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Biomass Resources in the Island of Ireland

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Introduction

The objective of this paper is to analyse the biomass resource on the island of Ireland and see how it can contribute to our energy supply in the future. The paper mentions, but is not focussed on the debate between crops for food production being in competition with crops for energy.

Biomass is any biological material that can be grown. In terms of energy production, and energy crops, it refers to any crop that can be grown from which energy can be produced. The most obvious example in the island of Ireland is wood from trees, but it can also include grass and other crops that would normally be considered as food crops, such as grain.

Biomass can also include other materials such as chicken litter, landfill gas, tallow (animal fat) and sewage sludge gas. For the purpose of this report the scope is limited to produce which can be grown on land, or which is a product of agriculture and can be converted to energy. This includes wood, grass, energy crops, tallow, bone meal, straw and oat hulls.

There are several ways of measuring the amount of energy that can be produced. It can be in kilo tonnes (ktoe) of oil equivalent, which provides a direct comparison with oil. It can also be measured in Mega Watts (MW) or Mega Joules (MJ), units usually used for heat or electricity. This paper uses the amount of energy as a percentage of national use, or national requirement, as it is less complicated and more easily understood.

The figures should be treated with some caution as the percentage of bioenergy produced and consumed annually changes in accordance with demand, industrial output, and overall efficiency measures. This report is therefore a simplified overview.

Background: Policy Context and Trends

Northern Ireland and the Republic of Ireland (Ireland from here on) have a similar climate, and an analogous agricultural system. The only thing that really differentiates production is Government policy. North and South have different biomass policies and different energy targets, so while this paper is focussed on the island in its entirety, it is necessary to consider the territories separately.

Republic of Ireland

Ireland has been more successful in meeting its renewable electricity targets than it has with its renewable heating targets. Over 15% of all the electricity produced is now from renewable sources, most of that coming from wind. However the amount of heat from renewable sources is less than 5%. Most of the renewable heat goes into the industrial sector (78%), and it is the biomass sector that provides most of the fuel.

Since 2008, there has been a change in energy consumption patterns, largely as a result of the economic downturn. Up to that point, the amount of land in forestation had been

increasing steadily and the consumption of renewable heat from biomass had also risen. The use of biomass in residential heating from 2005 to 2010 increased annually by an average of 18%. Since 2010, it has slightly decreased. The use of biomass for industrial heating increased 6% annually from 1990 to 2007, but since 2008 it has fallen by an average of 2% per annum.

Most of the biomass used for heating in Ireland comes from traditional forestry. In 2010, of the 2.9 million cubic metres (cu.m) of wood produced, just under 1 million cu.m, (i.e. 984,000 cu.m) went to the heat market. That represents 34% of total production; of that total, only 1% came from energy crops.

Based on scenario modelling by the Sustainable Energy Authority for Ireland (SEAI), Ireland will require approximately 8 million cubic metres of woody biomass to satisfy its energy requirements. They estimate that about 25% of that can be provided from traditional forestry, 20% will come from agricultural residues and the rest will either come from energy crops or imported biomass.

The headline driver for Ireland's renewable energy policy is the National Renewable Energy Action Plan (REAP). This is in response to the EU Directive 2009/28/EC, which will require the country to produce 16% of its total energy from renewables. This is further developed within a raft of policies that include energy efficiency and a drive towards a greener economy, with increased numbers of jobs in the sector and improved competitiveness.

The REAP addresses renewable electricity, transport fuels, and renewable heat. The transport targets, in the form of the National Biofuels Obligation 2010, require suppliers of road transport fuels to initially blend 4% biofuels. At present 57% of those biofuels are imported, particularly bioethanol. There is a commitment that 10% of all vehicles will be electric by 2020, which is related to Ireland's capacity to produce up to 40% of its electricity from renewables by that date.

The renewable heat target is 12% by 2020 (Table 1). That is likely to be the most challenging of all the renewable energy targets, to get it up from the current figure of 4.9%. Most of that is likely to come from biomass.

Ireland has produced a BioEnergy Roadmap to 2050. Its objectives include:

- Establishing a minimum of 20,000 hectares of new forests each year;
- Introducing the REFIT scheme for electricity production from biomass;
- Promoting and supporting growers of energy crops; and
- Cultivating high yielding and demand driven energy crops.

Northern Ireland

Northern Ireland is in a similar position to Ireland in terms of its electricity and heat production from renewable sources. It is now producing over 11% of its electricity from

renewables, and again the majority of that comes from wind. Its production of renewable heat is less than 2%, and that figure has not risen significantly in the last 6 years.

The level of afforestation in Northern Ireland is significantly less than that of Ireland. While the South has increased its forest cover to nearly 11%, up by 100% since 1980, the North is still sitting at around 4% a figure that has not increased in the last 30 years. The production of timber within the North is less than 1 million cu.m per annum, and the North already imports about 200,000 cu.m annually.

The main policy driver in Northern Ireland is the Sustainable Energy Action Plan 2012-2015. This has evolved out of the Strategic Energy Framework document, which was produced by the Department of Enterprise Trade and Investment in 2010. Northern Ireland, as part of the UK, is not required to provide its own REAP, under 2009/28/EC, but is expected to contribute to the UK's targets.

The Sustainable Energy Action Plan has identified specific targets for the production of renewable heat: 2% by 2013, 3% by 2014, 4% by 2015, and 10% by 2020. These targets are challenging, as the existing base of 2% has been attained over many years and it requires a significant impetus to increase the production of renewable heat by what amounts to 40%, year on year for 8 years.

That impetus will be the Renewable Heat Incentive (RHI) which is due for introduction in 2013. It is a similar scheme to the Renewables Obligation which has been successful throughout the UK and Northern Ireland in incentivising the renewable electricity market.

	Renewable Electricity		**Renewable Heat**	
	Target	**Year**	**Target**	**Year**
Ireland	20%	2020	12%	2020
Northern Ireland	40%	2020	10%	2020

Table 1. Comparative renewable energy targets for Ireland and Northern Ireland.

Potential for Renewable Energy Production

The potential to produce more biomass in the island of Ireland is significant. Paterson's Climatic Index is an indicator of the growing potential for wood. The island of Ireland is rated at 10, which is significantly higher than most other European countries. The growing conditions for trees are ideal, with typical production capability two or three times that of mainland Europe. Ireland was once densely forested, but large areas were cleared in the 16th to 18th centuries, and our levels of afforestation, 11% in the South and 4% in the North, are well below the EU norm (the only EU country with a lower level of afforestation is Malta).

However, Ireland has not realised its potential to produce woody biomass to date, for several reasons. These include: lack of incentives (particularly in Northern Ireland), reliance on traditional land management, the culture within agriculture and the focus on food production.

Ireland exports 80% of its food production, but imports 90% of its primary energy requirement. Until recently, this has not been regarded as an issue. There is now a realisation at national level, particularly within the respective Departments of agriculture, that agriculture is more than food production.

With specific regard to woody biomass, the supply is dependant upon several factors. They include:

- Price: The value of timber for processing, co-product and for energy has risen significantly in the last 10 years. It is reasonable to assume that the price/value will continue to rise to match global oil and gas prices.
- Access to the forests: Many of the forest stands in the island of Ireland are difficult to access economically with the current road infrastructure. As prices rise, more forests become economically viable.
- Harvesting techniques: Such techniques are improving in Ireland as a whole, partly as a result of economies of scale, increased investment, and changes in practice.
- Regulatory framework: This refers to regulations such as the Habitats Directive and requirement for fuels to be sourced sustainably.
- Support mechanisms: This is more of a long term consideration in assessing the levels of afforestation that will be achieved in the future. Over the last 20 years, there is a clear correlation between the amount of new forests that have been planted and the level of financial support for establishment.

The forest sector is dominated by Coillte in Ireland, and the Forest Service in Northern Ireland. They will continue to be the major producers and suppliers of small scale round-wood for the foreseeable future, and their policies for releasing wood to the energy market are crucial. It will be difficult to leverage supplies from the private sector, where cost is the main driver.

There are several "solutions" to increase the availability of wood, including:

- Improve enabling environment by continuing to improve road access and support enhanced harvesting techniques.
- Increase level of support for establishment of new forests.
- Increase imports, which unfortunately are likely to be the short-term implication of policy formulation, particularly in Northern Ireland, where the RHI is likely to create a demand for wood fuel that cannot be met from indigenous resources. This will have the result of replacing dependency on imported fossil fuels with a dependency on imported biomass.
- Increase production from short rotation coppice.

In addition to increasing its wood production, the island of Ireland also has the opportunity to increase its production of energy crops, both dedicated crops, such as miscanthus or hemp, and food crops such as grass. Grass can be used as an energy crop, particularly within anaerobic digestors, for the production of both electricity and heat. In many countries there has been a displacement of land, which has traditionally been used for the production of food crops, to now be used for the production of energy crops. This has been evident both in the use of

maize/corn being re-routed to bioethanol production and the use of sugar for liquid biofuel production. This had the effect of causing staple food prices to rise worldwide in the period 2005 to 2009. However, this would not be an issue in the island of Ireland where food production is more than sufficient to meet current needs.

It is likely that the EU will drop its ban on genetically modified crops within the next few years. That will present Ireland with an opportunity to choose new varietals for energy crop production, particularly on marginal land, which is currently abandoned or out of use.

Implications for Land Use

The Governments, both North and South, are encouraging the increased use of renewable energy, including bioenergy. This will inevitably lead to changes in land use, which may be considered positive or negative in terms of biodiversity, environmental quality and the landscape.

It is generally accepted that forestry and short rotation coppice offer the best potential for increase bioenergy feedstock production across the island of Ireland. Small-scale expansion is likely to have less impact than large-scale expansion; large scale expansion will require good land use planning on a macro scale level.

The most obvious question is where to accommodate such an expansion. Forestry expansion is likely to take place in lowlands where there is lower sensitivity, and in marginal ground (particularly marginal grassland). It would be beneficial to avoid soils with high carbon content as there is the potential for them to become net carbon emitters if disturbed.

	UK	EU average	RoI	N.I.
Arable Land	23	26	17	14
Forest/Woodland	15	39	12	4
Crops	20	24	5	4
Grassland	42	20	64	67
Shrub	10	6	6	1
Bare Land	2	2	1	1
Less Favoured	47	57	67	70

Table 2 Land cover as a percentage of total area.

Table 2 looks at the distribution of different land types in Ireland, Northern Ireland, UK and the EU average. The figures are shown as a percentage of total land area. The figures do not add up to 100% as land use types such as wetland, water and built up areas have not been considered given that these areas are not likely to be part of the bioenergy land resource.

Ireland and Northern Ireland have similar patterns of land use in terms of percentages. They have higher rates of less favoured areas (LFA) than the EU average, and lower rates of afforestation. There is financial support within the EU for areas designated as LFA, though this

may change after the CAP reform. This decoupling of agricultural support is likely to increase the opportunities for turning marginal areas of current food production into more efficient and remunerative areas of bioenergy/crop production.

Although the ratio of hectares of agricultural land per capita in each country is not shown in Table 2, it is worth noting that the EU average is 0.42, while Ireland and Northern Ireland have ratios of over 1.0, which are the highest in Europe. This is an indication of the potential to convert to non-traditional agricultural land use without having a significant effect on the landscape.

Conclusion

The island of Ireland imports over 90% of its energy but exports up to 80% of its food production. It has ideal growing conditions for both trees and other dedicated forms of energy crops, but to date has low levels of afforestation and levels of energy crop production which are not contributing a sustainable energy future.

Most of the energy consumed is in the form of heat, and it is easier and more efficient to produce heat from biomass than electricity from biomass. It would therefore make sound economic sense for Ireland to increase its production of both wood from trees and biomass from energy crops.

There is likely to be a shortage of biomass in the Irish market. This will be driven, in the short-term, by the RHI in Northern Ireland. The RHI will have the effect of making wood fuel more valuable in the North and encouraging suppliers, particularly in the border counties of the South, to supply to consumers the North. It is probable that Ireland, as a whole, will be importing 5-10 million tonnes of biomass within 8 years. It does not seem sensible for the island of Ireland to replace fossil fuel dependency with a dependency on imported biomass.

The island of Ireland, both North and South, has higher levels of marginal land than most other European countries. This land could be used to produce energy crops, or converted to forestry, without having a significant, detrimental, impact on biodiversity, landscape or the environment.

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