Spending Review 2019

Beef Data Genomics Programme

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Executive Summary

The Irish beef sector is a key indigenous industry with 615,000 tonnes of output produced in 2017, valued at €2.5 billion (6% increase on 2016), representing 20% of the total agri-food exports. Ireland was the fifth largest exporter of beef in the world in 2017. Food Wise 2025, a ten year plan for the agri-food sector, credits the Irish beef sector as one of the principal drivers of success in international markets.

The development of the beef sector must be considered within the context of environmental sustainability obligations which are a key policy focus for international agriculture. The Paris Agreement in 2015 recognised that the efforts to limit global temperature increases and environmental degradation must do so in a manner that does not threaten sustainable safe food production. Irish agriculture contributed 32.3% to the total Green House Gas (GHG) emissions in 2016 and 44% of non-Emissions Trading Sector.

The Beef Data and Genomics Programme (BDGP) is one of a range of sustainability actions for Irish agriculture under Ireland’s Rural Development Programme (RDP) 2014-2020. The objectives of the BDGP are:

- To improve the genetic merits of the national beef herd through the collection of data and genotypes of selected animals which will allow for the application of genomic selection in the beef herd; and
- To lower the intensity of GHG emissions by improving the quality and efficiency of the national beef herd.

Participants must undertake a range of actions to ensure compliance including:

- a mandatory training course; and
- the completion of the Carbon Navigator online tool that raises awareness in the sustainability of production.

A centralised database is key to the programme with data feeding into a genomics based index communicated through a Euro star rating system. Animals are ranked according to their efficiency on a scale of 1 to 5 with 5 star being most efficient. The inclusion of genomic data ensures a superior predictor of future performance and identifies areas to improve.

The programme budget is co-funded by the EU at a rate of 56% under measure 10 of the RDP to run the programme and 53% for measure 1 which covers training. Payment rates are based on costs incurred and income forgone excluding any economic gains. Some of the key descriptive statistics to date include:

- Payments totalling €179m have been issued from 2015-2018;
- Approximately 24,800 suckler beef farmers are enrolled;
- Approximately 580,000 suckler cows are enrolled;
- Payments refer to the number of cows calved in the reference year of 2014, with were converted to a per hectare basis using a stocking density, at a rate of €142.50 for the first 6.66 hectares and then €120 for the remainder; and
- The average payment is €2,053 for farms with 24 suckler cows.
As the BDGP payments are capped on a specified stocking rate, it does not incentivise the keeping of additional stock. In contrast, the focus is to improve existing herds by replacing inefficient cattle of lower genetic merit (i.e. 1 or 2 stars) with higher rated stock (4 or 5 stars) to improve performance. The number of higher rated animals in the national herd has increased since the introduction of the BDGP, with a decrease in lower rated stock. Although a longer time frame is necessary to evaluate the cumulative benefits associated with genetic improvements attributed to the BDGP, preliminary evidence indicates positive gains in performance. These include:

- Calving interval days have been reduced (-20 days);
- The number of calves per cow per year has increased (+0.08); and
- The percentages of births with known sire (+8%) and AI bred (+2%) have increased.

The value of the animals as represented by their replacement index value shows that BDGP participants have gained approximately €4 more value per animal per year on average than non-BDGP herds to date, although non-participating farmers have also benefitted from a positive spillover as awareness of the €uro star system has increased. The projected increase in the replacement index is approximately €110 per suckler cow by 2035 compared to current values of c. €90 per head in 2018 for BDGP participants. Furthermore, the introduction of the BDGP appears to have reversed a relatively stagnant trend and accelerated the genetic gain in terms of their replacement index with heifers experiencing the sharpest increase.

In terms of GHG mitigation, higher-rated animals produce lower GHG emissions than the lower-rated animals due to improved efficiencies in animal performance which will contribute to GHG targets particularly in the longer-term as the cumulative genetic gain is realised. In other words, inefficient animals will be incrementally replaced with more efficient animals. The BDGP will lead to the breeding of robust cows with improved survivability that are better suited to in-situ grazing of grass and the maintenance of permanent pasture, which will build resilience of the suckler herd to the impacts of climate change. Participation in the BDGP, including the use of the Carbon Navigator is raising awareness of environmental sustainability at farm level. The continued implementation of the principles set out under the BDGP imply a projected cumulative reduction of c. 1.6 Mt of CO₂ over the period 2015-2030 which represents a marginal abatement of approximately 11% with the size of the herd held constant at current levels.

Cumulatively, the long-term benefits associated with the BDGP could lead to an additional value of up to €306m over 20 years depending on the supplementary actions of farmers after the expiration of the BDGP. A more conservative estimate indicates a gain of €58m in additional value assuming no supplementary behavioural change. The true value will lie within these ranges.

The review also identified some recommendations for the remainder of the programme,

- Promoting the significance of the database where the Irish system is ahead of its peers as recognised by ICAR for providing accurate data on the national herd.
- Efficiencies of the programme could be enhanced by increasing the online element of the scheme, for participating farmers.
- Continue to develop the scientific robustness of the Carbon Navigator and improve its implementation at farm level.
- Providing a longer term evaluation of the cumulative benefits of the genetic gain.
## Glossary of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AI</td>
<td>Artificial insemination</td>
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<tr>
<td>Carbon Navigator</td>
<td>An online farm management package produced by Bord Bia and Teagasc which allows participants to set improvement targets in key areas and automatically calculate the potential results on their farm in terms of environmental and economic performance</td>
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<tr>
<td>DAFM</td>
<td>The Department of Agriculture, Food and the Marine</td>
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<td>DPER</td>
<td>The Department of Public Expenditure and Reform</td>
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<tr>
<td>EBI</td>
<td>Economic Breeding Index which is similar to the €uro star but applicable to the dairy herd</td>
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<td>ETS</td>
<td>Emissions Trading Sector</td>
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<tr>
<td>€uro star</td>
<td>A beef breeding index rated as 1-5 star with 5 as most efficient</td>
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<tr>
<td>Genotyping</td>
<td>The analysis of tissue/blood samples in a Laboratory which results in a genomic breeding value being calculated by the ICBF</td>
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<tr>
<td>Heifer</td>
<td>A female bovine that has not previously calved</td>
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<td>ICBF</td>
<td>Irish Cattle Breeding Federation</td>
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<tr>
<td>MACC</td>
<td>Marginal abatement cost curve to illustrate options to mitigate GHG emissions</td>
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<tr>
<td>Maternal index</td>
<td>Index which builds on terminal index by including cow traits namely, survival, calving interval, age at first calving, maternal weaning weight, maternal calving difficulty, live weight and cull cow carcass weight</td>
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<tr>
<td>Replacement index</td>
<td>Refers to the maternal index</td>
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<tr>
<td>Stock bull</td>
<td>A beef bred bull in the herd</td>
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<tr>
<td>Suckler cow</td>
<td>A beef bred cow to produce/rear a calf for meat production and not to supply milk commercially</td>
</tr>
<tr>
<td>Terminal index</td>
<td>Index based on offspring traits including calving difficulty, gestation length, mortality, carcass, feed intake and docility</td>
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Chapter 1: Context

Beef Sector

The Irish beef sector represents a key Irish indigenous industry with exports valued at €2.5 billion (a 6% increase on 2016) accounting for 20% of the total agri-food exports based on 615,000 tonnes of beef output produced in 2017. Iceland is the fifth largest net beef exporter in the world with 79% of beef exports to the EU. The United Kingdom accounts for the majority of these exports but market access has recently been secured with China and the United States which will provide further opportunities. According to the Central Statistics Office, the national cattle herd was approximately 6.7 million head in December 2017, a slight increase of 1% on the 2016 figure. There were just over 1 million suckler cows in Ireland in 2017. According to the Farm Structure Survey in 2016 there were 72,400 specialist beef farms in Ireland with an average size of 26.5 acres (10.7 ha).

Food Wise 2025, the strategy for developing the Irish agri-food sector, credits the Irish beef sector as a principal driver of success in international markets and that value can continue to grow even with static cow numbers through improved efficiencies and utilising innovative technologies. The Irish beef sector has a number of strengths that drive its competitiveness including a reputation for environmentally sustainable grass-based production systems which incur lower costs and a lower reliance on concentrate feeds than their EU counterparts. Ireland’s beef industry is also renowned for its strong traceability controls and advanced genomics schemes. However, although the pace of policy change for beef sectors can be described as lethargic due to the compartmentalisation of livestock policy across EU member states, change is occurring and a strategic system approach could accelerate the progress of the sector towards policy objectives, particularly around genetic improvement. The Beef Data and Genomics Programme (BDGP) is the core support to the Irish suckler herd as it targets production and environmental efficiency. The BDGP aims to improve the genetic merit of the beef herd to further develop the sector and contribute to the achievement of the aims of Food Wise 2025.

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Climate Change

The development of the beef sector must be considered within the context of environmental sustainability obligations which are an important policy focus for international agriculture and the Irish agricultural sector. A key policy question is how to design and implement policies that incentivise practices which stimulate agricultural productivity growth and sustainable resource use without trade-offs on environmental obligations.\(^9\) The Paris Agreement in 2015 recognised that the efforts to limit global temperature increases and environmental degradation must do so in a manner that does not threaten sustainable safe food production. The 23rd UN Climate Change Conference specifically identified “improved livestock management systems”\(^10\) as a specific area in the achievement of the objectives agreed in Paris.

Agriculture has a significant role to play in meeting Ireland’s climate change targets, including reducing Green House Gas (GHG) emissions in line with the National Mitigation Plan objective of an approach to carbon neutrality\(^11\) for agriculture and land use that does not compromise sustainable food production. The plan states that “this effectively means that agricultural emissions are balanced by increasing carbon-sequestration, reducing emissions from the land sector, increasing fossil fuel displacement and energy intensive materials displacement.” This vision aligns with the EU Council conclusions of October 2014 which state: “...the multiple objectives of the agriculture and land use sector, with their lower mitigation potential, should be acknowledged, as well as the need to ensure coherence between the EU’s food security and climate change objectives.”\(^12\) This sustainable intensification documented in the National Mitigation Plan:

- To recognise the multiple goals of agriculture and land use in a vibrant rural economy
- To reduce the carbon intensity of food production and to contribute to both food security and GHG mitigation objectives through efficiency multi-trait animal breeding strategies, maximising efficiency of grass based feeding systems and supporting improvements in animal health and welfare among others

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To advance the approach to carbon neutrality as is possible in cost-effective terms, while not compromising the capacity for sustainable food production, in accordance with the Paris Agreement and the goal in Article 4 of achieving a balance between GHG emissions caused by human activity by sources and the removal of these GHG emissions by the second half of this century.\(^\text{13}\)

The Department of Agriculture, Food and the Marine (DAFM) is committed to protecting the environment and reducing the emissions intensity of our production systems. Ireland is, and will continue to be, a world leader in responding to the new challenges of climate change and global food and nutrition security. Livestock production is a key contributor to both food and nutrition security as well as to rural economies. Therefore, it is important that livestock systems are supported but research and innovation must be mobilised to further reduce the environmental footprint of livestock. Additionally research by Teagasc illustrates that livestock are necessary to maintain the high nature value of our landscapes that are dominated by grassland.\(^\text{14}\) The Common Agricultural Policy (CAP) of the EU also requires the maintenance of permanent grassland as part of their strategy to store carbon which relies on an efficient suckler herd.\(^\text{15}\) Prominent among the environmental considerations is the levels of GHG emissions where the following EU targets have been agreed for Ireland:

- The 2020 non-ETS GHG reduction target is 20% below the 2005 level (EU average is 10%)
- The 2030 non-ETS GHG reduction target is 30% below the 2005 level (EU average is 30%)
- The Effort Sharing Regulation (ESR) includes the potential to use up to a maximum annual flexibility of 5.6% of 2005 emissions (2.7 Mt CO\(_2\)eq per annum) from LULUCF (Land-Use, Land-Use Change and Forestry) in order to meet emission reduction requirements, based on a combined contribution of net afforestation and cropland and grassland management activities
- The above flexibility broadens the ‘toolbox’ of abatement options available to achieve targets. This is particularly the case for Member States where existing abatement measures are costly and action in the LULUCF sector,\(^\text{16}\) that encourages removals and limits emissions, may present a more cost-effective option, although still at a cost.\(^\text{17}\)


\(^{16}\) c. €3 billion has been invested in Forestry related projects

\(^{17}\) For example, 2016 analysis for input to the National Mitigation Plan calculated a marginal abatement cost of €23 per tonne of CO2 for afforestation over a typical rotation
DAFM’s Food Wise 2025 Sustainability Dialogue held in June 2018 to raise awareness and discuss various environmental challenges, heard that the national GHG emissions in Ireland rose 3.6% in 2016 compared to the previous year reflecting GHG emissions at 2009 levels despite the targets outlined above. Over the previous two years, total emissions increased by 11.2% for the ETS and 5.9% in the non-ETS sector.\(^\text{18}\) Ireland exceeded its annual binding limit in 2016 and is projected to cumulatively exceed its compliance obligations to 2020 at a cumulative level of approximately 16.5 Mt CO\(_2\)eq. Irish agriculture contributed 32.3% to Ireland’s total GHG emissions in 2016 and 44% of the non-ETS.\(^\text{19}\) Although these emissions are estimated to have increased by 2.7% (0.53 Mt CO\(_2\)eq) in 2016, the overall level remains flat to the 2005 level.

In terms of absolute agricultural GHG emissions, Ireland rank 8\(^\text{th}\) compared to EU counterparts, contributing approximately 4.4% of EU agricultural emissions. France, Germany and the UK contribute 43% of EU agricultural emissions. While the beef sector (which includes beef originating from the dairy sector) accounts for approximately half of Ireland’s agricultural emissions, Ireland’s beef production system has been ranked 5\(^\text{th}\) lowest in Europe in terms of GHG emissions intensity per unit of output and almost four times lower than Brazil. Austria has the lowest carbon footprint for beef production in Europe, but this is likely due to the high ratio of dairy sourced beef output and local conditions such as the high proportion of mountainous regions and smaller scale part-time farmers\(^\text{20}\) which may not be directly comparable with other countries.

The anticipated GHG emission projections across the entire agri-food sector outlined above create a challenge for efficiency measures such as the BDGP (which is related to a specific sub sector) to maintain the downward trajectory which was evident between 1998 and 2011. \(\text{Teagasc (2018)}\) conducted analysis on the GHG mitigation options available by employing a Marginal Abatement Cost Curve (MACC). The MACC is a graphic demonstration of potential GHG mitigation options that identifies the relative costs of each measure to rank each as a policy option. If the cost of a specific action exceeds the price of carbon credits, it is deemed cost prohibitive, and alternative more efficient options may be available.

Of these options, improved genetic performance of the beef herd (maternal traits and liveweight gain) was included as a mitigation option. Although Teagasc acknowledges that efficiencies related to genetic improvement are incremental in nature, they yield substantial benefits to GHG reductions as part of a wider strategy that included improved fertiliser use. The Teagasc report found that significant GHG savings could be achieved from agricultural mitigation (of which the BDGP is one part), which was reported as a ‘win-win’ cost beneficial measure that leads to lower emissions per unit of output (benefit to the farmer) for the sector (benefit to the state) and lower individual costs to the producer. This refers to the benefit of lower overall emissions and the improved efficiency of production. Taking the cumulative

\(^{18}\) ETS refers to the Emissions Trading Sector with agriculture classified as a non-ETS


\(^{20}\) [https://www.bmnt.gv.at/english/agriculture/Productionandmarkets/Animal-production-in-Austria/Cattle-farming-in-Austria.html](https://www.bmnt.gv.at/english/agriculture/Productionandmarkets/Animal-production-in-Austria/Cattle-farming-in-Austria.html)
effect of all efficiency measures Teagasc identified €136 million of savings per annum at farm level could be achieved. However, this was calculated using a different methodology and does not include the Programme expenditure and assumes the volume of animal numbers are held constant.\(^{21}\) Furthermore the Teagasc MACC does not factor the Exchequer cost into their model, so the annual figure of €136m must be considered in the context of the current spending which is €295 over the 6 initial years (approx. €49m per annum) with any further extension of the programme to be determined.

**Beef Data and Genomics Programme (BDGP)**

The BDGP is one of a range of current sustainability actions for Irish agriculture under the Rural Development Programme (RDP) of which funding has been committed. Other sustainability actions under the RDP include:

- The Knowledge Transfer Programme
- The Green Low Carbon Agri-Environment Scheme (GLAS)
- The Targeted Agricultural Modernisation Schemes (TAMS)
- The Organic Farming Scheme

The BDGP was designed to build on the experience of previous schemes (Table 1) to achieve multiple objectives, but specifically targets the rearing component of the suckler beef sector to address the GHG emissions. Previous schemes have prioritised the improvement of the animal performance indicators such as carcass weight and the conformation of the animal as per the EU classification system. However, there has been a lack of data on maternal traits such as fertility and milk yield, which are equally important for improving the genetics of the national herd. The BDGP places a greater emphasis on maternal traits, such as reducing calving intervals, younger first-time calvers and producing more efficient weanlings. Preparatory analysis undertaken during the design of the BDGP estimated that substantial GHG savings were possible as animals became more efficient. The production of superior animals more suited to local conditions will help to build resilience to the impact of climate change as these animals will adapt more efficiently than others. Accordingly, a key national policy priority is to encourage better uptake of efficient breeding strategies with a greater emphasis on maternal traits to deliver more climate and resource efficient animals, and consequently, reduce GHG emissions.

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Extensive suckler beef farming is recognised in many EU Member States\(^{22}\) with:

- significant social benefits in maintaining farm communities in isolated rural areas;
- economic benefits in providing beef output and a source of rural employment;
- environmental benefits in relation to maintaining landscapes and biodiversity, as suckler farming is generally carried out on an extensive pasture-based system.

Each EU Member State implements a variation of a support scheme based on different eligibility criteria, with Scotland also implementing an additional payment for efficiency gains based on genomics.\(^{23}\) These schemes are ongoing with no published evaluations to date, but the continued funding suggests policy makers attribute a value to these schemes.

The EU took a policy decision in 2005 to decouple direct payments from production as part of the CAP reform in 2005. The decoupled basic payment replaced the Special Beef Premia, the Suckler Cow Premia and the Extensification schemes that preceded it and was based on an entitlement calculated on the value of subsidy payments received over a reference period of 2000-2002. A number of specific support schemes have also been introduced for the suckler sector post 2005, as listed in Table 1, but these differ from the ‘voluntary coupled payment’ in that payments were based on farmers adopting specific measures for animal welfare or environmental purposes, rather than a simple payment per head.

**Table 1: Suckler beef supports post 2004**

<table>
<thead>
<tr>
<th>Name</th>
<th>Years</th>
<th>Objective</th>
<th>Payment rate</th>
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<tbody>
<tr>
<td>Animal Welfare Recording and Breeding scheme (AWBRS)</td>
<td>2008-2012</td>
<td>To improve welfare actions in areas such as weanling, castration, disbudding and recording breeding data</td>
<td>€80/cow (subsequently reduced to €40/cow) up to a maximum of 100 cows per herd</td>
</tr>
<tr>
<td>Beef Data Programme</td>
<td>2013-2014</td>
<td>To record breeding and calving data</td>
<td>€20/calf up to 30 calves and €10/calf thereafter up to a maximum of 50 calves per herd up to a max of 80 calves in total</td>
</tr>
<tr>
<td>Beef Genomics Scheme</td>
<td>2014</td>
<td>Added to the Beef Data Programme, this scheme aimed to collect genomic data to complement this data</td>
<td>€40/calf in addition to payments made under the Beef Data Programme.</td>
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</table>

*Source: DAFM*

\(^{22}\) The Member States are: France, Italy, Spain, Scotland, Portugal, Belgium, Finland, Hungary, Greece, Estonia, Czech Republic

The BDGP was introduced in 2015 and designed around lessons learned in previous schemes to accommodate new genomic technologies to improve the dataset on animal traits by increasing the level of on-farm data collected by farmers. This then enables the development of more accurate and reliable indexes. The objectives of the previous scheme, the Animal Welfare Recording and Breeding Scheme 2008-2012 were to enhance animal welfare standards, improve husbandry standards to reduce illness at weaning, provide education on best practice suckler beef production and improve both the quality and competitiveness of the Irish beef herd. Participating farmers received training on welfare practices such as dehorning and received additional advice from veterinarians on best practice to influence on-farm management. However, the level of welfare data collected has been enhanced further as part of the BDGP, which is collecting additional data so the performance of the suckler herd can be monitored and evaluated. This is a key development of the BDGP compared to previous schemes.

**Relevance of BDGP to Government Priorities**

The broad objectives of the BDGP are to improve the genetic merits of the national beef herd by collecting genotypes and data which enables the selection of the most efficient animals for breeding, which in turn will contribute to lowering the level of GHG emissions associated with the beef herd. The dual benefits from these objectives represent a win-win for both farmers and the state as farmers will gain in profitability from more efficient animals and the associated benefit to the beef sector in terms of value and GHG emissions mitigated will benefit the state. Given the Government policy objectives of improving the competitiveness and quality of Irish beef, as stated in Food Wise 2025, and the need for the agri-food sector to contribute towards Ireland’s target of a 30% reduction in GHG emissions by 2030 (on 2005 levels), the broad objectives of the BDGP are closely aligned, and will contribute to the overall target to address the sectoral responsibility.

In more detail, Food Wise 2025 recognises that “environmental protection and economic competitiveness are equal and complementary: one cannot be achieved at the expense of the other”. Specifically, the improvement of breeding/genetics was identified as an ongoing research priority (Action 420) to improve productivity and sustainability of primary production. This includes the mitigation of methane generation in the beef sector (Action 423) which is the key contributory factors towards GHG emissions for the sector.
A number of key themes underpin the Food Wise 2025 strategy namely, sustainability, human capital, competitiveness, market development and innovation with sector specific recommendations drawn from these. The beef sector recommendations for DAFM include a number of actions relevant to the BDGP, namely to:

- Leverage the benefits of the recent adoption of genomics technology to improve the genetic quality of the national breeding herd through inter alia, maximising participation in the BDGP, to help lower emissions and improve farm competitiveness (Action 226)
- Intensify the level of research aimed at informing the formulation of the breeding indexes used in the sector and the distribution of the traits therein (Action 229)

The ‘Steps to Success’ annual progress report of Food Wise 2025 published in 2016 indicated that progress had been made in relation to improving the sustainability of production with practices such as extending grazing seasons to reduce GHG emissions. The subsequent report for 2017 also indicated progress on reducing the carbon footprint of the beef sector. Participation in the BDGP encourages such actions through use of the Carbon Navigator. In addition, finalising a sectoral plan on the beef sector to inform the National Mitigation Plan under the National Climate Action and Low-Carbon Development Act were identified as key actions for 2017 under the Food Wise 2025 Steps to Success update in 2017.

The general objective of these plans is to transition Ireland to a low-carbon, climate resilient and environmentally sustainable economy. This includes an approach to carbon neutrality for the agriculture and land use sector which doesn’t compromise the capacity sustainable food production. The National Mitigation Plan published in 2017 also states that the agricultural sector “must be in a position to anticipate and adapt to the negative impact of climate change, as well as looking to maximise the benefits for the food production system.”

The data recorded under the BDGP will be a valuable contributory factor to these objectives, as farmers undertake a range of actions to accelerate genetic improvement of the beef herd to achieve associated climate benefits such as reduced emissions intensity. The BDGP runs parallel to other schemes under the RDP, the Forestry Programme, and the Origin Green initiative, with a common objective of achieving economic and environmental sustainability. These are complementary and represent a suite of interventions designed to assist the agriculture sector in achieving its targets.

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Objectives of the Review

To evaluate the full impact of the BDGP, a longer time period is required as the genetic improvements will cumulate over time. This is due to the process of identifying higher rated animals, implementing a robust testing programme and the lengthy time period from breeding to slaughter for each individual offspring for the suckler cow. Nonetheless, identifying initial trends and challenges is important to identify current impacts and outline practical recommendations to improve the BDGP in future years. The focus of the review is to:

(i) Evaluate the impact of the scheme to date in terms of efficiency and effectiveness and;
(ii) Identify aspects of the programme that could be improved.

The impact to date in terms of efficiency and effectiveness

The impact of the BDGP in terms of efficiency and effectiveness form the basis of this analysis. Efficiency refers to the level of outputs achieved from a set level of inputs and is determined in terms of the funds allocated to the Programme, the level of participation to date and efficiencies within the suckler beef system attributed to knowledge gained through the BDGP. Effectiveness refers to the outcomes of the BDGP to date and whether they are achieving the desired objectives as set out. For example, the review will determine if there is evidence of genetic improvements in the suckler beef herd and/or improvements in the level of GHG emissions recorded.

To identify any aspects of the BDGP that could be improved

The implications of these findings will then be used to offer practical suggestions to improve the remainder of the BDGP. These recommendations will be based on the capability of the BDGP to achieve its core objectives. This approach aims to ensure a robust analysis that can be used to inform the remainder of the programme as well as identifying lessons to be learned for future policies targeted at suckler beef production.
Chapter 2: Methodology

This review follows the principles of the Public Spending Code and the recommended programme logic model. The logic model is a framework that depicts a linear process towards impact. Initially the inputs are quantified followed by the key actions of the BDGP to influence farmer behaviour. Next the outcomes are considered including the profitability, productivity, efficiency and sustainability of the suckler herd. This enables the evaluation of the impact of the BDGP compared to the intended objectives of increased genetic merit of the national suckler beef herd and lower GHG emissions. The methodology is illustrated in Figure 1.

Figure 1: Logic Model

This structure is in line with similar Spending Reviews published by the Department of Public Expenditure and Reform such as “Climate Change Related – Research and Funding in Ireland” and “Environment Fund”. Specific variables were collected to test these indicators including financial based data and subscription rates for efficiency and animal performance indicators for effectiveness: as well as case studies to illustrate the experience of the BDGP at farm level. The implications of these outcomes were then discussed in terms of impact.

The analysis was desk-based and data was co-ordinated by the Economics and Planning Division and gathered from Divisions within DAFM including Livestock Breeding, Production and Trade, and Meat and Milk Policy, and externally through the Irish Cattle Breeding Federation (ICBF). This data was then quantitatively analysed to identify the key trends and supplemented with qualitative insight through case studies from key informants on the challenges of delivering the Programme.

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28 Curtain, F. (2017) Spending Review 2017 – Climate Change Related – Research and Funding in Ireland, Climate Change Unit: Department of Public Expenditure and Reform
The key indicators examined aimed to quantify the impact of the programme in terms of efficiency and effectiveness. To achieve this, specific data was required that included expenditure and administrative data related to the participants training and compliance as well as animal performance related indicators to track the impact of the BDGP since its introduction in 2015. The animal performance indicators included the following:

- Number of hectares covered by the BDGP herd
- Number of beef animals within the programme
- Breakdown of these animals into the €uro star classification system
- Duration of the calving interval
- Number of calves per cow per year
- Age of first time calvers
- Weights (both cow and weanling)
- Weaning efficiency
- Replacement index to identify profitability
- Change in the length of grazing season.

Definitions of each indicator are provided in Chapter 4 alongside the findings. These indicators are then presented in a series of tables and charts to track the progress from the base year of 2015 when the BDGP was introduced.

These animal performance indicators analysed have significant implications for GHG emission targets. External research was used to inform the study on the effects on GHG emissions as a result of genetic improvement arising from the BDGP. Research conducted by Quinton et al. (2018)\(^{30}\) and Murphy et al. (2013)\(^{31}\) are important in this regard and are published in the Animal Consortium Journal. These papers provide robust and peer reviewed estimations that enabled the forecasting of the impact of the BDGP on GHG emission levels in the long term, when the cumulative effects are realised.

Data was collected in April and May after a series of meetings with the other Divisions within DAFM to agree the objectives and necessary evidence for the review. The review was finalised in September 2018.


Chapter 3: Beef Data and Genomics Programme Overview

The BDGP is a six-year programme which was approved under Article 28 of EU Regulation 1305/2013 as part of Ireland’s RDP (2014-2020). The first tranche BDGP I 2015 – 2020 was launched in 2015 with a second tranche, BDGP II 2017 – 2022, launched in April 2017. €295m has been committed under the RDP in respect of the BDGP for its duration. The programme is co-funded by the European Commission under the European Agricultural Fund for Rural Development (EAFRD) at the rate of 56% for Measure 10 to deliver the scheme and 53% for the training required under Measure 1 which equates to c. €165 million of the total.

A centralised database is key to the programme with data feeding into a genomics-based star-based breeding index. The database is maintained by the Irish Cattle Breeding Federation (ICBF), which is a non-profit organisation charged with providing cattle breeding information to the Irish beef and dairy industries to benefit farmers, the agri-food industry and ultimately the public by providing accurate data on genetic information that can be used to improve the national herd. Their objectives, in addition to maintaining the database, which reduces the costs for DAFM in having to maintain it, include creating scientific knowledge to identify superior animals for breeding which can then inform farm management and industry related decisions. A Data Processing Agreement is in place between DAFM and the ICBF to govern the exchange of data which is derived from EU Regulation 1305/2013. The data is ultimately owned by the farmers themselves, but they cooperate with the ICBF to contribute to the common goal of improving the genetic performance of the beef herd. DAFM have a seat on the board of ICBF and have access to the data and can monitor progress to inform policy making. Ireland is viewed as a leader in providing reliable data through this system by the international coordinating body ICAR, given the cooperative nature of scientists, farmers, the State and companies working together to maintain this source. This has proven much more difficult in other countries that do not have access to a centralised system.

All EU Member States have a form of genetic evaluation for their beef herd, but these are tied to their policy objectives and typically involve an index that quantifies the value of profitability for animals. The BDGP simplifies this task in Ireland and ranks animals according to their efficiency, with 5 stars equating to the most efficient. These ‘€uro stars’ are a calculated index based on the ancestry of the animal (both sire and dam), the animal’s genotype and its performance results. The ‘€uro’ part refers to the additional profitability gained from BDGP participation, and the ‘star’ refers to the quintiles with 5 star representing the top 20% of animals. Within each quintile the farmers can further breakdown the animals based on an array of detailed and regularly updated data recorded to identify animals that are suitable for breeding within their herd. In short, the ‘€uro star’ refers to a combination of the monetary

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32 As part of the N+2 that was later supplemented by the N+3 rule which permits payments for ongoing commitments under the 2014-2020 RDP to continue to 2023
value plus a star ranking system, that farmers can utilise to make breeding decisions. This informs farmers as to the quality of the animals within their herd, and can act as a predictor of future performance once genotyped.

**Economic Breeding Index (EBI)**

The value of the €uro star approach mirrors the success of the EBI which was developed to improve the genetics and profitability of the dairy herd in Ireland. Established in 2001, the EBI revolutionised the pace of genetic gain through the adoption of information on 7 sub-indexes related to profitable milk production. The EBI established the value in genetic indexes that was further enhanced with the introduction of genomics in 2009 (Hayes et al. 2009; Spellman et al. 2013). The EBI was supplemented with the Gene Ireland Dairy Programme from 2012 where bulls were specifically selected for stronger maternal traits to increase the milk yield and fertility. Early results from this initiative show that the daughters of those sired by the bulls are now producing more efficient offspring themselves and thus the initial impact has been positive.

The utilisation of genomic information has resulted in accelerated gains in genetic performance. This is as a result of an improved understanding of the key animal traits, which enables the breeder to focus on improved breeding practices. These advances were based on the central database (that replaced the previous 27 databases), that enabled new research and to evaluate new technologies. The EBI provides an indication of how well the animal is likely to perform by attaching a monetary value to each animal. A higher EBI value indicates a higher performing animal which will deliver higher profitability. This was achieved after an initial flat lining period before modest gains accumulated (see Figure 2). The EBI value should therefore guide farmer decision making on breeding to ensure they invest in the animals that will improve their herd and drive profitability. Research conducted by Teagasc has indicated that for each €1 gain in the herds EBI, an additional €1.96 is gained in net profit per cow per year. This is equivalent to €11,800 in additional profit for a 100 cow herd performing at the highest EBI rate (€130) relative to the average herd (€70). Moreover, O’Sullivan et al. (2017) found in excess of €200 per cow and €600 per hectare for the top 1% of EBI herds compared to the national average herd. Their study employed a strict control group with identical management practices and found these economic gains were directly attributable to the impact of genetic gain. In a follow up study, O’Sullivan et al. (2018) found EBI aligned with

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39 ICBF (2017) “EBI delivers more profit per cow” available: [https://www.icbf.com/wp/?p=8492](https://www.icbf.com/wp/?p=8492)

the national breeding objective by delivering higher levels of more profitable solids (fats and proteins) and a higher consistency of performance over a range of feeding conditions.\textsuperscript{41}

In addition, the ICBF found that 78\% of dairy semen sold in Ireland during 2017 was from genomic bulls\textsuperscript{42} which have proven to be economically far more advantageous compared to conventionally selected bulls. This gain is attributed to an increased use of AI in breeding practices and the BDGP aims to follow this path as the programme becomes embedded in the Irish beef sector.

**Figure 2: Genetic Gain in EBI**

These advancements in the EBI illustrated the potential benefits of a genetic programme and these principles underpin the design of the \textit{€uro star system} for the BDGP. The initial modest gains from the EBI accumulated into higher sustained progress across the key performance indicators and have added considerable value to the sector over time.

**Objectives**

The objectives of the BDGP are:

- To improve the genetic merits of the national beef herd through the collection of data and genotypes of selected animals which will allow for the application of genomic selection in the beef herd.
- To lower the intensity of GHG emissions by improving the quality and efficiency of the national beef herd.


\textsuperscript{42} ICBF (2017) “78\% of AI Straws are to young bulls” available: \url{https://www.icbf.com/wp/?p=8369}
In order to achieve these objectives, participants must fulfil a range of criteria underpinning the BDGP to ensure compliance. Specifically, these actions include:

- Committing to the six-year duration of the BDGP.
- Recording specific animal data for calves, cows and bulls including sire details, calving ease, docility, vitality, size, quality and health traits, milk score, functionality and culling reasons.
- Genotyping priority animals in the herd by submitting a tissue sample for DNA analysis.
- Ensuring replacements are of 4 or 5 star quality by programme end (bulls must be genotyped 4 or 5 star; 20%/50% of females genotyped 4 or 5 star by 2018/2020).
- Completing a Carbon Navigator which is an instrument to estimate emission levels and set targets for improvement of carbon efficient production.

**Eligibility & Payment Rates**

In order to participate in the BDGP, farmers must meet the following criteria:

- Must be over 18 years of age;
- Hold a valid herd number;
- Possess registered beef-breed animals and;
- A valid Basic Payment Scheme must be submitted declaring all eligible land parcels each year.

A reference year of 2014 was set, except in exceptional circumstances where 2014 was not a typical year e.g. an outbreak of disease or new entrants to farming in which cases 2015 was permitted. The number of calved cows in 2014 was adopted as the number of reference animals, and the number of forage hectares declared in 2014 was established as the eligible forage area which is recorded as the Maximum Payable Area. This ensures that there is no incentive to increase the number of animals on the holdings. Instead the incentive is to improve the genetic merit (breeding value) of the existing herd through an effective replacement strategy. Targets were set to ensure that the suckler herd consisted of 20% four or five stars by October 2018 and 50% by 2020. As of August 2018, c. 1,000 farms were behind schedule to reach this target with the remaining farms (96% of the total) on course to achieve the 20% and likely to reach the 50% in 2020 if current behaviour is maintained.

In addition a minimum of 80% of the reference area must be retained and 60% of the reference animals must be genotyped each year without repetition. The 60% level was chosen on the basis of balancing the requirements of the scheme and to ensure an efficient use of sampling. For example, genotyping younger bulls may have been a waste of a sample if the animal was not retained for breeding.

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Full compliance for the duration of the Programme is mandatory and non-compliant farmers will be disqualified and payments recovered by DAFM. Applicants are deemed ineligible where persistently infected (PI) Bovine Viral Diarrhoea (BVD) animals have not been removed from the herd, i.e. the death must be recorded on the Animal Identification Movement (AIM) within seven weeks of the initial test. Genomics should be seen as an integral part of an overall programme to improve cattle health to affect health and disease traits.\textsuperscript{44} The BDGP facilitates this objective by helping to identify infectious cattle from the tissue samples collected, which can then be removed from the herd.

Payments are calculated on the basis of the costs incurred and income forgone excluding any economic gains. Specifically, the costing incurred in achieving compliance included costs related to collecting the data from the tissue samples, having the animals genotyped, and completing the Carbon Navigator to reach a final net payment rate. The BDGP was designed to incentivise farmers with smaller herd sizes (those with less than 10 cows) to participate. However, agri-environmental schemes under the RDP must be paid on a per hectare basis. Thus, the stocking rates were converted to a per hectare basis and prioritised the first 10 cows. Specifically, the calculation was based on a European Commission coefficient to convert the number of cows into eligible hectares. Farmers would be paid on a set number of hectares calculated based on this conversion from the number of cows calved for the reference year of 2014, which could not be changed thereafter. The conversion was based on a stocking density of 1.5 suckler cows per hectare to include the vast majority of suckler farmers profiled in the previous Beef Genomic Scheme data. This equates to 0.66 hectares for each suckler cow, or 6.66 hectares for the first 10 cows. The rates payable under the BDGP are as follows:

- €142.50 for the first 6.66 eligible hectares
- €120 for remaining eligible hectares

The degressive payment was introduced with a view to maximising the value for money based on previous experience as participants gain economies of scale as tasks are repeated for higher numbers of animals/eligible hectares. The average suckler herd in the BDGP scheme is estimated at 23.8 suckler cows which equates to 15.8 ha once the 1.5 stocking density is converted. 6.66 ha paid at rate of €142.50 and the remaining 8.2 ha paid at €120 which equates to €949.05 + €1,104 = €2,053.05.


\textsuperscript{45} 23.8 cows equates to 15.8 ha once the 1.5 stocking density is converted. 6.66 ha paid at rate of €142.50 and the remaining 8.2 ha paid at €120 which equates to €949.05 + €1,104 = €2,053.05.
Training

The BDGP involved a mandatory training programme provided by trained advisors. Advisors were trained under the Continuous Professional Development (CPD) module under Measure 2.3 of Ireland’s RDP. Each participating farmer received a cheque payment of €166 from the training provider to compensate them for travel and time-related costs. The material used for the training included presentations, videos profiling BDGP farmer participants and an information manual. The course consisted of four hours of teaching to give participants a better understanding of:

(i) The different requirements within the programme to achieve the objectives
(ii) How €uro star indexes are produced and how they can be used to improve the suckler herd
(iii) Genomics and how it improves the accuracies of the €uro star index
(iv) The options available to applicants to source replacement females for the remaining years to meet the programme requirements.

Carbon Navigator

A key component of the BDGP is to engage with the Carbon Navigator tool to encourage more awareness in the sustainability of production systems. The Carbon Navigator is an online tool developed by Bord Bia and Teagasc that captures the actual carbon footprint of the farm and provides a menu of options to improve on this footprint. These options include actions to lower GHG emissions such as improving efficiencies in fertiliser usage, improving calving rates and extending the grazing season. The Carbon Navigator is an important first step in quantifying the carbon footprint of each individual farm to set targets to achieve future reductions. Once sufficient data is collected to establish a baseline, methodologies to improve this level can be developed and implemented thereafter.

The Carbon Navigator training support delivered corresponds to a payment at the rate of €160 to the advisor with the farmer’s costs incorporated into their annual BDGP payment. Whilst the training only has to be completed once during the lifetime of the programme, the participant will learn how to complete their Carbon Navigator for each year thereafter. The preparatory training on the Carbon Navigator aims to assist farmers with the online completion of the record and to outline the benefits of the Carbon Navigator. The training sessions demonstrate the workings of the online tool and allowed the advisors to work through some typical examples illustrating the benefits to the participating farmers. All training was completed in 2017 with BDGP I participants completing in April and BDGP II participants completing in October.
The results of the Carbon Navigator can be compared with other similar farms or against the individual farm itself to set targets to reduce these levels. For example, by turning animals out to grass two weeks earlier in spring, a farmer will save on feed costs and see an increase in animal performance by getting more grass into the diet. Participants are required to provide details that highlight how a farm’s GHG emissions can be reduced. Specifically, these requirements included:

- Length of grazing season
- Age at first calving
- Calving interval
- Animal weight gain
- Nitrogen efficiency
- Slurry management.
Chapter 4: Outcomes

This Spending Review focuses on the efficiency and effectiveness of the BDGP to date. This chapter presents the findings arising from these objectives.

Efficiency

Payments amounting to c. €179m have issued to 2018 which includes payments related to training. Approximately 24,800 suckler beef farmers are currently participating in the BDGP as of 2018 (23,277 in BDGP I and 1,524 in BDGP II) with 580,000 suckler cows which is over half the total number of suckler cows in the country. Approximately, 5,000 applicants have either withdrawn or have been removed from the programme for non-compliance, resulting in the retention of farmers most committed to the objectives. Table 2 highlights some of the key descriptive statistics to date.

<table>
<thead>
<tr>
<th>Key figures</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDGP Payments (€)*</td>
<td>28,989,048</td>
<td>50,801,060</td>
<td>44,218,425</td>
<td>44,776,287</td>
</tr>
<tr>
<td>BDGP Training Costs (€)</td>
<td>0</td>
<td>8,471,401</td>
<td>1,592,854</td>
<td>355,364</td>
</tr>
<tr>
<td>Total area supported (Ha’s)</td>
<td>236,261</td>
<td>334,830</td>
<td>320,794</td>
<td>331,574</td>
</tr>
<tr>
<td>No. of paid participants</td>
<td>15,914</td>
<td>23,185</td>
<td>22,042</td>
<td>22,901</td>
</tr>
<tr>
<td>No. of Carbon Navigators completed</td>
<td>0</td>
<td>23,553</td>
<td>23,650</td>
<td>21,868</td>
</tr>
<tr>
<td>No. of BDGP reports issued to farmers</td>
<td>27,493</td>
<td>23,844</td>
<td>99,042</td>
<td>46,074</td>
</tr>
<tr>
<td>No. of BVD PI’s removed from BDGP herd</td>
<td>1,982</td>
<td>985</td>
<td>775</td>
<td>599</td>
</tr>
</tbody>
</table>

Note: source DAFM; * expenditure includes EU funding at 53% rate; years refer to calendar year

The BDGP involved a mandatory training programme as discussed in Chapter 3. Over €10.4m was paid to farmers to attend this training. Courses were delivered nationally with the Galway Clare region recording the highest number of applicants (4,706) and Cork East recording the lowest (689) as of 2017. The breakdown of applicants trained by region is provided in Figure 3. In total 24,174 participants were trained over 940 courses across 90 locations throughout Ireland.47

Average attendance at these courses was 26. Feedback on the BDGP training was positive with the vast majority (99%) of participants surveyed stating they had a better understanding of what was expected of them as participants in the BDGP.

46 Reports issued to farmers increased substantially in 2017 due to being issued quarterly
47 Additional participants have been trained across since the 2017 Evaluation bringing the total to c. 27,000
Additional information from the survey\(^{48}\) included that 70.1% stated on a scale that their knowledge had significantly increased on bull selection using the indexes.\(^{49}\) This represents


an enhanced willingness for change for participants. A key feature of the BDGP training programme is to persuade farmers to engage with the ICBF website to search for higher rated stock to improve the genetic merits of their herd. This is particularly relevant for males as they can achieve accelerated genetic improvements for a herd by producing approximately 30 progeny per annum. This data is publicly available for bulls free of charge, with a modest subscription fee associated for female searches via the Herd Plus service.50 The ICBF website and app enables farmers to search the €uro star rating of each animal to make a better informed decision on their breeding strategy.51 Figure 4 shows an increasing trend in farmers utilising the website which has increased significantly since the BDGP was introduced. It is important to note that non-BDGP participants can also access this search tool which suggests a spillover effect to a more general increase in the awareness of the €uro star rating system.

Figure 4: No. of searches for stock on ICBF website

This has translated into an increase in the numbers of higher rated bulls for both BDGP and non BDGP participants alike (although the gains are more significant for BDGP participants as per the requirements of the replacement rates) as evident in Figure 5:

The Carbon Navigator aspect of the training was delivered mainly on a one-to-one basis by approved advisors with 23,553 individual Carbon Navigators completed in 2016 and a further 26,650 in 2017. The utilisation of the Carbon Navigator helped to focus participating farmers to evaluate their individual GHG emissions and increase their awareness of sustainability goals. The main outcomes from engagement with the Carbon Navigator Tool were:

- The identification of the approximate carbon usage on individual farms
- An attitudinal change in the awareness and interest of carbon efficiency for farmers
- An identification of the strong linkages between production efficiency, carbon efficiency and profitability
- The identification of management steps to improve carbon efficiency.\(^\text{52}\)

\(^{52}\) European Network for Rural Development (2017) “Good Practices – EAFRD Projects” available: https://docs.wixstatic.com/ugd/2a834d_b211f2d84f614f3f8ddee1be48ff26ff.pdf
Effectiveness: Objective 1 – Improve the genetic merit of the national herd

The aim of the BDGP is to breed better quality and more efficient cows that are more fertile, docile and produce higher value calves per cow. The BDGP payments are based on the level of stock recorded in the reference year and there are no additional benefits for increasing herd size. This ensures that the quality of the existing herd improves as opposed to the quantity of animals (which is positive for GHG emission targets as it reduces the number of animals required to produce a given level of output). The total number of suckler cows in the national herd decreased by 10,207 between 2015 and 2017 (-1%). In addition, it is forecasted that the total beef herd will contract by 11% between 2020 and 2035. Figure 6 shows that the number of beef animals has marginally decreased over time.

Figure 6: Relationship between introduction of supports and suckler cow numbers

Figure 6 shows the trend in suckler cow numbers in Ireland from 1994 to 2016 with the four green markers representing the key support schemes introduced since 2005. The decoupled payment was introduced in 2005 which coincided with an initial reduction in cow numbers. Numbers increased again until 2008 before a gradual decline thereafter after the Animal Welfare Recording and Breeding scheme (AWBRS) was introduced. As the BDGP is designed to improve the productivity and environmental efficiency of the existing suckler herd, the improved genetics will also ensure a cumulative and permanent improvement in the existing herd.

Furthermore, given the slow inflexible production cycle and relatively low incomes and a strong reliance on direct payments associated with beef farming in Ireland (€14,665 per

53 Source: ICBF database
annum in 2017\(^{55}\)) there is no strong incentive to increase the quantity of animals. In contrast the objective is to increase the quality of existing animals and farmers will replace inefficient animals with more efficient higher rated animals which in turn will improve profitability. An increase in profitability would help to alleviate these significant income challenges with price received by farmers a constant challenge as evident in Figure 7.\(^{56}\)

![Figure 7: EU farmer, processor and consumer prices for the period 2007 to 2016](image)

Source: DG Agriculture and Rural Development based on Eurostat

**Average Herd size and movements across Stars**

The average herd size for BDGP participants since the introduction of the scheme is 24 suckler cows which reflects a marginal increase in stocking rates of 3.4% from a base of 23.2 suckler cows in 2015 although slightly lower than 2017 level of 24.2 cows in 2017. However, given the replacement rates required under the BDGP, this increase reflects a shift from less efficient cows to more efficient cows in line with the set objectives, whereas the non-BDGP herds are replacing their animals at a slower pace. The movements across star classes for suckler cows is presented in Figure 8 with 13,464 cows moving from lower rated animals to higher rated. This data also reveals that the movements across bulls and calves also showing the intended response from participants has materialised.

In addition, participants in BDGP are usually participants in GLAS, which is the key agri-environment scheme, with 61% recorded as in both in June 2018. This supports the assumption that suckler farming in Ireland is generally carried out on an extensive pasture-based system. This type of farming has multiple environmental benefits in relation to maintaining landscapes and biodiversity.

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Figure 8: Star rating movements for cows, bulls and calves: BDGP & *non BDGP

**Star rating for Cows**

- **Lower Rated**
- **Higher Rated**
- **Lower Rated***
- **Higher Rated***

**Star rating for Bulls**

- **Lower Rated**
- **Higher Rated**
- **Lower Rated***
- **Higher Rated***

**Star rating for Calves**

- **Lower Rated**
- **Higher Rated**
- **Lower Rated***
- **Higher Rated***

*note: source ICBF; Lower rated is sum of 1, 2 & 3 stars; Higher rated is sum of 4 & 5 stars; Lower/Higher rated* refers to non-BDGP herds.*
The preliminary data on outcomes indicates a positive impact has emerged in the performance of enrolled animals. However, the full extent of the impact requires a longer term view to evaluate the permanent cumulative benefits associated with genetic improvements. Amer et al. (2007) found that genetic progress will yield substantial financial benefits but they may take considerable time to accumulate. There is no ‘quick fix’ solution to improving breeding and evidence from the EBI shows that the cumulative gains increase over time. The low replacement rate in cattle (i.e. each cow has just one calf per year as opposed to two in sheep and ten in pigs) means that genetic gain is slower. By building up the data set through the BDGP, farmers can engage with more accurate indexes to improve their herd’s performance which is based on the €uro star rating system.

The genetic improvement to date has led to increased profitability as represented by the replacement index (monetary value based on multiple trait indicators) for each animal illustrated in Figure 9a and 9b:

**Figure 9: (a) Average replacement index; (b) Predicted index to 2020**

![Graph showing the average replacement index and predicted index to 2020 for BDGP and non-BDGP farmers.](source:ICBF)

Figure 5 (a) and (b) show modest gains in the average replacement index prior to the introduction of the BDGP. This gain has accelerated significantly for BDGP participants in the first two years, which reflects a direct impact of the BDGP. Participants have earned €12.40 more per cow on average since the programme was introduced. The non-BDGP herds have also benefitted from a gain (€8.20 per cow on average per year), albeit at a slower pace, but this suggests that as awareness of the star system has spread, farmers are making more informed decisions on breeding. A key benefit of the BDGP index is this spillover effect as non-participants can also utilise the information from the €uro star index to influence their breeding decisions, which ensures the benefits are more widespread than previous programmes. The predicted gain to 2020 and beyond suggests a continued widening of the gap between BDGP and non-BDGP farmers, with a target of €10 per cow per year gain.

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(currently €4.20), which equates to €200 replacement rate for BDGP animals in 2030 with non-BDGP animals expected at €180. Figures released by the ICBF in October 2018 on the trends for first time calving females illustrates the context of these increases from a relatively stagnant and declining trend to an upward gain as illustrated in Figure 10:

**Figure 10: Genetic trends in replacement index 2000-2018**

![Genetic Trend in Replacement Index, by year of first calving for suckler beef females.](source)

*Source: ICBF*

The introduction of the BDGP in 2015 appears to have reversed a relatively stagnant trend and accelerated the genetic gain in terms of their replacement index with heifers experiencing the sharpest increase. Figure 11 illustrates this point.
The preliminary data also indicates that animals enrolled in the BDGP are breeding younger first-time calvers, have reduced average calving intervals, record improved weights for weanlings and lengthier grazing seasons (weather permitting). Table 3 outlines some key performance indicators:

**Table 3: Key indicators from BDGP herd 2014-2017**

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving Interval days (National Averages)</td>
<td>412</td>
<td>402 (407)</td>
<td>394 (399)</td>
<td>382</td>
</tr>
<tr>
<td>Calves per cows per year</td>
<td>0.79</td>
<td>0.83</td>
<td>0.84</td>
<td>0.87</td>
</tr>
<tr>
<td>Heifers calved @ 24 months (%)</td>
<td>17</td>
<td>18</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Females not calved in period (%)</td>
<td>13</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Births with known sire (%)</td>
<td>63</td>
<td>64</td>
<td>69</td>
<td>71</td>
</tr>
<tr>
<td>AI bred calves (%)</td>
<td>23</td>
<td>23</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

*Source: data assimilated from ICBF and DAFM records: 2014 included as base year pre BDGP*
There have been modest gains in animal performance since the BDGP was introduced. The heifers are calving younger, the calving intervals have been reduced, and the calves per cow per year have increased as have the percentages of births with known sire and AI bred. These represent economic efficiency gains that are beneficial for profitability and reduce GHG emissions as inefficient animals are replaced by genetically superior animals. All figures have improved since the inception of the programme. Data on the number of 4/5 star (on the maternal index) replacement heifers, the percentages of cows/heifers calving in three months and replacements calved between 22 and 26 months and the change in the length of the grazing season are yet to be determined and require more time to evaluate.

Within the herd, the €uro star system has highlighted the scale of impact between the different stars recorded. Data collected from the Teagasc BETTER\textsuperscript{58} demonstration farm shows that 5 star animals achieved the highest carcass traits and achieved the highest weaning efficiency. This suggests that the evaluation system is showing positive results across the country. As expected the 5 star animal outperforms the 1 star significantly, as evident in Table 4.

Table 4: Comparative analysis – €uro star system

<table>
<thead>
<tr>
<th>Stars</th>
<th>Repl. Index</th>
<th>Cow weight</th>
<th>Calf wean weight</th>
<th>Calving interval</th>
<th>Progeny carcass weight</th>
<th>CO\textsubscript{2} output</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 star</td>
<td>€108</td>
<td>669 kg</td>
<td>336 kg</td>
<td>403 days</td>
<td>358 kg</td>
<td>3,355 kg</td>
</tr>
<tr>
<td>4 star</td>
<td>€86</td>
<td>680 kg</td>
<td>324 kg</td>
<td>407 days</td>
<td>356 kg</td>
<td>3,432 kg</td>
</tr>
<tr>
<td>3 star</td>
<td>€60</td>
<td>690 kg</td>
<td>319 kg</td>
<td>411 days</td>
<td>356 kg</td>
<td>3,475 kg</td>
</tr>
<tr>
<td>2 star</td>
<td>€43</td>
<td>691 kg</td>
<td>315 kg</td>
<td>416 days</td>
<td>357 kg</td>
<td>3,502 kg</td>
</tr>
<tr>
<td>1 star</td>
<td>€12</td>
<td>739 kg</td>
<td>309 kg</td>
<td>426 days</td>
<td>357 kg</td>
<td>3,552 kg</td>
</tr>
<tr>
<td>Diff 5* v 1*</td>
<td>+ €96</td>
<td>- 70 kg</td>
<td>+ 27 kg</td>
<td>- 23 days</td>
<td>+ 1 kg</td>
<td>- 197 kg</td>
</tr>
<tr>
<td>Diff 4* v 3*</td>
<td>+ €16</td>
<td>- 10 kg</td>
<td>+ 5 kg</td>
<td>- 4 days</td>
<td>0 kg</td>
<td>- 43 kg</td>
</tr>
</tbody>
</table>

Source: ICBF

Table 4 shows that 5 star animals outperform all others in terms of profitability, sustainability and carbon efficiency. In other words, these cows produce more output with lower levels of input. The difference between the 5 star animals and 1 star are significant. More modest differences were recorded between the 4 star and 3 star animals, but the trends for moving all 1, 2 and 3 star animals to 4 and 5 star levels are positive for the BDGP objectives. Data

\textsuperscript{58} Teagasc BETTER farms Business Environment Technology through Transfer of Education and Research are a Technology Transfer model that relies on a partnership with a commercial farmer and intensive advisory input.
recorded from mart sales in 2017 showed that 56% of all weanlings sold in the €1,000 plus category were either 4 or 5 star animals.\textsuperscript{59}

Another indicator of effectiveness of the BDGP lies in the weaning efficiency of the animals involved. The ICBF conducted analysis in 2017 to show the efficiency of each quintile of the €uro star system.\textsuperscript{60} Weaning efficiency is the percentage of a cow’s own weight that she has produced in the form of a calf at 200 days. It is increasingly recognised as a key indicator as suckler beef performance given the single unit of output (the calf) typically associated with the efficiency of the system.\textsuperscript{61} Ideally the cow is weighed in mid to late lactation before she has had a chance to regain all the condition lost during her dry period and early lactation (weight can fluctuate up to 70 kg per annum). Achieving 50% or higher is considered optimal and represents supreme technical efficiency, whereas data from the Teagasc BETTER farms in 2017 found that weaning efficiency ranged from 36-49%. This figure is driven by boosting calf weight gain and pulling down cow live weight. The results of the analysis are presented in Table 5:

<table>
<thead>
<tr>
<th>Star</th>
<th>No. Cows</th>
<th>Calf 200 day wt (kg)</th>
<th>Calf ADG (kg)</th>
<th>Cow wt (kg)</th>
<th>Weaning efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 star</td>
<td>19746</td>
<td>291</td>
<td>1.24</td>
<td>659</td>
<td>44.2</td>
</tr>
<tr>
<td>4 star</td>
<td>10075</td>
<td>288</td>
<td>1.22</td>
<td>664</td>
<td>43.4</td>
</tr>
<tr>
<td>3 star</td>
<td>8095</td>
<td>285</td>
<td>1.21</td>
<td>677</td>
<td>42.1</td>
</tr>
<tr>
<td>2 star</td>
<td>7124</td>
<td>282</td>
<td>1.2</td>
<td>679</td>
<td>41.5</td>
</tr>
<tr>
<td>1 star</td>
<td>6956</td>
<td>278</td>
<td>1.17</td>
<td>711</td>
<td>39.1</td>
</tr>
<tr>
<td>National Average</td>
<td>286</td>
<td>1.22</td>
<td>673</td>
<td>42.5</td>
<td></td>
</tr>
</tbody>
</table>

notes: Table based on 4,000 herds; ADG refers to average daily gain which is the amount of weight the calf gains from feed; Weaning calculated as calf weight/cow weight*100.

The ICBF weaning report (2017) estimated that 65% of maintenance on an individual cow is feed, and an additional 100 kg of weight requires a 12% higher level of feed. In terms of the calf, data from the Teagasc BETTER farm found that by using the breeding sub-index, selection for cow milkability leads to 140g daily increase in calf growth pre-weaning. Therefore at eight months the difference is 34 kg, which at a rate of €2.60/kg this means a gain of €89 per cow.

\textsuperscript{59} Based on the total number of €1,000+ weanlings (n = 11,180) sold across 66 marts in 2017 according to ICBF. This category of animals represents the most valuable animals sold on the market.


which could significantly enhance farmer income levels in a sector that is typically characterised by lower profitability.\textsuperscript{62} In addition, by keeping cow weight down and pre-weaning growth up, carbon emissions also fall (estimated at 6\% in the report).

**Effectiveness: Objective 2 – Lower the intensity of GHG emissions**

In terms of GHG mitigation, the rating system introduced in the BDGP showed that higher rated animals produce lower GHG emissions than the lower-rated animals which will contribute to GHG targets as the suckler herd becomes more efficient in the longer term. In other words, inefficient animals will be incrementally replaced with more efficient animals. In addition, ICBF data suggests that the BDGP will lead to the breeding of more robust cows with improved survivability that are suited to in-situ grazing of grass and the maintenance of permanent pasture. There is also a significant benefit in improving the resilience of the suckler herd to the impacts of climate change. For example, the breeding strategy produces more efficient cows from the best performers which are more suited to the Irish climate. By improving the efficiency of animals under the BDGP system, GHG will lower for the overall beef sector which will contribute to Irish GHG targets for the agricultural sector.

The precision of GHG emission measurement is highly complicated from both a scientific and administrative perspective,\textsuperscript{63} but there are some relevant scientific studies. Research from Murphy et al. (2013) showed that the overall estimate for reductions in GHG emissions in beef systems related to increased grazing season length is 0.09\%/kg beef carcass per additional day. Work by Quinton et al (2018), Beauchemin et al. (2011)\textsuperscript{64} and Wall et al. (2010)\textsuperscript{65} have attributed improvements in these traits to the genetic gain in both maternal and terminal beef cattle indexes and also to the intensity of emissions per unit of output.

Using the BDGP specifically as an example, Quinton et al. (2018) estimated that the accumulation of these benefits would lead to a 0.4\% reduction in CO$_2$e after 5 years and 1.5\% after 20 years based on the current supply of beef (155 kt per annum). This refers specifically to beef cows and does not include dairy origin beef or cull cows.\textsuperscript{66} These references inform the estimations of the GHG related impact from the BDGP. The cumulative effect of these reductions in the national herd will make a substantial contribution to GHG related targets as the genetic gain increases over time. In other words, there is an inverse relationship between


\textsuperscript{65} Wall, E., Ludemann, C., Jones, H., Auldsley, E., Moran, D., Roughsedge, T. And P. Amer (2010) “The potential for reducing greenhouse gas emissions for sheep and cattle in the UK using genetic selection” funded under DEFRA project: Would livestock breeding goals change if carbon and nitrogen efficiency rather than economic efficiency were the priority objectives? IF0182.

\textsuperscript{66} Dairy origin beef refers to calves born in dairy herds being finished as beef. Cull cows refers to cows removed from the herd. available: https://www.teagasc.ie/media/website/publications/2015/Beef-Production-System-Guidelines.pdf
genetic gain and GHG reductions, the more genetic gain increases, the greater the level of reduction in GHG emissions.

The results confirmed this inverse relationship with Table 4 illustrating a difference of 197 kg of CO\textsubscript{2} from 5 star rated animals to 1 star and 43 kg between 4 star and 3 star animals. As more animals increase their rating as required under the BDGP, these figures will make a further contribution to GHG emission targets. Table 5 shows that higher rated animals are lighter, with bigger calves and therefore are more efficient, which is positive for GHG emission reduction. Five star cows produced the heaviest calves while the cows themselves were the lightest, which leads to a higher cow weaning percentage. The lower weight of the cow is particularly relevant for the policy objectives as heavier cows require additional feed which incurs an additional cost for profitability due to increased maintenance costs and higher levels of GHG emissions and other environmental pressures for heavier animals.

Given the cumulative nature of genetic gain, the benefits from the BDGP are expected to increase in the medium to longer term. Assuming an uptake of 700,000 cows (which was the original target when the BDGP was designed but 120,000 higher than current levels), and based on the difference between 3 star animals and 5 star animals, significant GHG reductions of c. 86kt CO\textsubscript{2} per year by 2020 are expected. This is equivalent to 4.4% of marginal abatement potential for the suckler herd, meaning it will produce 4.4% less GHG from the same beef output. If maternal traits were factored into the analysis this could extend up to 300 kt per year, but further data is necessary to predict this with greater precision.

The level of benefit will increase further in the years after 2020 as the cumulative benefits increase over time, and the suckler herd evolves so that the current top 1% of animals becomes the norm in 2030. If this projection is realised then 1.9 Mt of CO\textsubscript{2} would be removed from the atmosphere from the current herd numbers which represents approximately 12-14% marginal abatement. Additionally, these gains would lead to more robust cows that are better suited to local climatic conditions as discussed previously. These projections are dependent on the continued implementation of the practices at farm level that were learned through the BDGP. The annual decrease in GHG from analysis carried out by both DAFM and the ICBF is presented in Figure 12.
Figure 12: Projected reduction in CO₂ emissions from BDGP to 2030

Source: data assimilated from DAFM preliminary analysis in conjunction with Teagasc, ICBF and EPA; projections based on constant herd size

Cumulatively, this equates to the 1.9 Mt of CO₂ by 2030 noted above, but is dependent on the target uptake of 700,000 cows (blue line) which is above the current level of 580,000 cows (red line) currently enrolled as of 2018.⁶⁷ If this number remains constant at the current level the cumulative reduction equates to 1.6 Mt of CO₂ representing c. 11% abatement on current levels. The actual reduction will depend on the number of higher rated cows over time, but assuming the herd size remains constant this is still a significant reduction on the current levels of GHG emissions and will positively contribute to achieving Government priorities as set out in Food Wise 2025.

In addition, two independent studies carried out in collaboration between the ICBF and New Zealand based agricultural research units focused on a range of scenarios to predict the impact of beef genetic programmes. Of these scenarios the best case included the following elements:

1. Selection of better females
2. The replacement index
3. Genomics
4. Maximum AI

The author of these reports from the ICBF and AbacusBio commented that the BDGP is currently aligning with these objectives but intends to increase their emphasis on all especially the AI to achieve the outcomes outlined in Figure 13:

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⁶⁷ Representing a marginal increase of 3.3% in suckler cows from 2015 base of 560,000 cows.
Using the estimations on CO₂ savings outlined in Figure 11 and applying the projected shadow price of Carbon as set out in the Public Spending Code, this would result in approximately €135m of savings, representing the best case scenario. By adopting the most conservative estimate of the BDGP alone without any supplementary actions or changes in farmer behaviour the saving accumulates to €22.5m. The true value will lie within these ranges, and the challenge is to drive the sector towards these additional actions such as a greater use of Irish bred AI and stock bulls than is currently the case to achieve the upper level of saving.

The cumulative benefits based on these predicted gains based on 65% adoption of the BDGP scheme and includes a discount rate of 7%. The predicted cumulative benefit from the BDGP alone without any supplementary actions is €32.4m after 10 years and €58.2m after 20 years of additional value. However, the actual benefit will likely exceed these levels with an upper value estimated at €117.9m after 10 years (8 years of benefit after a 2 year lag for the programme to become embedded) and €306.5m after 20 years. Admittedly, this estimate is also considered best case scenario (and a replacement index trend increase of €10/year), but it also omits additional benefits such as the improved value of the finishing phase of beef animals which are likely to perform better by having improved weaning efficiency and the

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69 Note: The discount rate as specified in the Public Spending Code in Ireland is 5% so the predicted benefits would marginally increase

70 Best case scenario refers to maximum usage of all breeding strategies and genomics as defined in AbacusBio Ltd. (2016) *The Industry Structures Required to Maximise Genetic Gain in the Irish Beef Industry*. Specifically, this refers to a replacement index increasing trend of €10/year. On the other hand, the lower estimate refers to a permanent step change without the compounding cumulative benefits and operates on a trend increase of €1.84/year. The current trend to 2018 is a €4/year increase so the actual cumulative benefit will exceed the minimum but short of the potential higher rate.
adaptation benefit of more efficient cows to navigate poor land conditions due to climate change effects. Again the true value will fall within these two ranges over time.

While these charts are based on estimations, the underpinning theory of genetic gain driving profitability and reducing GHG emissions is clear, supported by the preliminary evidence from the BDGP to date. As the national herd moves towards higher rated animals becoming the norm, the impact of the BDGP will augment as the genetic merit is achieved. This implies a smaller, more efficient, more fertile and milkier suckler cows, that produce a more efficient beef output i.e. from a lower level of input, with is beneficial for GHG emissions.

**Case Studies**

In order to evaluate the effectiveness of the BDGP at farm level, the ICBF carried out three case studies with BDGP participants to investigate their motivations and experiences.71

1. The first farmer based in Co. Kilkenny operates a suckler to beef system with 14 cows, 35 heifers and three stock bulls and his replacement strategy is all bred within the farm. His motivation to participate was based on the innovativeness of the scheme to drive genetic gain at farm level. “The continuous collection and accumulation of data coupled with the in-depth genomic information will make the €uro star indices a powerful breeding tool.” This farmer uses a 5 star rated Simmental bull chosen on the basis of his a Replacement Index of €198 and has been very impressed with results to date. The €uro star index guided his decision when acquiring this bull, although he also noted the need to visually assess the functionality, docility and overall quality prior to purchase. He also commented that an increased emphasis on genetic merit at pedigree events would accelerate the improvements in genetic performance further. “To think that you can take a DNA sample from a young heifer calf and get a more accurate prediction of how that heifer will potentially perform as a cow in your herd in the future is something to really look forward to”.

2. The second farmer based in Co. Limerick also operates a suckler to beef system with 31 cows, 43 heifers and a stock bull although he also uses AI in his replacement strategy. His motivation to participate was based on the premise of improving the reliabilities of his herd by utilising the genomic information and indexes to accelerate his breeding performance. “Reliability is a big factor for me and if the programme results in more reliable indexes on young breeding stock, then it will be a success”.

3. The third farmer based in Co. Wexford also operates a suckler to beef system with 31 cows, 28 heifers and utilises AI exclusively for his replacement strategy. His motivation to participate in the BDGP was driven by a desire to improve his herd through basing breeding decisions on genomic information. Although he is on track to meet the 2018 and 2020 replacement targets, this farmer notes that there is scope for further improvement and the BDGP will equip him with the necessary knowledge to achieve this. “I plan to place more emphasis on the Replacement Index in the future whilst also maintaining a good carcase performance. Docility is something which I also plan to watch very closely”.

71 These case studies were published in the Irish farming media
Chapter 5: Conclusions

The BDGP is an integral element of sustainability for Irish agriculture under the RDP. The findings presented in this paper identify key trends that demonstrate the initial impact of the BDGP. The objectives of the BDGP to improve the genetic merit of the suckler beef herd whilst mitigating GHG emissions are being met, although a longer term perspective is necessary to fully evaluate the impacts. Compliance rates in terms of replacement targets are set to be met, and perhaps more aggressive targets could have been set to accelerate the progress of the herd. However, the voluntary nature of participation and the fact that farmers cannot be coerced to dispose of their cattle was considered in the design to facilitate a cooperative environment where advice and guidance were provided on accurate breeding values to ensure informed decision making for farmers on their breeding practices.

The results presented are in line with Lankoski et al. (2018) that found that policies aimed to improve breeding have increased productivity per animal for the resources available, increased the resilience of these breeds to withstand increased climate extremes and their GHG mitigation potential is positive.72

The preliminary evidence presented here highlights three main benefits of the BDGP to date.

1. The BDGP is delivering improved performance for higher rated animals as evident from the replacement index and performance indicators. The findings show that profitability increases with higher rated animals, and given the replacement strategies sought as part of the BDGP, the implication is that this increase will be sustained with further improvements predicted in the short and medium term. This will benefit individual farmers in terms of viability and employment, but also collectively improve the competitiveness of the Irish beef sector.

2. Non-participants are also benefitting from a spillover effect by utilising the Euro star system and improved awareness of genetic performance, although with a lagged time effect compared to BDGP participants. These farmers are able to make better informed decisions on their breeding practices, and can also gain from increased efficiency and profitability available in the market.

3. The genetic improvements in the suckler herd are contributing to reducing the GHG emissions intensity from output. Food Wise 2025 sets out targets for the Irish agri-food sector which includes recognition of the complementary nature of economic prosperity and environmental sustainability. The BDGP is a prime example of this ethos as increased efficiencies are sought in the beef system which in turn lowers the negative externalities associated with GHG emissions, albeit at a modest pace at first before the cumulative benefits are realised.

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In addition, by inputting all the data accurately into the central database of the ICBF, the traceability and quality of Irish beef is further reinforced. This strengthens the commitment to a safe sustainable food supply which is also a key aspect of Food Wise 2025. The inclusion of genomic data for each animal ensures a superior predictor of future performance, and identifies areas to strengthen ensuring the herd improves. An increased number of higher rated genetic animals is positive for the national herd.

The two primary objectives of improved breeding practices and reducing GHG emissions are being positively impacted, but a longer term analysis would enrich the evaluation to take account of the cumulative benefits attributed to the programme. The specific benefits to each objective are presented in the following subsections.

**Key benefits on breeding**

The BDGP is facilitating better breeding in the Irish national herd. Key benefits of this breeding include:

- The introduction of the latest science and technology to Irish agriculture through genomic testing. Genomics is a significant advance in technology that enables an improved predictor of performance when combined with ancestry data.

- The enhancement of Ireland’s reputation as a world leader in genetics, with metrics and data to back up our message of sustainable livestock systems. Ireland is viewed as a leader in providing reliable data through this system by the international coordinating body ICAR,73 given the cooperative nature of scientists, farmers, the State and companies working together to maintain this source. This has proven much more difficult in other countries that do not have access to a centralised system.

- The BDGP is database driven, allowing for intensive monitoring of all aspects of its delivery including the level of compliance and the key trends in genetic improvement. The database is a useful source of information on the quality of the national herd, which can be monitored accurately to target further efficiencies. It further enhances the reputation of Irish beef internationally by providing evidence of genetic improvements through a centralised national dataset. The collection of a vast amount of data from commercial farms starting at calving ease, sire, calf quality, health traits, milk ability of dam, and bull quality. The generation of accurate indexes for all animals, enables an easily interpretable index (star system), which can only be achieved accurately if there are large amounts of data recorded. The BGDP has been very effective in this regard.

- The uptake at farmer level of these indexes. The training course was the first time that beef farmers were educated on the potential benefits of efficiencies to be gained through the use of the star based evaluation system. In a feedback survey

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from a sample of 1,223 farmers analysed by Teagasc, 99% of participants acknowledged that the course had increased their awareness of the requirements under the BDGP. Specifically, when asked about their knowledge of the Programme, 61.3% of participants stated that they knew a lot more about the six key requirements. All comments were predominantly positive although a minority (1%) did raise a concern over the scheduling of the training and the limited time spent with the advisor on individual reports. In addition, the movements across the star classes show that farmers are responding to the conditions of the programme.

- The BDGP has provided improved profitability for participants. Loughrey and Hanrahan (2018) found that payments under the programme combined with stable output prices led to higher margins, and that farmers that do not participate are likely to incur further negative margins. The findings here showed that BDGP participants achieved accelerated genetic gain which resulted in superior values in terms of the replacement rate. Furthermore, the heifers are outperforming the cows which reverses a previous negative trend prior to the initial phases of the BDGP becoming embedded.

**Key benefits for GHG emissions**

An efficient beef herd is beneficial for GHG emission mitigation. The BDGP has enabled inefficient animals to be incrementally replaced by more efficient animals and the key benefits for GHG emissions include:

- The retained animals are of superior quality and breed younger first-time calvers, have reduced calving intervals and improved weights from lower levels of input, including extended grazing seasons. The reduction in time spent on farm due to factors such as infertility, alongside a reduced need for silage and concentrate supplementation, will in turn reduce the level of GHG emissions. In addition, the improved productivity and efficiency at the individual animal level would further reduce ‘wastage’ such as infertility, disease and mortality. 

- Genetic gain generates permanent and cumulative benefits which will lead to system-wide reductions in GHG emissions. The evidence presented here confirms a downward trajectory that is expected to accumulate to a reduction of 1.6 Mt of CO₂ in the atmosphere over the period 2015-2030 which represents a marginal abatement potential of c. 11%. This equates to a saving of between €22.5m and €135m using the projected shadow prices for Carbon.


75 Scottish Agricultural College (2010) “Determining strategies for delivering environmentally sustainable production in the UK ruminant industry through genetic improvement” DEFRA project code: iFO149
• The Carbon Navigator helps to guide and focus farmers on their levels of GHG emissions and identify targets for improvement. Farmers who engage with this tool are more likely to adopt more climate friendly practices due to an increased awareness of the need to build and protect carbon pools. Instruments such as the Carbon Navigator will be an important influence on farmer behaviour to ensure more sustainable production methods are implemented.

• As the BDGP is based on a reference year of 2014 for most cases and a specified stocking rate, it does not incentivise the acquisition of additional stock. In contrast, the focus is to improve the existing herds by replacing inefficient animals with higher rated animals to achieve improved performance. Therefore, the national beef herd is not expected to rise due to the BDGP and animals retained will achieve higher efficiencies, which are both beneficial for GHG emission levels. There has been a net movement of 13,464 suckler cows from lower rated stars to higher rated to date.

• The European Council concluded in the Climate and Energy Framework to 2030 that ‘the multiple objectives of the agriculture and land use sector, with their lower mitigation potential, should be acknowledged, as well as the need to ensure coherence between the EU’s food security and climate change objectives.’ These additional benefits must be considered when evaluating the benefits of the BDGP. The GHG mitigation effect must be considered alongside the improved genetics and associated productivity gains to ensure a secure and safe food supply. The BDGP is one sub-measure within the range of measures to address GHG emission targets.

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Chapter 6: Recommendations

Although the preliminary evidence on the BDGP is predominantly positive, there are a number of practical issues that could be improved. These include:

- Promoting the usefulness of the centralised database where the Irish system is ahead of its peers as recognised by ICAR. The data provides an accurate reflection of the performance of the sector which is a valuable source to identify the sectoral trends. This resource provides a central resource that can be developed further through the inclusion of additional variables.

- Efficiencies could be enhanced further by increasing the online element of the scheme, for participating farmers, similar to the move online for the Basic Payment Scheme. With significant customer support by DAFM, 100% of BPS applications were made online in 2018.

- The impact of the scheme could be accelerated further if the replacement rates were more ambitious. For example, the 20% replacement rate by 2018 could have been higher and likewise for the 50% target for 2020. However, this would likely have negatively affected farmers with lower rated stock in the short term and distorted the market place significantly, which would have devalued their value. An incremental changeover was preferred on this basis for the BDGP, but future iterations of similar programmes could opt for higher replacement targets.

- The Carbon Navigator tool has proven a useful tool to promote sustainable production. The scope to further develop its relevance to on-farm decision making should be explored further, to understand the motivations of participating farmers to implement their newly acquired knowledge on farm or not, and to enhance the scientific robustness of the tool by evaluating the accuracy of the data collected.

- The BDGP is a significant programme in terms of investment of both EU and National Funds. The programme’s objectives require a longer term view to evaluate the cumulative benefits. Though the initial trends are positive, the BDGP must continue to be monitored on an on-going basis to ensure the objectives are being met.
Appendix – Quality Assurance

Quality assurance process

To ensure accuracy and methodological rigour, the author engaged in the following quality assurance process.

- Internal/Departmental
  - Line management
  - Spending Review Steering group
  - Other divisions/sections
  - Peer review (IGEES network, seminars, conferences etc.)

- External
  - Other Government Department
  - Steering group
  - Quality Assurance Group (QAG)
  - Peer review (IGEES network, seminars, conferences etc.)
  - External expert(s)

☐ Other (relevant details)