

A Comparison of Land manager and Stakeholder Attitudes to Agri-Environmental Contracts – Evidence from Ireland and the Netherlands

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Abstract

The objective of this research is to improve the contract design of environmental programmes in Ireland and the Netherlands. Landowners' and stakeholders' attitudes to various contract types are assessed and the findings show a clear gap in knowledge between the parties in both countries. Most land managers in Ireland consider results-based to be economically beneficial while most Dutch land managers feel that value chain contracts add economic value. The results of Probit models show that existing use of a contract type, farming system, land rental and the number of family farm workers influence landowners' attitudes to the economic benefits of contracts.

Keywords: environmental public goods, agriculture, contract design

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Introduction

The European Union (EU) is increasingly utilising agri-environmental policy to influence farmers to protect and support ecosystems which are crucial for both society and long-term sustained agricultural production (Cullen et al., 2020). The common agricultural policy (CAP) has three clear environmental goals, each of which are reflected in the European Green Deal and Farm to Fork strategy. These include addressing climate change, protecting natural resources and enhancing biodiversity. A goal of the Green Deal is to achieve net zero greenhouse gas emissions across the EU by 2050 (European Commission, 2022).

The objective of the research is to improve the contract design of environmental programmes. As part of the Horizon 2020 funded project CONSOLE, data is collected on the attitudes of land managers and stakeholders to types of agri-environmental contracts. The types of contracts analysed are results-based, collective action, value chain and land tenure.

This paper compares data from Ireland and the Netherlands. The countries differ in that produce in Ireland is predominately from grass-fed livestock with Irish agriculture facing concerns over ruminant emissions. The Netherlands produces mainly non-grass-based meat and dairy produce. In terms of economic value, the flowers and bulbs are the greatest export. The Netherlands is recognised for its innovative and sustainable production methods. However, the Dutch government aims to cut nitrogen pollution.

Literature Review

Agriculture in Ireland

Ireland has the greatest percentage of land dedicated to agriculture in the European Union, at 70 percent (Eurostat, 2020). The average farm size in Ireland is 43 hectares (Dillon et al., 2021). Agriculture accounted for approximately 7 percent of gross national income, 10 percent of the value of exports and just over 7 percent of employment in Ireland in 2020 (DECC, 2021). Agriculture produced 37 percent of greenhouse gas emissions in Ireland in 2020 (DECC, 2021). Much of this can be attributed to Ireland's growing dairy sector with dairy farms being predominately pasture-based. When the milk quota was abolished in April 2015, dairy herd sizes began shrinking due to lower milk prices in most EU countries, except in Ireland, Belgium and the Netherlands (Lapple et al., 2021). More than 80 percent of agriculture related GHG

emissions are directly linked to livestock numbers and the management of the manures they produce, with 12 percent attributed to chemical fertilisers, and the remainder from fuel combustion and carbon dioxide from lime usage (DECC, 2021). The Environmental Protection Agency notes that agriculture significantly contributes to the decline in water quality nationally, with other sectors also contributing to this trend. The agriculture sector is also responsible for over 99 percent of national ammonia emissions (DECC, 2021). The Climate Action Plan 2021 commits to a 22-30 percent reduction in Ireland's agricultural emissions by 2030, based on 2018 figures (DECC, 2021).

Existing Agri-Environmental Projects in Ireland

Agri-environmental contracts in Ireland have traditionally been results-based with farmers receiving a payment for the delivery of environmental or climate results. An example is the BurrenLife Project which seeks to protect biodiversity in the Burren in West Ireland which is an UNESCO Geopark area of exposed limestone. Five year environmental targets and action plans are agreed between farm advisors and farmers. Payments are dependent on farmers implementing plans and performing according to an evidence-based scoring system. The success of this project is attributed to the fact it was locally led, there's high levels of local engagement and that farms' assessment is based on science (CONSOLE, 2022a).

The Biodiversity Regeneration in a Dairying Environment (BRIDE) project is an example of a results-based landscape biodiversity project in a low-land intensive farming region, where farmers agree to improve the quality of the habitats on their farms. A results-based payment scheme is applied whereby farmers are assessed and scored, with higher quality habitats gaining higher payments. The project is based on a simple model that is understandable and the results are achievable. The project has benefitted from strong engagement from the farmers. The project has strong farmer leadership that is local and has arisen out of the intensive dairy sector. This gives the project credibility to both intensive and less intensive farmers. The project has shown that the introduction of biodiversity measures makes sense and contributes to tangible environmental, economic and social benefits (CONSOLE, 2022b).

Other types of contracts proposed by the European Commission for agri-environmental schemes are collective action, value chain and land tenure. Collective contracts require farmers to become members of a group which applies jointly for compensation in order to implement environmental or climate activities. Value chain contracts result in farmers providing

environmental, or climate benefits connected to the production of selected products. It is paid for by the market, mainly through a premium price. Land tenure contracts mean that a land manager accepts a lower lease payment than for comparable land under usual land tenure agreements, to compensate farmers for their additional efforts to protect the environment.

Attitudes to Agri-Environmental Practises in Ireland

Cullen et al. (2020) surveyed Irish farmers to determine their self-identity and how it affects the uptake of agri-environmental schemes. They note the importance of a farmer having a strong 'forward looking' self-identity in increasing the likelihood of participation in an agri-environmental scheme. These farmers see themselves as innovative and are looking to continue farming into the future, suggesting that a positive relationship to participation could be due to their willingness to make the changes which are needed to participate in such schemes. Cullen et al. (2020) also note that some farmers may be risk averse regardless of the benefits of a scheme which decreases their willingness to enrol in an agri-environmental scheme, while some farmers are motivated by financial benefits. Morris et al. (2000) argue that while mass media and literature are relevant, personal contact and demonstration are critical for the adoption process of measures.

Agriculture in the Netherlands

In 2020, 59 percent of the 3,367,000 hectare land area in the Netherlands was used for agriculture. 29 percent of this (526, 000 ha) was arable land, 54 percent was grassland, 11 percent was used for fodder, and 6 percent was used for horticulture. This land was used by 52,700 farms, of which 18,670 are based on arable land, 13,180 are horticulture farms and 36,520 focus on livestock. Arable land is dominated by maize, cereals, potatoes and sugar beets. The main products of livestock farms were 13,960 million kg of milk and 1,658 kg of pork (StatLine, 2022).

Agricultural workers make up 1.3 percent of the total job market in the Netherlands. While the agricultural sector is 6.4 percent of the Dutch economy, the primary sector is only 1.4 percent (Afrian et al., 2020). The sector is strongly globalized: almost 75 percent of the land used for food production in the Netherlands (where primarily soy and other fodder is produced) is located in other countries, and labour migrants are an essential production factor

(Muilwijk et al., 2020). The sector is strongly embedded in industrial agri-food chains that are optimized towards production (Runhaar, 2017).

Most farms (12,000) have an economic size of €250,000 to €300,000 and 1,040 farms have an economic size >€3 million (StatLine, 2022). The average Dutch agricultural income equals €47,000 per worker, 80 percent of the average wage across the Netherlands, and at least 20 percent of farmers have an income below the poverty standard. Direct payments form 25 percent and 30 percent of the income of dairy and cattle farmers, respectively, and this figure is 10-15 percent for the agricultural sector, on average (European Commission, 2020).

Environmental challenges in the Dutch agricultural sector relate to scale enlargement and the high intensity. Since 2000, the number of farms decreased by 46 percent, while the agricultural area decreased by 8 percent and the average size per farm increased from 20.3 to 34.4 ha (StatLine, 2022). Landscape quality is already under pressure and there are widespread concerns about further declines, as well as widespread support in society for contracts for agri-environmental public goods (Buijs et al., 2019). The abolition of the EU milk quota in 2015 was an important driver of scale enlargement. Other environmental effects are nitrogen deposition, greenhouse gas emission, biodiversity loss, and subsidence. Nitrogen deposition is too high to ensure biodiversity protection in 70 percent of nature areas, and 46 percent of the nitrogen deposition originates from agriculture (Afrian et al., 2020). The greenhouse gas emission intensity (amount of GHG per € added value) of the agricultural sector in 2018 was 2.5 kg CO₂ equivalents, eight times as high as for the economy in total. While greenhouse gas emissions from agriculture decreased between 1990 and 2003 by 26 percent, since then emissions hardly decreased. The farmland bird index decreased by 35 percent over 2000-2017, and since 1940, butterfly abundance in grasslands decreased by 80percent (Van Strien et al., 2019).

Agri-environmental measures in the Netherlands are typically implemented through collective contracts. Farmers can join a local cooperative, that arranges and executes measures, funded by regional governments. This approach was introduced in 2016. Many of the local cooperatives are in charge of creating and maintaining landscape elements (CONSOLE, 2020). Furthermore, several value chain contracts exist.

International Comparison

Compared to the rest of the European Union, Ireland and the Netherlands have a clear focus on livestock production from grazing systems, with permanent grassland comprising a clearly larger share of farmland than in the EU on average, and with considerably more livestock specialists than in the EU on average. The scale enlargement trend seen in the Netherlands and Ireland is in line with changes across the EU (European Union, 2021). As previously mentioned, in most European countries the decrease of dairy prices following the quota abolition resulted in a decline of livestock numbers. However, in Ireland, Belgium, and the Netherlands production expanded, which was facilitated by their high efficiency and low production costs (Lapple et al., 2021) as well as the increasing demand from Asia for dairy products (Jongeneel and Gonzalez-Martinez, 2022). The trends of greenhouse gas emission of the Netherlands are in line with European trends (European Union, 2021) With regards to farmland biodiversity, severe declines in populations are seen across Europe (Gregory et al., 2019), as a consequence of land use change and intensification, among others scale enlargement (Rüdiger et al., 2015).

Data and Methodology

Data from fifteen countries is collected as part of an EU Horizon 2020 funded project CONSOLE which analyses **Contract Solutions** for **Effective** and lasting delivery of agri-environmental-climate public goods. The objective of this research is to compare data Ireland and the Netherlands where 370 land managers and 36 stakeholders were surveyed in 2021.

Table 1 – Variable Definitions

<i>Variable</i>	<i>Definition</i>
Self-chosen measures	In the contract, the land manager is free to decide about the management practices used to achieve the specified environmental result.
Better results, higher payment	The payment gets higher, the better the environmental results are.
Collective agreement	Land managers can collectively agree on environmental targets and measures at landscape-level together with other land managers.
Common payment	A group of land managers receive a common payment and they jointly agree on the distribution of the payment.
Labelled product	Land managers sell their products labelled as environmentally friendly (e.g. animal welfare products, climate friendly products) when following management measures as prescribed in a processor or retailer contract.
Paid by customers	The contract is not paid by public money, instead the compensation that a land manager gets for environmentally friendly production is paid by buyers of products.
Reduced rent	Land managers pay reduced rent on land rented in if they agree to follow environmental management clauses as specified in the lease contract.
Self-monitoring	Land managers do the monitoring of the environmental results themselves (e.g. count specific plants).
Authority control	The results that land managers achieve are regularly controlled by the competent authority visiting a farm e.g. once a year.
Free training	Land managers are offered free training and advice that enables them to reach the environmental targets.
Sales guarantee	Land managers receive a sales guarantee from a processor or retailer in return for implementing environmental measures.
Annual compensation	Land managers receive environmental compensation payment on an annual basis.

Periodical payment	Land managers receive half of the environmental payment at the beginning of the five-year contract period, and half at the end of it.
Agri./Forestry Training	= 1 if a land manager has engaged in agricultural/forestry education. =0, otherwise.
No. of Family Workers	The number of family members working full-time on the farm.
Rented/Owned Land	The number of hectares rented in, divided by the number of owned hectares.
Farm Y >50percent of Total Y	=1 if a farm/forest's income is greater than 50 percent of a land manager's total income. =0, otherwise.
Contract Usage	Never – A land manager has never engaged in this contract type. Current – A land manager currently uses this contract type. Previously – A land manager is not currently using this contract type but previously did.

Tables 2 and 3 provide results of Probit models. The following Probit model is used to assess the factors influencing a land manager to agree with a type of contract being economically beneficial or not (Greene, 1993; Wossink and van Wenum, 2003):

$$a_i = B_0 + \sum_{j=1}^k B_j x_{ij} + u_i \quad (1)$$

Where x_{ij} denotes a set of explanatory variables j for land manager i and u_i is the error term.

$a_i = 1$, if a land manager agrees that a contract is economically beneficial.

$a_i = 0$, otherwise.

Results

Figures 1-3 – The Percentage of Land Managers that Agree That a Contract Type is Understandable/Applicable/Economically Beneficial



Figure 1 shows that a greater portion of land managers in Ireland compared to the Netherlands either agree or strongly agree that they've an understanding of results-based contract. Figure 2 shows that a high percentage of farmers feel that results-based contracts are applicable to their farm. This may be explained by the fact agri-environmental schemes have traditionally been results-based in Ireland. The fact farms in Ireland are predominately family owned. 99.7 percent in Ireland (Eurostat, 2018; Balaine, 2019). This may reflect a hesitancy towards collective action as external influences on management decisions would not be common. Ireland has a low level of land rental which is typically on short-term agreements. 19 percent of land agricultural land was rented in 2015, which is the lowest percentage in the EU (European Commission, 2018). The fact 43 percent of land managers that feel a land tenure contract would be applicable to their farm suggests a desire for tenure security to improve.

The understanding, applicability and perceived benefits of the various contract types is lower in the Netherlands. Land tenure contracts are understood and applicable by the greatest percentage of surveyed land managers. The land rental market in the Netherlands is much more active than in Ireland with 60 percent of land rented in 2015 (European Commission, 2018).

Figure 3 shows that Irish land managers perceive results-based contracts to be the most economically beneficial. Most land managers in the Netherlands feel that value chain contracts would be the most financially beneficial to them. Similar to result-based farming in Ireland, this might have to do with the familiarity of value chain contracts in the Netherlands: the Dutch dairy sector is organized by a few large dairy cooperatives which already have value chain contracts in place (Vermunt et al., 2022).

Figures 4-6 – The Percentage of Stakeholders that Agree That a Contract Type is Understandable/Applicable/Economically Beneficial



When compared to land managers, a greater percentage of stakeholders in both counties agree the contract types are understandable, applicable and economically beneficial. This highlights the need for greater knowledge transfer between the two groups to bridge this gap. Again, results-based contracts score highly across the three categories in Ireland. 78 and 81 percent of stakeholders in the Netherlands agree that value chain and land tenure contracts,

respectively, are applicable to farms but only 50 and 44 percent agree that they're economically beneficial. 61 percent feel that collective contracts are economically beneficial.

Figure 7 – The Percentage of Stakeholders who think a characteristic of agri-environmental contracts increases land managers’ willingness to enrol to an environmental contract/programme

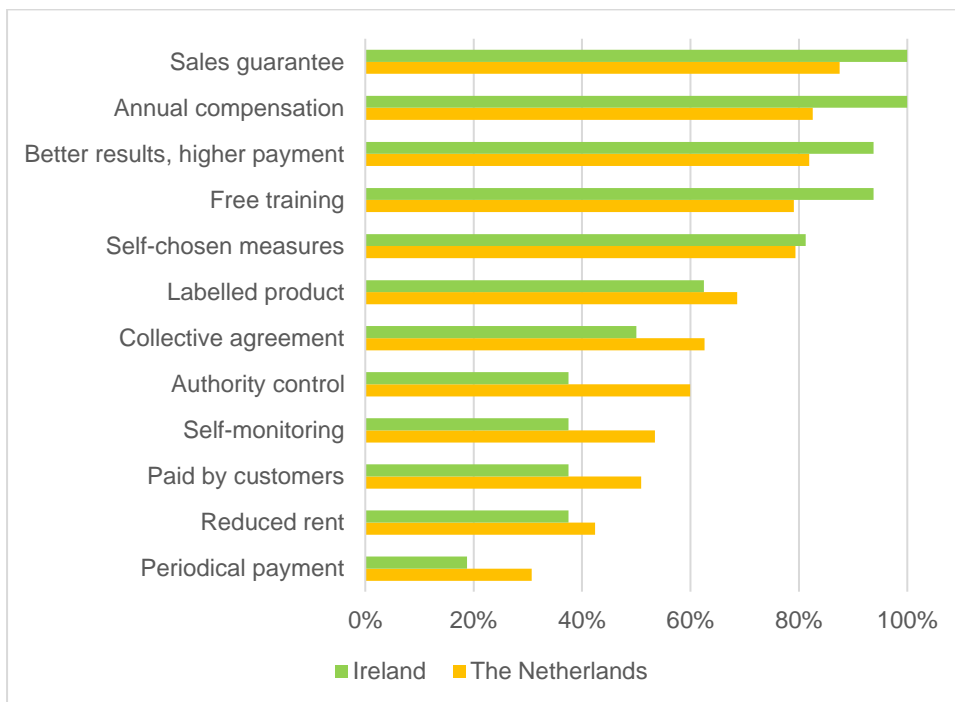


Figure 7 shows that stakeholders in both countries have similar thoughts on what characteristics of contracts would increase the adoption of agri-environmental contracts. Guaranteed sales, annual compensation and performance-based payment are the most popular traits. Feedback from workshops reflect this as many land managers and stakeholders stressed that farmers must be rewarded for their positive actions and the remuneration must be long-term and consistent. Training and autonomy over measures are also important to increasing adoption. Common or periodical payments are the least favourable contract characteristics when trying to increase adoption.

Table 2 – Probit Models for Ireland

	<u>Results-Based</u>		<u>Collective</u>		<u>Value Chain</u>		<u>Tenure</u>	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Dairy (ref.)								
Cattle Rearing	0.23	0.33	-0.22	0.32	-0.26	0.32	-0.82**	0.38
Mixed Livestock	0.55*	0.32	-0.10	0.30	-0.18	0.30	-0.01	0.30
No Agri./For. Training (ref.)								
Agri./Forestry Training	-0.31	0.32	0.27	0.29	0.09	0.28	0.07	0.29
No. of Family Workers	0.17	0.14	-0.05	0.13	0.00	0.13	0.22*	0.13
Contract Term <1 Yr (ref.)								
Contract Term 1-5 Years	0.00	0.41	0.59	0.50	-0.20	0.42	-0.44	0.46
Contract Term 5-10 Years	0.45	0.46	1.08**	0.53	0.34	0.46	-0.13	0.49
Rented/Owned Land	0.05	0.14	-0.30*	0.15	-0.09	0.14	0.23*	0.13
Farm Y >50% Total Y	0.48*	0.27	-0.02	0.26	0.21	0.26	-0.24	0.27
Contract Usage - Never (ref.)								
Contract Usage - Current	0.38	0.26	0.62**	0.28	0.49*	0.28	0.00	omitted
Contract Usage - Previous	-0.85*	0.47	-0.25	0.76	-0.18	0.67	0.00	omitted
_cons	-0.06	0.60	-1.04	0.67	0.01	0.59	0.01	0.63

In Ireland, a mixed livestock farmer is more likely to agree that a results-based contract is economically beneficial compared to a dairy farmer. Mixed farmers, on average, earn less than dairy farmers and they have more diversified income sources. This may make them less risk adverse. Farms with more than 50 percent of their income coming from farming activities are more likely to agree that results-based contracts are economically beneficial. This shows the trust farmers have in these contracts maintaining their household income. However, land managers who previously used this type of contract are less likely to agree that the contract type is economically beneficial when compared to land managers who have never used the contract type. More research is required to understand why previously contract holders do not find the contract type to be economically beneficial.

For collective contracts in Ireland, a long-term agreement is preferred. Those with a high portion of rented land are less likely to agree that this contract type is economically beneficial. It may be a case that tenant farmers feel that they have less control over their resources which affected the collective nature of this contract type. Those who are currently using this contract type are more likely to agree that it's economically beneficial compared to

those who have never used it. The same is found for value chain contract, where current experience increases likelihood of agreement with economic benefits.

For tenure-based contracts, it's not surprising that likelihood of agreement increases as the percentage of rented land increases. Cattle rearing farmers are less likely to agree with the economic benefits when compared to dairy farmers. Dairy farmers in Ireland consistently earn the highest average farm income, making them the category with the greatest earning potential from rented land. From the data, only 3percent of farms are currently using this contract type which explains why the Probit model has omitted this variable. The likelihood of a land manager agreeing that tenure contracts are economically beneficial increases as the number of full-time family farm workers increases.

Table 3 – Probit Models for the Netherlands

	<u>Results-Based</u>		<u>Collective</u>		<u>Value Chain</u>		<u>Tenure</u>	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Dairy (ref.)								
Cereals and Crops	-0.21	0.30	-0.86**	0.41	-0.07	0.31	-0.70**	0.33
Fruit and Vineyards	0.36	0.84	-0.44	1.04	0	omitted	0	omitted
Mixed Systems	-0.47	0.62	-0.25	0.58	0.33	0.64	-0.58	0.67
Agricultural/Forestry Training	-0.45	0.51	-0.27	0.6	-0.55	0.66	0.56	0.6
No. of Family Workers	0.02	0.10	-0.23	0.16	-0.12	0.12	0.35***	0.12
<1 Year Contract (ref.)								
1-5 Years Contract	-0.13	0.32	0.51	0.47	0.07	0.35	0.44	0.36
5-10 Years Contract	-0.25	0.41	0.61	0.53	0.57	0.42	0.25	0.45
Rented/Owned Land	0.07	0.52	0.98	0.56	-0.68	0.62	1.15**	0.56
Farm Y >50percent Total Y	0.28	0.41	0.24	0.52	0.42	0.45	-0.23	0.42
Contract Usage - Never (ref.)								
Contract Usage - Current	0.95***	0.29	0.87	0.31	0.84***	0.28	0.25	0.36
Contract Usage - Previous	0.02	0.5	0	omitted	0.02	0.83	-0.43	0.8
_cons	-0.4	0.66	-1.24	0.85	-0.46	0.86	-1.21	0.77

With regards to results-based contracts, the findings in the Netherlands differ to those in Ireland as land managers with results-based contracts currently in place are more likely to agree with that they're economically beneficial, when compared to land managers who have never engaged with this contract type. Cereal and crops farmers are less likely than dairy farmers to agree that collective contracts are economically beneficial. Cereal and crop farming requires irreversible investment on the land which may make such farmers feel at risk if a collective agreement enters difficulty. Land managers currently using value-chain contracts are the most likely to agree that they're economically beneficial. Similar to the Netherlands, the likelihood of land managers agreeing that tenure contracts are economically beneficial increases as the percentage of rented land increases and the likelihood of a land manager agreeing increases as the number of full-time family farm workers increases.

It's a concern that there is no clear difference in either country amongst educated or non-educated farmers seeing contracts as understand as economically beneficial. Given the results of figures 1 to 3, we know that is not a case that the farming population is fully knowledgeable of the various contract types. Variance inflation factor tests confirm that multicollinearity is not evident in any of the Probit models.

Conclusion

The objective of the research is to improve understanding of land managers' and stakeholders' attitudes in Ireland and the Netherlands to the contract design of environmental programmes. This is important for the management of agri-environmental climate public goods which is a priority of the EU CAP.

It is clear than a high portion of land managers in Ireland agree that results-based contracts are understandable, applicable and economically beneficial. A lower portion of Dutch land managers agree with these traits with value-chain contracts scoring the highest in terms of economic benefits due to these contracts currently being popular. It is worth noting that a greater percentage of stakeholders in both countries agree that the contracts are understandable, applicable and economically beneficial. This suggests that greater knowledge transfer between stakeholders and land managers in required to increase participation in agri-environmental contracts.

Results of Probit models show that, in many cases, current users of a particular contract type are more likely to see it as economically beneficial when compared land managers who have never adopted the contract type. This is the case in Ireland in relation to collective, value-chain and tenure contracts. In the Netherlands this is found in the context of results-based, value-chain and tenure-based contracts. Results-based contracts are the predominate contract type in Ireland and land managers who have previously used this type of contract are less likely to agree that it is economically beneficial, when compared to land managers who have never used it. Further research is required to determine if this finding is due to unfavourable experiences amongst previous users or a strong desire of non-users to engage in such contracts.

Some additional interesting findings are that an agreement that collective contracts are economically beneficial is associated with a desire for long term contracts of between 5 and 10 years in Ireland. This is important for farm advisors and policymakers to note when they are

designing contracts. Collective contracts are also more economically attractive to land managers who own a high portion of their land. As land is typically renting on short-term leases in Ireland, this finding may represent a concern that tenant farms may have in entering a collective agreement when they don't have security over their largest asset. Naturally, land managers with a high percentage of rented land in both countries see tenure-based contracts as being economically beneficial.

References

- Afrián, K., van der Wal, R. and Hoeksma, L., 2020. *Agriculture in the Dutch economy*. [online] Central Bureau of Statistics. Available at: <<https://www.cbs.nl/nl-nl/longread/de-nederlandse-economie/2020/de-landbouw-in-de-nederlandse-economie?onepage=true>> [Accessed 23 February 2022].
- Balaine, L. 2019. Gender and the Preservation of Family Farming in Ireland, *EuroChoices*, 18(3), pp.33-37.
- Buijs, A., Nieuwenhuizen, W., Langers, F. and Kramer, H. 2019. Resultaten Nationale Landschapsenquête.
- CONSOLE Project, 2021a. BurrenLife Project. CONSOLE Project. Available at: <https://console-project.eu/> [Accessed February 7, 2022].
- CONSOLE Project, 2021b. BRIDE - Biodiversity Regeneration in a Dairying Environment. CONSOLE Project. Available at: <https://console-project.eu/> [Accessed February 7, 2022].
- CONSOLE Project, 2020. Kromme Rijn Collective management. CONSOLE Project. Available at: <https://console-project.eu/> [Accessed March 1, 2022].
- Cullen, P., Ryan, M., O'Donoghue, C., Hynes, S., Ó hUallacháin, D. and Sheridan H. 2020. Impact of farmer self-identity and attitudes on participation in Agri-Environment Schemes. *Land Use Policy*, 95, 104660.
- Department of the Environment, Climate and Communications (DECC). 2021. Climate Action Plan 2021 Securing Our Future.
- Dillon, E., Donnellan, T., Moran, B., Lennon, J. 2021. Teagasc National Farm Survey 2020 Preliminary Results. Teagasc.
- European Commission. 2018. *Agricultural capital and land value*. Brussels: European Commission. Retrieved from: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/agricultural-capital-land-value_en.pdf
- European Commission, 2020. Commission recommendations for The Netherlands' CAP strategic plan. Commission staff working document. Brussels, 18.12.2020. Report SWD(2020) 388 final.

European Commission. 2022. An environmentally sustainable CAP. [online] Available at: <https://ec.europa.eu/info/food-farming-fisheries/sustainability/environmental-sustainability/cap-and-environment_en> [Accessed 24 February 2022].

Eurostat. 2018. Farms and farmland in the European Union – statistics. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Farms_and_farmland_in_the_European_Union_-_statistics#Farmland_in_2016

Eurostat. 2020. Farms and farmland in the European Union - statistics (2020). Retrieved 22 July 2020, from https://ec.europa.eu/eurostat/statistics-explained/index.php/Farms_and_farmland_in_the_European_Union_-_statistics#Farmland_in_2016

European Union. 2021. Key figures on the European food chain – 2021 edition. Luxembourg: Publications Office of the European Union.

Greene, W. H. 1993. *Econometric Analysis*. New York: MacMillan.

Gregory, R., Skorpilova, J., Vorisek, P. and Butler, S. 2019. An analysis of trends, uncertainty and species selection shows contrasting trends of widespread forest and farmland birds in Europe. *Ecological Indicators*, 103, pp.676-687.

Jongeneel, R. and Gonzalez-Martinez, A.. 2022. The role of market drivers in explaining the EU milk supply after the milk quota abolition. *Economic Analysis and Policy*, 73, pp.194-209.

Läpple, D., Carter, C.A. and Buckley, C. 2021. EU Milk quota abolition, dairy expansion, and greenhouse gas emissions. *Agricultural Economics*, 53(1), pp.125–142.

Morris, J., Mills, J. and Crawford I.M. 2000. Promoting farmer uptake of agri-environment schemes: The Countryside Stewardship Arable Options Scheme, *Land use policy*, 17, pp. 241-254

Muilwijk, H., D. Boezeman D. and Tiktak, A. 2020. Kansrijk landbouw- en voedselbeleid. Analyse van beleidsopties voor de Tweede Kamerverkiezingen van 2021 vanuit verschillende perspectieven. Den Haag: Planbureau voor de Leefomgeving. [in Dutch]

Runhaar, H. 2017. Governing the transformation towards ‘nature-inclusive’ agriculture: insights from the Netherlands. *International Journal of Agricultural Sustainability*, 15, 340-349.

Rüdisser, J., Walde, J., Tasser, E., Frühauf, J., Teufelbauer, N. and Tappeiner, U. 2015. Biodiversity in cultural landscapes: influence of land use intensity on bird assemblages. *Landscape Ecology*, 30(10), pp.1851-1863.

StatLine. 2022. The Netherlands in numbers. [online] Available at: <<https://opendata.cbs.nl/#/CBS/nl/>> [Accessed 23 February 2022].

Vermunt, D., Wojtynia, N., Hekkert, M., Van Dijk, J., Verburg, R., Verweij, P., Wassen, M. and Runhaar, H., 2022. Five mechanisms blocking the transition towards ‘nature-inclusive’ agriculture: A systemic analysis of Dutch dairy farming. *Agricultural Systems*, 195, p.103280.

Wossink, G. and van Wenum, J. 2003. Biodiversity conservation by farmers: analysis of actual and contingent participation. *European Review of Agriculture Economics*, 30(4), pp.461-485.