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Smart Farming in Ireland

Ireland is a country in Europe. It is a part of the European union. The Republic of Ireland is the larger part of the island, west of Great Britain. There are three bodies of water surrounding Ireland; North Atlantic, the Irish Sea, and St. George's Channel. Northern Ireland is the other country that resides on the island. 16% of the island is Northern Ireland while the other 86% is The Republic of Ireland. 4.83 million people currently live there. A majority of the population lives in an urban area (64%) while the other 36% lives in a rural area. Ireland is about 6.9 million hectares of land. 4.4 million hectares or 64% of the land is suitable for agriculture. Ireland has enviable natural advantages for farming the land to produce food, fiber and fuel, with fertile soils, a temperate climate and plenty of rainwater. Helped by the Gulf Stream's influence, Ireland's climate is particularly suitable for ryegrass production, an excellent and affordable animal feed. This simple comparative advantage is the basis of many of today's farming in Ireland. About 1/3 of Ireland's greenhouse gas emissions in Ireland come from agriculture. Because of this farmers are starting to use Smart Farming, Smart Farming is "the application of modern Information and Communication Technologies into agriculture, leading to what can be called a Third Green Revolution." These technologies can help every type of farmer in Ireland because it meets the needs of different farming communities. This program can help farmers earn a greater profit, eliminate greenhouse gases while also helping end hunger in their country.

In Ireland the average household size is about 3 people per household. (ArcGIS). Ireland has preserved the tradition of abstaining from meat-eating on a Friday as a predominantly Catholic country, usually replacing meat with fish as the main protein. According to the Irish Sea Fisheries Board, fresh fish sales in Ireland on Fridays account for about 30 percent of weekly sales. Because Ireland is also abundant in peat, spongy material formed by the partial decomposition of organic matter, primarily plant material, in wetlands such as swamps, muskegs, bogs, fens, and moors, as a fuel source, the culinary tapestry places particular emphasis on slow-cooked stews and casseroles. "Stobhach," or Irish stew, as the national dish, with carrots, potatoes, onions and lamb. Traditionally, at the beginning of a meal, soups are eaten, while stews are a main course dish of potatoes and vegetables. (Marshall, 2018) The development of processed food industries, brought the expansion of retail outlets into even smaller towns and villages and more efficient methods of railway and later road distribution which created a significant shift to 'shop-bought' food in the late 1800s and early 1900s, with even rural residents now making regular trips to local towns to buy biscuits, bread, sugar, tea and other 'delicacies' to supplement what they grew on their own. (DoChara, 2017). In the late 1800s and early 1900s getting food from the farm to table has never been easier. It paved the way for modern day technologies to help get food on every table, whether

you were rich or poor. Smart Farming is helping the farmers grow the food in safe and effective ways so that the food will also be healthy and safe to consume.

The Irish education system consists of: early childhood, primary, post-primary, further education and training, higher education, recognition of qualifications, provision of education to students with special educational needs, provision for disadvantaged students, and state-funded education at all levels, unless you decide to send your child to a private institution. The Irish Constitution states that parents are primarily responsible for their child's education. It guarantees the right and duty of the parents to provide for the education of their children. It also says that the state requires certain minimum education to be given to children. It costs about €200 per year to go to primary school, but this is just the cost of school essentials. About an additional €600 is used for lunch, clothing and after-school activities. To go to primary school, it costs about €400 per year, for books, supplies and transportation, with an overall cost of about €1,700 per year. The additional €1,300 is used for lunch, clothing and after-school activities. The annual cost for college in Ireland is about €8,800. This includes things like student accommodation, fees, transport, etc.

One does not need to pay Irish tax or social insurance to access publicly funded health services, but one must be able to satisfy the HSE that they are an 'ordinarily resident.' However, there are long waiting lists in place for medical treatments, and as a result, many people choose to take out private health insurance to receive medical procedures more quickly. The HSE pays for the patient to be treated overseas (e.g. the UK) in some cases where specialist care can not be provided for patients in Ireland. Alternatively, to receive prompt and cheap treatment, some people turn to medical tourism. (Health Care in Ireland) Public healthcare is free, as you don't have to pay into a particular state insurance policy: it is funded primarily through taxation. If you apply for a Medical Card, it's also free to use almost all public health services. There are costs for general practitioner (GP) visits, hospital stays, drugs, and some other services if you don't qualify for a card, even though the rates are subsidized. (Healthcare in Ireland: A guide to the Irish healthcare system)

In 2016, there were 86 hospitals in Ireland, the lowest number in the country since the time period began. There has been a gradual decline in the number of hospitals in Ireland since 2000 but there has been a significant drop between 2008 and 2009. (Stewart, 2019). The number of health workers in Ireland has risen over the period since 2000. In 2018, Ireland's hospitals had nearly 65,7 thousand employees, an increase of over 23,000 from the year 2000. While the number of general practitioners in Ireland has more than doubled in the period since 2000 to 4.25 thousand in 2018. (Stewart, 2019) The average distance from a hospital in Ireland is about 20km. (Cullen, 2019)

In 2016, Ireland's agri-food sector generated 7% of the gross value added (€ 13.9 billion), 9.8% of Ireland's merchandise exports, and 8.5% of Ireland's national employment. When jobs are

included in inputs, processing and marketing, the agri-food sector accounts for nearly 10% of jobs. The agri-food sector is one of the most important indigenous manufacturing sectors in Ireland, with approximately 167,500 people in employment. It includes nearly 700 food and beverage companies across the country that export food and seafood to more than 160 countries around the world. In other traded sectors of the economy, economic activity among agriculture and food yields a far greater return than comparable activity. That's because agri-food companies make up 74% of Irish suppliers' raw materials and services, compared to 43% for all manufacturing companies. Exports of agri-food account for more than 11% of total exports of Irish merchandise. However, taking into account the low import content of agriculture and food exports and the low repatriation of profits earned in the agri-food sector, it is estimated that the agri-food sector accounted for about 40% of net foreign export earnings in 2008. Irish exports of food and drink have grown dramatically in 2017, rising by 11.6 percent, with a record € 12.7 billion worth. The value of Irish agri-food exports has increased by more than 61 percent since 2007-2009.

The impacts of climate change are expected to increase over the coming decades and throughout the remainder of this century. The size and magnitude of these impacts remain uncertain, particularly during the second half of the century. The biggest uncertainty is how effective global action to reduce greenhouse gas emissions will be. Predicted adverse effects include: rising sea levels, more severe storms and rainfall events, increased likelihood and magnitude of river and coastal flooding and water shortages in the summer, adverse effects on water quality changes in the distribution of plant and animal species affecting fisheries sensitive to temperature changes. (EPA) Climate change is such a big issue and will continue to affect the way we live including the way we farm. "The sea swallows up about 750 acres of Ireland each year, and the process is only quickening as sea level rise crawls up the western and northern coasts of the island. Due to its "saucer shaped" topography, with coastal cliffs feeding into lower inland areas, Ireland's coastlines and inland are particularly threatened by more frequent, long lasting, widespread flooding induced by global warming. With ever rising sea levels, the Irish coast is dwindling away. As coasts rapidly change over the next century, coastal infrastructure, fishing communities, native plant species, and agricultural practices will be greatly impacted. Much of sea level rise in Ireland will be associated with weather extremes, particularly the severity of storms and storm surges. Irish precipitation and flooding has been traditionally associated with long duration and low intensity events, but with climate change- more intense precipitation is likely to result in increased incidence of flooding and give rise to water quality issues," as it states in "Keeping the Emerald Isle Green". If something is not done, farmers will have intense loss of crops and will have to adapt to the new climate. There are proven case studies from Smart Farming that prove that one farm's greenhouse gases can be eliminated by 10%. It might be hard for people to lose their ways and not do the traditional farming ways that they were grown up on, but if they do not start now by changing smaller things, farmers will have to change their entire way of life.

Temporary greenhouse gas emissions from Ireland are estimated at 60.51 million tons of

carbon dioxide in 2018, which is 0.2% lower than emissions in 2017 and follows a 1.0% reduction in emissions reported in 2017. Over the past 10 years, emission reductions have been recorded in 7 of the 10 years. National total emissions have dropped by only 1.2 percent in the last 2 years, following very large increases of over 3.5 percent in both 2015 and 2016. Emissions in the stationary ETS sector decreased by in the same period, whereas emissions under the ESD (Effort Sharing Decision) increased by 3.4%. Ireland's greenhouse gas emissions decreased by 0.2% in 2018 compared to 2017, with declines in just 3 sectors including: Energy Industries emissions decreased by 11.7%; Waste emissions decreased by 2.8%; F-gas emissions decreased by 10.2%. Emissions trends are heading in the wrong direction in the following sectors: Agriculture with an increase of 1.9 percent, Transport up 1.7 percent, Residential up 7.9 percent, Manufacturing Combustion up 3.9 percent, Industrial processes up 2.0 percent and Commercial and Public Services both increased 5.3 percent and 8.2 percent compared with 2017 emissions. Arresting this growth is a challenge in the context of a growing economy, but one that households, businesses, farmers and communities need to address if Ireland is to take advantage of a low-carbon economy. (Current Situation) A way to help eliminate greenhouse gases is with Smart Farming.

Smart Farming is a voluntary resource management programme run by the Irish Farmers' Association (IFA) in partnership with the Environmental Protection Agency (EPA) with a view to addressing climate change issues and increasing profitability. On participating farms, the average cost savings were € 6,336, while steps were reported to reduce greenhouse gas emissions by an average of 10 percent. Addressing soil fertility accounted for 24 percent of gains, while 23 percent accounted for better grassland management. (O'Sullivan, 2019) This program has involved over 2,000 farmers, focusing on eight key areas: soil fertility, grassland, energy, water, feed, inputs and waste, machinery, and time management. The program is coordinated with the assistance from bodies such as Teagasc, EPA and SEAI. "The lead and the drive on this came from the work of the IFA environment and rural affairs committee, at a time when there was an adversarial debate around climate change and greenhouse gases in Ireland. This was a genuine effort on their part to get involved in a positive way with the environment, and make a direct impact on their income," says IFA Smart Farming programme manager Thomas Ryan. The program's key objective is to identify cost savings of € 5,000 and, on average, and reduce greenhouse gas emissions by 5-7% per farm. This goal has been surpassed. The average cost savings on participating farms amounted to about € 8,700 in 2017, the average reduction in greenhouse gas emissions was 10%. "Forty-seven percent of the cost savings came from getting soil fertility right. In Ireland, almost two thirds of soil are classified as nutrient-hungry. The point we were able to demonstrate was that you can decrease your concentrates bill and increase grass growth by improving soil fertility. This may require an initial investment, in liming for example, but what we are able to show is the value of that investment."(Lewis, 2018)

Smart Farming is also incredibly easy to use. A farmer can do one of two things; They can either follow the Smart Farming advice or participate in their case survey. The case survey will go in depth for what that specific farm needs to do to become a "Smart Farm".

Smart Farming is a concept of farm management that utilizes modern technology to increase the quantity and quality of agricultural products. Farmers in the 21st century have access to technologies such as GPS, soil scanning, data management and the internet. Farmers can significantly increase the effectiveness of pesticides and fertilizers and use them more wisely by accurately measuring differences within a field and adjusting accordingly. Farmers can also better monitor the needs of individual animals using Smart Farming techniques and adapt their nutrition accordingly, thereby preventing disease and improving herd health .(Schuttelaar & Partners, 2017)

Each farm in Ireland has the potential to become a smart farm. A smart farm is one that uses technology such as sensors and mobile phone apps combined with agricultural, environmental, and economic data to assist farmers in making, planning, and farm management decisions. Through developing and implementing these types of smart farming technologies all farms can become more efficient and productive from small holdings upwards. Knowledge and expertise is crucial to any progress. New farming techniques require increasingly professional skills. A farmer today is not only a person with a passion for agriculture, he or she is also a legal expert (to navigate his way through a maze of regulations) and a part-time data analyst, economist and accountant (to make a living from selling agricultural produce requires bookkeeping skills and a thorough knowledge of market chains and price volatility). (Mooney, 2019)

2019 was a very successful year, with Smart Farming being awarded the inaugural Talamh Agri- Innovation prize at the RDS Spring Awards and selected by Richard Bruton, Minister of Communications, Climate Action and the Environment, as Champion for Sustainable Development Goals for 2019 and 2020. The average cost savings on farms of € 6,336, 10 percent average reductions in greenhouse gas emissions identified on farms, addressing soil fertility represented 24 percent of the savings and improved grassland management represented 23 percent of the savings. IFA President Joe Healy said, “2019 has been a very busy and successful year for Smart Farming. It is really great to see farmers’ good work being recognised at the RDS Spring Awards and also being selected as a Sustainable Development Goals Champion for 2019 and 2020. This provides a positive platform for farmers to build on their sustainability actions, in the face of increasing climate, biodiversity, air and water challenges”. Laura Burke, EPA Director General said, “Since 2014, Smart Farming has identified pathways and solutions for farmers to reduce the environmental burden of agriculture, while also improving farm finances. In 2019, it was recognised for its leadership through an RDS Talamh Agri-Innovation award and the national Sustainable Development Goals Champions initiative. In a fast-changing world, the EPA will continue to work with the IFA to deliver best-practice guidance, driven by the latest science. The Agency calls on farmers and agribusiness leaders across the country to participate in Smart Farming and ensure the long-term environmental and economic sustainability of Ireland’s agricultural sector.”

There are 137,000 farms in Ireland but only 2,000 use Smart Farming. It will take effort, investment and time to promote this concept of Smart Farming in Ireland. The best time to

start is now. Efforts must be made to integrate smart farming into education and training. Policymakers, research institutions and farming organizations will need to make an effort and put money to disseminate and illustrate effective use-cases for Smart Farming at the farm level. This can be driven by peer-to-peer exchanges, Smart Farming training and demonstration. Smart Farming Technologies are a new and innovative set of tools that farmers can use at their farms. The framework for closing the gap between farm research and rural development is provided by them. Farmers will be able to make decisions which are more environmentally sustainable. Importantly, it can also give farmers more time within their rural communities to spend on other activities. Those technologies are not in themselves an endpoint. Smart farming technologies are emerging to complement and improve farmers' skills and knowledge but not to replace them. Rumors of a future in which robotic machines take full control of agriculture are far fetched, misleading and generally unhelpful. (Mooney, 2019)

The EU is currently supporting the adoption and advancement of Smart Farming through a wide range of policies, including: Common Agricultural Policy (CAP); Regional Policy; Environmental Policy; Food Safety Policy; Competition Policy; and EU Innovation Policy. Current production of Smart Farming Technologies is primarily funded by Horizon 2020 Research Policy and the CAP's Rural development policy. Nevertheless, the implementation of smart farming in the EU is financed by local, regional and national regional development projects, which are co-funded by the EU and the relevant Member State. The proliferation of Smart Farming programs results in an excessively complex system, resulting in high governmental costs and high entry barriers when seeking funding. The EU is currently in the process of simplifying[its agri-food programs, rules and regulations and reforming its approach to innovation:'...[the objective] is to have a more demand-driven research policy and a more evidence-based agricultural policy.' This means that there are currently many factors at stake in the Smart Farming theme: 1) public and private sector funding is rapidly increasing out of necessity and partly motivated by business opportunities; 2) public sector funding is difficult to reach, and 3) the EU is currently in the midst of a reorganization of its financing methods.

According to experts in precision agriculture, the EU Common Agricultural Policy, after 2020, will mobilize both direct payments and rural development pillars to pave the way for the implementation of much-needed digital technologies in the agricultural sector. The increasing demand for agricultural products and the need to protect the environment have put pressure on policymakers to find innovative ways to "produce more with less." Additionally, price volatility in food and agricultural markets has highlighted the need to increase European competitiveness worldwide so that the sector can thrive on a long-term basis. (Michalopoulos, 2016) The latest Common Agricultural Policy (CAP) reform for 2021- 2027 aims to counter the fact that many farmers do not know about new technologies by placing greater emphasis on technological innovation, digitisation, and research and development designed to encourage positive environmental change. This would then enable farmers to access additional funding as, under

the new CAP, direct payments and their amount will depend not only on the size of the area but also on the environmental or climate impact of the farm. (Strzałkowski, 2019)

The new reform will work to support this by setting up organizational committees that bring together businesses, administration and experts, among others, to collaborate on designing and implementing creative farmers solutions. Over 3,200 of those groups are expected to be formed across the EU. In addition, the largest EU research program, Horizon, to be called Horizon Europe in its new version, will also remain a significant instrument. The € 10 billion program will support specific scientific projects and innovations in the fields of rural development, organic economy, healthy food production and EU agriculture in general. With increased financial support and professional advice the European Commission hopes to encourage EU farmers to use and invest in new technologies. It is hoped that these technologies will in the long term help to increase yields or reduce production costs, but also help farmers better meet new, more stringent environmental needs. One of the new Commission's main aims, for example, is to reduce the use of harmful pesticides, with new Agriculture Commissioner Janusz Wojciechowski highlighting the promotion of organic farming as a key objective for the new European Commission in his inaugural speech. (Strzałkowski, 2019)

Regional policy aims to support job creation, business competitiveness, economic growth, sustainable development and the improvement of the quality of life of citizens in all regions and cities in the European Union. Regional policy provides the necessary investment structure to meet the objectives of the European Union's Europe 2020 plan for smart, sustainable, and inclusive development. One of the main targets for the EU is Climate change and energy sustainability: Greenhouse gas emissions 20%, 20% of energy from renewable, 20 % increase of energy efficiency. These numbers can be dropped because of Smart Farming.

The EU citizens benefit from some of the world's highest expectations for the climate. With the support of dedicated research projects, legislation and funding, the EU and national governments have set clear goals to direct European environmental policy until 2020 and a vision beyond that, where to be by 2050. Work is ongoing on many fronts to protect endangered species and natural areas in the EU, ensure safe drinking and bathing water improve air quality and waste management, and reduce the harmful chemicals effects. Environmental protection and innovation help create new opportunities for business and employment which stimulate further investment.

The concept of Smart Farming can be used in every country. All that has to be done is that it has to be adapted for that certain country's environment. With the proven results of about €6,000 savings and the average elimination of 10% of greenhouse gases per farm, Smart Farming should be everywhere. With the savings the farmers are making they can use that money to grow more crops, by obtaining more land, or getting new farm equipment, etc. This can allow for a larger production of crops and help end hunger by making food more

accessible.

References

About: Smart farming. (n.d.). Retrieved from <https://www.euractiv.com/topics/smart-farming/>

Anonymous. (2019, April 09). Connectivity is essential for precision farming. Retrieved from

<https://ec.europa.eu/digital-single-market/en/news/connectivity-essential-precision-farming>

BLOG: Smart Farming is key for the future of agriculture. (n.d.). Retrieved from [https://www.schuttelaar-](https://www.schuttelaar-partners.com/news/2017/smart-farming-is-key-for-the-future-of-agriculture)

[partners.com/news/2017/smart-farming-is-key-for-the-future-of-agriculture](https://www.schuttelaar-partners.com/news/2017/smart-farming-is-key-for-the-future-of-agriculture)

The Cost of College Education in Ireland 2019. (n.d.). Retrieved from [https://www.zurich.ie/savings-and-](https://www.zurich.ie/savings-and-investments/education-costs/college/)

[investments/education-costs/college/](https://www.zurich.ie/savings-and-investments/education-costs/college/)

Cullen, P. (2019, January 07). Residents in five counties over 30 minutes from emergency department. Retrieved

from [https://www.irishtimes.com/news/health/residents-in-five-counties-over-30-minutes-fro](https://www.irishtimes.com/news/health/residents-in-five-counties-over-30-minutes-from-emergency-department-1.3749420?mode=amp)

[m-](https://www.irishtimes.com/news/health/residents-in-five-counties-over-30-minutes-from-emergency-department-1.3749420?mode=amp)
[emergency-department-1.3749420?mode=amp](https://www.irishtimes.com/news/health/residents-in-five-counties-over-30-minutes-from-emergency-department-1.3749420?mode=amp)

Current Situation - Environmental Protection Agency (EPA). (n.d.). Retrieved from

<https://www.epa.ie/ghg/currentsituation/>

Education_Ire. (n.d.). Irish Education System. Retrieved from <https://www.education.ie/en/The-Education->

Syste
m/

The EU's main investment policy. (n.d.). Retrieved
from

[https://ec.europa.eu/regional_policy/en/policy/what/investment-
policy/](https://ec.europa.eu/regional_policy/en/policy/what/investment-policy/)

Examiner, I. (2018, May 03). Smart Farming boosts income and helps the planet at the same
time. Retrieved

from

[https://www.irishexaminer.com/breakingnews/farming/smart-farming-boosts-income-and-helps-t
he-](https://www.irishexaminer.com/breakingnews/farming/smart-farming-boosts-income-and-helps-t
he-)

[planet-at-the-same-time-840692.](https://www.irishexaminer.com/breakingnews/farming/smart-farming-boosts-income-and-helps-t
he-planet-at-the-same-time-840692.html)

html

FAO.org. (n.d.). Retrieved from

<http://www.fao.org/family-farming/detail/en/c/428469/>

Farming in Ireland Overview. (n.d.). Retrieved from

<http://www.askaboutireland.ie/enfo/sustainable->

[living/farming-in-ireland-over](http://www.askaboutireland.ie/enfo/sustainable-
living/farming-in-ireland-over)

vi/

Food in Ireland after the Famine. (2017, March 31). Retrieved from

<https://www.dochara.com/the-irish/food->

[history/food-in-ireland-after-the-fami](https://www.dochara.com/the-irish/food-
history/food-in-ireland-after-the-fami)

ne/

Ireland - Rural population. (n.d.). Retrieved from

<https://www.indexmundi.com/facts/ireland/rural-population>

Ireland - Urban population (% of total population). (n.d.).

Retrieved from

<https://www.indexmundi.com/facts/ireland/indicator/SP.URB.TOTL.I>

N.ZS

Land Use in Ireland. (n.d.). Retrieved from
<http://www.askaboutireland.ie/reading-room/life->

[society/farming/farming-in-ireland-overview/land-use-in-ireland/](http://www.askaboutireland.ie/reading-room/life-society/farming/farming-in-ireland-overview/land-use-in-ireland/)

Lee, Colleen, Henriette, Sommer, H., Howell, T., & Chuck. (2019, March 11). Health Care in Ireland. Retrieved

from
<https://relocatingtoireland.com/irish-essentials/healthcare-in-ireland/>

Marshall, N. (2019, January 15). Everyday Eating Customs in Ireland. Retrieved from

<https://traveltips.usatoday.com/everyday-eating-customs-ireland-109252.html>

McCall, B. (2017, December 07). Spreading the smart message on the farm. Retrieved from

<https://www.irishtimes.com/sponsored/spreading-the-smart-message-on-the-farm-1.3316457>

Nrn. (2019, March 28). How do we Transition to Smart Farming in Ireland? Retrieved from

<https://www.nationalruralnetwork.ie/farm-viability-blog/how-do-we-transition-to-smart-farming-in->

[ireland/](https://www.nationalruralnetwork.ie/farm-viability-blog/how-do-we-transition-to-smart-farming-in-ireland/)

O'Sullivan, K. (2019, October 22). Save the planet, save on the farm: Irish farmers learn smart farming.

Retrieved from
<https://www.irishtimes.com/news/environment/save-the-planet-save-on-the-farm-irish->

[farmers-learn-smart-farming-1.4058247](https://www.irishtimes.com/news/environment/save-the-planet-save-on-the-farm-irish-farmers-learn-smart-farming-1.4058247)

Ranelagh, J. O., Boland, F. H., Fanning, R., Kay, S., & Edwards, R. W. (2020, January 08). Ireland. Retrieved

from

<https://www.britannica.com/place/Ireland#ref23009>

SMART FARMING RESULTS FOR 2019 SHOW AVERAGE SAVINGS OF €6,300 AND 10% REDUCTION

IN CLIMATE IMPACT. (2019, October 16). Retrieved from

<https://www.ifa.ie/smart-farming-results->

[for-2019-show-average-savings-of-e6300-and-10-reduction-in-climate-impact/#.XhvfN OjYrnE](https://www.ifa.ie/smart-farming-results-for-2019-show-average-savings-of-e6300-and-10-reduction-in-climate-impact/#.XhvfN OjYrnE)

The Select Committee on Energy Independence and Global Warming. (n.d.).

Retrieved from

<https://www.markey.senate.gov/GlobalWarming/impactzones/ireland.html>

Stewart, C. (2019, September 26). Hospitals in Ireland 2000-2017.

Retrieved from

<https://www.statista.com/statistics/557036/hospitals-in-ireland/>

Teagasc. (n.d.). Agriculture in Ireland. Retrieved from

<https://www.teagasc.ie/rural-economy/rural->

[economy/agri-food-business/agriculture-in-ireland/](https://www.teagasc.ie/rural-economy/rural-economy/agri-food-business/agriculture-in-ireland/)

Thompson, S. (2019, May 19). Irish farmers will adapt to climate change 'with the right advice'.

Retrieved from

<https://www.irishtimes.com/news/environment/irish-farmers-will-adapt-to-climate-change-with-the-right->

[advice-1.38976](https://www.irishtimes.com/news/environment/irish-farmers-will-adapt-to-climate-change-with-the-right-advice-1.38976)

33

TransferWise. (1970, January 01). Healthcare in Ireland: A guide to the Irish healthcare system. Retrieved from

<https://transferwise.com/gb/blog/healthcare-system-in-ireland>

What Impact will climate change have for Ireland? (n.d.). Retrieved from

<https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/whatimpactwillclimatechangehaveforireland/>

<https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/whatimpactwillclimatechangehaveforireland/>

What Impact will climate change have for Ireland? (n.d.). Retrieved from

<https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/whatimpactwillclimatechangehaveforireland/>

<https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/whatimpactwillclimatechangehaveforireland/>

What is Smart Farming? - Smart-AKIS. (n.d.). Retrieved from [https://www.smart-](https://www.smart-akis.com/index.php/network/what-is-smart-farming/)

[akis.com/index.php/network/what-is-smart-farming/](https://www.smart-akis.com/index.php/network/what-is-smart-farming/)

What percent of the island of Ireland is part of Northern Ireland? (n.d.). Retrieved from

<https://www.quora.com/What-percent-of-the-island-of-Ireland-is-part-of-Northern-Ireland>

Your key to European statistics. (n.d.). Retrieved from [https://ec.europa.eu/eurostat/en/web/population-](https://ec.europa.eu/eurostat/en/web/population-demography-migration-projections/statistics-illustrated)

[demography-migration-projections/statistics-illustrated](https://ec.europa.eu/eurostat/en/web/population-demography-migration-projections/statistics-illustrated)