Centre for Agricultural Strategy

# Priorities for a new century – agriculture, food and rural policies in the European Union

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# 3 Environmental and agricultural policies

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## INTRODUCTION: A MATTER OF DEFINITION

I have been asked to talk about environmental and agricultural policies. The presumption is that they are somehow different. Is this so? How? Why? Albert Einstein is said to have commented that 'environment is everything that isn't me'. The environment is the whole encircling world - the world of nature, driven by the sun's energy, within which we and all other life forms live, and the built world, created by human ingenuity over the millennia. We are all part of one another's environment.

But when we speak of 'environmental policies' today, we usually mean one of three things:

- measures to protect people, crops, livestock, wildlife and natural ecosystems against damage from pollution, or from the knock-on effects of pollution, like ultraviolet-B radiation pouring through a weakened ozone screen or climate change caused by greenhouse gas accumulation;
- measures to maintain natural beauty, the diversity of wild nature (described by today's new buzz-term 'biodiversity'), and the historic features of town and country;
- measures to curb urban and industrial developments, and especially urban and motorway sprawl.

When we speak of 'agricultural policies' we normally mean measures to maintain the productivity – both biological and financial – of agriculture.

## A LITTLE HISTORY

Agriculture takes place within the environment. Over the thousands of years of human history it has been the foundation of the process we call development - the changing by human skill of aspects of the natural world so that it is better able to support human life. Development is a process of increasing the carrying capacity of the environment for people. Agriculture has been central to development. Think simply of cereal yields. Under the old open-field system in around 1200 AD, our ancestors maybe gathered in 0.5 tonnes per hectare of wheat (Cooke, 1970). With the new seed drills and four-course rotation of the 18th Century, the output rose to around 1.75 tonnes per hectare. With fertilisers and selective weed killers and new short-straw varieties, the production lifted to around 3 tonnes per hectare in the 1950s. In 1990 it had reached between 6.5 and 7.5 tonnes per hectare in Germany, France, the UK and the Netherlands (Prescott, 1994).

This process has been a liberator of humanity from all the ills and uncertainties of insecure food supplies. It has allowed much higher population densities to live sustainably. Some thirty years ago the distinguished American ecologist, HT Odum, compared the capacity of four environmental systems to support people. The systems were a tropical rain forest, Ugandan grasslands, Indian monsoon croplands and United States intensive agriculture. The population supported? From a few hunter-gatherers per square kilometre in the forest, to 25 pastoralists per square kilometre on the savannas, to 230 villagers and 30 city dwellers supported by a square kilometre of rainfed cultivation in the monsoon zone, to 60 people on the land and 2000 in the city, sustained per square kilometre in the USA (Institute of Ecology, 1971).

Of course this process of development has meant environmental change. About 46 million square kilometres of land were forested before humanity began to develop agriculture. By 1970 some 15% of that forest had gone. About 6.5 million square kilometres had been cleared in the temperate zones - notably in Europe and north America. Worldwide, some 16 million square kilometres of forest and grassland were converted from natural vegetation to farmland by 1980 (Tolba *et al*, 1992). In Britain, according to Oliver Rackham's fascinating *History of the countryside* (1986), most of the 'wildwood' was stripped from high altitudes and river valleys in Bronze Age times, and half of the English wildwood had probably gone by the early Iron Age (500 BC). By the time of the Domesday Survey, the distribution of woodland in large parts of England was probably much as it is now. Outside a few remaining areas of extensive forest like the Weald, Chilterns, Arden and the Forest of Dean the landscape was farmland with islands of wood. Of course these processes of conversion had their negative sides. There was a lot of erosion in Britain during forest clearance in

Bronze Age and later times. The soil profiles in many upland areas were truncated, and much alluvial material was transferred from hilltops to valley bottoms. We were not alone. Plato mourned the damage done by deforestation in Attica in classical Greek times, while badly managed irrigation leading to salinisation and waterlogging was probably a factor in the population crash - a drop of some 90% -in Mesopotamia between 800 and 1300 AD (Whitmore *et al*, 1990). Today, an area as big as India has been lost from productive agriculture through misuse and a tract three times the size of India yields less than it could and should (Tolba *et al*, 1992).

My point is that over most of the world and throughout most of history, agriculture has been the foundation of human development, but that it has not always used the essential resources of soil and water well. This remains the case today. And as Professor Anderson's paper demonstrates, if we are to curb the poverty that afflicts around a billion people today, and cater for a population increase from today's 5.8 billion to the projected 8.5-10 billion in the second half of the next century, we shall have to about double world food production. And we shall have to do so sustainably - without losing more Indias. This is likely to mean great increases in production from the more fertile lands suited to intensive cultivation rather than more encroachment on the land that retains natural vegetation. The problem is that there is a severe mismatch between human population distribution and growth and areas with the capacity to produce more food, and the poorer countries lack money to buy food from elsewhere. Hence, the enhancement of food production has to go hand-in-hand with economic growth and more open trading systems.

Two conclusions emerge from this opening scenario. First agricultural policy is inevitably a part of environmental policy because - *reductio ad absurdum* - you can't have agriculture without the environment and you won't spend much time talking about environmental policy unless the people are fed. Second, whatever is done in Britain and in the rest of Europe has to be seen in the context of a rapidly changing world. My thesis is, therefore, that the debate is not about agricultural policies versus environmental ones, but the place of agriculture and of particular agricultural techniques **within** environmental policy as a whole, and especially within - to use another buzz-term - 'sustainable development'. Development, to quote the World Commission on Environment and Development (1987) 'that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs'.

## THE CONFLICT BETWEEN AGRICULTURAL AND ENVIRONMENTAL POLICIES

It is here that conflict has arisen between the agricultural community and the champions of conservation - whether of wildlife or the landscape. It is worth reminding ourselves why. Modern agriculture has developed dramatically since the 1940s. That development has two principal roots - one socioeconomic and the other scientific. Many people here today will know far more than I do about the impact of the depression in the 1930s on the life of rural communities in this country. Many more of us have some memory of the problems of feeding the population of Britain during the 1939-1945 war. At the end of that war, there was, I believe, a social determination, expressed at a high level in Government, that we would never again neglect our agriculture and revert to pre-war dependence on foreign imports. The farm support schemes then adopted were of course very different from those now in operation under the Common Agricultural Policy (CAP) of the European Union (EU), but the goal is the same. We find it throughout Europe, not just in the Union. In Switzerland and Finland, for example, agricultural support is an important area of public policy and public expenditure. The second root is scientific. Thanks to science, the yields of crops and livestock have been boosted enormously. Some of the means are genetic - expressed in new high-yielding short-straw cereals, and strains that do not shed their grains even when over-ripe. Some are chemical - improved synthetic fertilisers and a wide spectrum of ever more selective pesticides. Some are engineered - better machinery, permitting a vastly reduced labour force to handle the vastly increased production of vastly enlarged fields.

Many of our problems stem from these gains in efficiency - for we have become an urban, or at least a non-agricultural community. In pre-industrial times, virtually everyone either lived in the countryside or had close kin that depended on agriculture. Today, under 2% of the British population work in agriculture. For most of the population the countryside is a place to visit for recreation - a landscape to look at. But the countryside is less beautiful than it was. At least, many people think so. The arable revolution has not only lost us trees, hedgerows, ponds and stone walls, but all the little patches of rough ground that used to be rich in birds and butterflies. The transformation of pastures and meadows by reseeding and copious applications of nitrogenous fertiliser has lost us the herb-rich, flower-filled meadows that I can still remember from, for example, the limestone country of what used to be Westmorland. The geographical specialisation of farming means that you can drive through a dozen parishes in eastern England and never see a cow. And the town-dweller not only sees these things but, perhaps more to the point, reads how dreadful they are in a literature - a litany - of environmental complaint. Some of the books have become

famous. The first and perhaps most famous of all of all - Rachel Carson's seminal work, *Silent Spring* (1962) shocked people by its allegation that the wonder chemicals, DDT, dieldrin and their relatives, were destroying birdlife. In Britain the deaths of foxes in fox-hunting Leicestershire, from eating pigeons poisoned by persistent organochlorines, sent shock waves through the rural community and led directly to the creation of the Nature Conservancy's Pesticides and Wild Life Section under the distinguished naturalist, Dr Norman Moore. At that time the accusation that these wonder chemicals could be 'Bad Things' was angrily rejected by the agrochemical industry. We now know that while pesticides bring immense benefits, they also need much stricter controls than was then thought necessary.

People read of other damage to be laid at agriculture's door. Stubble burning brought farming a bad press - not, incidentally, eased by the fact that now that the incorporation of straw residues into soil has been forced on a reluctant farming community, their value in enhancing soil organic content is being recognised. The contamination of aquifers with nitrogen, making water blending or treatment an expensive necessity if potable water supplies are to stay within EU health standards; the eutrophication of rivers, lakes and estuaries, leading in turn to dangerous 'red tides' in places like the Kattegat; all these feed the fires of criticism. It is intensified by press reports of financial wastefulness in the CAP - allegations, for example, that the CAP costs every citizen of the EU £250 a year, yet that the farmer is not the main beneficiary because in 1990 48% of the CAP budget went on storing surpluses and subsidising exports.

People's imaginations are fired by the new prospect of the twin peaks of Butter Mountain and Mont Boeuf, seen across Wine Lake. And they strongly dislike the notion that we are paying subsidies to farmers (and also to foresters, but they are not today's target) to destroy our nature and our landscape. It is not helped by the view that the agricultural community is - to quote a long-gone Minister - 'featherbedded'. Almost all industries are required under the 'Polluter Pays Principle' to internalise the costs of their actions - to pay the costs of meeting the standards set for emissions to the environment. Yet when nitrogenous fertilisers contaminate chalk aquifers, and then drinking water, the consumer pays - twice : on water bills for water treatment, and in general taxation for payment to farmers in Nitrate Sensitive Areas. When run-off from farmland leads to ecological changes in estuaries and coastal seas, it is the fishing community, the tourist industry and wildlife that bear the costs. People ask why the agricultural industry should not be made to internalise these costs, as other industries have been made to do.

The third area of environmental criticism is the most serious of all. It arises from the argument that intensive modern agriculture may be

ecologically unsustainable in the long term because its use of chemicals - fertilisers and pesticides - is stressing soil systems beyond the limits of their resilience. It is linked to the argument that the marginal cost of subsidy to agriculture exceeds the marginal benefits and hence that we would gain net benefit by spending less, applying less chemicals, securing marginally lower yield, but having a more diverse and resilient countryside.

Quite a lot of people in this room no doubt hold as an article of faith that the beauties of the English countryside have been made by farming, are maintained by farming, and would be lost without farming. It is true that the wonderful landscapes we cherish were carved by agriculture out of the wild wood. It is true that many of our most beautiful scenes were moulded by caring landowners over the past three centuries. But is this still true? Or was Professor Bryn Green right when he wrote in 1981 that 'it is now the dominant rural uses themselves - agriculture and forestry - which present ever-growing threats to the countryside'?

The debate, or argument, is not really between environmental and agricultural policy at a fundamental level - everyone cheerfully assents to the proposition that we all want healthy agriculture in a healthy environment filled with healthy wildlife - but at the level of detail. I want now to be constructive and look at ways in which environmental and agricultural policies are coming together, and then, finally, to flash a torch on the green lane ahead.

## THE RECONCILIATION OF ENVIRONMENTAL AND AGRICULTURAL POLICIES

Attempts at reconciliation are nothing new. I remember taking part in a weekend conference at Silsoe in the 1960s, masterminded by Derek Barber and Eric Carter, in which three syndicates of conservationists, farmers and agricultural advisers, walked a farm and drew up alternative management plans - for maximum agricultural return, for maximum nature conservation compatible with viable farming, and for the 'common sense' balance of both. That meeting was one spur to the creation of the Farming and Wildlife Advisory Group (FWAG) (with or without an extra initial 'F' for Forestry), which have undoubtedly done valuable work.

Where now? There have been several big strategic documents in recent years that try to plot a course for farming within the overall process of 'sustainable development'. If I may begin with one I was concerned with personally, in 1991 IUCN - The World Conservation Union, the United Nations Environment Programme and the World Wide Fund for Nature published a second World Conservation Strategy entitled *Caring for the earth. A Strategy for sustainable living*

(IUCN/UNEP/WWF, 1991). It has a simple message. We need development to ease the problems of the billion or more people who live in poverty and to cater for the 3 to 5 billion we are warned will be added to the world population during the next 50 years. But that development must provide real improvement in the quality of life and must conserve the vitality and diversity of the Earth. To quote: 'We need development that is both people-centred, concentrating on improving the human condition, and conservation based, maintaining the variety and productivity of nature. We have to stop talking about conservation and development as if they were in opposition, and recognize that they are essential parts of one indispensable process'. *Caring for the earth devotes* a chapter to how we can use the world's farmlands and rangelands sustainably. It makes fourteen points summarised briefly as:

- countries should draw up national strategies for sustainable living;
- the best farmland should be protected for agriculture, and effective soil and water conservation should be promoted through good land husbandry;
- where marginal lands are already being used by agriculture, its impact must be carefully regulated;
- the productivity and sustainability of rainfed farming should be increased;
- integrated crop and livestock farming systems, with more efficient fertiliser use, should be encouraged;
- integrated pest management should be promoted, and the use of fertilisers, pesticides and herbicides should be controlled by both regulation and market incentives;
- genetic resources must be conserved both in their natural habitats and in gene banks, botanic gardens and collections, and this action must be coordinated and supported internationally;
- support for farmers should be switched from price support to conservation support; they should be helped to care for soil, water, wild resources like fisheries, and natural beauty; and non-farm employment should be made available in rural communities.

Nothing very radical there! What about *Agenda 21*, the resounding 650-page Action Plan for the 21st Century adopted by the largest-ever gathering of Heads of State and Government in Rio de Janeiro in June 1992 (Robinson, 1994)? It also emphasises that 'the integration of environment and development concerns, and greater attention to them, will lead to the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems, and a safer and more prosperous future'. I am not sure whether that statement is in the realm of pious hope, extreme optimism or political manifesto - but at least, preamble safely passed, *Agenda 21* does get

down to some prescriptions for agriculture. It calls for an integrated approach to land use. 'National Sustainability Strategies' are a means to that end. It calls for action to combat the wasteful destruction and mismanagement of forests, and to halt desertification. It has a long chapter about meeting agricultural needs without destroying the land. What actions? The list is not unlike that in *Caring for the earth.* Let me tick them off headline by headline:

- integrate sustainable development into agricultural policy and planning;
- ensure people's participation;
- improve farm productivity and diversify rural employment;
- harmonise land resources planning;
- conserve and rehabilitate land;
- conserve plant and animal genetic resources, and use them sustainably;
- use integrated pest management;
- employ sustainable plant nutrition;
- move the energy mix in rural areas from fuelwood, dung and muscle power to a blend of renewable and fossil fuels;
- evaluate the effects of ozone layer depletion (and let me add, climate change) on agriculture.

Splendid. But the problem is, of course, that these are headlines while we have to get down to real action on the real earth. What, for example, has the United Kingdom (UK) Government done about translating these prescriptions, that John Major broadly endorsed in Rio, into national plans? The answer is in the shape of a volume slim relative to *Agenda 21* but still running to 265 pages, entitled *Sustainable development: the UK strategy* (Anon, 1994a). Let me turn rapidly to page 106, where Chapter 15 on Agriculture starts. This is not to deny that there is not a great deal else that is relevant in earlier and later sections, for of course action to curb pollution, to control urban sprawl, to prevent climate change - these and many other actions are highly relevant to the land and what grows on it. I shall indeed look in a minute at climate change, and whether the green lane to the future may become a dry and dusty one. But back to our national strategy for sustainable agriculture. The most important thing about this Chapter (and the whole strategy) is that it accepts that any UK action has to be taken within the context of the EU, and indeed of the world as a whole. Sustainable agriculture in Britain depends on how the CAP is developed and applied. But the goals for sustainable agriculture are clear:

- to provide an adequate supply of good-quality food and other products in an efficient manner;
- to minimise consumption of non-renewable and other resources, including by recycling;

- to safeguard the quality of soil, water and air;
- to preserve, and where feasible enhance, biodiversity and the appearance of the landscape, including the UK's archaeological heritage.

This vision, I note, is shared by the Government and the non-governmental movement, at least in the shape of WWF-UK and BirdLife International, who produced a statement in March this year (Dixon & Murray, 1994). They called for a prosperous rural economy, which produces sufficient quantities of high quality food for the nutritional needs of Europe and contributes to an equitable trading system; an integration of land uses; a sustainable agriculture which internalises the environmental and social costs of its activities, applies the 'Polluter Pays Principle', and is subsidised only for achieving wider social and environmental objectives rather than for food production in itself; and a wildlife-rich countryside within a diverse, prosperous and peopled landscape. The Government (and I must not make the Minister's speech for him, but this is what the Strategy says) 'will encourage environmentally sensitive agriculture, and will work for further CAP reform to reduce levels of support and integrate fully environmental considerations'. To this end, we now have a broad raft of policies and special schemes in operation here:

- there are 33 Environmentally Sensitive Areas (ESAs) covering over 2.7 million hectares, where incentives are offered to farmers to farm in ways that maintain or enhance natural beauty, biological diversity and historic interest;
- payments can be made for management of Sites of Special Scientific Interest (SSSIs) to safeguard species and habitats;
- in Nitrate Sensitive Areas (NSAs), farmers are being paid to restrict their activities (I am not sure that this does not breach the 'Polluter Pays Principle');
- some 60 000 hectares are within the scope of the Countryside Stewardship Scheme to protect habitats and landscapes;
- farm woodland schemes encourage the planting of new woods;
- the Farm and Conservation Grant Scheme gives grants for pollution control equipment and environmental improvements such as hedge planting.

The Strategy also records a widening of the system, with more ESAs, more NSAs, a Moorland Scheme, a Countryside Access Scheme, a Habitat Scheme, and an Organic Aid Scheme.

These schemes, and the commitment to sustainable agriculture within a healthy environment, are of course welcome. But I have to say that sceptical noises can still be heard in the green undergrowth. They particularly concern the environmental benefits to be expected from the 1992 reform of the CAP. According to a report prepared for WWF (Baldock & Beaufoy, 1992) the Regulations underpinning the new

support arrangements make little or no reference to the environment. Only Set-aside land is subject to environmental conditions and these are minimal. An opportunity has been missed for attaching environmental conditions to income payments under both the livestock and arable support regimes. It is difficult to forecast precisely how farmers will react to the new rules.

There has been a particular debate about Set-aside. As I understand it, the basic policy is that farmers producing more than 92 tonnes of arable crops (as most British arable farmers do) will only be eligible for their arable area payments if they set aside 15% of their arable land. But this 15% was, under the initial scheme, to be rotated around the farm, not returning to the same area for at least 5 years. The land must be out of 'beneficial use' for a minimum of 7 months, but cared for so as to maintain 'good cropping conditions'. Land set aside has to be managed 'to ensure protection of the environment', but what does this mean? A one-year break in cultivation will certainly not permit the return of many of the wildlife species - plant and animal - whose loss has impoverished our arable landscape. Any area of land left to nature for one year will simply grow a crop of opportunistic, widely dispersed, plants. Moreover, many farmers seem set on curbing what they see as excessive weed growth by some kind of growth-regulating herbicide. Really, what we are seeing is a reversion to the old practice of fallowing. It is unlikely to do much for plant, insect or bird diversity, although it is fair to add that in this country the Ministry of Agriculture has specified that environmental features such as hedges, trees, ponds, streams and ditches on land adjoining that set aside must be maintained. And the FWAG have suggested that some birds like larks, finches, partridges, thrushes and lapwings might benefit - depending on just how the land is used.

If we want to restore the diversity and beauty of the farmscape, something more will be needed. We shall have to consider some permanent Set-aside for new wild habitats. The Farm Woodlands Scheme could be valuable here, if it leads to planting of native broadleaved species, not simply conifers. It would do no harm to leave odd corners to nature, as what we used to call 'rough'. The aim cannot be to restore the old landscape - that would not be sensible or practicable, but we can insert new patches and corridors of wild habitat into the farmed environment, alongside the relict patches of wild habitat that persist. We must cherish these latter, for example with a firm presumption in law against the destruction of SSSIs or of landscape features of high quality. We should blend the farm support schemes under the reformed - and further to be reformed - CAP with the more narrowly conservationist measures in Europe like the Habitats Directive and the Birds Directive. They should all be complementary to one another.

Patience will be needed. Remember that many cherished, species-rich, habitats like chalk and limestone grassland are nutrient-poor. The soils that used to support them now have greatly elevated nitrogen concentrations. Their profiles have been altered by cultivation. Just stopping cultivating downland fields and leaving them to nature will not speedily restore a downland turf. It is likely to need decades of leaching, and close grazing. Similarly, abandoning a lowland field will not create a woodland in less than fifty years. Management will be needed, and that means harnessing the skills of the ecologist and the farmer. The FWAGs have an obvious role here.

None-the-less, I believe that there is now a strong desire, in Britain and elsewhere in the EU, for a new kind of environmental policy for the farmed landscape. A policy that blends prosperous farming with landscape quality, natural beauty and rich wildlife. And we have some achievements to show in Europe. For example, our continent was the creator of the kind of National Park that is essentially a protected landscape - a place where natural beauty and wildlife diversity is cherished, but in a farmed and inhabited countryside that is the basis for many trades, and for much recreation. This is also the welcome approach in the recently published Action Plan for protected Areas in Europe (IUCN, 1994). We do not have great wilderness areas like Yosemite, Yellowstone or the Serengeti, but we do have a Lake District and a Schwarzwald. For densely populated continents, ours is the better model.

One thread that runs through *Agenda 21, Caring for the earth*, and many national Strategies for Sustainability is what we might call - if our semantic stomachs are strong - 'subsidiarity' - getting the policy debate into the communities that live on, value, and manage the land; getting the national strategy turned into local action plans. The UK Biodiversity Action Plan (Anon, 1994b) emphasises the need for wide involvement of the community, and for restoring habitats in the urban and peri-urban zones, and amid the farmlands, as well as maintaining the more outstanding habitats like SSSIs. But when it comes to the precise pattern, why not let the local community discuss what they want and help them turn their consensus into action? We call this 'Primary Environmental Care' in the environment business. We stress that the plans and strategies that work best are those that the local community - farmers, landowners, village residents, hoteliers, local businesses and local conservationists - feel they **own**. Why not back the raft of support schemes with grant to local groups to get together and work out plans for sustainability and the conservation of biological diversity that fit their areas? They might surprise all of us!

The key is **integration**. Clearly, there is some way to go in the EU in developing the CAP and, among other changes, giving it an environmental heart. But the Union can set a world example by

demonstrating that it is possible to have integrated policies for the rural environment, in which agriculture is productive, prosperous and sustainable, within a wider environment that is biologically diverse and beautiful. The countryside should provide food for both the body and the spirit. If we can get that right in Western Europe, we shall do good to others beyond ourselves. There is an urgent need for such a model in Eastern Europe as the economies there struggle to modernise themselves, and as their agriculture moves into a market economy. Those countries are some of the most diverse biologically in Europe, and have large areas of outstanding scenery and wildlife habitat. It would be a tragedy if they copied our mistakes just as we were beginning to move to new things.

## THE WIDER CONTEXT

But what we do here in European agriculture will be immensely influenced by what happens in the wider world. And we have some major uncertainties to consider. Indeed, the idea that we have surplus land to set aside may be false - or transient. There are three reasons for this:

- first, sustainable agriculture, even in Europe, may prove to be less intensive agriculture in which we apply fewer agrochemicals, adopt semi-organic farming and integrated pest control, and accept somewhat lower yields per hectare for the sake of landscape quality and environmental health;
- or second, we may have to maximise food production in Europe because we have the kind of farmland that can be used intensively to help meet the estimated requirement for twice today's world food production half a century hence;
- or third, our productivity may be forced down, our cropping patterns altered, and our natural habitats transformed by climate change.

We need to debate the prospects for all three, but because of time I will only talk about the third, the largest uncertainty that confronts us.

What's that I hear you say? 'We thought all that speculation had been dismissed because greenhouse warming is being cut out by sulphate aerosols and more clouds?' Sorry. No. Do remember that it is the greenhouse gases in the atmosphere that make the Earth habitable for our kind of life. Thanks to the natural greenhouse effect of water vapour and carbon dioxide, the Earth is about 30°C warmer than it would otherwise be. Since pre-industrial times, human activity has greatly increased the atmospheric concentrations of carbon dioxide, nitrous oxide and methane as well as the artificial greenhouse gases, chlorofluorocarbons, in the atmosphere. We are committed to the equivalent of at least a doubling in carbon dioxide. It seems to me

absurd to argue that although the natural greenhouse effect makes the planet habitable, the effective doubling of concentrations of carbon dioxide from pre-industrial levels will have no effect. The best estimates are that while the increased reflectivity of clouds and the reduction in incoming radiation by sulphate aerosols may reduce warming in the industrial belt of the northern hemisphere, they will not stop it. Globally the projection of a 1.5°C increase in mean temperature over the next 50 years is about right. Some models suggest that rainfall may increase by about 10% in many regions, but fall on fewer days, leading to more flash floods. And the seasonal differences may increase - southern England, for example, may have warmer wetter winters, and warmer drier summers, and the same holds even more so for the near continent like France, Germany, Switzerland and northern Italy.

The big issue is how such changes will affect the distribution of farming patterns, forests, and wild ecosystems. Some of the implications are disturbing. A 1.5°C rise in mean temperature spread over the next 50 years does not sound much, but this would displace the limits of tolerance of species some 225 kilometres polewards in North America and Europe, and would elevate the limits of crop cultivation by some 200 m in the UK, and a rather larger figure in the Alps (Parry, 1990). Some models suggest that if changes of rather larger magnitude were to occur, the boreal coniferous forest in Europe would be limited to the far north of Scandinavia, and to high altitudes, with the broadleaved forests displaced northwards from England into Scotland and southern Scandinavia and a mediterranean-type vegetation established in southern England.

One can only assume that the agricultural limits will shift similarly. Wheat and barley production, on that basis, would become much more competitive in the Nordic countries. Silage maize might be capable of growth almost anywhere in lowland England and Wales, or even eastern Scotland. Vineyards would do well in southern Britain. But France and Spain might be more prone to desertification. And the farming community will have to be ready for quite considerable husbandry changes.

Wild nature would be affected greatly. And the problem is not only the magnitude of the projected changes but their rate. For even these changes that don't sound very much are in fact bigger than we have evidence for in such a short period at any time in the past 20 000 years, if not longer. On average, dominant trees like the American eastern hemlock, maple or oak have only spread at a rates of around 25 km per century since the last ice age. Some trees, such as birches, may have kept up with the retreating ice, but others appear to have moved much more slowly (Bennett, 1986). Rapid greenhouse-induced climate change may well, therefore, disrupt ecosystems by reducing

productivity and regeneration at the 'trailing edge', where conditions are no longer tolerable for dominant species, while leaving slowly-dispersing dominants behind the advancing margin of increased favourability. No doubt opportunistic species will do well: a warming of several degrees in the Arctic would no doubt lead to rapid spread of birch and willow species and also favour wind-dispersed plants like willow herb, but a lot of valued species would tend to be squeezed out and biological diversity would decline. A lot of nature reserves would no longer be able to support the species for which they were created.

There is another feed-back loop to land-use practices in Europe, for changes may be called for as part of the raft of measures to curb greenhouse warming. The EU is seeking the return of our carbon dioxide emissions to the 1990 level by the year 2000. This won't be enough to cure the problem, but it is a useful first step. Some people have suggested planting new forests as one means of abstracting some of this carbon dioxide. However, the contribution this process can make seems to me to be limited. It has been calculated that to counterbalance all human additions of carbon to the atmosphere to date we would need to plant an area as big as the whole of Europe, from the Atlantic to the Urals (Nilsson, 1992). Can we really find the land, in a world which now has 5.8 billion people and may have to feed and support 8.5-10 billion by the latter part of the next century? And developing countries, embarking as many are on their own industrial development, are unlikely to agree to their land being afforested simply so that developed countries can go on building coal-burning power stations.

None the less, the proposition that we might grow energy crops, such as coppiced poplars or willows, on land not required for food production and now set aside under European agricultural policies, has attractions. This is so because by substituting wood for fossil fuel, we transfer some of our energy sources from the fossil to the active carbon cycle. Recent estimates (REAG, 1992; ETSU, 1994) suggest that energy crops might become economically attractive if electricity prices rose to between 3 and 5 pence per kilowatt hour (1991 prices). Today's basic price is around 1.5 to 2 p per KWh, but this figure is artificially low because we use a lot of old power stations that are fully depreciated, and also allow externalisation of cost through pollution. ETSU has estimated that energy crops might supply a maximum of 200 terawatt hours a year of electricity in the UK - equivalent to 60% of 1992 supply - assuming, of course, that the land can be found. That figure is undoubtedly unrealistic, but the possibility of real interest in energy woodlands remains and should be considered. It seems more than possible that this new form of cropping will therefore attract some of the land now set aside. The challenge will be to make such new coppices scenically attractive and biologically diverse as well as economically efficient.

## CONCLUSIONS

My thesis is that we are just about coming to terms in Europe with the need for adjustment to our agricultural policies so as to achieve sustainability under today's conditions. The ingredients of this fusion of agricultural and environmental policy are becoming clear. Essentially they involve support for a more integrated, multi-purpose approach. They demand subsidiarity. They will probably need a reversal of some over-centralised EU policies on the genetic strains of crops and trees we plant - for genetic diversity is a positive asset in a diverse continent such as ours and encouragement needs to be given to the continued growth of locally-developed strains. Indeed, subsidiarity should mean more Union and Government support for locally-based plans under which local communities would farm and forest according to local tradition.

But I am myself convinced that the test will be how well we can adapt our policies to cope with changes in world demand, world trading and economic patterns and the world environment. The world may well have twice as many people in a marginally less favourable environment a century from now. I am not aware of any game plan in the UK or the rest of Europe that really faces up to this challenge. The minimum need is to be able to adapt our economic, social and environmental policies at least as fast as the environment itself changes. On Mr Micawber's principle - if we can do that: result, happiness. If we do not: result - disaster.

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DISCUSSION

**Mr Richard Knight** (Farming and Wildlife Advisory Group) said that he was pleased that Sir Martin had recognised the valuable contributions made by FWAG, but expressed concern that he had appeared to separate innate conservation issues from what he would describe as forward-looking agriculture. He asked whether the approach advocated was a carrying forward of extensification or a combination of environmental possibilities, as put forward in an earlier paper, that would result in an agriculture which is competitive in world markets and which not only protects the environment but also provides nature conservation benefits.

**Sir Martin Holdgate** in reply said that as a believer in seeking the best of all possible worlds, he certainly did not want to give the impression that he was other than personally committed to pressing for environmental and agricultural policies to come together. He was sure that landscapes must be looked at area by area to decide the optimum pattern of uses of land and he recognised that this is an approach towards which FWAG can effectively contribute. He was optimistic that this can be done so long as the extraneous variables do not become too great - whether they are environmental variables like climate change, the effect on photosynthesis of ultra-violet penetrations through a thinned ozone screen, or socio-economic variables such as the very real imperatives that will have to be faced world-wide through efforts to promote global sustainability, especially in areas that are going to find it very difficult to feed their own people within their frontiers.

**Mrs Vera Chaney** (Green Network) commented that when the public object to the distribution of subsidies to farmers, this does not mean that they are not supporting farmers - they are actually supporting small farmers but are very much against the large subsidies being paid to the large farmers.

**Ms Annabel Holt** (Annabel's Crusade for the Environment) added her concern that although financial support is intended to limit surplus output and conserve wildlife and habitats, every effort should be made to persuade public opinion that in the interests of future generations, such payments should not be regarded as encouragement for the destruction on our living planet of animal and plant life in any form, and that species once lost cannot be re-created.

**Sir Martin Holdgate's** response was that we should be endeavouring to get the best blend and balance of policies, and that we should accept that this country and all countries in Europe must have highly

productive and prosperous agricultural communities. He felt unable to share the wholesale condemnation of the big farmer, nor the wholesale exaltation of the small farmer. He favoured a blend of both within which people can make a decent living and gain personal satisfaction out of farming, even from holdings of modest size. He felt that there are areas where large-scale agriculture is clearly right, and that what is required is a blend of subsidisation that achieves the social goals of the community. On the second point, he was unable to share the condemnation of shooting by proper competent expert shots. He considered that the sustainable use of wildlife control is a legitimate activity and whilst he did not condone inhumanity in any form, he could not go so far as to condemn reasonably competent shooting practices.

**Mr Robin Campbell** (Farmway) welcomed acceptance by Sir Martin of the necessity for getting the implementation of national strategy down to the local level, and asked him to continue to encourage this approach, especially in the interests of the many people now doing worthwhile work with inadequate recognition. He instanced his own experience of judging the Silver Lapwing Competition, and encouraged all present to look round themselves and see the enormous amount of work being done by small and large individual farmers towards the diversity of conservation work within the community. He expressed particular concern about the damage and stress to local effort by major projects such as National Grid pylons and road development schemes.

**Sir Martin Holdgate** expressed considerable sympathies with these problems and said that some of the onus does rest on the farming community, in partnership with the conservation community. He believed that that partnership is strong and growing in many areas, and urged publicity to encourage others to set up similar models. Sir Martin also referred to a conference in Manchester last year called 'Partnerships for Change' which was designed to bring together case studies where different sectors of the community had worked through partnerships towards sustainable development. Some very good examples were identified and published, and other participants were inspired to go away and establish working relationships in their fields of interest with the support of broad-based partnerships.

**Mrs Ruth Rawling** (Cargill Europe) asked Professor Anderson in relation to his world scenario up to 2030 to indicate in more detail whether he expected the increases in productivity to come from Europe, the United States of America or from the former Soviet Union and Asia.

**Professor Anderson** said that the question was a deeply meaningful one which basically required exposure of the complexities of the model he had used as a basis for summarising. Broadly however he saw the productivity gains as literally across the board, in some parts greater than in others. He referred to earlier references to the likelihood that the higher productivity gains are more likely to come from the relatively good quality agricultural areas rather than from marginal lands, and added that in proportional terms there is a lot more marginal land around, and small productivity gains from these areas which includes the vast tracts of the former Soviet Union will still contribute greatly in the aggregate. His broad assessment was that increased productivity may come from pretty well everywhere with some concentration on the currently most productive lands, and he expected that maize will be the leading commodity.

**Ms Annabel Holt** (Annabel's Crusade for the Environment) referred to Professor Anderson's analysis of the resources that support agriculture, in particular the 'knowledge' resource, and questioned in the context of DNA genetics of diverse animal and plant life, the value attached by humans to monetary projects and the industrial creation of lifeless and 'soon-to-be-obsolete' machines and objects.

**Professor Jock Anderson** felt that Sir Martin Holdgate was better equipped to address this question which he interpreted as implying that 'present' people are not as important as 'future' people, and that money is somehow contaminating and dirty, and unnecessary and complicating. As a 'world banker' however he regarded 'today' as probably a bit more important than 'tomorrow' so it would be very distracting to look only to the millenia hence rather the many contemporary problems that have to be addressed very urgently. He also referred to a question raised earlier on the issue of who is going to finance the reforming processes in the countries of Eastern Europe and the former Soviet Union; and he commented that whilst the World Bank will not itself finance the re-structuring, the Bank along with other international agencies, will certainly be a major player.

**Sir Martin Holdgate** added that it is in his view right that the big strategies like Agenda 21 do stress the importance of the inter-generational equity, rather than passing the world on in a diminished state to future generations. He considered that the achievement of sustainability is not solely a matter of technology, nor a matter of having the money for investment - it is, as is widely recognised in UN agencies and elsewhere, the promotion of good governance in many parts of the world that is an essential part of this whole process. Many countries which expropriated individual and community rights in the

belief that the ownership of land should be vested in the State, are now feeling their way back towards restoring rights in land in recognition of the fact that security of tenure provides incentives to care for the land and pass it on in good condition to future generations. Sir Martin also referred to a theme expressed at a meeting in UN headquarters in New York that the amount of money that is wasted by investment in military hardware, even by very impoverished countries, and which is neither used or needed as a deterrent or required for real security, is appalling. There is thus a huge waste of human, financial, technical and material resources which he believed, without being too passionate or anti-military, the world community should consider with a view to redressing the balance through changes of deployment of resources, including greater emphasis on investment in sustainable agricultural developments.

**Mr Barry Higgs** (Fertilizer Manufacturers Association) expressed his concern about the differences of approach between Professor Anderson and Sir Martin Holdgate in relation to the utilisation of land to feed the increasing world population. He considered that if the world is going to make the most of its soils, then it will need to adopt proper fertiliser practices to improve soil fertility that becomes heavily depleted by 'slash and burn' and various other mining and similar activities; but those in the developed areas with a recognition of this issue appear to be frequently challenged by the philosophies of people who are well-intentioned, but who do not understand the need to replace soil nutrients when they are taken off in the crop.

**Sir Martin Holdgate** said in response that he believes he is right in saying that 'slash and burn' which we use as a pejorative term need not be a destroyer of fertility. The issue is whether there is enough time for natural processes to restore the soil at the end of the period of cultivation. Whilst he in no way denied the need for proper applications of fertiliser to maintain soil fertility, there are he felt examples where it can be shown that the application of less fertiliser in conjunction with other kinds of husbandry techniques, would not sufficiently diminish yield, and would deliver a net benefit. He finally mentioned examples from Indonesia where as he understood it, substantial sums of money were saved without significant pest infestation problems by adopting fewer pesticide applications in conjunction with integrated pest control processes, including cultivation practices which must be economically much more attractive in developing countries. Though he could not say that there is no justification for the application of fertilisers he felt that it is, as always, a matter of balance.

**Professor Jock Anderson,** who was invited to make a final comment, said that the only qualifier is that under the population growth scenario he had presented earlier, the intensification of traditional systems like 'slash and burn' is such that they do result in serious destruction of soil fertility, and under such pressures there is no opportunity for nature to take its course in the way that it once did. He felt that systems are no longer sustainable under such intensification and that it is necessary to bring in outside inputs to make them more sustainable.