1 Introduction

1.1 Conservation on farmland – why?

The population of planet earth stands in excess of 6.6 billion people, more than double what it was 50 years ago, and it is predicted to increase to approximately 9 billion in the next 50 years. That’s a lot of mouths to feed, and more of the land will inevitably need to be turned over to farming to supply that demand. As the amount of land used for production increases, so does the impetus for integrating conservation into farming, we cannot think just in terms of designating specific conservation areas and national parks. Such areas are extremely important, but they are simply not enough if we are to get the balance between that which we take out of the ecosphere, and that, which needs to be replenished and replaced, back on track.

There is considerable disparity in the percentage of land each country currently uses for farming. For example, in the United Kingdom (UK) around 23% of land is used for growing arable crops, in India the figure is nearly 50%, but in Egypt it accounts for less than 3%. The reasons are clear when one considers such issues as terrain, sub-strata, the underlying geology that predetermines the bedrock and subsequently the composition of the top soil, population dynamics and urbanisation, however food security has to be addressed on a global scale despite such statistics. In countries where the land is difficult to cultivate, conservation may not come very high up on the list of priorities when considering the need to feed an increasing population – but perhaps it should? Conservation is not just about protecting individual species; it comes as a whole package, where sustainable land management will endeavour to enhance habitat and species conservation while simultaneously producing nutritious and healthy food. Below are a few examples of the, often devastating, consequences when the proper connection between farming and habitat conservation is not made.

- El Salvador, January 2001 and Argentina, February 2009 provide just two of numerous examples where heavy rainfall has created massive mudslides that have killed many people and devastated homes and arable land. Deforestation has been postulated as one possible cause; certainly it will have exacerbated the problem. Soil is bound together by roots such that removing trees can cause significant loss of topsoil which results in both poor soil structure for growing crops, damaging
run-off into watercourses, (discussed in greater depth in Chapter 5), and, when there is high rainfall, these massive mudslides may result. So could these terrible tragedies have been avoided if large-scale deforestation had not taken place? They certainly believe so in Kyrgyzstan, Central Asia. With the support of Switzerland, large numbers of walnut trees (*Juglans spp.*) have been planted, and existing trees preserved. This has resulted in fewer mudslides and provided a new and sustainable source of income for the local rural populace, (www.sdc.admin.ch – accessed 12 January 2010).

- In the UK, grants were given to farmers to remove hedgerows (Agricultural Act 1947) to increase the area of production and increase the speed of harvesting, larger, more efficient machinery were then able to be used in the larger fields. Approximately ¼ million miles of hedgerows were removed as a result. The long term effects of this decision were to increase soil erosion → which thus increased the need for chemical nutrient inputs → thus increasing costs → and so increasing the run-off into water courses → thus damaging streams, rivers and often estuaries, and increasing chemicals in the water table from where our drinking water originates. This is all before we consider the ecosystems damaged more directly by the removal of hedges. Hedges support a vast number of species of plants and invertebrates. Many of these invertebrates feed on crop pests, so an important ally was being removed along with the hedgerow plants. In turn, these invertebrates support numerous songbirds, many of which have now become endangered through both the loss of habitat and the increase in inputs mentioned. A whole cycle of damage followed as a result of this dubious decision, and no real long-term benefits resulted. Now in 2010 grants are being awarded to farmers to replant hedgerows.

- Our use of ever increasingly bigger, more high-tech and expensive machinery is so often ludicrously disproportionate to the landscape that it is bludgeoning across. As this equipment becomes more and more expensive to buy, smaller farmers often get together in co-operatives to share such equipment to reduce costs, or perhaps more commonly, hire contractors to carry out the work for them. Over the years this machinery ‘overkill’ has sometimes resulted in the loss of some of the smaller marginal habitats such as vernal pools, and the specialist plant and animal species that are dependent on such habitats have come under threat. One such rare plant in the UK is the Starfruit plant (*Damasonium alisma*) (Species Box 1.1). Its demise – from 50 ponds in the Home Counties (Fisher, 1991) to some 15 ponds currently in Buckinghamshire and Surrey (www.plantlife.org.uk – accessed 6 March 2010), occurred as a result of farm animals making less use of ponds. The trampling by cattle while drinking enabled the plant to germinate. Now Plantlife volunteers walk into the ponds to replicate the former activity of the animals.

- Overseas, mangrove swamps provide another example. Large areas of mangroves have been felled, mainly for agriculture on the landward side and for shrimp farming on the seaward side, but mangrove systems support a vast array of wildlife.
Species Box 1.1: Starfruit Plant (*Damasonium alisma*)

Profile:
A small plant of water meadows in south-east England, parts of northern Europe, Spain, Asia Minor and northern Africa. It has three white petals, yellow at the base and is defined by the distinctive six-star shaped fruits. This plant has extremely distinct requirements to survive. It will only germinate underwater in vernal ponds; it then puts out fairly long floating leaves. In order to flower the pond must dry out early in the season, to prevent competition, at which time the floating leaves die back and the plant puts out new, more rigid leaves and stems bearing the flowers which are insect pollinated. Seeds may lay dormant for many years until conditions are right. This is a plant that has evolved with farming. The seeds require disturbance to break dormancy that historically occurred when livestock went to drink at the ponds. Paradoxically modern farming practice largely excludes this likelihood now as farmers are discouraged from allowing their stock to drink at the delicate poolsides in lieu of the damage this causes to this environment.

Conservation Status:

Current Status:
Always a rarity in the UK, the starfruit plant declined rapidly over the last few decades, due to habitat loss through changes in farming practice and through competition, until at one point it was recorded in only one pond. It has since been subject to a number of conservation programmes, including Kew’s Millennium Seed Bank Project, BAP recovery programme and work by English Nature and Plantlife. Numbers are reported to be growing; though it’s highly specific requirements make conservation in the wild potentially tenuous.

References
www.kew.org
www.english-nature.org.uk
www.plantlife.org.uk
www.ukbap.org.uk
They provide a buffer between land and sea. On the seaward side, they form an important nutrient cycle with coral reefs (Hogarth, 1999), and also sometimes with seagrass (*Thalassia spp.*) beds which are often intermediary between the two. Also the shallow waters in which the mangrove trees grow provide a nursery for juvenile reef fish and invertebrates living in the sea grass beds and on the reef, a place where most predators are just too big to go. The mangroves also help to bind the soil, reducing erosion and provide protection from floods. Where mangroves have been removed, tropical flash floods have swept soil down rivers and out of estuaries smothering and choking both sea grass beds and coral reefs often beyond redemption. On the landward side, mangrove based habitats, the ‘Mangal’, support numerous epiphytic plants, invertebrates and vertebrate species, but mangrove leaves are low in nutrients and not very digestible so that species living in this community are highly adaptive and for some, mangroves are therefore their primary habitat. From a human perspective, the mangroves’ capacity to reduce soil erosion is important for the local farming populations that are growing crops nearby. Also, use of the wood from mangroves is important for local people. Such use can be potentially devastating to the mangrove habitat but harvesting can be carried out sustainably, for example in the Matang Forest of western Peninsula Malaysia the wood is harvested by block rotation and used for making charcoal plus some replanting helps to sustain the cycle (Hogarth, 1999).

Other examples include the Lowland Native Grasslands of Australia, discussed in Chapter 3 and the extensive logging of tropical rainforests in South East Asia discussed in Chapter 4.

### 1.2 Historical relevance of on-farm conservation

‘Old-World’ countries, such as Britain and other European nations have farmed the land for over 9000 years. Here species of plants, fungi, microbes and animals have evolved in conjunction with farming practices, examples like the common poppy (*Papaver rhoeas*) and the corn marigold (*Chrysanthemum segetum*), highlighted in Species Box 2.2, are known as arable flora and were brought in from the Mediterranean among the crop seeds. Songbirds such as the cirl bunting (*Emberiza cirlus*), highlighted in Species Box 2.1, have co-evolved with arable crops. Another example is the co-evolution of waterfowl and wet grassland pasture. Here birds of international importance (The Wet Grassland Guide, 1997) like the Bewick swan (*Cygnus columbianus*) the bean goose (*Anser fabalis*) and the wigeon (*Anas penelope*) are partially dependent on wet grassland for overwintering on flooded meadows. The relevance of on-farm conservation is therefore paramount – to exclude species that have become part of the farmland ecosystem is to exclude what has become part of a semi-natural cycle.

This begs the question, is on-farm conservation relevant to the ‘New-World’? During our travels researching for this book, we visited New Zealand. From a farming
point of view, New Zealand is one of the newest countries in the world, most having only been farmed for less than 200 years even in the oldest settlements, and for less than 50 years in many parts. Clearly native wild species cannot have evolved within these farming systems, indeed many such native species struggle for survival at all amidst the introduced species brought by European settlers.

The New Zealand Government has set aside vast tracts of land as conservation areas, with the aim of protecting native and indigenous species from non-native species in particular predatory species that predate the eggs of flightless birds such as the kiwi (*Apteryx spp*). The settling of the country was accompanied by the introduction of many species not native to the country. The consequence is that in many places conservationists work hard to eradicate non-indigenous species; indeed many of the numerous islands have proven to be ideal for this type of conservation programme. On most areas of the mainland however, they seem to be fighting a losing battle. Driving south on state highway 6 towards Queenstown in late December, flanked by snow-capped mountains, lakes and creeks, the road is lined for mile upon mile by colourful flowers; vipers bugloss (*Echium vulgare*) (Figure 1.1), *Lupinus spp.*, dog roses (*Rosa canina*) and *Verbascum spp.*, fill the roadside and foothills, a stunning sight to behold – all European invaders – and certainly there to stay! However, many areas of natural bush do exist and support indigenous insects and birds. Indeed, as you drive down the road you can have the schizophrenic experience of one side of the road being covered in familiar European species while the opposite side of the road is like nothing you’ve seen before, including tree ferns and a range of trees. Farmed areas have had the natural bush grubbed up and these areas have been seeded

![Figure 1.1 Viper’s Bugloss are one of many European plant species seen en masse across many parts of New Zealand. (Photo: Sarah Burchett)](image-url)
with exotic grasses for grazing by the 45 million sheep and 10 million beef and dairy cattle – also introduced – as New Zealand has no indigenous land mammals. Clearly New Zealanders have to eat and just as clearly many native species are largely excluded from farmland.

Thus we return to the question ‘Is on-farm conservation relevant to the New World’? Despite the apparent arguments against it, we believe that ‘yes’ it still is. Most farmland in New Zealand will never again be populated by predominantly indigenous plants and animals, indeed this farmland now supports numerous European songbirds also introduced by settlers who wanted to ‘feel at home’ in their new country and these birds have evolved historically within farmland communities back in their original homeland, plus there are many native birds and insects are opportunists and benefit from the farmland too.

Conservation of water courses on farmland is recognised to be important as native aquatic species can still be found in abundance in the creeks and rivers criss-crossing the farmers’ land. Run-off from farmland may potentially cause harm to these species, and small grants have been awarded to some farmers to plant riparian strips. Legislation also exists, compelling farmers to build bridges or to develop alternative routes for stock movements to passage for stock across watercourses. Unfortunately, though such legislation exists, and some small grants may be awarded, there is at present very little financial incentive for New Zealand farmers to apply conservation measures on their land.

In America, also a ‘New World’ country farming practices are somewhat different from New Zealand. Though large-scale farming in America is relatively recent compared to Europe and Asia, the first European settlers learned to grow maize (Zea mays), a crop indigenous to Mexico, from the Native Americans. Since then many of the major crop species grown in the Americas, such as the blueberry (Vaccinium spp.), the sunflower (Helianthus annuus) and cotton (Gossypium spp.) are native plants that have been cultivated as opposed to introduced species and many of the grazing animals also feed on native grasses. Here then farming and conservation of native wildlife can go comfortably hand in hand given the opportunity to do so.

1.3 Legislation and policy

Making changes to farming practice is a big undertaking. There may be considerable costs involved, not to mention time, available labour and materials and, of course, the will to make such changes. Many farmers recognise the need to conserve the land that they are farming, but do not have the resources or manpower to implement such radical steps. Other farmers may require a little ‘educational nudging’ to urge them to actually see the point in committing time and effort on such an undertaking.

A further issue, which compounds the problem with respect to wildlife conservation on farmed lands, is that farmers produce their products in response to national and international policy. Since the 1940s agricultural policy across Europe and the USA
has been biased towards increasing food production and improving the efficiency of agricultural systems. This is quite logical, as nation states need to secure food supplies for their populations. However during the 1980s food surpluses became a problem in Europe and it was this very fact that instigated change in policy drivers to control food production and maintain commodity prices. Early changes in policy instruments were aimed at reducing the area of certain crops, notably cereals, and impose a quota system on some products like milk. In 1988 the European Union (EU) implemented a voluntary grant aid programme where farmers could set aside 20% of their productive land for five years. In America a similar land diversion scheme was introduced during the 1950s in an attempt to reduce food surpluses (Warren et al., 2008). The subsequent benefits to wildlife conservation were noted during these early attempts at land diversification (set-aside). Set aside provides nesting habitats for partridges (*Perdix perdix*) yellowhammers (*Emberiza citrinella*) reed buntings (*E schoeniclus*) and a refugia for ground beetles and many other invertebrate species (www.rspb.org.uk – accessed 6 March 2010). Land diversification schemes eventually became enshrined in the European Common Agricultural Policy (CAP). However, they had been welcome side effects rather than deliberate goals.

### 1.4 Impact of agricultural policy on the environment

In 1957 Belgium, France, Germany, Italy, Luxemburg and the Netherlands signed the Treaty of Rome and established the Common Market and from this point forward agriculture in these six member states was strongly affected by state intervention through the CAP. Article 33 (39) enshrines the legal basis of CAP and established a set of internal objectives:

- increase agricultural productivity by promoting technology and optimising labour;
- ensure fair standard of living for farmers;
- stabilise markets;
- assure the availability of supplies;
- ensure reasonable price for consumers.


During the 1950s, and as a consequence of the Second World War, other European countries, such as the UK, were developing their own agricultural policies and infrastructure. The 1947 UK Agricultural Act guaranteed prices for products like cereals, sugar beet, beef and milk; such price guarantees encouraged farmers to expand and modernise their production systems. In 1952, the Agriculture Act paid grants to farmers of £30 ha\(^{-1}\) to plough up 12-year-old pasture maintained by grazing animals and convert it to cereal production (Warren et al., 2008). This was a further conversion of permanent pasture in an attempt to increase food production, following
an initial conversion of 2 million ha of permanent pasture between 1939 and 1945, as a consequence of the cultivation orders. In the 1970s and 1980s, Britain and many other European countries joined the EU and were subsequently directly affected by CAP.

The impact of CAP and other policy drivers on agriculture was profound and from the late 1950s through to the early 1990s advances in agricultural technology changed the face of farming across Europe to such an extent that extensive traditional mixed farming systems evolved into specialised large scale industrialised farms. The impact of industrialised agriculture on wildlife was overwhelming as large areas of land were subjected to nutrient enrichment from continued inputs of artificial fertiliser (Figure 1.2); increased pesticide use and activities that modified the landscape. These activities included the removal of hedgerows, the conversion of woodlands and heathlands to arable land and intensively managed dairy pasture together with the drainage of wet meadows and flood plains to improve field systems and make them suitable for intense arable crop production. Such changes in land use removed valuable habitats for numerous species which had coevolved with agriculture in the preceding 10,000 years (Warren et al., 2008). These species have now become synonymous with modern wildlife conservation across Europe. Examples include the annual flora of cereal fields (Wilson and King, 2003) such as the catchflies (Silene noctiflora and S. gallica, Species Box 2.3), which have declined in their range and abundance since the advent of modern farming practice. Other examples of co-evolved organisms that have declined in recent times are the farmland birds and in particular the small seed eating birds of the arable landscape, such as the cirl bunting (Emberiza cirlus, Species Box 2.1). The list for Europe and the UK is almost endless with examples such as the black grouse (Tetrao tetrix), capercaillie (T. urogallus), red grouse (Lagopus lagopus) and the ptarmigan (L. mutus) in Scotland as land use change was driven by policy.
to convert moorlands into commercial softwood plantations and the subsequent application of poor management and pest control practice (Rose, 2004).

In the USA, similar examples of habitat loss and decline in associated species can be observed such as the decline in longleaf pine habitat and associated fauna, in particular the red cockaded woodpecker (*Picoides borealis*, Species Box 4.3). This bird is a specialist species of a natural habitat but it has been highly modified by modern logging practice. Sadly, as the population of humanity increases and the demand for increased standards of living rises, the ecological impact of humanity on natural ecosystems can be devastating. Many highly charismatic and keynote species are in decline, examples include the orang utan (*Pongo pygmaeus*) of Borneo as their forest home is being logged and/or converted to oil palm (*Elaeis guineensis*) at an alarming rate. All the above examples of land use change and associated decline in species are a direct response of landowners to policy edicts from governments aimed at improving agricultural performance and standards of living reflecting a lack of understanding of the importance of the natural world.

In recent years there has been a change in political philosophy across Europe and the USA towards agriculture and wildlife conservation, which is now reflected in policy decision-making processes. In Europe, the all-encompassing CAP has undergone a number of modifications (Table 1.1). There has been an increasing emphasis on the conservation of biodiversity and rural communities, and similar changes have occurred in USA policy (Table 1.2). In the USA the application of rural policy is focused on government renting land from the farmer in an attempt to take land out of cultivation and thus protect fragile habitats. Indeed the approach in the USA reflects a philosophical difference between European and US agriculture. In Europe, agriculture and wildlife conservation are perceived by policy makers as multifunctional uses whereas the US view agriculture and conservation as mutually exclusive (Warren *et al.*, 2008) and this difference is clearly reflected in the approach to on-farm conservation between the two continents.

In a multifunctional model, agriculture is not only responsible for producing food and fibre crops with a monetary value but also ecosystem services such as the maintenance of wildlife, biodiversity, water and air quality, cultural and historical heritage – that have an elusive fiscal value (Warren *et al.*, 2008). This concept was clearly set out in the Millennium Ecological Assessment (2005) and a UK version is currently being worked on which will be published in 2010. Such a model can have both positive and negative impacts on agriculture and the environment. The assumption that an increase in an agricultural product, for example beef or dairy will increase grassland and hill pasture and thus improve biodiversity is not essentially accurate, and conversely the idea that removing an agricultural product, again beef or dairy, will improve the integrity of the environment is also misleading. With respect to beef and dairy production it is how these items are produced that has the greatest impact on the environment, and conversely removing traditional grazing from European uplands results in abandonment and subsequent change in coevolved ecosystems, which are now recognised as High Nature Value Farmland (EEA Report, 2004). Thus
**Table 1.1** Evolution of agricultural and agri-environment policy in Europe

<table>
<thead>
<tr>
<th>Year</th>
<th>Scheme</th>
<th>Objectives</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>Less favoured area (LFA)</td>
<td>A subsidy scheme aimed at supporting farmers in highly disadvantaged areas, such as mountains and moorlands.</td>
<td>57% of utilised agricultural area in the EU is classed as less favoured area, however not all farmers receive LFA payments.</td>
</tr>
<tr>
<td>1987</td>
<td>Environmentally sensitive area (ESA) scheme</td>
<td>To encourage farmers to adopt agricultural practices which could safeguard and enhance semi-natural habitats in sensitive areas.</td>
<td>Payments were only available to farmers in environmentally sensitive areas. Now closed and superseded by the environmental stewardship schemes.</td>
</tr>
<tr>
<td>1991</td>
<td>Countryside stewardship (CSS) scheme</td>
<td>Payments made to farmers to adopt measures to conserve the semi-natural environment.</td>
<td>Open to farmers outside environmentally sensitive areas.</td>
</tr>
<tr>
<td>2005</td>
<td>Single payments scheme (SPS)</td>
<td>To decouple production and link payments to environmental protection through adherence to cross compliance.</td>
<td>Subsidy payments linked to area and environmental protection. Scheme is biased towards large estates and disadvantageous to small mixed farms. Could lead to further loss of landscape heterogeneity.</td>
</tr>
<tr>
<td>2005</td>
<td>Cross compliance (CC)</td>
<td>To regulate the application of good agricultural practice and maintain land in good agricultural and environmental condition.</td>
<td>Statutory management requirements help to reduce the impact of farming on the environment through mechanisms that help to reduce soil erosion.</td>
</tr>
<tr>
<td>2005</td>
<td>Agri-environment schemes (entry level scheme, organic entry level scheme and higher level scheme)</td>
<td>Three linked schemes aimed at targeting habitat and species conservation in the farmed environment.</td>
<td>–</td>
</tr>
</tbody>
</table>
## Table 1.1 (continued)

<table>
<thead>
<tr>
<th>Year</th>
<th>Scheme</th>
<th>Objectives</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Entry level scheme (ELS)</td>
<td>Aimed at increasing the area of the farmed environment under measures to protect and enhance farmland habitats. Modest payments that are linked to points for habitat protection.</td>
<td>Open to most farmers in Europe who agree to enhance and/or maintain farmland habitats, examples include hedgerow and watercourse management. Scheme may not actually achieve high impact on the conservation of specialist species but will help to reduce excessive degradation of common farmed habitats.</td>
</tr>
<tr>
<td>2005</td>
<td>Organic entry level scheme (OELS)</td>
<td>To increase the area of organic agriculture.</td>
<td>–</td>
</tr>
<tr>
<td>2005</td>
<td>Higher level scheme (HLS)</td>
<td>To target payments for advanced conservation effort.</td>
<td>Scheme is competitive and implementation is targeted to areas of conservation concern such as Site of Special Scientific Interest SSSI. Scheme allows for the development of special projects that can enhance specialist species. Very complicated scheme and requires farm environment plan.</td>
</tr>
<tr>
<td>2010</td>
<td>Uplands entry level scheme (UELS)</td>
<td>Aim is to support traditional farming methods in upland areas in England. The objective is to move away from compensatory payments made through hill farm allowance to a scheme that targets payments for maintaining and improving the upland landscape and environment.</td>
<td>A new scheme aimed at supporting farmers in marginal environments that have inherent high nature and historical value.</td>
</tr>
</tbody>
</table>
the policy makers in Europe have a demanding challenge in that they have to develop policies that support food production but simultaneously support environmental protection. Good examples of such policies are the implementation of the EU Water Framework Directive (Chapter 5) and Nitrate Vulnerable Zones (NVZs); these policies are ensuring that farmers across Europe undertake their management practices with the objective of improving water quality in all member states, and in the UK the NVZ aims to reduce nitrogen loading in fresh water to a maximum of 50 mg/l.

In the USA, the situation is significantly different, and traditionally US policy has treated agriculture and conservation as different entities, such that an increase in agricultural products is at the expense of conservation and the environment, that is a conflict. Historically in the US the approach to wildlife conservation has been to designate large areas of land as Wildlife Reserves or National Parks and remove agriculture from these areas. A good example is the development of the Shenandoah National Park in the Appalachian Mountain range, which was originally cleared by European settlers of forest and converted to agriculture, but is now largely devoid of agriculture and has been designated as a Wildlife Reserve (Crandall, 1990). However, this has numerous problems as large areas of land are scarified to promote modern intense agricultural production (Jackson and Jackson, 2002) and, of course, numerous

Table 1.1 (continued)

<table>
<thead>
<tr>
<th>Year</th>
<th>Scheme</th>
<th>Objectives</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Electronic identification (EID)</td>
<td>A mandatory and regulatory policy development aimed at electronic identification and recording of sheep movements in Europe. Objectives is to improve tractability of sheep and goats with respect to disease control.</td>
<td>Very controversial in the UK as high levels of animal biosecurity and market focused tractability has reduced issues associated with many infectious diseases. Cost are borne by the producer and implementation of this scheme is believed to lead to further reductions in sheep numbers in the UK uplands and therefore potentially lead to further encroachment of invasive weeds in upland areas (Chapter 3). Potentially antagonistic to UELS.</td>
</tr>
</tbody>
</table>

INTRODUCTION TO WILDLIFE CONSERVATION IN FARMING

Table 1.2  Evolution of agricultural policy in the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>Program</th>
<th>Objectives</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>Agricultural Act</td>
<td>re-establishes flexible price support</td>
<td>An integral component of US Farm Bill which is the primary agricultural and food policy tool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support US farming sector</td>
<td>Farm bill is modified every five years.</td>
</tr>
<tr>
<td>1956</td>
<td>Soil Bank Act</td>
<td>To retire land producing basic commodities that were surplus.</td>
<td>Served as a model for conservation reserve program</td>
</tr>
<tr>
<td>1985</td>
<td>Food Security Act</td>
<td>Reduce government farm support, promote export and establish conservation</td>
<td>Origins of the wide reaching conservation reserve program and the Sodbuster, Swampbuster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>measures.</td>
<td>Programs.</td>
</tr>
<tr>
<td>1981</td>
<td>Conservation Easements</td>
<td>To reduce sub-division and development on land of high historic, scenic and conservation value.</td>
<td>Land owner may donate or sell a legally binding agreement that limits land use. Original activity, farming and forestry may continue. Income tax deductible.</td>
</tr>
<tr>
<td>1985</td>
<td>Conservation Reserve Program</td>
<td>Encourage farmers to convert highly erodible cropland or other environmentally sensitive areas to vegetative cover.</td>
<td>Cost sharing and land rental payment programme. As commodity price increases land may be withdrawn from CRP as agreements end.</td>
</tr>
<tr>
<td>1990</td>
<td>Wetlands Reserve Program</td>
<td>To encourage landowners to protect, restore and enhance wetlands on their property.</td>
<td>Payments based on the difference in the value of land placed under the Wetland easement. In 2002 1 075 000 acres conserved.</td>
</tr>
</tbody>
</table>


rivers, streams and semi-natural environments still co-exist in this intensely managed landscape. Consequently these surrounding and adjacent, associated habitats are subjected to environmental degradation from nutrient enrichment and downstream pollution from pesticides and animal faeces (Jackson and Jackson, 2002). The folly of this approach is now recognised and US policy is currently moving towards a multifunctional model (Warren et al., 2008), indeed the conversion of and intense use of prairie grasslands for cereal production in the Pacific North West is being moderated by a 30-year programme of research and extension to mitigate against the negative impacts of soil erosion (Chapter 2).

Changes to the CAP are also aimed at meeting several international agreements such as the Convention on Biological Diversity (CBD), the first global agreement on biodiversity made at the 1992 Earth Summit in Rio de Janeiro. When the outcomes of this summit are directly applied in Europe it is immediately clear that conservation effort has to align directly with farming practice because 40% of European landscape
is under agricultural production. In context with modern farming practice across Europe, application of the outcomes from Rio can be viewed as on-farm conservation of biological diversity, with farmers adopting good agricultural practice to comply with cross compliance regulations that underpin the single farm payment subsidy and fiscal support from targeted EU agri-environment policy (Table 1.1). These schemes financially support farmers in their efforts to improve species diversity and the integrity of on-farm habitats and as these schemes evolve there is the genesis of joined-up thinking. Advanced schemes such as the Higher Level Agri-environment Scheme (HLES), are designed to support farmers where effort is targeted towards vulnerable habitats and species which are often gazetted under the 1992 EU Habitats Directive, a policy that evolved as a direct consequence of the 1992 Earth Summit in Rio de Janeiro. The HLES scheme will support special projects that are aimed at increasing the abundance of rare species such as the cirl bunting and the arable flora. However there are some fundamental flaws in many of these schemes, for example the biology and locations of rare plants are not always known by project officers and, unless the farm advisors are alert to this issue, many rare plants could disappear unwittingly. The operation of the policy assumes such knowledge exists.

1.5 Further afield

Developments in agricultural and environmental policy in other developed countries differ from those outlined above and in many ways are not focused on providing farmers with financial incentives for specific conservation projects, but are more directly targeted to issues associated with the security of food production systems. In Australia the focus is on water, soil salinity and weed control, in New Zealand there is a strong focus on biosecurity with particular attention to preventing the importation of exotic pests. Nevertheless the New Zealand Ministry of Agriculture and Forestry (MAF) support sustainable agriculture through the Sustainable Agriculture Facilitation Programme, which cooperates with land users and other government and local authorities in efforts to maintain and enhance the sustainability of New Zealand agriculture. Since 1988/1989, Resource Management Grants have been provided for projects focused on flood defence and for cost-sharing efforts in projects aimed at soil conservation (www.maf.gov.nz – accessed 9 January 2010). However, this is not to say New Zealand does not commit considerable financial effort to wider conservation issues in their country. In 1987 the Department of Conservation was instigated and became responsible for 17,000 parcels of fragmented public estate that was legally protected for the purpose of conservation (Molly and Potton, 2007), and extends to 8.1 million ha of land.

In Canada the 2003 Agricultural Policy Framework has recognised the relationship between biodiversity and agriculture and has established a financial programme to support farmers in developing Environmental Farm Plans (EFPs) and environmental monitoring to identify vulnerable areas, which can be supported via the EFPs.
1.5.1 Developing countries

In many developing countries agri-environment policy is uncommon and, quite understandably, people in these countries face an enormous struggle for daily essentials that many of us living in economically developed countries take for granted. Indeed many of the problems facing people in developing countries could be alleviated by the development of a self-sufficient agricultural system that provides a secure supply of staple food products and an export surplus of exotic goods. Such a development could help to reduce the volume of bush meat taken from native forests, estimates of wildlife harvest are alarming, in the Malaysian state of Sarawak, on Borneo, 2.6 million animals are shot annually and consumed as bush meat, and in the neighbouring state of Sabah over 100 million animals are shot annually for bush meat (Bennett, 2002). In the forests of Africa and the neotropics 5 million tonnes of bush meat is consumed annually (Fa, Peres and Meeuwig, 2002). These figures are disquieting and when combined with the continued reduction in natural forest area it does not take a genius to calculate that these wild animals are facing a mass extinction event.

How can policy and agriculture work with wildlife rather than ignoring it? In the developed world some marginal improvements are being implemented but in the developing world how can the trade in bush meat be stemmed and how can the inappropriate conversion of forest to land producing global commodities such as oil palm be halted? Particularly when much of the woodland in the developed world made way for modern industrialised systems of agriculture, that is do as we say rather than as we did.

The answer is simple, fair and equitable trade, but the reality is probably unattainable in our modern fiscal society. This is not to say there is no movement towards a solution, because many international organisations have developed a number of policies to aid agriculture and forestry in developing countries. The International Tropical Timber Organisation (Chapter 4) has developed a range of policies and associated funding streams to improve the livelihoods of forest peoples around the world by promoting sustainable forestry practice. Another example of international agreement in fair trade is being developed by the Organisation for Economic Co-operation and Development (OECD). A number of policy drivers have been developed to open up trade routes for agricultural products from developing countries into the rich developed countries. The most wide reaching impact is that agricultural policy in developed countries must align with OECD rules on fair trade. These rules, known as ‘Traffic Light’ rules (OECD, 2000) are based around limiting government subsidies to growers that directly distort trade and there are three categories:

- **Amber Box** is where World Trade Organisation (WTO) members are committed to reducing domestic subsidies that distort the production of commodities that may impede the development of world trade in agricultural products from Emerging and Transitional Economies (ETEs).
Blue Box includes any support that would be included in the amber box but in this scenario the support has limits on production or crops are grown over a fixed area or a fixed number of livestock, in which case there are no limits on spending in the Blue Box category and examples include compensation payments in the EU and deficiency payments in the US.

Green Box includes domestic subsidies that do not distort trade and thus domestic subsidies are targeted at growers decoupled from production. Green Box programmes can support environmental protection and therefore EU agri-environment schemes and the Conservation Reserve Program (CRP) of the US is largely considered Green Box (Warren et al., 2008), but some WTO members disagree with this view and argue that agri-environment schemes and CRP can lead to a distortion in trade (Warren et al., 2008).

How can these rules aid people in ETE countries and simultaneously support wildlife conservation? The answer lies in opening up trade in agricultural products, for many ETE countries international trade in agricultural markets has remained static for over 20 years (OECD, 2000). Consequently, the development of employed and settled rural communities in ETE countries has been impeded, leaving many people vulnerable to starvation and hence reliant on bush meat. Agriculture is the largest employer in poor countries employing about 60% of the workforce (Bolton, 2008) and one example of international co-operation is the Economic Partnership Agreements (EPAs), which are regional trade agreements between the EU and African, Caribbean and Pacific countries (ACPs) and are aimed at instigating sustainable development (Bolton, 2008). The system is not perfect but a quote from a Kenyan vegetable grower exporting his products to the EU illustrates the key issue:

*My family gets a good income from growing green beans for export. We have to work hard but we can get regular income from a contract with the buyer. A lot of our income goes on education for the children we are also saving to build a better house.*

*Mwenge, cited in Emmet (2008)*

Many of us will recognise the sentiments in Mwenge’s quote and therefore if wildlife conservation is going to be globally effective we come back to the central tenet of our opening argument; on-farm conservation is essential for the future security of the world’s biodiversity.

But legislation alone is not enough, the best conservation on farmland occurs where the mind-set of landowners whether individuals, large corporations or the public sector is attuned to the ethos of protecting the resources of which they are the current custodians. From around the world, large and small farms, from arable, to forest to coastal – from protection of a single species, to management of a whole ecosystem, we aim to illustrate many examples of farmers who have chosen to take this way of thinking on board, and who have often had to make major lifestyle changes.
as a result. Their words tell of the benefits of this choice and they are the people who hope to inspire others to follow their example.

References


www.nature.org (accessed 12 January 2010).


