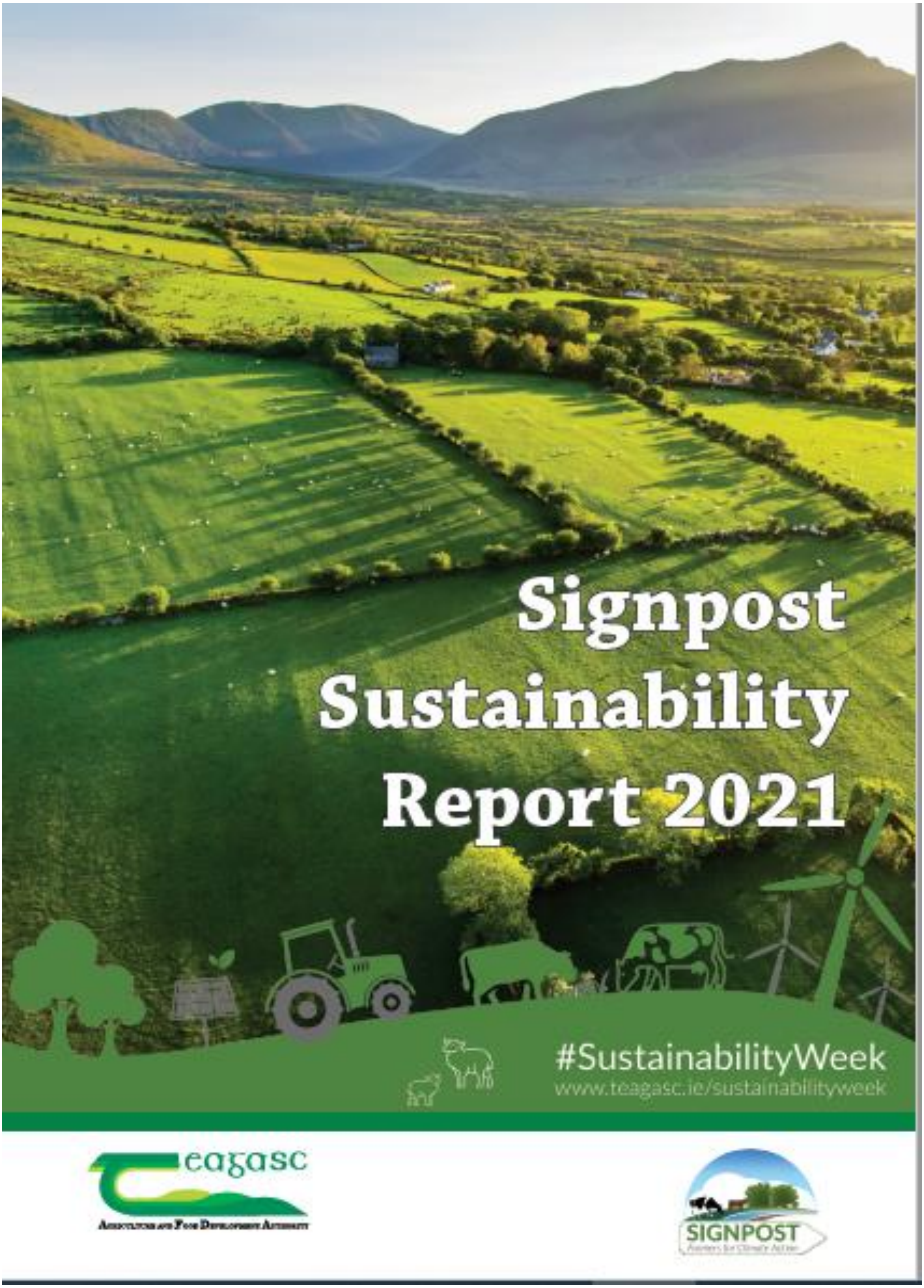
Signpost
Sustainability
Report 2021
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SIGNPOST

Foreword

Welcome to the first Signpost Demonstration Farm Programme - Baseline Sustainability Metrics 2021.

The pressing need to reduce greenhouse gas (GHG) emissions within the agriculture sector is a priority for Teagasc. This requirement was highlighted once again during the summer with the Government announcement of the sectoral GHG reduction target for agriculture – a 25% reduction by 2030, compared to a 2018 baseline.

The Signpost Programme is a Teagasc-led, whole of industry partnership (62 partners) to support and enable farmers to take climate action, while transitioning to more sustainable farming systems. As part of this programme, Teagasc and the Signpost Programme partners have established a network of 119 demonstration farmers, across each of the farming enterprises (dairy, suckler beef, dairy calf to beef, sheep, tillage, pigs and poultry).

The purpose of this publication is to provide a summary of the results from the data gathered from the Signpost Farms relating to 2021. Results will be presented for the four farming enterprises of dairy, beef (including both suckler beef and dairy calf to beef), sheep and tillage. The data in this publication are based on data provided by the Signpost Farmers to the Teagasc National Farm Survey recorders and on results from various analyses completed.

The results presented can provide useful targets and benchmarks for comparison. While many of the metrics will be familiar, there are some which will be new to readers, specifically relating to GHG and ammonia emissions and a useful glossary is included towards the end of this report.

The Signpost Farmers were not selected to be representative of the typical or average farmer. In fact, some of the results indicate that they are above average; for example in terms of farm size, herd size and GHG emissions generated. For comparison purposes, readers should refer to the National Farm Survey Sustainability Report 2021, which is available at www.teagasc.ie. In addition, the NFS Average figure is included for information in various tables in this report.

Finally, I would like to acknowledge and thank the Signpost Farmers for providing the data, the National Farm Survey data recorders for gathering the data, colleagues Brian Moran and Cathal Buckley for data analysis and Siobhan Kavanagh and Eoin Downing for compiling the report and the creation of the graphics and images contained in this report.

Tom O'Dwyer,
Head of Signpost Programme

Acknowledgements

The Signpost team wish to recognise all who contributed to the Signpost Sustainability Report 2021. Most importantly, we would like to thank all the participating farmers for their time and commitment to the Signpost Programme. To the National Farm Survey (NFS) recorders for the collection and validation of the farm data: J. Colgan, A. Curley, L. Deane, L. Delaney, P. Harnett, P. Healy, G. Kenny, P. Madden, J. Maughan, J. McConnon, E. McGrath, K. McNamara, M. Nicholson, J. Robinson, J. Teehan and to Muriel Clarke for the administration of the survey. To Brian Moran and Cathal Buckley for the processing of the data and distribution of the reports to the individual farmers. To all the Teagasc local advisers and programme advisers for supporting the Signpost farmers. Thank you to the partners to the Signpost Programme for their continued support. Any errors or omissions remain the responsibility of the authors.

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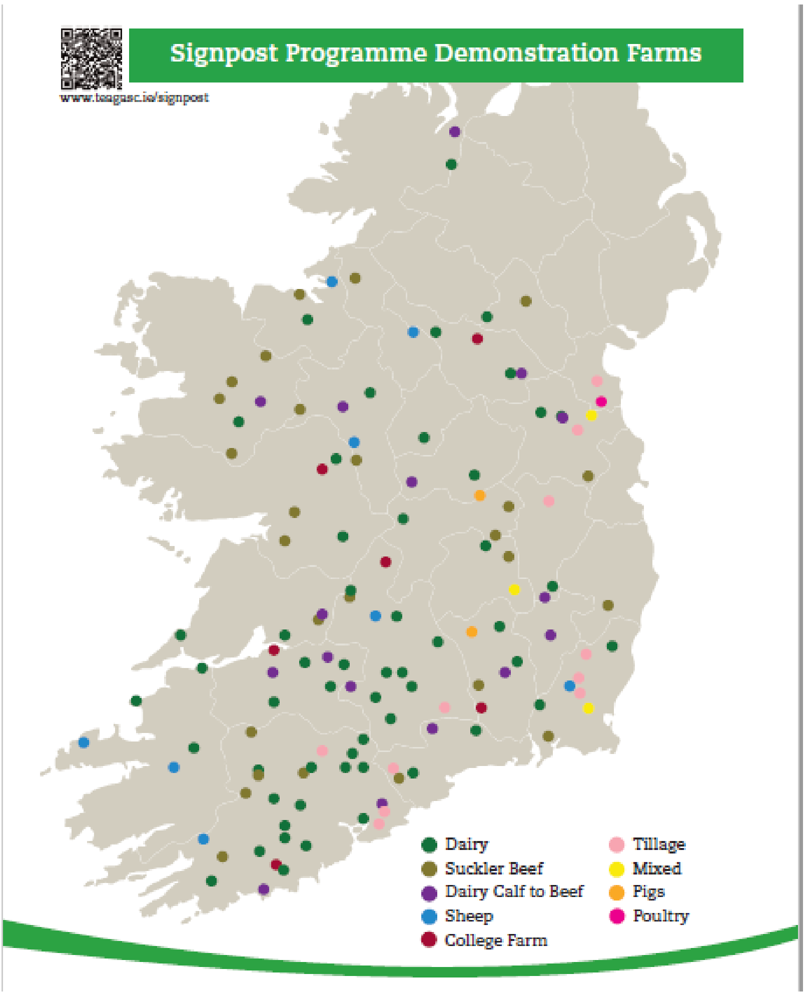
Background

There are 119 Signpost demonstration farms across the Republic of Ireland. The Signpost farms are across all enterprises: 50 dairy, 24 suckler beef, 16 dairy beef, 8 sheep, 10 tillage, one pig, one poultry farm and 10 other farms including six Agricultural Colleges and a number of Teagasc research demonstration farms. There are also 5 organic farmers included in the total. For the purposes of the report, dairy beef and suckler beef have been combined.

A Farm Sustainability Plan (FSP) has been created with each Signpost farmer, identifying areas for improvement and action. Signpost farmers have been asked to create plans with their advisers that will help reduce greenhouse gas and ammonia emissions as well as improving water quality on their farms, where relevant, and enhance biodiversity. A holistic approach is being taken to sustainability with 4 key areas if sustainability included – economic, social, environmental and innovation.

This Signpost Sustainability Report is prepared on an annual basis for these farms throughout the duration of the programme. The baseline year is 2021 and presented in this report. The report will allow the programme, Signpost farmers and all farmers to benchmark and track progress of the Signpost demonstration farms but also to make adjustments to sustainability plans to ensure these farms meet the targets set out in the programme

Map of the Signpost Farms for all enterprises



Data recording
The economic, environmental, social and innovation sustainability metrics for individual farmers presented in this report are generated by the National Farm Survey (NFS) team. The procedure for data collection and validation as well as data processing is the same as for the NFS annual sustainability reports (https://www.teagasc.ie/rural-economy/rural-economy/national-farm-survey/sustainability-reports/), as per the European Union's Farm Accountancy Data Network (FADN) dataset[1]. The data collected in the Teagasc NFS surpasses the requirements of FADN, giving the Teagasc NFS dataset much more capacity to measure and track developments in agricultural sustainability.

This report presents results for the four dominant farm systems in Ireland, namely, dairy, cattle, sheep and tillage. This data will produced on an annual basis, with 2021 being the baseline year for the Signpost Programme. It will be possible to generate and compare indicators for economic, social and environmental sustainability over time.

Future Developments

This report sets out the baseline data for the Signpost farms across all the enterprises. This process will be repeated on an annual basis so that we can track the progress of the Signpost farms in reducing emissions and it will also allow the programme to benchmark the Signpost farmers against other farms and the National Farm Survey average. The information in the individual farm reports will allow the programme advisers and local advisers to the Signpost farms to revise and update action plans in line with the reported progress. Carbon sequestration will be estimated on each of the farms going forward. Initially using default data for soil carbon sequestration and hedgerow carbon sequestration. Lidar measurements on the Signpost farms over the next 12 months will allow the programme to calculate hedgerow carbon sequestration. Soil carbon sequestration data will become available in the next few years. Additional key performance indicators such as soil fertility, age at slaughter, age at first calving etc. will be included in Signpost sustainability reports going forward to match changes in the .

Key performance indicator targets

Metric	**Target by 2030**
Target net profit € / ha (dairy)	€2,000/ha
Target net profit € / ha (beef & sheep)	> €500 / ha
Reduction in total farm GHG emissions	-25%
Reduction in total farm NH_3 emissions	-5%
Nitrogen use efficiency %	35%
Reduction in total chemical N use	-30%
% of N spread as protected urea	100%
% slurry spread using LESS	100%

Summary

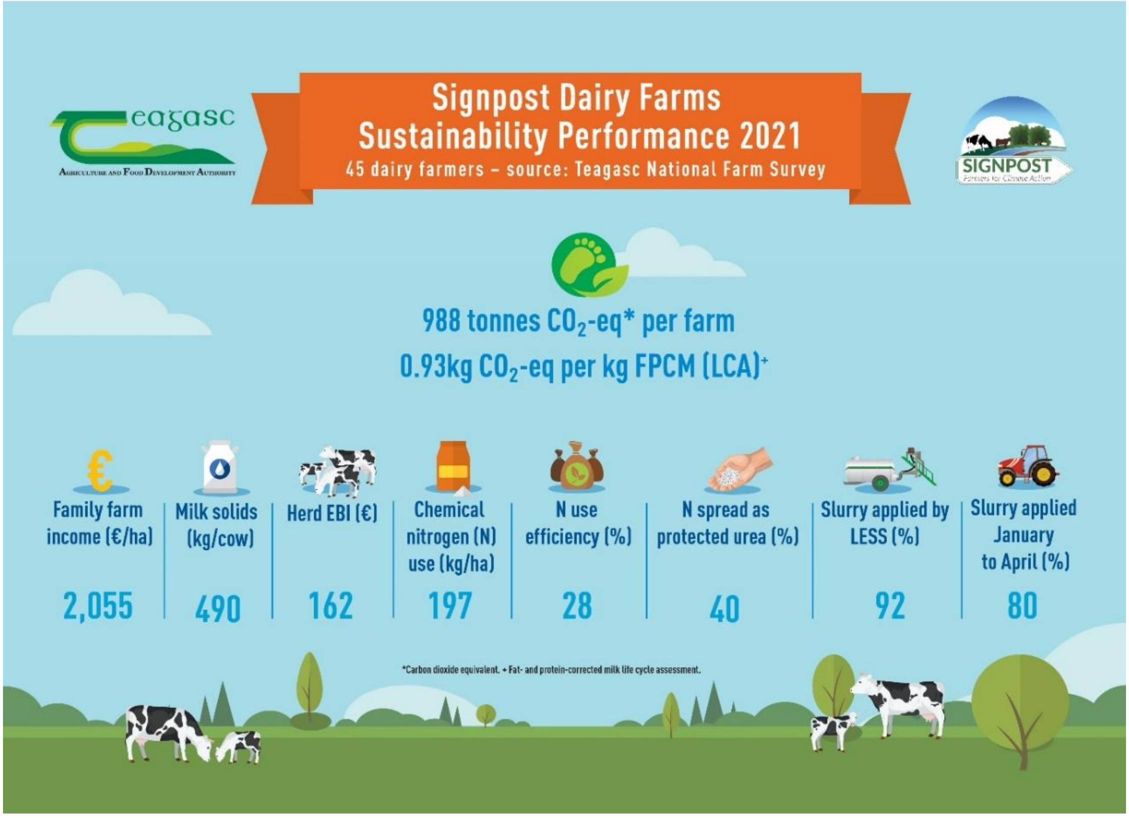


Figure 1. Summary of Signpost dairy farm sustainability performance 2021

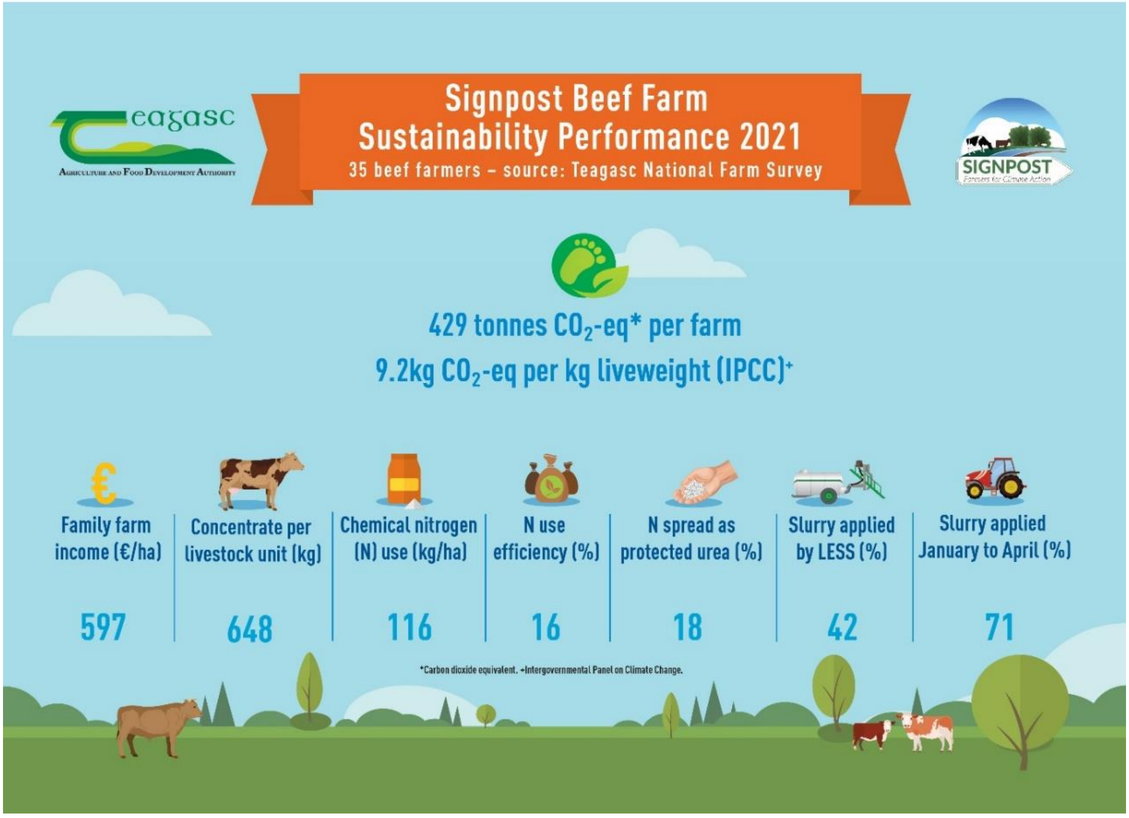


Figure 2. Summary of Signpost beef farm sustainability performance 2021

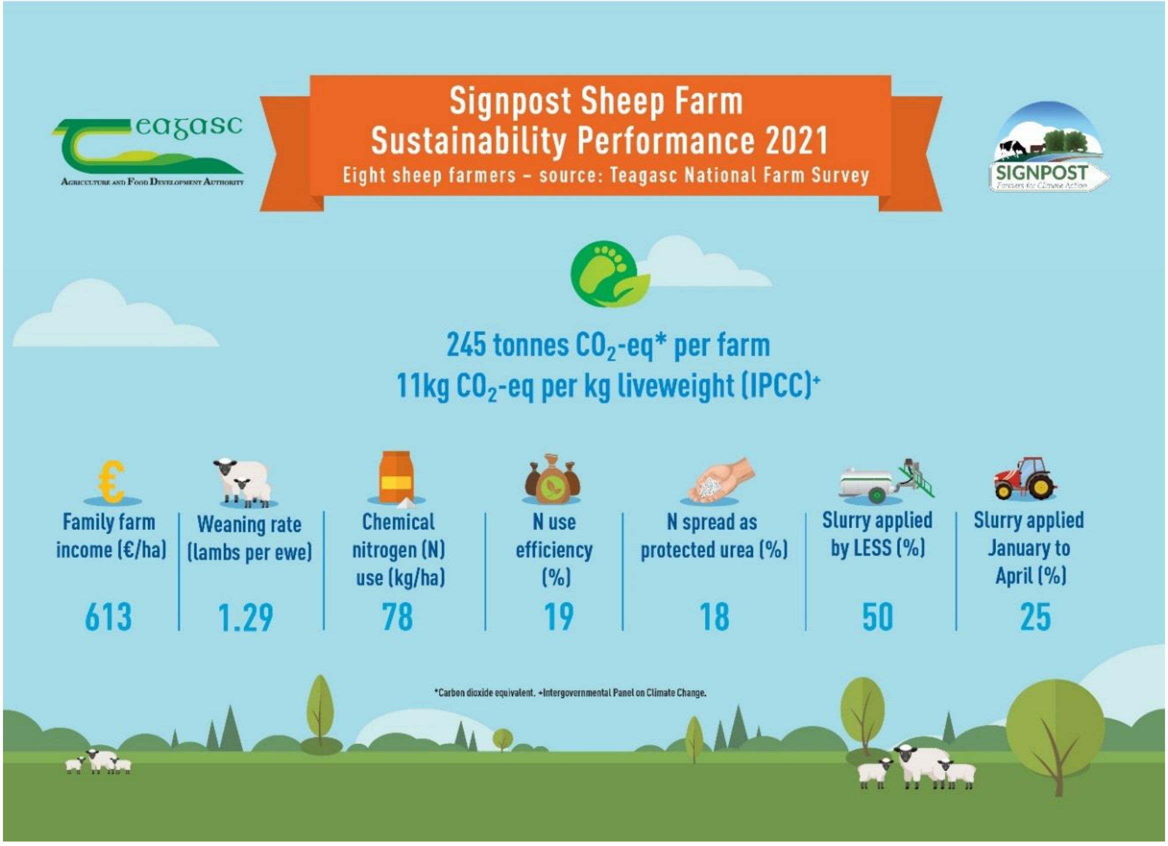


Figure 3. Summary of Signpost sheep farm sustainability performance 2021

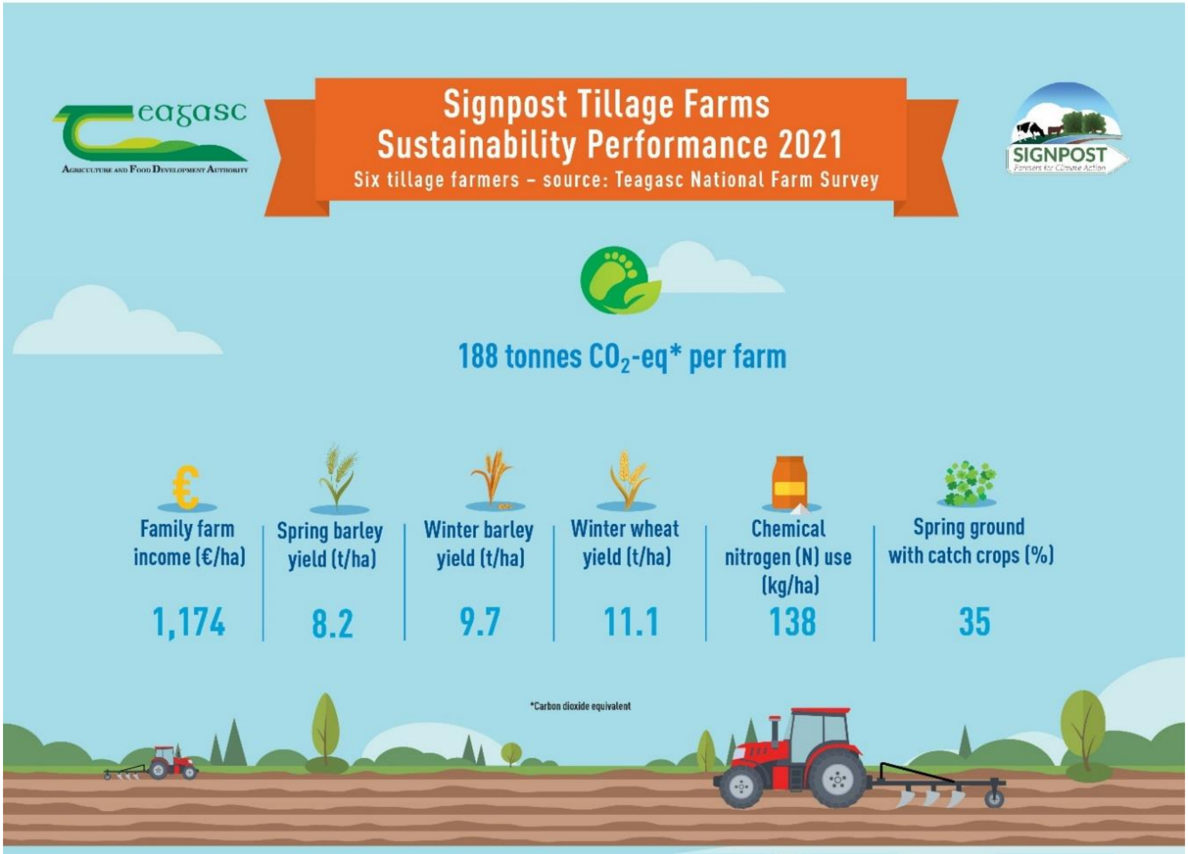


Figure 7. Summary of Signpost tillage farm sustainability performance 2021

Table 1. Signpost Dairy Farm Economic and Social Sustainability Metrics

Economic Sustainability Metrics	Units	NFS Average	Average	Minimum	Maximum
Economic return per hectare (gross output)	€	4324	5204	2539	8978
Profitability per hectare (gross margin)	€	2396	3119	1459	5213
Family farm income per hectare	€	1548	2055	557	4394
Market orientation	%	91%	94%	91%	96%
Social Sustainability Metrics	**Units**	**NFS Average**	**Average**	**Minimum**	**Maximum**
Hours worked on farm	hrs	1486	2906	1500	4212
Total hours worked	hrs	2221	2992	1500	5526
Hours per LU	hrs	58	29	17	71

Table 2. Signpost Dairy Farm Environmental Sustainability Metrics

Environmental Sustainability Metrics	Units		NFS Average	Average	Minimum	Maximum
Total farm average Ag. GHG emissions	tonnes CO_2-e	per farm	614	988	455	2317
of which dairy	tonnes CO_2-e	per farm	454	779	316	1852
cattle	tonnes CO_2-e	per farm	158	210	39	495
Energy use	tonnes CO_2-e	per farm	21	28	16	64
Farm GHG emissions	tonnes CO_2-e	per ha	9.5	10.4	5.9	14.5
Energy GHG Emissions	tonnes CO_2-e	per ha	0.35	0.31	0.17	0.58
Ag. GHG Emissions per kg FPCM	kg CO_2-e		0.85	0.76	0.64	1.02
Ag. GHG Emissions per € output	kg CO_2-e		2.50	2.18	1.61	3.05
Energy GHG Emissions per kg FPCM	kg CO_2-e		0.04	0.02	0.01	0.04
Energy GHG Emissions per € output	kg CO_2-e		0.09	0.06	0.03	0.10
GHG Emissions per kg FPCM (LCA)	kg CO_2-e		1.05	0.92	0.69	1.18
Total farm average NH3 emissions	tonnes NH_3 per farm		2.9	4.5	1.7	11.2
of which dairy	tonnes NH_3 per farm		2.1	3.5	1.3	9.7
cattle	tonnes NH_3 per farm		0.8	1.0	0.2	2.4
NH3 emissions per hectare	kg NH_3		45	47	23	63
NH3 emissions per Euro output	kg NH_3		0.012	0.010	0.006	0.013
Chemical N per kg per hectare	kg per ha		167	197	97	299
N Balance per hectare	kg per ha		164	180	85	281
P Balance per hectare	kg per ha		12.9	13.0	-1.8	51.7
N use efficiency	percentage		27%	28%	20%	41%
P use efficiency	percentage		53%	57%	23%	113%

Table 3. Signpost Dairy Farm Innovation Metrics

Innovation Metrics	Units	NFS Average	Average	Minimum	Maximum
Milk Recording	percentage	48%	84%	0.0%	100.0%
% of slurry spread using LESS	percentage	67%	92%	10.0%	100.0%
% of slurry applied during spring	percentage	51%	80%	0.0%	100.0%
% chemical N applied as Protected Urea	percentage	7%	40%	0.0%	100.0%
% Slurry stores covered	percentage	85%	82%	20.0%	100.0%
Clover Reseeding 3 years	percentage	17%	49%	0%	100%
Average days at grass	days	241	258	201	365
Concentrates per dairy cow	kg	1167	1005	507	1354
Concentrates per cattle	kg	436	483	0	1362
Concentrates per total	kg	1013	866	344	1248

Table 4. Signpost Beef Farm Economic and Social Sustainability Metrics

Economic Sustainability Metrics	Units	NFS Average	Average	Minimum	Maximum
Economic return per hectare (gross output)	€	1532	2300	1302	6372
Profitability per hectare (gross margin)	€	653	980	366	2566
Family farm income per hectare	€	404	579	-841	2121
Market orientation	%	66%	76%	60%	92%
Social Sustainability Metrics	**Units**	**NFS Average**	**Average**	**Minimum**	**Maximum**
Hours worked on farm	hours	1486	1891	300	3927
Total hours worked	hours	2221	2864	1500	4260
Hours per LU	hours	58	30	4	85

Table 5. Signpost Beef Farm Environmental Sustainability Metrics

Environmental Sustainability Metrics	Units		NFS Average	Average	Minimum	Maximum
Total farm average Ag. GHG emissions	tonnes CO_2-e	per farm	157	429	118	2740
cattle	tonnes CO_2-e	per farm	151	406	118	2514
sheep	tonnes CO_2-e	per farm	4	15	0	192
tillage	tonnes CO_2-e	per farm	1	8	0	226
energy use	tonnes CO_2-e	per farm	6	11	3	62
Ag GHG Emissions	tonnes CO_2-e	per ha	5	7	4	10
Energy GHG Emissions	tonnes CO_2-e	per ha	0.20	0.18	0.07	0.47
Ag. GHG Emissions per kg live-weight beef	kg CO_2-e		12.0	9.3	4.1	18.8
Ag. GHG Emissions per € output	kg CO_2-e		4.5	3.7	1.5	5.3
Energy GHG Emissions per kg live-weight beef	kg CO_2-e		0.50	0.25	0.07	0.51
Energy GHG Emissions per € output	kg CO_2-e		0.19	0.10	0.03	0.21
Total farm average NH3 emissions	tonnes NH_3 per farm		0.8	2.4	0.5	22.4
cattle	tonnes NH_3 per farm		0.8	2.3	0.5	22.2
sheep	tonnes NH_3 per farm		0.0	0.1	0.0	0.7
tillage	tonnes NH_3 per farm		0.0	0.01	0.0	0.2
NH3 emissions per hectare	kg NH_3		23	34	17	72
NH3 emissions per Euro output	kg NH_3		0.02	0.02	0.01	0.03
NH3 emissions per kg live-weight beef	kg NH_3		0.07	0.05	0.03	0.07
Chemical N per kg per hectare	kg per ha		64	116	43	179
N Balance per hectare	kg per ha		63	125	48	192
P Balance per hectare	kg per ha		6.2	11.3	-3.5	37.9
N use efficiency	percentage		22%	16%	4%	69%
P use efficiency	percentage		63%	51%	6%	147%

Table 6. Signpost Beef Farm Innovation Metrics

Innovation Metrics	Units	NFS Average	Average	Minimum	Maximum
% of slurry spread using LESS	percentage	25%	42%	0%	100%
% of slurry applied during spring	percentage	49%	71%	0%	100%
% chemical N applied as Protected Urea	percentage	2%	18%	0%	85%
% Slurry covered	percentage	94%	95%	0%	100%
Clover Reseeding 3 years	percentage	6%	14%	0%	100%
Average days grass Cattle	days	228	235	184	302
Concentrates per Cattle	kg	436	648	32	1962
Concentrates per Sheep	kg	412	334	93	657
Total Concentrates	kg	428	637	74	1962

Table 7. Signpost Sheep Farm Economic and Social Sustainability Metrics

Economic Sustainability Metrics	Units	NFS Average	Average	Minimum	Maximum
Economic return per hectare (gross output)	€	1476	1578	391	2606
Profitability per hectare (gross margin)	€	623	747	96	1286
Family farm income per hectare	€	445	613	152	953
Market orientation	%	66%	64%	32%	82%
Social Sustainability Metrics	**Units**	**NFS Average**	**Average**	**Minimum**	**Maximum**
Hours worked on farm	hrs	1541	2476.8	1200	3640
Total hours worked	hrs	2085	3052.8	2200	4140
Hours per LU	hrs	51	60	28	125

Table 8. Signpost Sheep Farm Environmental Sustainability Metrics

Environmental Sustainability Metrics	Units		NFS Average	Average	Minimum	Maximum
Total farm average Ag. GHG emissions	tonnes CO_2-e	per farm	166	245	75	471
cattle	tonnes CO_2-e	per farm	75	86	0	286
sheep	tonnes CO_2-e	per farm	90	151	75	217
tillage	tonnes CO_2-e	per farm	1	8	0.0	66
energy use	tonnes CO_2-e	per farm	6	10	4	22
Ag GHG Emissions	tonnes CO_2-e	per ha	4.1	3.8	0.8	6.5
Energy GHG Emissions	tonnes CO_2-e	per ha	0.17	0.15	0.04	0.23
Ag. GHG Emissions per kg live-weight sheep produced	kg CO_2-e		11.4	11.0	7.7	16.8
Ag. GHG Emissions per € output	kg CO_2-e		4.0	3.4	2.3	4.6
Energy GHG Emissions per kg live-weight sheep produced	kg CO_2-e		0.50	0.56	0.19	1.38
Energy GHG Emissions per € output	kg CO_2-e		0.16	0.16	0.07	0.32
Total farm average NH3 emissions	tonnes NH_3 per farm		0.8	1.2	0.4	3.1
cattle	tonnes NH_3 per farm		0.4	0.6	0.0	2.3
sheep	tonnes NH_3 per farm		0.4	0.6	0.4	0.8
tillage	tonnes NH_3 per farm		0.0	0.01	0.0	0.1
NH3 emissions per hectare	kg NH_3		19	18	4	31
NH3 emissions per Euro output	kg NH_3		0.02	0.02	0.01	0.03
NH3 emissions per kg live-weight sheep	kg NH_3		0.04	0.05	0.03	0.09
N Balance per hectare	kg per ha		53	76	11	168
P Balance per hectare	kg per ha		7	9	2	23
Chemical N per kg per hectare	kg per ha		46.7	77.7	9.6	152.0
N use efficiency	%		26%	19%	8%	60%
P use efficiency	%		58%	35%	16%	70%

Table 9. Signpost Sheep Farm Innovation Metrics 2021

Innovation Metrics	Units	NFS Average	Average	Minimum	Maximum
% of slurry spread using LESS	%		50%	0%	100%
% of slurry applied during spring	%	33%	25%	0%	100%
% chemical N applied as Protected Urea	%	2%	18%	0%	68%
% of Slurry stores covered	%	95%	96%	91%	100%
Clover Reseeding 3 years	%	6%	25%	0%	100%
Weaning Rate*	(lambs per ewe)	1.4	1.3	0.8	1.7
Concentrates per Cattle	kg	436	1279	5	5666
Concentrates per Sheep	kg	412	387	223	610
Total Concentrates	kg	434	444	217	954

*Includes hill and lowland flocks

Table 10. Signpost Tillage Farm Economic and Social Sustainability Metrics

Economic Sustainability Metrics	Units	NFS Average	Average	Minimum	Maximum
Economic return per hectare (gross output)	€	2218	3030	2134	4778
Profitability per hectare (gross margin)	€	1189	1870	1227	2823
Family farm income per hectare	€	839	1174	625	2162
Market orientation	%	79%	85%	80%	91%
Social Sustainability Metrics	**Units**	**NFS Average**	**Average**	**Minimum**	**Maximum**
Hours worked on farm	hrs	1519	2148	600	3000
Total hours worked	hrs	2215	2964	2520	4200

Table 11. Signpost Tillage Farm Environmental Sustainability Metrics 2021

Environmental Sustainability Metrics	Units		NFS Average	Average	Minimum	Maximum
Total farm average Ag. GHG emissions	tonnes CO_2-e	per farm	176.9	188	100	360
cattle	tonnes CO_2-e	per farm	104.5	15	0	91
sheep	tonnes CO_2-e	per farm	15	0	0	0
tillage	tonnes CO_2-e	per farm	57.4	173	100	360
energy use	tonnes CO_2-e	per farm	16.5	32	19	53
Ag GHG Emissions	tonnes CO_2-e	per ha	2.5	1.5	1.1	2.2
Energy GHG Emissions	tonnes CO_2-e	per ha	0.22	0.26	0.19	0.34
Ag. GHG Emissions per € output	kg CO_2-e		1.48	0.6	0.4	1.1
Energy GHG Emissions per € output	kg CO_2-e		0.12	0.11	0.04	0.17
Total farm average NH3 emissions	tonnes NH_3 per farm		0.73	1.5	0.1	4.2
cattle	tonnes NH_3 per farm		0.49	0.06	0.00	0.36
tillage	tonnes NH_3 per farm		0.19	1.47	0.11	4.17
NH3 emissions per hectare	kg NH_3		9.8	14.6	1.3	55.9
NH3 emissions per Euro output	kg NH_3		0.01	0.0	0.0	0.0
Chemical N per kg per hectare	kg per ha		99	138	131	145

Table 12. Signpost Tillage Farm Innovation Metrics 2021

Innovation Metrics	Units	NFS Average	Average	Minimum	Maximum
% of slurry spread using LESS	%		17%	0%	100%
% of slurry applied during spring	%		0%	0%	0%
% chemical N applied as Protected Urea	%	0.01%	0%	0%	0%
% of Slurry stores covered	%	88%	77%	0%	100%
Clover Reseeding 3 years	%	12%	17%	0%	100%
Spring barley yield t/ha	t/ha	6.6	8.2	7.5	9.0
Winter barley yield t/ha	t/ha	8.8	9.8	8.5	10.7
Winter wheat yield t/ha	t/ha	9.7	11.2	9.6	12.7
% of Spring ground with catch crops	%		35%	0%	100%

Soil Test Results 2021

Number of fields sampled: 2993

Number of farms: 101

Main Farm Enterprise	Number of farms sampled
Beef	33
Sheep	8
Dairy	49
Tillage	6

Standard 10cm core soil samples were taken from fields <5ha. Samples were dried and sieved to 2cm and analysed by an accredited laboratory.

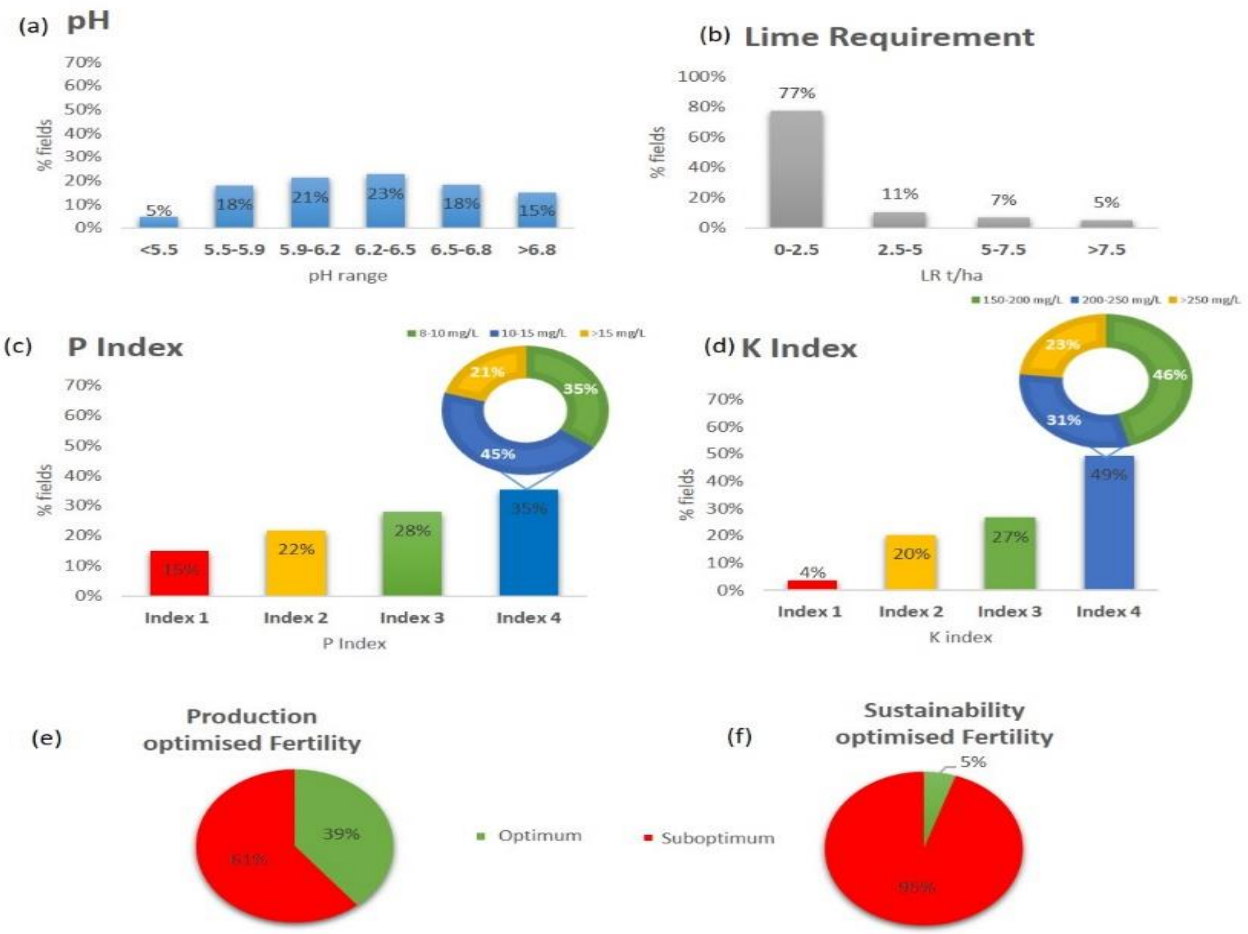


Figure 1 Soil Results for all Farms. (a) pH; (b) Lime Requirement; (c), (d) P Index, Pie Charts show a breakdown of soils at phosphorus (P) index 4 and potassium (K) index 4. (e) Fertility Reports Chart based on Soil pH >6.3, P & K Index 3 and 4. (f) Fertility Reports Chart based on Soil pH >6.3, P & K Index 3.

Farm slurry analysis results 2021

Enterprise	No. Samples	pH	Dry matter	N	N @ 40% availability *	P	K
			%	Units / 1,000 gals	Units / 1,000 gals	Units / 1,000 gals	Units / 1,000 gals
Dairy	56	7.1	6.5	25.7	10.3	6.3	24.8
Suckler Beef	42	7.1	7.3	26.8	10.7	6.9	28.6
Dairy calf to Beef	15	7.0	7.4	28.4	11.3	8.8	28.9
Sheep	5	6.9	6.8	28.3	11.3	7.6	33.06
Tillage	6	7.5	5.4	35.7	14.3	11.7	16.8
Pigs	4	8.0	4.5	37.8	15.1	11.7	19.9

* availability of N in the slurry was assumed at 40% N recovery based on spreading the slurry in the January to April window and by using Low Emission Slurry Spreading (LESS) technology.

Appendices

Abbreviations

CH_4	Methane
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
FPCM	Fat and protein corrected milk
GHG	Greenhouse gases
GM	Gross Margin
LCA	Life Cycle Analysis
N	Nitrogen
NH_3	Ammonia
N_2O	Nitrous oxide
NFS	National Farm Survey
NUE	Nitrogen use efficiency
P	Phosphorus
PUE	Phosphorus use efficiency

Glossary of Terms

CO_2 equivalent: For reporting purposes all non-carbon dioxide (CO_2) emissions are converted to CO_2 equivalents using appropriate global warming potentials for CH_4 and N_2O which are respectively 25 and 298 times greater than CO_2.

Direct Costs: Costs directly incurred in the production of a particular enterprise, e.g., fertilisers, seeds and feeding stuffs.

Fat and Protein Corrected Milk (FPCM): This is the functional unit used for carbon foot printing dairy output on farm. It adjusts kg/litres of milk to allow for the level of milk solids produced which is standardized to 4% fat and 3.3% true protein per kilogramme of milk.

Greenhouse Gases (GHG): The amount of greenhouse gas emissions (CO_2, N_2O, CH_4) associated with the production of a specific type of agricultural produce, expressed as kg CO_2 equivalent per kg of produce (e.g. per kg beef, milk).

Gross Output: Gross output for the farm is defined as total sales less purchases of livestock, plus value of farm produce used in the house, plus receipts for hire work, services, fees etc. It also includes net change in inventory, which in the case of cows, cattle and sheep is calculated as the change in numbers valued at closing inventory prices. All non-capital grants, subsidies, premiums, headage payments are included in gross output in this report.

Gross Margin: Gross output minus direct costs.

Labour Unit: One labour unit is defined as at least 1,800 hours worked on the farm by a person over 18 years of age. Persons under 18 years of age are given the following labour unit equivalents:

16-18 years: 0.75

14-16 years: 0.50

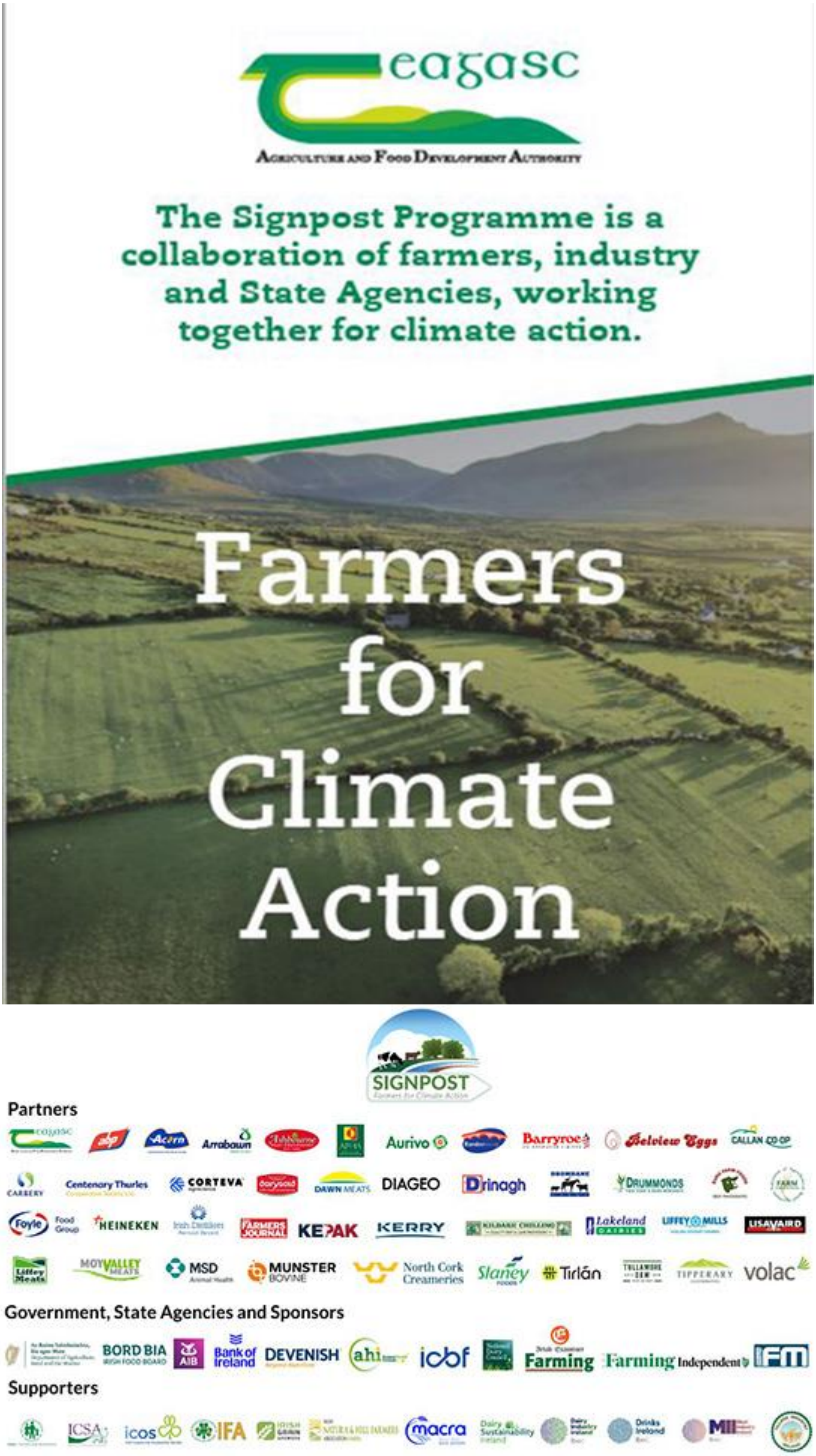
Life Cycle Analysis: An alternative method to the IPCC approach to measuring carbon is the Life-Cycle Assessment approach which accounts for emissions through the entire food production supply chain.

Nitrogen balance / surplus: (per hectare farmed), is used as an indicator of the potential magnitude of nitrogen surplus which reflects the risk of nutrient losses to water bodies all other things being equal. It is calculated on the basis of N inputs less N outputs on a per hectare basis at the farm gate level.

Nitrogen use efficiency: is used to highlight the proportion of N retained in the farm system (N outputs / N inputs). This is a generic measure allowing comparison across disparate farm types at the farm gate level.

Phosphorus balance / surplus: (per hectare farmed), is used as an indicator of the potential magnitude of phosphorus surplus which may result in nutrient losses to water bodies all other things being equal. It is calculated on the basis of P inputs less P outputs on a per hectare basis at the farm level.

Phosphorus use efficiency: is used to highlight the proportion of P retained in the farm system (P outputs / P inputs). This is a generic measure allowing comparison across different farm types.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The Signpost Programme is a collaboration of farmers, industry and State Agencies, working together for climate action.
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