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Regional Self-Assessment (Summary)

Ireland – Northern & Western Region

October 2021

IT Sligo

An Institiúid Teicneolaíochta Sligeach

Contract Research Unit

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V1	10/20/2021	Mel Gavin (IT Sligo)	Stevie Donnelly (IT Sligo)

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Executive Summary

This Regional Self-Assessment examines the current levels of deployment of Renewable Energy (RE) technologies in Agriculture in the Northwest (NW) Region. The Northwest Region accounts for 36% of the land area of Ireland but only 18% of the population. As a region with significant rural population, the farming sector is critically important to communities and the economy. Agriculture in the region can be categorised as follows:

- Smaller average farms sizes and economic output
- Vast majority of land use is accounted for by Grassland (82%) and Commonage (16%)
- Most land use is attributable to beef and sheep farming
- Generally high likelihood of High Nature Value farmland

The pig and poultry sectors are also likely to have the most significant on-site energy demand. Other sectors with significant energy demand include dairy farms and grain drying on tillage farms, although these sectors are less represented in the NW region.

the uptake of RE technology in agriculture in the NW region, and Ireland as a whole, is quite limited. Factors that have contributed to the low uptake include, but are not limited to the following:

- Small farms with limited financial capacity for investment
- Lack of on-farm or regional agencies with knowledge of technologies and regulatory issues
- Dominance of beef and sheep farming in the region, which don't have significant energy demand, are much less suitable for self-consumption RE deployment
- Absence of an available market tariff for small and micro-scale renewable electricity generation for export
- Poor experience among early adopters of energy crops
- Limited market for biomass and energy crops in renewable heating
- Aging farm holder profile
- Policy focus on GHG reduction, rather than renewable energy, as a priority in the sector

The RE technology and market supply chain have improved significantly in recent years. The policy landscape in Ireland in relation to climate action and renewable energy continues to evolve. As new government incentives emerge, the key opportunity identified in this study is to provide independent advice and clarity to the farming sector to make appropriate investment choices.

1. Introduction

As a key deliverable of the AgroRES project each partner is tasked with completing a regional self-assessment of the situation in their region regarding investments and use of Renewable Energy (RE) in the agricultural and rural sectors. The purpose of this assessment is to draw a clear map on the strengths, weaknesses, opportunities and threats in each involved region. The assessment must consider, not only the current situation, but the potential and resources that exist in each region. As the natural resources are different in each region, the self-assessment must identify which REs are more cost-effective and have a higher potential, and therefore should be promoted. The Regional Self-Assessment will examine the RE resources and current levels of deployment of RE technologies in the Northwest (NW) Region. Further to this the routes to exploitation will be examined from the perspective of the agricultural and rural sectors. As the AgroRES project aims to inform policy makers, the Regional Self-Assessment focuses on RE solutions which are more likely to have a widespread impact.

2. Regional overview

2.1. Northwest region

Changes made under the 2014 Local Government Act prompted a revision to the NUTS3 Regions. These changes included the movement of Co. Louth from the NUTS3 Border to the Mid-East Region and moving the NUTS3 Midland region to the new NUTS2 Eastern & Midland region. At the NUTS2 level the new arrangement comprises of 3 regions as shown in Table 2.1. This regional assessment will refer primarily to the current NUTS2 Northern & Western (NW) region as this will be the subject Northern & Western Regional Assembly moving forward. However, much of the available data was collected in 2016 prior to the changed arrangement, and in some cases is only available for the older BMW region.

Table 2.1 – Changes to NUTS Regions in Ireland

NUTS2 Region – 2016	NUTS3 Region – 2016
Northern & Western (NW)	Border – Cavan, Donegal, Leitrim, Monaghan, Sligo.
	West – Galway, Mayo, Roscommon.
Southern (S)	Mid-West – Clare, Limerick, Tipperary.
	South-East – Carlow, Kilkenny, Waterford, Wexford.
	South-West – Cork, Kerry.
Eastern & Midland (EM)	Dublin – Dublin City, Dún Laoghaire-Rathdown, Fingal, South Dublin.
	Mid-East – Kildare, **Louth**, Meath, Wicklow.
	Midland – Laois, Longford, Offaly, Westmeath.

The NW Region accounts for 36% of the land area of Ireland but only 18% of the population. The territory is presented in the map below.

Table 2.2 – NW Regional statistics

Parameter	Data / value	Notes	Source
Surface (km2)	24,829	Land only (water excluded). 36% of State total.	CSO, 2016
Population			
Female:	421,734		CSO, Census 2016
Male:	425,708		CSO, Census 2016
Total:	847,442	17.8% of State total	CSO, Census 2016
Socio-economic characteristics of the territory			
Regional GVA (at basic prices) (€m)	16,647	10% of State total	CSO, 2017
Pro-capita GVA	€19,644		
Average net household income	€41,804		CSO, 2015
GVA by main economic sectors: (industry, services, agriculture) (€m)			
Industry	4,625	28% of Region total	CSO, 2017
Services	11,347	68% of Region total	CSO, 2017
Agriculture (includes forestry and fishing)	675	4% of Region total	CSO, 2017

2.2. Agriculture in the Region

When considering agriculture in the target NW region, some comparison at the sub-regional level (NUTS3) is worthwhile. In 2016, 43% of all farms were located in the NW region. However, the region is characterised by smaller average farm sizes and considerably lower average Standard Output (SO, the average monetary value of the agricultural output at farm-gate prices).

Table 2.3 – Average farm size and output

NUTS2 region	NUTS3 region	Total number of farms ('000)	Average farm size (ha)	Average Standard Output (€)	Average Standard Output per hectare
NW	Border	28.4	26.3	€30,977	€1,178
	West	31.4	24.6	€19,683	€800
EM	Mid-East and Dublin	10.3	42.4	€65,483	€1,544
	Midland	12.8	35.0	€47,147	€1,347
S	Mid-West	15.9	34.6	€48,398	€1,399
	South-East	16.5	42.3	€80,784	€1,910
	South-West	22.3	36.1	€64,211	€1,779

The Standard Output (SO) of farms is impacted by several factors including size, land characteristics and farm type. The standard EU farm typology includes Specialist Tillage, Specialist Dairying, Specialist Beef Production, Specialist Sheep, Mixed Grazing Livestock, Mixed Crops & Livestock, Mixed Field Crops[1] and Other[2]. The average farm SO for each farm type is shown in Fig 2.1. It is likely that the relatively high value of the 'Other' farm type is largely accountable to the pig and poultry sectors included in that category. Excluding 'Other', which accounts for less than 1% of all farms in Ireland, dairy and tillage farming has significantly higher value than beef or sheep farming.

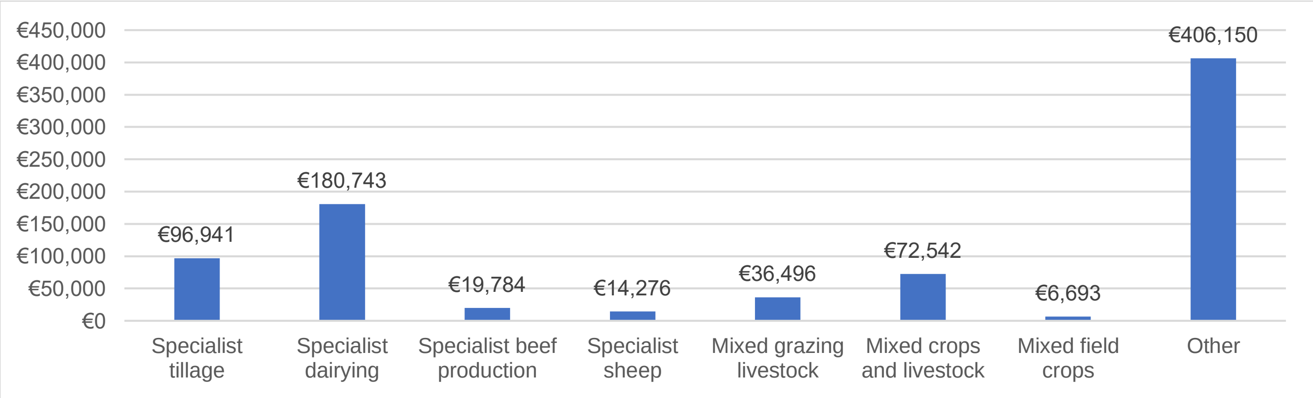

Fig 2.1 –Average farm Standard Output by farm type in the State

The NW region has 1,797,000 hectares of Agricultural Land including Commonage[3], comprising 72% of the total land surface in the region. Commonage refers to land that is owned by more than one person, in which each shareholder owns a defined fraction of the total area and this is detailed on each shareholders folios. From a traditional agriculture perspective, commonage generally represents difficult to access, lower quality land with lower economic output. Commonage accounts for 15% of the Agricultural land in the NW region, approximately three times that of the Eastern and Midland and Southern regions.

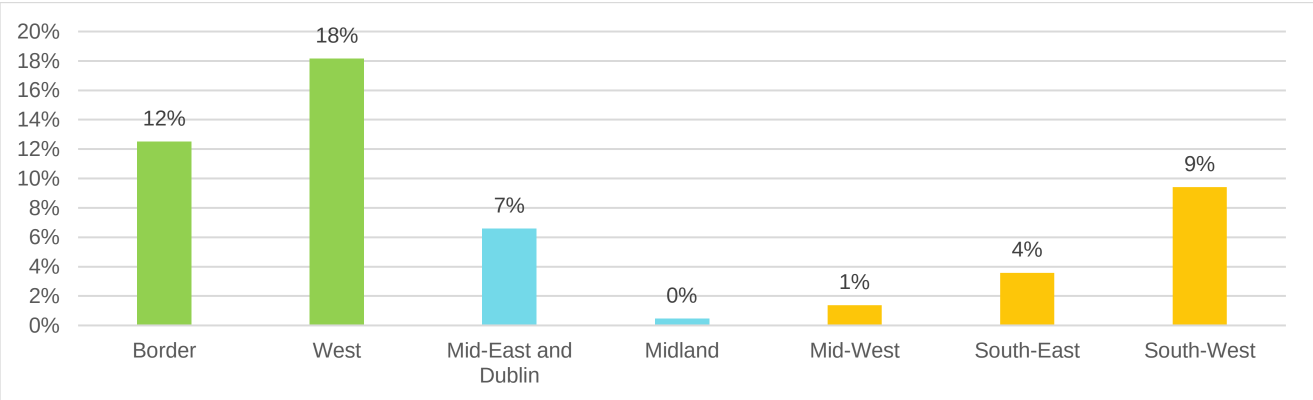

Fig 2.2 – NUTS3 regions – Commonage % of total Agricultural land per NUTS 3 region

1 This group includes farms growing various crops (including silage, hay, pasture or rough grazing) but with no dominant crop type.

2 This group includes farms specializing in horticulture, fruit, pig or poultry production, mixed crops, mixed livestock and a small number of unclassified farms.

3 http://www.yourcommonage.ie/p/commonage_3.html

The relatively higher percentages of commonage in the Border and West correlate with lower average Standard Output and higher proportions of sheep farming. This also correlates with higher potential for High Nature Value (HNV) farmland. HNV farmland is managed farmland that has high biodiversity and can aid the conservation of semi-natural habitats and the plants and animals linked with them. The IDEAL-HNV project[4] identified the distribution and extent of agricultural land of High Nature Value in Ireland. Fig 2.3 shows the high likelihood for HNV in the NW region.

Almost two thirds of all Specialist Sheep farms were in the NW region (65.6%), while the Southern Region contained 52% of Specialist Tillage farms and 72% of Specialist Dairying farms. Beef and sheep farming accounts for most farms in the NW region as shown in Fig 2.4.

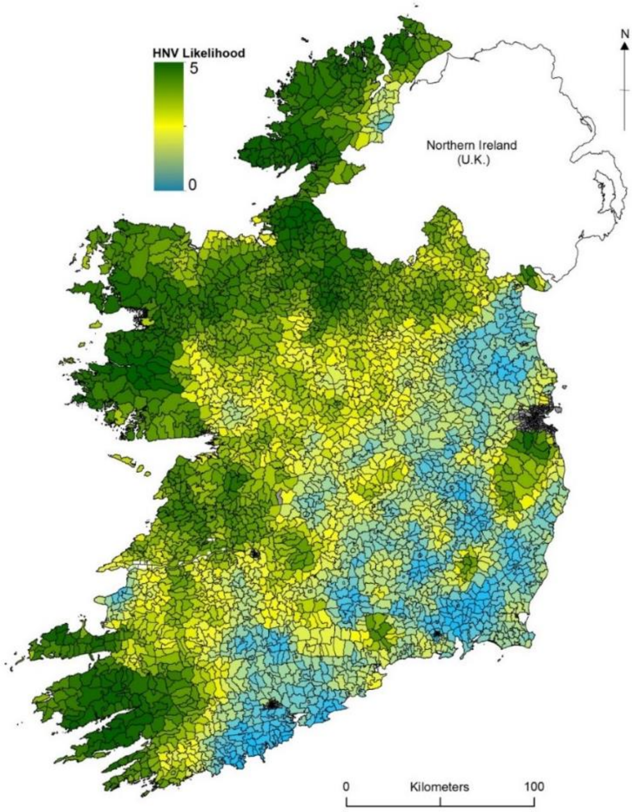

Fig 2.3 – Potential for HNV farming in Ireland

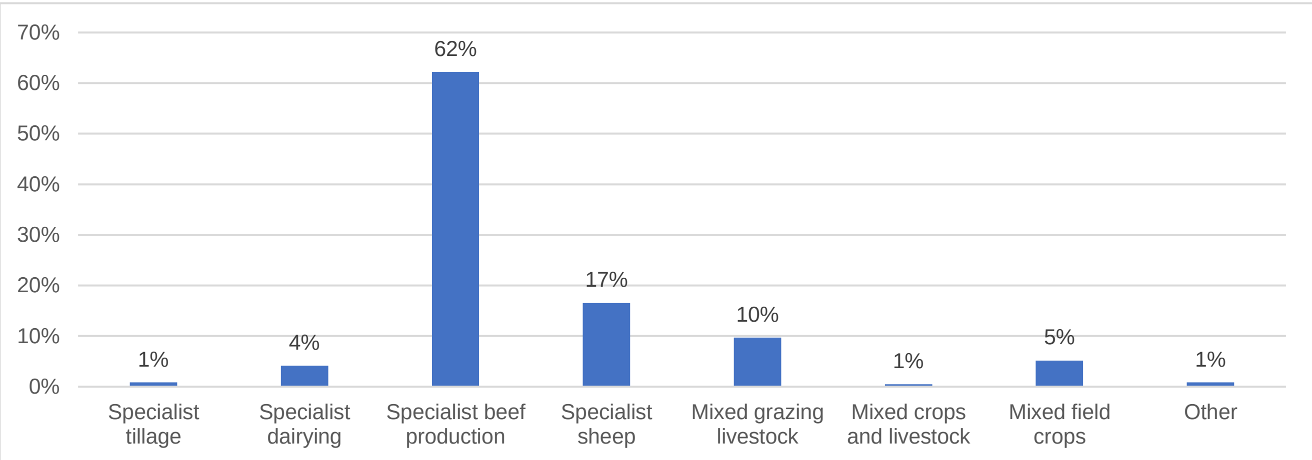

Fig 2.4 – Distribution of farm types in the NW region by number of farms

As referred to previously, pig and poultry farms are included in the 'Other' category. While there is only a small number of 'Other' farms in the NW Region, Table 2.4 shows that the NUTS3 Border region accounts for 30% of pigs and 70% of poultry in the State.

Table 2.4 – Number of livestock (1,000 units)

4 http://www.high-nature-value-farmland.ie/

Livestock type	NUTS2 NW Region	NUTS3 West	NUTS3 Border	State
Cattle	1909.6	980.8	928.8	7331.5
Goats	3.6	1.6	2.0	10.2
Pigs	529.3	47.1	**482.2**	1,605.2
Poultry	7,813.8	127.4	**7,686.4**	11,062.0
Sheep	2,553.7	1,412.7	1,141.0	5,177.2
Total	**12,810.0**	**2,569.6**	**10,240.4**	**25,186.1**

The agriculture sector supports employment of farm families and contract workers. The associated farm labour is outlined in Table 2.5. The CSO Farm Structure Survey data is only available for the older NUTS 2 regions. The Teagasc National Farm Survey 2019[5] indicated that the Family Farm Income (FFI) per Annual Work Units (AWU) is significantly higher for Dairy and Tillage farms. This is compatible with the average Standard Output for farm types.

Table 2.5 – Farm labour Annual Work Units (1,000 AWU[6])

Characteristics of holder	BMW region	SE region	State
Total labour input	**80.2**	**80.6**	**160.7**
Breakdown			
Family & regular non-family workers			
Males	63.9	63.1	**127.0**
Females	14.9	15.5	**30.5**
Family workers	**74.7**	**72.8**	**147.5**
of which: Holder	52.4	49.4	**101.8**
Other family	22.2	23.4	**45.7**
Regular non-family workers	4.1	5.9	**10.0**
Non-regular[7] labour input	1.4	1.9	**3.2**
Average labour input per farm	1.11	1.24	**1.17**

A small percentage of farms in the NW region reported income from non-agricultural activities, as listed in Fig 2.5. Renewable energy production was reported as an alternative income by approximately 70 farms in the region in 2016, but no further details are included in the survey.

5 https://www.teagasc.ie/publications/2020/teagasc-national-farm-survey-2019.php

6 One Annual Work Unit =1,800 hours or more of labour input per person per annum

7 Non-Regular Labour includes casual, relief and contract workers. A gender breakdown is not available for this category.

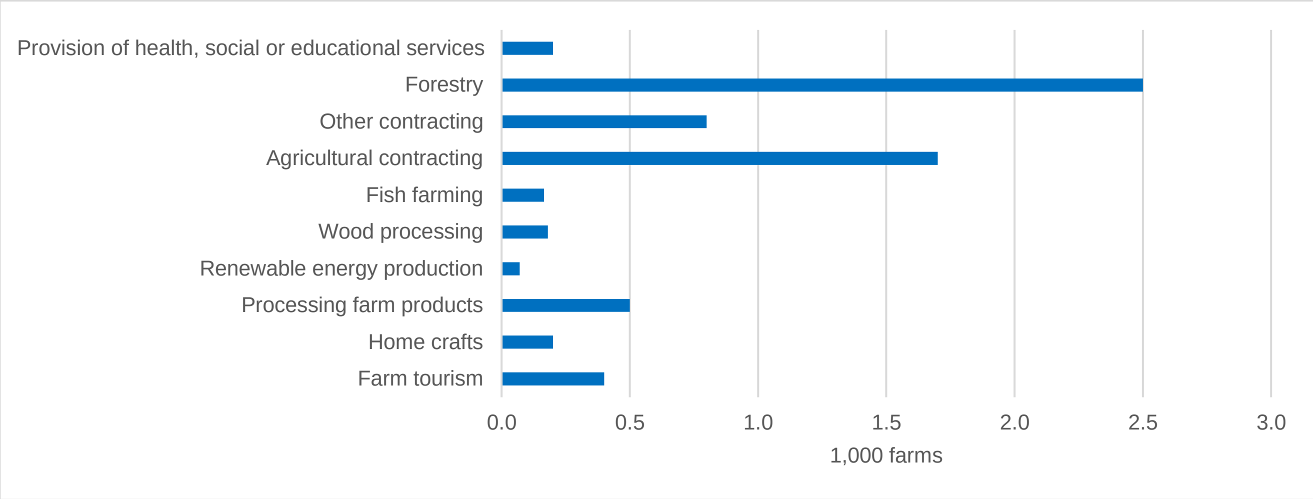

Fig 2.5 – Gainful non-agricultural activity in the NW region

The average Irish farm size in the Teagasc National Farm Survey in 2018 was 43 hectares, with average income per hectare coming in at €541. Teagasc's National Farm Survey results found that 32% of Irish farms surveyed were classified as viable[8] in 2018. A further 34% were classified as sustainable[9], mainly due to off-farm income, while the remaining 34% were deemed economically vulnerable[10].

Fig 2.6 shows the age of farm holders in the BMW region, highlighting the generally aging profile. This is in keeping with the State as a whole.

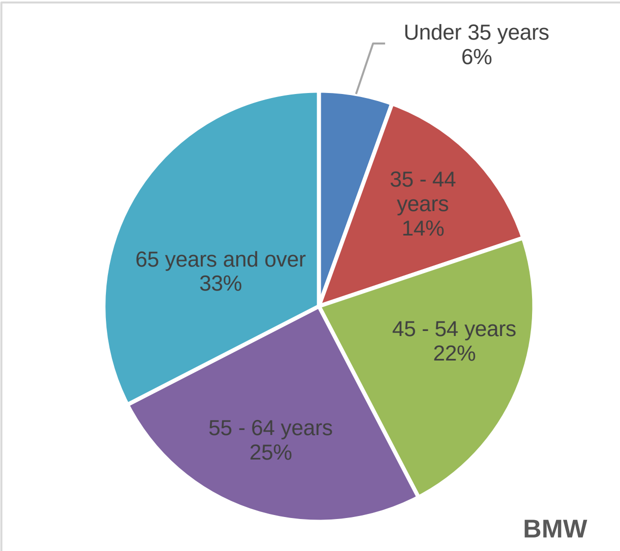

Fig 2.6 – Age profile of farm holders in the BMW region

8 A farm business is defined as being economically viable if Family Farm Income is sufficient to remunerate family labour at the minimum wage (which is assumed here to be €20,129 per labour unit), and provide a 5 percent return on the capital invested in non-land assets, i.e. machinery and livestock.

9 Farms that are found not to be economically viable, but which have an off-farm income source (either from a job, pension or social welfare) within the household, earned by either the farmer or the spouse, are considered to be economically sustainable.

10 Farm households are considered to be economically vulnerable if they are operating non-viable farm businesses and neither the farmer or spouse works off-farm.

Agriculture is notably the most significant sectoral contributor to Ireland's Greenhouse Gas (GHG) emissions, accounting for over 35% of the State total in 2019, as shown here.

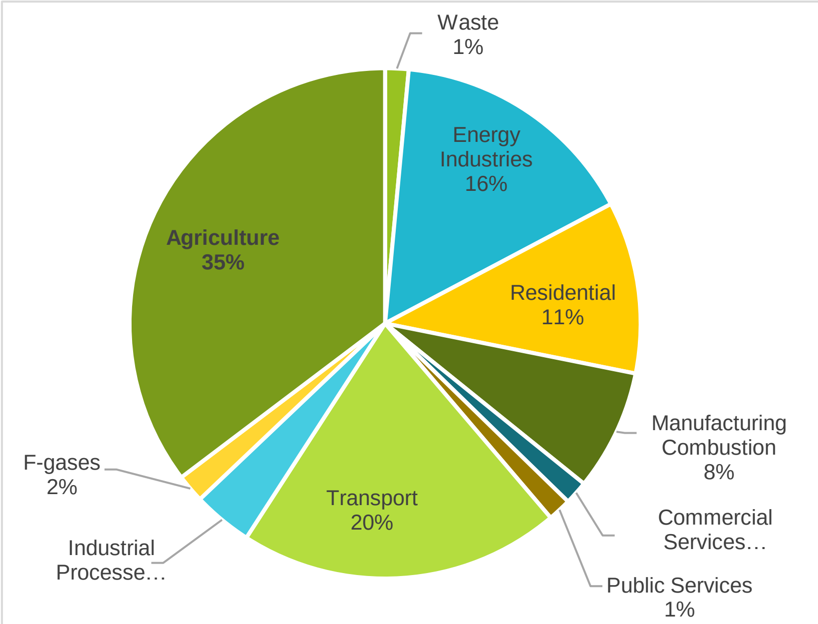

Fig 2.7 – Ireland's GHG Emissions share by sector in 2019[11]

It should be noted that the vast majority of GHG emissions for the Agricultural sector are not energy related, as shown in Fig 2.8.

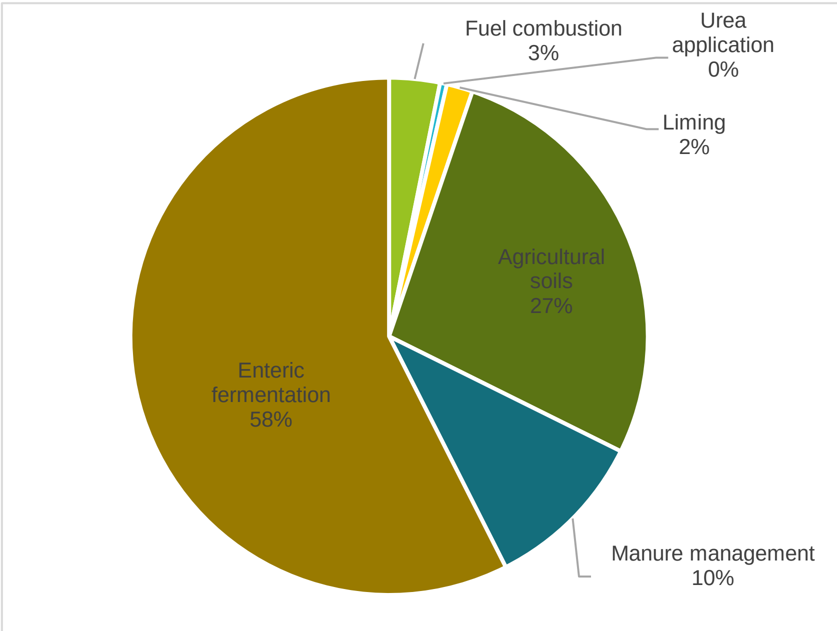

Fig 2.8 – Ireland's Agriculture Greenhouse Gas emissions share, by source - 2019[12]

11 https://www.epa.ie/ghg/currentsituation/#:~:text=In%202019%2C%20Ireland's%20provisional%20GHG,data%20(2009%2D2019).

12 https://www.epa.ie/ghg/agriculture/

2.3. Energy in the region

Energy data is not currently collected at the regional level. The data presented here is for the State as a whole. Fig 2.9 illustrates the total energy flow in 2019.

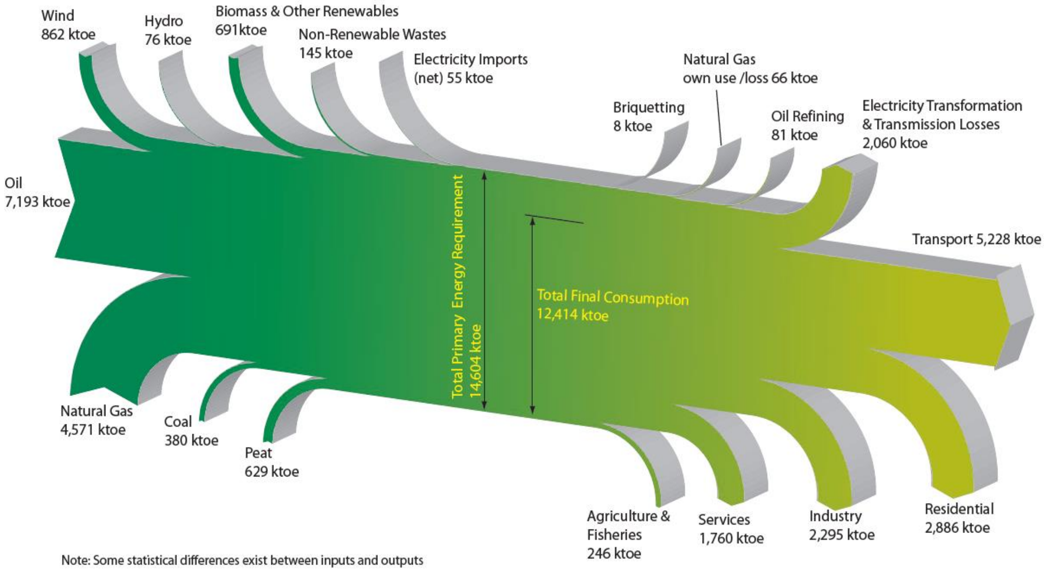

Fig 2.9 – Total energy flow in the State 2019[13]

The State remains significantly reliant on imported Oil and Natural Gas as shown in Table 2.6.

Table 2.6 – Total Final Consumption by fuel – State (ktoe)				
Fuel	**2016**	**2017**	**2018**	**2019**
Oil	6,732	6,775	7,065	7,014
Gas	1,794	1,821	1,962	1,973
Electricity	2,268	2,291	2,397	2,444
Renewables	401	461	465	488
Coal	315	313	351	255
Peat	198	189	197	183
Wastes Non-Renewable	42	57	55	57
Total	**11,750**	**11,908**	**12,493**	**12,414**

The contribution of Renewable Energy (RE) is growing, largely due to increases in wind energy deployment. However, Ireland has fallen short of its 2020 renewable energy targets as shown in Table 2.7.

Table 2.7 – Progress Towards 2020 renewable energy targets

[13] SEAI, 2019

Energy	2016	2017	2018	2019	2020 Targets
RES-T	5.2%	7.5%	7.2%	8.9%	10.0%
RES-H	6.3%	6.6%	6.3%	6.3%	12.0%
RES-E	26.8%	30.1%	33.3%	36.5%	40.0%
Overall RES	**9.1%**	**10.4%**	**10.9%**	**12.0%**	**16.0%**

As shown in Table 2.8, the most significant growth in RE deployment, apart from wind, has been liquid biofuels which account for 98% of the total RES-T achieved to date. The main driver of this is the Biofuels Obligation Scheme[14].

Table 2.8 – Renewable energy (%) contribution to Gross Final Consumption (Directive 2009/28/EC)				
Renewable energy source	**2016**	**2017**	**2018**	**2019**
Hydro	0.5%	0.5%	0.5%	0.5%
Wind	4.7%	5.5%	6.0%	6.9%
Biomass	1.9%	2.0%	1.9%	1.7%
Landfill Gas	0.1%	0.1%	0.1%	0.1%
Biogas	0.1%	0.1%	0.1%	0.1%
Liquid Biofuels	0.7%	1.1%	1.0%	1.3%
Solar	0.0%	0.0%	0.0%	0.0%
Ambient	0.3%	0.3%	0.4%	0.4%
Total Renewable	**9.1%**	**10.4%**	**10.9%**	**12.0%**

Total Final Consumption (TFC) by sector is shown in Table 2.9, which indicates that the Agricultural sector accounts for less than 2% of the total.

Table 2.9 – Total Final Consumption by sector – State (ktoe)				
Sector	**2016**	**2017**	**2018**	**2019**
Industry	2,094	2,167	2,291	2,295
Transport	4,969	5,068	5,202	5,228
Residential	2,818	2,806	3,026	2,886
Services	1,642	1,631	1,723	1,760
Agriculture & Fisheries	226	236	251	246
Total	**11,750**	**11,908**	**12,493**	**12,414**

14 https://www.nora.ie/biofuels-obligation-scheme.141.html

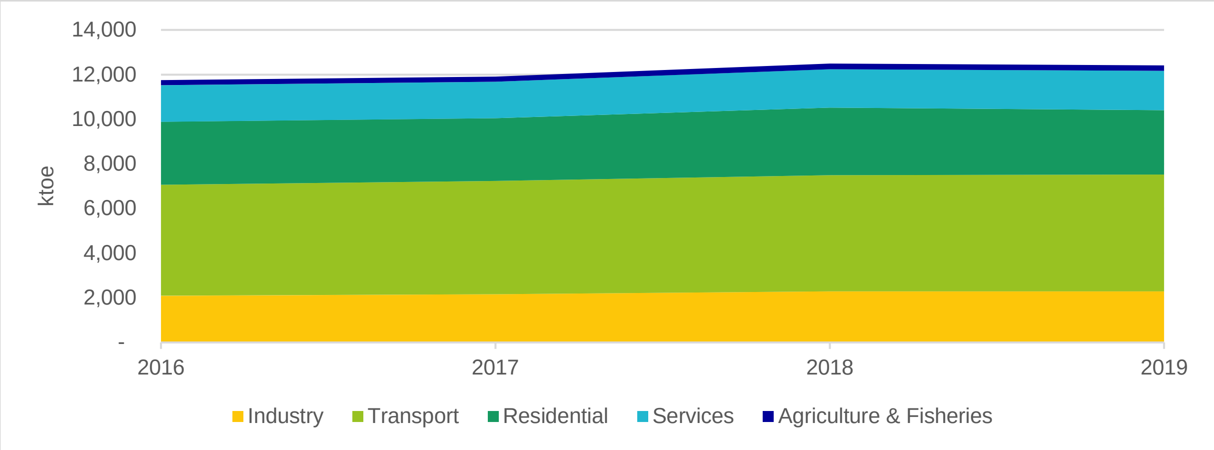

Fig 2.10 –Total Final Consumption by sector – State (ktoe)

TFC of heat and electricity by sector is shown in the following tables. Heat use accounts for 80% of the TFC in the Agriculture sector.

Table 2.10 – Total Final Consumption of heat by sector – State (ktoe)

Sector	2016	2017	2018	2019
Residential	2,141	2,121	2,323	2,186
Industry	1,517	1,579	1,670	1,653
Services	680	665	703	710
Agriculture & Fisheries	179	188	203	199
Total	**4,516**	**4,553**	**4,898**	**4,749**

Table 2.11 – Total Final Consumption of electricity by sector – State (ktoe)

Sector	2016	2017	2018	2019
Industry	577	588	622	642
Transport	4	5	5	7
Residential	677	684	703	699
Services	962	966	1,019	1,050
Agriculture & Fisheries	48	48	48	47
Total	**2,268**	**2,291**	**2,397**	**2,444**

2.4. Summary

Agriculture in the NW region can be categorised as follows:

- Smaller average farms sizes and economic output
- Vast majority of land use is accounted for by Grassland (82%) and Commonage (16%)
- Most land use is attributable to beef and sheep farming
- Generally high likelihood of HNV farmland

The higher Standard Output for the Border Region is likely to be associated with the concentration of pig and poultry farming in that region. Both pig and poultry farming continue to be an intensive activity carried out by a small number of specialised producers. These farms are also likely to have the most significant on-site energy demand. Other sectors with significant energy demand include dairy farms and grain drying on tillage farms, although these sectors are less represented in the NW region.

3. Evolution of the spread of renewable energies in agriculture and in rural communities

3.1. Wind energy

Wind energy is currently the largest contributing resource of renewable energy in Ireland. It is both Ireland's largest and most economical renewable electricity resource. Large scale wind generation is widely deployed in Ireland and is the largest contributor to RE targets. The wind energy capacity factor in Ireland is generally higher than the EU average[15] and as such makes the country an attractive location for investors and developers. The Irish Wind Energy Association (IWEA) compiles details of all grid connected wind farms in Ireland[16]. In 2018 Wind provided 85% of Ireland's renewable electricity (RES-E) and 28% of our total electricity demand[17]. It is currently the second greatest source of electricity generation in Ireland after natural gas. Ireland is one of the leading countries in its use of wind energy and 3rd place worldwide in 2018, after Denmark and Uruguay[18]. Fig 3.1 illustrates the growth of wind energy in Ireland up to 2019.

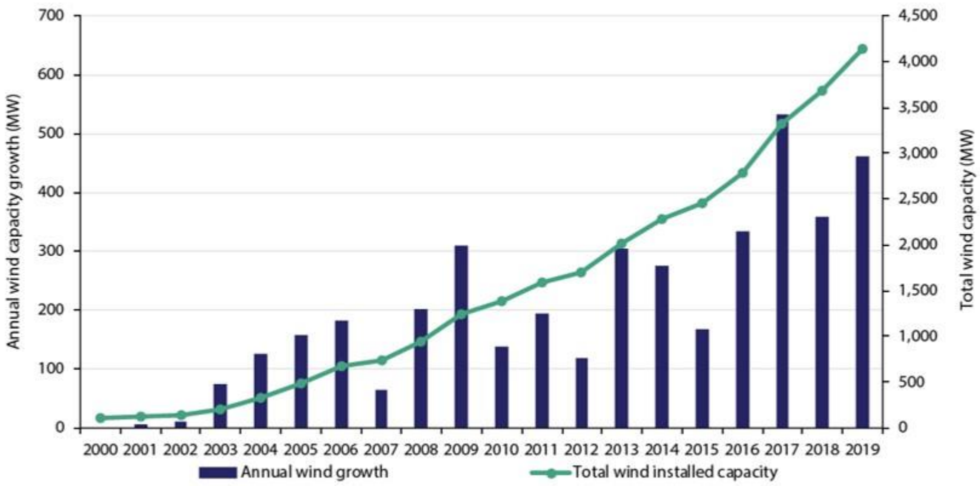

Fig 3.1 – Installed wind-generation capacity, 2000 to 2019[17]

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15 Wind Europe, Wind energy in Europe in 2019

16 https://www.iwea.com/about-wind/interactve-map

17 SEAI, Renewable Energy in Ireland 2020 Update

18 SEAI, Energy in Ireland 2018 Report

Table 3.1 – Installed generation (MW) in the NW Region[19]	
County	**Installed generation (MW)**
Cavan	103.5
Donegal	363.7
Galway	240.6
Leitrim	34.3
Mayo	80.3
Monaghan	7.5
Roscommon	87.1
Sligo	40.3
Total in region	**957.2**
Total in State	**2,375.0**

Approximately 40% of total installed wind capacity is in the NW region with a breakdown per county shown in Table 3.1.

There are limited examples of small-scale wind turbine installations in various locations. However, studies by SEAI[20] indicate that results at small scale are highly variable with payback ranging from 14 years to over 50 years. It should also be noted that exploitation of small-scale wind is currently based on self-consumption only due to the absence of an export tariff at this scale.

The most common examples of wind energy deployment in agriculture, to date, are through lease agreements between grid scale wind farm developers and farm landowners. Such lease agreements can be attractive to farmers by providing a relatively profitable payment per turbine and/or a share of electricity sales, whilst taking up a small portion of land[21]. However, there are only limited examples of wind farms being developed primarily by farmers[22], which indicates the general lack of capacity for farmers to lead these projects.

3.2. Solar energy

Solar energy technologies deployed in Ireland are a mixture of Solar Thermal (water heating) and Solar PV (electricity generation). Some examples of Solar Thermal systems are found in the region, but there is little collated data on total deployment. Solar thermal systems for water heating have been deployed in the dairy farming sector for a number of years, generally in dairy farms. SEAI reports[17] estimate that Solar Thermal accounted for 4% of total renewable heat (RES-H).

The Solar Photo Voltaic (PV) potential for Ireland is shown in Fig 3.2. For comparison, the solar potential in Ireland is similar to that of Denmark.

19 https://en.wikipedia.org/wiki/List_of_wind_farms_in_the_Republic_of_Ireland

20 https://www.teagasc.ie/media/website/publications/2010/Ivan_Sproule_MicroGeneration.pdf

21 https://www.irishtimes.com/news/midlands-landowners-offered-18-000-a-year-per-wind-turbine-1.1320270

22 https://www.independent.ie/regionals/newrossstandard/news/north-tipperarys-first-wind-farm-27439477.html

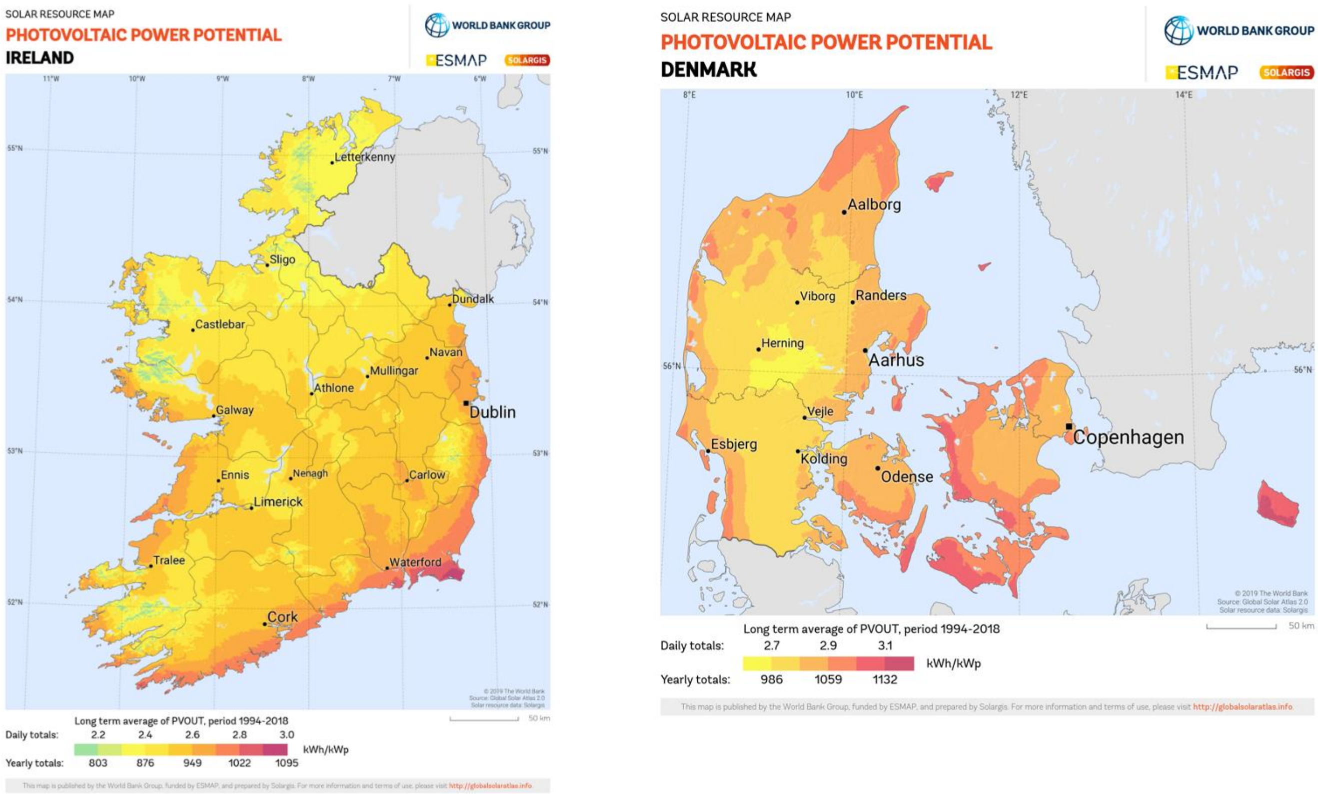

Fig 3.2 – PV potential Ireland and Denmark[23]

There has been an increase in Solar PV uptake in recent years, predominantly driven by new Building Regulations for a minimum of installed RE in residential construction and also reducing equipment costs. Solar installations in Ireland are currently all at building scale, i.e., designed for on-site consumption in homes and commercial facilities. However, there is currently a pipeline of grid-scale Solar PV farms which are expected to be operational in the coming years through the Renewable Electricity Support Scheme (RESS). Again, for comparison purposes Denmark has installed over 1,000 MW of Solar PV compared to Ireland's total of 36 MW[24].

The decrease of costs for Solar PV has also resulted in increasing uptake of the technology on farms. As there is currently no Microgeneration tariff in Ireland, these systems are all based on self-consumption. As such, the examples to date are on farms with significant daily electricity demand such as dairy, pig & poultry, and food processing.

Now that grid scale Solar Farms are in development, similar lease agreements to those for wind farms between energy developers and farm landowners are also emerging.

23 https://solargis.com/maps-and-gis-data/overview

24 https://www.eurobserv-er.org/photovoltaic-barometer-2020/

3.3. Heat pumps

Ambient energy refers to freely available but low-grade energy from the outside environment: from air, water, or ground. Ambient energy from the ground is often referred to as geothermal energy. Heat pumps upgrade ambient energy to provide an output temperature that is useful to us. The majority of heat pumps currently installed in Ireland are air-source heat pumps. Uptake of heat pumps has increased significantly in recent years, particularly in the new-build and retrofit residential sector. Uptake has also increased in farms with a significant heat demand such as dairy, pig and poultry.

3.4. Bioenergy

The term bioenergy in this context includes all solid, liquid and gaseous materials which can be used to generate useful heat and electricity.

3.4.1. Biomass

Uptake of biomass in heating has been limited in Ireland and has suffered from issues with fuel quality and technology servicing. A Western Development Commission (WDC) report in 2018[25] identified the main biomass heat installations in the WDC region, summarised here in Table 3.2.

Table 3.2 – Biomass installations in the WDC region 2018

Indicative scale of biomass installations	Number of installations	Estimated size
Large industrial scale	7	Confidential
Small industry, public sector and commercial	24	Ranging from 80 - 540 kW Examples include schools, hotels, leisure centres.

The WDC report also noted 9 further installations whose operational status was unknown and 10 installations that were understood to have been permanently turned off by their owners.

In 2019 the Support Scheme for Renewable Heat[26] (SSRH) opened as an incentive for biomass and bioenergy. The SSRH had been in development for several years and its launch was delayed due to publicly known problems with similar schemes in Northern Ireland. The anticipation for the SSRH resulted in low biomass technology uptake in the market. The SSRH has now provided an incentive to potential investors with significant potential for heat supply in the pig and poultry sector. However, it is too early to collate any meaningful data on the impact.

There is also significant potential for biomass production (wood and energy crop fuels) on farms in Ireland as an alternative revenue stream. Early pioneers of energy crops such as willow and miscanthus have experienced significant challenges including:

- Lower than expected yields
- Harvesting in Irish winters

25 https://www.wdc.ie/wp-content/uploads/biomass_report.pdf

26 https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/

- Relatively low profitability compared to other farmed crops
- Long-term commitment in diverting land from conventional agriculture
- Achieving moisture contents suitable for energy fuels

However, the key limiting factor for biomass production is the market. This too has been impacted by delays in the opening of the SSRH.

Bord na Mona's (BnM) Edenderry 128MW Power Station has been the only peat plant in Ireland to co-fire with biomass, and this has been a key market of agri-based energy crops. In 2018 the plant reached a 41% biomass co-fuelling rate, but with 30% of the biomass still sourced from abroad[27]. The All of Government Climate Action Plan 2019[28] (CAP), published by the Department of Communications, Climate Action and Environment (DCCAE), includes targets to complete the phase-out of coal and peat fired electricity generation. Proposals to extend the life of Edenderry and 2 other peat burning power stations by partial, and eventually complete, conversion to biomass fuel have now been abandoned following the rejection by An Bord Pleanala (ABP) for such a proposal at West Offaly Power Station. The ABP ruling cited the following (among other) considerations[29]:

- *national policy provisions supporting the cessation of the burning of peat as a fuel source for electricity generation,*
- *the dependence of the proposed development on the continuance of peat burning and its ongoing contribution to greenhouse gas emissions, notwithstanding any transition period proposed,*
- *the requirement for the alternative fuel to be used to produce renewable energy to be 'sustainable',*
- *the inadequacy of the indigenous biomass supply in the State to serve the proposed development, and the proposed high dependence on imported biomass which is contrary to European Union and national policy,*
- *the siting of the existing power plant in the Midlands, away from coastal ports, and its significant dependence on the importation of biomass from global markets, which will result in unsustainably high volumes of Heavy Goods Vehicle (HGV) movements across the State to serve the development…*

The final point above illustrates that the necessary increase in HGV traffic to service a biomass plant of these scales (>100MW), even from an indigenous supply, is likely to remain unacceptable from a planning perspective.

3.4.2. Biogas

Biogas is a product of Anaerobic Digestion (AD). In Ireland this technology is predominantly utilised in wastewater management processes, where the biogas is used on site in CHP units and/or for process heating. Wide spread deployment of biogas in Ireland has yet to emerge, despite the potential for indigenous production in the agricultural sector. Reasons for this include scale challenges and dispersed resources on farms in Ireland. Table 3.3 indicates the approximate number and scale of currently installed biogas capacity in Ireland.

27 https://greennews.ie/esb-abp-peat-biomass/

28 https://www.gov.ie/en/publication/5350ae-climate-action-plan/

29 An Bord Pleanála, Board Order, ABP-303108-18

Table 3.3 – Biogas production in Ireland 2018[30]			
Plant type	**Number of plants**	**Installed capacity (MWe)**	**Notes**
WWTP	15	No data	Data difficult to obtain – plants in private operation.
Bio-waste	3	3.5	
Agricultural	12	6.4	
Industrial	4	>8.7	Data found for only output of 3 of 4 facilities
Biomethane	3	2.6	
Landfill	22	64.7	
Total	**59**		

A report published by the SEAI[31] identifies a number of barriers to the development of the industry in Ireland outside of cost competitiveness. The results were based on a survey of the supply chain in Ireland. Limitations in the available feedstock resource, unavailability of local heat loads for biogas-CHP systems, increased capital and operating costs, and increased heat demand due to need for pasteurisation of slurry imports and investment risk are some of the barriers mentioned.

Gas Networks Ireland (GNI) has set a target to reach 20% renewable gas in the network by 2030 in their Vision 2050 strategy[32]. The GNI vision is based on agricultural waste and grass which they consider to be a significantly cheaper source than those assumed in other national strategies. This figure is supported by independent reports by the EU Commission and the SEAI. To achieve this level of Renewable Gas, GNI is focusing on supporting anaerobic digestion (AD) with separate initiatives for the agriculture sector (Agri-AD) and the commercial waste industry sector. GNI forecast that up to 9.8 TWh per annum of renewable gas can be delivered from the agriculture sector by 2030. The GNI strategy proposes that Agri-based biogas is purified to Natural Gas standard at the AD site, ready for collection. The Renewable Gas is then transported to Central Grid Injection (CGI) facilities located on the gas transmission network where Renewable Gas quality will be verified and the grid injection process will be managed and metered. Ireland's first purpose-built CGI facility began operating in 2019 in Cush Co. Kildare, with a second facility in planning, in Mitchelstown, Co. Cork. These and other planned facilities represent significant opportunities for the agricultural sector to engage in Anaerobic Digestion both for the production of clean energy and also fertiliser.

3.5. Hydro

There is currently 238MW of connected hydro generation on the national grid. Large ESB owned generators account for the majority of this (212MW) capacity all connected to the Transmission System[33]. In the NW region the ESB Erne Hydro Power Stations (2 generators at Cliff, 2 generators at Cathaleen's Fall) in Co. Donegal contribute a total of 65MW. There are a further 61 hydroelectric generators connected to the electricity

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30 IEA Bioenergy Task 37, Country Report, Summaries 2019

31 SEAI 2017, Assessment of Costs and Benefits of Biogas and Biomethane in Ireland

32 Gas Networks Ireland, Vision 2050, A Net Zero Carbon Gas Network for Ireland

33 http://www.eirgridgroup.com/customer-and-industry/general-customer-information/connected-and-contracted-generators/

Distribution System[34], with a total installed capacity of 26.5 MW. 12 of these hydroelectric generators are located in the NW region with a combined installed capacity of 7.4MW.

Table 3.4 – Hydroelectric generators in the NW region (excluding Erne Hydro in Co. Donegal)

Project	MEC (MW)	Feeding Station	Feeding 110kV Station
Rockygrange Hydro	2.19	Collooney	Sligo
Anarget Hydro	2.1	Donegal	Cathaleens Fall
Lough Eske	0.66	Donegal	Cathaleens Fall
Collooney Manufacturing	0.5	Collooney	Sligo
Barnesbridge Hydro	0.48	Donegal	Cathaleens Fall
Nadirkmore Hydro	0.41	Westport	Castlebar
Doorian Hydro	0.32	Glenties	Binbane
Adeery Hydro Scheme	0.23	Killybegs	Binbane
Aghadullagh Mill	0.2	Ballyshannon	Cathaleens Fall
Stewart Hydro Ltd	0.132	Boyle	Carrick on Shannon
Springvale	0.1	Ballinrobe	Dalton
Glebe Mills	0.1	Boyle	Carrick on Shannon
Total	**7.4**		

In general, hydro power tends to be very site specific and specialised. The feasibility of hydro projects is also challenged by lowering costs of other RE technologies and habitat protection of inland fisheries. As such the potential for further significant uptake is considered to be low.

3.6. Summary

In general, the uptake of RE technology in agriculture in the NW region, and Ireland as a whole, is quite limited. While there are case studies at individual farm level, there is very little meaningful collated data on RE consumption, production or value at a sectoral level for agriculture.

Factors that have contributed to the low uptake of RE in agriculture in the NW region include, but are not limited to the following:

- Small farms with limited financial capacity for investment
- Lack of on-farm or regional agencies with knowledge of technologies and regulatory issues
- Dominance of beef and sheep farming in the region, which don't have significant energy demand, are much less suitable for self-consumption RE deployment
- Absence of an available market tariff for small and micro-scale renewable electricity generation for export (NOTE: The REFIT scheme, which offered such tariffs on some technologies, closed in 2015)
- Poor experience among early adopters of energy crops
- Limited market for biomass and energy crops in RES-H
- Aging farm holder profile

34 https://www.esbnetworks.ie/new-connections/generator-connections/generator-connection-statistics

- Policy focus on GHG reduction, rather than renewable energy, as a priority in the sector

AgroRES seeks to reduce barriers to the opportunities for the agri-sector in both reducing its own climate impact and supporting a regional low-carbon economy. Agriculture in Ireland can be characterized by tradition, which requires encouragement and confidence to diversify. The RE potential in the agri-sector requires a significantly higher profile, as the sector is valuable and often crucial to many of the low-carbon solutions being promoted.

4. Local policies and actions in order to pursue the main goals of the Europe strategy

4.1. Policy background

The Energy White Paper 2015[35] sets out a framework for energy policy to 2030 and outlines a transition to a low carbon energy system for Ireland by 2050. The White Paper 2015 set out Ireland's three core energy policy objectives: ***sustainability, security of supply, and competitiveness***. The 2015 paper takes into account European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities. The paper refers to the agriculture sector primarily in the context of its place as the largest contributor to GHG emissions. The paper notes that RES-E projects to date have typically been large scale, but also acknowledges the importance of an increasing role for smaller, community-level projects.

The All of Government Climate Action Plan 2019 (CAP), published by the Department of Communications, Climate Action and Environment (DCCAE) sets out a decarbonisation pathway for Ireland for 2021 to 2030, and also supports the adoption of a net zero target by 2050 at EU level. The CAP focus on agriculture is to decarbonise through land management and improved animal production efficiency. The CAP includes limited references to the opportunities for renewable energy in agriculture such as:

- Indigenous biomethane production and supplies of sustainable feedstock
- Biomass mobilisation

In December 2020 the DAFM published A Roadmap towards Climate Neutrality (Ag Climatise[36]). The roadmap remains in keeping with the policy focus referred to above, but expands somewhat on the potential role for agriculture in contributing to sustainable energy and decarbonisation of the energy system through provision of bioenergy feedstocks for the transport and heat sectors. The recommended actions for RE in Ag Climatise focus on deployment at farm-level (on-site consumption) for energy intensive farming sectors.

35 https://www.gov.ie/en/publication/550df-the-white-paper-irelands-transition-to-a-low-carbon-energy-future-2015-2030/

36 https://assets.gov.ie/100931/7c8b812c-d857-4f39-96b9-1e7f134ba896.pdf

4.2. Renewable energy support schemes & policies

4.2.1. Renewable Energy Feed-in Tariff

The Renewable Energy Feed-in Tariff (REFIT) schemes[37] were designed to ensure Ireland meets its goal of 40% of electricity coming from renewable sources by 2020. The REFIT schemes provided a guaranteed Feed In Tariff (minimum price) for renewable electricity connected to the national grid over a 15 year period. REFIT included 3 schemes which supported the following RE technologies:

- Large wind (> 5MW); Small wind (5MW or less)
- Hydro
- Biomass landfill gas; Biomass combustion; Biomass CHP
- AD non CHP, AD CHP

The REFIT schemes opened in 2006 with the last scheme closing for applications in 2015. The REFIT schemes were the key drivers of RE deployment, particularly grid scale wind energy, in that timeframe.

Impact on AgroRES objectives
○ No longer available to applications ○ Established the common forms of land lease arrangements between wind farm developers and farmers. These tend to restrict farmers to a less participatory role.

4.2.2. Renewable Electricity Support Scheme

REFIT has now been replaced by the new Renewable Electricity Support Scheme[38] (RESS) as a key measure designed to deliver on the 70% RES-E target by 2030. RESS includes a series of auctions to sell renewable electricity. Each RESS auction is designed to attract a specific generation capacity and/or technology mix. The 1st auction, RESS 1, was completed in 2020. A key aspect of RESS is the in-built support for community participation and ownership in renewable electricity projects. All projects seeking for support under the new RESS will need to meet pre-qualification criteria including offering a Community Benefit Fund. In addition to this, RESS includes a category for Community owned in the auctions, which provides an opportunity to invest in and take ownership of a portion of renewable projects in their local area. This mechanism has the potential to nurture more trusting relationships between energy project developers and communities, and ultimately support community ownership of such projects. Due to their importance to rural communities and ownership of open land, farms have the potential to pay a major role in community projects in RESS.

Impact on AgroRES objectives

37 https://www.gov.ie/en/publication/9bf994-renewable-energy-feed-in-tariff-refit-scheme/

38 https://www.gov.ie/en/publication/36d8d2-renewable-electricity-support-scheme/

- Includes significant targets for Onshore Wind and grid scale Solar PV
- Key driver for Community owned Renewable Energy projects
- Farmers can play larger and crucial role in community owned projects
- Community owned projects will require significant support in development stages to address risk. The Community Enabling Framework, referenced in RESS is still in development.

4.2.3. Targeted Agricultural Modernisation Schemes (TAMS)

This scheme provides an investment grant to farmers to improve the energy efficiency of farm buildings or their equipment. TAMS focuses on building and equipment upgrades but includes grant support for selected renewable energy technologies (solar PV, heat pumps, biomass boilers). The investment grant can cover up to 60% of total installations costs. TAMS support for Solar PV is limited to 6kW as the microgeneration limit for grid connection on single-phase.

Impact on AgroRES objectives

- Established tax relief incentive
- Most RE technology suppliers can advise

4.2.4. Microgeneration

A Microgeneration Pilot Scheme[39] was established by Electric Ireland (the retail arm of ESB) in 2009 and gave customers free installation of an import/export meter and a support payment of 10 cent/kWh. The scheme supported microgenerators with a Maximum Export Capacity (MEC) limit of 6kW on single phase and 11kW on 3-phase. The pilot scheme attracted approximately 700 micro-generators but was closed to new customers from 31st December 2014.

The proposed Microgeneration Support Scheme (MSS) currently in development by the Department of the Environment, Climate and Communications, is due to be launched in 2021, to deliver on the requirements of the recast Renewable Energy Directive (RED II), i.e. to provide a fair market value for exported electricity from renewable self-consumers. While the design of the MSS remains to be confirmed, it is indicated to include systems up to an MEC of 50kW.

There remains an absence of incentives for electricity export from microgeneration in Ireland. As such, the deployment of small-scale renewable electricity has been quite limited as it needs to be based on self-consumption.

Impact on AgroRES objectives

39 https://www.electricireland.ie/residential/help/efficiency/electric-ireland-micro-generation-pilot-scheme

- Emerging policy, details remain to be confirmed
- Will improve the commerciality for self-consumption projects – **not a driver for export**
- Likely to result in removal of microgeneration installation grants such as TAMS

4.2.5. Accelerated Capital Allowances (ACA) Scheme[40]

This scheme is aimed at incentivising companies to invest in highly energy efficient plants and machinery. As part of the scheme, businesses can claim depreciation of up to 100% of the capital costs of energy efficient plant and machinery and deduct it from their tax liability in the year of purchase. The products that are covered by the scheme are listed in a register and include micro-solar PV and micro-wind technologies. All companies and unincorporated businesses who pay income tax or corporation tax in Ireland are eligible to apply for the scheme, including farmers.

Impact on AgroRES objectives
○ Established tax relief incentive ○ Most RE technology suppliers can advise

4.2.6. Community Energy Grant scheme[41] (formerly the Better Energy Communities scheme)

The Community Energy Grant (CEG) is the SEAI national retrofit initiative with grant support of C.€20 on an annual basis. CEG provides grant support for renewable energy installations as part of wider retrofit projects. The scheme is not open to individual applications and is generally accessed by experienced Project Coordinators. Farmers wishing to avail of the scheme can contact a Project Coordinator to request support. The scheme provides up to 30% grant funding for private sector businesses including farms.

Impact on AgroRES objectives
○ Farmers are reliant on private sector Project Coordinators to access this support ○ Timeframes are often challenging for RE projects due to planning and grid connection requirements

40 https://www.seai.ie/business-and-public-sector/business-grants-and-supports/accelerated-capital-allowance/

41 https://www.seai.ie/grants/community-grants/

4.2.7. Support Scheme for Renewable Heat[42] (SSRH)

The SSRH is a government funded initiative designed to increase the energy generated from renewable sources in the heat sector. The scheme is open to commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users. The SSRH has two different support types as follows:

1. Installation grant: Up to 30% of eligible costs for heat pumps.
2. Operational support: A tariff for each kWh of renewable heat used for a period of up to 15 years for biomass or AD heating systems. This support is only eligible for the replacement of an existing fossil fuel heating system.

The SSRH was launched in 2019, therefore it remains at an early stage of exploitation which has been hampered by the Covid-19 crisis. However, it is noted that the scheme has had significant interest from poultry farming sector, particularly in the Border region.

Impact on AgroRES objectives
○ Very high potential for increased Renewable Heat uptake ○ Well suited to pig, poultry and horticulture sectors ○ Early experience suggests that the administrative burden is considerable. However, this is not uncommon in early stages of policy deployment.

4.3. Regulatory issues

4.3.1. Planning permission

Certain RE installations are considered exempt from having to obtain Planning permission. SI 235 of 2008[43] sets out the limitations for such exempted RE developments. Those intending to install a technology that is mentioned in the exemptions are advised to get a written declaration from their local authority which will provide assurance that their particular development is covered by the exemptions. This is of particular relevance to wind turbines which are high visibility. The cost of such a declaration (Section 5 Declaration) is approximately €80 and it must be provided by the local authority within the statutory timelines set out in Section 5 of the Planning and Development Act 2000. Table 4.1 outlines some of the key exemption limits which relate to the overall visual scale of the installation.

42 https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/

43 http://www.irishstatutebook.ie/eli/2008/si/235/made/en/pdf

Table 4.1 – Key planning exemption limits on RE Technology visual scale		
Technology aspect	**Exemption limit – residential**	**Exemption limit – non-residential**
Wind turbine – general	○ Must not be attached to the building ○ No more than one turbine shall be exempt from planning	○ Must not be attached to the building ○ No more than one turbine shall be exempt from planning
Wind turbine – height	○ Max 13m	○ Max 20m
Wind turbine – rotor	○ Max 6m diameter	○ Max 8m diameter
Solar panels – array area	○ Max $12m^2$ or 50% of the roof area, whichever is the lesser	○ Max $50m^2$ or 50% of the roof area, whichever is the lesser for roof mounted array ○ Max $25m^2$ for wall mounted or free-standing array in an agricultural holding, business premises or light industrial building. ○ Max $50m^2$ for wall mounted or free-standing array in an industrial building

The limits on visual scale appear to be somewhat arbitrary and were likely to be set based on best available knowledge at the time. The limits are such that Solar PV projects larger than approx. 10kW are likely to require Planning Permission. However, these specific limits are now in excess of 12 years old and a rethinking of the limits would be advisable. Reference to this has been made in the public consultation process for the Microgeneration Support Scheme, but details are yet to be made available.

Impact on AgroRES objectives

- Planning Permission is required for most RE installation larger than 6kW for wind or 10kW for Solar PV
- Some effort to rationalise the scale with the MSS may be emerging

4.3.2. Electricity Grid connection

RE generators that require a grid connection to export electricity, either for sale or to spill excess generation, must apply to the appropriate System Operator. Eirgrid are the Transmission System Operator (TSO) and ESB Networks (ESBN) are the Distribution System Operator (DSO). Applicant must have Planning Permission where this is required. The requirements for the grid connection application are currently set out in the Enduring Connection Policy (ECP) 2 ruleset[44]. The complexity and cost of the grid connection application process increases with the capacity of the connected generator.

Microgeneration

For Microgenerators (11kW on three-phase, 6kW on single-phase) the application is a relatively straight forward and process, often referred to as 'Inform & Fit', and is generally completed by the installer. There is no application fee or cost at this level.

44 https://www.esbnetworks.ie/docs/default-source/publications/ecp-2-ruleset.pdf?sfvrsn=c8c1d0e7_13

Small-scale generators (11kW to 500kW)

The application process at this level is more complex and requires considerable technical information to be confirmed. The application fee is currently between €780 and €1,591.

Large-scale generators (> 500kW)

The process at this level is subject to a 'batch' assessment, the timeframe for which is determined by the System Operators (SOs). The current ECP-2 batch schedule is shown in Fig 4.2 below. The application fees are considerably higher and increase significantly with MEC.

ECP-2 Batch	Schedule	
ECP-2.1	Application: Batch formation: Batch processing:	September 2020 October-December 2020 January-December 2021
ECP-2.2	Application: Batch formation: Batch processing:	September 2021 October-December 2021 January-December 2022
ECP-2.3	Application: Batch formation: Batch processing:	September 2022 October-December 2022 January-December 2023

Fig 4.2 – ECP-2 batch schedule[45]

The grid connection process and costs are a significant challenge, and often prohibitive, for individual projects.

Impact on AgroRES objectives

- Considerable cost and risk for projects over 500kW MEC – often prohibitive for individual projects
- Timeframes can be unclear but will determine access to the RESS auctions
- Availability of grid connections for small-scale generators is unclear

45 https://www.cru.ie/wp-content/uploads/2020/06/CRU20060-ECP-2-Decision.pdf

5. SWOT Analysis from policies and market for the spread of renewable energy in agriculture

The Regional Self-Assessment shows that uptake of RE in the agricultural sector remains very low. It is also evident that there is no current or emerging policy incentives for RE specifically in the agri-sector. A SWOT analysis, based on the finding in this assessment, is illustrated below.

<table>
<tr><th>Strengths</th><th>Weaknesses</th></tr>
<tr><td>

Very good wind energy resource – onshore capacity factor 28%
Solar resource comparable to Denmark – Denmark has approx. 28x Solar PV installed
Cheap land owned by farmers

</td><td>

Small farms with limited financial or technical capacity for investment
Aging farm holder profile
Beef and sheep farming are not energy intensive – low potential for self-consumption
No available market tariff for small scale (50kW to 500kW) Renewable Electricity generation for export to grid
Very limited market for energy crops
Infrastructural deficits – proximity to electricity and natural gas grid

</td></tr>
<tr><th>Opportunities</th><th>Threats</th></tr>
<tr><td>

SSRH opened in 2019 – good potential for pig and poultry sector.
Climate Action Plan (CAP) targets for 2030:

70% of all electricity from renewable sources: 1.5GW Solar PV, 8.2GW onshore wind
RESS includes a category for ‘Community owned’ projects

Sustainable Energy Community (SEC) Programme
GNI target for 20% Renewable Gas on the network by 2030 (11.6 TWh):

AD deployment and AD feedstock potential
Sligo Local Gas Network project in development stages

Microgeneration Support Scheme (MSS) currently in public consultation:

Export payment for excess renewable electricity (up to 50 kW)
Review of Planning exemptions and grid connection process for RE ongoing

Emerging policy for CPPAs:

May provide a route to market for small-scale renewable electricity

</td><td>

Administrative burden of support schemes
Regulatory barriers
Cost and availability of grid connection
Local opposition to onshore wind energy
No clear emerging policy for 50kW to 500kW renewable electricity export to grid
Policy focus on decarbonization of agriculture through land management and improved animal production efficiency. While this is a valid approach, it may result in less consideration of the RE opportunities for farms.

</td></tr>
</table>

As noted, the current policy focus for agriculture in Ireland is decarbonization through land management and improved animal production efficiency. Therefore, uptake or exploitation of RE in the sector is likely to take a back seat in the short to medium term. Further to this, the primary motivation for uptake of RE in the agri-sector is for self-consumption as there are limited existing routes for sale of energy. Therefore, in the short term the main potential is to raise awareness and improve access to supports for target sectors i.e. those with a higher energy demand such as pig, poultry and horticulture.

In the medium to longer term, more ambitious projects can be supported. The growth of Community owned energy projects supported by RESS is a key area in which farmers can play a leading role, rather than simply as land leasers. This opportunity can best be exploited through the Sustainable Energy Communities (SEC) network.

The GNI target for 20% Renewable Gas on the network by 2030 will stimulate an indigenous biogas market. While small-scale AD remains a commercial challenge, there will be opportunities for cooperative approaches in providing feedstock to larger central AD plants for the production of biogas and fertilizer.

The RSG for Ireland has agreed a 3 strand strategy to support the objectives of the AgroRES project, as shown below. This strategy will be used for the nest phase of the AgroRES Project which is to design and implement an Action Plan.

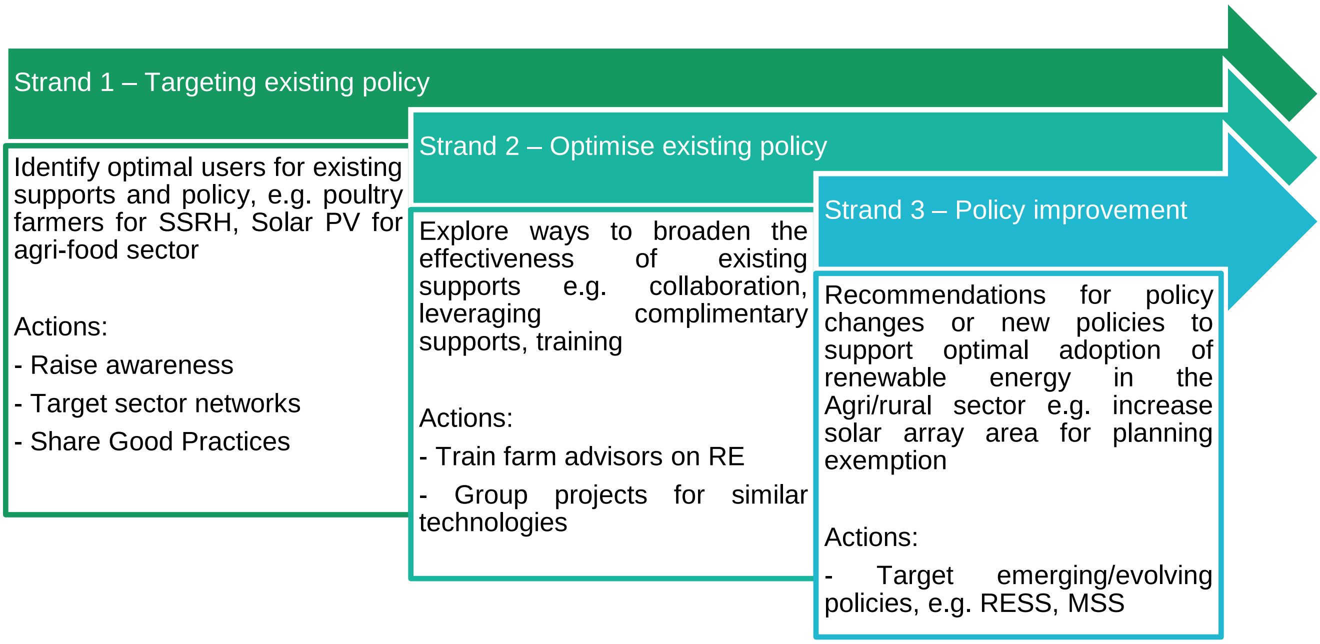

Fig 5.1 – RSG Ireland project strategy

Glossary

Term	Definition
ABP	An Bord Pleanala
ACA	Accelerated Capital Allowances
AD	Anaerobic Digestion
AWU	Annual Work Units
BMW	Border, Midlands & West (region)
BnM	Bord na Mona
CAP	Climate Action Plan
CHP	Combine Heat and Power
CPPA	Corporate Power Purchase Agreement
CSO	Central Statistics Office (www.cso.ie)
DAFM	Department of Agriculture, Food and the Marine
DCCAE	Department of Communications, Climate Action and Environment
DSO	Distribution System Operator (ESB Networks, also referred to as ESBN)
FFI	Family Farm Income
Gas Networks Ireland	Gas Networks Ireland
GFC	Gross Final Consumption
GHG	Green House Gas
GVA	Gross Value Added
HNV	High Nature Value
IWEA	Irish Wind Energy Association
ktoe	kilo-tonnes of oil equivalent
kV	kilovolt
MACC	Marginal Abatement Cost Curve
MEC	Maximum Export Capacity
MSS	Microgeneration Support Scheme
MW	Megawatts
NUTS	Nomenclature of Territorial Units for Statistics
NW	Northern & Western (region)
NWRA	Northern & Western Regional Assembly
PV	Photo Voltaic
RE	Renewable Energy
REFIT	Renewable Energy Feed-in Tariff
RES-E	Renewable Energy Sources for Electricity
RES-H	Renewable Energy Sources for Heat
RESS	Renewable Electricity Support Scheme
RES-T	Renewable Energy Sources for Transport
SEAI	Sustainable Energy Authority of Ireland

Term	Definition
SO	The Standard Output (SO) of an agricultural product is defined as the average monetary value of the agricultural output at farm-gate prices. SO is not a measure of farm income. It does not take into account costs, direct payments (such as the Single Farm Payment), value added tax or taxes on products. This has replaced the concept of Standard Gross Margin (SGM) which was previously used to measure the economic size of a farm. Therefore, direct comparisons cannot be made between the economic size of farms in this report and the economic size of farms published for earlier years.
SSRH	Support Scheme for Renewable Heat
SWOT	Stregths, Weaknesses, Opportunities, Threats
TAMS	Targeted Agricultural Modernisation Schemes
TFC	Total Final Consumption
TSO	Distribution System Operator (Eirgrid)
TSO	Transmission System Operator (Eirgrid)
WDC	Western Development Commission
WWTP	Wastewater Treatment Plant