

THE IRISH AGRICULTURAL LANDSCAPE

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Introduction

Teagasc is the agriculture and food development authority in Ireland. It is the national body providing integrated research, advisory and training services to the agriculture and food industry and rural communities. Teagasc has an influence on the landscape through its Farm Advisory and Training Services and through its Research Programme. Research at Johnstown Castle in Wexford and the Rural Economy Research Centre in Athenry generates new technology and policy information to support the competitiveness and sustainability of Irish agriculture and to enhance the landscape and quality of life in rural Ireland.

The future of the landscape is dependent on the implementation of clear and effective policies that support desired landscape characteristics. This paper on the Irish agricultural landscape details the influence of farming on an ever changing landscape; examines how multiple policies impact on land use; and outlines how the adoption of Best Practice in landscape management is achieved.

AGRICULTURAL INFLUENCE ON THE RURAL LANDSCAPE

Prehistoric farming has been revealed at Céide, Co. Mayo, where Ireland's earliest agricultural landscape has been preserved beneath the blanket of peat for over 5,000 years. The most visible signs of ancient farming on the landscape, dating from the Early Christian Period (500-1200 AD), are the many thousand ringforts whose circular enclosures were essentially protected farmyards. Medieval monastic orders and Anglo-Norman settlers in the twelfth century brought considerable change and new technology to agriculture. They cleared woodland and founded towns, villages and medieval field systems.

In the sixteenth and seventeenth centuries, land ownership in large areas of the country was redistributed by force to English 'planters' and others. The smallholders generally became tenants. The 'agricultural revolution' involved the introduction of new crops, vegetables, trees, improved breeds of sheep and cattle and new systems of crop rotation. The agricultural boom of Napoleonic times, when there was a shift from pasture to tillage, helped fuel the population explosion in the century up to the 1840's.

Most of the lowland landscape was laid out in the eighteenth and nineteenth centuries when landlords forced tenants to enclose common land by establishing earth banks, stone walls and hedgerows. Enclosure of millions of hectares of land created the 'patchwork-quilt' appearance of the present rural landscape. Townland boundaries often date from medieval times or earlier and are of greater historical and cultural value. Field boundaries in the lowlands and east of the country contrast with the smaller dry stone walls of the west. Stone walls are the result of the labours of small landowners who reclaimed and 'made' land from the limestone dominated landscape.

Hedgerows are an integral part of Ireland's lowland agricultural landscape. In the book *Irish Hedgerows: Networks for Nature* (2004), aesthetics are used to explore how we see hedgerows in the landscape. They appeal to us visually. They give character and a sense of place to a particular landscape and give an identity to a townland or county, making it distinct from other areas. They are appreciated as part of a working landscape shaped by human hands over time. Order has been created by means of disciplined and judicious management through the centuries. This is evident in an intensively farmed landscape where human mastery and control prevail and are expected. The way we view hedgerows is enriched by an understanding of history, ecology, rural society or farming practices, all of which stimulate interest and deepen our aesthetic appreciation.

Ireland's landscape is enriched by its heritage of farm houses and outbuildings. The original occupants were often also the builders. They made clever use of materials available locally. Traditions followed were founded on experience of the climate, the locality and its resources. These vernacular buildings appear very much in harmony with their local setting.

Geology and soil type influence landscape. A Heritage Council case study of High Nature Value farmland in north Connemara illustrates this (Smith et al., in prep.). Siliceous rock types and poor parent material provide limited nutrients for overlying soil whilst influencing poor soil structure through its geochemical make-up. Compounded by high rainfall, nutrient leaching occurs. Subsequent waterlogging influences the colonisation of peatland species tolerant of poor soil conditions, which form large areas of peat that cover or 'blanket' the area.

Knowledge of the distribution of our soils and their properties is important to our understanding of the landscape. The Geochemical Atlas provides an overview of the chemical elements found in Irish soils. The development of an Irish Soil Information System, a Teagasc epa co-funded project, is currently under way and will be completed in 2013. The first soil survey in the '70s and '80s mapped the soils of approximately half of the country. The Irish Soil Information System is bringing together old and new and will support sustainable land use management.

The unique Irish agricultural landscape is valued by inhabitants and visitors alike for ecological, educational, aesthetic and economic reasons. It instills a 'Pride of Place' in people living in it and inspires those who visit. The 2008 Fáilte Ireland Visitor Attitudes Survey shows that the beauty of the scenery and hospitality of the people continue to be the most important reasons for visitors choosing Ireland as their destination. Ireland's tourism industry generates six billion euro for the economy annually.

FORCES OF LANDSCAPE CHANGE

In recent years, Ireland has experienced unprecedented urbanisation and landscape fragmentation due to widespread construction of housing and roads. This has affected open countryside as well as villages and towns in all parts of the country. Artificial areas (residential, industrial and commercial) are up twenty per cent between 2000 and 2006 (epa, 2008). Just as landscape evolved in the past, it will continue to change in the future with agricultural influences remaining significant.

The agriculture and food industry is Ireland's largest indigenous sector. It is of major importance to the economic welfare and development of the Nation and central to the socio-economic vitality of rural communities. It accounts for over half of the country's indigenous exports and almost one-tenth of the economy. The sector is likely to become even more important in the coming years as scientific and market developments find exciting new uses for natural resources and the key dairy sector expands substantially after the European Union (EU) quota system is abolished in 2015.

Teagasc undertook a Foresight exercise designed to establish a broadly-shared vision for the agri-food and rural economy in 2030 (Teagasc, 2008). Agriculture, forestry, the marine and their related processing sectors are on the cusp of profound change so it makes sense to redefine the sector into the broader concept of the bioeconomy, encompassing the traditional agri-food sector and a wide range of novel activities that can now be generated from natural resources. The four pillars of this future bioeconomy, identified by this exercise are food production and processing; value-added food processing; agri-environmental products and services; and energy and bio-processing.

Land use

An ever expanding world population, higher demand for food and increased use of land for the production of renewable energy crops could significantly change the look of the farmed landscape. Over the next twenty years all of Bórd na Móna's 80,000 hectares of industrial peatland will be exhausted of their peat reserves. Decisions on their subsequent use will influence the landscape of the midlands.

The present tillage area of 350, 000 hectares has decreased from a high of 1,867,000 hectares in 1851. By 2030, grass-based dairying will have fewer but generally larger farms producing twice the volume of higher quality milk as now. Grass will provide the basis for a significant beef industry. Sheep farming will remain an important enterprise on part-time farms and on some mixed large-scale farms and will provide a landscape management function on hills. Tillage farming will occupy 0.5 million hectares dominated by a relatively small number of large scale growers. The next twenty years will see an increase in the area devoted to traditional tillage crops and also to maize and energy crops.

Farm types

Within agriculture, we expect to see a continuing trend towards two contrasting farm types: large-scale full-time farms and small-scale part-time farms. Approximately forty per cent of farmers will retire in the next ten years and almost all farms will change hands at least once by 2030. The majority of Irish farms are family owned and entry to the industry through channels other than inheritance is rare due to the limited availability and high cost of land. For example, in 2002 just 0.1 per cent of the total farmland in Ireland was sold. Research shows that less than ten per cent of farm heirs plan to sell the farm with the majority (approximately seventy per cent) opting to farm on a part-time basis (Hennessy and Rehman, 2007). The extent of part-time farming will depend on the willingness of offspring to continue to hold at least one other job and the availability of additional local employment. Part-time farming is not just an option being pursued by new farm entrants, many full-time farmers are also choosing to supplement declining farm profits with off-farm employment. In general small-scale part-time farms are less intensive.

Climate Change

Climate change presents a particular challenge for agriculture to reduce greenhouse gas emissions (carbon dioxide, methane and nitrous oxide). Opportunities are presented in carbon storage or sequestration; biofuel production; and production of heat and electricity from biomass. Targets for the energy sector include the planting of 70,000 hectares of perennial biomass crops (miscanthus and willow) initially for the electricity and heat markets, but ultimately for second-generation biofuel production; and developing the capacity of existing biodiesel and pure plant oil industries to process up to 50,000 hectares of oil seed rape and all available beef tallow. Willow or miscanthus can also sequester significant quantities of carbon. Currently, 3,500 hectares of energy crops have been planted. Afforestation levels over the past five years averaged 8,000 hectares annually, giving a total of 730,000 hectares of forestry. The national strategic target is to expand forestry to seventeen per cent of the land area by 2030, which would increase carbon sequestration and energy production. This increased target area of energy crops and forestry would have a significant influence on the landscape.

Invasive Species

Some alien invasive species of flora threaten to alter the landscape they invade. *Rhododendron Rhododendron ponticum* forms dense thickets, out-competing native plants in woodlands. Japanese knotweed *Fallopia japonica* introduced as an ornamental plant has infested a wide range of habitats, including river banks. When it dies back in winter the banks are left bare and vulnerable to erosion. Curly leaved waterweed *Lagrisiphon major* is commonly sold as an oxygenating plant. It has had a serious impact on Lough Corrib, carpeting extensive areas, excluding light and restricting angling, boating and other water based activities. These are just some examples.

Species which are native can also be invasive, encroaching on land where it is not being grazed. Examples are blackthorn and even hazel in the Burren where scrub expansion is increasing by almost five per cent annually. Land abandonment is of increasing concern because of the decline in traditional agricultural practices which preserved unique landscapes and habitats of high ecological value. Poor market prices, alternative off-farm employment opportunities and certain agricultural policies favor land abandonment in remote, inaccessible areas often with difficult, unproductive soils.

POLICY IMPACT ON LANDSCAPE

Sustainable farming

In 2001, the European Council added the environment to its economic and social reform pillars to create the 'Gothenburg Agenda', ensuring that environmental protection is systematically integrated into all EU policies. Farms must be sustainable from an economic and environment point of view. To create the reality of a living countryside, people must be able to attain a qualitatively good standard of living. Increasingly, Irish farmers have become more dependent on direct payments for their income. Payments now account for 31 per cent of farm output and 103 per cent of average farm income. CAP and World Trade Organisation reforms in future seem certain to lower the level of taxpayer and consumer support for agriculture in general; in the long-run, direct farm income support is likely to be replaced by support for the development of the rural economy.

Multi-functionality

In addition to food production, farmers, as custodians of the countryside, deliver a wide range of important and socially valuable agri-environmental products and services which include the management of our landscape. Related services include the protection of water, air, biodiversity, archaeological heritage and the provision of recreational access to the countryside. Less obvious agri-environmental 'products' and services include a clean rural environment, prevention of land abandonment, maintenance of genetic diversity of farm animals and plants, control of weeds and pests, and mitigation of climate change. Agri-food systems also provide security of food supply, animal welfare, maintenance of natural amenities, oversight of rural development, contribution of land use and spatial policy and support of tourism. This is multi-functional agriculture. It provides an argument for the continued support of farmers.

In the Cork Declaration, the European Commission (1996) expressed confidence that there is acceptance of the need for public funding for management of natural resources, biodiversity and cultural landscapes, and that farmers have a duty as stewards of many of the natural resources of the countryside. The European Model of Agriculture embodied the concept of multi-functionality in 1997. Traditional payments under the first pillar of the CAP based on agricultural production account for almost ninety per cent of agricultural support funds and are unlikely to ensure the multiple outputs of agriculture now desired by taxpayers and consumers. Under the second pillar resources are being targeted towards measures addressing the multifunctional agenda of farming. A 2007 Communication on the CAP Health Check stated the aim of the European Commission for increased modulation or transfer of funds from pillar one to pillar two.

Teagasc research

In a Teagasc survey (Hynes and O'Donoghue, 2009) the general public's perception of farmers as custodians of the countryside was seen to be generally positive. While respondents were strongly against *'farmers maximising their income irrespective of the environmental consequences'*, they agreed *'farmers should be compensated when environmentally friendly farming costs more'*. In terms of the general public's preferences for future farm landscapes there appears to be little difference between those living in urban versus rural settings and those on higher versus lower income brackets. The conserved farm landscape is the most preferred indicating the Irish public value the range of agri-environmental products and services that farming delivers. Despite the publicity in terms of the benefits of bio-fuels and renewable energy, the landscape associated with this (rapeseed and wind turbines) was least preferred.

Using the generalized Tobit Interval model the average 'Willingness To Pay' for protecting the traditional rural landscape was estimated at €44 per person (Howley et al., 2009). Income and education had a significant and positive effect. Respondents with siblings involved in farming; with children; and those living in the countryside were also more willing to pay. Features associated with wider biological and cultural diversity of the countryside such as woodland, bogland, wild flora and fauna, water quality and features associated with cultural heritage played a more significant role in influencing 'Willingness to Pay' than more traditional and scenic features of farming activities such as open grass covered fields, grazing farm animals and well maintained farm buildings. The results

would indicate a strong justification for increasing the support for second pillar objectives under the CAP such as the protection of the rural landscape.

Policy mechanisms

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 can and have been learned from past policies resulting in undesirable landscape effects. Headage payments encouraged overstocking of sheep on upland peatlands. This resulted in overgrazing, loss of vegetation 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. Teagasc research in Leenane in Mayo has developed hill sheep production systems to assist the continued viability of producers while reducing environmental impacts.

Another undesirable landscape effect is scrub encroachment which can impact negatively on natural and cultural heritage. 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 (McCormack and O'Leary, 2004). Most were planted under obligation of Acts of Parliament in the eighteenth and nineteenth centuries. Until the 1970's, many hedgerows remained. Ireland's entry into the EU in 1973 brought about change with the EU agriculture support system helping farmers to modernise and increase productivity. 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. Hedgerows and drains on all farms receiving direct payments may soon become protected as landscape features under GAEC. Since 2004, under REPS 3 and REPS 4, farmers have undertaken to plant or rejuvenate an incredible hedgerow length of over 10,000 km, the largest planting in over 200 years.

Agri-environment schemes

Biodiversity strategies using trees, hedgerows, riparian zones and field margins have positive effects on the landscape. There were very positive conclusions from the study: Landscape Impact of REPS - a Quantitative Assessment (O'Leary et al. 2005). Through REPS, this generation of farmers will contribute a lasting positive impression on the landscape, becoming more evident over time as trees, hedgerows and other habitats develop. Over one million individual native broadleaved trees will be planted. Currently there are 62,000 farmers in REPS, all of whom are involved in the creation of new wildlife habitats on farms in every townland in Ireland.

Over 3,000 km of the stone wall network in the west is being maintained, preserving this unique landscape. One million euro is available each year for the conservation and repair of traditional farm buildings under REPS 4 Supplementary Measure 12. In partnership with the Department of Agriculture Fisheries and Food, The Heritage Council administers this grant for weatherproofing the exterior of farm outbuildings. Our rich heritage of archaeological sites and traditional farm buildings are valued under REPS. 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 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. in press).

THE ROLE OF TEAGASC IN LANDSCAPE MANAGEMENT

In accordance with the European Landscape Convention, ratified by Ireland in 2002, Teagasc has a role in increasing awareness of and promoting landscape policy. Given their prevalence, farm landscapes are crucial in regard to achieving landscape enhancement at a national scale (Bell, 1996).

Landscape Character Assessment (LCA) is regarded as a key tool for those involved in influencing the landscape. As it concerns all landscapes, not just those of high quality and value, it is relevant on all farms. A report for The Heritage Council recommended that LCA's be used as a targeting and monitoring framework for REPS (Martin and Farmer, 2006). Teagasc research found the language of REPS 4 reveals an expanded emphasis on landscape (Whelan, 2009). Recommendations were made to improve the framework for the treatment of landscape issues in future agri-environment schemes.

Not only are Ireland's landscapes especially rich in historic and cultural features, but historic landscape is a concept that people can readily understand and identify with, which at local level may be a key tool in raising landscape awareness. For example Historic Landscape Characterisation could influence measures undertaken on farms in agri-environment schemes.

When planning new agricultural buildings, farm advisers take account of Local Authority Development Plans and their objectives for the preservation of the character of the landscape; areas of special amenity; and landscape conservation areas; which may impact on the exempted development status of proposed structures. Teagasc has had significant positive influence on the development of quality farm buildings. Controlled by planning law and encouraged by grant aid, progress has been made in recent years encouraging building design, colour and landscaping in tune with the locality.

Teagasc's forestry programme gives Best Practice landscape advice using the Forestry and the Landscape Guidelines published by the Forest Service. These provide recommendations for various forest development scenarios and for four distinct landscape character types commonly found in Ireland: rolling moorland; rolling fertile farmland; drumlins; and mountain and farmland complex.

Adoption of Best Practice

The involvement of farmers, advisers, researchers, policy makers and funders in the design of schemes is important. Use of pilot schemes; monitoring and ongoing modification help to achieve the adoption of Best Practice. Multidisciplinary teams with production and environmental skills including basic and applied research using an effective model for technology uptake through the BETTER farm programme and discussion group network will drive the adoption and development of agri-environmental products and services. Examples of Teagasc Best Practice projects are the Lough Melvin Project in Leitrim and the Agricultural Catchments Programme. Researchers and advisers working closely with farmers at catchment scale facilitate the sharing of information and experience, thus speeding up knowledge dissemination and maximising its impact.

In the Burren LIFE Project, Teagasc are taking a lead role in the first major farming for conservation project in Ireland. It is on course to improve the conservation status of Burren habitats with associated landscape benefits. It focuses on the local farming community as key agents for ensuring effective conservation and uses farm-level management plans as the delivery mechanism for effecting change. A Blueprint of Best Practice management is being implemented, using new concentrate feeding systems on winterages developed with Teagasc specialist expertise. Transfer of this technology occurs through twenty Burren LIFE demonstration farms. Even in the Burren with its important species rich grasslands, choices regarding the desired landscape must be made as hazel scrub is also a priority habitat under the Habitats Directive.

Teagasc aims to provide evidence-based knowledge to support policymakers in designing, implementing and evaluating programmes; and develop quantifiable agri-environmental measures targeted at spatial variation and different farming systems. The support and advice that intensive systems need to meet basic levels of environmental regulation differ greatly from those required by extensive farming systems that receive payments to provide agri-environmental benefits.

The Teagasc Environment Programme is not just essential for maintaining biodiversity and prudent stewardship of natural resources; it also makes sound economic, commercial and financial sense. Sustainability is vital for future success and, significantly, the environment is now a 'product', with economic value, and is of immense importance to society. The result of Teagasc's environment research and dissemination programme provides a double dividend, or 'win-win' situation for farmers, the rural economy, the bioeconomy and Ireland as a whole.

Conclusions

Agriculture always has and will continue to mould the landscape. The landscape as we know it needs farming activity. Land use policies which shape our future landscape must ensure viable and sustainable farming systems. Teagasc has and will continue to influence the adoption of Best Practice landscape management.

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