



Biodiversity
as a Resource
in Agriculture
and Rural
Development

A NATIONAL
RURAL
NETWORK
REPORT

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This report explores the actual and potential for 'biodiversity as a resource in agriculture and rural development'. The report was undertaken by the Biodiversity Working Group established by the National Rural Network. The content of the report was informed by national and international research but most significantly by the input, knowledge, experience and expertise in this field of the members of the Working Group.

Biodiversity as a Resource in Agriculture and Rural Development in Context

Biodiversity is the term used to describe the great variety of life on earth. It is a key measure of the health of ecosystems, and increasingly a cause for concern because of its ongoing decline and degradation, mainly as a result of human activities. Biodiversity underpins or provides a wide range of products and ecosystem services without which human societies cannot function, and farming is involved in many of these. The task of maintaining and promoting biodiversity has become one of the most important responsibilities of government, a task implemented primarily through legislation, the provision of incentives, and to a lesser extent the purchase of land for conservation.

Apart from its fundamental and indispensable importance in the general provision of goods and services, biodiversity acts as a resource that directly supplements farm income in two sorts of ways. Firstly, through the various schemes and other initiatives whereby farmers are paid to farm in ways that enhance biodiversity and secondly through the provision of biodiversity-enhancing goods and services for which there is a growing market as concern for biodiversity and related environmental issues grows in the wider community.

In the Republic of Ireland the main incentive schemes currently in operation are the Rural Environment Protection Scheme (REPS) and the Agri-Environmental Options Scheme (AEOS), and in the North of Ireland the NI Countryside Management Scheme (NICMS).

Conclusions on Biodiversity as a Resource

Biodiversity is essential to the healthy functioning of natural and agricultural ecosystems in a great variety of ways. However, it is only when action to maintain or promote biodiversity affects our income or welfare that we can be counted on to develop a deeper personal concern that translates into action. Many of the functions served by biodiversity can only be managed and conserved on regional or global scales and depend on legislation and incentive.

Economic Value of Biodiversity

The value of biodiversity can be hard to estimate because of its contribution in a number of areas, significantly beyond the landscape or recreational value which are commonly perceived as the main values of biodiversity.

Farming and Biodiversity

The initial adoption of farming practices in Ireland had an impact on biodiversity but did not lead to a decline. In fact farming practices began to shape the landscape and the diversity of species within it. However, the intensification of agriculture particularly in the past 60 years has had significant negative impacts on biodiversity. Many of these negative aspects are now being addressed by new policies or legislation but reversal is a slow process.

Biodiversity as a Resource

It is obvious that biodiversity makes enormous contributions to agriculture in the areas of: pollination; soil; drainage; prevention of flooding; natural water purification; and diversity of species. However, even farmers themselves in many cases fail to recognise or underestimate the contribution made by the natural environment in these areas. Farmers have to be proactive in exploiting the concern of the broader society about biodiversity in ways that generate income. The development of biodiversity-enhancing strategies provides greater scope for the farmer's own initiative. The potential here is very considerable. Such initiatives can be very farm-specific depending on location, area farmed, capital available and owner motivation and incentivisation. Success beyond this depends on the level of understanding and appreciation of biodiversity among the public, but equally so on the part of the individual farmer.

A genuinely deep understanding coupled with appropriate skills training can enable any farmer to develop the product that is best tailored to maintain and promote biodiversity on their farm and in the wider rural community. This will also attract the custom of a discerning buying public that is increasingly concerned about key environmental issues, of which biodiversity is one of the most important. While there has been a long interaction between farmers and the natural environment, the renewed focus on biodiversity is often a source of conflict or irritation for farmers (not involved or adequately consulted in the development of environmental policies). Other rural dwellers feel the impact of farming on biodiversity most, and farming underpinned by sound environmental and conservation principles greatly enhances the total quality of rural life. The development of a genuinely deep appreciation among the farming community is therefore a priority.

Much is already being done, but this is not yet seen as a priority from within farming: rather as something imposed, reflecting the concern and interest of others outside farming who may have little appreciation of the realities of farming today.

Biodiversity Incentive Payments

The natural benefits of biodiversity have always prevailed, however biodiversity policy measures/incentives also bring financial benefits to farmers. While farmers may not always appreciate the requirements of specific policy measures, adherence to them or participation in schemes can deliver significant payments. The evolution of the environmental schemes has also brought about a change in focus on the environment, initially REPs was about protection of further losses but has evolved to a stage where it seeks to enhance natural biodiversity and restore habitats. A return to more traditional practices may have benefits in terms of the requirements for less artificial inputs. There may also be significant benefits in the marketing of farm produce as a more natural product. The environmental schemes and linking of cross compliance for EU payments has brought biodiversity and the environment to the forefront. However, it is not yet evident of the extent to which the measures are leading to a reversal of some of the biodiversity damage.

Potential in Rural Tourism

Rural tourism is the enterprise which offers the most potential to capitalise on the resource presented by biodiversity and the natural environment and in doing so, contribute to the economy. The biggest obstacle to maximising the potential of this resource is the awareness, understanding and appreciation of the natural environment and heritage by rural residents, farmers and tourists. Physical (routes, pathways, facilities and services) and intellectual (understanding/appreciating) access are key issues. However, the importance of intellectual access is probably not fully understood by those living in rural areas and even those promoting rural tourism, people need knowledge of what their own area has to offer, which equips them with the ability to explain their area and environment to visitors.

Challenges to Maximising the Potential Resource

The potential for further increase in the contribution biodiversity can make to agriculture and rural development depends on the value placed on biodiversity by wider society, and on the legislation and incentives put in place. The biggest challenge to maximising the potential resource of biodiversity is that enough of the population have not experienced the true beauty of the natural environment first hand and therefore do not have a full appreciation for it. Even

farmers and rural dwellers themselves may not have sufficient knowledge of their own area to exploit that resource in financial terms. Another significant challenge is to ensure that further degradation does not occur and that adequate steps are taken to restore some of the past damage. Everyone feels they have their own legitimate claims to the natural assets of their area based on their own interests. These often conflicting and opposing interests need to be reconciled if the true potential of these assets are to be realised with benefits for everyone and nobody feels that their interests are being ignored.

Report Recommendations

The information in this report should be disseminated to the wider public and the issues debated and discussed (priority recommendations are highlighted).

Education

The full potential of biodiversity as a resource in agriculture and rural development can only be realised if it becomes an integral part of farming education and training. Biodiversity should be incorporated as a core module in farmer education, of equal standing with traditional production modules. The syllabus for this module should lay equal emphasis on the development of an informed awareness and the development of strategies at farm and community level to promote biodiversity. There is a need for a general re-education of farmers on the financial benefits of biodiversity and of how they can maximise them to reduce their input costs and also how to maximise efficiency with reduced artificial inputs. ***Ongoing training in biodiversity should be an integral part of all agri-environmental schemes.***

Awareness and Appreciation of Biodiversity

Biodiversity awareness and appreciation programmes need to be undertaken with the public (including farmers) to explain the role and importance of biodiversity and of what could be lost if we don't appreciate it and protect it (including the cost to farmers). A value needs to be placed on public goods such as landscape, scenery, natural environment, recreational value of the countryside so that it is more widely appreciated by those who protect it (farmers) but also that those who avail of it recognise that.

Biodiversity Policies

New and imaginative policy measures and schemes are needed which not only protect the environment but enhance it. Farmers and those who understand the interaction between farming and nature should be involved in developing these policies. It is important that the public understands that there is a cost to

maintaining and conserving the environment.

The engagement of leading production-orientated farmers in agri-environment schemes with appropriate biodiversity measures is critical. The Food Harvest 2020 vision for the Irish agri-food industry (and other reports) foresees an agricultural sector that acts 'smartly' to achieve a competitive critical mass in the international marketplace and targets those consumers in key markets who recognise and reward food producers across the island of Ireland for their 'green' output. It is critical that both the production and environmental targets in these reports are achieved in harmony with each other.

Agri-Environmental Schemes

There are opportunities for biodiversity enhancement in environmental schemes which would widen the scope of these measures. It is worth considering making schemes less prescriptive and allowing farmers (perhaps with imaginative advice from biodiversity / environmental / ecological consultants) the opportunity to come up with their own ideas for conserving and enhancing biodiversity on their farms and support them appropriately.

Support (within Agri-Environment schemes) is required for raising and planting of tree and hedgerow plants from suitable indigenous sources of native seed to contribute to the conservation of Irish genetic resources.

Any future High Nature Value Farmland Scheme must recognise that there are already farming systems delivering High Nature Value across the country, and acknowledge that some is of higher value than other. Valuing local biodiversity is necessary to engage public appreciation of biodiversity and ultimately engender a willingness to pay for it. Encouraging biodiversity hotspots in intensive dairy or tillage areas is critical for biodiversity to survive as agriculture intensifies to meet growing food security and food production demands.

On-Farm Biodiversity Enhancing Actions

There are opportunities to make changes on farms relating to: wetlands; peatlands; farm woods; and grasslands.

Wetlands: There are opportunities to regain much of the lost ecological value of reclaimed land if drainage is reversed. The re-wetting of farm ponds and quarries could be promoted and encouraged.

Peatlands: Extensive areas of natural habitat could be created by blocking the drains in the cutaway bogs, including developing new habitats on the edges of the larger bogs which are owned by farmers. Areas of cutaway bog could be linked to form a continuous

mosaic of species-diverse land large enough to function as ecological networks. However, there are no guidelines for this reversal of management and enhancement of habitats.

Farm Woods: There is an opportunity to ensure that the increased level of farm forestry develops into something much more than the current short-rotation monocultures.

Grasslands: Species rich grassland has floristic and faunal interest but also has a value in that it enhances organic and other 'labelled' food produce. Future extensification could result in the utilisation of fewer inputs on marginal grassland. However, the decline or cessation of grazing can bring problems and intervention may be necessary to maintain these habitats in the absence of intensive farming (in terms of controlling invasive species and also on how the ryegrass monocultures can be replaced with more traditional mixtures).

Exploiting the Potential in Tourism

The potential contribution of biodiversity can only be maximised if the right approach is adapted to build the awareness and knowledge of the provider, local residents and custodians (farmers and others) and the tourists (potential clients/customers). There is a need to recognise, appreciate and understand the small elements of the rural countryside which make it attractive as a resource. In particular, measures need to be taken to improve the access to the rural tourism and biodiversity resource and the need to educate the wider public and in particular local custodians on their local assets.

Best Practice Case Studies

A survey of best practice case studies both in Ireland and abroad should be compiled and disseminated. Support should be given to a core of best-practice farms to permit visits, open days and organised training sessions whereby best practice can be demonstrated.

Research on Biodiversity Enhancement

There is a need to explore and research the opportunities for farming practices to adapt to biodiversity enhancement - look at the reversion options and also more traditional and diverse species which may be more productive on a reduced input system. Consideration needs to be given to how the lessons from the Burren Life Project could be applied in other areas. Studies should be supported in order to establish how biodiversity interacts with life and how the diversity of views on biodiversity can be reconciled in a harmonious manner.

1. The Strategic Issues Working Group



The Strategic Issues Working Groups were established by the National Rural Network (NRN) in order to develop the discussion around key issues of concern and importance in rural areas. The focus of these groups was to draw together existing policies and research in a coherent manner and following debate to develop practical proposals for changes to current policies/programmes/measures.

The NRN assists in the efficient and effective implementation of the Rural Development Programme. The Network is facilitated by the Rural Development Support Unit within Tipperary Institute. The NRN embraces all four axes of the programme and seeks to promote synergies across measures, encouraging individuals and organisations to work together and expand the possibilities available to those involved in the delivery of the programme and beneficiaries. The NRN seeks to support stakeholders in addressing important issues of concern and focus on practical opportunities and responses.

The aim of the Biodiversity Working Group which was established in 2010 (see Appendix 1 for membership) is to explore 'potential for biodiversity as a resource in agriculture and rural development'.

The purpose of this report is to explore the current and potential contribution of biodiversity to agriculture and rural development and develop recommendations for how the Rural Development Programme can respond to maximise this potential.

This report explores: the importance and functions of biodiversity; the interaction between farming and biodiversity; biodiversity as a resource in agriculture and rural development; incentive payments to farmers; biodiversity enhancing strategies; the potential in rural tourism; appreciating the natural water resource; challenges to maximise the potential of biodiversity; increasing understanding and awareness; and recommendations for maximising the potential for diversity as a resource in agriculture and rural development.

2. Introduction – Setting the Scene



2.1 The Importance of Biodiversity

Biodiversity is the term that has come to be generally used in the course of the last three decades to refer to the great variety of life on earth: during which time we have become ever more aware of the central role it fulfils in human welfare, and increasingly concerned about the scale and effects of its diminution as a result of human activities. The term refers more familiarly to the number of living species, but also to the diversity of the genetic blueprints of life, and the diversity of ecosystems: it is the variation of life at all levels of biological organisation (Gaston et al., 2004). Critically, it also encompasses the great diversity of crop plants and domesticated animals that have been developed through artificial selection over the last 10,000 years in all regions of the world where agriculture evolved. There is much debate as to how great this variety actually is. Estimates of species numbers range from 2 to 100 million, the vast majority of which are arthropods, followed in terms of numbers by green plants (if we exclude bacteria, whose genetic diversity we are only beginning to appreciate) (Holmes, 2006).

What is clear is that the scale of the reduction in biodiversity today is such that the term Holocene Extinction is not an exaggeration. Species are being lost at a rate between 100 and 100,000 times as fast as they would be naturally, mainly as a result of the loss of natural habitat to make room for the burgeoning human population (Hassan et al., 2006). If the present rate of loss continues, 30% of species will be extinct by 2050; already one-eighth of plant species are in danger of being lost. It has been argued that the present rate of extinction could lead to the loss of all wild species on earth by the end of the century (Wilson, 2002).

Biodiversity underpins or provides a wide range of products and ecosystem services without which human societies cannot function. Most obviously it provides our entire food supply, along with materials we need for construction purposes and medicine. It also provides critical services that are less readily visible, and on this account were for long ignored. The task of taking the cost of the loss of these services or their restoration fully into account has become a major task of environmental economics.

2.2 The Functions of Nature/Biodiversity

Around 40 main functions of nature are recognised, covering a wide range of ecological, social, cultural,

scientific and economic values (Appendix 2). Each function depends on particular environmental characteristics and parameters. It is these parameters which are actually studied, measured and assessed in evaluating the function.

Regulation functions: relate to the capacity of natural and semi-natural ecosystems to regulate essential ecological processes and life support systems that, in turn, contribute to the maintenance of a healthy environment by providing clean air, water and soil. Regulation functions are often latent: because it is only when they are disturbed or removed that actual damage results (through loss of their functions).

Carrier functions: natural and semi-natural ecosystems provide space and a suitable substrate or medium for such human activities as habitation, cultivation, recreation and communication. Carrier functions are usually exclusive. It is estimated that 30% of the earth's land surface has been converted to cropland or pasture.

Production functions: nature provides many resources which range from food and raw materials for industrial use to energy resources and genetic material.

Information functions: natural ecosystems contribute to the development of knowledge and experience; they contribute also to the maintenance of mental health by providing opportunities for reflection, spiritual enrichment, cognitive development and aesthetic experience.

2.3 Calculating the Economic Value of Biodiversity

The capacity of biodiversity to function as a resource lies in the range of functions it serves and the services it provides in human life. These functions and services are reflected in the different kinds of values placed on the natural world: Economic value; Scientific value; Ecological value; Aesthetic value; Biophilic value; Transformative value; Spiritual value; and Intrinsic value.

Farming systems deliver many ecosystem services. It would be better to promote farming systems as delivering a package of ecosystem services: water quality, soil quality and health, carbon storage, landscape and cultural heritage as well as the maintenance of biodiversity. Such a holistic approach is being taken in the implementation of the Water

Framework Directive. Consideration should be given to take a similar approach to the issue of biodiversity in agriculture. When biodiversity is considered as a resource, however, what we usually mean is the financial contribution it makes. The economic value of the goods and services of biodiversity is most easily seen in its productive function, goods that can be sold and used, and which can easily be costed in ordinary economic terms.

The other functions served by biodiversity can less immediately be translated into monetary value. They are taken for granted, public goods with no 'real' economic value because they are out of sight, not traded in the marketplace. It is of course because of this that the natural capital inherent in biodiversity and other natural resources continues to erode. The Millennium Ecosystem Assessment calculated that some 60% of the Earth's ecosystem services have been degraded over the last 50 years, a situation that can only be exacerbated by the expected rise of the human population to 8 billion by 2030, resulting in potentially catastrophic shortages of food, water and energy, and further erosion of biodiversity and the ecosystems upon which it depends (European Commission, 2008).

It is increasingly clear therefore that a monetary value must be calculated (addressed later), so important are these functions to human welfare, in order to ensure they are safeguarded for the common good, and that they are adequately built into the sums when trade-offs are an issue. Such adequate emphasis is difficult to achieve when public goods carry very little weight in the balance against private wealth and private gain, leading to wrong choices in key areas such as long-term food security.

Even when global estimates of monetary value are made, it is not always easy to see how they are to be applied at local or farm level. In due course certainly we may expect to see them reflected in policy and legislation, and implemented through prohibition, incentive and compensation. These developments will have an important determining influence on the capacity of biodiversity to contribute as a resource in agriculture and rural development in the future. Of more immediate concern is the question of what ways biodiversity now contributes, and what the scope to increase that contribution is.

2.4 The Challenge of Mainstreaming Biodiversity

In the nineteen years since the drawing up of the Convention on Biological Diversity (CBD) in 1992 it has become increasingly clear that its objectives of sustaining the earth's biodiversity will not be met until consideration of biodiversity is fully integrated into other sectors. The need to mainstream the conservation and sustainable use of biological resources across all sectors of the national economy, society, and the policy-making framework is a complex challenge at the heart of the convention (World Summit on Sustainable Development, 2002).

As defined at the September 2004 Global Environment Facility (GEF) workshop on biodiversity held at Cape Town, the objective of mainstreaming biodiversity is 'to internalise the goals of biodiversity conservation and the sustainable use of biological resources into economic sectors and development models, policies and programmes, and therefore into all human behaviours' (Huntley et al., 2005). But despite the importance of international and national policies, political and economic, it is only at the farm gate, where the benefits on the lives of real people can be appreciated, that this all-important process of internalising the biodiversity agenda can be effective (Pierce et al., 2002).

At the end of the day the question that matters is: what difference does it make to the personal circumstances of the farmer and his family? Concern for some of the values and functions served by biodiversity impose constraints on the individual by law or agreement, so one complies with them. But without it being something that matters to me why should I care whether those orchids survive on my bit of esker, whereas if it means money in the bank then I am happy enough to look out for them as part of my REPS plan. But really, without that I wouldn't care. Should I care? Why do others care? Could it be that we're missing something? The challenge is to integrate and harmonise the different concerns, where possible in a win/win situation.

A major constraint is the low level of awareness of the meaning and importance of biodiversity among most people: not just in developing economies but in this part of the world as well (Orr, 2002; Balmford et al., 2002). The 'biodiversity community' has failed to get the message across effectively (Cowling, 2005). How much do people in general know about the content/goals of Biodiversity Action Plans? Or how

2. Introduction – Setting the Scene

(Continued)

much real attention to them do the economic or sectoral planners pay? The norms and practices of the economic sector are the prevailing view; those that relate to biodiversity are merely ancillary. 'How can we hope to mainstream biodiversity when most people do not know what biodiversity is or how it affects their lives?' (Cowling, 2002). People have become disconnected from nature (Pyle, 2003). 'The rhythm and run of unrestrained market economics are inherently in conflict with those of ecosystems' (Orr, 2002). 'Can biodiversity concerns really be taken seriously by sectors that operate along such completely different lines' (Cowling, 2005). 'At present, biodiversity is a sidestream, still viewed by most as a luxury' (Orr, 2002). Mainstreaming biodiversity in production landscapes and sectors (as distinct from concentrating on protected areas (PAs)) is a strategic priority under the revised GEF programme. 'While protected areas (PAs) form the cornerstone of conserving wild nature' (Redford et al., 1999; Rodrigues et al., 2004), it is now widely accepted that strict protection alone has no chance of achieving all of the goals and targets required to ensure the persistence of the world's biodiversity (Miller et al., 2002; Rosenzweig, 2003). The burden of conserving biodiversity will increasingly fall on sectors traditionally not associated with it, namely, agriculture, forestry, mining, urban development, and others' (Burbridge et al., 1995; Hutton et al., 2003).

3. The Interaction Between Farming and Biodiversity



Farming began to become part of life in Ireland about 5,500 years ago. For more than three millennia before this people had lived from nature's bounty alone: by fishing and hunting, and gathering wild plants. Small communities were scattered throughout the island of Ireland, and their impact upon the biodiversity around them was probably little more than that of the animals with which they shared the wilderness: certainly not significant enough to be detectable in the pollen record.

The gradual adoption of farming to replace this mesolithic way of life had a profound impact on biodiversity, but it did not lead to decline. Although the dominating theme in Irish history from this time on is the retreat of the wild, this change in direction was not at first characterised by a reduction in natural diversity, but increasingly by a shaping of it. Fields replaced woods, but at first they were fields of opportunity. Fields were won at the expense of the wilderness, of woodland in particular, but for most of the history of farming the new habitats still retained much of the diversity of wild nature. The fields that farming brought to the landscape provided opportunity for very many new species of plants and animals whose occurrence was more restricted before. In response to the spread of farming, birds like swallow, skylark and corncrake multiplied, adapting their ways to meadow, barn and byre. Cowslips, primroses and waxcaps flourished with new profusion in the manmade grasslands; and along the edges of the fields, the marches where farmland met the wildwood, hawthorn responded to the light with new riot of blossom at the entry of each summer, establishing the special place in rural lore which came to be reflected in the special role of the May tree in the custom and practice of Bealtaine, the Celtic celebration of the arrival of summer (Feehan, 1999). People's attitudes to nature in these earlier times were essentially utilitarian; the rest of nature, the rich natural tapestry woven through the slow interaction of nature and culture, which did not figure in the equations of the farm economy, was simply taken for granted. There were plenty of woods, and the bog was an endless, haunted expanse beyond the control of farming.

The rising population of modern times put great strain on biodiversity however, at its peak in the decades before the Great Famine. These decades saw the complete disappearance of woodland outside the great estates (Feehan, 2005), increasing encroachment on fen and bog, and great pressure on wild species used as food or for other purposes. Apart from the obvious threat to bird and mammal populations, the use of plants for dyes and medical purposes must have had an enormous impact, lichens such as crotal must have been pushed to the brink

of extinction. The disappearance of the wolf in the 18th century and of birds such as eagles and bittern a century or so later are emblematic of this decline.

Nevertheless, the effects of agriculture on biological diversity were contained by the restriction to human and animal muscle power for agricultural work, and the very limited application of nutrients on farmland. The progress of the Agricultural Revolution from the early 19th century saw this change gradually (Feehan, 2002), but it was only the general intensification of agriculture that followed Ireland's accession to the EEC in 1973 that saw widespread reduction in rural biodiversity, reflected not in actual extinction of species, but in great decline in distribution and abundance (Feehan, 2003).

3.1 Impact of Changes in Farming on Biodiversity

Biodiversity can be reduced by the nature and/or scale of many of the activities that characterise modern intensive farming. The decline and loss of biodiversity is due primarily to habitat loss. Actual loss or decline of species is generally due to the loss of their habitats. Direct persecution or removal of individual species also takes its toll, but less so.

The main activities responsible for declining biodiversity are:

- Arterial and field drainage. Drainage schemes had funded agricultural improvement in nearly one third of Ireland by 1986 including some Areas of Scientific Interest.
- Commonage division. Between 1982 and 1989, 23,412 ha in 248 commonages were divided. This was usually followed by more intensive management.
- Land reclamation, including removal of small-scale farmland habitats such as trees, hedges and hedgebanks, drystonewalls, remnant woods and scrub. Some 25,000 individual applications for land reclamation were approved between 1981 and 1991.
- The substitution of silage-making for hay-making. Grass grown for silage production requires more fertiliser or slurry than grass grown for hay as the process of ensilage depends more on building up a high leaf mass. Such grass is cut several times and is usually reseeded on a regular basis. The high inputs used favour the sown grasses at the expense of most of the traditional herbs and less competitive grasses. The amount of silage went up from 0.3 million tonnes in 1960 to 20 million in 1990, the wet summers of the 1980s boosting the change. The move to silage was probably a major factor in the decline of the corncrake. Other factors were the conversion of hay meadows to closely-grazed sheep pastures encouraged by the

3. The Interaction Between Farming and Biodiversity (Continued)

introduction of the ewe premium in 1980, and possibly the early grazing of grassland which is subsequently closed off for silage production.

- The abandonment of small-scale rotational cropping, leading to the disappearance of many arable weeds.
- Increasing herd numbers and overgrazing of marginal grasslands and heaths, especially of western blanket bog. High stocking rates were a direct outcome of the sheepmeat regime and the LFA headage payments. The national flock grew by 270% between 1980 (when the ewe premium was introduced) and 1992. Overgrazing of uplands also seriously affected populations of red grouse, dunlin, golden plover and hen harrier.
- Increasing use of fertilisers, increased stocking densities and increased nutrient inputs through supplementary feeding. Increased nutrient inputs result in the decline of the competitiveness of species that are not adapted to the high nutrient conditions of modern intensive agriculture. Fertiliser application leads to increased yield and percentage cover of most grasses, as well as of white clover, composites and certain agricultural weeds, but most non-weed herbs decline in yield, variety and percentage cover. It also impacts on water bodies. The effect is perhaps most obvious in those which are naturally oligotrophic or dystrophic (it led for example to the collapse of the arctic char populations in Lough Conn and Lough Corrib in the early 1980s). Another major source of increased nutrient input comes from the dramatic increase in the production of compound feeds in concert with the increases in livestock numbers and increased fertiliser input.
- Increasing use of pesticides and veterinary chemicals: leading to a dramatic decline of arable weeds and the animals that depend on them.
- Declining water quality: whether from point source pollution (farmyard run-off, silage run-off, slurry tanks, pesticide spills) or diffuse sources (nitrate and phosphate leaching and run-off). This can lead to contamination of drinking water sources, especially in arable areas. The quality of group water schemes in rural areas lags behind that of public water supplies and remains a cause for concern. Because it can take 20-30 years for pollutants to reach groundwater, the full impact may take years to express itself.

Most of these practices were triggered by EU membership (farm support schemes, special aid schemes etc.), and most of them have been curtailed by CAP reform, which has as one of its five main objectives protection of the countryside, and development of its natural potential.

The growing realisation of the damaging environmental effects of the intensification of agriculture unintended, and indeed often unforeseen resulted in the UN Conference on Environment and Development at Rio de Janeiro in 1992. Since then legal and incentive instruments at international, EU, national and local levels have been at work attempting to staunch the loss of biological diversity and restore where possible something of what has been lost.

4. Biodiversity as a Resource in Agriculture and Rural Development

Land devoted to agricultural production currently accounts for approximately 45% of the land area of the EU and 62% of the Republic of Ireland (Henle, 2008; DAFF, 2008). It is estimated that during the period 1970-2000 the species diversity associated with European farmland had decreased by 23% (Heer et al., 2005). This can be attributed in large measure to the intensification of agricultural practices and simplification and homogenisation of the farmed landscape promoted under the Common Agricultural Policy (CAP) (Purvis et al., 2009; Stoate et al., 2002; Wilson et al., 1999). Estimates of land cover change indicate that Ireland has not avoided this international trend, with an increase of 35% in the CORINE landcover class 'arable land,' which includes land used for silage production and 31% and 23% increases in the land under artificial surfaces and afforested land respectively during the period 1990 and 2000. These increases have primarily been at the expense of land area under permanent pasture, mixed farmland and wetland habitats (EPA, 2007). Estimates of field boundary removal from 36 farms within SE Ireland indicate that this may on average be in the region of 1.22 km per farm (Purvis et al., 2009). Data for Northern Ireland suggest increases of 33% and 12% in the area of improved grassland and coniferous forestry respectively over the period. This has largely been at the expense of habitats such as fen/marsh/swamp, bog and calcareous grasslands that have suffered decreases of 19.8% and 7% respectively between the period 1987 and 1998 (Cooper et al., 2003). More recently, land abandonment and its subsequent impacts on biodiversity are becoming an increasing cause of concern (Henle et al., 2008).

The increasing concern relating to loss of biodiversity is now reflected in a growing body of legislation, which aims to at least maintain, if not enhance existing levels of biodiversity. These include: the Convention on Biological Diversity (1992); the European Commission Biodiversity Action Plan for Agriculture (COM (2001) 162 vol. III); the Birds Directive (74/409/EEC); Wildlife Act (1976, 2000); Habitats Directive (92/43/EEC); Agri-Environmental Regulation, Council Regulation No. (EEC 2078/92); Article 16, Regulation (EC) No. 746/96, among others.

These have largely been welcome developments. However the legislation governing protection of biodiversity on farmland often appears to have been developed with little input from the individuals who are ultimately responsible for its implementation, i.e.

farmers. As a result, farmers often feel disenfranchised in terms of the implementation of management decisions for their holdings and as a result can be resentful towards the imposition of this legislation. They often feel that protection of biodiversity will result in a loss of competitiveness and productivity, rather than seeing it as a resource that is central to the sustainable and long-term competitiveness and productivity of agricultural systems.

4.1 The Economic Value of Ecosystem Services: Introduction

Calculation of the economic value of ecosystem services has been a central theme in environmental economics in recent years. The European Commission initiated a major study on the economics of biodiversity loss on a global scale in 2007. This Economics of Ecosystems and Biodiversity study (TEEB) published its interim report in May 2008 (UNEP, 2008). The TEEB report calculates that ecosystems deliver essential services worth between \$21 trillion and up to \$72 trillion a year, comparable to World Gross National Income in 2008 of \$58 trillion. Wetlands half of which have been drained over the past century, often for agriculture provide annual services of almost \$7 trillion and forested wetlands treat more wastewater per unit of energy and have up to 22 fold higher cost-benefit ratios than traditional sand filtration in treatment plants. Pollination from bees and other insects provides services boosting agricultural production worth at least \$153 billion annually. The report provided strong evidence of the economic costs due to the loss of ecosystem services and functions, on which it put a tentative price tag of \$50 billion a year globally (UNEP, 2008).

The second phase of the study is now under way and the findings will be presented in four reports, the first of these was published in December 2009. This first report claims that 'investing in nature pays off': *Well-targeted investment in natural capital supports a wide range of economic sectors and maintains and expands our options for economic prosperity, and sustainable development. Such investments can be a cost-effective response to the climate change crisis, offer value for money, support local economies, create jobs and maintain ecosystem services for the long term* (NRN, 2010).

The report also points out that 'each economy relies on nature in a different way and each country starts with a different set of policies already in place. However, in



4. Biodiversity as a Resource in Agriculture and Rural Development (Continued)

all cases, the policy response should not be limited to environmental policy-making processes but should also come from other sectoral policies.'

In addition to the intrinsic and cultural values associated with biodiversity it has a functional value in that it is the foundation from which all domesticated plants and animals have been developed and exploited, and from which we obtain food, fuel, fibre etc. and income. It is now widely recognised that this functional role also includes the provision of a wide range of supporting and regulating ecological services. These services include such things as: pollination, recycling of nutrients, regulation of hydrological processes, control of local microclimate, detoxification of noxious substances, storage of carbon, prevention of soil erosion and maintenance of soil structure (Giller et al., 2002; Altieri, 2009). Such ecological services are now believed to be central to sustainable agroecosystems (Smeding et al., 1999).

Bullock et al. (2008) estimate that in Ireland alone, their value in terms of contribution of productive outputs and human utility is approximately 2.6 billion per annum. However, modern agricultural systems tend to overlook the importance of such ecological services. High levels of external inputs and landscape simplification, which often define this method of farming, can lead to the disruption and/or destruction of these fundamental services.

4.2 Pollination Services of Biodiversity

It is estimated that honey bees, bumble bees, solitary bees, wasps, hover flies and other flies, beetles, thrips and birds are responsible for pollination in 84% of 264 crops grown within the EU (Williams, 1994; Klein et al., 2007). The global value of the service undertaken by pollinating animals has been estimated to be 65-75 billion per annum (Petersen et al., 2005). Of the invertebrate pollinators, the activities of the European honeybee are probably best understood, and it is thought to be the pollinator that contributes most to crop pollination (Williams, 2002; Williams, 1994).

Wild bee decline in the UK is attributed to loss of natural and seminatural habitat and degradation (UK National Ecosystem Assessment). Climate change is also likely to result in a decline in pollinator species richness. Of great concern at the moment is the widespread and increasing occurrence of diseases that cause serious decline in honeybee populations. With regard to other

groups of pollinating invertebrates, recent research by Purvis et al. (2009) has shown that while bumblebees are still widespread within Irish farmland, they are present in low density with little species richness. Purvis et al. (2009) also identified the potential importance of solitary bees as pollinators, indicating that they may be the most abundant bee pollinators within Ireland. However, up to 33% of the solitary bee fauna of Ireland is considered threatened.

In terms of the monetary value attached to pollinating animals (vertebrates and invertebrates) Costanza et al. (1997) estimated this to be in the region of US\$112 billion per annum, while within the EU the value attached to wild and domesticated bees has been €9 billion annually. Within Ireland alone, the monetary value associated with pollinators is estimated to be in the region of €85 million per annum (Pimentel et al., 1997). The importance of pollinators in pollinating crops imported into Ireland should not be forgotten either: it is not just Ireland's environmental services that are involved in our diet.

Wildflowers are often pollinator-limited and have declined more than self-or wind-pollinated plants (UK National Ecosystem Assessment; Ricketts et al., 2008). Wildflowers (generally showier if animal-pollinated than if wind-pollinated) can be a significant contributor to 'cultural services' as well, but this value is hard to compute. Pollinator diversity is related to greater crop yield, resilience and stability (UK National Ecosystem Assessment; Hoehn et al., 2010; Winfree et al., 2009). Decreased pollinator communities result in reduced crop yield and/or quality. Loss of pollinators can of course lead to loss of plant species and species diversity. Ecologically crucial wild plants can also be lost from food webs if their pollinators are lost (UK National Ecosystem Assessment; Ricketts et al., 2008). Insect pollinators are also important for the pollination of such forage crops as clover, for crops in allotments and gardens, in agricultural seed production and the production of ornamental flowers.

There are thought to be around some 900 beekeepers (mainly small scale) in Northern Ireland who maintain about 4,000 colonies of honeybees. Northern Ireland produces about 30 tonnes of honey per year (non-commercial). For hobbyist beekeepers the revenue per hive is around £45. The total revenue earned by Northern Ireland beekeepers from honey, hive products and pollination fees is estimated at around £220,000. Soft fruits, oilseed rape, tomatoes, clover and beans

Table 1: Crop Pollination Services Provided by Bees (Northern Ireland)

| Crop | Dependency on Insect Pollination | Market Value of Crop (5 yr Ave.) | Market Value of Insect Pollination (5 yr Ave.) £ |
|--|----------------------------------|----------------------------------|--|
| Apples | 0.9 | 7,820,000 | 7,038,000 |
| Strawberries | 0.1 | 329,000 | 33,000 |
| Beans and other proteins | 0.2 (avr) | 134,000 | 26,800 |
| Oilseed Rape | 0.1 | 222,000 | 22,175 |
| Raspberries | 0.1 | 139,000 | 13,900 |
| Currants | 0.9 | 3,000 | 2,700 |
| Other Soft Fruit | 0.1 | 21,000 | 2,125 |
| Total | | | 7,138,700 |
| Proportion of insect pollination due to honeybees | | | 0.8 |
| Total value of honeybee crop pollination in NI | | | 5,710,960 |

all benefit from bee pollination. Given the value of these crops and their requirement for insect pollination, the crop pollination services provided by bees in Northern Ireland are estimated to be worth £6 million to agricultural production (Agri-Food & Biosciences Institute, 2009).

4.3 The Economic Value of Soil Biodiversity

Soils capture and release carbon, nutrients and water. They detoxify pollutants, purify water, and suppress soil-dwelling pests and pathogens. The capacity to do this is determined by chemical, physical and biological properties and their interaction. Soils differ in their abilities to deliver the various benefits.

Soil biodiversity is of fundamental importance because its involvement in processes such as nutrient cycling, soil formation, development and maintenance of soil structure, regulation of soil-borne plant and animal pests, nitrogen fixation, carbon storage, bioremediation is fundamental to agricultural sustainability (Brussard et al., 2007; Altieri, 2009; Pimentel et al., 1997). According to Pimentel et al. (1995) a square metre of soil may contain populations of 200,000 arthropods and enchytraeids together with billions of microbes. One hectare of 'high quality' soil may contain a biomass comprising 1,300kg of earthworms, 1000kg arthropods and 4000 kg of fungi (Pimentel et al., 1992). As is the case for most other aspects of biodiversity, the primary

threat to soil biodiversity appears to arise from activities associated with intensive agricultural production, e.g. fertiliser and pesticide applications, and soil disturbance associated with ploughing etc.

Costanza et al. (1997) estimate a worldwide value of US \$17 billion for the ecological services facilitated through soil biodiversity. In terms of earthworm activity in Ireland alone, Bullock (Bullock et al., 2008 and in Renou Wilson et al.) estimates that they contribute up to €723 million per annum in terms of their value to livestock production systems.

The extent of the soil carbon store in Irish peatlands has only recently been investigated, and this recent work shows that earlier attempts have greatly underestimated the size of the peat carbon stock in Ireland (Renou Wilson et al.). Tomlinson (2005) estimated that Irish peatlands had a carbon stock of 1071 Mt C in 2000, whereas Eaton et al. (2007) estimated it to be almost 50% higher, at 1503 Mt. These two estimates amount to 53% and 62% respectively of the total soil organic carbon stock present in Ireland.

The most recent research has improved the accuracy of several critical parameters, and calculates the national blanket bog carbon stock to be around 1073 Mt C. When Tomlinson's figure for basin peat SOC is added to the new blanket bog SOC figure, the total peat soil carbon stock is estimated to be 1566 Mt C.

4. Biodiversity as A Resource in Agriculture and Rural Development

(Continued)

Without a doubt, Irish peatlands are a huge carbon store, containing more than 75% of all the soil organic carbon in Ireland. Peatlands should therefore be carefully managed, as the size and functioning as well as disturbance of any large carbon pool is of importance to future climate change.

4.4 Savings Made Because of Biodiversity ('Hidden' Economic Benefits of Biodiversity)

Other ecosystem functions biodiversity delivers in Ireland include:

- The prevention of flooding. There is a growing awareness and concern, especially in towns, of the money that would be saved if floodplains were not built on, and this concern will increase over time.
- Sustainable Drainage Systems (SUDS).
- Hedges and ditches helping to prevent flooding, minimising spread of disease and stopping run off of nutrients etc. The flooding of recent winters has highlighted the danger of areas and has resulted in increased flooding off higher land in areas where hedgerows have been taken out.
- The potential contribution of natural water purification systems ('treatment wetlands' such as reedbeds) is being recognised. There is an increasing recognition that this is not only cheaper, but more effective and easier to manage than the chemical solutions on which we have traditionally relied. The role of water lice and crayfish in water purification was recently highlighted in a report by Cliona O'Brien for the Heritage Council (2010).
- Although this is hard to quantify, the 'healthy communities' concept of exercise in biodiversity areas promoting health and well being is being recognised more.
- The hidden economic benefits of species-diverse grasslands are of major importance in Ireland.
- The role of bogs and other mires in carbon sequestration is a major global issue (Farrell et al., 2008). Ireland has its small, but highly significant part to play here (Renou-Wilson et al.).

5. The Contribution of Biodiversity to Farming and Costs: Incentive Payments



Biodiversity makes its main financial contribution to Irish agriculture and rural development in two kinds of ways: through incentive payments made to the farmer for managing land in ways that promote biodiversity; and by means of production strategies that target markets that exercise a preference for goods produced in ways that are understood to benefit biodiversity under a system of farming that is more extensive or sustainable.

5.1 Agri-Environment Schemes

The main Agri-Environment schemes include REPS, AEOS, Burren Farming for Conservation Scheme Programme and the National Parks and Wildlife Service Farm Plan Scheme.

5.1.1 REPS 1 and 2

Since 1994, it has been compulsory for each member state to have an agri-environment scheme. The schemes in the Republic of Ireland are the Rural Environment Protection Scheme (REPS) and Agri-Environment Options Scheme (AEOS). These are the primary mechanisms through which farmers are financially rewarded for farming in an environmentally friendly manner, maintaining and protecting biodiversity within the farmed landscape.

Irish agri-environment schemes evolved over the years from REPS 1, 2, 3 and 4; to the Agri-Environment Options Scheme introduced in 2010. REPS was first introduced in 1994 and has gone through a number of revisions, with each one increasing the emphasis on pro-active measures by which farmers protect and improve the environment. REPS is co-financed by the EU and by the Irish Exchequer: originally 75% by the EU, but less in recent years.

REPS is a scheme designed to reward farmers for carrying out their farming activities in an environmentally friendly manner and to bring about environmental improvement on existing farms. Further information on REPS and AEOS is presented in Appendix 3.

Between 1994 and 1999, 45,500 farmers participated in REPS 1. Approximately 33% of the utilisable agricultural area was being farmed under REPS guidelines. In November 2000, REPS 2 was introduced, with 24,576 participating in REPS 2 in June 2005.

REPS 1 and 2 were about the maintenance of biodiversity, holding on to what we have, putting

up barriers to pollution and preventing further loss of biodiversity. Over the ten years however this has gradually come to be regarded as no more than what we have a right to expect, it is now simply seen as what society wants from good farming practice, and most of what we have been about in REPS can be regarded as little more than this. The EU has now adopted the more demanding twin targets of halting the loss of biodiversity which means preventing any further habitat loss by 2010 and of restoring all waters to satisfactory status by 2015 under the Water Framework Directive. The EU Sixth Environment Action Programme specifies as one of its objectives the protection and where necessary restoration of 'the structure and functioning of natural systems' and halting the loss of biodiversity both in the European Union and on a global scale by 2010. That has implications for all sectors of society and of course most profoundly has implications for farming and rural land management in general. REPS 3 and REPS 4 seek to enhance rather than simply maintain biodiversity at its current levels through habitat restoration, enhancement and establishment.

5.1.2 REPS 3 and 4

In June 2004, REPS 3 was introduced. This scheme allowed farmers to choose from a range of additional undertakings, with an emphasis on biodiversity and the enhancement of the environment that allowed them to benefit from higher payment rates. On average farmers got 28% more in payments under REPS 3 than under the previous scheme. For example a farmer with a holding of 55 hectares received €8,550 per annum compared to €6,040. For the first time, REPS land areas in excess of 55 hectares also qualified for payment. Up to 2004 the REPS approach has been to conserve what was there in the natural and built environment. REPS 3 kept that but added a much more pro-active environmental element. As well as keeping what is there already, REPS 3 farmers will be adding to it and replacing something of what may have been lost in the past.

When REPS 3 closed to new entrants in December 2006 there were over 59,000 farmers taking part. In August 2007, REPS 4 was launched. This current version encourages farmers to enhance the environment through a range of actions including reduced use of fertilisers and pesticides contributing to lower greenhouse gas emissions as well as improved water quality. The scheme also assists in maintaining existing hedgerows and planting new ones, growing crops to provide food for wild birds and preserving traditional

5. The Contribution of Biodiversity to Farming and Costs: Incentive Payments (Continued)



breeds of animals. The remit of REPS 4 was extended to include intensive farmers.

In line with the social partnership agreement (Towards 2016, Dept of an Taoiseach, 2006), all payment rates, including those for Natura 2000 designated land, were increased by 17% compared to REPS 3. However, this increase was reversed in April 2009 with the significant deterioration in public finances.

A record 17,000 applications were received for the 2009 scheme, which closed in mid-May 2009. The 2009 scheme also represents the highest-ever spending on REPS, bringing REPS spending of over 3 billion to tens of thousands of Irish farmers. Existing REPS 3 and 4 participants remain in REPS until the end of their existing contracts. Farmers will continue to be involved in REPS until 2015. On 9 July 2009, because of the budgetary situation and the increase from 46,694 to approx. 62,000 in the number of REPS participants, REPS 4 was closed to new applicants, as well as those completing their current five-year REPS contracts.

5.1.3 Agri-Environment Options Scheme (AEOS)

In March 2010, a new agri-environment options scheme (AEOS) was launched, and was open for applications until 17th May. Funding for the AEOS comes from modulated funds (negotiated as part of the CAP Health Check), topped up significantly by Exchequer funding. It is mandatory that the modulated funds are spent on the so-called 'new challenges', including biodiversity, water management and climate change. A total of €50 million had been made available for the Scheme, with a maximum payment of €5,000 for up to 10,000 participants. Funding is available at the rate of €5,000 per farm per year for applicants, who join for five years. AEOS is open to farmers not involved in REPS and the National Parks and Wildlife Farm Plan Scheme (Tomlinson, 2010).

AEOS differs from REPS in that farmers can choose any number of extra actions (above the minimum of two required) and any extent of any action. The whole farm is not involved. Actions are chosen for specific areas. Some actions involve capital investment. Receipts must be provided in support of claims for payment. Farmers can claim approximately 50% of the capital investment for their own labour.

Apart from normal cross-compliance standards, there are no further requirements on the remainder

of the farm. Only participants with Natura or non-Natura commonage will have to follow a 'Sustainable Management Plan'. Priority entry will be given to farms with NATURA land or non-NATURA commonage. A Sustainable Management Plan must be drawn up by a planner for such farms. Farmers claiming the payment of €75 per ha on 67 ha will receive the full payment of €5,000. Farmers with less than 67 ha of NATURA land or non-NATURA commonage can avail of extra actions to increase payments to the maximum of €5,000. (The AEOS scheme for 2011 was announced by the Minister for Agriculture, Food and the Marine on 6th April 2011).

5.1.4 Burren Farming for Conservation Programme

The BurrenLife Project (BLP 2005-2010) was the first example of a major farming for conservation project in Ireland. This project recognised the importance of farming in terms of its role in shaping and maintaining many of the designated habitats of the Burren, e.g. limestone pavements, limestone heaths, orchid-rich grasslands, turloughs, semi-natural dry calcareous grasslands, lowland species-rich dry grasslands and lowland hay meadows and the wider Burren landscape. During its lifetime, the project team, together with interested stakeholders in the Irish Farmers Association (IFA), Teagasc, National Parks and Wildlife Service (NPWS) and the farming community, developed a model for sustainable agriculture within the Burren, i.e. a model of agriculture which focuses on habitat restoration and conservation and also the economic viability of such a system (DAFF, 2010). The key principles of Farming for Conservation arising from the BurrenLIFE are presented in Appendix 3.

The Burren Farming for Conservation Programme (BFCP) is in the first year of a three-year programme, with €1m each year for Burren farmers. It is funded by the Department of Agriculture, Fisheries and Food and the Department of Environment, Heritage and Local Government. The BFCP was developed taking account of the lessons learned from the BurrenLife project. A basic payment is made on the extent of designated SAC habitat on the farm. A further payment is made for enhancement work such as scrub clearance, the provision of water or stone wall maintenance. A third measure is a bonus payment for the production of species-diverse grassland. For example, farmers can receive €100 per hectare for the first forty hectares, based on the quality of the species-diverse grassland. This is the first agri-environment scheme in Ireland in which payment is based on results.

The BFCP is based on research findings from the Burren LIFE Project, in which twenty farms were involved. Up to 120 farmers have been offered places in the BFCP. Once a farmer enters the BFCP, a detailed plan is completed by one of the fifteen trained BFCP advisors. Fifty-four plans have been submitted to the BFCP office. The average payment is €6,200. This will increase as farmers complete their REPS plan, which pays for the same measure. Farmers may undertake further enhancement work next year, having more time to plan for and carry out the work in summer 2011.

Farmers who are new to the scheme are anxious about not being allowed to feed silage to sucklers on the winterages, where only meal can be fed. Farmers who are not in the scheme are anxious to know when the scheme will be extended to allow more farmers to participate. As the current BFCP covers 13,500 hectares – half of the SAC or Annex 1 habitat land in the Burren – it is a very cost-effective method of supporting Best Practice management of farmland in the Burren, which is seen as Ireland's agri-environmental 'jewel in the crown'.

5.1.5 The National Parks and Wildlife Service (NPWS) Farm Plan Scheme

The NPWS Scheme operates as an alternative to the Department of Agriculture, Fisheries and Food agri-environment schemes. Participating farmers enter a 5-year contract and are paid for actions favouring biodiversity in Natura 2000 sites, Natural Heritage Areas and commonages. The NPWS Farm Plan Scheme commenced in 2006 and was made available to those farmers whose holding was entirely or partially designated as an NHA, SAC, SPA or commonage; to date 622 farm plans have been approved, with an annual budget of €5 million. The scheme has been solely funded by the national exchequer. Although the objective of the Scheme was not to provide additional income, it did compensate these farmers for any costs, works or loss of revenue experienced through the management of target lands. Examples of this include compensatory payments for destocking of animals, additional costs incurred through the required housing of animals over winter months, costs associated with scrub removal from target habitats, compensation for loss of agricultural forage caused by target species. Payments per farm vary according to the specific circumstances on each individual holding e.g. destocking of 76 ewes would generate a payment of €2,100/yr while overwinter housing of an additional five cows would generate a payment of €1,000/yr, with payments received on an annual basis (NPWS, 2010). However, due to the budgetary constraints the Farm Plan Scheme was curtailed in April 2010 and the

budget allocation for 2011 (if any) is not yet known. New applicants to the scheme will be accepted in a given year based on available funding for those plans which offer best value for money.

5.2 Other Schemes Impacting on Biodiversity

Other schemes also impact on biodiversity, including: Single Payment Scheme; Disadvantaged Area Scheme; Afforestation Grant and Premium Scheme; Forest Environment Protection Scheme; Native Woodland Scheme; Organic Farming Scheme; and Targeted Agricultural Modernisation Scheme.

5.2.1 The Single Payment Scheme

While the EU Council of Ministers still endorses direct payments being made to European Farmers under the Common Agricultural Policy, it also recognises that farmers have a very important role to play in the provision of public goods and services through protection of the environment. The Single Payment Scheme (Single Farm Payment) was introduced in 2005 to replace the Livestock and/or Arable Aid premia. It differs from previous direct payments made to EU farmers in that it has been decoupled from production and recipients are subject to the requirements of Cross Compliance, meaning that farmers in receipt of these payments must comply with basic standards relating to environmental protection, animal health and welfare and plant protection (DAF, 2005). While farmers are not paid directly to comply with the legislation, they may suffer a reduction in their SFP if they do not farm in accordance with the requirements of cross compliance. Cross Compliance is composed to two elements:

- 1) Statutory Management Requirements (SMRs) (Directives and Regulations); and
- 2) Good Agricultural and Environmental Condition (GAEC).

There are now 19 SMRs, many of which relate to issues such as animal welfare, disease control and traceability, hormone and pesticide usage, food hygiene, use of sludge, nitrates and the protection of groundwater etc. However, two relate directly to the protection and conservation of biodiversity:

SMR 1 Conservation of wild birds. This outlines what is required of farmers operating within a Special Protection Area (SPA), or outside of an SPA, in order to comply with the Birds Directive 79/409/EEC, 2009/147/EC.

SMR 5 Conservation of natural habitats and of wild flora and fauna. This outlines the requirements on farmers of the Habitats Directive 92/43/EEC (DAF, 2005).

5. The Contribution of Biodiversity to Farming and Costs: Incentive Payments (Continued)



Only GAEC Measure 6 deals directly with the protection and conservation of biodiversity on farmland:

- 'Designated NHAs, SACs, SPAs and other habitats protected under EU or National legislation must not be damaged'.
- 'Vegetation growing on land not cultivated or vegetation growing in any hedge or ditch must not be burned between the dates of 1 March to 31 August in any year'.

However, many of the other requirements of GAEC are likely to have indirect benefits for biodiversity, e.g. prevention of soil erosion, maintenance of soil organic matter and soil structure, minimum level of maintenance to keep land in a state that permits continued agricultural production through appropriate stocking rates and avoidance of encroachment of unwanted vegetation (invasive and noxious species). In addition, recent changes to GAEC requirements have resulted in the recognition of hedgerows, ditches and open drains as 'landscape features' which must be maintained and cannot be removed (DAFF, 2009; Copland, 2010).

SPS is open to all farmers who have an active herd number. The total payments to farmers through the SPS amounted to €1,300 million during 2008 (DAFF, 2009). Individual payments vary according to farmer entitlements from the national reserve, which are calculated based on a reference year. On average, SPS payments in 2009 amounted to €289/ha (top third €367/ha and bottom third €257/ha) (Connolly, 2010).

The CAP is currently at a crossroads. Of a current EU CAP budget of approximately €53bn, over €40bn are spent on 'Pillar 1' income payments that have little connection with biodiversity. Meanwhile, the EU is failing to achieve environmental aims that are intimately tied up with farming and the use of rural land, such as the target to halt biodiversity decline by 2010. A key action for achieving this target is the maintenance of 'High Nature Value' farming, which supports a high level of biodiversity.

5.2.2 Disadvantaged Area Scheme (DAS)

Payments under DAS amount to €220 million to 102,000 farmers per annum. In order to prevent the abandonment of land there is a minimum stocking level requirement of 0.15 Livestock Units per forage hectare, except where a REPS plan or a Commonage Framework Plan or any other requirement specifies a lower level of stocking. DAS provides payment as follows, up to an overall payment ceiling of 34 hectares:

- Less Severely Handicapped Lowland and Coastal Areas with Specific Handicaps: €82.27 per forage hectare;
- More Severely Handicapped Lowland: €95.99 per forage hectare; and
- Mountain Type Grazing: €109.71 on the first ten forage hectares or part thereof and €95.99 on the remaining forage hectares.

5.2.3 The Afforestation Grant and Premium Scheme

These schemes were introduced in recognition of the benefits of woodland/forestry habitats in terms of biodiversity, provision of ecosystem services (e.g. carbon sequestration, clean air), and in response to the situation where Ireland has one of the lowest areas of forest throughout Europe.

The Afforestation Scheme was introduced in 2007 and provides grants for the planting and establishment of new afforestation projects, with annual premiums for up to 20 years to farmers and 15 years to non-farmers. The objectives of the Scheme are:

- 1) To increase the area under forest in Ireland to contribute towards climate change mitigation;
- 2) To produce a commercial crop of timber;
- 3) To provide a sustainable source of wood biomass for energy purposes;
- 4) To provide a sustainable basis for development of the rural economy;
- 5) To increase the area of purpose-designed recreational and amenity forests;
- 6) To improve water quality through riparian planting; and
- 7) To increase overall biodiversity by providing woodland habitat which is under-represented in the complex of habitat types.

A full list of acceptable tree species for planting within this Scheme is presented in the relevant schedules (DAFF, 2011). Species grown in various predefined combinations form the grant/premium categories which determine the level of payment landowners will receive (DAFF, 2007).

While the primary emphasis of this Scheme is the production of a commercial crop which reaches the required yield class, requirements provide a number of opportunities for biodiversity enhancement e.g. all plantations on improved/enclosed lands must contain a minimum of 10% broadbanded species and approximately 15% of the plantation area must qualify as an 'Area

of Biodiversity Enhancement' (ABE) (DAFF, 2007). Some examples include: open spaces for biodiversity; hedgerows; and scrub (DAFF, 2007).

5.2.4 Forest Environment Protection Scheme (FEPS)

The Forest Environment Protection Scheme (FEPS) was introduced to encourage farmers participating within the REPS to establish woodlands on their farms. It differs from the Afforestation Scheme in that there is an increased emphasis on the maximum delivery of benefits for biodiversity and the wider environment. Its stated objectives are:

- 1) To encourage farmers to establish and maintain high nature-value forestry through measures such as increasing biodiversity and protecting water quality;
- 2) To support, establish or provide habitat for wildlife;
- 3) To encourage the provision of protective forestry, for example riparian planting;
- 4) To produce a commercial crop of timber while making an enhanced contribution to the environment; and
- 5) To increase Ireland's woodland cover to contribute positively towards climate change mitigation.

Participants are required to undertake a number of mandatory measures (details of which are provided within DAFF, 2008). However, a number of these are particularly important in terms of the conservation and enhancement of biodiversity, including retention of 18-20% of the plantation area as 'Area of Biodiversity Enhancement'; planting of pure plots of Sitka spruce or lodgepole pine is not allowed, nor is aerial fertilisation; only sites which are likely to require a maximum of one fertiliser application are allowable within the Scheme. In addition the Scheme requires participants to undertake a further six of the 20 optional measures. Some of which are of particular importance in terms of the protection and enhancement of biodiversity include: creation of new habitats such as ponds, or extending existing ponds or wet areas; provision of deadwood for invertebrates; creation of wildlife corridors between habitats and augmenting wildlife food supplies through the planting of berry-producing species. Participants are also required to retain an extensive list of habitats, one or more of which may occur on their farm (see DAFF, 2008).

While the increased emphasis on biodiversity is welcome, a likely negative impact of forestry on biodiversity is that it is most likely to replace marginal land of high nature value.

In terms of the monetary reward for participating within

the FEPS, farmers receive the same establishment grant rates as those available within the Afforestation Scheme. FEPS farmers also receive an annual Afforestation Premium payable for 20 years. In addition, FEPS farmers are eligible for a FEPS Premium payable annually for five years. This varies from €150/ha to €200/ha depending on the size of farm and the area planted e.g. on a farm ≤ 30 ha in size a participant has to plant a minimum of 5 ha up to a maximum of 8 ha and the premium on this is €150/ha. In total €73.8 million was paid to farmers through forestation premia during 2008, while grants for planting and related works amounted to an additional €43.2 million in the same year (DAFF, 2009a).

5.2.5 Native Woodland Scheme

The Native Woodland Scheme (NWS) was first introduced in 2001 but has evolved over time under the National Development Plan. It is implemented by the Forest Service of the DAFF, NPWS, Coillte, Regional Fisheries Boards, the Heritage Council, COFORD and others. The Scheme was introduced in recognition of the situation that native woodlands form a key aspect of Irish biodiversity, culture and heritage, and in order to allow these habitats generate a sustainable measure of income for their owners. The principal aim of the scheme is the protection, expansion and appropriate management of Ireland's native woodlands, taking factors such as appropriate woodland type (based on soil, altitude etc), native species stock, seed provenance etc. into account (DAFF, 2008a).

Applications by landowners and subsequent payments through the NWS consist of two elements:

- 1) 'Conservation provides funding for the protection and enhancement of existing native woodland, and (where appropriate) the conversion of non-native forest to native woodland'. This element includes a conservation grant and premium. Examples of the types of works for which payments are made include: Preparation of NWS plan; Purchase of suitable planting stock; Ground preparation; Clearance of invasive species; Tree felling; Woodland rejuvenation, e.g. planting; Maintenance; Woodland edge management; Maintenance of open spaces; Respacing; Coppice restoration; Other agreed operations.

The maximum payment to a landowner under this element of the Scheme is €5,000/ha, with approximately 75% in the first instalment and the balance paid four years after completion of the works. Private landowners may also be eligible for an annual Conservation Premium of €350/ha for seven years, subject to continued compliance with their NWS plan requirements.

5. The Contribution of Biodiversity to Farming and Costs: Incentive Payments (Continued)



2) *Establishment provides funding for the establishment of new native woodland on open sites, through planting and/or natural regeneration*. This is payable on lands which have not been under forest cover in recent years. This element includes an establishment grant and premium (and possibly an additional payment under the Forestry Environment Protection Scheme (FEPS)). Examples of the operations eligible for payment under this element are similar to those listed above. The total grant available for this is €6,470.07/ha, payable in two instalments.

5.2.6 Organic Farming Scheme

This scheme, administered by the Department of Agriculture, Fisheries and Food, was introduced in 2010. Its primary objective is *'to deliver enhanced environmental and animal welfare benefits and to encourage producers to respond to the market demand for organically produced food'*. Though not stated as a specific aim, it can be assumed that the implementation of organic farming methods would be beneficial for biodiversity. Participation within the scheme is voluntary, open to all farmers to include all or part of their holding (subject to different species and/or varieties being used in the organic and conventional sections of the farm), for a period of five years. Among the requirements for participation are that all participants farm in accordance with Council Regulation (EC) No 834/07 (Amended), submit an application for the SPS, develop a business plan for the farm and farm a minimum of three hectares except where the application is for horticultural production where the minimum is one hectare. Full terms and conditions for the Scheme are available from (DAFF, 2010a).

Organic farming and producer certification more generally are often considered to be one of the most important ways in which biodiversity makes a direct economic contribution to rural livelihoods. Worldwide over 2,500 products are produced organically. Italy has the largest number of organic holdings in the EU (44,000; 31% of the EU total in 2003), followed by Austria with 19,000, Spain and Germany with about 17,000 holdings each. Five others have a share of organic holdings in total holdings above 3%: Austria 9.5%, Denmark 7.2%, Finland 6.6%, Germany 4.0%, and Sweden 3.8%.

5.2.7 Targeted Agricultural Modernisation Scheme (TAMS)

The objective of the TAMS is to provide an incentive to

sheep farmers to remain in the sector, and to maintain their existing sheep numbers or halt further decline in ewe numbers. This will be achieved by assisting sheep farmers in reducing their labour input with support for sheep fencing and mobile handling facilities. The grant rate is 40% on approved and eligible expenditure. The maximum grant payable under the scheme is €4,000 per farm.

5.3 Biodiversity Policy

In terms of biodiversity policy, it is worth exploring the past experience and also the experience of Northern Ireland.

5.3.1 Past Experience

Sustainable land use is the intention of a variety of policy mechanisms such as Cross Compliance, Disadvantaged Area Payments, Natura 2000, Forestry and Agri-Environmental Schemes. Lessons have been learned from past policies that resulted in harmful environmental effects. Headage payments, for example, encouraged overstocking of sheep on upland peatlands, which resulted in overgrazing, loss of biodiversity and soil erosion. Due to a combination of Commonage Framework Planning, and decoupling of EU agricultural support subsidies from production in 2005, overstocking of the uplands has now effectively been resolved.

Another undesirable effect has been scrub encroachment which can impact negatively on biodiversity. This is a problem for example in the Burren, one of the most important and best-known landscapes in Ireland and Europe. The obligation to maintain land eligible for Pillar One payment under the Single Payment Scheme in Good Agricultural and Environmental Condition (GAEC) should alleviate the problem of scrub encroachment in future.

The story of hedgerows illustrates the determining influence of policy decisions. Hedgerows are a visual record of the historical processes of land use (Feehan et al., 2001). Until the 1970s, many hedgerows remained. Ireland's entry into the EU in 1973 brought about change, with the EEC/EU agriculture support system helping farmers to modernise and increase productivity. One effect of this was field enlargement. The rate of hedgerow removal between 1908 and 1998 in a study area in Cavan was 31 per cent (Keena, 1998). Grant aid for land improvement encouraged hedgerow removal until December 1994. A major impact of the Rural Environment Protection Scheme (REPS) when introduced

in July 1994 was the protection of hedgerows. In 2009, the Department of Agriculture, Fisheries and Food designated hedgerows, ditches and open drains as landscape features on all farms under the GAEC of Cross Compliance. Where in exceptional circumstances a hedgerow must be removed, for example to facilitate farmyard expansion, a replacement hedge of similar length must be planted at a suitable location in advance of the removal of the existing hedgerow. Since 2004, under REPS 3 and REPS 4, farmers have undertaken to plant or rejuvenate an impressive hedgerow length of over 10,000 km, the largest such planting in over 200 years. Similar hedgerow options continue under AEOS.

REPS and its successor AEOS are by far the most significant channels of incentive payments in the Republic of Ireland at present. At its peak there were 62,000 farmers in REPS, all of whom were involved in the creation of new wildlife habitats on farms. Biodiversity strategies using trees, hedgerows, riparian zones and field margins have positive effects on the landscape (O'Leary et al., 2005). Through REPS, this generation of farmers is making a lasting positive impression on the landscape, which will become more evident over time as trees, hedgerows and other habitats develop.

Over 3,000 km of the stone wall network in the west is being maintained, preserving this unique landscape feature. The conservation and repair of traditional farm buildings is also an element of REPS 4. Research has shown REPS to have been directly instrumental in protecting both known and previously unrecorded archaeological features (Sullivan, 2006), and through its training courses it has increased awareness of archaeological features amongst planners and farmers alike (O'Sullivan and Kennedy, 1998). Future agri-environmental payments to farmers will be designed and financially justified for both direct and indirect costs incurred in the supply of public goods (Finn et al, 2009).

One drawback with incentive payment schemes such as REPS is that although the decision to participate may be the farmer's own, the initiative comes from outside. The farmer's participation may be more or less willing compliance, but with little enough understanding of the environmental values and functions involved, and perhaps with little enough sympathy with them. The stipulation that all participants must attend a (20-hour) training course is intended to obviate this, but attendance at such a course need itself be no more than mere compliance. The absence of any training requirement in AEOS is regrettable. The provision of good education on biodiversity to farmers is *critical* to effective scheme delivery. We can only appreciate what we know, and farmers are more likely to comply where the aim of the management required is fully understood.

Grant aid is also provided under a range of other schemes such as the Corncrake scheme. The cutting back of the Native Woodland Scheme and the uncertainty of REPS gives out a negative message to the land owner: that biodiversity is not taken seriously and may be cut back and trimmed when budgets are tight.

The question of whether the scheme actually delivers its intended objectives in relation to biodiversity is a separate, if very large, question, and one on which more detailed information is available from Northern Ireland.

5.3.2 Incentive Schemes in Northern Ireland

In Northern Ireland the cornerstone of delivery of biodiversity targets within the government's Biodiversity Strategy is its agri-environment schemes. A key objective of the NIRD 2007-2013 is to protect and to enhance biodiversity in line with priorities established in the Northern Ireland Biodiversity Strategy (DAFF, 2007). Agri-environment (AE) schemes in Northern Ireland are important in that they are the main mechanism for habitat management in the rural environment and therefore have the potential to greatly contribute to biodiversity.

Agri-environment (AE) schemes in Northern Ireland are voluntary, open to all farmers or landowners and apply to the whole farm. Schemes are administered by the Department of Agriculture and Rural Development (DARD). As well as following general environmental practices, participants are required to carry out management prescriptions for specific habitats. The Environmentally Sensitive Area (ESA) scheme was introduced in 1988 and covered 20% of Northern Ireland in five areas designated on the basis of high ecological or landscape value. Subsequently the Countryside Management Scheme (CMS) was launched in 2000 and was open to all landowners outside ESA areas. This had a greater range of management options and more emphasis on environmental enhancement. These schemes have now both been replaced by the revised Northern Ireland Countryside Management Scheme (NICMS), which opened in June 2008. The scheme is a key part of the agri-environment measure within the Northern Ireland Rural Development Programme (NIRD 2007-13). The NICMS is the most focused and refined AE scheme yet implemented in Northern Ireland. It has clear, specific objectives and targets, particularly in relation to the reversal of the decline in farmland biodiversity. There are currently 467,097 ha of land under AE scheme management, which represents over 40% of the eligible farmland in Northern Ireland.

5. The Contribution of Biodiversity to Farming and Costs: Incentive Payments (Continued)



There have been criticisms of the effectiveness of AE schemes in Europe and the design of scientific evaluation studies. Evaluation of any scheme requires clear objectives and targets. Since their introduction, DARD has been required to monitor the performance of AE schemes in relation to their stated environmental objectives, i.e. the maintenance and enhancement of biodiversity, landscape and heritage features. However the lack of specific targets meant that effective evaluation of previous AE schemes in Northern Ireland was difficult. A long-term monitoring programme was established in 1992 to determine whether the ESA scheme was fulfilling its general objectives. This programme aimed to evaluate the effectiveness of ESA management prescriptions on target habitats. Botanical, invertebrate and landscape monitoring was carried in all ESAs between 1993 and 2005. Monitoring of the CMS was initiated in 2002/03 with resurveys completed in 2006/07. These monitoring programmes were funded by DARD and carried out independently by Queen's University of Belfast (QUB). A new monitoring and research programme is due to commence in 2010, with indicators to include farmland bird, mammal and invertebrate populations, in addition to habitat monitoring. This should allow assessment of scheme effectiveness in delivering benefits for a wide range of habitats and priority species.

A review of the environmental benefits of AE schemes in the UK has been recently carried out (Boatman, 2008). The authors concluded that there was good evidence that schemes deliver significant benefits to biodiversity.

Monitoring of the ESA scheme indicated that the majority of grassland and moorland habitats under agreement were being maintained in terms of botanical diversity. There were few indications of enhancement. Concerns identified included an increase in rushes on grassland sites, possibly due to less intensive management. There were also indications of changes in broadleaved woodland, in which grazing was no longer permitted under ESA prescriptions. These included loss of plant species diversity, reduction in bare ground and a possible increase in bramble due to exclusion of livestock. The increase in dwarf-shrub cover and the decrease in plant and invertebrate diversity on heather moorland in the Slieve Gullion ESA indicated undergrazing. The lack of management or, in some cases, abandonment of this habitat was considered a matter of non-compliance for DARD to address.

Monitoring of the CMS showed that there had been very little change in plant diversity or composition of

the main habitats over five years. Longer-term CMS monitoring is required to detect potential changes and assess the effectiveness of the scheme in terms of contributing to the biodiversity of farmland. There was an apparent decrease in species diversity of woodlands, possibly due to cessation of grazing. Condition assessment showed some improvements in habitat condition but the majority of sites could not be considered favourable, this having been the case since the baseline was established. Degraded heath sites had shown an improvement in condition and an increase in heather cover, probably directly due to reduced stocking rates. It was suggested that the unfavourable condition of grassland sites, particularly of species-rich dry grassland, may have been related to the lack of adequate management, particularly in relation to grazing. However there was also high variation in botanical composition and diversity across grassland sites, with some sites relatively poor and therefore with limited potential to achieve favourable condition. It was suggested that specific options for pro-active management should be considered in order to restore or to enhance suitable sites.

A review of the local evidence base for the evaluation of the biodiversity benefits of previous agri-environment programmes has recently been carried out for DARD. A range of other organisations (e.g. NGOs, government departments and universities) were contacted to request information on any previous or ongoing research and monitoring relating to AE schemes in Northern Ireland. Apart from long-term monitoring work, there have been few direct research projects that have focused on assessing potential biodiversity benefits of these schemes. There is little evidence to date in relation to delivery of external targets such as the Northern Ireland Biodiversity Action Plan (BAP). Studies of any benefits of AE schemes to Northern Ireland priority species or species of conservation concern are few, recent and/or ongoing. Hence, results are as of yet ambiguous or indicate no particular benefit of certain AE schemes to target species (e.g. the ESA scheme on the Irish hare). In the latter case, this is perhaps not surprising given that ESA designation was based on broad environmental characteristics and not related to individual species, although inherently such schemes should be benefiting a range of species through habitat and landscape management. Current knowledge suggests that AE schemes in Northern Ireland have assisted in the maintenance of important habitat types and landscape elements in the rural environment, thereby fulfilling part of their primary objective. There is also some evidence that certain habitats are being

enhanced by scheme management, particularly degraded moorland. Any direct impacts on wider biodiversity are less clear. It is important to acknowledge that this does not necessarily mean that AE schemes are not benefiting biodiversity but merely reflects that there are currently insufficient data available to assess general AE scheme impacts on wider biodiversity.

Hence it can be seen that although agri-environment schemes, as operated in NI (and indeed Europe-wide) are largely maintaining biodiversity, they are actually *enhancing* it only in certain selective situations. It is fair to say though that reversing biodiversity declines will take time – perhaps more time than government departments are willing to give it! Hence support and monitoring need to be long term.

It is also clear that many of the management prescriptions in place are not achieving their desired effect and need to be modified. The opportunity will be there to do this when the Rural Development Programme is reviewed after 2013. It is worth considering the new Agri-Environment scheme proposed for Wales (Glastir), which is based on paying for public goods and the premise of ecosystem delivery e.g. for 'biodiversity hotspots'.

Agri-Environment schemes contributed £24.7m to the agricultural economy in Northern Ireland in 2009. Of this, £7m went to the Environmentally Sensitive Areas Scheme, £17.5m to the Countryside Management Scheme and £0.2m to the Organic Farming Scheme. This should be set alongside other subsidy payments of £22.1m to the Less Favoured Areas Compensatory Allowance and £291.1m for Single Farm Payment, i.e. agri-environmental subsidies make up 7.9% of total subsidy. Total income from farming in 2009 was £243 (DARD, 2009).

6. Biodiversity-enhancing Production Strategies

The agriculture sector and the market it underpins are driven to an overriding extent by two drivers: produce (principally food), and recreation. The new, growing market here is the ever-growing number of people who, while recognising that the growth in population and welfare over this past half century is due in large measure to modern intensive agriculture, a heavy price has been paid in terms of biodiversity loss on all levels: ecosystems, species and genetic (Heywood et al., 1995). In the EU 20% or so of farmland is now under some form of agri-environmental scheme to counteract or repair the negative environmental impacts of modern agriculture at a cost of US\$1.5 billion (4% of CAP expenditure).

The farmer's primary interest is in securing his income. Nature conservation is a poor second as a general rule, especially in the context of a farming that is driven by economic pressures to increase its intensity (McNeely, 2005). To capitalise on the opportunities presented here, a greater sympathy with and understanding of the motives that underlie the consumer's decision to choose produce that is understood to benefit biodiversity is required, so as to conform to market expectation as far as the particular circumstances of the individual farm allow. The greater that understanding, the more closely it approximates that of the customer, the better. This last point is especially important, because it is not a mass market that is being catered for, but one where the identification of niche opportunities is important, indeed, indispensable.

The adoption of a biodiversity-enhancing management regime along a more 'traditional' model might appear on first inspection to lead to a reduced profit margin because of a loss in bulk productivity. This can be offset in several ways. In the first place, under skilled management the productivity on a per hectare basis of the best land under the proper species diverse-rotations is comparable to input-intensive systems of management, and (as outlined in Appendix 4) any difference is likely to be more than offset by rising fertiliser costs. Secondly, on land of lesser quality (in upland situations especially) a drop in productivity per hectare can often be made up by an increase in the acreage maintained for grazing, utilising land that has been taken out of production or allowed to decline in productive capacity.

More immediately, the fact that grazing animals are being provided under this more biodiverse regime with the naturally varied and balanced diet to

which evolution has adapted them, with beneficial consequences for animal welfare and food quality, has enormous potential as a strategic selling point that can be exploited to much greater advantage than is currently the case. Certainly many production groups are already doing this, but it could be done in a much more focused way by some of those which are already taking this approach, and there is enormous scope for an extension of the approach in other parts of the country and in other sectors.

The claim that animals reared under more natural conditions, with more space and freedom and a more varied natural diet, taste better is widely accepted, but is generally based on personal experience and often anecdotal. Scientific research however is beginning to add quantitative teeth to the claim. Recent work in England and Wales for example has shown that beef, lamb and milk from species-diverse pasture have improved flavour, colour and shelf life, and higher levels of beneficial fatty acids. This work begins to provide a scientific basis for the concept of 'terroir', which links locally-produced foods to particular geographical locations (Wood et al., 2007; Dunn et al., 2007; Hopkins et al., 2007; Hopkins et al., 2006).

Organic farming and producer certification more generally are often considered to be one of the most important ways in which biodiversity makes a direct economic contribution to rural livelihoods. Worldwide over 2,500 products are produced organically (WOCX, 2010). However, it is unlikely that organic farming will deliver in a significant way on biodiversity objectives for two reasons: It is never likely to command more than a small market share (which will decrease in times of economic austerity); and there is no real evidence that it is environmentally better than other less intensive farms to any significant extent. In Northern Ireland biodiversity enhancement is not a stated aim of the Organic Farming Scheme.

7. The Potential in Rural Tourism



Rural tourism is the enterprise that has the capacity to exploit biodiversity as an economic resource more widely than any other, with the exception of organic farming and related production systems. The rural tourism 'product' can also create viable markets for a number of other alternative enterprises, which increases its potential to contribute to rural income.

The importance of rural tourism as a form of alternative enterprise has become ever more widely appreciated during the last two decades. In this case the basic resource the raw material that is being exploited is the countryside experience, of which wildlife and scenery, which are aspects of biodiversity, are important components. However, the extent to which these elements are exploited as part of the resource is much less than it might be. As with biodiversity-enhancing market strategies, the fuller utilisation of the resource in this case requires a deeper understanding and appreciation on the part of the entrepreneur of the nature and importance of biodiversity and the values it underpins, and an imaginative exploitation of the new opportunities it presents. But whereas other forms of alternative enterprise require resources that are not always readily available to develop them, in this case the basic resource is always there, different in each part of the country, but depending all the more on individual initiative to market it on that account.

Two main elements in the hospitality/tourism package have been identified. The absolutely essential elements are the standards of comfort, hygiene and food. In order to compete, Ireland must provide the same standards as other locations. Then there are the elements which are identified as being special to this place (landscape, communities, local food, music sessions, trails, ringforts etc.). These elements constitute this local distinctiveness and uniquely enhance richness of experience are very important. These are the special qualities which will do most to enhance the competitiveness of Irish tourism. This is the area in which local biodiversity can be exploited more.

7.1 What Kind of Tourism?

For rural tourism, the countryside in its entirety is the potential resource, if it can be made accessible to the visitor. The rural tourist shares with all other kinds of tourists the wish to get away from the pressures, anxieties and cares of their everyday world for a while. The main attraction for the rural tourist is the countryside and the people who live there. Rural tourism is not just farm tourism, where the visitor stays on a farm and can experience something of the life of the farm. It is tourism in the countryside, where the resources and character and experience of the

countryside provide the context of the holiday. Activity in the countryside is a defining character of the rural tourist experience. This activity can be anything from a leisurely ramble around the village to the most strenuous of adventure sports, from nature holidays and ecotourism to special interest archaeology hikes.

7.2 What is the Resource?

The raw material for rural tourism is the countryside the scenery, topography, geology, flora and fauna to be experienced in a great variety of different ways and on different levels. Everything in the countryside is potentially part of the resource in rural tourism. In any area, there is a multitude of smaller things which cumulatively constitute the special and distinctive character of the countryside. When we move into the world of rural tourism development we need to look at our surroundings with new eyes. We must learn to recognise this detail in all its variety, and be able to evaluate its significance in terms of community heritage, and more specifically its role in rural tourism. Rural tourists generally have an interest in everything about the countryside. Visitors whose primary interest is birds or flowers will still be interested in geology or archaeology, especially when these are presented in an intelligent, informative and accessible way, and where they can be experienced explored as part of the authentic rural context where the prime interest is focused.

7.3 The Geology Resource

Significant progress has been made in making the natural geological resources more accessible to the public/tourists. Geology determines the characteristics of the natural landscape and is important in the rural tourism product. It influences other aspects such as heritage, flora, fauna, archaeology, architecture and folklore. It is essential for the uniqueness and individuality of each area. In some places geology has much to contribute to the resource, in others less, while in a few instances it will be a key attraction. It is important for the rural tourism developer to understand the geology in order to be able to tell the local story in a way that paints a clear and exciting picture of the events of the remote past which shaped this particular landscape. The basics of geology should be part of the educational foundation of everybody in the modern world, and in a special way the rural tourism operator. The visitor will certainly be interested in the local geology. Most rural tourists are well-educated, with an interest in geology that ranges from modest to passionate. It is our task to make sure that our local geological endowment can contribute as much as

7. The Potential in Rural Tourism (Continued)

possible to the enjoyment and excitement of their stay. In order to maximise the potential of tourism, we need to facilitate them by providing access, by opening up the possibility of the experience for them. Access always has two components: physical (pathways, benches) and intellectual (clear directions and enough information for the visitor to fully appreciate what is around him).

7.4 Wildlife as a Tourist Resource

The natural and semi-natural environment is an important part of the tourist attraction of Ireland. Ireland is considered as a country where nature and agriculture have integrated and where the post-world war 2 intensification has been lower than elsewhere. There are four important types of wild habitat in Ireland: The Coastline; Upland Habitats; Peatlands; and Traditional Farm Landscape.

Wildlife or eco tourism is not as well developed in Western Europe as it is in other parts such as East Africa. While the wildlife may not be as dramatic, there are many areas where birds in particular are plentiful and diverse (coast and wetlands). There are possibilities of organising specialist bird holidays, while wild birds can also be part of the holiday experience for the non-specialist. Rural tourism operators need to seek ways in which to build the local bird life into the tourism package where the potential exists.

Mammals offer less potential than birds due to their shy, evasive and nocturnal habits. However, there are opportunities to organise for tourists to see these creatures (fox, stoat, badger, deer, feral goat etc.) in their natural habitats. These experiences will only be possible when the local facilitator has a good knowledge of the distribution and habits of the local fauna and involves small groups. The potential significance of an experience of bird-watching or badger-watching should not be underestimated. Even though the experiences will involve small groups, there are thousands of accessible and suitable locations across the country. Where mainstream tourism tends to cater for large numbers of people in big groups at a small number of highly-developed attractions, rural tourism caters for potentially large numbers of people in small groups at a large number of dispersed and minimally 'developed' resource locations.

7.5 Nature on the Farm

Ireland is a land of scattered, small farms. Settlement is dispersed rather than nucleated as it is in much of rural Europe, with its heritage of central villages surrounded

by agricultural land that was originally communally-worked. The fields are small, enclosed by hedges, walls, banks and fences. The most important elements of this landscape from a conservation and heritage resource perspective are old semi-natural grasslands, walls and hedges, and wetlands. These grasslands can be wet or dry depending on their situation, but what distinguished them is their richness in plant species, in animal life and in macrofungi. Such grasslands are now rare in Europe, and are increasingly valued and protected. While few visitors will actually want to study or look closely at grasslands, they make an essential contribution to the distinctive character of the natural/rural landscape of Ireland. But there are places where the grassland biota is so rich and special that it is a major element in the resource, a specific attraction. An outstanding example is the Burren, but there are many areas where much more could be made of the grassland flora as an attraction with the right focus of understanding, good interpretation and sensitive access, especially on the fringes of areas of bogland.

8. Appreciating the Natural Water Resource

A growing awareness on the part of local authorities of the ecosystem services of biodiversity is beginning to find expression in measures that target the retention or restoration of the elements of biodiversity that provide these services. Up to now sections of Local Authorities have had a view that biodiversity lies in designated areas (which are to be avoided on this account). There has been a change over the past 10 years, but certainly the countywide biodiversity relationship has not become the common view yet. The Water Framework Directive and the plans falling out from this are seen to be very important in the future work of all Councils. Water quality is certainly an area of biodiversity which is seen more as the bigger picture with all sources and streams included. This is different from the 'designated' patches given to other areas of biodiversity.

There is a much better understanding and appreciation than there was 50 or 60 years ago of the many ecosystem functions other than the productive function (in the narrow economic sense) that different dimensions and facets of the natural environment perform in our lives. In the decades following the establishment of Bord na Mona the bogs were of greatest value to us as a source of the raw material from which we could make turf or briquettes, or burn to generate electricity. At that time we had little leisure to consider the recreational, aesthetic, ecological, cultural or spiritual functions they served: or that the other functions might in certain circumstances outweigh what in conventional economics would be considered the more valuable functions. The same shift of emphasis can be traced in forestry, reflected most obviously in the efforts made by Coillte in recent years to upgrade its environmental standards in order to merit certification by the Forest Stewardship Council. The same process of evolution is now at work in our attitudes to water in the landscape.

It is not long since rivers were seen to be there to have been created for three main reasons, all to do with us: to supply us with resources such as water and fish; to carry away our waste; and in between times to provide water for recreation. Other value perspectives counted for little. Rivers were convenient sewers. When the natural flooding pattern of rivers impacted negatively upon our agricultural ambitions they were regulated, their channels deepened and their bends eliminated, so that they conformed to our will.

There was a time when clean and clear water was the norm, taken for granted, and we could use and abuse it in these ways with impunity. Water has become the New Gold in this century (Pearse, 2007). But at the same time as our burgeoning population has begun to

drain and pollute rivers and aquifers beyond levels of recovery on human time-scales, we have seen a great increase in ecological and hydrological understanding. In our ability, in other words, to know how water in the landscape works, how our behaviour influences it for better or worse, how we must change our ways in order to manage the resource as we so urgently need to. The other major development is the way our awareness, understanding and appreciation of the other functions served by water in the landscape, the other values of water, has grown.

The fascination of mammals such as the otter and the wonder it evokes, as well as of birds and fish, are immediately accessible to us because they are built on our scale of things as it were. We can encounter them as we walk along the bank. This is the starting point for that deeper appreciation of the multifunctionality of the river and the ways those different functions of the river are woven together and influence each other. We have also become more aware of and better understand the regulatory functions performed by water in the landscape. Much of our concern for everything else about water is ultimately grounded in the preservation of these functions, and much effort goes into repairing the mistakes of the past in this regard.

9. Challenges to Maximising the Potential Resource



Many people live in a prison of deprivation they don't recognise as a prison, because they have been born in it. The experience of woods carpeted with wood anemones and bluebells should be part of the birthright of every child, the opportunity to catch for a moment an echo of the magic and wonder of the woods of that deeper childhood. We don't know enough about our nature as humans to be able to measure or judge the deeper psychological and spiritual effects of its loss.

Unintended of course and almost un-noticed, we have allowed that treasure of a richer natural world to become tarnished and diminished in our short lifetime, but the challenge of restoration is firmly in hand as a result of the Water Framework Directive which sets out to restore all waters to good status by 2015.

The challenge that faces us is not merely to be aware ourselves of the full spectrum of values for human living embodied in biodiversity, and to manage it in ways that optimise all of those values, but the promulgation of this appreciation right across the community. The Biodiversity Convention lays just as much emphasis on the need for the community as distinct from professionals to take ownership of all of the values served by biodiversity as it does on new research and the of course all-important need to focus on issues of conservation, on the need to get the community as a whole to appreciate how all of the functions of biodiversity can enrich their lives.

The wider community has certainly taken ownership of the recreational values of the rivers and streams, lakes and ponds. In earlier times angling was a pastime for the privileged who could afford such leisure, and access to fishing waters was limited to the few. Today it is one of the most popular outdoor pastimes. In the UK it is the largest participant sport, with between 1 and 4 million participants, contributing £3.5 billion to the economy.

But we need to take possession of biodiversity in the same way. We need as a community to reach the point of being able to say, this enhances my world, enriches my life; makes my everyday world a better place to live in, with the same kind of reason and sincerity as we would say a better health service or transport system makes my world a richer place to live in. It makes my home a richer place to grow up in, to work in, and to share life in. Our lives would be not just different without clear streams and lakes, but poorer.

And the missionary challenge this faces us with is a much more difficult one today than it was 20 or even 10 years ago by orders of magnitude especially

the educational challenge of bringing it to younger people, because of the way cyber recreation has engulfed the time and space of their lives. The attention of younger people is so sucked up by the riches of the cyberworld that they might as well be in prison, so cut off are they from contact with the reality of the real place that is home. They may well be well and happy in all the ways you can easily measure, but personal contact with the natural and historical environment is fundamental to a richer emotional and intellectual life on all sorts of levels, and that should be everybody's birthright. Natural heritage features in landscape are moorings to which we unconsciously anchor our sense of belonging, being in place, at home, even if that rootedness is something that only matures as we grow older. The loss or diminution of this is something that has crept up on us, its psychological effects in this regard almost unnoticed although we are increasingly concerned about its effects on fitness and health more generally.

What it comes down to ultimately is the anaesthetisation of experience. Having a poster on your wall with an inspiring caption of a runner in a mountain landscape is not the same as running the hills myself. Watching the emergence of a dragonfly on television is not a substitute for witnessing the real thing. The challenge is to restore the experience.

9.1 Biodiversity and Agricultural Challenge

One of the most important ways in which biodiversity functions as a resource in agriculture and rural development is through exploitation of the interest of non-farming people in different aspects of biodiversity. This may be a particular interest in one or other taxonomic group, such as birds or flowers, or it may be the simple enjoyment of a landscape where there is a diverse fauna and flora or a geological structure that makes for landform diversity: a landscape to which the human spirit is naturally attuned and which is more 'recreational'.

The more the rural tourism entrepreneur can empathise with this response, and the greater his/her understanding and appreciation of flora and fauna, the more fully is he going to be able to exploit the opportunity presented economically. There is much more that can be explored and exploited in this regard, especially in farming areas that have woodland, bog, upland or marine habitats, or are within easy reach of them. We are often insufficiently aware of the attraction and fascination of what lives here, and to that extent limited in how we are able to exploit them in financial terms. There is a real need for education in what is there, perhaps through the

establishment of a series of demonstration farms. A striking example of a recent initiative along these lines is the way farmers involved in the Burren Life Scheme have come together to provide farm walks (on a paying basis) to show off the natural and cultural heritage of their farms, and how their management of the farms maintains and promotes this heritage (NRN, 2010a). The growth of the internet provides an avenue for the advertising of the most diverse products in this respect, to a widely-dispersed clientele/market that would hitherto have been too scattered and anonymous to be considered a market.

We are at something of a disadvantage because of the relative species poverty by comparison with warmer climes, but can compensate for this through our greater awareness and better 'packaging'. This once again raises the question of how to bring about a better appreciation of the importance of biodiversity within the rural community. It is a particular aspect of the challenge to do this in the wider community, which is being tackled under the broader agenda of the Biodiversity Action Plans drawn up at county level (e.g. Clare, Offaly, South Tipperary) which emphasise the twin-track approach demanded.

'When seeking to promote the mainstreaming of agrobiodiversity in production systems, it is often helpful to work at a landscape scale that includes numerous farms and the surrounding landscapes that support the farming communities. Such landscapes may often contain protected areas. While each individual farm has contributions to make, the entire farming system is the level at which biodiversity can most effectively be conserved' (McNeely, 2005).

9.2 The Conflict of Legitimate Interests

When any individual runs down that long list of the different functions that water in the landscape fulfils in our human lives he/she will of course unconsciously rank them in importance depending on their own interest, their own experience, and their own particular stage or level of understanding of what rivers are about. For example, I am an angler and I represent Derryboy District Council, so I want to stock Derryboy lake with trout and I don't see why we shouldn't have powerboats for the tourists. But you are the chairperson of the Derryboy branch of BirdWatch Ireland and you don't want the birds to vanish when the powerboats arrive. This man over here has land on the other side of the lake and his cattle need access to drinking water. She is a teacher and uses the exceptionally diverse ecology of the lake for Leaving Cert geography and biology projects each year. And what about the

peace and quiet walkers from the town at present enjoy? There are potential conflicts that are the result of legitimate interests, different interests focused on different functions, the other functions are on the periphery or maybe out of sight, not recognised even, in each case.

So we evaluate, put value on the functions differently depending on our interest. But if we are charged with the duty of managing or influencing management, we have each of us a responsibility to appreciate, to understand the other functions even if they don't affect us directly or even if we didn't appreciate their importance or even know they existed up to now. It is essential to appreciate the many ways in which the functions are interdependent. Amenity value depends fundamentally on the ecology. Ecology may benefit from appropriate management by anglers and vice versa. In taking an interest in the other functions of the river, I am as often as not furthering my own particular interest.

So it is a two-stage process, of understanding and appreciating ourselves first of all the range of values and functions of water in our lives as a community and to keep growing in appreciation, because this is a process, not a fixed state of understanding and understanding that the maintenance and enhancement of these matters to us, to my community, first and foremost. Then secondly the practical questions as to how to manage with all those functions and interests in view, and that is where all the argument between competing sectors comes in, but the oath we all have to swear as we come to the table is that the ways we come up with do not compromise the integrity of the resource.

10. Increasing Understanding, Awareness and Appreciation



Studies show convincingly that '*communicating the issues in language that was comprehensible to stakeholders was absolutely essentially for initiating the implementation of mainstreaming activities*' (Cowling, 2005). What can be achieved depends to a very great extent on how alert a particular community or group is to the values that particular facets of biodiversity represent, and to the possibilities these present (McNeely et al., 2003).

Biodiversity can function as a resource in rural development on a deeper level. The pleasure or sense of fulfilment that people with an interest in birds or flowers derive from this interest is the result of the closer acquaintance and better understanding that result from increased attention and study. Ultimately, it is a matter of education. The opportunity to take advantage of this enrichment of living is most readily available to the rural dweller. An interest in these aspects of the countryside, the flora and fauna, the geology, contribute enormously to human enrichment, something those who devote time to these various interests appreciate profoundly. Farming people and other rural dwellers generally take a comparable interest in the human aspects of countryside heritage, its archaeology and history, and the cultural heritage fabric of the landscape that links us to the past. It is not many generations since an interest in such things as archaeology was seen by farming people as the preserve of more privileged folk who had little to do on Sundays or indeed working days except traipse across other people's fields to look at old forts and bits of megalithic tombs and the like. But those who own and work these fields now understand that the people who lived in and worked these same fields hundreds, even thousands, of years ago lived in that ringfort, warmed themselves at the fires of the fulacht fiadh, that these features were once the focal points of the same farm they make their living from in this short span of history for which it is entrusted to their care.

And so, these things belong to rural people in a more personal and profound way than they do for outsiders for whom this interest is purely academic or recreational. An interest in these things enriches rural living. It may not contribute financially to a better life on the farm: although of course it may contribute, but it does so in less tangible ways. The natural history of the countryside can and should contribute in the same way. It is only a generation or two ago since farmers who made a precarious living in the Burren watched in amazement as grown-up people with English accents spent their days in short trousers wandering across the limestone pavement with nets and cameras, looking at moths and mosses. Some of the farmers now involved in the Burren Life Project, where they are paid to

farm in ways that preserve and enhance the farmed landscape for moths and mosses, flowers and fossils, now share that fascination because they have had the opportunity to take a closer look at it, and they now know why people would spend the most precious few weeks of their working year looking at these things and even paying to do so.

Of course, the farmers in the Burren Life Project are paid to develop and apply these interests, but the contribution it can make to life in the country does not disappear if there is no financial reward, nor is it absent from areas where there is no financial incentive. The potential is there to exploit the natural heritage of the countryside so that it can contribute to a richer life, and this potential is everywhere, in every part of the countryside, on every farm. Nothing has to be shoved aside to make room for it. It can be fitted in between all the tasks and concerns of the farm. The farmer is entitled to the enrichment it has to offer as much as anybody else.

10.1 Seeing Biodiversity from Inside Farming: a Proposal

Part of the reason that biodiversity degradation has occurred is that just as with archaeology until recently, the protection of the environment and biodiversity was seen as the preserve of others, nothing to do with us, with nothing to offer us. Attention to these things has often been an imposition from outside, we only do it because we are paid to do it, because these things matter to outsiders. But we should make this interest our own, because we have more to get from it than any outsider, and we have greater opportunity than any outsider to do so. A proposal was made to Offaly IFA in 2007 to carry out a detailed survey of the habitats of the county that would be spearheaded not, as is usually the case, from outside the farming community, but from inside the farm house, looking out. Its focus would be on how the natural heritage of the countryside looks from that perspective, but taking due account of all the values other perspectives might bring, and carried through with the same ecological expertise so that it would bear scrutiny and possible criticism from outside.

Such a survey would:

- Produce a detailed habitats map, bringing the EcoNet under higher magnification;
- It would review each habitat in turn, showing the distribution of each, accompanied by an account that explains how it fitted into or onto the farm economy or its margins;
- Provide an account of the land and its habitats in time and space that puts the farm at the centre,

but with no agenda or hidden motive. It would explicate the colours of the EcoNet as seen from the perspective of the reality of farming: past, present and future;

- Prepare a set of case studies of representative (volunteer) farms; and
- At the same time it would focus wider, outside appreciation and understanding on local food and sustainability.

As an outcome of the present study, and as an action for 2011-2012 under the county's Biodiversity Action Plan, it is proposed to implement a pilot survey of this kind in an area between Tullamore, Rahan and Clara in County Offaly. The local community will be asked to act as sponsors or hosts, and relevant local voluntary organisations invited to appoint members to a Steering Group. The local authority will in effect be a '*patron*', and will provide assistance as appropriate. Fieldwork, desk review and direction will be provided by staff and students on the Masters in Environmental Resource Management programme in the School of Agriculture, Food Science and Veterinary Medicine at University College Dublin.

The survey will involve an overview of the environmental heritage and resources of the area, based in the first instance on the viewpoint of those who live in the area, supplemented where relevant by expertise brought in from outside. The survey will consist of field work, community input and literature review, and will be followed by an evaluation that will look at how the economic and educational potential of the rural environment can be more fully harnessed in the interest of community development.

11. Conclusions: Biodiversity as a Resource



Biodiversity is essential to the healthy functioning of natural and agricultural ecosystems in a great variety of ways. But although we are all concerned to varying degrees and in our different ways for biodiversity, much of that concern is theoretical or focused on places far away. At the end of the day it is only when action to maintain or promote biodiversity affects our income or welfare that we can be counted on to develop a deeper personal concern that translates into action. Many of the functions served by biodiversity can only be managed and conserved on regional or global scales, and depend therefore on governmental and inter-governmental action in the form of legislation and incentive, and to a lesser extent the purchase of land for conservation.

11.1 Economic Value of Biodiversity

The value of biodiversity can be hard to estimate because of its contribution in a number of areas, significantly beyond the landscape or recreational value which are commonly perceived as the main values of biodiversity. Calculating an economic value for biodiversity is a difficult task. The productive value of biodiversity can be costed in terms of the goods produced, however, other elements such as public goods and scenery are very difficult to place a value on.

11.2 Farming and Biodiversity

The initial adoption of farming practices in Ireland had an impact on biodiversity but did not lead to a decline. In fact farming practices began to shape the landscape and the diversity of species within it. However, the increasing population and industrial revolution brought about increased demands for food but also competition for land and resource usage. However, the intensification of agriculture particularly in the past 60 years has had significant negative impacts on biodiversity. Significantly many of the changes which have resulted in the loss of habitats are as a direct result of measures implemented to improve farming (drainage, reclamation, commonage divisions, premium payments). While the increased use of fertilisers, pesticides, chemicals and silage making have also had an impact. Many of these negative aspects are now being addressed by new policies or legislation but the damage has been done and reversal is a slow process.

11.3 Biodiversity as a Resource in Agriculture and Rural Development

It is obvious that biodiversity makes enormous

contributions to agriculture in the areas of: pollination; soil (structure, nutrients, regulation of pests, carbon storage etc.); drainage; prevention of flooding; natural water purification; and diversity of species. However, even farmers themselves in many cases fail to recognise or underestimate the contribution made by the natural environment in these areas.

There are opportunities for the farmer to be proactive in exploiting the concern of the broader society about biodiversity in ways that generate income. This can be done through the adoption of biodiversity-enhancing production strategies or through exploitation of the income-generating potential of the countryside as a resource in tourism.

In these cases (the proactive opportunities) the driving reins are in the hands of the farmer: to a degree limited obviously by the particularities of his situation; how much land he has; where he is situated; access to capital; and so on. But, other things being equal, the extent to which he is able to exploit the biodiversity dimension depends firstly on the level of understanding and appreciation of biodiversity, what it is all about, on the part of the customer, and secondly once again on that of the farmer himself.

The development of a high level of understanding and appreciation is therefore necessary if the farmer is to be equipped to maximise on opportunities for farm-based initiatives (biodiversity-enhancing strategies), the success of which in turn is proportionate to the level of awareness in the wider public, the paying customer in effect.

While there has been a long interaction between farmers and the natural environment, the renewed focus on biodiversity is often a source of conflict or irritation for farmers. They may not be involved or adequately consulted in the development of policies which seek to maintain or enhance the natural environment. Some of these policies may not fully understand the interaction between farming and the environment. Or in any case are not adequately explained to those who must implement or adhere to them.

11.4 Biodiversity Incentive Payments

The natural benefits of biodiversity have always prevailed, however the policy measures/incentives to maintain or enhance biodiversity also bring many financial benefits for farmers. While farmers may not always appreciate the requirements of specific policy measures, adherence to them or participation in schemes can deliver significant payments to farm

families. Some farmers need to alter their practices (some significantly) to comply with the regulations, however, those who were causing least harm to the natural environment can in effect reap these payments as a bonus for their protection or enhancement of the environment.

The evolution of the environmental schemes has also brought about a change in focus on the environment, initially REPS was about protection of further losses but has evolved to the current phase which seeks to enhance natural biodiversity and restore habitats. Therefore, even the incentive schemes have taken the protection of the environment to a higher level.

The broad opinion is that measures to protect the environment and enhance biodiversity impact negatively on the incomes of farmers because they impact on modern practices and systems. However, a return to more traditional practices may also have benefits in terms of the requirements for less (increasingly expensive) artificial inputs (fertilisers, chemicals etc.). There may also be significant benefits in the marketing of farm produce as a more natural product which may have greater appeal to the consumer and earn a premium price.

The environmental schemes and linking of cross compliance for EU payments has brought biodiversity and the environment to the forefront. However it is not yet clear if they have brought about such a change in mindset and attitude that the favourable practices would be continued in the absence of or removal of the incentive payments. Equally it is not yet evident of the extent to which the measures are leading to a reversal of some of the biodiversity damage from previous decades.

11.5 Potential in Rural Tourism

Rural tourism is the enterprise which offers the most potential to capitalise on the resource presented by biodiversity and the natural environment and in doing so, contribute to the economy (local and national). However, the biggest obstacle to maximising the potential of this resource is the awareness, understanding and appreciation of the natural environment and heritage by rural residents, farmers and tourists.

There is a multiplicity of attractions for the rural tourist (landscape, geology, flora, fauna, heritage, farms, villages etc.). Generally rural tourism is by nature more about small scale, localised attractions rather than large scale attractions. The key issues for access have been identified as physical and intellectual.

Physical are foremost in people's minds and focus on routes, pathways, facilities and services. However, the intellectual access is probably more important in order for the tourist to gain a real appreciation for the rural area and the true experience. However, the importance of intellectual access is probably not fully understood by those living in rural areas and even those promoting rural tourism. This is the area that needs to be developed, people need knowledge of what their own area has to offer, which equips them with the ability to explain their local area and environment to visitors.

11.6 Appreciating the Natural Water Resource

An important example of the changing attitude to the natural environment is the usage of waterways. Two of the traditional functions were obviously conflicting, the provision of water and the disposal of waste. The focus on waterways was the extent to which it could meet these human needs and little if any consideration was given to the wildlife or the other natural benefits of waterways. Some of the damage caused to the natural biodiversity was due to a lack of awareness or appreciation of the functions of nature. The attitude towards and appreciation of the waterways has changed significantly in the recent years and the advent of the Water Frameworks Directives brings a policy focus to these changes.

11.7 Challenges to Maximising the Potential Resource

The potential for further increase in the contribution biodiversity can make to agriculture and rural development depends in the first instance on the value placed on biodiversity by wider society, and on the legislation and incentives put in place to sustain and promote it. The indications are that in response to what is perceived as a real public demand, the post-2013 CAP Reform will see a significant shift in policy whereby there will be greater emphasis on the use of public money to support the provision of public goods, including biodiversity, rather than a continuation of direct payments based on historic production (IEEP, 2010).

To what extent the various schemes, legislative instruments or other incentives become more important in terms of the contribution they make to rural income depends on how much the broader society and its public representatives (at EU and national level especially) are prepared to invest in these initiatives. For this reason the farmer should be actively concerned for and involved in awareness-raising

11. Conclusions: Biodiversity as a Resource (Continued)

among the general public. This can only happen if there is already a high level of appreciation by farmers themselves of the issues and the strategies to secure the objectives of sustaining and enhancing biodiversity.

The biggest challenge to maximising the potential resource of biodiversity is that enough of the population have not experienced the true beauty of the natural environment first hand and therefore do not have a full appreciation for it. Even farmers and rural dwellers themselves may not have sufficient knowledge of their own area to exploit that resource in financial terms. Another significant challenge is to ensure that further degradation does not occur and that adequate steps are taken to restore some of the past damage.

A further challenge in this area is the conflicting interests regarding the utilisation of the natural resources. Everyone feels they have their own legitimate claims to the natural assets of their area based on their own interests. These often conflicting and opposing interests need to be reconciled if the true potential of these assets are to be realised with benefits for everyone and nobody feels that their interests are being ignored.

12. Recommendations



The primary recommendation is that the information in this report is disseminated to the wider public and that the issues are debated and discussed. (The authors have identified a number of priority recommendations which are highlighted in bold in this section.)

12.1 Education

The full potential of biodiversity as a resource in agriculture and rural development can only be realised if it becomes an integral part of farming education and training rather than something peripheral to the concerns of the farmer. Biodiversity should be incorporated as a core module in farmer education, of equal standing with traditional production modules. The syllabus for this module should lay equal emphasis on the development of an informed awareness and the development of strategies at farm and community level to promote biodiversity while augmenting rural income and welfare.

There is a need for a general re-education of farmers on the financial benefits of biodiversity and of how they can reduce their input costs and maximise efficiency with reduced artificial inputs. The content of educational courses will need a revamp to include these elements. It is important that these elements are presented as core aspects of the management and not as insignificant and 'soft' add-ons.

Ongoing training in biodiversity should be an integral part of all agri-environmental schemes. Farmers can only appreciate what they understand.

12.2 Awareness and Appreciation of Biodiversity

Biodiversity awareness and appreciation programmes need to be undertaken with the public (including farmers) to explain the role and importance of biodiversity. In particular for farmers there is a need to explain the economic contribution of biodiversity to their farming operations (whether farming in environmentally friendly manner or not) and the importance of maintaining the environmental balance.

There is a need to encourage a wider appreciation among all society of biodiversity and the role it plays in all our lives and of what could be lost if we don't appreciate it and protect it. Society needs to be encouraged to take possession of biodiversity to such an extent that they are determined to protect it because it is essential to their lives and without it, they would be much poorer. This will take considerable effort but is vital.

There is also a need to foster an understanding of the conflict of legitimate interests when it comes to biodiversity. Everyone needs to appreciate the legitimate claims that others may have on the natural environment and how it is utilised. The cost of biodiversity and environmental policies need to be considered in terms of the public good value they provide. It is important that a value is placed on public goods such as landscape, scenery, natural environment, recreational value of the countryside so that it is more widely appreciated by those who protect it (farmers) and by those who avail of it. Farmers need to be working towards conservation and protection. This can only happen when there is trust and harmony between farming and environmental agendas, this needs to be carefully approached and managed.

12.3 Biodiversity Policies

There is a need for new and imaginative policy measures and schemes which not only protect the environment but enhance it. There is a need to involve farmers and those who understand the interaction between farming and nature to develop these policies. Farmers (who are responsible for implementing many measures) need to be consulted and actively involved in the development of policies/measures/legislation relating to the environment and biodiversity.

Actions to protect the environment and biodiversity will only be brought about if they affect incomes or welfare. There is a need for policies and legislation which create awareness and protection. There is a cost to maintaining and conserving the environment and that environmental policies which provide money to farmers and others are necessary and worthwhile.

12.3.1 Food Harvest 2020 and other related statements of intent

The engagement of leading production-orientated farmers in agri-environment schemes with appropriate biodiversity measures is critical. The Food Harvest 2020 vision for the Irish agri-food industry (DAFF, 2010b), the UK Government's 'Foresight' Report on The Future of Food and Farming (GO-Science, 2011), and the influential Royal Society report Reaping the Benefits-science and the sustainable intensification of global agriculture (The Royal Society, 2009) documents foresee an agricultural sector that acts 'smartly' to achieve a competitive critical mass in the international marketplace and targets those consumers in key markets who recognise and reward food producers across the island of Ireland for their 'green' output. It

12. Recommendations (Continued)



is critical that both the production and environmental targets in these reports are achieved in harmony with each other.

12.4 Agri-Environmental Schemes

There are opportunities for biodiversity enhancement in environmental measures (such as AEOS) which would widen the scope of these measures. This could present opportunities to increase the flow of capital into farms. It is worth considering making schemes less prescriptive and allowing farmers (perhaps with imaginative advice from biodiversity / environmental / ecological consultants) the opportunity to come up with their own ideas for conserving and enhancing biodiversity on their farms and support them appropriately. Enhanced ecological understanding on the part of farmers themselves would also increase the possibility of developing schemes devised by those who understand the opportunities and constraints of the land best and should be in the best position to tailor management prescriptions in the light of these constraints and opportunities so as to maximise the likelihood of success.

12.4.1 Tree and Hedgerow Plants of native provenance

Most of the hedgerows and trees planted under agri-environment schemes come from foreign plants. Support is required for raising and planting of tree and hedgerow plants from suitable indigenous sources of native seed to contribute to the conservation of Irish genetic resources. This support should come through government-supported schemes such as agri-environment schemes: supporting the remaining suppliers who are struggling to survive by growing hedgerows plants from native Irish seed in Ireland.

12.4.2 High Nature Value Farmland

Any future High Nature Value Farmland Scheme must recognise that there are already farming systems delivering High Nature Value across the country, and acknowledge that some is of higher value than other. Valuing local biodiversity is necessary to engage public appreciation of biodiversity and ultimately

engender a willingness to pay for it. Encouraging biodiversity hotspots in intensive dairy or tillage areas is critical for biodiversity to survive as agriculture intensifies to meet growing food security and food production demands.

12.5 On-Farm Biodiversity Enhancing Actions

There are opportunities to make changes relating to: wetlands; peatlands; farm woods; and grasslands (need to be considered as part of future Agri-environmental schemes).

12.5.1 Wetlands

The return to more extensive and environmentally friendly measures means that previously reclaimed land is once more considered marginal and there are opportunities for it to regain much of its lost ecological value if drainage is reversed. The re-wetting of farm ponds and quarries could be promoted and encouraged. In the past there was a very definite boundary between productive land and marginal land, however pressure to increase production particularly under the early CAP regime led to much of the less productive land being utilised for farming. Much of this land was reclaimed and/or drained, however it required a high level of care and maintenance to ensure it remained productive.

12.5.2 Peatlands

A tremendous opportunity for the development of extensive areas of natural habitat are presented by blocking the drains in the cutaway bogs (e.g. Boora Complex in Offaly). Bord na Mona is the sole owner of these which means it can be addressed as a whole. There is also scope to develop new habitats on the edges of the larger bogs which are owned by farmers. Areas of cutaway bog could be linked to form a continuous mosaic of species-diverse land large enough to function as ecological networks.¹

A related opportunity are the marginal grasslands reclaimed in the past from peatland margins and sometimes still underlain by a considerable depth

of peat. These are generally heavy species-diverse marshy grasslands. These will require a level of management to maintain the habitats but present opportunities to extend them into the neighbouring turbary or cutaway. The problem is that there are no guidelines for this reversal of management and enhancement of habitats. These opportunities will only be maximised if the enhancement of habitats is considered carefully and clear imaginative guidelines are provided.

12.5.3 Grasslands

Grassland is the most important land use and little grassland on modern farms could be considered as being sufficiently species diverse or natural to be regarded as a habitat in contrast to the situation 50 years ago. Species rich grassland has floristic and faunal interest but also has a value in that it enhances organic and other 'labelled' food produce. A significant amount of grassland has been lost to production in recent years as a result of extensification. Extensification is expected to lead to a cessation of inputs on the marginal grasslands. However, the decline or cessation of grazing can bring problems as a reversion to scrub and eventually woodland occurs. Intervention may be necessary to maintain these habitats in the absence of intensive farming (such as in the Burren). Control of bracken and furze could become important actions in future agri-environmental schemes. The encroachment of these two weed species is almost always at the expense of species rich grassland with a high natural value. Appropriate management and practices need to be developed in order to ensure that this habitat is maintained. Consideration also needs to be given to the intensively managed grasslands, particularly on how the ryegrass monocultures can be replaced with more traditional mixtures. These traditional swards may be more relevant now on small to medium farms as the hidden values of these diverse swards come to the forefront (see further detail in Appendix 4).

12.6 Exploiting the Potential in Tourism

The potential contribution of biodiversity to tourism needs to be carefully nurtured. It does exist but can only be maximised if the right approach is adapted both locally and nationally. There is a need to build the awareness and knowledge of the provider, local residents and custodians (farmers and others) and the tourists (potential clients/customers). There is a need to recognise, appreciate and understand the small elements of the rural countryside which make it attractive as a resource. In particular, measures need to be taken to improve the access to the rural

tourism and biodiversity resource. Most important is the enhancement of the intellectual access, the need to educate the wider public and in particular local custodians on their local assets. There is a need to develop and foster the natural strengths in the areas of wildlife and natural habitats. These attractions are often dismissed because they are small scale and localised but are widely dispersed all over the country. There is a need to focus on this multiplicity of smaller attractions and deliver on them to smaller niche markets rather than trying to deliver to the larger well established and well served mainstream tourist market.

12.7 Best Practice Case Studies

A survey of best practice case studies both in Ireland and abroad should be compiled and disseminated. This should lay particular emphasis on factors responsible for success in each case, and comment on the scope for, or constraints limiting, the development of similar initiatives elsewhere in the case of each project. The results of the survey might be considered for a future National Rural Network Conference, and material from it could be used to assemble an exhibition that could be mounted in venues throughout the country. Support should be given to a core of best-practice farms to permit visits, open days and organised training sessions whereby best practice can be demonstrated and publicised.

12.8 Research on Biodiversity Enhancement

There is a need to explore and research the opportunities for farming practices to adapt to biodiversity enhancement. Similar to the research in past decades on reclamation and on improving grass species. There is a need to look at the reversion options and also more traditional and diverse species which may be more productive on a reduced input system.

There is a need for a close examination of the outcomes from the BurrenLife Project and the dissemination of the lessons from the project. Consideration needs to be given to how these lessons could be applied in other areas and other environmental schemes and national programmes.

Studies such as the pilot proposed for County Offaly should be supported in order to establish how biodiversity interacts with life (farming, food production, recreation etc.) and how the diversity of views on biodiversity can be reconciled in a harmonious manner. Similarly the lessons from these studies should be considered in mechanisms to enhance biodiversity.

¹ An ecological network is made up of the following elements: core areas to conserve ecosystems, habitats, species and landscapes of importance; corridors or stepping stones, where these will improve the coherence of natural systems; restoration areas, where damaged elements of ecosystems, habitats and landscapes of importance need to be repaired or certain areas completely restored; buffer zones, which support and protect the network from adverse external influences. The core areas will comprise the main areas and features that represent biological and landscape diversity of importance. They will in many cases also include important semi-natural systems which are dependent for their integrity on the continuation of certain human activities, such as extensively used agricultural landscapes. The coherence of the network will be ensured through the provision where appropriate of continuous corridors or discontinuous 'stepping stones' which will facilitate the dispersal and migration of species between the core areas. In many cases the connectivity function of corridors and stepping stones will be compatible with appropriate forms of economic activity in the respective areas (Council of Europe, 1995).

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Appendix 1

Membership of the Strategic Issues Working Group

The Biodiversity Working Group was chaired by **Dr John Feehan**, School of Agriculture, Food Science and Veterinary Medicine, UCD and consisted of the following members:

- Dr Enda Bannon, formerly UCD;
- Mr Joe Gaffey, Farmer;
- Ms Catherine Keena, Teagasc;
- Professor Jim McAdam, Queens University Belfast;
- Ms Amada Pedlow, Offaly Heritage Officer; and
- Dr Helen Sheridan, UCD.

Appendix 2 Functions of Biodiversity

| Regulation Functions | Production Functions |
|--|--|
| 1. Protection against harmful cosmic influences | 1. Oxygen |
| 2. Regulation of the local and global energy balance | 2. Water (for drinking, irrigation, industry etc.) |
| 3. Regulation of the chemical composition of the atmosphere | 3. Food and drink |
| 4. Regulation of the chemical composition of the oceans | 4. Genetic resources |
| 5. Regulation of the local and global climate (including the hydrological cycle) | 5. Medicinal resources |
| 6. Regulation of runoff and flood prevention (watershed protection) | 6. Raw materials for clothing and household fabrics |
| 7. Water catchment and groundwater recharge | 7. Raw materials for building, construction and industrial use |
| 8. Prevention of soil erosion and sediment control | 8. Biochemicals (other than fuel and medicine) |
| 1. Formation of topsoil and maintenance of soil fertility | 9. Fuel and energy |
| 2. Fixation of solar energy and biomass production | 10. Fodder and fertiliser |
| 3. Storage and recycling of organic matter | 11. Ornamental resources |
| 4. Storage and recycling of nutrients | |
| 5. Storage and recycling of human waste | |
| 6. Regulation of biological control mechanisms | |
| 7. Maintenance of migration and nursery habitats | |
| 8. Maintenance of biological (and genetic) diversity | |

| Carrier Functions | Information Functions |
|--|---|
| <i>Providing space and a suitable substrate for</i> | 1. Aesthetic information |
| 1. Human habitation and (indigenous) settlements | 2. Spiritual and religious information |
| 2. Cultivation (crop growing, animal husbandry, aquaculture) | 3. Historical information (cultural heritage value) |
| 3. Energy conversion | 4. Cultural and artistic inspiration |
| 4. Recreation and tourism | 5. Scientific and educational information |
| 5. Nature protection | |



Appendix 3 - Summary of REPS and Scheme Payments

REPS 1

€125 per ha up to a maximum of 40 ha
Jan 1999: €151 per ha up to a maximum of 40 ha

REPS 2 (2000)

€151 per ha up to a maximum of 40 ha for farms over 20 ha
€165 per ha for farms less than 20 ha

REPS 3 (2004)

€200 per ha for the first 20 hectares,
€175 per ha between 20 and 40 hectares,
€70 per ha between 40 and 55 hectares and
€10 euro for every hectare over 55.

REPS 4 (2007)

Payments increased by 17% compared to REPS 3, but this increase was reversed in April 2009.

| Total REPS paid Million € | | | |
|---------------------------|-----|-------------|-----|
| 1994 | 1.5 | 2002 | 173 |
| 1995 | 37 | 2003 | 184 |
| 1996 | 71 | 2004 | 209 |
| 1997 | 128 | 2005 | 284 |
| 1998 | 168 | 2006 | 331 |
| 1999 | 183 | 2007 | 311 |
| 2000 | 206 | 2008 | 312 |
| 2001 | 165 | 2009 | 330 |
| Total 3,092 | | | |

| Scheme | Amount (€ m) | No. of Farmers |
|--------------------------------------|--------------|----------------|
| Single Farm Payment | 1,257 | 127,000 |
| Disadvantaged Areas | 220 | 102,000 |
| REPS 4 (due in 2010) | 186 | 30,000 |
| REPS 4 (delayed from 2009) | 41.5 | 20,000 |
| REPS 3 | 142 | 23,000 |
| New Agri-Environment Options Scheme* | 50 | 10,000 |
| Sheep Grassland Scheme | 18 | 29,000 |
| Suckler Cow | 34 | 50,000 |
| Dairy Emergency Fund | 11.5 | 19,000 |
| Forestry Premium | 80 | 16,500 |
| Total | 2,040 | |
| Farm Grant Schemes Due | | |
| Farm Waste Management (40% tranche) | 190 | 13,400 |
| Farm Improvement Scheme | 19 | 2,000 |
| Total | 209 | |

Appendix 3 - Summary of REPS and Scheme Payments (Continued)



Direct Payments Due to Farmers in 2010

Source: IFA Newsletter Spring 2010

* Expected that payments will relate to the number of months farmer is in the Scheme

The objectives of REPS are to:

- Establish farming practices and production methods which reflect the increasing concern for conservation, landscape protection and wider environmental problems;
- Protect wildlife habitats and endangered species of flora and fauna; and
- Produce quality food in an extensive and environmentally friendly manner.

Agri-Environment Options Scheme

Farms must apply under one of three Environmental Objectives: Biodiversity; Water; and Climate Change. A budget is planned for each objective. Only tillage farmers are eligible under the Climate Change objective. Within the chosen objective, farmers must choose at least two actions: One Mandatory and One Complimentary; OR Two Mandatory. All eighteen actions are available (with different rankings) on each of the three Environmental Objectives lists EXCEPT Wild Bird Cover is not available on the Climate Change list. Extra actions above the minimum two required may be chosen from any of the three categories: Mandatory; Complimentary; or Additional.

Application does not guarantee automatic entry. Choosing extra actions increases your chances of gaining entry to the scheme if there are more than 10,000 applicants. If oversubscribed, selection for admission to the scheme will be prioritised using a ranking system. Initially ranking will be based on a marking system. Every extra action undertaken attracts more marks. Undertaking more than the minimum requirement of any action does not attract more marks. Further selection will be applied in the following order: Location of farms in the Less Favoured Areas; Previous participation in REPS; Farm size (favouring smaller farms). Priority entry will be given to farms with NATURA land or commonage, for which a Sustainable Management Plan must be drawn up by a planner.

BurrenLIFE – Farming for Conservation

Key Principles of Farming for Conservation

'BurrenLIFE - Farming for conservation' is a new approach to managing our countryside. It is built on a number of important principles.

The central role of the farmer

The farmer is the key to farming for conservation. Firstly, farmers own the land of the Burren and the livestock needed to graze it. Secondly, farmers have the understanding and experience of how best to manage the land and livestock, knowledge that has been built up over generations. Thirdly, farmers are the ones with the most to lose and the most to gain from farming for conservation. Farmers need to play a vital role in planning, delivering, monitoring and promoting farming for conservation.

Partnership - pulling together

Farming for conservation does not rely solely on the farmer, it requires different agencies to work together and pool their skills. NPWS, Teagasc and the Burren IFA were the main partners in the BurrenLIFE Project. A team of ecologists, agronomists, economists and farmers helped deliver the programme. This approach was taken because in spite of differences in their interests and skills, groups and individuals who have a common objective can achieve more by working together than they would by working alone.

The importance of farm planning

Every Burren farm is different and must be treated differently. We need to know and understand a farm well before we can recommend management changes. Effective farm planning – where the farmer combines his or her expertise with that of a trained farm advisor - can help to create a template from which the farmer can work effectively in future years. Without such a plan, works undertaken may be haphazard and will probably fail to deliver the best possible result for the farmer and the Burren.

Being practical and innovative

Farming for conservation is based on sound, traditional principles of managing the land with respect and care, but is not an approach which seeks to 'turn the clock back' to old ways of farming. Instead, this is a practical approach which seeks to blend the best aspects of existing farming systems with new innovations and technologies to develop effective ways to feed and water livestock and to control scrub.

Being flexible

Farming is a highly unpredictable business and is increasingly so. Climate change is leading to unforeseen events, from floods to droughts. Markets are highly volatile and diseases new and old continue to impact on livestock. A farmer needs the flexibility to respond to unforeseen events. Farming for conservation sets out conservation goals and gives guidelines, advice and incentives to reach these goals, but ultimately, it allows the farmer the flexibility and discretion to deliver these goals as he/she sees fit.

An honest day's work for an honest day's pay

Farmers have the knowledge, skills and experience to farm for conservation. At a time when farming is not viable, farmer's need society's support to apply these talents for the benefit of the Burren. Farming for conservation is based on results – it doesn't just seek to support farmers per se; it supports active farming which helps to maintain or enhance the Burren's heritage. Under the BurrenLIFE project, money was paid to farmers only when work was completed and completed properly. In all cases the farmers also had to contribute a proportion of the cost involved whether in labour or money.

Creating real benefits

Farming for conservation will benefit the Burren and its communities. It will help to improve incomes and create new opportunities. It will help to protect the Burren's heritage for the people of the Burren so that they can enjoy it and hand it on in a condition of which they can be proud. It will help Ireland meet its legal obligations under the Habitats Directive, avoiding hefty fines for the Irish taxpayer. Society too will benefit from having this special place well looked after for this and future generations.

The importance of monitoring

Monitoring is essential to prove that farming for conservation does what it is meant to, and to show that it provides value for money. A rigorous monitoring programme, which confirms that work has been done to a high standard and has had a positive impact on the Burren's habitats, will help guarantee the future of 'farming for conservation' by proving to the taxpayer and tourist alike that this approach actually works. Monitoring is something we cannot afford not to do. *Source: BurrenLIFE, 2010*

Burren Farming for Conservation Programme

The BurrenLife Project (BLP 2005-2010) was the first example of a major farming for conservation project in Ireland. This project recognised the importance of farming in terms of its role in shaping and maintaining

many of the designated habitats of the Burren, e.g. limestone pavements, limestone heaths, orchid-rich grasslands, turloughs, semi-natural dry calcareous grasslands, lowland species-rich dry grasslands and lowland hay meadows, and the wider Burren landscape. During its lifetime, the project team, together with interested stakeholders in the Irish Farmers Association (IFA), Teagasc, National Parks and Wildlife Service (NPWS) and the farming community, developed a model for sustainable agriculture within the Burren, i.e. a model of agriculture which focuses on habitat restoration and conservation and also the economic viability of such a system.

Following the success of the BLP, the Department of Agriculture, Fisheries and Food launched its successor, the Burren Farming for Conservation Programme (BFCP) in April 2010. This is essentially an Agri-Environment Scheme, the measures of which are specifically tailored to the needs of the Burren landscape and rural community. The primary objectives of the scheme are:

- To ensure the sustainable agricultural management of high nature value farmland in the Burren';
- To contribute to the positive management of the Burren landscape and the cultural heritage of the Burren'; and
- To contribute to improvements in water quality and water usage efficiency in the Burren region'.

The scheme is voluntary and open to all farmers within the Burren region who have a minimum of two grazed Annex 1 listed habitats on their holding. One million euro has been made available to fund this scheme over each of the next three years (2010-2012). It is expected that this will fund 100-110 farmers to a maximum of €15,000 per annum. Payments will be made to farmers for the adoption of three measures:

1) The production of species-rich limestone grasslands.

This measure, with its system of bonus payments as grasslands increase in terms of their ecological quality, is designed to reward farmers who have looked after these habitats well in the past, but also provides incentives for those farmers who have not, so that they will improve in the future. The maximum payments under this measure are:

- 0-40 ha = €100/ha
- 40-80 ha = €50/ha
- 80-120 ha = €25/ha

2) Site enhancement works

This measure provides payments for landowners to undertake a range of works to improve aspects of farm infrastructure which are necessary for effective

Appendix 3 - Summary of REPS and Scheme Payments (Continued)

conservation. A proportion of the costs associated with the works are paid by the scheme and the farmer must pay the balance, e.g.

- Stone wall restoration; gate insertion; scrub removal and re-treatment and habitat restoration – funded up to 75%
- Provision of watering and feeding facilities – funded up to 50%
- Access provision and improvement – funded up to 25%
- Guideline payment rates are similar to the maximum rates within measure 1.

3) Protection of designated land and other areas of Annex I habitat

This measure provides an area-based payment for all designated and other areas of Annex I habitat on the farm provided that the landowner is not currently receiving a REPS or AEOS payment on the same lands, or feeding silage / large bales of hay. Payment rates are:

- 0-40 ha = €42/ha
- 40-80 ha = €24/ha
- 80-120 ha = €18/ha (DAFF, 2010).

Appendix 4 - Biodiversity and Fertility Costs



Biodiversity plays a key economic role in the maintenance of fertility. A greater understanding of how this works at farm level can be an important factor in reducing costs incurred in exclusive reliance on extensive fertiliser inputs to maintain fertility. Such reliance on inherent fertility is of course characteristic of organic farming, but has much wider application, especially in the economics of managing grassland.

Considerable emphasis is placed on the biodiversity value of extensive grassland. Extensive grassland is species-diverse, an important contributor to biodiversity and potentially the most widespread in occurrence. Trends increasingly evident in world resource exploitation make it likely that such grasslands will extend their cover in the medium to long term. The key driver will be economic: the cost of maintaining intensive pasture with this heavy dependence on increasingly expensive fertiliser inputs. There are in parallel with the other environmental benefits of improved water quality, the benefits to animal health and comfort, the improvement in product quality, and the opportunity to exploit all of these in marketing terms.

The multi-species sward of a more traditional form of agriculture / when managed with understanding, is scarcely less productive than the intensively managed ryegrass sward of the modern farm, it is more resilient in its ability to withstand drought and disease, it provides a healthier diet for grazing animals and it is far less costly, if more demanding of care and attention, and of ecological understanding, to maintain.

It is often the case that earlier techniques of land management became outmoded only because industrial interests were able to exploit the modest advantages of a more intensive approach for reasons which had more to do with commercial gain than because it was inherently better.

The extent to which the prevalence of the modern intensive system of grassland management is due rather to the very successful efforts of the oil and fertiliser industries to find a market for their products rather than to any great superiority is not generally recognised.

The nutritional advantage of multi-species grassland may come as a surprise to some but not to anybody familiar with the sophisticated agronomic practice of the late 19th and early 20th centuries. And apart from the nutritional arguments for a re-consideration of the best practice of the era that preceded the ryegrass revolution there is now a compelling economic

argument. With the introduction of the Single Farm Payment replacing the various cattle and sheep premia, arable aid payments and extensification premium from 2005 (and hence decoupled from production), many grassland farmers are reducing the amount of artificial fertiliser applied to grassland. The mushrooming price is an equally compelling consideration.

Under conditions of lower artificial input the responsiveness of ryegrass to higher nutrient levels can only be properly exploited on the very best soils. Under conditions of lower input, traditional mixtures perform better when properly managed. The race for the mind and heart of progressive agriculture was won by the newly ascendant artificial input-reliant approach to farming in the early decades of last century. But it was won by a narrower margin than many of us appreciate. And that narrow victory in the production stakes was dependent on relatively cheap artificial inputs, and when that advantage is withdrawn because we appreciate its cost in terms of hidden environmental, economic and social costs more fully the advantage lies with an older approach, endowed with the stamina of a performance that is essentially sustainable.

Replacement of ryegrass monocultures with a more traditional species-diverse sward that outperforms input-dependent ryegrass under conditions of lowered input and on poorer soils would not only give more optimal productivity but greatly assist agriculture to play its part in meeting the EU's twin targets initiatives to halt the loss of biodiversity. The EU sixth environment action programme specifies as one of its objectives the protection and where necessary restoration of 'the structure and functioning of natural systems' and halting the loss of biodiversity both in the European Union and on a global scale by 2010. That has implications for all sectors of society and of course most profoundly does it have implications for farming and rural land management in general.

There is a widespread lack of awareness of the sophistication and productivity of best practice within the agronomic systems prevailing immediately before the triumph of agrochemicals. It is time to blow the dust off the farming manuals that were relegated to the top shelf with the triumph of ryegrass, and breathe into their pages the new life that our modern understanding of ecology makes possible, in order to produce a regime of grassland management that is more productive under the changed circumstances, is more sustainable in relation to environmental quality, and utilises the inherent resources of the individual

Appendix 4 - Biodiversity and Fertility Costs

(Continued)



farm to the full. One of the many problems facing us is that we have become increasingly unfamiliar with these more traditional approaches, both in theory and practice. It is as though, when we peer into the past of agricultural history, a curtain of invisibility descends at about 60 years, and we think there was nothing of true value before this, before the advent of the prescription farming that so dominates our own time. One area of particular concern is the fact that not only are these methods not being taught or practiced, but the notion that they are only marginally relevant is allowed to persist (We need a new research agenda in grassland management). Things are not going to change overnight, but it is important for the farmer to keep it in mind, and be aware that there are alternatives.

Much of the reduction in biological diversity in the agricultural grasslands of northern Europe can be attributed to the burgeoning of agricultural inputs, especially fertilisers that accompanied intensification, resulting in the replacement of a species-diverse ecosystem with highly productive systems of minimal diversity. This is what the modernisation of grassland farming was all about: a pattern pioneered on more progressive farms in the late 19th and early 20th centuries, and then put forward as the model to be followed when it became possible to extend the intensive paradigm to middle and small-sized farms with the development of the CAP. But we have lost sight of the extent or may not be aware of the extent to which the superiority of the new system was promoted by eager advocates of the developing agrichemical industry. And with regard to the superior productivity of the new ryegrass-clover sward, it is not in fact all that much more productive, not in a league of its own as it were. The progressive advice given to farmers was to re-seed and liberally apply the fertiliser. Now that tide has turned and we appear again at the farm gate and tell the farmer the policy has changed. We need to reduce production, we need to restore lost biodiversity, and we need to stop eutrophication. But the best way to achieve this is not to simply reduce the number of bags of 10:10:20, resulting in an impoverished ryegrass pasture. It is to restore the traditional agro-ecosystem that maximises inherent fertility, not necessarily cut bag manure out, but make it largely redundant. Productivity will be lowered, but only by a moderate amount, and only to a level in balance with the new reduction in stocking rates; grazing animals will have a better, more balanced diet, there will be minimal pollution, biodiversity will approach its former levels. And, equally importantly for many of us, we may see the restoration to the farmer of something of the craft of farming which has been to a large extent lost to him, requiring as it does greater skill

than knowing how to apply inorganic fertiliser.

It is also likely that the benefits of a return to a more naturally balanced diet would include a reduction in methane emissions, although new research is required to establish this in other than anecdotal terms. This research should not be delayed, because such a reduction might contribute significantly to our international climate change obligations.

The improved agricultural grasslands associated with the more intensive system of modern agriculture are often dominated by perennial ryegrass *Lolium perenne*, which in combination with white clover *Trifolium repens*, can provide a high quality sward (Easton, 1996). The popularity of perennial ryegrass as the basis for these grasslands is due to a number of attributes, i.e. early spring growth, long growing season, ability to recover from numerous defoliations and other animal-associated disturbances, and its palatability (Stapledon, 1938). However, it is an aggressive, high nitrogen-demanding grass that is unable to survive at low levels of fertility (Lampkin, 1990). Its dominance within temperate grasslands coincided with the development of the fertiliser industry, which led to the widespread availability of relatively cheap fertiliser resulting in its widespread 'profitable' usage, i.e. a fourfold increase in the use of inorganic fertiliser to 20 million tonnes yr⁻¹ was recorded within the EU during the period 1950s-80s (Hammel, 2001), while Ireland experienced an almost eighteen-fold increase in the use of nitrogenous fertilisers between 1961 and 1990 (Cabot, 1985) and big investment in breeding new varieties.

While the high nitrogen levels give rise to productive perennial ryegrass swards, they also give rise to a competitive asymmetry among plant species (Shipley et al., 1994) leading to the exclusion of slower-growing and less invasive grass and herb species (Frame, 2000) and ultimately to the establishment of species monocultures. Within this system of grassland management, secondary grass species such as meadow foxtail *Alopecurus pratensis*, crested dog's-tail *Cynosurus cristatus*, Yorkshire fog *Holcus lanatus* and bent *Agrostis* species, sweet vernal grass *Anthoxanthum odoratum* and Timothy *Phleum pratense*, together with herbs such as ribwort plantain *Plantago lanceolata*, yarrow *Achillea millefolium* and sorrel *Rumex acetosa* are often considered to be weeds whose presence is not welcomed due to the belief that they give rise to lower dry matter yields, (Tallowin et al., 1999) produce forage of lower digestibility and therefore give rise to lower intake levels within animals (Bruinenberg et al., 2001;

Armstrong et al., 1986). This is because individuals within the mixture mature at different times, giving rise to varying proportions of plant tissue (leaf:stem ratios) and associated chemicals (Akin et al., 1990). In addition, these grasslands tend to be harvested later in the season than do the ryegrass monocultures (Bruinenberg et al., 2001).

However, opinions as to the feed value of multispecies grasslands are mixed, with Cooper and Morris (1983) reporting little difference between the feed value of many of the common grass species when they are compared at similar stages of growth. Bruinenberg et al. (2001) reported digestibility values for various species (*Poa pratensis*, *P. Trivialis*, *Elytrigia repens*, *H. lanatus* and *T. repens*) which were sufficiently high for them to be considered adequate forages for dairy cows. Even where digestibility and dry matter intake of silage made from multispecies grasslands is lower, milk production levels have been found to remain consistent with those from silage produced from species with higher digestibility values (Korevaar et al., 1997). This could be due to the potential of forage produced from multispecies swards to provide additional sources of micro nutrients and trace elements to animals (Sheridan et al., 2003; Tallowin et al., 1999; Rumball et al., 1997; Wilman et al., 1993). In addition a number of authors have reported positive relationships between grassland productivity and sward plant diversity. This relationship is believed to be due to complementarity between the species, i.e. because of their differing growth and rooting strategies, they are better able to utilise available resources (Nyfeler et al., 2009; Kirwan et al., 2007; Hector et al., 1999; Tilman et al., 1996). It is also believed that the diversity of species lends stability to the system so that it is better able to cope during times of disturbance (Tilman et al., 1994).

This is particularly important when one considers that forage consumption and intake directly influence approximately 90-95% of an animal's mineral supply (Rogers et al., 1989). Thus mineral deficiencies in grazing animals are largely determined by deficiencies in their diet. The majority of essential mineral elements are associated with one or more catalytic functions in the cell (McDonald et al., 2002). Among the conditions caused by mineral and trace element deficiency are abortion, stillbirth, death of young calves, infertility, retention of the placenta, scour, increasing susceptibility to infections such as pneumonia and mastitis, stiff joints and muscular weakness, and a general lack of thrive (McDonald et al., 2002; Rogers et al., 1989).

While the incorporation of herbs other than white clover into modern seed mixtures is largely ignored

today, Turner (1955) described the herbal ley as 'my manure merchant, my food manufacturer and my vet, all in one' (Turner, 1955). This was reflected in some of the seed mixtures which he recommended, where the herbal portion (not including legumes) accounted for over 30% of the total mixture. During this period of grassland research, there was a general appreciation that inclusion of herbs within the sward had benefits at numerous levels (Turner, 1955; Stapledon, 1938). For example, ribwort plantain has long been recognised as one of the most mineral-rich herbs available and Stapledon (1938) recommended its use where there were insufficient levels of Ca and P in the grazing animals' diet. Indeed he attached a similar importance to the inclusion of deep rooting herbs such as chicory *Cichorium intybus*, salad burnet *Sanguisorba minor*, yarrow *Achillea millefolium* and ribwort plantain *P. lanceolata*, within swards. These species can retrieve minerals from the lower layers of the soil profile, making them available to the grazing animal. Deep rooting species are also known to improve soil structure by increasing aeration and drainage (Culleton et al., 2002).

The global dimension

Looking at the situation globally it is very clear that farming has to change, though the change is likely to be slow and forced on us by circumstance rather than adopted in advance because it is the better thing to do. An important recent study by the Royal Society emphasises the need for agricultural sustainability if we are to meet the global challenge of being able to feed a projected 9 billion people by 2050. It regards any system that depends on non-renewable inputs as unsustainable (Royal Society, 2009). In the longer term these global developments will bring about a sea change in Irish agriculture. The replacement of external input-intensive rye-grass/clover grasslands by the more species-diverse and biodiversity-enhancing swards discussed above meets all the attributes considered by the Report to characterise a sustainable production system.

A sustainable production system exhibits most of the following attributes:

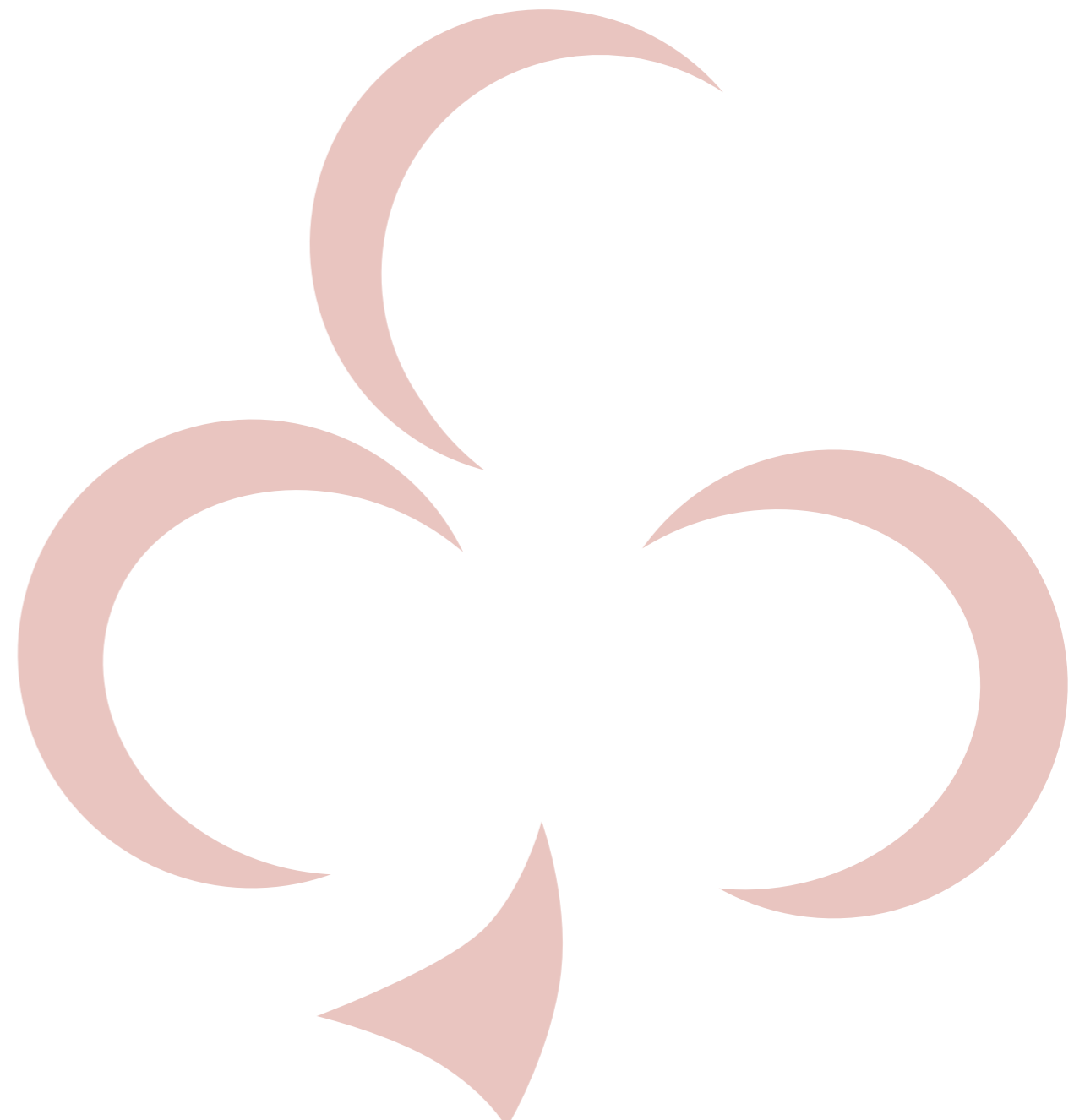
1. Utilises crop varieties and livestock breeds with high productivity per externally derived input;
2. Avoids unnecessary use of external inputs;
3. Harnesses agroecological processes such as nutrient cycling, biological nitrogen fixation, allelopathy, predation and parasitism;
4. Minimises the use of technologies or practices that have adverse impacts on the environment and

Appendix 4 - Biodiversity and Fertility Costs (Continued)



human;

5. Makes productive use of human capital in the form of knowledge and capacity to adapt and innovate and social capital to resolve common landscape-scale problems; and
6. Quantifies and minimises the impacts of system management on externalities such as GHG emissions, clean water availability, carbon sequestration, conservation of biodiversity and dispersal of pests, pathogens and weeds (Royal Society, 2009).





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