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NATURE AND AGRICULTURE: A FUTURE OF DIVERGENCE OR CONVERGENCE?

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ABSTRACT

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Agriculture is a major contributor to biodiversity loss across the world and Ireland is not immune from the losses in plant and animal life. Yet despite the declines in certain plant and animal species across the country, agricultural intensification continues. This paper firstly considers the driver for agricultural growth and intensification. This is followed by an overview of the impact of agricultural growth and intensification on farm biodiversity. The case for nature-based farming as a means of mitigating these impacts is presented and there is consideration of the supports needed for such approaches and some examples of existing support programmes. The paper concludes with a discussion detailing that an agricultural policy with food production as the only market outlet will lead to further biodiversity declines. To reverse this, within a subsidised agriculture there needs to be a market for the supply of other services such as biodiversity. Otherwise, the farmers are carrying the costs of providing these other services, which is unsustainable.

INTRODUCTION

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Feeding a continuously growing world population has required an associated increase in food production. From 1980 to 2000, the total global population grew from 4.4 billion to 6.1 billion, which was accompanied by a 50% increase in the world food production (FAO 2009). The increase was achieved through the expansion and intensification of agriculture which has improved food security globally. Historically agricultural intensification has focused almost entirely on yield delivery, largely neglecting the cost of detrimental effects to broader ecosystem services provision (Dornbush and van Haden 2017). This intensification process has resulted in the destruction or damage of natural ecosystems, and the ecosystem services they provide becoming degraded or lost (MEA 2005) at a national and international level.

The main driver behind agricultural intensification has not changed, and with the world's population expected to increase by 2 billion persons in the next 30 years from 7.7 billion to 9.7 billion in 2050 (United Nations 2019), there will continue to be a demand on the world's natural resources. This demand has raised concerns regarding the associated loss of biodiversity in terms of natural ecosystems and the loss of species that are vital in maintaining a particular agricultural system. For example, pollinators are a key component of global biodiversity, providing vital ecosystem services to crops and wild plants. Yet there is clear evidence of recent declines in both wild

and domesticated pollinators, and parallel declines in the plants that rely upon them (Potts *et al.* 2010).

Despite these concerns the market prices offer farmers little incentive to conserve biodiversity, and international conservation efforts tend to focus on the protection of biodiversity hotspots or ecoregions and pay little attention to agriculture (Perrings *et al.* 2006). Although recent reforms of Europe's Common Agricultural Policy (CAP) indicate that the situation is changing, the European Court of Auditors recently concluded that such reforms, as currently implemented, are unlikely to be beneficial for soil quality, carbon sequestration and biodiversity (European Court of Auditors 2017). This would suggest a new approach is required or else the prospects are gloomy for biodiversity within agriculture.

This paper firstly considers the driver for agricultural growth and intensification. This is followed by an overview of the impact of agricultural growth and intensification on farm biodiversity. The case for nature-based farming as a means of mitigating these impacts is presented and there is consideration of the supports needed for such approaches and some examples of existing support programmes. The paper concludes with a discussion detailing that an agricultural policy with food production as the only market outlet will lead to further biodiversity declines. To reverse this, within a subsidised agriculture there needs to be a market for the supply of other services such as biodiversity. Otherwise, the farmers are carrying the costs of providing these other services, which is unsustainable.

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THE DRIVE FOR AGRICULTURAL GROWTH AND INTENSIFICATION

The world's population is expected to increase by 2 billion persons in the next 30 years, from 7.7 billion to 9.7 billion in 2050 (United Nations 2019). With such population increases, intensification of agriculture is likely to continue, especially in countries with good infrastructure and a climate suitable for crop and grass growth.

As part of the Irish economic policy the government produced a national strategy for the agri-food sector, set out in Food Wise 2025 (DAFM 2015), which identified growth projections for the industry over the next ten years. The targets include an 85% increase in exports, 70% increase in value added, 65% increase in primary production and the creation of 23,000 additional jobs all along the supply chain from producer level to high-end value-added product development. Progress to date indicates the achievements, with growth in agri-food exports of 70% since 2009 (Government of Ireland 2019), through a continued rise in intensification.

On individual farms, farmers continue to look at ways of improving financial returns. With little control over historically based farm subsidy payments, this can only be achieved through increasing the agricultural output or improving the overall efficiency of the farm by reducing variable and/or fixed costs. In general this improves the overall efficiency of the agricultural industry but at the expense of biodiversity. High Nature Value (HNV) farming systems are usually associated with high levels of semi-natural vegetation and low stocking rate and therefore returns are poor. This is reflected across Europe, with these farming systems becoming unprofitable and thus disappearing due to both intensification of agriculture and abandonment of unprofitable land (Halada *et al.* 2011).

Consider grassland as an example in terms of maximising biodiversity value against maximising agricultural food output. Many of the practices essential in maintaining biodiversity, such as late cutting or little to no fertiliser input, differ from those required for a more intensive system where emphasis is to maintain grassland in a vegetative state as the fresh growth is of higher nutrient content. This involves either replacing existing swards through ploughing, renovating the sward by introducing new species or rejuvenating by change of management, often with addition of fertiliser and drainage (Soffe 2003). This is and has been the basis of advice supplied to farmers through advisory organisations (Teagasc 2011; CAFRE 2020). Changing the composition of semi-natural grasslands can be achieved with small changes in management. Results from research at Castle Archdale Experimental Centre in County Fermanagh showed that applying fertiliser to existing swards could bring about considerable yield increases (O'Neill 1981). The study showed

that for every 1kg of additional nitrogen there was a 21kg dry matter/ha increase in yield on *Molinia* meadow swards. A reduction of half of the total number of plant species can be observed for fertiliser rates between 20 and 50 kg of nitrogen per hectare per year and the average number of wildflower species is low where nitrogen inputs exceeded 75kg of nitrogen per hectare per year (Plantureux *et al.* 2005). In agricultural production terms such fertiliser applications would be considered as low. For example, the 'Low Input Permanent Pasture' option under the GLAS scheme allows fertiliser levels up to 40kg of inorganic nitrogen, which, based on research, would lead to a reduction in half the total number of plant species.

The agricultural system involved in the production of hay is characterised by a high level of botanical diversity, with meadows used for hay-making often having a particularly large number of broad-leaved herb species and supporting large populations of insects and birds (Eakin 1994; Wilkins 2000; Riley 2005; McGurn 2008). However, there has been a massive decline in hay production due to weather constraints and better animal performance with silage-based systems. Silage making is not as weather dependent as the conservation of grass as hay, and grass can be cut at an earlier stage of growth. The maturity of herbage at harvest is the most important factor affecting the nutritive value of silage (McIlmoyle and Steen 1979). Certain grasses are more suitable for silage production. Wilson and Collins (1980) compared a range of grasses found in permanent swards and concluded that perennial ryegrass (*Lolium perenne*) and Italian ryegrass (*Lolium multiflorum*) were considered easier to preserve successfully than other grasses. Keating and O'Keily (2000) compared silages made from a perennial ryegrass sward and from previously well-managed, agronomically productive old pasture of diverse botanical composition. The perennial ryegrass silage produced more beef per carcass per hectare. Thus, economic drivers in modern grassland management on Irish farms mitigate against biodiversity.

THE IMPACT OF AGRICULTURAL GROWTH AND INTENSIFICATION ON FARM BIODIVERSITY

The associated effects of intensification of agriculture on the environment have been documented (Vickery *et al.* 2001; Beckmann *et al.* 2019), as have the threats posed by agricultural change to biodiversity (Krebs *et al.* 1999; Petit *et al.* 2001; Donald *et al.* 2006; Dudley and Alexander 2017). Beckmann *et al.* (2019) found that, across all production systems and species groups, conventional intensification is successful in increasing yield but it also results in a loss of species richness.

The effects of the intensification of agriculture on the environment in Ireland are evident. The Water Quality in Ireland 2013–2018 report states that just 52.8 per cent of surface water was found to be in ‘satisfactory ecological health’. The remaining 47.2 per cent was deemed to be in a moderate, poor or bad ecological state (EPA 2019). Nutrients from agriculture are considered a significant pressure in about 50 per cent of vulnerable watercourses (EPA 2019), with a net decline of 5.5% in the status of river water bodies since the previous assessment.

Habitat condition assessments also highlight a continuing decline in habitat quality, with agricultural practices impacting negatively on 70 per cent of internationally important habitats in Ireland (NPWS 2019). The recent assessment of EU-listed habitats and species in Ireland (NPWS 2019) found 85 per cent of habitats are reported as having ‘unfavourable status’ (46 per cent ‘unfavourable inadequate’ and 39 per cent ‘unfavourable bad’), while 46 per cent are demonstrating ‘ongoing declines’.

At farm level, declines in biodiversity associated with a higher intensity of farming have been recorded. O’Brien *et al.* (2008) reviewed the national available literature and found that conventional methods of crop cultivation have an adverse impact on the level of biodiversity on Irish farms, with 15 out of 21 studies showing negative trends. McMahon *et al.* (2008) compared farms with a range in the level of habitat diversity and found direct evidence that the number and diversity of habitat types on a farm has a positive significant effect on bird species number.

CURRENT INCENTIVES TO MITIGATING THE IMPACT OF AGRICULTURAL GROWTH ON THE ENVIRONMENT

Following its introduction in the 1960s, the Common Agriculture Policy (CAP) supported European farmers to achieve the Treaty of Rome’s objectives of increasing productivity and ensuring food security. Intensification was actively sought and encouraged resulting in increased pressure on the environment. Despite this approach farmland with an associated High Nature Value (HNV) is still present throughout Europe and is dependent on the continuation of an agricultural system. Halada *et al.* (2011) identified the habitat types listed in the Habitats Directive Annex I that require low-intensity agricultural management for their existence. Of the 231 habitat types listed, 63 are dependent on the continuation of agricultural practices; thus, it is clear that agriculture has an irreplaceable role in the maintenance of these habitats at large spatial scales. In an Irish context, such habitats include *Molinia* meadows (6410), Machairs (21A0), Northern Atlantic wet heaths (4010), European dry heaths (4030) Calcareous grasslands (6210), *Nardus* grasslands (6410) and Lowland hay meadows (6510). Ireland reports to the European Commission every

six years on the condition status of the Natura 2000 sites under Article 17 of the Habitats Directive, the results of which are a good indication of how well protected these habitats are. Based on this assessment, of the 7 habitats listed above, 6 are deemed to be in bad condition and one (Machair 21A0) in inadequate condition. A recurring theme is that the main threats are agricultural intensification and inadequate grazing regimes leading to both overgrazing and undergrazing for different areas. This would indicate that the present CAP system is not delivering in protecting farmland biodiversity.

Reforms of the CAP have aimed to overcome the negative externalities associated with production supports and to incorporate positive environmental aims (Bouwer and Lowe 2000). In the 2003 CAP reform there was a shift from headage payments to decoupling. The new programme broke the link between production and support. Instead, farmers observe certain conditions (known as Cross-Compliance) in return for receipt of direct agricultural support. Cross Compliance requirements were first introduced in 2000 in a limited format and developed further under subsequent reforms. Cross Compliance is implemented under two main areas; Statutory Management Requirements (SMRs) and Good Agricultural and Environmental Condition (GAEC) standards. They are intended to provide protection to the environment and promote biodiversity over production (DAFM 2016). The 2016 CAP reform introduced the Basic Payment Scheme (BPS). Incorporated into this is a greening payment in return for certain agricultural practices beneficial for the climate and the environment. The measures involved are in addition to Cross Compliance obligations and involve Ecological Focus Areas (EFAs), Crop Diversification and Permanent Pasture. For Ireland, all farmers eligible for payment under the BPS Scheme are subject to greening but only the arable sector has obligations under greening. If a farmer has more than 15 hectares of arable land, they need to declare at least 5% of ‘Ecological Focus Areas’ on that arable land. The management of Permanent Grassland is done at national level and, therefore, no requirements are placed on individual farmers (DAFM 2016).

Do the existing policies protect small, species-rich fields? Under greening they are not an EFA nor is it necessary to retain them as permanent pasture at a farm level. There is a requirement under the rules where the conversion of previously uncultivated land or semi-natural pastures to improved grassland requires an Environmental Impact Assessment. However, there are minimum thresholds of 5ha to intensify agriculture production or above 15 hectares to carry out land drainage works on lands used for agriculture (DAFM 2017). Therefore, areas of semi-natural vegetation can still be agriculturally improved within the existing rules, so the

present policies are clearly not maintaining or encouraging positive environmental aims. The weaknesses in the greening measure in the 2016 CAP reform were highlighted by the European Court of Auditors who concluded that greening, as currently implemented, is unlikely to be beneficial for soil quality, carbon sequestration and biodiversity, mainly due to the low level of requirements. They estimated that greening has led to a change in farming practice on only around 5% of all EU farmland and made a number of recommendations on how to design more effective environmental instruments for the Common Agricultural Policy post 2020 (European Court of Auditors 2017).

CAP reforms also included other measures for farmers to mitigate the environmental impact of agriculture. Since 1994, it has been compulsory for each EU member state to have agri-environment schemes (AES). These are the mechanisms through which farmers are financially rewarded for farming in an environmentally friendly manner thereby maintaining and protecting biodiversity within the farmed landscape, above the requirements of Cross Compliance.

Approximately 25% of the EU's utilised agricultural area is under AES contracts with farmers, including organic farming, and expenditure for 2007–13 was approximately €23 billion. Agri-environment schemes provide financial support for member states to design and implement agri-environment measures (AEM). These measures should have a specific environmental objective such as the protection or enhancement of biodiversity, soil, water, landscape, air quality or climate change mitigation or adaptation (Science for Environment Policy 2017). In Ireland, schemes evolved over the years from the Rural Environment Protection Scheme (REPS 1, 2, 3 and 4) to the Agri-Environment Options Scheme (AEOS) introduced in 2010 with AEOS 1, 2 and 3; and currently the Green Low Carbon Agri-Environment (GLAS) scheme. For the period 2014–20 a total of €1.23 billion has been allocated to agri-environment schemes in Ireland, of which €895 million has been paid to date to farmers (personal communication DAFM).

In a subsidised agricultural system incorporating measures to protect the environment and with €895 million spent on agri-environment schemes in the period 2014–20, one may assume that sufficient enticements exist to maintain these habitats whilst remunerating the farmers for their management. However, it should be emphasised that these schemes are voluntary and compete against economic drivers on many farms to increase profitability via increased production. From a purely business point of view, the financial incentive to the farmer entering any of these schemes has to equal or outweigh any proposed profits achieved through increased production to be attractive for the farmer. The continued

declines in water quality and the present condition of many of our designated sites quoted earlier indicate that the present approach is not working.

SUPPORTING NATURE-BASED FARMING IN CAP REFORMS

The CAP governs the future direction of agriculture, forestry and rural development in the EU and the implementation of CAP in Ireland will determine future nature conservation within the agricultural industry. Improving nature conservation on farms will depend on the policies developed at an EU level and how they are implemented at country level.

Post 2020 CAP reforms are proposing measures towards tackling climate change, protecting the environment and preserving landscapes and biodiversity. The proposals include an improved system of conditions ('conditionality') to be met by farmers receiving area-based CAP payments and a complementary set of (voluntary) tools to be offered to farmers to help achieve the CAP environmental and climate objectives (European Commission 2019). The voluntary tools—called eco-schemes—are payment schemes for care for the environment and climate which will be funded from member states' direct payment budgets (in CAP Pillar I). They are mandatory for member states but voluntary for farmers and it is envisaged that between 20–30% of the value of Pillar I direct payments will be dedicated to these schemes. The requirements laid down in a given eco-scheme must go beyond those of baseline conditionality. This is viewed as a new approach to target and tailor direct payments to support farmers who wish to transition towards more sustainable farming practices and systems (Meridith and Hart 2019). Such eco-schemes are not looked at as a replacement to agri-environment schemes but allow the possibility of a more targeted approach for agri-environment measures in the High Nature Value areas of the country. Finally member states must also make provision for agri-environment climate measures (AECM) funded under Pillar 11.

Within the Commission's proposal, member states will have greater flexibility in deciding how best to meet general and specific objectives of the CAP. Member states will be responsible for drawing up a CAP strategic plan, setting out targets to be achieved over the subsequent programming period. This proposed approach will provide an opportunity for member states to tailor the instruments and measures of the CAP to address their specific needs and the issues of declining biodiversity. Ireland's approach in developing its CAP strategic plan will play a central role in determining the future of Ireland's biodiversity, particularly how it implements the three main tools, improved baseline conditionality,

eco-schemes and agri-environment climate measures (AECM).

Based on DAFM's Foodwise 2025 and the present infrastructure of the agri-food industry, it has to be accepted that a relatively intensive agriculture system will continue in certain areas of Ireland. Whilst Foodwise 2025 acknowledges the role of the sector in maintaining the environment, there is no emphasis placed on the intrinsic value of biodiversity. With rising fuel and fertiliser prices and climate change, the system may adapt but with Ireland's natural advantage in relation to grass growth productivity (Creamer and O'Sullivan 2018), the country has a competitive advantage over other EU producers and continued good grassland management means farmers can minimise other inputs, such as imported feed sources, while achieving the same levels of animal performance. The implementation of CAP reform within Ireland needs to be flexible to accommodate this, recognising that improvements in nature can be achieved on intensive farms and supply sufficient support to ensure HNV can survive without associated intensification.

The detail of the new proposed CAP will determine whether there is a divergence or convergence between nature and agriculture. The status quo will lead to further declines in biodiversity. Whilst the new proposed CAP looks promising, just replacing the BPS and greening payments with enhanced conditionality and eco-schemes associated with non-targeted agri-environment measures with no changes in their overall objectives, will mean continuation of biodiversity decline.

The next CAP needs a new approach. Enhanced baseline conditionality would set the minimum standards for farmers to keep agricultural land in GAEC. These baseline conditionality requirements need to acknowledge the ecosystem services provided by non-farmed and farmed semi-natural areas to the whole landscape. Basically a farmer would not have to exclude certain areas of the farm that are deemed ineligible as in previous CAP policy. The shift from headage payments to payments per hectare in past reforms saw many areas of habitat within a farm being ineligible for payment. Despite cross compliance this led to widespread 'cleaning' of land by farmers to ensure eligibility and reduce the chances of occurring financial penalties. A change in definitions to include land with agricultural activity delivering a range of ecosystem services and not just limited to food production will mean that small areas of scrub, woodland, small ungrazed areas within a grazed habitat can still be eligible, reducing the threat of their removal.

Eco-scheme payments must be only available on farms with a higher level of environmental benefits, linking payments to farmers with existing biodiversity on the farm rather than a general payment that all farms are eligible for due to low threshold criteria.

This could be for areas of semi-natural habitat based on a percentage of the total area and/or related to specific landscape features. For example, a farm could be required to have a minimum of 10–20% semi-natural vegetation that includes native woodland, species-rich grassland and heathland. Where such features are absent or scarce on the farm, then farmers could have the option of adding natural value to the farm by increasing more permanent features such as hedgerow planting, native tree planting, and pond creation. Based on the amount of semi-natural vegetation and landscape features present on a farm, a score can be given and payment is based on the farm having a minimum score. This should include a tiered structure, with higher payments for higher points. Farmers under the minimum threshold could propose work at the beginning of the application period and have it completed within the period. Advances in remote sensing in determining land-cover types can aid in the administration of such an approach. This can be supported by ongoing work delivering a new high-resolution national baseline land-cover and habitat-mapping datasets (NLCHM 2017). These measures create a market for biodiversity and put a value on the maintenance and enhancement of the level of biodiversity on the farm, and enables farmers to maintain payment levels under the previous CAP, providing they have the habitats or are willing to add additional works.

AECM measures can aid in the management of targeted sites and should be available within a two-tiered approach. The first tier would be a simple action-based approach, similar to GLAS, that supplies a range of actions to compliment the eco-scheme, encouraging farmers who have met the minimum points already for the eco-scheme to consider completing non-profit investments that may not normally be considered as part of farming practise. Such investments could include hedgerow options, arable options, provision of buffer zones and some targeted species-specific management options, pollination strips, management of riparian zones and specific management of semi-natural areas on the farm.

The second tier would aim to encourage favourable management of habitats rather than retention and reward the farmer for the quality of output. Research by Kleijn *et al.* (2009) indicated that conservation benefits are disproportionately more costly on high-intensity than on low-intensity farmland and that conservation initiatives are most cost effective if they are implemented in extensively farmed areas that still support high levels of biodiversity. The AECM measures should be targeted towards HNV areas. To date agri-environment measures have been applied at a country level with a one size fits all approach, despite the variation in farming systems. These range from the extensively grazed grasslands of the Aran Islands to the intensive grasslands of the Cork lowlands. Considerable work has

been completed in Ireland on defining the HNV farmland areas in Ireland. Matin *et al.* (2016) looked at the distribution and extent of HNV farmland and developed a map that provides an indication of the likely presence of such farmland.

Offering an alternative market with payment for management of a habitat in HNV farmland areas gives the farmer a choice: continue with the more intensive approach or provide a service where the nature capital on the farm is maintained and/or improved and the farmer receives a higher level of support payments. The design of the agri-environment programmes in this tier should be results-based with a range of complementary actions. Results-based agri-environment schemes pay not for performing specific management actions (such as mowing or grazing on set dates), but for achieving set environmental outcomes, such as a species-rich grassland or the promotion of an endangered species (O'Rourke and Finn 2020). Within results-based payments the farmer is free to choose the most appropriate management to achieve the prescribed result, and payments reflect the level of achievement. Higher quality habitats result in higher associated payments; this has been a weakness in previous agri-environment measures with Ó hUallacháin *et al.* (2016) reporting that the botanical composition of selected grassland habitats managed under the AEOS scheme varied greatly but was not reflected in associated payments. They called for increased prioritisation of targeting aimed at species and habitats that are of the highest conservation concern and an evidence-based approach linked with differentiated payment rates. This is the principle of a results-based approach.

EXAMPLES OF EXISTING PROGRAMMES FOR NATURE WITHIN AGRICULTURE

Within Ireland there are examples of targeted results-based projects dealing with nature in an agricultural context. O'Rourke and Finn (2020) detail different targeted approaches in the Burren (BurrenLIFE, Burren Farming for Conservation Programme), the Aran Islands (AranLIFE), the Pearl Mussel Project in Kerry (KerryLIFE), the Results Based Agri-environmental Payment Schemes (RBAPS) project in Leitrim and elements of the National Parks and Wildlife Farm Plan Scheme. Although such projects were targeted at a number of farmers in relatively small areas, the principles could be applied in other areas.

Further examples exist in a number of projects under the European Innovation Partnership for Agriculture Productivity and Sustainability (EIP-AGRI). These programmes range across farming systems; for example, the BRIDE project is working in the more intensive dairying system, whilst Caomhnú Árann, a follow up project to AranLIFE, is working with small extensive farms managing

species rich calcareous grasslands. Other projects with a results-based approach include an upland area project named the Blackstairs Farming Futures and Protecting Farmland Pollinators in the mid-east region. There are also projects dealing with specific species such as the Pearl Mussel EIP, the Hen Harrier project and the Curlew Conservation project—a hybrid agri-environmental scheme combining a results-based approach with some prescriptive elements specifically for Curlews. Such projects are not restricted to HNV areas (Results Based Payments Network 2020).

Details of the Caomhnú Árann, Hen Harrier Project and Pearl Mussel Project are provided elsewhere in this journal.

DISCUSSION

Maintaining and enhancing biodiversity within farming systems is, and will remain, a challenge. HNV farming systems have higher associated biodiversity and are associated with high levels of semi-natural vegetation and low stocking rate, and therefore conventional agricultural returns are poor (Halada *et al.* 2011). Where the only market for farmers on HNV farmland is the sale of agricultural produce, to improve income farmers will either choose a higher level of production by intensifying or if this isn't possible cease farming or farm at sub-optimal grazing rates; both approaches lead to habitat degradation. Many of our main habitats and biodiversity hotspots within Ireland are dependent on a particular agricultural system and the declines in biodiversity can be traced to changes in those systems. Within the farming community, there will always be farmers who continue with a system that maintains isolated areas of species-rich grasslands, continuing with a hay system over silage and/or extensive grazing management systems with no fertiliser inputs. With the overall decline in levels of biodiversity, it is evident that such contributions, whilst important, are not enough to maintain a high level of nature in Ireland's total farmland. Relying on altruism in maintaining biodiversity on farms will lead to continued decline.

The intensification of farming will continue. With a growing world population and with Ireland's economic policy aiming for a 65% increase in primary production, reverting to a less intensive system is unlikely. The major issue presently is that whilst farmers receive a level of support through subsidy to improve income, agricultural output remains the only revenue-raising path to follow and the existing support mechanisms are failing in maintaining biodiversity levels on farms. As a society we cannot expect the farmer to maintain species-rich meadows if it makes more economic sense to fertilise the field, graze it

tighter and encourage a more grass-dominated sward or to convert to forestry. Otherwise, the farmers are carrying the costs of providing the services that society wants. That is unsustainable.

To be successful, policy supports need to create a market for environmental services as an alternative to the existing market for agricultural produce. This support needs to be more than just supporting farmers' incomes and maintaining existing management practices—it needs to be linked to results. With three billion Euro paid out in the Rural Environmental Protection Scheme between its inception in 1994 and 2010, there is an argument that this is already happening. However, with continuing declines in biodiversity (NPWS 2019), it is evident that these are not achieving the desired objectives.

Under the proposed new delivery model for CAP post 2020, there are opportunities for policy support that recognises and rewards the presence of biodiversity on farms with a results-orientated approach. The three main components of the new proposals (baseline conditionality, eco-schemes and agri-environment climate measures (AECM)) need to be designed to target support to farmers with a higher level of biodiversity on their farm. With member states having greater flexibility in deciding how best to meet general and specific objectives of the CAP, Ireland's approach in developing its CAP strategic plan will play a central role in determining the future of Ireland's biodiversity.

Setting minimum thresholds for support under eco-schemes has great potential and if the payments are tiered, areas with higher biodiversity on the farm become value to the farm and worth keeping. Credited programmes like Origin Green—the industry's food and drink sustainability programme—could link in with eco-schemes as a basic minimum entry, adding market value to the way food is produced.

AECM measures can be targeted to HNV farmland areas for improved habitat management as this approach offers the best use of financial resources. The ongoing work of the Burren Programme, Caomhnú Árann, Hen Harrier Project and Freshwater Pearl Mussel Project shows that results-based incentives appeal to farmers, as such incentives demonstrate high levels of engagement, produce measurable results and also receive positive reaction from the wider community (personal communication). The built-in measurable scoring system details the results, acting as a ready-made monitoring system that facilitates verification for the funding bodies. In the longer term linking the result with financial gain will change policy from an agricultural produce output to a biodiversity output. Biodiversity will then become an important aspect of the farm where presently for the industry it is of limited importance. Farmers will begin to develop a business attitude to the delivery of public goods and biodiversity will be the beneficiary.

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