural economy, especially farming and forestry. By encouraging and incentivising the preservation of our vital natural resources, and by ensuring that our productive capacity is maintained, we can ensure that Europe will be in a position to respond positively and appropriately to future global food security risk.

Now add Climate Change to the twin challenges



29. There is a strong scientific consensus that climate change is happening; and there is a large component which is man made. It is projected that; depending on the collective global response, it will increase average temperatures 2 to 5 degrees this century. In doing so, this will significantly increase both the food and the environmental challenges.

30. The research effort and literature on the potential impacts of climate change on the environment and on the production of renewable natural resources are booming. But it is early days for this relatively new science and projections decades ahead are necessarily broad brush and highly dependent on assumptions.

31. As far as the environmental impacts are concerned, studies have focussed on land and water resources and the competition from agriculture. Demand for irrigation may reduce water available for wildlife and natural ecosystems. There is also likely to be more deforestation in moist tropical regions. The European Commission have suggested that,

- “Water: Climate change will further reduce access to safe drinking water. Glacier melt water currently supplies water to over a billion people; once it disappears, populations will be under pressure and are likely to migrate to other regions of the world, causing local or even global upheaval and insecurity. Drought-affected areas are likely to increase.
- Ecosystems and biodiversity: Approximately 20 – 30 % of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5 – 2.5°C.
- Food: Climate change is expected to increase the risk of famine; the additional number of people at risk could rise to several hundred millions.”

The increased incidence of extreme weather events which is a predicted part of climate change, will also increase the volatility of crop production providing further challenges for all market participants. These are useful indicators, but going beyond such generalities requires site specific studies.

32. As far as agricultural production is concerned, there are great unknowns about the combined effects of higher temperatures and greater CO₂ concentrations.

Scientists talk of the CO₂ 'fertilisation' effect on crops which can certainly lead to higher yields. However a great deal depends on the degree of water stress. So the impacts of climate change vary enormously by crop and by region. They will also depend greatly on the combined skills of scientists, farmers and foresters to adapt to the changing climate.

33. The 2001 Intergovernmental Panel on Climate Change (IPCC) assessment, using grain prices as an indicator of the production and consumption balance, concluded that provided global temperature increase is below 2.5°C and especially if this is accompanied by a modest increase in precipitation, then real agricultural prices will continue their long term decline of the last several decades. However, a global temperature rise of more than 2.5°C is likely to exceed the capacity of the global food system to adapt without price rises. Note however they offer this conclusion 'with low confidence'. Note also that it currently seems unlikely that the rise in temperature will be limited to 2.5°C as we have seen almost a 1°C rise already.
34. What is clear is that the vulnerability to climate change will be very uneven. In the tropics where crops are already near their maximum temperature tolerance and in the large areas where non-irrigated dry-land agriculture predominates, yields will decrease even with small climate change. There are very large numbers of people in these affected regions and the most vulnerable will be the smallholders, pastoralists, rural wage labourers, urban poor, refugees and displaced people. Where do we suppose these displaced people will seek to come?
35. The more recent 2007 IPCC assessment provided the summary shown below in Table 1.

Table 1 Climate Change & Agriculture, IPCC 2007

Region	Impacts
Australia	Worse droughts; desertification of farmland
East Asia	Increased storm activity & intensity
S Asia	Increased flooding; increased drought; increased disease
S America & Caribbean	Increased storms; lower yields; increased drought
Africa	Increased disease; lower yields, droughts
N America, Europe, Rus.	Increased crop varieties & yields, but more disease
S Europe	Yield fall, drought

36. It is ironic indeed that despite being the major contributors to the cumulative increase in atmospheric CO₂ to date, the developed countries in mid-latitudes, that is N. America, Europe and Japan, seem relatively less negatively affected than most other parts of the world. In addition, these countries also have the governance and industrial structures, the technology and the research capacity to help their societies and their food and other renewable natural resources to adapt. It could be concluded that these countries therefore, with their public as well as private actors, have both the capacity, and one could add the moral responsibility, to steward their own resources in such a way as to be capable of increasing their net exports of food as this century progresses.
37. In his weighty report, at the end of 2006, Sir Nicholas Stern called climate change the biggest market failure facing mankind. He argued that collective action now, which of course, will impose costs on current activity, is cheaper than doing nothing and clearing up the damage later. A debate is now raging on what collective action to take. What should be the mix of: exhortation; information and awareness-raising; regulation; and incentivising different behaviour? This latter has to be done by adding the social cost of carbon to the constellation of costs and prices to which citizens and businesses must adjust. In turn, this can be done by capping and trading carbon, or by taxing it. There are problems with both. What is clear however is that because climate change is global, implementing these schemes demands global co-operation, particularly from the largest countries.
38. It is hard to be optimistic that mankind is capable of achieving the necessary co-operation in time. If this somewhat pessimistic conclusion is merited, then it suggests we are not going to be able to take the action necessary to limit global warming to the lower levels projected, so prudent policy would take flood and coastal defence very seriously to protect property, food production capacity and nature. Taking European examples, 57% of UK Grade 1 agricultural land, and 10% of UK's notified nature reserves are less than 5 Metres above sea level. In the Netherlands, some 50% of the territory is less than 1 metre above sea level, and if sea levels rose by 5 metres, almost all the Netherlands would be at risk of being lost!
39. More generally, as the European Commission suggest,
- “Under a changing climate, the role of EU agriculture and forestry as providers of environmental and ecosystem services will further gain importance. Agricultural and forestry management have a major role to play regarding, among others, efficient water use in dry regions, protection of water courses against excessive nutrient inflow, improvement of flood management, maintenance and restoration of multifunctional landscapes such as high nature value grassland that provide habitat and assist migration for numerous species. Promotion of climate resilient forest management, soil management measures related to maintenance of organic carbon (e.g., no or minimum tillage) and protection of permanent grasslands are mitigation measures that should also help adaptation to climate change risks. “

We agree with all of these heightened environmental security roles for EU land management, though we insist that food security must stand along side.

A particular focus on Bio-energy



40. Land management is likely to suffer from climate change, it is also an important contributor of Green House Gases. However, uniquely amongst productive sectors in the economy, land management can also contribute to the mitigation of climate change. It can do so through carbon sequestration in soils and trees. There is much to learn about how to manage soils, especially peaty upland soils, so that they are net carbon stores, but the potential here is enormous. The scientific challenge here is immense. The land sector can also help other sectors reduce their emissions by enabling energy and material substitution. The helpful energy substitution is to provide biogas, biomass and biofuels to replace fossil fuels. The material substitution is to enable timber to replace materials such as concrete, brick and steel which are very energy intensive and thus carbon emitting, in their manufacture.
41. There are now rapid developments in bio-energy around the world, and also an increasing use of crops to manufacture bio-degradable packaging. These developments are stirring complex debates. At the very general level it seems entirely sensible to produce this year's energy from this year's solar energy using crop plants rather than burning up, in a few decades, the cumulated solar energy of millions of years by using fossil fuels.
42. It is certain that during the next couple of decades, we will divert crops into production of bio-fuels; the Brazilians have been doing it for a long time, and the Americans are now actively engaged in a programme to significantly increase their production of bio-fuels. This can only have the effect of raising agricultural prices, indeed it is already evident. Such price rises will be welcomed by grain farmers, but not by livestock farmers, still less the hungry and malnourished in net grain importing countries. These raw material price rises will also contain the current dramatic growth of biofuels.
43. This must be carefully monitored. There is no sense in producing bio fuels from crops if it is not an effective way of reducing transport emissions. If the global numbers of malnourished people were to rise because the developed world diverts grain exports to keep their fuel-guzzling cars and air-conditioning running, this does not seem a morally sound resource use. It is therefore essential that we quickly establish internationally agreed benchmarks for the life-cycle impacts on GHG of the bio-fuel production systems in use. For their other environmental effects, on biodiversity and water quality, there is no reason to treat these crops any differently from existing agricultural crops.
44. Whatever the longer-run future for producing our liquid transport fuels from crops, there are exciting prospects for other bio-energy sources, both woody biomass crops for renewable heat, and perhaps especially biogas, which can help us deal with waste, reduce pollution and recycle nutrients, as well as deliver renewable energy. This offers prospects for increasing woodland cover, as well as the wider establishment of energy crops such as Miscanthus and Short Rotation Coppice. These can often take place on soils unsuitable for food production.

45. Second generation biomass processes will enable us to better utilise the energy of the whole crop, leaving the grain for food use, as well as transform woody materials in bio-refineries, delivering both renewable energy and a wide range of high value biodegradable plastics and other outputs. This has the potential to contribute a large quantum of renewable energy, and to transform land management.
46. Running through these challenges, the use and management of our **water** resources, including rivers and lakes, is critical. Water is quite often referred to as the life-blood of ecosystems, supporting both terrestrial and aquatic flora and fauna. Managers of water bodies play an important role in the management of flooding, as well as ensuring – to the extent possible – that water supplies are safe and plentiful. Farmers and other land managers are of course fundamental in this regard.
47. Having outlined the challenges, their interactions, and how they are affected by climate change, we now turn to policy responses, focusing on the European Union.

What is a Food and Environmental Security Policy?



indeed we have had periods of policy-induced food overproduction. This is why some Governments are extremely reluctant, even opposed in principle, to mentioning food security as a legitimate element of policy. However Europeans have set themselves targets of achieving significantly higher environmental standards. The British Government recently adopted the concept of One Planet Farming – adapting the suggestion of WWF that the world is currently living on three planet's worth of resources and pollution absorption capacity. This concept, if taken literally, suggests that we have to find ways of reducing our environmental impacts by two-thirds.

48. It is suggested that there is no choice about whether we want food security or environmental security. We need both. They are highly interrelated. They are both threatened. The threats to both are increasing with global climate change and continued population growth.
49. In the developed part of the world we know how to produce food security. We already have it, indeed we have had periods of policy-induced food overproduction. This is why some Governments are extremely reluctant, even opposed in principle, to mentioning food security as a legitimate element of policy. However Europeans have set themselves targets of achieving significantly higher environmental standards. The British Government recently adopted the concept of One Planet Farming – adapting the suggestion of WWF that the world is currently living on three planet's worth of resources and pollution absorption capacity. This concept, if taken literally, suggests that we have to find ways of reducing our environmental impacts by two-thirds.
50. It is conceivable that Europe could do this, but with what impact on food production? If we massively reduced the intensity of our food production, reduced or eliminated the use of manufactured fertiliser, crop protection and animal health products, and reduced the sheer degree and weight of mechanisation, there would be significant reductions in soil erosion, and we would reduce water and air pollution, and biodiversity loss. In the course of such action we would also, of course, equally massively reduce farming output and profitability. Farmers do not use these techniques and inputs for fun, but because they are productive and privately profitable. This in turn would massively reduce the number of farmers and even the area cultivated, and agricultural production. The agricultural input supply manufacturers have estimated that simply going organic would reduce output by 40%. Suppose we did this, and

over a period of years we ran down EU food production capacity and output, reduced EU food exports, this would significantly increase imports (note, the EU is already the world's largest food importer). In this process we would create a very different rural environment. Whether it was the beautiful landscape which satisfied citizens and served a thriving rural tourism industry is not clear. The main surviving farming would be the low intensity, perhaps high quality, and thus high price, specialist, organic, local and traditional produce. There is no doubt a growing market for this amongst Europe's wealthy, and growing, middle classes. However a rapidly increasing share of the basic commodity production which produces the daily needs of the bulk of the population would be imported.

51. This strategy would be to conclude that all of the increase in global food output for this century has to come from outside Europe. Simply to replace the current and projected EU food exports, and increased imports in this scenario would necessitate significant expansion in the Americas and, if they could manage it, the Antipodes. We ask, at what cost to *their* environment? Are not biodiversity protection and combating climate change global concerns?
52. Our argument is that Europe has a self-interest and moral responsibility to follow a different path. With the wealth and capital, knowledge and skills, stable political and social systems, and climate and resources that Europe possesses, we have to show the way to the "third generation agriculture". We have to find ways of maintaining *and increasing* efficiency of production. This will require precision land management reducing the per unit applications of water, fertilisers and plant protection products to the minimum required to achieve the high outputs required. In doing so this will reduce soil, water and air pollution and at the same time we have to manage our less intensively farmed areas to increase biodiversity and landscape services.
53. But how? This necessitates significantly more research, development, extension and training. We simply don't yet know how to achieve these goals. How do we breed and feed ruminant livestock which produce less methane? How do we maintain crop yields with less fertiliser and water? Even when we find out it takes considerable time and effort, and appropriate incentives, to transfer the knowledge to everyday practice on our farms. A large investment is required to find this highly productive but less environmentally intrusive agriculture. But from where will the investment come?
54. Economists would argue that the investment ought to come from consumers via the prices they pay for their food. However, apart from the political consideration of food price inflation and its impact on Europe's poor, there are two structural problems which prevent food consumers paying the full social costs of their food. This latter phrase refers to the fact that currently consumers are not paying certain environmental, animal welfare and social costs of the food they consume. This is because such costs are not captured in market prices. They show up as deteriorating environment and, for many observers, still unacceptable welfare standards in some forms of livestock production. We could add to these another market failure, namely the social costs represented by the increasing use of insecure migrant labour in the food chain who do not enjoy all the norms of social protection. This is common in parts of the EU food chain.
55. The first structural feature bringing this about, is the highly competitive and innovative, but also highly concentrated, food processing and distribution systems which increasingly dominate the food chain downstream of the fragmented farming sector. This sector has the market power to maintain its own normal return on capital and investment, but at the cost of depressing margins in farming to the point where in Europe and N America commodity production is

dependent on subsidy, and on techniques which degrade the environment. Many governments are determined to eliminate farming subsidies and they wish to reduce environmental damage. However, the tools available in competition policy are incapable of dealing with these environmental impacts of the imbalance in market power in the food chain – indeed their legal basis prevents them even to take it into account.

56. Our society is at a loss to know how to pass through to consumers the real cost of producing to the desired environmental and welfare standards. There is a small, and growing, specialist sector where consumers do pay for *some* of the environmental costs. But it is revealing that even in the case of organic production which has had several decades of favourable publicity, consumers still do not pay all the additional costs, and public payments are deemed necessary for those converting to and staying in organic production. Labelling schemes and exhortation for consumers to behave more responsibly are the other ideas on offer. Unfortunately the experience with labelling and certification does not encourage the belief that this is the way to internalise all environmental externalities. Likewise, timber that has been certified as sustainably produced entails higher production costs but there is often little or no additional premium paid by consumers.
57. The second structural feature is that international trade rules are not designed to deal with externalities. They are based on the underlying presumption that such externalities are specific and minor and best dealt with by other more direct policy. The reality is that externalities surrounding land management are pervasive, and, for example, diffuse pollution is not easily dealt with by other more direct policies. The result is that International trade negotiations strive for liberalised i.e. open markets where prices are based entirely on private costs and do not include the costs to the environment. Again no easy solution is in sight. It proves difficult enough to negotiate trade rules when the prime focus is on liberalising markets. The WTO agreement on Agriculture includes a green box, but this may prove to be too narrowly focussed a concept for dealing with the scale and importance of market failures in agricultural production.
58. This is why *we must find an integrated solution to the integrated problems of food and environmental security*. If food producers deny the threat they pose to environmental security, or if environmentalists deny that they have any concern for food security, we will not move forward. This suggests we need policies which deals with *both*. This certainly requires changed mindsets amongst farmers, environmentalists and governments. Because it brings together food, farming, forestry and the environment, it may also require different government structures in Member States and in Brussels.
59. The institutions and the policies to deliver Food and Environmental Security will have to emerge from the existing arrangements and policy instruments. This will undoubtedly take a great many years to achieve. It is important that it is agreed that we are involved in an evolutionary process giving businesses time to adjust.

Why should this be a European Policy Concern?



Göteborg commitment on sustainable development, the Lisbon commitment to a knowledge-based economy, and, of course 5 decades of development of the CAP, together form the basis of the integrated European economic policy we must build on.

60. Why should food and environmental security be tackled at EU level and not left to the Member States? There are principally two answers to this. First, there is no sense in ditching the last half century of carefully constructed supra-national agreements and every reason to build on the key aspects of what we have already achieved. Thus the EU treaties, the single market, the Göteborg commitment on sustainable development, the Lisbon commitment to a knowledge-based economy, and, of course 5 decades of development of the CAP, together form the basis of the integrated European economic policy we must build on.
61. Second, because nearly all aspects of Europe's natural and cultural environment cross national boundaries, and because of the existence of the single market, a large part of environmental policy is designed and agreed at an EU level within framework directives. These exist for birds, habitats, nitrates, waste, water and soil. It therefore makes sense that EU policy should play a key role in securing food and environmental security. There would be no sense at all trying to define policies for these issues independently for 27 Member States. These insights were presumably behind the naming of the second heading in the EU Budget for the current Financial Perspective (2007-2013) the "Preservation and Management of Natural Resources". Currently, the main element of this part of the budget is for the CAP. The policy task is therefore to build on these achievements and to develop these established building blocks to deal with the future challenges.
62. It is encouraging to see that the Commission believe that "community support to agriculture, forestry and rural development plays an important role in food production, the maintenance of rural landscapes and the provision of environmental services. The recent reforms of the Common Agricultural Policy (CAP) have been a first step towards a framework for the sustainable development of EU agriculture. Future adjustments of the CAP and the 'Health check' of 2008 could provide opportunities to examine how to better integrate adaptation to climate change in agriculture support programmes. It should for instance be considered to what extent the CAP can promote good farming practices which are compatible with the new climate conditions and which contribute proactively to preserving and protecting the environment."
63. For better or worse, the CAP has been the major public policy instrument impacting on land management and its environmental impacts in Europe. During the sequence of reforms since 1992 there has been a strong development in measures to deal with environmental market failures and to encourage farmers to deliver environmental and cultural landscape services. However outside specialist interests, these developments are not well understood or acknowledged.
64. Therefore the changing nature and purpose of Europe's key land management policy could perhaps be better explained to the public by using the terminology of Food and Environmental Security. This approach would allow us to move on

from the negative associations which the CAP arouses amongst many interest groups around Europe and the world outside of EU farming circles. It is simply the case that arising out of the notorious grain, beef and butter mountains and the wine lake of the 1980s the CAP is still routinely scorned in finance and economic Ministries; amongst trading interests in and outside Europe; amongst environmental and third world development NGOs, and most general journalists. Many of these groups may know little about the CAP and the industry it supports, and still less about the reforms of the last decade, but they carry the view that it is a piece of EU nonsense. This is most demoralising for farmers themselves. It creates a negative defensive atmosphere and great uncertainty, because the legitimacy of the policy is constantly under question.

65. It could be highly invigorating for farmers and other land managers to feel they were part of something positive helping to overcome some of the biggest challenges of the 21st Century. Linking food and environmental security can also bring together groups in civil society who have been more often in the past at each others throats; farmers and other land managers and environmental NGOs. The political power of the former has diminished, while that of the latter has grown. Yet they need each other. Far sighted environmentalists acknowledge that they will not achieve their goals without working closely and constructively with farmers and foresters; they also realise that farming and forestry are not charitable activities but businesses which must make normal returns on their investment. Equally, while farmers are, understandably, highly nervous of being told how to manage their land by those who have no interest in economic returns, they appreciate that they have a wider social role in environmental management. We can legitimately ask who are the real 'greens' the farmers and foresters who do it, or the NGOs who talk about it? Perhaps it is more useful to conclude we all are green now.
66. The challenge is to turn the whole mindset of the public, politicians, and land managers to create a new rural policy fit for the 21st Century. This is the sort of vision a European Food and Environmental Security Policy could grasp – with food security and the preservation of our natural environment at its core. The objective of such a new policy could be summarised as
- “enabling and incentivising private sector rural resource managers to produce the socially optimal quantities of the highest quality food and fibre, raw materials, renewable energy, biodiversity, landscape, heritage, and soil, water and air management.”*
67. It would be premature at this point in the debate to spell out the measures which would make up food and environmental security policy, likewise the steps required to move to these measures from where we are. First we have to debate and agree that these are the core objectives. The final paragraphs below indicate some of the considerations which will have to be discussed.
68. The core of the **food security policy** is to protect the long run *food production capacity* of the EU. This refers of course to its agricultural land – particularly the most fertile land, but also to the knowledge, skills and commitment of its farmers, and to research, development and extension capacity. The long run aim of such policy is to feed the European population and contribute appropriately to feeding parts of the rest of the world too.
69. Farmers will say, this is no problem at all, give us remunerative prices, free us from unnecessary bureaucratic shackles, and we'll do the job! The problem is how? We know the approaches which do not work, namely state intervention into commodity markets for example by setting prices; market management, production and export subsidies. We have plenty of experience of how these

instruments distort production and trade – and do not provide long run profitable conditions for farmers either.

70. In the developed world we are still struggling to find the best mix of instruments to encourage the structural and technological developments in farming which create the best guarantee of food security, namely profitable farming. This requires the right balance of domestic agricultural support measures, competition policy and regulation. In the EU we have a two-Pillar CAP. On the one hand we have a decoupled, land-based Single Payment System, and on the other hand we have a mix of modernisation, rural development and agri-environment schemes. In the United States there is still a massive dependence on various price stabilisation schemes and publicly assisted income insurance.

71. Some of the elements of the policy are thus well understood they are to:

- improve food productivity and competitiveness;
- stimulate private & public sector Research, Development & Extension
- help farmers integrate farming and the environment to reduce pollution
- encourage them to share resources & work together to deal with imbalanced market power in the food chain;
- help raise product quality and marketing;
- ensure food safety, and
- deal better with environmental, market and policy volatility.

72. The aims of **environmental security policy** are to achieve the food security goals but to do so while enhancing the environment. This language will undoubtedly trouble environmentalists; but does it make any real difference if we speak instead of ‘socially optimal protection of biodiversity, landscape, soil, water and air’? However it is expressed, there are uncomfortable trade-offs to be managed between ensuring acceptable living standards, in particular basic food needs, for the population and the preservation of natural capital.

73. Our contribution in Europe is to continue to experiment with, and develop, public policies which seek the shared goal of reducing the resource intensity of food (and all other) production, and reducing its unwanted spill-over effects. The elements of this policy will concern the protection and enhancement of:

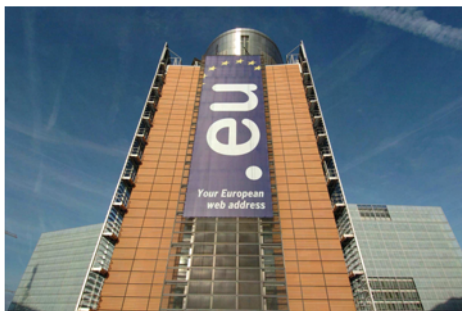
- biodiversity: habitats and species;
- landscape including heritage;
- agricultural and forest soils;
- water quality and quantity
- carbon in soils and in forests
- land based renewable energy

and it will be essential to pay special attention to these issues for remote, mountainous and otherwise marginal areas.

74. The EU does not start from scratch in developing practicable ideas and instruments for rising to these challenges. We have over a decade of experience of trying to deal with environmental market failures by developing schemes to pay private sector land managers to deliver public environmental services, and at the same time to improve protection of natural resources. The Water Framework Directive contains within it important principles of identifying programmes of measures to ensure water quality which are cost effective and do not impose disproportionate costs. However there is a long way to go to successful implementation of these ideas.

75. The devilishly difficult task is to integrate the Food and Environmental security measures: to ensure that they are coherent and mutually supportive, they are operationally practicable, and they can work in a globalised world.
76. It is all too easy to say that the food security – and indeed all renewable resource security - is best achieved by liberalising markets. (Full stop). This overlooks the integrated nature of multifunctional land management. We want both Food and Environmental security – not just one or the other. Land managers don't only deliver food, fibre and forest products; they deliver, or could deliver, renewable energy; landscape, heritage, recreation, protection of flora and fauna, flood and avalanche prevention, and carbon fixation. We can sensibly tell our farmers to be market oriented for the marketed part of what they produce (e.g. food and fibre) but this will not help the correct supplies of their non-market outputs.
77. The practical operation of policy is similarly difficult to achieve. What we mean by the environment is fantastically complex, multi-dimensional, interactive and dynamic. There are very difficult balances to be struck; measures to reduce GHG pollution, may increase water pollution, or diminish biodiversity, or impair landscape to a degree. Schemes to incentivise land managers to improve the environment have to cope with these problems and also be manageable by our public administration, and not to drown out the entrepreneurial spirit of our farmers and foresters.

The EU Budget to achieve Food and Environmental Security



78. If it is agreed that Europe must construct a comprehensive Natural Resource Security policy it is not unreasonable to ask what EU budgetary resources this will require. How does this compare to the current resources devoted to the CAP and to environmental policy? This analysis argues that delivering food and environmental security is a far greater challenge for Europe for the next half century than that addressed by the CAP and EU environmental policy over the last 50 years. It therefore does not seem outrageous to suggest that it is likely to require no less of a budget.

79. Budget heading 2 which deals with Protection and Management of Natural Resources is set to average about €53 billion per annum for the current financial period 2007-2013. This represents less than 0.5% of current EU GDP, or about 1% of EU total public expenditure. This expenditure currently deals with 80% of EU territory and its environment, 40% of its population, 5% of the working population engaged in land based activity, and 3% of EU GDP arising in agriculture.
80. Maintaining Natura 2000 sites alone, which cover between 15% and 30% of EU member states' territory, have been costed at over €6 billion per year. Coincidentally, all academic studies and surveys show that the public value the rural environment very highly – measured in the billions of Euro. At the same time, many billions of euros of other business in local food chains, rural tourism and in countryside sports are dependant on the maintenance of the rural environment. These spill-over landscape and biodiversity benefits are key for the

directly affected businesses such as rural tourism, and they are also part of the attraction for many other businesses, and the increasing population who moved to the countryside for the benefits that they perceive it provides. These considerations take us into wider rural development policy to which this paper has paid little attention as we have chosen to focus of food and environment. Rural development is a subject in its own right and deserves its own vision.

81. We have argued that the challenges faced by the food and environmental sectors will increase in the future, not decline, so it does not seem unreasonable to argue that there is no case for reducing budget heading 2 at all, and a very serious case to expand it, especially so as the EU territory and population expands. It is necessary to say this because there are many seeking to prejudge the EU policy reviews and to insist that the EU budget in total, and certainly the CAP related expenditure in Budget Heading 2, are significantly cut.
82. At the very least it must be agreed that suggestions to cut the CAP budget by up to 30%, before agreement has been reached on the purpose and key objectives of the new policy, is deeply flawed; we must first agree on the policy objectives and then determine the resources necessary to deliver it.
83. Now is therefore the time for governments, scientists, industry, environmentalists, as well as farmers and land managers to agree on the scale and likely impact of the major pressures discussed in this paper, consider the practical options for meeting those challenges, and then to make the case for the policies and resources they feel will be necessary for Europe to play a responsible part in meeting the challenges outlined in this paper.



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