Outlook 2022
Economic Prospects for Agriculture

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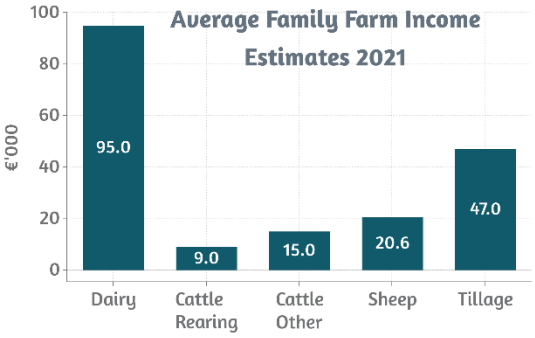
Summary Review of 2021

Global Economy

- Global economic demand rebounds
- Supply chain issues
- Emerging inflationary pressures



Margins (relative to 2020)

- Dairy: Up substantially - higher milk prices, rising costs
- Beef: Up slightly - higher cattle prices, rising costs
- Sheep: Up substantially - higher lamb prices, rising costs
- Tillage: Up substantially - higher cereal yields and prices, rising costs
- Pigs: Down significantly - lower pig prices and rising costs

Support Payments (relative to 2020)

- Total payments down 4% (no exceptional aid type measures)

Average NFS Farm Income 2021e us 2020

Input Costs

Up on the 2020 level
Higher feed, fertiliser and fuel prices

Fertiliser Prices

Up 10% on the 2020 level

Feed Prices

16% higher in 2021, with prices trending upward over the year

Oil Prices

Up sharply relative to 2021, averaging US$71 in 2021 (up almost 70%)

Average Annual Exchange Rate in 2021e

$ 1.18 / Euro
£ 0.86 / Euro

Eurozone inflation

Notably higher than in recent years

Irish Unemployment

16% in 2021 (COVID-19 adjusted)

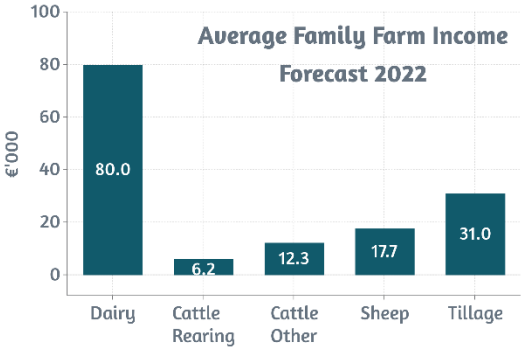
Weather

Reasonable for grassland
Favourable for tillage

Summary of Prospects for 2022

Global Economy

- Economic recovery continues
- Lower economic growth than in 2021
- Inflation rate to slow
- Some COVID-19 uncertainty remains



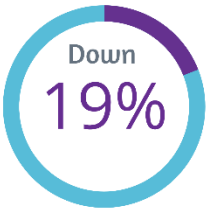
Margins in 2022 (relative to 2021)

- **Dairy:** Down substantially - higher costs
- **Beef:** Down substantially - higher costs
- **Sheep:** Down substantially - higher costs
- **Tillage:** Down substantially - higher costs and lower yields
- **Pigs:** Down slightly - higher costs exceed increase in pig prices

Support Payments (relative to 2021)

- Total Payments assumed to be unchanged on 2021 level

Average NFS Farm Income 2022f vs 2021e



Input Costs

Sharp increase, with higher feed, fertiliser and fuel prices

Fertiliser Prices

Up 120% on the 2021 level, but outlook is highly uncertain

Feed Prices

Up 6% on the 2021 level

Oil Prices

Expected to average higher than in 2021 (US$ 79) with carbon tax to increase also

Average Annual Exchange Rate

$ 1.13/ Euro

£ Stg 0.85/ Euro

Eurozone inflation

To ease from 2021 level

Irish Unemployment

to continue to fall as economy recovers from COVID-19

Weather conditions

Normal weather assumed

Outlook 2022 and Fertiliser Expenditure

This Outlook report has been produced in Q4 of 2021 at a time when an unprecedented escalation in fertiliser prices has taken place. There is considerable uncertainty as to whether fertiliser prices will remain at elevated levels for the duration of the 2022 production season. The escalation in fertiliser prices makes it difficult to anticipate the level of fertiliser production. Furthermore, it raises questions about the level of fertiliser usage, fertiliser expenditure, farm output and farm profitability in 2022. Therefore, it is necessary to set out assumptions in relation to the fertiliser price and farmer response to these price changes for 2022.

Background to Fertiliser Price Increases

The farm sector as a whole managed to avoid much of the disruption that has been a feature of the COVID-19 pandemic to date. However, the recovery in international economic activity has delivered logistical challenges in the wider economy, along with some unanticipated rapid and large increases in energy prices, particularly for natural gas. The high price of natural gas, a key input in the manufacture of fertiliser, has caused disruption to production in the fertiliser industry this year. This escalation in natural gas prices is unprecedented and has been caused by a reduction in the supply of gas available in the European market, which is increasingly dependent on imports. The spike in natural gas prices witnessed in 2021 is likely to persist into 2022. Inflation in fertiliser production costs has caused fertiliser prices to rise to record levels as a result in Q4 2021. Concerns regarding the level of availability of fertiliser in 2022 have also emerged.

Fertiliser Price Assumptions and Consequences For 2022

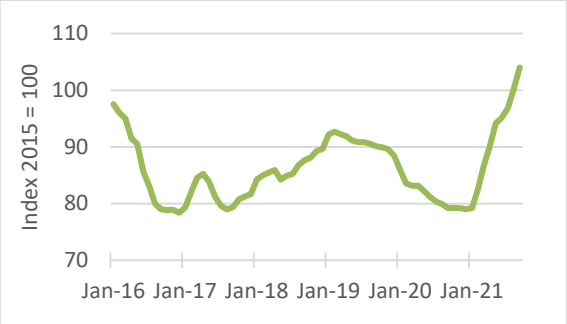
- High gas prices have caused the cost of producing fertiliser to increase. Consequently the price of fertilisers in 2022 could be more than double their 2021 level. The high cost of producing fertiliser may cause a reduction in the overall production of fertiliser
- Grassland farmers may review their level of fertiliser usage in an attempt to offset some of the rise in production costs. If lower fertiliser usage leads to a fall in grass production, farmers could come under pressure to increase concentrate feed use
- Tillage farmers will have less discretion in relation to fertiliser use, given the impact lower usage would have on tillage yields
- Sector specific assumptions in relation to fertiliser for 2022 are outlined at the outset of each of the individual sectoral papers which follow in this document
- Forecasts for 2022 are conditional on these assumptions

Overall Sector: Summary Review of 2021

Output Value	Input Spend	Support Payments	Income
↑ Up	↑ Up	↓ Down	↑ Up

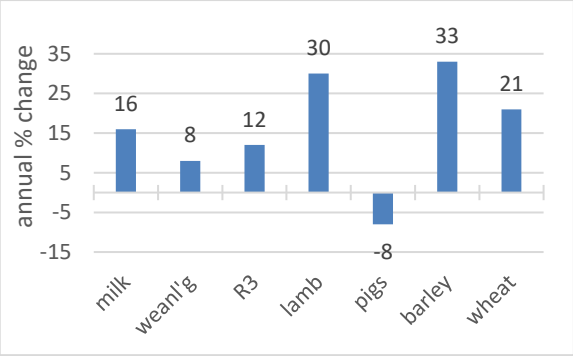
- Weather conditions in 2021 were reasonable for grassland systems and favourable for tillage.
- Total production costs increased in 2021 due to higher feed, fertiliser and fuel prices. Input usage volumes increased in some systems.
- Averaged over the year, there was a 16 percent increase in milk prices in 2021, with VAT inclusive prices averaging over 40 cent per litre (actual fat and protein). Irish milk production is estimated to have risen by about 6 percent in 2021.
- In 2021 the increase in milk prices surpassed the increase in milk production costs. The average dairy net margin rose 31 percent to an estimated 15.1 cent per litre.
- Prices for finished cattle increased by 12 percent in 2021. Weanling prices increased by 8 percent, while prices of store cattle increased by 9 percent relative to the 2020 level.
- The average gross margin on the single suckling enterprise increased by 4 percent in 2021. The average gross margin on the cattle finishing enterprise increased by 9 percent in 2021.
- Net margins increased for most cattle farms with a specialist cattle finishing enterprise. Net margins remained unchanged on most of the other cattle farms due to a rise in input prices and lower direct payments.
- Higher marketed output values in 2021 resulted in higher margins on the average mid-season lowland lamb enterprise, up 24 percent on average. The positive margins were further influenced by the receipt of payments from the Sheep Welfare Scheme, while total costs increased by 20 percent.
- The gross margin for Irish mid-season lowland lamb producers in 2021 is estimated to have increased by over 26 percent.
- In 2021 Irish cereal yields for major crops were up significantly on the 2020 yields, with the increase varying by crop. Cereal prices at harvest in Ireland in 2021 were up on the 2020 level, due to relatively low stock levels internationally.
- Direct costs for cereal production increased in 2021, due mainly to an increase in fuel, fertiliser and seed expenditure. Whilst direct costs were higher in 2021, the substantial increase in gross output led to a considerable increase in cereal margins in 2021.
- Higher feed costs and lower pig prices combined to reduce pig margins and pig farm incomes substantially in 2021.
- The 2021 pig production 'Margin Over Feed' (MOF) per kg is estimated to be 41 cent per kg dwt. This is a full 10 cent below the 5 year average MOF.

Figure E1: Monthly Price Index of Fertiliser in Ireland from 2016 to 2021



Source: CSO (various years)

Figure E2: Change in Output Prices 2021 vs 2020



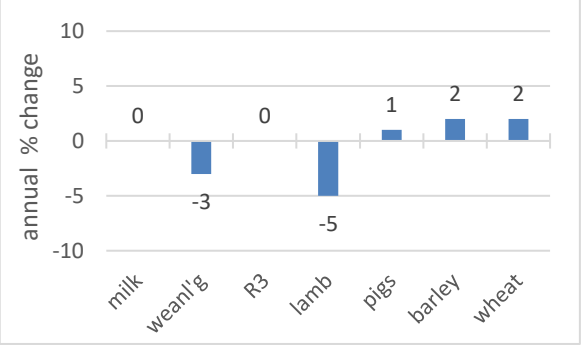
Source: Authors' estimates

Overall Sector: Outlook for 2022

Output Value	Input Spend	Support Payments	Income
↑ Up marginally	↑ Up	→ Stable	↓ Down

- The outlook for Irish agriculture in 2022 is conditional on a normal weather assumption.
- Significant inflationary pressure has emerged. This is being driven by a surge in energy prices, particularly for natural gas, as well as supply chain pressures associated with both production and logistics.
- Fertiliser prices are forecast to average 120 percent higher in 2022 relative to 2021. In grassland systems this price rise is likely to prompt reduced usage.
- For the year as a whole, feed prices are forecast to increase by about 6 percent in 2022.
- Fuel prices are forecast to rise by 16 percent in 2022. Crude oil prices are forecast to stabilise, but will be higher on average in 2022 than in 2021. A further carbon tax increase will also occur.
- In 2022 average Irish milk prices are projected to match the 2021 figure of just over 40 cent per litre (actual constituents Vat incl). With higher feed, fertiliser and energy prices, the margin per litre is expected to fall in 2022.
- Due to cost pressures, an increase in milk production of just 2 percent is forecast.
- In 2022 the average dairy net margin is forecast to fall by 22 percent to 11.8 cent per litre.
- Prices of finished cattle are forecast to be unchanged in 2022.
- Due to the rise in input prices, the average gross margin on the cattle finishing enterprise is forecast to decrease by 10 percent in 2022.
- Due to the pressure on cattle finishing margins, the prices of weanlings and stores are forecast to decrease by 3 percent in 2022.
- The average gross margin on the single suckling enterprise is therefore forecast to decrease by 22 percent in 2022.
- While an increase in sheep output volume is forecast, for 2022, this coupled with a somewhat less positive outlook for lamb prices, will result in slightly higher output value. With increases in input expenditure forecast, margins on sheep-farms are forecast to decline from the level estimated for 2021.
- Sheep gross margins are forecast to decline circa 15 percent on average, to €634 per hectare.
- EU winter planted area figures for the 2022 harvest are forecast to be similar to the 2021 harvest levels. Irish cereal prices at harvest in 2022 will be highly dependent on supply and demand conditions globally.
- On the assumption that EU and global yields are normal, supply and stock levels in 2022 are forecast to decrease slightly relative to the 2021 level. Irish cereal prices are forecast to increase slightly relative to harvest 2021.
- Overall, costs on cereal farms look set to increase significantly. With a normal yield forecast and a slight increase in prices, margins for most crops in 2022 will decrease significantly on the 2021 levels.
- In 2022, the Irish pig price is forecast to be a moderate 1.63c per kg, representing a slight increase. This forecast is contingent on ASF developments and Chinese import demand.
- The annualised composite pig feed price is forecast to increase by 6 percent in 2022 relative to 2021. This represents an increase to 125 cent per kg in 2022 compared with 118 cent per kg in 2021.
- The Irish pig sector will experience very low margins in 2022.

Figure E3: Forecast Change in Output Prices 2022 vs 2021



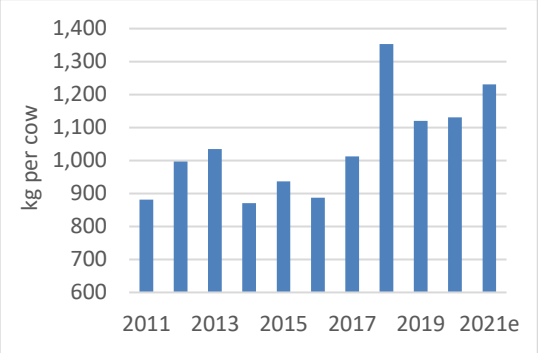
Source: Authors' forecasts

Dairy: Review of 2021

Output Value	Input Spend	Income
↑ Up	↑ Up	↑ Up

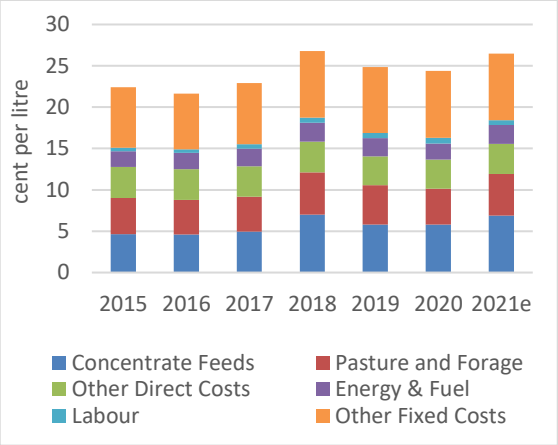
- The annual average milk price for 2021 is estimated to have risen by 16 percent to 40.6 cent per litre (vat incl. actual fat and protein).
- In aggregate, Irish milk production rose by about 6 percent in 2021.
- Dairy cow numbers are estimated to have increased by 2 percent to 1.6m in June of 2021.
- On a per cow basis, dairy feed usage is estimated to have increased by 9 percent in 2021 to about 1,231 kg.
- Due to an increase in feed prices and feed usage, concentrate feed expenditure increased in 2021 by 28 percent on a per hectare basis, and by 22 percent on a per litre basis.
- Fertiliser use also rose in 2021 and fertiliser prices increased also. This led to an increase in pasture and forage costs, of 16 percent per hectare and 10 percent per litre.
- Driven by higher direct costs, it is estimated that total production costs increased by 15 percent on a per hectare basis, with a 9 percent increase on a per litre basis (to an average of 26.5 cent per litre) in 2021.
- Despite the higher production costs, the increase in milk price and milk production, resulted in an estimated net margin of 15.1 cent per litre in 2021. This represents a 31 percent increase on the 2020 level.
- With an estimated 5 percent increase in milk production per hectare, it is estimated that the net margin per hectare increased 37 percent to a national average of €1,863 in 2021.

Figure E4: Irish Dairy Cow feed use 2011 to 2021



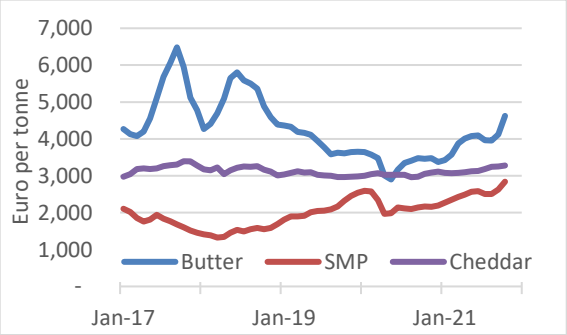
Source: Authors' estimates derived from DAFM and CSO data.
Note: e = estimate.

Figure E5: Average Total Milk Production Costs (cent per litre) in Ireland: 2015 to 2021



Source: Teagasc National Farm Survey and Authors' Estimate.

Figure E6: Monthly European Dairy Product Prices Jan 2017 to Oct 2021



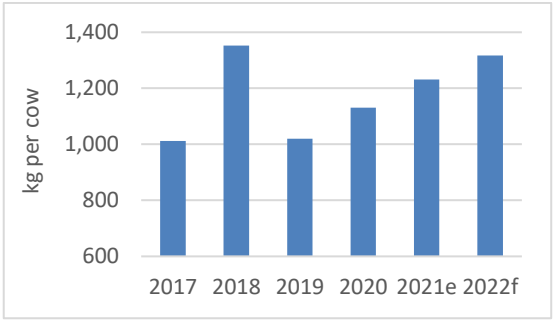
Source: MMO

Dairy: Outlook for 2022

Output Value	Input Spend	Income
Up	Up	Down

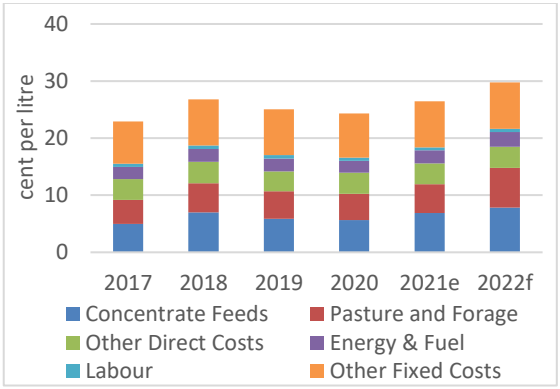
- The market outlook is somewhat uncertain. The strong international dairy demand experienced in Q4 of 2021 is expected to ease in 2022, but milk supply growth in the main export regions is expected to be lower than normal.
- International dairy prices are expected to remain at an elevated level, but to decrease gradually as 2022 progresses.
- The annual average Irish milk price in 2022 is forecast to be in line with the 2021 level. This would represent an annual average milk price of around 40.6 cent per litre (actual fat and protein VAT inclusive).
- Expenditure on fertiliser is expected to increase substantially in 2022, with fertiliser prices possibly 120 percent above the 2021 average level. Lower fertiliser use is anticipated in 2022.
- Even with normal weather conditions in 2022, feed use per head on Irish dairy farms is expected to rise by about 7 percent, due to the high price of fertiliser and expected fall in usage. Feed prices are expected to increase by 6 percent.
- With oil prices expected to average higher in 2022, fuel prices are forecast to increase by 16 percent in 2022, due in part to an increase in the carbon tax.
- Growth in Irish milk production of just 2 percent is forecast in 2022, as producers focus on containing cost increases.
- In 2022, total milk production costs are expected to increase by 15 percent per hectare and by 13 percent per litre.
- With output value expected to increase by 2 percent in 2022, the increase in costs is forecast to lead to lower margins. The forecast average net margin per hectare in 2022 is €1,487, a decrease of 20 percent relative to 2021.
- On a per litre basis, the average net margin is forecast to decrease by 22 percent in 2022 relative to the 2021 level, to an average of 11.8 cent per litre.
- A significant decline in income is forecast for 2022, of the order of 16 percent. However, it should be recognised that this is relative to the anticipated record high incomes in 2021.

Figure E7: Irish Dairy Cow feed use: 2017 to 2022



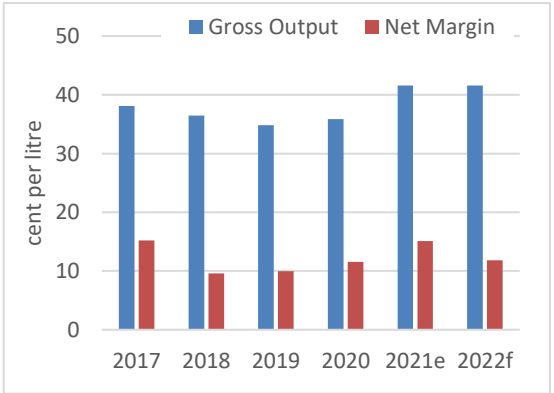
Source: Authors' estimates derived from DAFM and CSO data.
Note: e = estimate. f= forecast

Figure E8: Average Total Milk Production Costs (cent per litre) in Ireland: 2017 to 2022



Source: Teagasc National Farm Survey, Authors' Estimate for 2021 and Authors' Forecast for 2022.

Figure E9: Dairy Gross Output and Net Margin 2017-2022



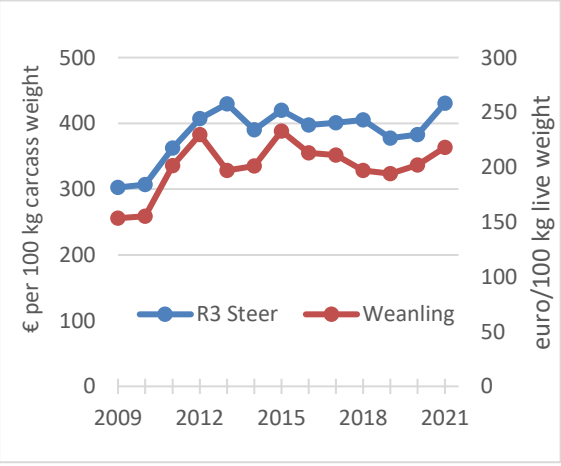
Source: Teagasc National Farm Survey, Authors' Estimates for 2021 and Authors' Forecast for 2022

Cattle: Review of 2021

Output Value	Input Spend	Income
Up	Up	No Change

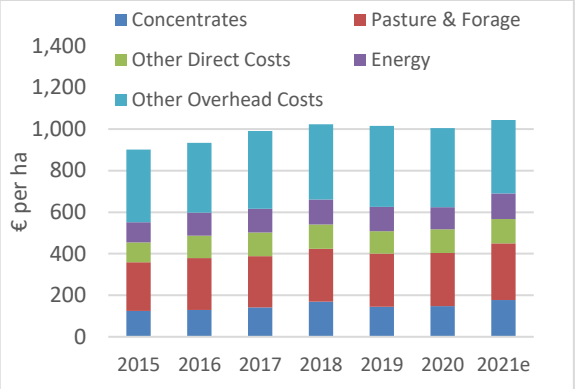
- In 2021, prices for prime finished cattle were 12 percent higher than the average levels in 2020.
- In 2021, prices for younger cattle were 8 to 9 percent higher relative to 2020, leading to an increase in output value on Single Suckling enterprises.
- The output value on the average Cattle Finishing enterprise increased in 2021, as a result of higher prices for finished cattle.
- The BEEP-S and BDGP schemes continued to contribute positively to gross output on Single Suckling farms.
- Large increases in feed prices have contributed towards higher feed expenditures on Cattle enterprises.
- In 2021, the average gross margin per hectare earned on Single Suckling enterprises is estimated to be €483 per hectare, a 4 percent increase on the 2020 level.
- In 2021, the average gross margin per hectare earned on Cattle Finishing enterprises is estimated to be €522 per hectare, a 9 percent increase on the 2020 level.
- For both cattle enterprises, the bottom one third of farms have no improvement in gross margin per hectare in 2021 relative to 2020.

Figure E10: Finished Cattle and Young Cattle Prices



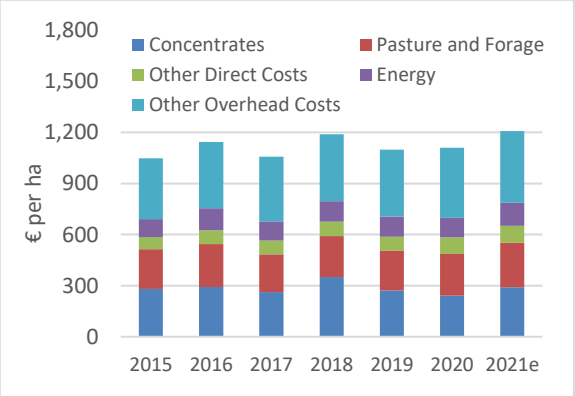
Source: 2009-2020 DG Agri, CSO, 2021 Authors' estimate

Figure E11: Costs of Production Single Suckling (SS)



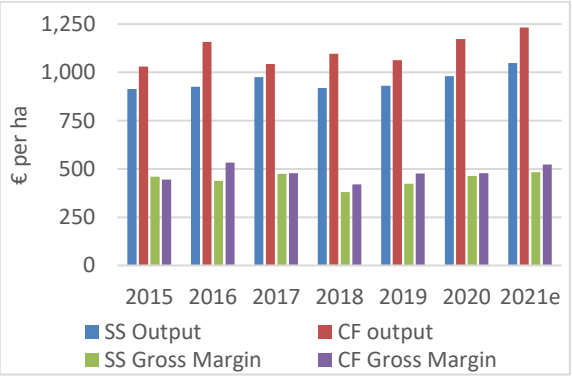
Source: 2015-2020 Teagasc NFS, 2021 Authors' Estimate

Figure E12: Cost of Production Cattle Finishing (CF)



Source: 2015-2020 Teagasc NFS, 2021 Authors' Estimate

Figure E13: Output and Gross Margin



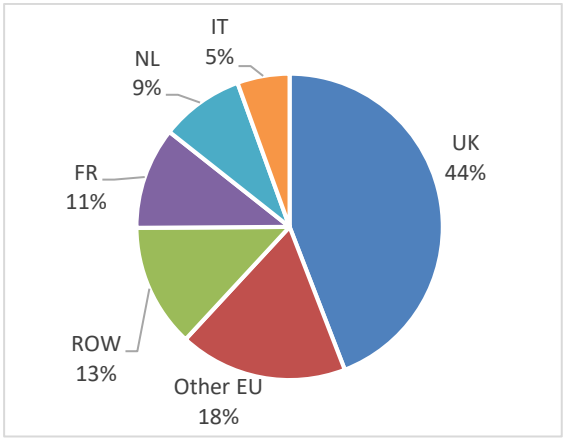
Source: 2015-2020 Teagasc NFS, 2021 Authors' Estimate

Cattle: Outlook for 2022

Output Value	Input Spend	Income
Mixed	Up	Down

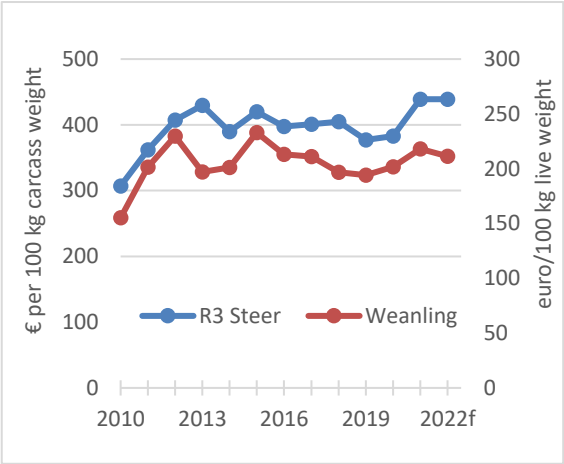
- EU beef supply is forecast to decline in 2022.
- UK beef supply is forecast to be unchanged in 2022.
- Irish finished cattle prices in 2022 are forecast to be equal to the 2021 level.
- Input expenditures in 2022 are forecast to increase on 2021 levels due to higher feed, fertiliser and energy prices.
- Direct costs of production on Single Suckling enterprises are forecast to increase by approximately 10 percent.
- Direct costs of production on Cattle Finishing enterprises are forecast to increase by approximately 12 percent.
- In 2022, the average gross margin per hectare on Single Sucking enterprises is forecast to decrease by 22 percent to €377 per hectare.
- In 2022, the average gross margin per hectare on Cattle Finishing enterprises is forecast to decrease by 10 percent to €469 per hectare.

Figure E14: Irish Beef Export by Volume in 2021



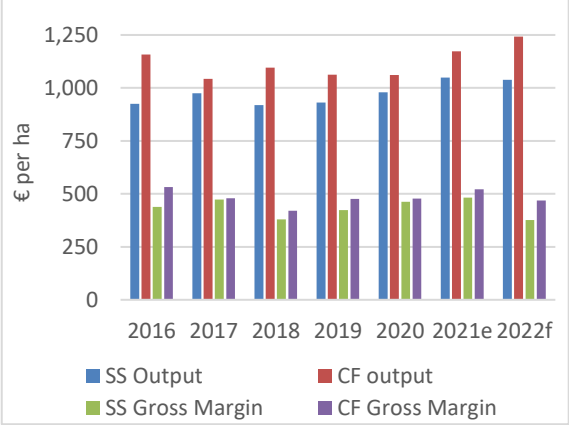
Source: Eurostat COMEXT (year through August)

Figure E15: Cattle prices with forecast for 2022



Source: Authors' forecast

Figure E16: Single Suckling (SS) and Cattle Finishing (CF) Output and Gross Margin per ha



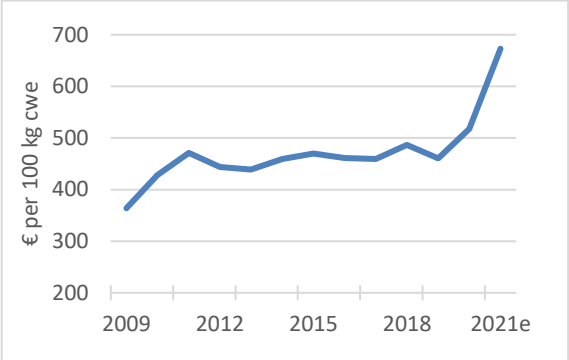
Source: 2015 to 2020 Teagasc NFS, 2021 Authors' estimate, 2022 Authors' forecast

Sheep: Review of 2021

Output Value	Input Spend	Income
↑ Up	↑ Up	↑ Up

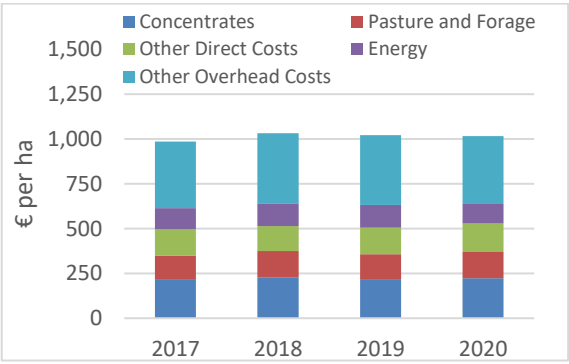
- EU sheep meat exports from Jan to Sept 2021 are down on the same period in 2020. For the year as a whole, EU exports are expected to decline 12 per cent on 2020 levels.
- This follows on from a 4 percent increase in exports in 2020 and an almost 10 percent increase in EU exports in 2019.
- With EU sheep meat production in 2021 forecast to grow by just over 1 per cent, the expectation is that EU consumption for 2021 as a whole will have remained relatively constant.
- Prices on the European lamb market in 2021 are much higher than in 2020, with prices for heavy lamb up on average 22 percent in the year to the beginning of November 2021.
- It is expected that the average lamb price in Ireland for 2021 for the year as a whole will be much higher than in 2020. The year on year price change is estimated at 30 percent.
- Total direct costs of production for Irish mid-season lowland lamb enterprises are estimated to have increased in 2021, up by just over 20 percent in 2021.
- Overhead costs of production are estimated to have increased by 6 percent.
- Gross margins per hectare for Irish mid-season lowland lamb producers are estimated to have increased in 2021 by over 26 percent, owing to much higher marketed output values in 2021.
- The receipt of Sheep Welfare Scheme direct payments boosted margins in 2021.
- In the absence of the coupled payment received from the Sheep Welfare Scheme, margins in 2021 would have increased by 19 percent relative to 2020. In 2021 the average gross margin on mid-season lowland enterprises is estimated to be €748 per hectare.

Figure E17: Irish Lamb price 2009-2020, with estimate for 2021



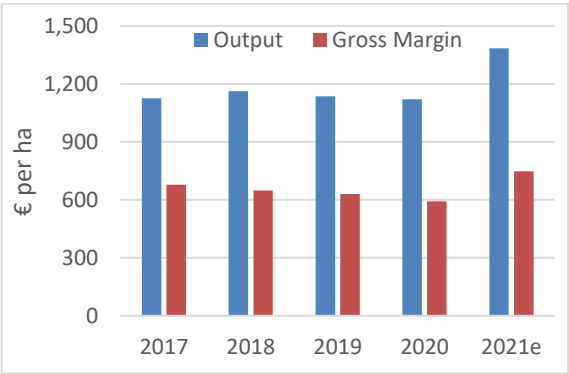
Source: European Commission DG AGRI and author estimate 2021

Figure E18: Average Sheep production costs 2017 -- 2020 and estimate for 2021



Source: Teagasc NFS 2017- 2020, Authors' Estimate for 2021

Figure E19: Average Sheep output 2017-2020 & margin estimate for 2021



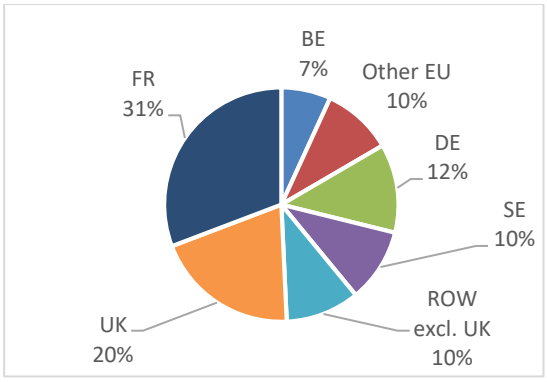
Source: Teagasc NFS 2017-2020, 2021 Authors' Estimate

Sheep: Outlook for 2022

Output Value	Input Spend	Income
Up	Up	Down

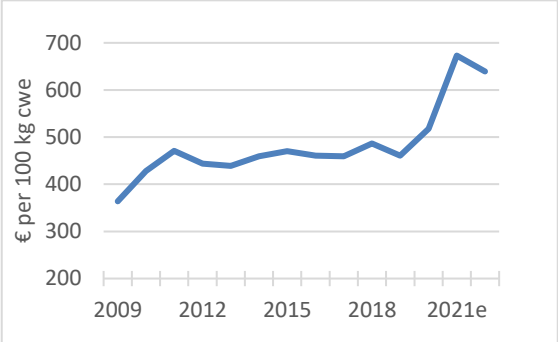
- The outlook for Irish and EU lamb prices for 2022 is less positive than in 2021. Global sheep meat prices are forecast to remain high, but down on 2021 record price levels.
- Following the UK exit from the Single Market, UK exports to the EU have fallen. Export opportunities for Irish sheep meat will support Irish prices in 2022.
- Sheep feed expenditure is forecast to increase. Concentrate prices are forecast to increase by 6 percent, with feed use forecast to remain stable.
- Fertiliser prices are forecast to increase substantially relative to 2021. With a forecast decline of 20 percent in fertiliser usage, pasture and forage costs are still expected to increase by 70 percent in 2022.
- With much higher costs of production in 2022 and a less positive lamb price outlook, gross margins for mid-season lowland lamb enterprises in 2022 are expected to fall by about 15 percent.
- The Sheep Welfare Scheme payment in 2022 will continue to support margins from mid-season lowland lamb production.
- In 2022, the average gross margin per hectare earned by Irish mid-season lowland lamb enterprises is forecast to decline to €634 per hectare.

Figure E20: Irish Sheep and Lamb Meat Exports (Volume) by Destination in 2021



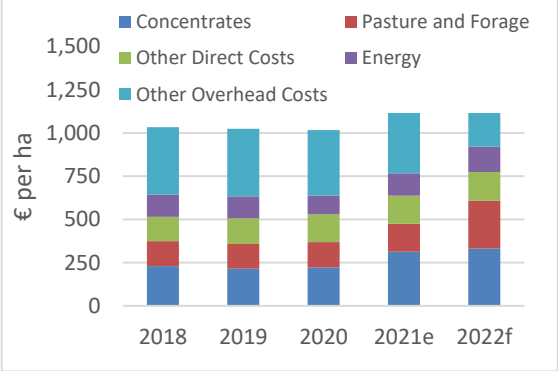
Source: Eurostat COMEXT (Volume, year to end September 2021)

Figure E21: Irish Lamb price forecast for 2022



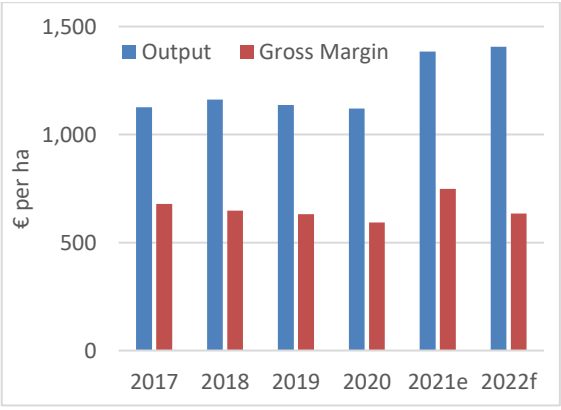
Source: DG Agri 2009-2019; Authors' Estimate 2021; Authors' forecast 2022

Figure E22: Sheep production costs forecast 2022



Source: Teagasc NFS 2018-2020, Authors' Estimate 2021, Authors' Forecast 2022

Figure E23: Average Sheep output & margins with forecast for 2022



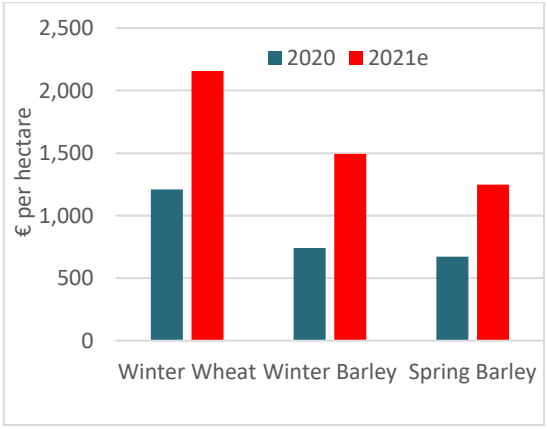
Source: Teagasc NFS 2017-2020, Authors' Estimate 2021, Authors' Forecast 2022.

Cereals: Review of 2021

Output Value	Input Spend	Net Margin per ha
Up	Up	Up

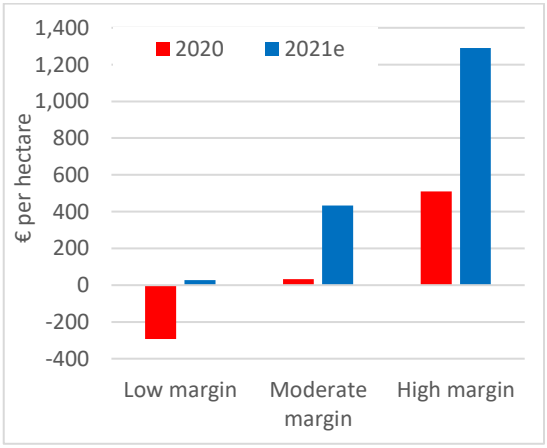
- Despite a 3 percent increase in wheat, barley and maize production on the international balance sheet in 2021, there was also an increase in demand for grains, and as a consequence ending stocks remained low.
- These market factors led to an increase in cereal prices at harvest 2021, with on account Irish harvest prices increasing by up to 33 percent in some cases.
- There was also an increase in yields of the main cereal crops in Ireland in 2021. Irish spring barley yields increased by 11 percent on a per hectare basis, while winter wheat yields increased by 25 percent per hectare, compared to 2020.
- Direct costs of production on Irish cereal farms increased in 2021 compared to 2020. The largest increases were for fuel related costs, fertiliser and seed, at 25 percent, 9 percent and 2 to 6 percent respectively.
- On average direct costs of production increased by 6 percent in 2021 on a per crop basis. Overhead costs allocated to cereal enterprises on tillage farms also increased in 2021.
- The net effect of the change in output value and input costs was a significant increase in the average gross margin for cereal crops in 2021. The gross margin per hectare for spring barley, winter barley and winter wheat increased by €580, €750 and €950 respectively.
- There remains a wide variation in terms of the economic performance of individual cereal farms nationally. It is estimated that the average cereal enterprise on specialist tillage farms has returned a positive market based net margin in 2021.
- But there is a range around this average figure, with the bottom one third of farms earning only a very slight positive market based net margin of approximately €30, while the top one third of farms earned nearly €1,300 per hectare.
- Overall, there was a €525 per hectare increase in the average market based net margin in 2021, relative to 2020. This can be attributed to significant increases in cereal price, cereal and straw yields, the Straw Incorporation Measure (SIM), which more than outweighed any increase in direct and overhead costs.

Figure E24: Gross Margin for Main Cereal Crops



Source: Teagasc, National Farm Survey Data & Author's estimate for 2021.

Figure E25: Cereal Enterprise Net Margin on Specialist Tillage Farms



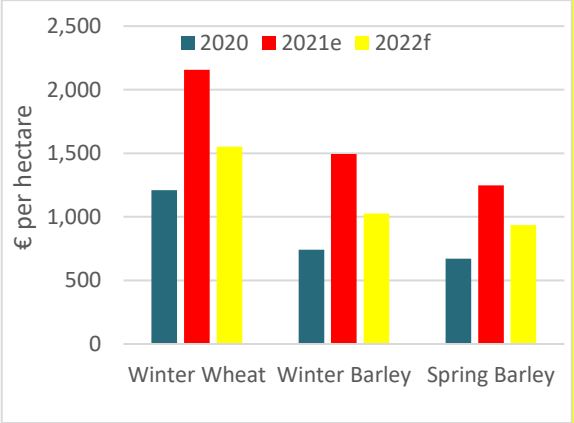
Source: Teagasc, National Farm Survey Data & Author's estimates for 2021.

Cereals: Outlook for 2022

Output Value	Input Spend	Net Margin per ha
Down	Up	Down

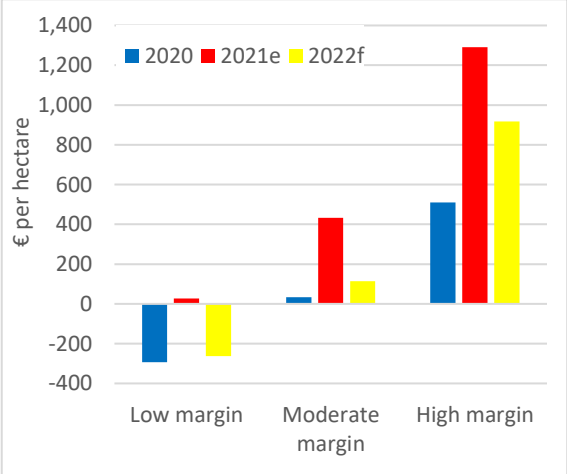
- EU grain production increased in 2021. In terms of market supply and demand, there is a lot of uncertainty at present, as stocks to use ratios are variable across wheat, barley and maize. However the ending stocks to use ratio for wheat in particular in 2021/22 is lower than in recent years.
- Current (December 2021) futures markets indicate that 2022 harvest prices will be slightly higher than those that prevailed at harvest 2021, by about 2 percent.
- This upward movement in prices can be explained by an expected reversion to trend yields in 2022 and a forecast for a slightly lower ending stock position for the 2022 harvest.
- A return to 5 year trend yields in Ireland in 2022 would mean only a slight yield decrease for most cereal crops in 2022.
- Direct costs of production on cereal farms are expected to increase significantly in 2022, with key inputs such as fertiliser and seed expected to increase.
- Total overhead costs are expected to also increase in 2022, with fuel costs expected to increase by about 18 percent and all other overhead costs to increase by about 3 percent compared to 2021.
- The net effect of the forecast changes in output value and input expenditure mean that 2022 gross margins for cereals are forecast to decrease over 2021 levels.
- The average gross margin for spring barley in 2022 is forecast to decrease by approximately €315 per hectare compared to 2021. The average winter barley and winter wheat gross margins are forecast to decrease by about €470 and €610 per hectare respectively in 2022.
- The cereal enterprise market based net margin on specialist tillage farms in 2022 is forecast to decrease on the 2021 level. It is forecast that the average specialist tillage farm will return approximately €280 market based net margin in 2022.
- It is forecast that approximately 40 percent of specialist tillage farmers will return a negative market based net margin in 2022.

Figure E26: Gross Margin for Main Cereal Crops (2021 estimate & 2022 forecast)



Source: Teagasc, National Farm Survey Data & Author's estimate for 2021 & forecast for 2022.

Figure E27: Cereal Enterprise Net Margin on Specialist Tillage Farms, 2022 forecast



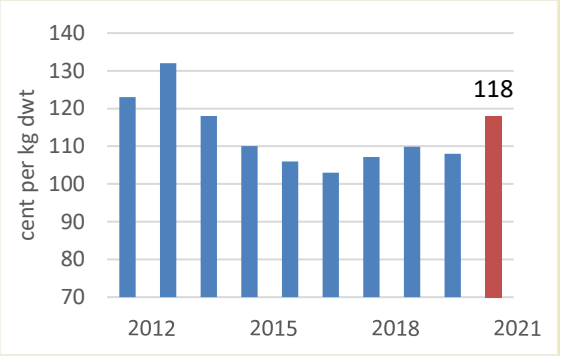
Source: Teagasc, National Farm Survey Data & Author's estimate for 2021 & forecast for 2022.

Pigs: Review of 2021

Output Value	Input Spend	Income
Down	Up	Down

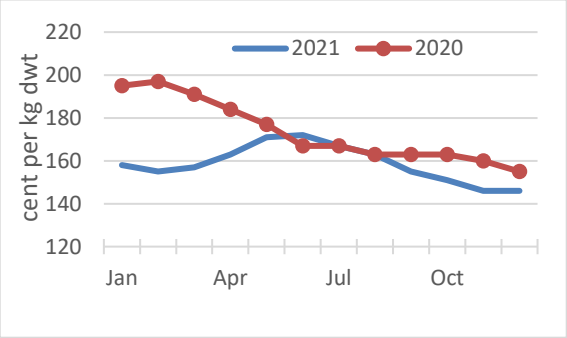
- The prices of the main pig feed ingredients increased in Q3 and Q4 of 2021.
- The annual average feed cost in 2021 is estimated to be 118 cent per kg dwt. This is 9 percent higher than the 2020 figure and the 5 year average of 109 cent per kg dwt respectively.
- At 159 cent per kg, the 2021 Irish pig price was significantly lower than the 174 cent per kg average for 2020. This decrease is primarily attributable to a lower volume of Irish pigmeat exports to China.
- The estimated 2021 average pig price of 159 cent per kg is marginally lower than the five year average (2017-2021) of 161 cent per kg.
- The 2021 'Margin Over Feed' (MOF) per kg is estimated to be 41 cent per kg dwt. During 2021 the monthly MOF reached a peak at 53c per kg in May and then gradually decreased to 19c per kg in December.
- The volume of Irish pigs slaughtered increased marginally to 3.93m in 2021, which was an increase of 0.1m pigs on the 2020 level. In 2021, of the 3.93m pigs of Irish origin that were slaughtered, 0.43m were slaughtered in Northern Ireland, a decline on the 2020 level.
- In 2021, pig slaughter volumes in the principal European pig producing countries increased by 1.1 percent when compared to 2020. The country with the largest decrease was Germany, at 4.3 percent.
- The average Irish pig slaughter weight continued to trend upward in 2021, with an estimated average sale weight of 116 kg. This is an increase of 13 kg since 2010.

Figure E28: Irish Compound Pig Feed Price 2012 to 2021



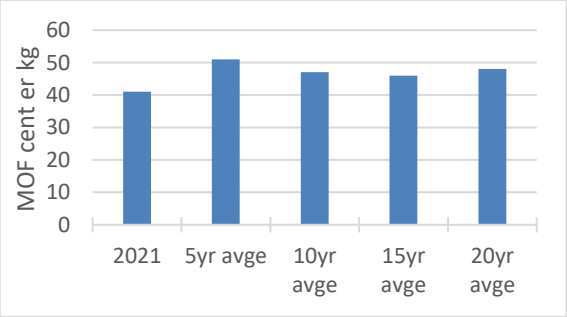
Source: Teagasc Pig Development Department, estimate for 2021

Figure E29: Monthly Irish Pig Prices 2020 – 2021



Source: Teagasc Pig Development Department, estimate for 2021

Figure E30: Margin Over Feed: Historical Comparison with 2021



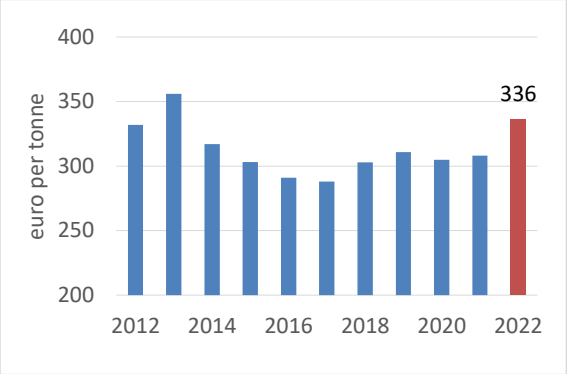
Source: Teagasc Pig Development Department

Pigs: Outlook for 2022

Output Value	Input Spend	Income
↑ Up	↑ Up slightly	↓ Down

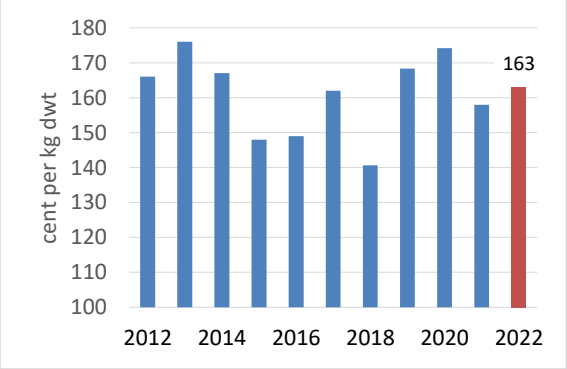
- The December 2021 composite pig feed price of €363 per tonne will increase in Q1 of 2022.
- In Q2 and Q3 of 2022, feed ingredient prices are forecasted to decrease, with expectations of higher harvest yields in the northern hemisphere.
- Forecasts for the 2022 South American (SA) soyabean harvest suggest it will increase relative to 2021 and is forecast to reach 140 mt.
- An increased SA harvest in Q1 2022, will reduce soyabean prices for the remainder of 2022.
- The annualised composite pig feed price is forecast to increase by 6 percent in 2022 relative to 2021. This represents an increase to 125 cent per kg in 2022 compared with 118 cent per kg in 2021.
- In 2022 the size of the EU sow herd is likely to continue to decrease in the main pig producing countries, with the exception of Spain. The Spanish sow herd is expected to increase by 2 to 3 percent.
- In 2022, the size of the Irish sow herd is expected to remain unchanged, but the volume of Irish pigs slaughtered is expected to increase by 1 percent to exceed the 4 million head.
- The average Irish pig sale weight is expected to increase by 1 percent in 2022 to 117 kg.
- The volume of exports of pigmeat from the EU to China will have an important influence on the Irish pig price in 2022. It is expected that China's import requirements will increase as 2022 progresses, with a higher Chinese domestic price making imports attractive.
- African Swine Fever (ASF) will continue to feature in 2022, with Germany struggling to prevent further cases due to infected wild boars crossing their border from Eastern Europe
- In 2022, the Irish pig price is forecast to be a moderate 1.63c per kg, but this forecast is highly influenced by ASF developments and Chinese import demand.
- Following high profitability in 2019 and 2020, and a fall in margins in 2021, the Irish pig sector will experience very low margins in 2022.

Figure E31: Historical Compound Pig Feed Price and forecast for 2022



Source: Teagasc Pig Development Department estimate for 2021 & forecast for 2022

Figure E32: Historical Irish Pig Prices and forecast for 2022



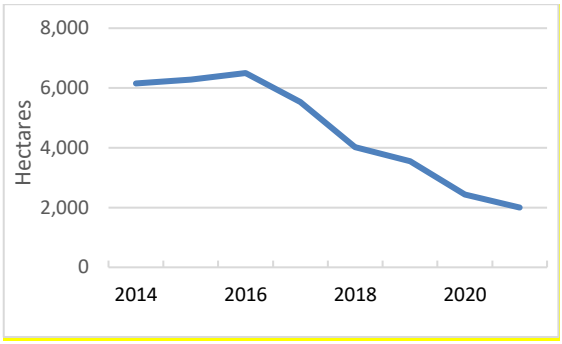
Source: Teagasc Pig Development Department estimate for 2021 & forecast for 2022

Forestry Sector: Review of 2021

Afforestation levels	Actual Timber demand	Timber prices
↓ Below 2020 levels	↑ Up due to licencing/timber supply issues	↑ Up due to timber supply restrictions and strong demand

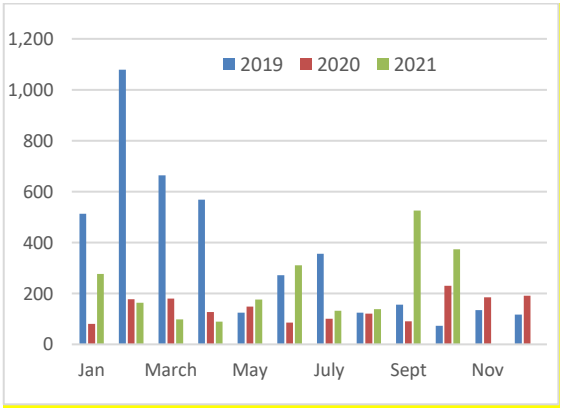
- Project Woodland was established in February 2021 to address key issues in forestry in Ireland and progress new woodland creation as well as other licenced activities.
- The likely forestry planting figure for 2021 is approximately 2,000 ha, continuing a downward trend in recent years.
- The forestry licencing system remained under major pressure during 2021. This led to an ongoing backlog in the issuing of permits for afforestation, road construction and timber harvesting activities.
- The total number of felling licences issued to October 31, 2021 was 2,285, compared to a total of 1,717 for the full year in 2020.
- With domestic timber supply limited due to licencing issues, significant log imports continued in 2021 to maintain timber supply to processors.
- A total of 100 km of forest roads were completed and funded in 2020. The year to date estimate for 2021 is 63 km.
- Timber markets remained very buoyant during 2021, reflecting increasing demand.
- Exports of all forest and wood based products totalled €446 million in 2020, down €20 million (over 4 percent) compared to 2019.
- The United Kingdom remains by far Ireland's largest export market, accounting for 78 percent of forestry and wood-based product exports.
- The level of Irish dwelling completions for 2021 is expected to be over 21,000 units.
- Approximately half of Ireland's forest estate is certified as sustainably managed by international non-governmental organisations. Most of this area is in the public forest estate, with 11,181 ha of private forest currently certified.
- Feedback from seven of the main timber processors indicates sawnwood production of almost 1.0 million m^3 in 2019 with an estimated 551,000 m^3 exported to the UK.

Figure E33: Annual planting 2014 to 2020, with projection for 2021



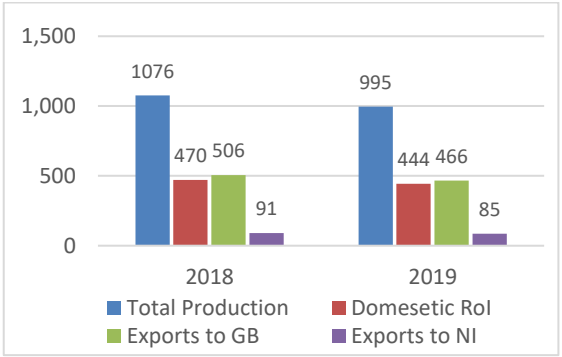
Source: DAFM (2021)

Figure E34: Monthly Felling Licences issued 2019 - 2021



Source: DAFM, Forestry Section Monthly Reports (2019/2/21) and Forestry Dashboard

Figure E35: Irish Sawnwood Production and Trade to the UK (000's m^3) in 2018/2019 for 7 of the main sawmills



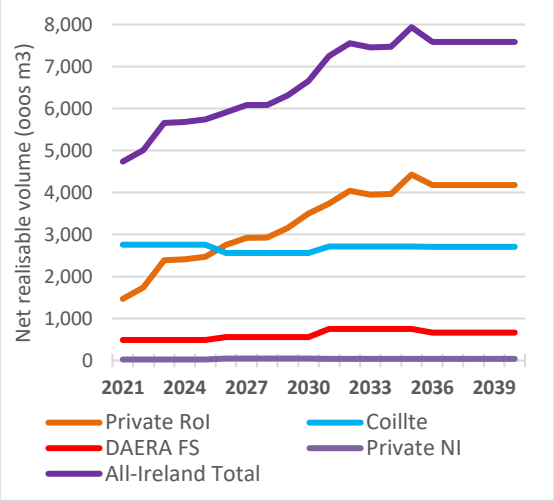
Source: Based on interviews with 7 of main sawmills in RoI

Forestry Sector: Outlook for 2022

Afforestation levels	Timber demand	Timber prices
↑ Up	↑ Anticipated increasing demand	↓ → Linked to easing of supply issues

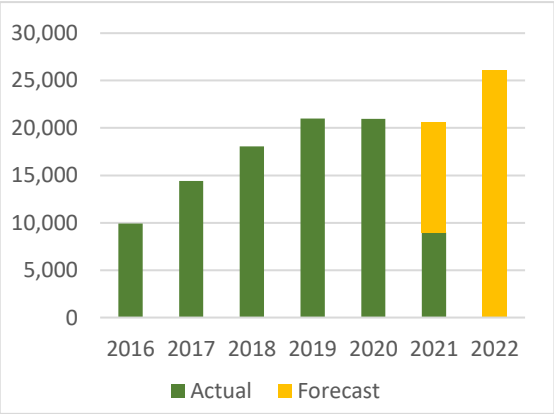
- The Government budget allocation for the Forestry Programme in 2022 is over €100 million. This allocation reflects funding to establish 8,000 ha of new forests, an ambitious target set out in the Food Vision 2030 Strategy.
- Increasing planting rates towards target levels will continue to be a significant challenge, requiring a progressive increase in the flow of afforestation approvals to support a sustainable planting programme.
- There is also a need to support farmers and landowners in building confidence regarding the merits of farm forestry and re-engaging with appropriate forestry options as a beneficial and complementary land use.
- Forecasts indicate that the net realisable timber volume (NRV) from private sector forestry in Ireland will increase from 1.47 million m^3 in 2021 to 1.74 million m^3 in 2022.
- The export-oriented sawmilling sector will continue to compete in a challenging market environment, but has significant potential to enhance its market position with an adequate level of timber mobilisation capacity.
- The level of Irish house completions for 2022 is estimated to exceed 26,000 units.
- Continued sustainable management of forests, including timely thinning operations as appropriate, will help optimise forest productivity, whilst also facilitating ongoing mobilisation of the timber resource.
- A focus on the rapid expansion of forest certification in the private forest sector is necessary to ensure the sector is well positioned to meet future timber market requirements.

Figure E36: Forecast of Total Net Realisable Volume Production by ownership category to 2040 (≥ 7cm top diameter)



Source: All-Ireland Roundwood Production Forecast 2021-2040 (COFORD, 2021)

Figure E37: Housing Completions RoI (actual and forecast) 2016-2022



Source: CSO and ESRI 20021

Irish Dairy Farming Factsheet 2020
Average Performance

Milk Sales per ha
11,296 litres (down 1.3%)

Days at Grass
233 days (down 3 days)

Milk Production per cow
5,647 litres (up 1%)

Stocking Rate
2.06 lu/ha (down 2%)

Milk price actual fat/protein
35.02 cent per litre (up 1%)

Dairy Enterprise* area
41.0 ha (up 7%)

Average Dairy Herd Size
84 dairy cows (up 4%)

Milk Fat Content
average 4.11% (up 0.03 points)

Concentrates Fed/Dairy Cow
average 1,131 kg (up 1%)

Milk Protein Content
average 3.48% (up 0.01 point)

Concentrates fed/litre of milk
average 0.20 kg (down 3%)

Milk Solids per Cow
average 434 kg (up 2%)

Nitrogen per ha of grassland
184 kg (unchanged)

Basic Payment Scheme
per farm € 16,449 (unchanged)

Total Production Costs
24.31 cent per litre (down 3%)
€2,826 per hectare (down 4%)

Somatic Cell Count
159,000 cells/ml (down 4%)

Gross Margin Dairy Enterprise
21.9 cent per litre (up 5%)
€2,565 per hectare (up 2%)

Net Margin Dairy Enterprise
11.54 cent per litre (up 15%)
€1,367 per hectare (up 9%)

Source: Teagasc National Farm Survey 2020 (Final Results)
Note: Percentage changes are relative to 2019
*Dairy Enterprise area refers to area for dairy cows only

Irish Dairy Farming in 2021

Bouyant dairy market
Strong demand, particularly in Q3 and Q4

Irish Milk Production
up 6 % on the 2020 level

Irish Milk Price
up 16% 2020 level

Weather Conditions
Relatively normal

Grass Availability
lower than normal over the summer

Fertiliser Prices up 10%
Fertiliser Use up 10%

Feed Prices up 16% in 2021
Feed Use up 9% per head

Other Direct Costs per litre
down 2%

Fuel Prices
up 21% on the 2020 level

Total Costs per litre of milk
up 9% on the 2020 level

Net Margin for Dairy Enterprise
up 31% per litre on 2020

Source: Teagasc Estimates for 2021 and Forecasts for 2022

Irish Dairy Farming in 2022

Considerable market uncertainty
Prices to average similar to 2021

Irish Milk Production
up 2% on the 2021 level

Irish Milk price
unchanged on 2021 level

Weather Conditions
Normal weather assumed

Grass Availability
normal conditions

Fertiliser Prices up 120%
Fertiliser Use down 15%

Feed Prices up 6%
Feed Use up 7% per head

Other Direct Costs per litre
up 1%

Fuel prices
up 16% on 2021 level

Total Costs per litre of milk
up 13% on the 2021 level

Net Margin for Dairy Enterprise
down 22% per litre on 2021

Note: percentage changes are relative to previous year

Review of Dairy Farming in 2021 and Outlook for 2022

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Fertiliser Expenditure Assumptions for 2022

At the time of writing, in December 2021, an unprecedented escalation in fertiliser prices has occurred. There is considerable uncertainty as to whether fertiliser prices will remain at elevated levels for the duration of the 2022 production year and what the farmer response to these price changes might mean for the level of fertiliser usage in 2022. Therefore, it is necessary to set out assumptions in relation to the fertiliser price and farmer response to these price changes.

- It is assumed that fertiliser prices will stay at their elevated price levels, observed in December 2021, until at least the end of Q2 2022.
- It is assumed that fertiliser prices, for use on grassland, will be 120 percent higher in 2022, compared to 2021.
- It is assumed that dairy farmers will reduce fertiliser application rates in response to the forecast high level of fertiliser prices. For the purpose of this paper, it is assumed that dairy farmers will reduce fertiliser application by 15 percent in 2022, compared to 2021.
- To compensate for a reduction in grass yield, associated with reduced fertiliser application, it is assumed that concentrate feed per head will increase by 7 percent in 2022 compared to 2021.
- These forecasts are based on the assumption of normal weather conditions prevailing in 2022.

1. Introduction

This paper looks back on dairy farm performance in 2020, reviews the outcomes for 2021 and looks ahead to the prospects for 2022. Data from the Teagasc National Farm Survey (NFS) are used in our review of 2020. The milk price and key input cost estimates for 2021 are used to produce an overall estimate of dairy enterprise margins for 2021. Finally, in the concluding sections of the paper, the forecast for milk price, production costs and dairy farm margins in 2022 are presented.

Although the impact of the COVID-19 pandemic was sharply felt across many sectors in 2020, agriculture remained somewhat insulated. On dairy farms, benign weather conditions, reduced input prices and an improved average milk price, resulted in continued production growth and an increase in typical Dairy farm income. On average, there was a 13 percent increase in Family Farm Income (FFI) to €74,249, as recorded through the Teagasc NFS.

Driven mainly by reductions in expenditure relating to feed and fertiliser, production costs decreased marginally on the average Dairy farm enterprise in 2020. On a cent per litre basis, average direct costs declined by 2 percent. A larger fall in fixed costs (primarily due to reduced depreciation for both machinery and buildings), resulted in a 3 percent reduction in total production costs overall. On average, purchased concentrate expenditure decreased by 4 percent per litre of milk. Average feed volumes per cow have generally been trending upwards since the abolition of EU milk quota. However, feed use on individual farms, are influenced by factors such as location, land type and stocking rate. In 2020, the average feed volume per dairy cow remained relatively stable at 1,131kg.

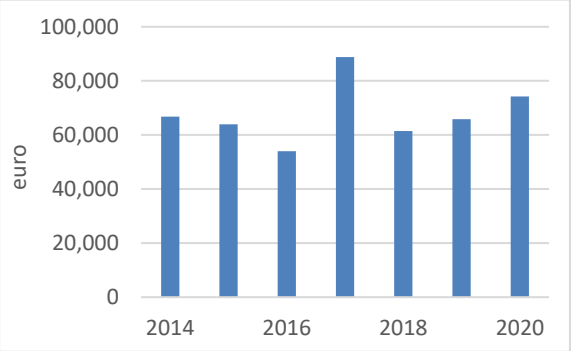
Pasture and forage costs on dairy farms declined in 2020, down 5 percent per litre, on average. There was a general increase year-on-year in other direct costs such as contracting charges and veterinary expenses. Expenditure relating to hired labour declined in 2020, with increased availability of family labour due to COVID-19. Cost savings in energy and fuel were also evident year-on-year.

2. Review of the Economic Performance of Dairy Farms in 2020

Results from the Teagasc NFS 2020 for Dairy farms are summarised here. Figure 1 presents the average FFI on *Specialist Dairy* farms over the years 2014 to 2020. Despite a difficult period in the immediate

aftermath of EU milk abolition (2015/16) due to a low milk price, and a difficult weather year in 2018, with a resultant escalation in costs, the average return in terms of FFI on Irish Dairy farms has been high relative to the other farm systems.

Figure 1: Average Income on Irish Specialist Dairy Farms 2014 to 2020



Source: Teagasc National Farm Survey (various years).

To further explore the economic performance of dairy farms in 2020, we next look at how margins have changed over the course of the past few years. Table A1 (see appendix) presents the average gross output, gross margin and net margin per litre of milk produced in 2019 and 2020. Farms producing mainly liquid milk are excluded from the sample, as are herds of 10 cows or less.

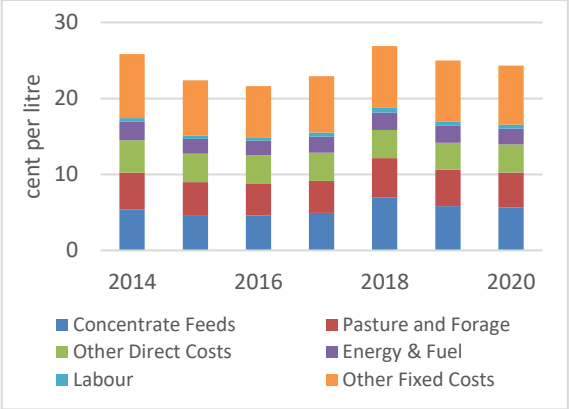
The gross output measure includes the value of milk and calf sales minus replacement costs. The data indicates that gross output per litre increased by 2 percent in 2020 relative to 2019, due to the strong milk price. On average, on a cent per litre basis, feed related costs declined and despite an increase in other direct costs, total direct costs (per litre) declined marginally by 2 percent year-on-year. Due to reduced expenditure on various other fixed costs, an overall reduction of 5 percent was reported year-on-year. The average Dairy gross margin in 2020 increased by 5 percent to 21.9 cent per litre. This resulted in a 15 percent increase in average net margin in 2020, to 11.5 cent per litre.

Table A2 (in the appendix) presents gross output, total costs and net margin per hectare of forage area allocated to the Dairy enterprise for 2019 and 2020. In 2020, milk production per hectare declined by 2 percent, reflecting an increase in the land area dedicated to dairy production. Net margin, on a per hectare basis, increased by 9 percent for the average Dairy enterprise in 2020, due mainly to milk price growth and relatively stable production costs.

The cost and margin data in Table A3 (in the appendix) allow us to examine the variability in economic performance across dairy farms in 2020. Farms are classified on the basis of gross margin per hectare: the best performing one-third of farms (Top), the middle one-third (Middle) and the least best performing one-third (Bottom). On a per litre basis, total production costs for the Bottom group (26.3 cent) were 14 percent higher than for the Top group (23.1 cent). The net margin for the Bottom group (8.6 cent) is approximately 60 percent of that of the Top group (14 cent). This reflects a narrowing in the profitability differential between the Top and Bottom groups in 2020 relative to 2019.

Figure 2 indicates that total milk production costs declined by 3 percent on average in 2020 to 24.3 cent per litre.

Figure 2: Total Milk Production Costs (cent per litre) in Ireland: 2014 to 2020



Source: Teagasc National Farm Survey Data.

3. Review of 2021 Estimated Performance

This section of the paper presents a review of Irish dairying in 2021. Actual Teagasc NFS results for 2021 will not be available until the middle of 2022. Therefore, it is necessary to estimate the price and volume of inputs and outputs in 2021, in order to estimate the outcome for margins in 2022. The following section of the paper first addresses cost estimates for 2021, looking at both input prices and input usage volumes. A cost assessment based on the average farm nationally is then given. Finally, the development of dairy product markets in 2021, in terms of both price and volume changes, is discussed.

3.1 Estimated Input Usage and Price 2021

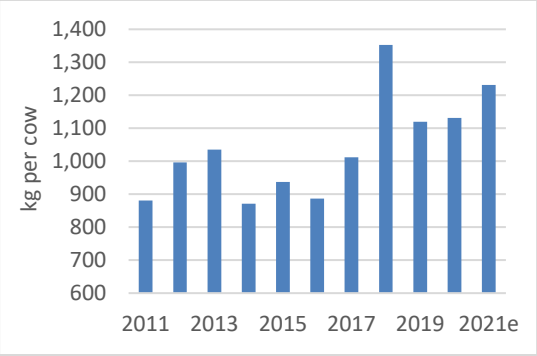
It is not yet possible to offer a comprehensive assessment of the precise changes in production costs at the farm level in 2021. In this analysis, it is assumed that the average dairy farm increased its milk production by 6 percent in 2021.

3.1.1 Feedstuff – usage and price 2021

Purchased feed (concentrates) is an important element of dairy production costs in Ireland, typically accounting for about 20 percent of total production costs, although this varies by farm and by year.

Although official aggregate feed sales data for the full year are not yet available, the trend in dairy feed use in 2021 is up significantly on the 2020 level. Department of Agriculture, Food and the Marine (DAFM) feed sales data for dairy farms for Q1 2021 show an increase of 6 percent compared to the same period in 2020. Data for Q2 show a year-on-year increase of 17 percent, with Q3 reporting an increase of 15 percent relative to the same period in 2020. The Irish dairy cow population is estimated to have increased by 2 to 3 percent in 2021. The average milk yield per cow in 2021 is estimated to have increased by 3 to 4 percent on the 2020 level. Figure 3 shows the average volume of compound feed use per cow in recent years, including an estimate for 2021.

Figure 3: Compound Feed Purchases per Dairy Cow in Ireland: National Average for 2011 to 2021e



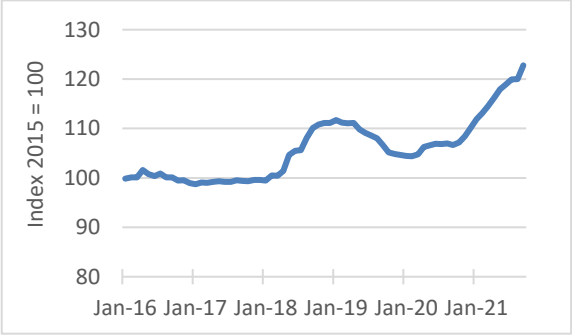
Source: Author estimates derived from DAFM and CSO data.
Note: e = estimate.

These data are derived from DAFM figures on feed sales to the end of Q3 and estimates for Q4 2021 by the authors, along with Central Statistics Office (CSO) data on animal numbers. For the average dairy farm, expanding milk production by 6 percent in 2021, feed use per cow, is estimated at approximately 1,231kg, a 9 percent increase in volume terms relative to 2020.

The feed price in any given year is a combination of supply and demand factors for the current production year, and the year previous. In 2020, due to a reduction in the EU grain harvest and ending stocks, 2020 cereal prices were high, with a lag evident in the transmission of higher cereal prices into the feed market in 2021. Furthermore, whilst grain production was up on the international balance sheet for the 2021 production year, there was also an increase in demand for wheat and maize in the EU, which has contributed to relatively low ending stock positions for both crops.

Figure 4 shows an index of monthly Irish cattle feed prices from 2017 to 2021. Due to a combination of events in 2020 and 2021, feed prices are estimated to be up 16 percent in 2021, for the year as a whole.

Figure 4: Monthly Price Index of Cattle Meal in Ireland 2016 to 2021



Source: Central Statistics Office (Various Years).

On a per litre basis, the expenditure on feed is estimated to have increased by almost 22 percent in 2021 compared to the 2020 level. Feed costs, measured on a per hectare basis, are estimated to have increased by almost 28 percent on the average farm producing 6 percent more milk in 2021.

3.1.2 Fertiliser – usage and price 2021

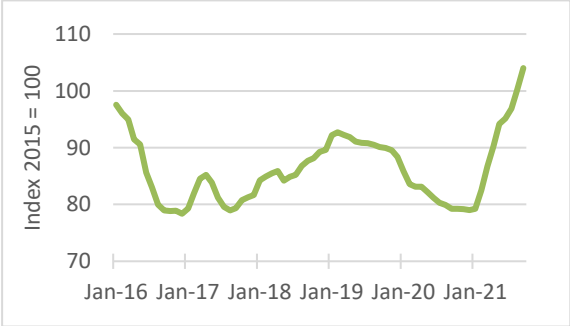
Pasture and forage costs typically comprise about 20 percent of total production costs on Dairy farms. Fertiliser purchases comprise about half of the pasture and forage cost element, with contractor costs accounting for most of the remainder. Figure 5 charts the Irish monthly index of farm level fertiliser prices from 2016 through to 2021.

Energy prices have increased in 2021, contributing to a rise in the price of nitrogen based fertilisers. Much of the increase in fertiliser prices in H2 of 2021 will not show up in farm costs until 2022. A 10 percent

increase in fertiliser prices in 2021 is estimated relative to 2020.

Fertiliser use on dairy farms has been following an upward trend in recent years. DAFM sales figures for 2021, as reported in Figure 6, indicate a 5 percent increase in the national level of nitrogen (N) and 4 percent in both phosphorus (P) and potassium (K) sales volumes in Ireland relative to 2020. The increase on dairy farms is likely to have been larger.

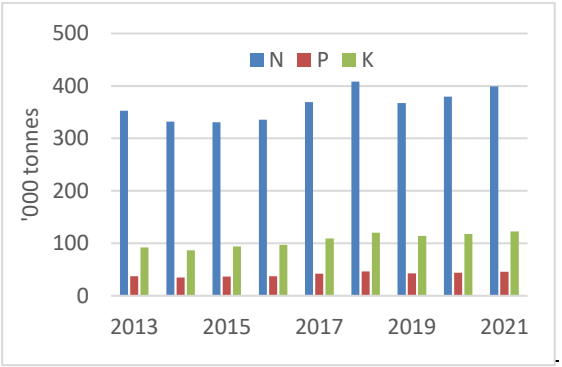
Figure 5: Monthly Price Index of Fertiliser in Ireland for 2016 to 2021



Source: Central Statistics Office (Various Years).

Overall, taking account of the increased level of fertiliser sales and the 10 percent increase in price, fertiliser expenditure per hectare on the average dairy farm in 2021 is estimated to have increased by 21 percent compared to 2020.

Figure 6: Irish Fertiliser Sales by Compounders 2013 to 2021 (Oct-Sept)



Source: DAFM (various years).

3.1.3 Contractor Costs - usage and price 2021

Contractor costs comprise the remaining 50 percent of the pasture and forage cost element. While no official figures are available, it is assumed that there has been a 10 percent increase in contractor prices in 2021, reflecting the increase in fuel prices. No increase in contracting volume is assumed.

3.1.4 Pasture and Forage – usage and price 2021

Fertiliser expenditure increased in 2021 relative to 2020, with expenditure on contracting also estimated to have increased. Therefore, expenditure on pasture and forage has increased by 16 percent on a per hectare basis and 10 percent on a per litre basis on farms where milk production has increased by the national average of 6 percent.

3.1.5 Electricity and Fuel – usage and price 2021

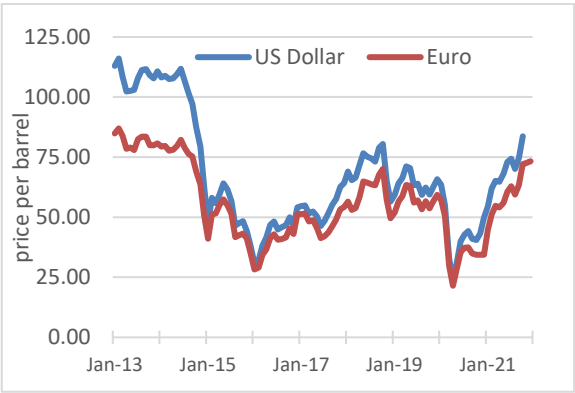
Energy (electricity and fuel) is a less important input than feed and fertiliser, comprising less than 10 percent of total costs on dairy farms. Electricity typically comprises about 30 percent of the total expenditure on energy on dairy farms, with motor fuel accounting for the remaining 70 percent.

Crude Oil and Motor Fuel Prices:

The global oil market has seen dramatic price movements in 2021, reflecting the persistence of the pandemic, the gradual recovery in global economic activity and the improved economic outlook. Brent crude oil prices began the year just below US$55 per barrel (pb). This rose steadily throughout the year and a price of $84 was reached by October.

Crude oil prices are presented in Figure 7. The annual average Brent price for 2021 was over US $71 pb, which represents a 69 percent increase on the average oil price in 2020 of €30 pb.

Figure 7: Monthly Average Brent Crude oil prices in Euro and US dollar from 2013 to 2021



Source: St Louis Fed

In 2021 the euro remained stable against the US dollar in H1, but depreciated in H2. The euro was valued at US$1.22 in June 2021, moving towards US$1.13 by November, averaging US$1.18 for the year as a whole.

For 2021 on average, there was a 4 percent increase in the value of the euro against the US dollar compared with its 2020 level. This appreciation of the euro limited the rise in crude oil prices when expressed in euro terms. Hence, the estimated average crude oil price for 2021 was over €60 pb, an increase in euro terms of about 63 percent on the 2020 value of approximately €37 pb. Overall, farm level fuel costs in Ireland increased in 2021, with marked (duty free) fuel prices approximately 29 percent higher in 2021 relative to the average level in 2020. Duty paid fuel prices increased by about 13 percent.

Electricity Prices: There has been much coverage of the escalation in electricity prices in recent months. Over the course of 2021, prices are likely to be at least 10 percent higher than in 2020.

Fuel and Electricity Volumes: Demand by farmers for fuel and electricity tends to be relatively inelastic with respect to price. It is difficult to determine to what extent incremental increases in milk production impact on energy and fuel requirements.

Given that milk production is estimated to have increased nationally by 6 percent, this suggests that the volume of electricity and fuel use has increased slightly in 2021. As a result, due to increased prices, for the average dairy farm the overall expenditure on both electricity and fuel is estimated to be up 18 percent on a per hectare basis in 2021, with a 11 percent increase when measured on a per litre of milk basis.

3.1.6 Other Direct and Fixed Costs– usage and price 2021

It is estimated that there was a 1 percent increase in agricultural wages in Ireland in 2021. It is assumed that the quantity of hired labour used on farms is likely to have increased marginally to cater for increased milk production.

The price of other input cost items increased by 2 percent in 2021. It is assumed that usage volume of these input items remained unchanged.

The assessment of fixed costs in the Teagasc NFS is quite complex and definitive information on how fixed costs have changed in 2021 will not be available until the Teagasc NFS results for 2021 are published in 2022. Factoring in the improved milk price in 2021 and the increase in milk production, the value of milk output will have increased. Hence the share of fixed costs allocated to the Dairy enterprise on dairy farms is estimated to have increased in 2021.

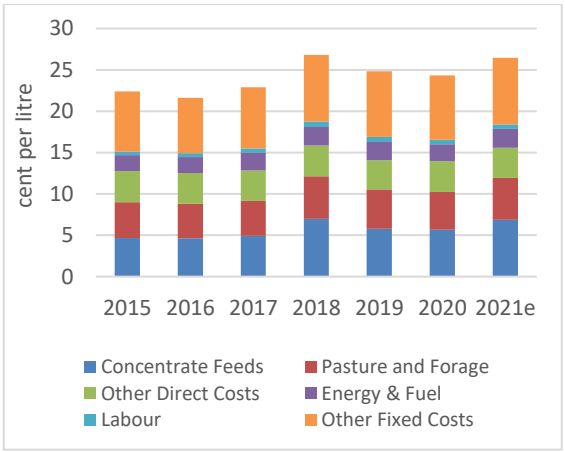
3.1.7 Estimate of Total Input expenditure for 2021

The average milk yield per cow increased by 3 to 4 percent in 2021. The 2 to 3 percent increase in dairy cow numbers, was sufficient to result in an overall increase in Irish milk production in Ireland, estimated at 6 percent.

Accordingly, an assessment of production costs for the average dairy farm is considered here on the basis that the farm has expanded its milk production by 6 percent in 2021.

Figure 8 charts the average total cost of production and its subcomponents from 2015 to 2020 and the associated estimate for 2021. The decline in total costs in 2019 was largely reflective of a reduction in direct input expenditure, mainly driven by the substantial decrease in volumes of concentrates and bulky feed and lower fertiliser usage, partially offset by higher feed and fertiliser prices. A further decline is evident in 2020, but in this case the cost reduction reflects a fall in input prices. The upward movement in 2021 is mainly due to increased input prices with some increase in volume use also experienced.

Figure 8: Total Cost of Milk Production in Ireland from 2015 to 2021



Source: Teagasc National Farm Survey Data and Authors' estimate. Note: e = estimate.

It is estimated that the average total cost of milk production in Ireland in 2021 was 26.45 cent per litre, compared to an average of 24.31 cent per litre in 2020.

3.2 Review of Dairy Market in 2021

Lower production growth has been observed across the main dairy export regions in 2021 relative to

2020. The increase in global milk production in 2021 should be around 1 percent. Demand remained robust through 2021 and actually strengthened in the Q4. Supply chain issues remain a concern and short term demand may have been driven by a desire on the part of customers to build stocks to assure product availability.

Dairy commodity prices increased from Q1 through to Q3 of 2021, and rose sharply in Q4. For the year as a whole, dairy product prices will be up considerably relative to the 2020 price levels.

European butter prices rose significantly in Q4 of 2021. By November of 2021 European butter prices had reached almost €5,000 per tonne. European SMP prices also increased in Q4 of 2021, trading at close to €3,000 per tonne.

In contrast to butter and SMP, European Cheese prices have moved over a fairly narrow range over the last 12 months. However, cheese prices have benefitted from the increase in dairy demand, averaging close to €3,500 per tonne in Q4 of 2021.
In the EU, milk production growth has been relatively weak in 2021 and is likely to increase by just 0.3 percent. This represents an increase in EU milk production of about 0.4 mt relative to the 2020 level.

Milk production in New Zealand (NZ) has exhibited very little growth over the last seven years. In the 2020/21 season production did increase by over 2.5 percent, reflecting good production conditions. However, production in 2020/21 was still only on a par with the 2013/14 level.

Early season production conditions in NZ in the current (2021/22) season have been less favourable, and production has lagged behind the previous year as a result. It is estimated that production in the 2021 calendar year will be up by less than 1 percent (0.2 to 0.4mt)

US milk production has continued to increase in 2021. However, margin pressures, rising feed costs and downward movement in cattle numbers was experienced later in the year. For the full calendar year, US milk production should be up by close to 1.7 percent (1.7mt) in 2021.

Overall, for the calendar year 2021 Australian milk production should show a slight decline of 1.5 percent (0.15 mt). However, conditions have generally been favourable, with near record high milk prices and an upbeat export market.

Following on from the historic low reached in recent years, milk production in Argentina has been in recovery over the last two years. Milk production in the 2020/21 season increased by almost 6 percent and was the highest for 6 years. For the calendar year 2021 it is expected that Argentinian milk production could increase by a further 4 percent (0.5mt).
Overall, milk production growth across the major dairy export nations was weaker in 2021 than in 2020.

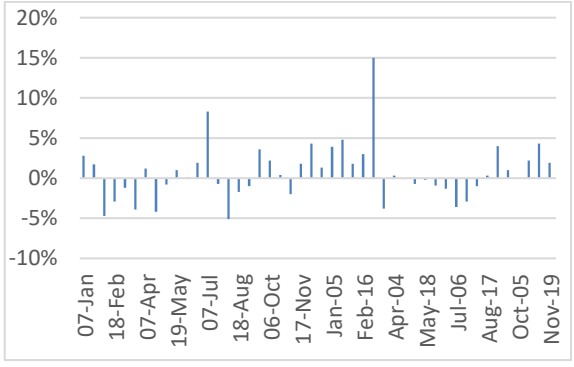
Chinese import demand has remained robust in 2021. In the period from January to September 2021 imports of SMP and WMP were up by 34 percent and 43 percent respectively relative to the same period in 2020. China's imports of whey powder were also up considerably in this period.

Total EU exports of SMP to third countries were down just 2 percent in the period January to September 2021, relative to the same period in 2020.

A decline in EU butter exports was experienced in 2021. For the period January to September, EU butter exports to third countries declined by 15 percent on the same period in 2020. EU exports of cheese to third countries performed more strongly, increasing by 7 percent in the same period.

Figure 9 shows price movements in the influential New Zealand Global Dairy Trade (GDT) Auction Index over the course of the past two years. Strong positive price movements occurred in Q 1 of 2021. This was followed by a series of negative price movements in Q2. Auction prices returned to a positive trend towards the end of Q3 and these positive movements were sustained well into Q4.

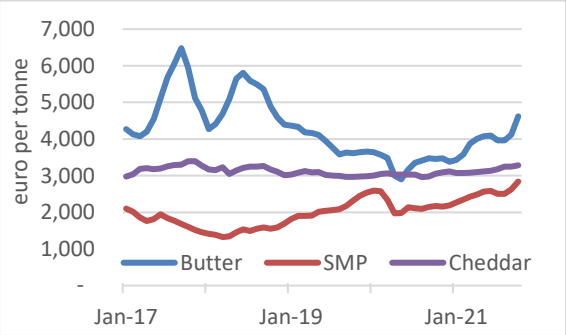
Figure 9: Monthly GDT Auction Index Price movements in 2020 and 2021



Source: GDT Auction 2021.

European wholesale dairy product prices are shown in Figure 10. In 2021 prices for butter and powders have trended upwards as the year has progressed. For 2021 as a whole, butter prices could be up over 20 percent and SMP prices up 16 percent. Cheese price increases have been more modest at about 5 percent.

Figure 10: European Dairy Product Prices 2017-21



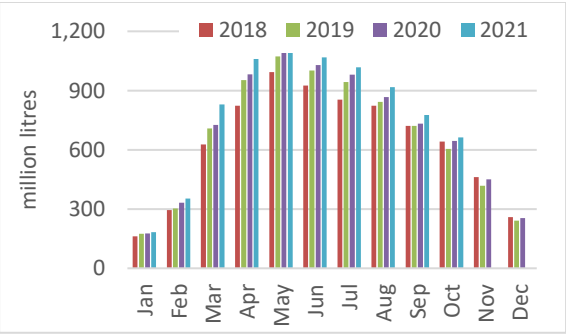
Source: MMO 2021.

3.3 Estimated Output Values 2021

Irish milk production continued to increase in 2021. Monthly milk deliveries are shown in Figure 11 and are reflective of continuing growth in dairy cow numbers in 2021.

For 2021 as a whole, milk production increased by approximately 6 percent on the 2020 level. Irish dairy cow numbers, as recorded in June 2020 increased to almost 1.6 million, compared with 1.57 million in 2020, an increase of 2 percent (CSO, 2021). In the year to October 2021, the increase in milk production was 6 percent (CSO, 2021).

Figure 11: Monthly Irish Milk Deliveries 2018 to 2021



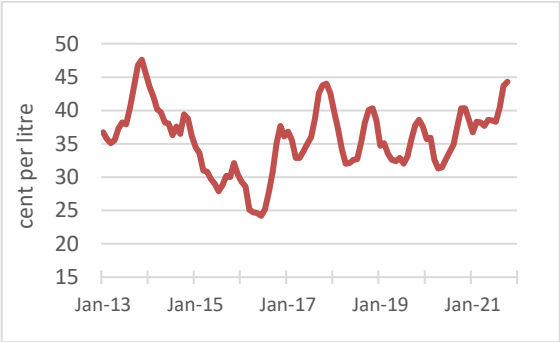
Source: CSO, DAFM 2021.

Figure 12 presents monthly Irish milk prices recorded by the CSO from January 2013 through to October 2021. In Ireland the average 2021 manufacturing milk price is estimated to be up about 16 percent on the 2020 level. Some farmers will have milk in fixed price contracts and therefore may not obtain the spot prices quoted.

In 2021, Irish farm gate milk prices rose as the year progressed, reflecting the rise in commodity prices. The annual average national milk price (CSO definition) is estimated to be approx. 40.6 cent per litre (vat inclusive) in 2021 on an actual fat and protein basis (estimated to be 4.22 percent fat and 3.55 percent protein).

The general upward trend in milk price is driven by a general slowdown in supply growth internationally and strong demand, particularly later in the year. This has resulted in a continued increase in key international dairy product prices.

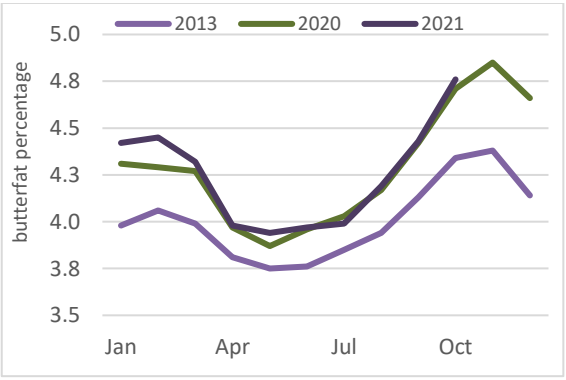
Figure 12: Irish Farm Gate Milk Prices Actual fat (vat incl.) Jan 2013 – Oct 2021



Source: CSO. Note: Actual fat (VAT inclusive).

In addition to the growth in milk production volumes, there has been an increase in both fat and protein levels in Irish milk deliveries in recent years. The butterfat content in Irish milk deliveries is shown in Figure 13. For 2021 as a whole, fat levels should be unchanged on the 2020 level, while protein levels will increase marginally.

Figure 13: Butterfat in Irish Milk Deliveries 2013, 2020 and 2021



Source: CSO.

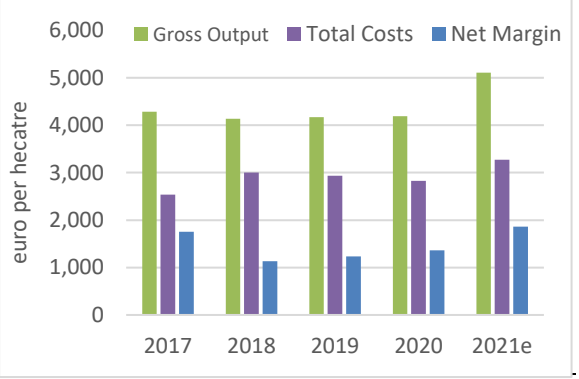
3.4 Review of Dairy Enterprise Net Margins in 2021

The review of milk prices showed that the average milk price for 2021 was up approximately 16 percent on the 2020 level. The review of input costs concluded that for the average farm, having expanded its milk production by 6 percent, total production costs on a per litre basis are estimated to have increased by almost 9 percent in 2021 relative to 2020.

The margin per hectare is described before examining margin on a per litre basis. Figure 14 presents the estimated average gross output, production costs and net margin per hectare for 2021 in comparison to recent years, on the basis of a 6 percent increase in milk production in 2021.

For 2021 the net margin for milk production is estimated to have averaged €1,863 per hectare. This means that the average net margin in 2021 has risen by €500 per hectare relative to 2020. This represents an increase of over 37 percent year-on-year.

Figure 14: Average Gross Output, Costs & Margins per hectare for Irish Milk Production in 2017-2020 & estimate for 2021

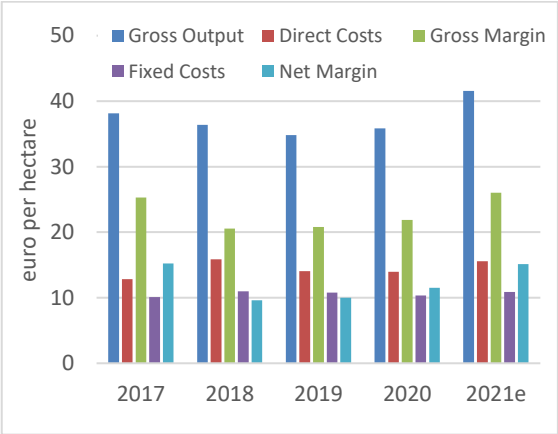


Source: Teagasc National Farm Survey Data and Authors' estimates. Note: e = estimate.

Estimated average gross output per litre in 2021 is shown in Figure 15, on the basis of a 6 percent increase in milk production. Average gross output per litre is estimated to be 41.6 cent per litre in 2021, representing a 16 percent increase on 2020.

See Table A5 (in the appendix) for estimates of output, costs and margins on a per litre basis for a farm that has achieved a 6 percent expansion in milk production in 2021.

Figure 15: Average Gross Output, Costs & Margins per litre for Irish milk production in 2017-2020 and estimates for 2021



Source: Teagasc National Farm Survey Data and Authors' estimates. Note: e = estimate.

4. Dairy Outlook for 2022

For the purposes of this analysis, a 2 percent increase in total Irish milk production in 2022 is forecast, with no change in the dairy enterprise's land base. Even though the forecast increase in production is lower than in recent years, production costs are forecast to increase substantially due to significant input cost inflation.

4.1 Outlook for Input Expenditure 2022

In this analysis of likely changes in production costs in 2022, for simplicity it is assumed that the average farm produces 2 percent more milk in 2022 than it did in 2021. This is in line with the forecast increase in Irish national milk production in 2022.

4.1.1 Feed - usage and price 2022

Irish animal feed prices are driven by a combination of Irish cereal harvest prices (for the previous year and current year) and the prices of imported feed. Irish cereal prices at harvest 2021 were up by between 21 and 33 percent on the 2020 level. Whilst the EU-27 balance sheet for wheat, barley and maize production was up by 4.5 percent on the previous year, what is probably most important to highlight is the change in the stocks to use ratio for individual crops.

On the international balance sheet there was a decline in the stocks/use ratio for wheat, and only a slight increase in stocks to use ratios for barley and maize. Furthermore, there was also an increase in demand for wheat and maize in the EU, which have contributed to relatively low ending stock positons

for both crops. These factors have contributed to the increase in prices at harvest 2021 compared to 2020.

Feed prices in 2022 will depend in part on cereal prices for harvest 2022, but the main determinant will be harvest prices in 2021. On a monthly basis there has been upward movement in feed prices over the course of 2021, with prices in early 2022 set to be higher than at the outset of 2021. Cereal prices at harvest 2022 are forecast to increase further on 2021 prices harvest prices. Averaging across the full year, feed prices are forecast to increase by 6 percent in 2022 relative to the average price for 2021.

The volume of dairy feed used in Ireland increased significantly in 2021 on a per head basis. Ordinarily, with the assumption of normal weather in Ireland in 2022, and with a 2 percent increase in milk production forecast, feed volume requirements per head for grassland enterprises would be expected to remain largely unchanged in 2022. However, fertiliser prices are forecast to be at unprecedented high levels in 2022 (as detailed in Section 4.1.2). It is assumed that feed use will therefore increase as the cost of producing grass and silage will rise sharply. It is assumed that feed use volume therefore will increase by 10 percent on a per farm basis in 2022. With dairy cow numbers likely to increase further, the increase in feed use per head would be smaller. Overall, expenditure on concentrate feed is estimated to increase by 14 percent on a per litre basis in 2021.

4.1.2 Fertiliser & Contracting Costs– usage and price 2022

Fertiliser prices have been on the increase over the second half of 2021 due to exceptionally high natural gas prices, which has led to reduced fertiliser production. It seems likely that these high fertiliser prices will persist into the growing season in 2022 and possibly thereafter. For 2022 as a whole fertiliser prices are forecast to increase by 120 percent compared with the 2021 level. On the assumption of normal weather, it is forecast that fertiliser use in 2022 will decline by 15 percent relative to the 2021 level, in response to the exceptionally high prices. With fertiliser prices rising sharply and with some decline in usage, this would mean that the total expenditure on fertiliser in 2022 would increase by 87 percent on a per hectare basis.

Due to high fuel prices and other inflationary pressures, an increase in agricultural contracting charges is forecast in 2022. If high fertiliser prices persist right through 2022, it is possible that less silage will be made, which could reduce the amount of silage contracting that takes place. Overall, this would leave total pasture and forage costs per hectare up about 40 percent in 2022 relative to 2021.

4.1.3 Electricity and Fuel – usage and price 2022

As of November 2021, prospects for the US$/euro exchange rate in 2022 are not clear. For the purposes of this outlook, a rate of $1.13 to the euro is assumed for 2022, an appreciation of the US$ of 4 percent on the 2021 average level of $1.18. An analysis of futures prices indicates that Brent crude oil could average just over US$79. This would represent an increase of about 11 percent on the 2021 level.

At a US$/euro exchange rate of $1.13, the forecast annual Brent crude oil price for 2022 would be €70 pb, which would leave the annual average Brent crude oil price up 16 percent in euro terms in 2022 relative to the average for 2021. Given that there will also be an increase in the carbon tax in 2022, this suggests that there would be an increase of about 16 percent in farm level fuel prices in 2022 compared with the average for 2021. Electricity prices are forecast to increase in 2021. This would mean expenditure per hectare on electricity and fuel in 2021 would be up 14 percent.

4.1.4 Other Direct and Fixed Costs – usage and price 2022

Projections relating to the macroeconomy in 2022 are conditioned by a significant unknown, in the form of COVID-19. In 2021 COVID-19 has had a large negative impact on employment in Ireland. However, as of November 2021 the unemployment rate had fallen sharply as most activities in the economy reopened. In spite of COVID-19, the Irish economy grew strongly in 2021, reflecting the export oriented nature of economic activity in Ireland. Employment in Ireland is projected to continue to recover in 2022, but unemployment will remain above pre COVID-19 levels (ESRI, 2021).

An increase in wage rates in 2022 of 3 percent is forecast. The increase in general inflation affecting other farm costs in 2022 is forecast to be 2 percent on a per hectare basis.

At an overall farm level, fixed costs on dairy farms are forecast to increase slightly in 2022.

4.1.5 Estimate of Total Input expenditure for 2022

Overall, direct costs per hectare are forecast to increase by a little over 21 percent in 2022, with a 19 percent increase on a per litre basis. Fixed costs are forecast to increase by over 6 percent on a per hectare basis. Overall, total production costs per hectare are forecast to increase by 15 percent per hectare in 2022.

4.2 The Outlook for Dairy Markets in 2022

Dairy market prospects for 2022 are uncertain, particularly on the demand side. Prices have increased considerably in Q4 of 2021 and are expected to remain elevated into Q1 2022. Thereafter the outlook is more uncertain and prices could weaken from the recent high levels as 2022 progresses.

EU milk production is likely to continue to increase in 2022 by 0.6 percent (0.8mt). Although EU dairy cow numbers are likely to continue to fall in 2022, the contraction in cow numbers should be more than offset by stronger growth in milk yields (European Commission, 2021).

For 2022, latest forecasts suggest a further 1.1 percent (1 mt) increase in US milk production. This increase would reflect a combination of increased milk yields and a growth in cow numbers (USDA, 2021).

There has been a relatively poor start to the 2021/22 milk production season in New Zealand due to adverse weather conditions. As a result it is less likely that there will be any growth in New Zealand milk production in the short term. An increase of 0.5 percent (0.1 mt) in 2022 may occur.

Recent international dairy product demand has been strong, but may reflect some stock building on the part of customers to ensure security of supply, suggesting that demand could ease in 2022. Given the high level of dairy commodity prices as we enter 2022, even with some reduction in price over the year it could still leave dairy commodity prices for the full year in 2022 on a par with the average for 2021.

Therefore, it is forecast that the annual average Irish milk price in 2022 will be unchanged on the 2021 level, giving to an annual average milk price (actual fat and protein vat inclusive) of about 40.6 cent per litre in 2022.

4.3 The Outlook for Milk Production in 2022

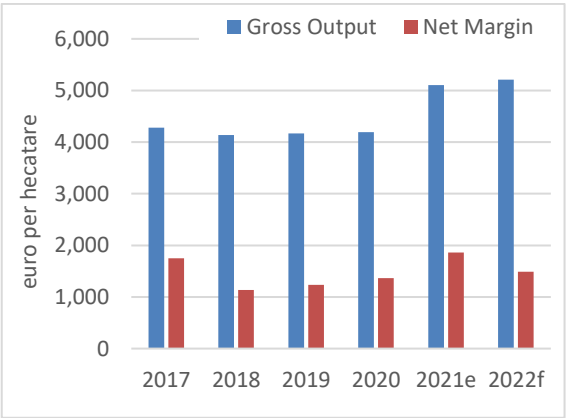
Irish milk production continued to rise in 2021, by about 6 percent. This increase was driven by an increase in dairy cow numbers and yield growth. Even though the milk price outlook for 2022 is quite positive, cost pressures will be substantial and reduced levels of fertiliser usage seem likely in order to contain cost increases and the pressure on margins. Therefore, just a 2 percent increase in milk production is forecast for 2022, with a further increase in cow numbers offset by marginally lower yields.

4.4 The Outlook for Dairy Enterprise Net Margins in 2022

This section considers the impact of changes in milk prices and production costs on gross and net margins on dairy farms in 2022. Price increases for feed, energy, and in particular fertiliser, are forecast for 2022. A 2 percent increase in milk output per hectare is assumed for 2022.

In 2022, profitability per hectare, as measured by net margin on the average dairy farm, is forecast to fall by about 20 percent. Average net margin per hectare is estimated to be €1,863 for 2021, but is forecast to fall to €1,487 in 2022, as illustrated in Figure 16.

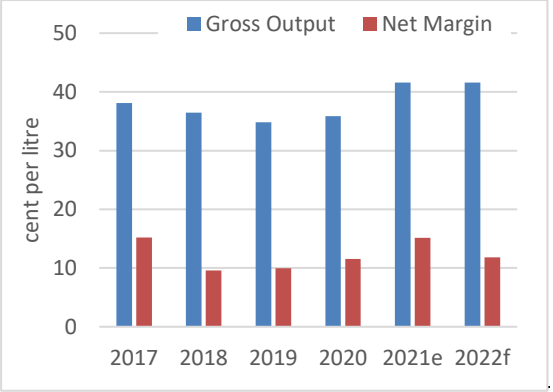
Figure 16: Average Gross Output and Net Margin per hectare for 2017 to 2021 with Forecast for 2022



Source: Teagasc National Farm Survey Data and Authors' estimates. Note: e = estimate f= forecast.

Figure 17 presents a margin forecast on a per litre basis for the average dairy farm, based on a 2 percent increase in milk production in 2022.

Figure 17: Average Gross Output and Net Margin per litre in Ireland 2017 to 2021, with Forecast for 2022



Source: National Farm Survey Data (Various Years) and Authors' estimates. Note: e = estimate f = forecast.

Given the forecast of an average milk price in 2022 in line with the 2021 level, the sharp increase in production costs in 2022, mean that gross and net margins are forecast to fall significantly in 2022. Net margin per litre is forecast to decrease by 22 percent in 2022, to an average of 11.81 cent per litre.

5. Concluding Comments

Production costs increased in 2021, but this increase in costs was more than offset by a sharp increase in milk prices and a further 6 percent increase in milk production.

There was a major increase in net margin per hectare and per litre of milk produced in 2021. On average, it is estimated that dairy enterprise net margin per hectare increased by 37 percent in 2021 to €1,863.

In 2022 the annual average milk price is forecast to remain in line with the 2021 level. On the assumption that normal weather is experienced in 2022, the high price of fertiliser is likely to lead to a reduced level of usage as a cost control strategy. In relative terms, concentrate feed will be cheaper in comparison with grazed grass and feed usage may increase as a result. Overall, a substantial increase in production costs in 2022 seems inevitable.

These cost pressures may mean that there is weaker milk growth in Irish milk production in 2022. It is forecast that total production costs will rise by about 13 percent to just under 30 cent per litre. The average net margin per hectare and per litre in 2022 are likely to be down 21 and 23 percent respectively on the 2021 level at €1,487 per hectare and 11.81 cent per litre.

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Table A1: Average Gross and Net Margin of Milk Produced in 2019 and 2020

	2019	2020	% Change
	cent/litre		
Total Gross Output	35.10	35.84	2.1%
Concentrate Costs	5.87	5.65	-3.7%
Pasture and Forage Costs	4.81	4.59	-4.7%
Other Direct Costs	3.50	3.70	5.9%
Total Direct Costs	14.18	13.94	-1.7%
Gross Margin	20.92	21.90	4.7%
Energy and Fuel	2.23	2.06	-7.5%
Labour	0.61	0.56	-7.7%
Other Fixed Costs	8.03	7.74	-3.6%
Total Fixed Costs	10.86	10.36	-4.6%
Net Margin	**10.05**	**11.54**	**14.7%**

Source: Teagasc National Farm Survey Data

Table A2: Average Net Margin per hectare* in 2019 and 2020

		2019	2020	% Change
Milk Produced	litres/ha	11,890	11,698	-1.6%
Total Gross Output	€/ha	4,192	4,193	0.0%
Total Costs	€/ha	2,941	2,826	-3.9%
Net Margin	€/ha	**1,251**	**1,367**	**9.3%**

* Hectare of forage area allocated to the dairy enterprise
Source: Teagasc National Farm Survey Data

Table A3: Costs and profit (cent per litre) for Top, Middle and Bottom one-third of farms in 2020

	Top	Middle	Bottom
		cent per litre	
Concentrate Feeds	5.06	5.35	6.53
Pasture & Forage	4.35	4.37	5.03
Other Direct Costs	3.52	3.69	3.90
Energy & Fuel	1.71	2.04	2.43
Labour	0.90	0.34	0.46
Other Fixed Costs	7.53	7.75	7.95
Total Costs	23.06	23.54	26.29
Net Margin	14.02	11.99	8.63

Source: Teagasc National Farm Survey Data

Table A4: Output and profit per hectare for Top, Middle and Bottom one third of farms in 2020

		Top	Middle	Bottom
Stocking rate	cows/ha	2.49	2.08	1.63
Milk sold	litres per ha	15,128	11,746	8,265
Concentrates fed per cow	kg	1126	1,104	1,162
Concentrates fed per litre of milk produced	kg	0.182	0.191	0.224
Gross output	€ per ha	5,590	4,150	2,857
Direct Costs	€ per ha	1,984	1,612	1,292
Gross Margin	€ per ha	**3,606**	**2,537**	**1,565**

Source: Teagasc National Farm Survey Data

Table A5: Average Gross and Net Margin per litre of Milk Produced 2019-2022

	2019	2020	2021e	2022f
	cent per litre			
Total Gross Output	35.10	35.84	41.57	41.57
Concentrate Costs	5.87	5.65	6.88	7.86
Pasture and Forage Costs	4.81	4.59	5.05	6.94
Other Direct Costs	3.50	3.70	3.64	3.67
Total Direct Costs	14.18	13.94	15.56	18.47
Gross Margin	20.92	21.90	26.01	23.10
Energy and Fuel	2.23	2.06	2.29	2.60
Hired Labour	0.61	0.56	0.55	0.56
Other Fixed Costs	8.03	7.74	8.05	8.13
Total Fixed Costs	10.86	10.36	10.89	11.29
Total Costs	25.04	24.31	26.45	29.77
Net Margin	10.05	11.54	15.12	11.81

Source: Teagasc National Farm Survey Data. Figures for 2021 are estimates, Figures for 2022 are forecasts.

Cattle Farming in 2020
Average performance

Irish Cattle Slaughter
1.882 million head (up 1.6%)

Live Exports
265,000 head (down 11.1%)

Irish Suckler Cow Numbers
0.92 million (down 4.2%)

Weanling purchase price
average €804/head (up 0.6%)

Male Store purchase price
average €919/head (up 0.9%)

Female Store purchase price
average €814/head (down 2.4%)

Male Finished Animals Price
average €1,380 per head (down 0.2%)

Female Finished Animals Price
average €1,210 per head (up 1.3%)

Gross Margin
(Single Suckling)
average €463 per hectare (up 9.5%)

Gross Margin
(Cattle Finishing)
average €478 per hectare (up 0.4%)

Stocking Rate (Calf to Weanling)
average of 1.22 LU/ha (down 0.6%)

Stocking Rate (Calf to Store)
average of 1.45 LU/ha (up 0.9%)

Stocking Rate (Calf to Finishing)
average of 1.56 LU/ha (up 3.6%)

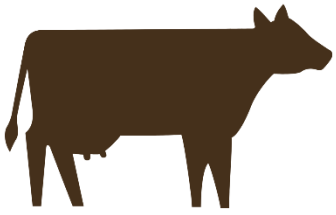
Stocking Rate (Cattle Finishing)
average of 1.47 LU/ha (up 4.3%)

Concentrate Fed/LU
(Cattle Finishers)
average 611 kg (down 6.7%)

Slaughter Weight/Head
average 336.6 kg (up 0.6%)

Total Production Costs
(Single Suckling)
average €1,005 per hectare (down 1%)

Total Production Costs
(Cattle Finishing)
average €1,111 per hectare (up 1.1%)



Source: Teagasc National Farm Survey, Central Statistics Office and Dept. of Agriculture, Food and the Marine

Irish Cattle Farming in 2021

R3 Steer price
up 12% on the 2020 level

Weanling and Store prices
up 8% and 9% respectively

Stable beef calf prices
no change on the 2020 level

Weather Conditions
Relatively normal weather

Grass Availability
Lower than normal over the summer period

Fertiliser Prices
up 10% on the 2020 level
Fertiliser Use
no change on the 2020 level

Feed Prices up 16% on 2020
Feed use up 4% on 2020

Other Direct Costs
up 2% on the 2020 level

Fuel prices
up 20% on the 2020 level

Total Input Costs
up 7% on the 2020 level

Gross Margin (Suckler)
up 4% on the 2020 level
Gross Margin (Finisher)
up 9% on the 2020 level

Source: Teagasc Estimates for 2021 and Forecasts for 2022

Irish Cattle Farming in 2022

R3 Steer prices
no change on the 2021 level

Weanling and Store prices
down 3% on the 2021 level

Lower beef calf prices
down 3% on the 2021 level

Weather Conditions
Normal weather assumed

Grass Availability
normal conditions

Fertiliser Prices up 120% on the 2021 level
Fertiliser Use down 20% on the 2021 level

Feed Prices up 6% on 2021
Feed use up 3% on 2021 (Cattle Finishing)

Other Direct Costs
up 3% on the 2021 level

Fuel prices
up 15% on 2021 level

Total Input Costs
up 13% on the 2021 level

Gross Margin (Suckler)
down 22% on the 2021 level
Gross Margin (Finisher)
down 10% on the 2021 level

Review of Cattle Farming in 2021 and Outlook for 2022

Jason Loughrey and Kevin Hanrahan

Agricultural Economics and Farm Surveys Department, Teagasc

Fertiliser Expenditure Assumptions for 2022:

At the time of writing, in December of 2021, an unprecedented escalation in fertiliser prices has occurred. There is considerable uncertainty as to whether fertiliser prices will remain at elevated levels for the duration of the 2022 production year and what the farmer response to these price changes might mean for the level of fertiliser usage in 2022. Therefore, it is necessary to set out assumptions in relation to the fertiliser price and farmer response to these price changes.

- It is assumed that fertiliser prices will stay at their elevated price levels, observed in December 2021, until at least the end of Q2 2022.
- It is assumed that fertiliser prices, for use on grassland, will be 120 percent higher in 2022, compared to 2021.
- It is assumed that cattle farmers will reduce fertiliser application rates in response to the forecast fertiliser price increases. For the purpose of this paper it is assumed that cattle farmers will reduce fertiliser application by 20 percent in 2022, compared to 2021.
- In attempting to compensate for the likely reduction in grass yield, associated with reduced fertiliser application, it is assumed that concentrate feed per head will increase by 3 percent on cattle finishing enterprises in 2022 compared to 2021. This volume of concentrate feed use is 7 percent above the levels reported in 2020.
- It is assumed that no change in concentrate feed use per head takes place on cattle rearing farms between 2021 and 2022. However, the estimated level of concentrate use will still be 4 per cent higher than the levels reported in 2020.
- These forecasts are based on the assumption of normal weather conditions prevailing in 2022.

1. Introduction

This paper presents estimates for the returns from cattle production in 2020. The paper contains a review of the economic performance of Irish cattle farms in 2020 based on data provided by the Teagasc National Farm Survey (Donnellan et al. 2021).

Finished cattle prices increased significantly in 2021 relative to 2020. In 2021, average steer prices and average heifer prices increased by 12 percent. Finished cattle prices reached levels previously observed during the H1 2015. Prices for store animals and weanlings increased by approximately 9 per cent and 8 per cent respectively.

Input prices increased significantly during 2021 with rising prices particularly evident for fertiliser, motor fuel, electricity and concentrate feeds. These rising input costs affect all cattle farms in Ireland but the extent of the direct impact will vary between different cattle farming enterprises.

In 2021, the volume of prime cattle slaughtered decreased by 3.5 percent relative to 2020. This decline is largely due to a decline in the slaughter of heifers. The average weight of finished prime cattle decreased by 1 percent relative to 2020. The volume of cows slaughtered decreased in 2021. As a result, total national beef production decreased by approximately 5 percent in 2021. The total volume of prime beef production is therefore significantly lower in 2021 relative to 2020.

In 2021, the adoption of online bidding technologies became more evident as marts combined online bidding with in-person bidding in the delivery of live cattle auctions. The adoption of online bidding technologies has supported a steady mart trade throughout 2021. In comparison to recent years, finished cattle prices were much less volatile in

2021. This price stability has supported a steady demand for forward store cattle and particularly during the second half of the year.

Grass-growing conditions varied during the course of 2021. Relatively cold weather in April and May reduced grass growth rates with improvement in June. Grass-growth rates were relatively low during the remainder of the summer. However, favourable weather conditions emerged in late autumn and promoted better grass cover entering the winter months. Overall, grass-growing conditions influenced the demand for concentrate feed with an estimated 3 percent increase in the quantity of concentrates for the average Cattle enterprise.

The average gross margin on Single Suckling farms are estimated to have increased by 4 percent in 2021. However, large increases in energy prices have offset the improvement in gross margins. The average Single Suckling enterprise are estimated to have earned an average negative net margin of -€30 in 2021. The gross margin per hectare on the average Cattle Finishing enterprise is estimated to have increased by 9 percent in 2021 with an estimate of €522 per hectare. Increases in energy prices have contributed to rising overhead costs. On average, Cattle Finishing farms are estimated to have earned negative net margins in 2021. The average Cattle Finishing enterprise net margin is estimated to be -€36 per hectare in 2021. This represents a marginal improvement on the average of -€50 per hectare in 2020.

Margins on cattle farms in Ireland are influenced by beef supply and demand. The per capita quantity demand for beef in the EU is estimated to be lower in 2021 (European Commission 2021). EU beef supplies declined in 2021 and are forecasted to decline further over the short to medium term. The dynamics behind the recent decrease can be attributed to various factors including the increasing milk yields of the EU dairy cow herd.

In the United Kingdom, data shows an increase in UK beef retail consumption since the onset of the COVID-19 pandemic. This increase in retail beef consumption is offsetting the impact of reduced foodservice activity. In 2021, UK consumer prices for sirloin/rump steak increased after a number of years of declining prices (Office for National Statistics 2021a). This is a positive development for the beef sector in Ireland given the importance of exports to the UK.

At a global level, there continues to be an important shift in the demand for beef. In 2021, the domestic consumption of beef and veal is estimated to have increased by 3.5 percent in China but declined in the European Union and Argentina with more significant declines in Brazil. Global consumption of beef and veal is unchanged in 2021 relative to 2020 (USDA, 2021).

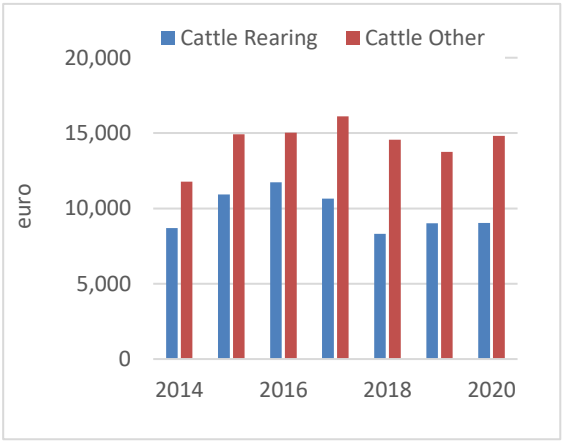
Global beef demand is expected to grow slightly in 2022 with China, Brazil and India contributing to rising consumption levels and helping to underpin global beef prices (USDA, 2021). Global production of beef is expected to increase by 0.5 percent in 2022. Beef production in China is expected to increase by 2.5 percent (USDA, 2022). The forecast increase in global meat production is also driven by developments in Brazil and India with declines forecast for the United States.

Unless stated otherwise, all figures referred to in this paper are in nominal terms and all enterprise output and profit estimates exclude the value of decoupled income support payments and are expressed per hectare.

2. Review of the Economic Performance of Beef Farms in 2020

The trends in average family farm income (FFI) for the two types of cattle farms identified in the Teagasc NFS over the period 2014 to 2020 are shown in Figure 1. In 2020, the average FFI on Teagasc NFS *Cattle Other* farms increased by 8 percent compared with 2019 levels while the average FFI on Teagasc NFS *Cattle Rearing* farms was unchanged in comparison with 2019 levels.

Figure 1: Average Family Farm Income on Cattle Rearing and Cattle Other Farm Systems: 2014 to 2020



Source: 2020 Teagasc National Farm Survey (2021)

In this year's enterprise analysis, we continue to present results based on the two way categorisation of Irish cattle enterprises: Single Suckling and Cattle Finishing enterprises first used in Breen and

Hanrahan (2012) and the Teagasc NFS cattle enterprise fact sheets (Teagasc, 2021a and 2021b).

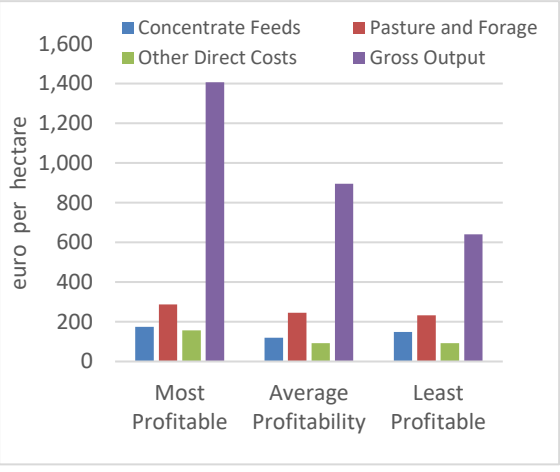
Single Suckling enterprises in the analysis that follows are enterprises with more than 10 cows, while the Cattle Finishing enterprises analysed are those with more than 10 livestock units where more than 70 percent of the animals sold off the farm were sold for slaughter. In total, these two enterprises were present on more than 40,000 farms nationally.

2.1 Irish Beef Enterprise Performance in 2020

This section discusses the cost structure of Single Suckling and Cattle Finishing enterprises in Ireland. Farms with these enterprises have been ranked on the basis of gross margin earned per hectare and each farm enterprise group has been broken into three equally sized sub-groups, which we have termed farms that are least profitable, those that have average profitability and those that are most profitable.

Single Suckling: In 2020, the average direct cost of production per hectare for Single Suckling enterprises varied from €473 per hectare, on those farms with the lowest average gross margin to €618 per hectare on the top third of profitable farms (see Figure 2). The cost of concentrate feed, along with the cost of pasture and winter forage typically accounts for approximately 80 percent of the direct costs of production on these farms. The average expenditure on concentrate feed varied from €119 per hectare on the middle third of farms to €174 per hectare on the most profitable farms.

Figure 2: Variation in Total Production Costs and Gross Output on Single Suckling enterprises in 2020



Source: 2020 Teagasc National Farm Survey (2021)

There was considerably more variability in the average gross output per hectare between the least profitable and most profitable farms. The most profitable third of Single Suckling enterprises earned an average gross output of €1,406 per hectare, compared with an average gross output of €641 per hectare on the least profitable one third of Single Suckling enterprises. This variability in average gross output is largely due to higher average stocking on the more profitable farms. In 2020, the most profitable Single Suckling enterprises had an average stocking rate of 1.75 livestock units (LU) per hectare compared with 1.11 LU per hectare on those Single Suckling enterprises with the lowest levels of profitability.

The capacity of farms to operate at high stocking rates is limited by the quality of the land farmed. In 2020, 65 percent of the most profitable Single Suckling enterprises farmed very good soils, whereas the proportion of the least profitable Single Suckling farms on very good soils was considerably lower at 22 percent.

The most profitable one third of Single Suckling enterprises in 2020 had an average gross output per hectare that was over 100 percent higher than the average output per hectare on the least profitable one third of enterprises, while average direct costs per hectare were just 30 percent higher.

Cattle Finishing: The second cattle enterprise category analysed is the Cattle Finishing enterprise. The enterprises analysed were again ranked on the basis of gross margin per hectare and assigned to three equally sized groups termed *least, average* and *most profitable*.

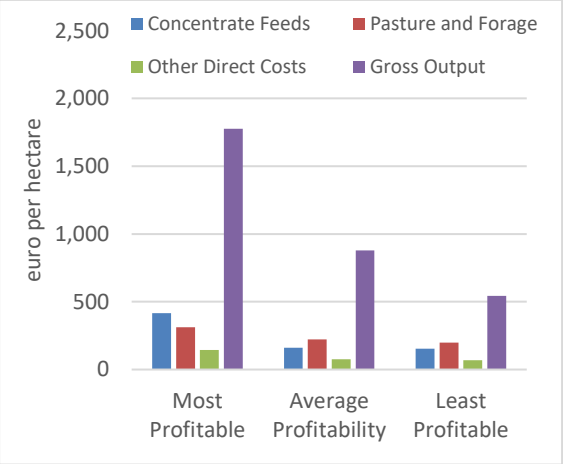
Average direct costs of production per hectare were highest on the most profitable farms and lowest on those farms with lower levels of profitability (see Figure 3). Total expenditure on concentrate feed is substantially higher on Cattle Finishing enterprises than on Single Suckling enterprises. The most profitable one third of Cattle Finishing enterprises had a gross output of €1,777 per hectare compared with €544 per hectare on the least profitable Cattle Finishing enterprises.

Relative to the Single Suckling enterprise, there is a larger degree of heterogeneity in gross output per hectare across the Cattle Finishing enterprises analysed. This diversity reflects the differing levels of production intensity on these farms. The average stocking rate on the least profitable Cattle Finishing enterprises was 1.05 LU per hectare, while the average stocking rate on the most profitable one

third of Cattle Finishing enterprises was 2.02 LU per hectare.

In general, more profitable Cattle Finishing enterprises were on farms with better soil, 80 percent of the most profitable Cattle Finishing enterprises farmed very good soils, while 52 percent of the least profitable farms farmed very good soils.

Figure 3: Variation in Total Production Costs and Gross Output on Cattle Finishing Enterprises in 2020



Source: 2020 Teagasc National Farm Survey (2021)

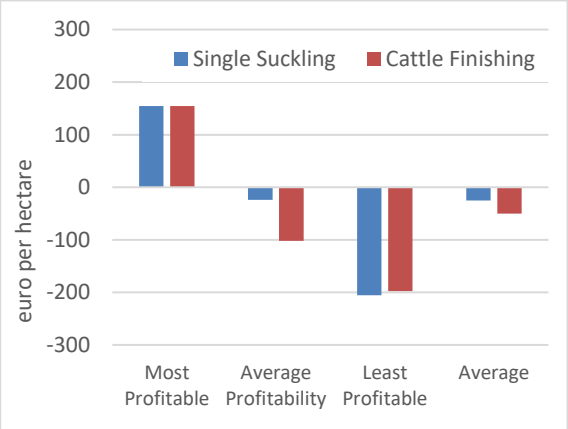
The results presented in Figure 2 and Figure 3 highlight the differences in costs per hectare on Single Suckling and Cattle Finishing enterprises. However, it is important to recall that there is even greater variation in gross output across different farm enterprises. While higher levels of gross output per hectare are in general associated with high levels of direct costs of production and farming on better than average soils, the difference in technical performance and productivity between the top one third and bottom one third of Cattle Finishing enterprises remains striking.

Average overhead costs per hectare on the Cattle Finishing and Single Sucking enterprises were €528 and €489 per hectare respectively (see Appendix Table A1 and Table A2 at the end of this paper). On a whole farm basis, the total overhead expenditures tend to be higher on Cattle Finishing enterprises due to the relatively larger farm size.

On Single Suckling farms, the net margins improved significantly in 2020 relative to 2019. In 2020, the dis-improvement in the performance of the Cattle Finishing enterprises can largely be attributed to rising overhead costs and the narrowing in the gap between purchased weanling prices and finished cattle prices. On average, Single Suckling enterprises in 2020 earned a better net margin per hectare relative to the average Cattle Finishing enterprise. However, an average negative net margin is reported for both enterprises in 2020.

Figure 4 shows the net margins earned on the two cattle enterprises analysed and illustrates that in 2020 only the most profitable one thirds of Single Suckling and Cattle Finishing enterprises earned positive net margins and that the level of these margins was relatively low.

Figure 4: Cattle Enterprise Net Margins per hectare in 2020



Source: 2020 Teagasc National Farm Survey (2021)

3. Estimated Performance of Irish Cattle Farms in 2021

This section of the paper presents a review of the economic performance of Irish cattle enterprises in 2021. A discussion of the estimated changes in input usage and input costs in 2021 is first presented and this is followed by a discussion of estimated changes in output value. Estimates of margins earned by Single Suckling and Cattle Finishing enterprises in 2021 are then presented.

Estimates for 2021 margins are based on relatively small changes in the intensity of production per hectare on the average cattle finishing farm. The impact of changes in the intensity of production on individual enterprises would be expected to vary from farm to farm. In some cases, a change in intensity may increase profitability, in others it could give rise to lower margins. In 2021, aggregate production of beef decreased in Ireland. Suckler cow inventories declined in 2021 relative to 2020 (DAFM 2021c).

3.1 Estimated Input Usage and Price 2021

3.1.1 Feedstuffs

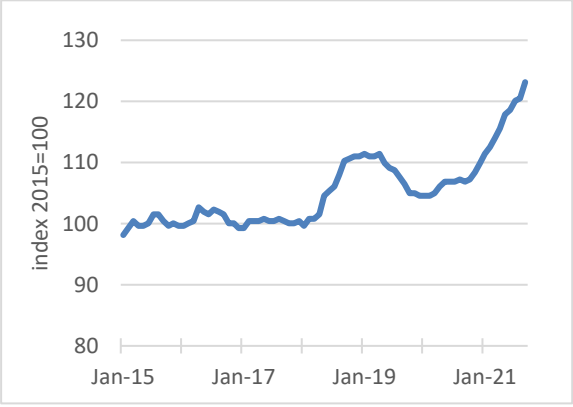
Purchased feed is an important element of the direct costs of beef production in Ireland. Typically this cost item accounts for approximately 30 percent of total direct costs on Single Suckling enterprises and 45 percent of direct costs on Cattle Finishing enterprises.

Weather conditions varied during 2021 with relatively cold weather conditions during April and May leading to lower than normal rates of grass-growth. Relatively high temperatures in the autumn supported grass cover towards the end of the year. Over 2021 as a whole, rainfall levels were significantly lower in the eastern counties relative to most other parts of Ireland.

The less favourable grass growing conditions in 2021 contributed to slightly higher volumes of concentrate feed purchases by Irish beef farmers. The aggregate volume of purchased feed used by Irish cattle farms in 2021 is estimated to have been higher than in 2020. Overall, it is estimated that feed use per head increased by three percent in 2021 relative to 2020.

Figure 5 presents the CSO monthly price index for cattle feed stuffs for the period January 2015 to September 2021. In September 2021, cattle feed prices were 15 percent higher relative to the prices reported in September 2020. For 2021 as a whole and accounting for the final quarter of the year, we estimate that cattle feed prices increased by 16 percent relative to 2020.

Figure 5: Monthly Price Index of Cattle Meal in Ireland 2015 to 2021



Source: CSO (2021)

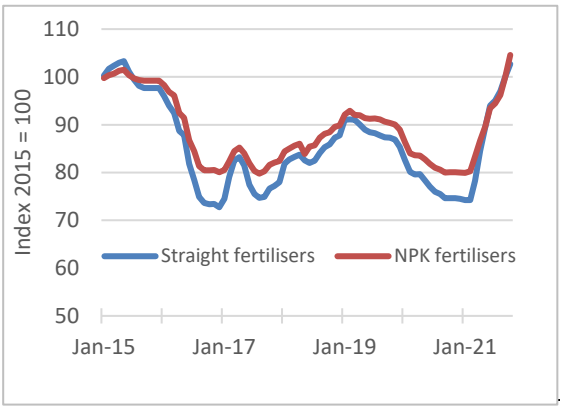
With relatively small changes in livestock numbers on a per hectare basis, we estimate that expenditure on concentrates by cattle finishing farms in 2021 increased significantly relative to 2020.

3.1.2 Fertiliser in 2021

Figure 6 presents monthly data on fertiliser prices since 2015. Fertiliser prices declined in 2020 but have increased dramatically during 2021. The large increase in Irish fertiliser prices means that overall fertiliser expenditure on Irish cattle farms are significantly higher in 2021.

The first six months of the year tend to be the most important in terms of fertiliser purchases. A continuation of rising fertiliser prices into the first half of 2022 will therefore have major implications for the costs of production on cattle farming systems.

Figure 6: Monthly Price Index of Fertiliser in Ireland from 2015 to 2021



Source: CSO (2021)

3.1.3 Energy and Fuel in 2021

In 2021, the average price for Brent crude oil will be about US $71 per barrel (pb), which represents an increase of approximately 69 percent on the average oil price in 2020. For 2021 as a whole, there was a 3.5 percent decrease in the value of the euro against the US dollar compared with its 2020 level. This depreciation of the euro accentuated the rise in oil prices when expressed in euro terms.

As a result of the increase in oil prices and the inelastic nature of farmer demand for fuel, fuel expenditure on Irish cattle farms is estimated to have increased by approximately 20 percent in 2021 relative to the 2020 level. The smaller decrease in farm level fuel costs as compared to crude oil prices reflects the impact of taxes and other activity along the energy supply chain.

While no official data on contractor charges exists, we estimate that for 2021, farmer contracting charges on cattle farms will have increased by 7

percent compared to 2021. When combined with higher expenditure on fertiliser, this means that overall expenditure on pasture and forage by cattle farmers in 2021 is estimated to have been higher relative to 2020. Electricity prices are estimated to have increased by 10 per cent in 2021. Motor fuel prices are estimated to have increased by approximately 20 percent thereby increasing machinery operating costs and total overhead costs during 2021.

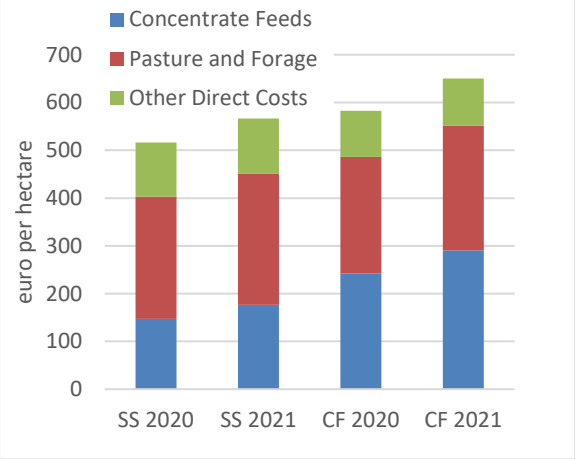
3.1.4 All Other Direct and Overhead Costs– usage and price 2021

Wages in Ireland are estimated to have increased by 3 percent in 2021; however, given the low usage of hired labour on Irish cattle farms, this development does not have a major impact on costs of production. Increased veterinary costs contribute towards an estimated 1 percent increase in other direct costs for 2021.

3.1.5 Estimate of Total Direct Costs for 2021

Figure 7 compares the average direct costs of production for the Single Suckling and Cattle Finishing enterprises in 2020 with the estimated direct costs for 2021.

Figure 7: 2020 Direct Costs and Estimated 2021 Direct Costs for Single Suckling (SS) and Cattle Finishing (CF) Enterprises



Source: Teagasc National Farm Survey (2021) and Author's Estimates

On average, total direct costs increased by 10 percent on Single Suckling farms and by 12 percent on Cattle Finishing farms. Higher fuel costs in 2021 contributed towards increasing overhead costs. The overall costs of production in 2021 are estimated to have increased by 7 percent on Single Suckling farms and by 9 percent on Cattle Finishing farms.

3.2 Estimated Output Values 2021

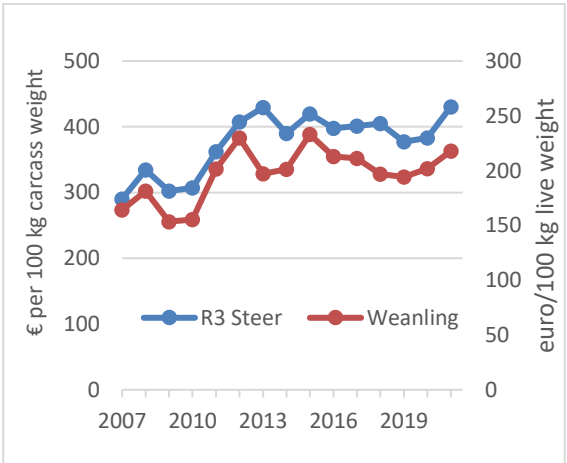
The value of gross output on Single Suckling enterprises is estimated to have increased in 2021, with higher prices for young cattle observed throughout most of 2021 and particularly during the early autumn. The average Gross Output will be higher than the levels observed in 2020. In 2021, the value of output per hectare on Single Suckling farms is estimated to be €1,049.

The value of gross output on Cattle Finishing enterprises is estimated to be higher in 2021 relative to 2020. The market value of output is influenced by the price of cattle sold and cattle purchased. The price of purchased cattle (weanlings and stores) increased further in 2021 relative to 2020. However, the rate of price increase was notably higher for finished cattle and this increased gross output on cattle finishing farms.

Steer and heifer prices increased by 12 percent in 2021 relative to 2020. In 2020, the Beef Finishers payment contributed to Gross Output. This payment did not occur in 2021. In 2021, the value of output per hectare on Cattle Finishing farms is estimated to be €1,173.

Figure 8 presents average R3 steer and weanling prices for the period 2007 to 2020 and an estimate for 2021. The weanling price refers to the value of bullocks in the 300-349 kg weight bracket.

Figure 8: Irish Cattle Prices 2007 to 2021



Source: DG Agri. and CSO; * Author's estimate 2021.

The estimated average R3 base steer price for 2021 of around €430/100kg (Including VAT) represents a 12 percent increase on the price level in 2020. The estimated average weanling price (300-349kg) is estimated to be approximately 8 percent higher in 2021 relative to 2020.

The decline in UK beef production is one of the likely factors influencing the increase in beef prices in 2021. During the first ten months of 2021, beef production in the UK decreased by approximately 4 per cent relative to the same period in 2020 (DEFRA 2021). The decline in UK beef production was therefore much greater in percentage terms than the decline at the EU level.

In our estimates and forecasts for 2021 and 2022, we have incorporated the payments made to cattle farmers under the Government's Beef Finishers Payment (BFP), Beef Data Genomics Programme (BDGP) and Beef Environmental Efficiency Programme - Suckler (BEEP-S) schemes. The payments under many of these schemes are contingent on farmers undertaking specified measures.

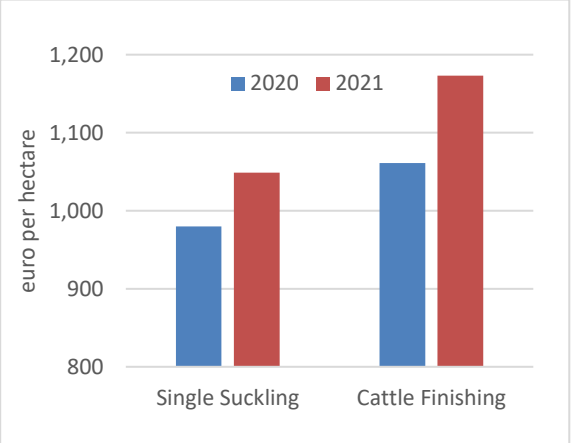
In 2021, the average Gross Output on Irish cattle farms continued to be supported by the BDGP and the BEEP-S schemes. These two schemes contribute to our estimates of gross output value in 2021. We estimate that coupled payments will provide €87 per hectare in 2021 to the average Single Suckling enterprise. This estimate represents the situation for all cattle rearing farmers. However, some cattle farmers with suckler cows are not participating in these schemes and receive no payments on a per hectare basis. Some farmers may be participating in one of these schemes. For recipients of these schemes, the actual payments per hectare are therefore significantly larger than the average estimates suggests.

Total BDGP payments were approximately €41.5 million in 2020 with 22,696 participating farmers (DAFM 2021b). For this analysis, we have estimated that the average suckler farmer will receive a payment of €46 per hectare from the BDGP in 2021 and 2022.

As in the case of the BDGP programme, the BEEP-S scheme accounts for suckler cows farmed by participating farmers. In the BEEP-S scheme, costs may be incurred by participating farmers e.g. weighing cattle, and these costs may vary by herd size and according to the availability on farms of weighing scales. Taking all available information into account, we have assumed that the average suckler farmer will earn an additional €41 per hectare from the BEEP-S programme in 2021 and 2022.

Gross output per hectare in 2021 was on average higher on Cattle Finishing enterprises than on Single Suckling enterprises. This largely reflects the higher stocking density per hectare on these farms. The average level of gross output per hectare for Cattle Finishing enterprise in 2021 is estimated to be €1,173 (an increase of 10 percent on the level in 2020).

Figure 9: 2020 Gross Output for Single Suckling (SS) and Cattle Finishing (CF) Enterprises and Estimate for 2021



Source: 2020 National Farm Survey (2021) and Author's Estimates 2021

There is a large degree of variation in the value of gross output per hectare between the least profitable, average profitability and most profitable groups of Cattle Finishing enterprises. Table A2 shows that the most profitable Cattle Finishing enterprises are estimated to have produced an average level of gross output per hectare (€1,777 per hectare) that was 320 percent higher than the average value of output per hectare on the least profitable group of Cattle Finishing enterprises (€544 per hectare).

3.3 Beef Enterprise Margin Estimates for 2021

As shown in Figure 7, the estimated expenditure on concentrate feed by finished cattle enterprises increased in 2021. On both the Single Suckling and Cattle Finishing enterprises, the expenditure on pasture and forage costs increased significantly in 2021. Total direct costs on both enterprises are estimated to have increased in 2021.

On Single Suckling enterprises in 2021, the margins are similar relative to 2020 and the average net margin therefore remains negative. Single Suckling enterprises in 2021, are on average estimated to have earned a negative net margin of - €30 per hectare and farmers that are not participating in the BDGP or BEEP-S are likely to have incurred larger negative net margins.

For the average Cattle Finishing enterprise, gross margins are estimated to have increased in 2021 due to the increase in price for finished cattle during the summer months. Cattle Finishing enterprises are estimated to have earned an average negative net margin of - €35 per hectare.

Table A1 and Table A2 decompose the Single Suckling and Cattle Finishing population into 3 groups of equal number on the basis of profitability (gross margin per hectare) and presents estimates of gross output, direct costs, gross margin and net margin for 2021.

For both the Cattle Finishing and Single Suckling enterprises, only the top one third of farmers are estimated to have earned positive net margins in 2020. For both the Cattle Finishing and Single Suckling enterprises, the middle and bottom third of farmers experienced negative net margins. This highlights the persistent profitability challenges in Irish beef production.

4. Outlook for 2022

In this section, we forecast the expenditure for various input items and the beef price that is most likely to prevail in 2022. We provide an estimate of the incomes from the production of cattle in 2022.

4.1 The Outlook for Input Expenditure

4.1.1 Feedstuffs in 2022

Global cereal and oilseed futures market prices point to some increase in feed prices in 2022. Cereal and other feed ingredient input prices began increasing in H2 2020 with much more significant price increases in 2021. The 2021 harvest price for cereals and oilseeds will affect the price of feed in the back end of 2022. At this stage, our estimate for world cereal and oilseed prices in 2022 is for a very significant increase relative to 2021.

Cattle feed prices are forecast to be 6 percent higher in 2022 with a 3 percent increase in feed volume on Cattle finishing enterprises. The increase in feed use is largely attributed to the situation on the top third of Cattle finishing enterprises. Our forecast is for an average 10 percent increase in overall feed expenditure on Cattle Finishing enterprises. It is estimated that a 6 percent increase in overall feed expenditure will occur on Single Suckling enterprises during 2022.

4.1.2 Fertiliser in 2022

Given the developments in global supply and global demand, the outlook for international fertiliser prices in 2022 is for prices for most fertilisers to increase sharply relative to 2021 levels. This will mean that fertiliser prices in 2021 are forecast to be on average 120 percent higher than in 2021. In our 2022 forecast, we estimate that on average fertiliser use will be down approximately 20 percent relative to the 2021 level. This is based on the response of farmers to previous episodes of rapidly increasing fertiliser prices particularly with the example of 2008. With higher prices outweighing a reduction in fertiliser usage, our forecast for total expenditure on fertiliser to increase significantly relative to 2021. Total expenditure on pasture and forage by Irish cattle farmers in 2021 are forecast to be higher relative to 2021.

4.1.3 Energy and Fuel in 2022

Fuel costs in 2022 will depend mainly on the evolution of crude oil prices. Current futures prices suggest that crude oil prices will increase in 2022 relative to 2021 prices, leading to a 15 percent increase in fuel prices.

4.1.4 Other Direct and Fixed Costs in 2022

The cost of labour is forecast to increase by 3 percent in 2022. However, on the average Irish cattle enterprises hired labour costs are very small and inflation in labour costs is not expected to have a major impact on costs of production. General inflation is likely to be higher than during most recent years and lead to an increase in other direct costs of 3 percent. Other overhead (fixed) costs are forecast to increase by 2 percent in 2022.

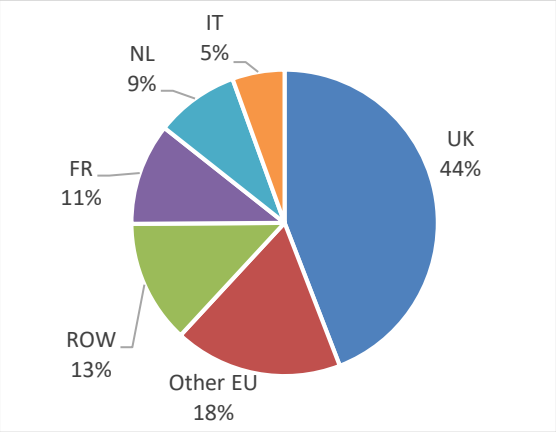
4.2 The Outlook for Cattle and Beef Markets 2022

Ireland exports close to 90 percent of its beef production (CSO 2021b). Conditions in markets to which Irish beef and cattle are exported largely determine Irish cattle prices; though supply developments in Ireland can cause Irish cattle prices to deviate from export market prices over the short run.

Figure 10 illustrates the destinations of Irish beef exports in 2021 (year to end of August). The dominance of the UK in Ireland's beef exports is clear. The continued dominance of the UK largely reflects the proximity and relative profitability of the UK as an export destination despite the exit of the UK form the EU. The UK has stated that in 2022 it will begin the process of introducing requirements for customs declarations and checks on imports of

goods from the EU including beef products. It remains to be seen whether during 2022 the introduction of customs declarations and physical and documentary checks in UK ports will occur and significantly affect UK demand for Irish beef.

Figure 10: Estimate of Irish Beef Export Markets by Volume in 2021



Source: Eurostat COMEXT, January to August (2021)

The share of exports to the rest of the world (ROW) remains significant with North America and the Philippines contributing to this share of exports. This ROW share remains relatively high despite the suspension of exports to China. A resumption of beef exports to China and a continuation of the growth in beef exports to the South-East Asia region can contribute to the demand for Irish beef over the medium to longer term.

Exports to EU markets have increased in recent years. In the medium-term, consumer demand for beef in other EU27 member states will increasingly determine Irish cattle prices. The demand for beef is declining in the EU (European Commission 2021). At the same time, there is evidence of rising consumer prices for beef within some EU member states. In France, significant increases are observed for consumer beef prices (INSEE France 2021a, 2021b). In Germany, beef and veal prices have increased in 2020 and 2021 (Federal Statistics Office Germany 2021). A similar pattern is evident in Italy (ISTAT 2021). In the Netherlands, there is evidence of rising beef and veal consumer prices between 2016 and 2020 with stable prices in 2021 (Statistics Netherlands 2021).

In the UK, the pattern in consumer prices has changed in 2021. According to the Office for National Statistics, the average consumer prices for steak and mince increased in 2021 after five years of declining prices (ONS 2021a; ONS 2021b). However, survey data indicates that shoppers in Britain are expressing an increasing preference for British origin premium beef products relative to product sourced from outside of Britain (AHDB 2021a).

In the UK, the evidence shows that the consumer demand for beef follows a seasonal pattern with rising demand for steaks during the summer months with mince and roasting joints more popular at other times of the year (AHDB 2020). Recent analysis indicates that consumers in Britain have increased consumption of steaks and roasting joints between 2019 and 2021 (AHDB 2021b). The increase in demand for higher value cuts is positive for beef prices in Ireland and the UK.

In 2021, beef prices in the UK increased in sterling terms and to an even greater extent in euro terms. Sterling strengthened notably against the Euro in 2021 as a response to the EU–UK Trade and Cooperation Agreement. This also appears to be having positive implications for beef prices in Ireland.

In Ireland, the domestic consumption of beef is a small proportion of domestic production. The consumer price for beef in Ireland plays a very limited role in influencing Irish beef prices at the farm level given the dependence of the beef sector on exports. However it is worth noting that beef consumer prices were declining in Ireland during 2020 and 2021 (CSO 2021c). This contrasts with the situation in other Western European countries.

In the short run, the outlook for prime beef supplies in Ireland are determined by the current inventories of animals aged 1-2 years. Data from the Department of Agriculture, Food and the Marine (DAFM) AIMS database provide insights into developments in these inventories. Inventories for animals aged 12-24 months of age are significantly higher than the levels observed 12 months previously. Overall, we forecast an increase of 2 percent in beef production on a per hectare basis for 2022.

In the rest of the EU, supplies of cattle for slaughter in 2022 are likely to be lower than 2021. Overall EU production of beef in 2022 is forecast to be approximately 0.9 percent lower in 2021 (European Commission 2021).

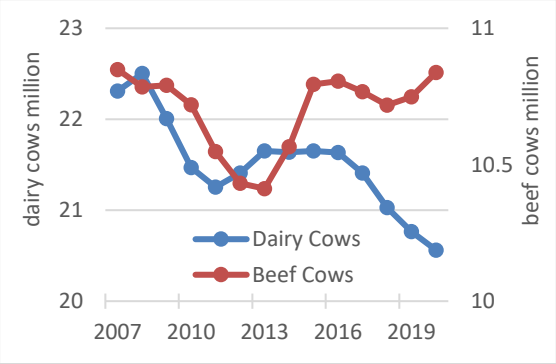
In the UK, the inventories for animals aged 12-24 months of age are similar in June 2021 relative to June 2020 (DEFRA 2021). This points to no significant change in UK beef production during H1 2022. The number of cattle aged less than 12 months is slightly higher in 2021 relative to 2020

and this may have some implications for UK beef production towards the end of 2022. Overall, no major changes in UK beef production are expected in 2022.

In the medium term (beyond 2021) inventories of breeding animals are the key determinant of beef supply. Figure 11 illustrates the recent trends in dairy and beef cow inventories in the EU (readers should note that the different scales on right and left axes). In anticipation of the abolition of milk quotas in April 2015, the numbers of dairy cows in the EU increased, however low levels of profitability in recent years has effectively reversed this trend.

Dairy cows account for approximately two thirds of the stock of cows in the EU. Under the CAP, many Member States have introduced coupled direct payments related to both numbers of dairy and suckler cows and these policy measures will mitigate the impact of on-going low levels of profitability on cow numbers.

Figure 11: EU27 Cow Numbers 2007 - 2020



Source: Own elaboration based on Eurostat (2021)

Our forecast is that the average price for finished cattle in 2022 will be equal to the levels observed in November 2021. A rise in domestic supply in Ireland will place some downward pressure on prices during the course of 2022 but as currently prices in export markets will remain the key determinant of Irish price levels. The overall EU supply and use balance projected for 2022 suggests that current price levels are unlikely to be reduced. The ongoing but slow contraction in domestic use of beef in the EU is in 2022 likely to be more than matched by contraction in aggregate EU beef supply. There is a risk of price volatility in 2022 and particularly during Q1 as countries seek to emerge from current COVID restrictions.

Notwithstanding the recent increase in input prices, cattle farmers in Ireland have benefitted from increasing consumer demand in 2020 and 2021 with rising consumer prices in key export markets contributing to higher farm-level prices.

In 2022, there may be some anticipation that the rise in costs at the farm-level will pass-through into retail prices and subsequently farm-level output prices. Recent peer-reviewed research has emphasised the importance of the duration and persistence of the input price increase and the precise source (Davidson et al 2016). The duration of the input price increase will become clearer during the course of 2022 with possible implications for pass-through in H2 2022 and the medium term. However, the scale and timing of any pass-through will depend on macroeconomic factors, exchange rates and the microeconomics of consumer decision-making. It can be noted that consumer prices for beef in Ireland and the UK are still below historical highs. However, this is not the case in other key export destinations where consumer prices have already reached historically high levels (INSEE 2021a; Rabobank 2021).

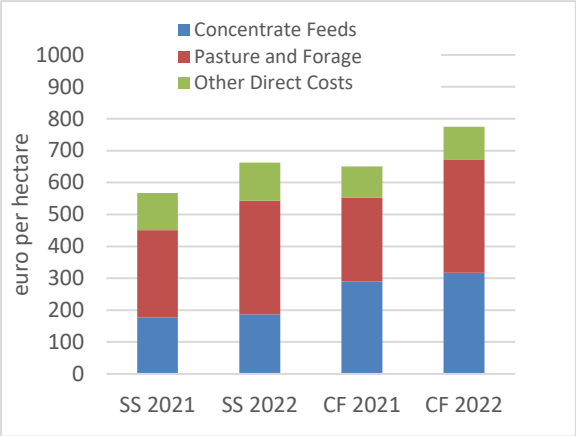
Ultimately, cattle farmers in Ireland will face significant challenges in 2022 in terms of cash-flow and farm income with off-farm income becoming even more important in the economic sustainability of the farm household despite our forecast stability in Irish beef prices in 2022.

In 2022, the increase in costs is expected to squeeze margins on Cattle Finishing enterprises. This is likely to translate into a reduced demand for the purchase of weanlings and store animals. Our forecast is that prices for weanling and store cattle will therefore decrease by 3 percent in 2022 relative to the 2021 levels. Gross output for the average Single Suckling enterprise is therefore forecasted to be lower relative to the estimated 2021 levels.

4.2.1 Outlook for Beef Enterprise Net Margins in 2022

Figure 12 compares the estimated and forecast average direct costs per hectare in 2021 and 2022 for the Single Suckling and Cattle Finishing enterprises. On both enterprises, the pasture and forage expenditures are expected to be significantly higher in 2022. The increase in the price of fertiliser is the main contributing factor. Concentrate feed prices are forecast to increase by 6 percent with some increase in the quantity of concentrated feed usage on Cattle Finishing farms. Expenditures on concentrate feed are forecast to be 10 percent higher on Cattle Finishing enterprises and 6 percent higher on Single Suckling enterprises in 2022.

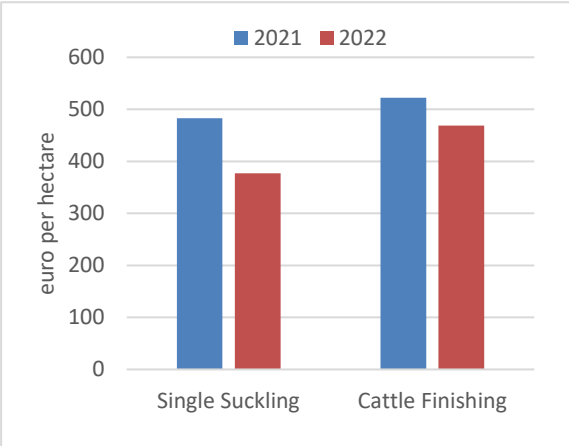
Figure 12: Estimated Direct Costs for 2021 and Forecast Direct Costs for 2022



Source: Author's Estimates 2021 and Forecasts 2022

Figure 13 shows the estimated gross margin on both cattle enterprises in 2021 and the forecasted gross margins for 2022. For 2022, the average gross margin for the average Single Suckling enterprise is forecasted to decrease by approximately 22 percent. The gross margin for the average Cattle Finishing enterprise is forecasted to decrease by approximately 10 percent.

Figure 13: 2021 Gross Margin for Single Suckling (SS) and Cattle Finishing (CF) Enterprises and Forecasts for 2022



Source: Author's Estimates for 2021 and Forecasts for 2022

Net margins on average Cattle Finishing farms are forecast to decrease significantly in 2022, with a forecast average negative net margin of -€117 per hectare. Net margins for the Single Suckling enterprise are forecast to also decrease in 2022. On the Single Suckling enterprise, a negative average net margin per hectare of €157 is forecast.

5. Concluding Comments

The beef sector in Ireland continues to meet the challenges of the COVID-19 pandemic and many of these challenges are set to continue into 2022. In addition, the recent sharp rise in input prices is challenging the economics of beef production in the short-term with implications for cash-flow, farm incomes and viability.

In 2021, there were mixed outcomes in relation to incomes on cattle farms in Ireland. On most cattle farms, the rise in output prices was offset by the impact of rising input prices. It should be noted that the Beef Finishers Payment (BFP) provided financial assistance in 2020. This form of exceptional aid did not occur in 2021.

The lack of improvement in financial margins is particularly evident for the bottom third of cattle farms where economic performance appears particularly challenging. Our estimates indicate that the average cattle finishing enterprise received a higher net margin in 2021 relative to 2020. However, this improvement is largely due to the performance of the top third of cattle finishing enterprises. This improvement occurred despite the absence of the BFP payment in 2021.

Overall, the average Cattle Rearing farm has a similar income in 2021 compared to 2020. In the Cattle Other system, there appears to be no overall change in the average farm income although there is some variability within this broad cattle production system. Some farms with a cattle finishing enterprise have gained. Other farms selling weanlings and stores to the marts have experienced no improvement in farm income. It should be noted that the BFP played an important role for this system in 2020.

Prices for younger cattle increased in 2021 following significant increases in the autumn of 2020. In 2021, prices for finished steers and heifers increased to an even greater extent. Overall, the gap between factory sales prices and purchased mart prices widened in 2021. This development particularly favoured cattle finishing enterprises. The BEEP-S and BDGP schemes continued to support gross output and gross margins particularly on Single Suckling farms.

Feed costs played a significant role in influencing farm incomes in 2021 and particularly in the final months of the year. We estimate a significant increase in feed expenditure on both Cattle Finishing and Cattle Rearing farms.

In 2021, we estimate that the net margin earned on the average Cattle Finishing enterprise remained negative at approximately €35 per hectare. In addition, we estimate that the net margin earned on the average Single Suckling enterprise remained negative in 2021 at approximately €30 per hectare.

Our forecast for 2022 is for no change in Irish finished cattle prices. The likelihood is that young cattle prices will come under pressure due to the rising costs associated with the operation of cattle finishing enterprises.

This outlook is based on the assumption that the euro-sterling exchange rate remains at the mid-November 2021 level. Exchange rate developments in 2022 could have some bearing on the extent to which the Irish price developments diverge from average EU price developments. The beef sector in Ireland continues to depend on the UK market. A further strengthening of sterling in 2021 could lead to a more optimistic outcome for Irish cattle prices. However, it should be noted that such a development while positive from an output value perspective would also likely lead to some offsetting increases in some input prices.

The levels of profit forecast for both Cattle enterprises in 2022 are significantly lower than the averages observed over the period 2015-2021. The profitability of the average Single Suckling and Cattle Finishing enterprise, when decoupled direct payments are excluded, has for most of the recent past been negative. While the top one third of both Single Suckling and Cattle Finishing enterprise often earn positive net margins, most enterprises are persistently failing to cover their costs of production with the value of output sold. This on-going lack of profitability reflects the structure of the industry and its high costs.

An urgent challenge continues to face the wider Irish beef industry in developing new markets for Irish beef that will reduce the dependence of the industry on the UK market that has traditionally been Ireland's second "home" market. Consumer prices for beef in the UK are rising but there appears to be an increasing preference among UK consumers for beef sourced in Britain.

Throughout 2020 and 2021, public health has taken priority in the response to the COVID-19 pandemic. The delivery of vaccines for COVID-19 has impacted positively on economic activity in 2021 but there remain challenges entering 2022 with restrictions evident across Europe and further afield.

Prospects for the Irish beef industry in 2022 will also depend on the duration of the increase in input prices and the possibility of pass-through occurring at some point. This outlook has highlighted the implications of the forecasted increase in input prices under the forecast of no change in output price. The implications of this development are severe in the short-term and will place significant pressure on finances on cattle farms in Ireland.

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Table A1: 2020 and Estimated 2021 Financial Performance per hectare: Single Suckling Enterprise

	Most Profitable	*Average Profitability*	*Least Profitable*	*Average*
		euro per hectare		
Gross Output 2020	1,406	895	641	980
Direct Costs 2020	618	458	473	517
Concentrate Costs	174	119	148	147
Pasture and Forage Costs	288	246	233	256
Other Direct Costs	156	93	92	114
Gross Margin 2020	787	437	168	463
Overhead Costs 2020	633	461	373	489
Net Margin 2020	154	-24	-205	-25
Gross Output 2021	1,504	957	690	1,049
Direct Costs 2021	676	501	521	567
Concentrate Costs	209	143	178	176
Pasture and Forage Costs	308	263	249	274
Other Direct Costs	159	95	94	116
Gross Margin 2021	828	456	168	483
Overhead Costs 2021	665	484	392	513
Net Margin 2021	**163**	**-28**	**-224**	**-30**

Source: Teagasc National Farm Survey Single Suckling Enterprise Fact Sheet 2020 (Teagasc NFS, 2021a) and Authors' Estimates 2021

Table A2: 2020 and Estimated 2021 Financial Performance per hectare: Cattle Finishing Enterprise

	Most Profitable	Average Profitability	Least Profitable	Average
		euro per hectare		
Gross Output 2020	1,806	945	473	1,061
Direct Costs 2020	874	460	421	583
Concentrate Costs	417	160	153	242
Pasture and Forage Costs	312	223	198	244
Other Direct Costs	145	77	70	97
Gross Margin 2020	932	486	52	478
Overhead Costs 2020	748	521	321	528
Net Margin 2020	183	-35	-269	-50
Gross Output 2021	2,010	1,042	523	1,173
Direct Costs 2021	983	509	467	651
Concentrate Costs	500	192	184	291
Pasture and Forage Costs	334	238	212	261
Other Direct Costs	148	78	71	99
Gross Margin 2021	1,027	533	56	522
Overhead Costs 2021	772	537	331	558
Net Margin 2021	255	-4	-275	-36

Source: Teagasc National Farm Survey Cattle Finishing Enterprise Fact Sheet 2020 (Teagasc NFS, 2021a) and Authors' Estimates 2021

Table A3: Forecast 2022 Single Suckling Enterprise Financial Performance per hectare

	Average
	euro per hectare
Gross Output 2022	1,039
Direct Costs 2022	662
Concentrate Costs	187
Pasture and Forage Costs	356
Other Direct Costs	120
Gross Margin 2022	377
Overhead Costs 2022	534
Net Margin 2022	-157

Source: Authors' forecast 2022

Table A4: Forecast 2022 Cattle Finishing Enterprise Financial Performance per hectare

	Average
	euro per hectare
Gross Output 2022	1,243
Direct Costs 2022	775
Concentrate Costs	317
Pasture and Forage Costs	356
Other Direct Costs	102
Gross Margin 2022	469
Overhead Costs 2022	586
Net Margin 2022	-117

Source: Authors' forecast 2022

Mid Season Lowland Lamb Factsheet
Average Performance 2020

Irish Sheep Slaughter
3.11 million head (up 2%)

Irish Lamb Slaughter
2.715 million head (up 3.4%)

Sheep Meat Exports
57,000 tonnes cwe (up 4%)

Irish Breeding Sheep
2.78 million (up 12%)
(June 2020)

Lamb price
€517/100kg (up 12.4%)

Lamb Carcass kg per ha
down 6% on 2019 level

Total Production Costs
(Mid Season Lowland)
€136 per ewe (up 1%)
€1,022 per ha (no change)

Gross Margin
(Mid Season Lowland)
€601 per hectare (down 5%)

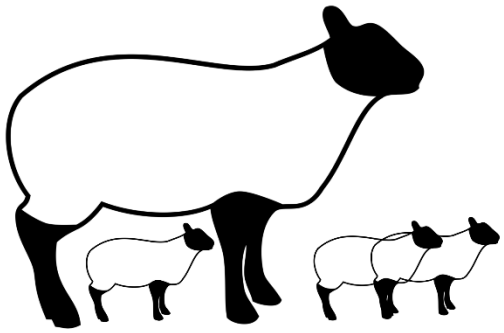
Net Margin
(Mid Season Lowland)
€114 per ewe (down 1%)

Stocking Rate
(Mid Season Lowland)
7.34 ewes/ha (down 5%)

Weaning Rate
(Mid Season Lowland)
1.39 lambs/ewe (up 1.6%)

Lamb Mortality
(Mid Season Lowland)
6% (down 1 percentage point)

Lambs Weaned/ ha
(Mid Season Lowland)
10.07 lambs/ha (down 6%)



Source: Teagasc National Farm Survey 2020 (Final Results) and Central Statistics Office
Note: Percentage changes are relative to 2019

Irish Sheep Farming in 2021

Higher lamb prices
higher price in EU for heavy lamb

Lamb Slaughter
number down 6%

Lamb Prices
up 30%

Weather Conditions
normal

Grass Availability
normal

Fertiliser Prices
up 10% on the 2020 level
Fertiliser Use
up on the 2020 level

Feed Prices up 16% on 2020
Feed use up 21% on 2020

Other Direct Costs
up slightly on 2020

Fuel prices
up on the 2020 level

Total Direct Costs
up 20% on the 2020 level

Gross Margin per ha
(Mid Season Lowland Lamb)
€748 (up 26% on 2020)

Source: Teagasc Estimates for 2021 and Forecasts for 2022

Irish Sheep Farming in 2022

Lower lamb prices
lower price in EU market

Lamb Slaughter
7% increase in lamb slaughter

Lamb prices
down 5% on 2021

Weather Conditions
normal weather assumed

Grass Availability
assumed normal

Fertiliser Prices
up 120% on the 2021 level
Fertiliser Use
down 20% on the 2021 level

Feed Prices up 6% on 2021
Feed use stable

Other Direct Costs
up 3% on the 2021 level

Fuel prices
up on the 2021 level

Total Direct Costs
Up 22% on the 2021 level

Gross Margin per ha
(Mid Season Lowland Lamb)
€634 (down 15% on the 2021 level)

Review of Sheep Farming in 2021 and Outlook for 2022

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Fertiliser Expenditure Assumptions for 2022:

At the time of writing, in December of 2021, an unprecedented escalation in fertiliser prices has occurred. There is considerable uncertainty as to whether fertiliser prices will remain at elevated levels for the duration of the 2022 production year and what the farmer response to these price changes might mean for the level of fertiliser usage in 2022. Therefore, it is necessary to set out assumptions in relation to the fertiliser price and farmer response to these price changes.

- It is assumed that fertiliser prices will stay at their elevated price levels, observed in December 2021, until at least the end of Q2 2022.
- It is assumed that fertiliser prices, for use on sheep farms, will be 120 percent higher in 2022, compared to 2021.
- It is assumed that sheep farmers will reduce fertiliser application rates in response to the forecast higher fertiliser prices. For the purpose of this paper it is assumed that Sheep farmers will reduce fertiliser application by 20 percent in 2022, compared to 2021.
- To compensate for the likely reduction in grass yield, associated with reduced fertiliser application, there may be pressure to increase concentrate feed use per head. However as sheep farmers already increased concentrate feed per head by over 20 percent in 2021, no increase in feed use is assumed for 2022.
- These forecasts are based on the assumption of normal weather conditions prevailing in 2022.

1. Introduction

For this paper, data from farms in the Teagasc National Farm Survey (NFS), which have a mid-season lowland lamb enterprise, are used together with data from the Central Statistics Office (CSO), European Commission DG Agri and Eurostat to analyse the financial performance of Irish sheep farms. Estimates of enterprise margins for 2021 are based on 2020 Teagasc NFS data and on CSO price indices for the year to date (CSO, 2021a) and preliminary CSO estimates for 2021 (CSO, 2021b). Forecasts for sheep enterprise margins for 2022 are based on our estimates of margins for 2021, and our forecasts of input and output price and volume changes in 2022.

We begin the paper with a brief review of the outturn for Family Farm Income (FFI) for the Teagasc NFS mainly sheep farms in 2020. A detailed assessment of the 2020 mid-season lowland lamb enterprise margins is then presented in section 3. This is followed by an overview of the current short term outlook for European and Irish sheep markets in section 4. Estimates and forecasts of margins for the mid-season lowland lamb enterprise for 2021 and 2022 are then presented in sections 5 and 6. The mid-season lowland lamb enterprise is the predominant lowland sheep system in Ireland. In our analysis we have limited the sample analysed to those enterprises with more than 20 breeding ewes.

In our analysis of enterprise margins for 2022 we have assumed that the Sheep Welfare Scheme (SWS) payment will continue in 2022. There has been a change to the reference year for the SWS, bringing the reference year to the higher of either the farmers' existing reference number or their 2017 sheep census return. For any farmer who joined as new entrants the reference year is updated to 2019. This better reflects the level of activity on participants' farms given the passage of time since the introduction of the scheme in 2016. These changes announced in 2021, mean an increased payment for 11,500 farmers under the scheme. As in previous years, there will be an opportunity for new entrants to sheep farming to join the scheme. The extension of the scheme into 2022 and the change to the reference year reflects the Government's commitment to the long-term

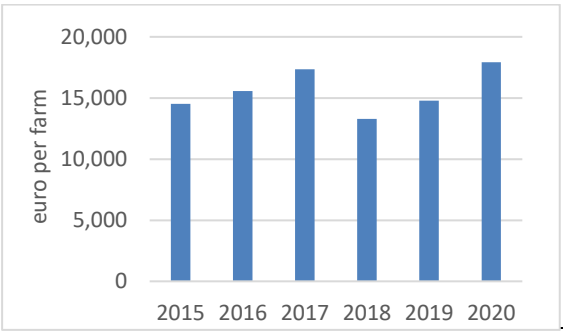
viability of the sheep sector, with funding secured for an additional year of the SWS, which will open in February 2022. As in 2021, we have assumed that the payment will be paid on a per ewe basis, at a rate of €10 per ewe. At an average stocking rate of approximately 7 ewes per hectare, this is equivalent to about €70 per hectare. However, based on average actual payments per hectare over the past few years a lower estimate of €45 is applied. This payment is incorporated in estimates of enterprise output for 2021 and forecasts for 2022 as it is linked to production.

2. Review of the Economic Performance of Sheep Farms in 2020

FFI on those farms classified by the Teagasc NFS as *Mainly Sheep* farms increased by 21 percent in 2020, to an average of €17,913. The average FFI earned on these farms for the period 2015 through 2020 is shown in Figure 1.

The increase in FFI on sheep farms in 2020 can be explained by an increase in gross output driven by an increase in prices with increased opportunities for Irish lamb exports. A decline in production costs was another driver in the increase in average FFI in 2020. In terms of direct costs, the largest component expenditure on concentrate feed declined by 8 percent in 2020, to just under €6,500 on average. Total direct costs of production declined by an average of 2 percent while total overhead costs declined by over 3 percent. Overall for 2020, the value of gross output on the average sheep farm increased by 4 percent, driven by increases in lamb and sheep prices.

Figure 1: Average Income on Mainly Sheep Farms in Ireland: 2015 to 2020



Source: Teagasc National Farm Survey (various years)

The mixed nature of most Irish sheep farms means that developments affecting non-sheep enterprise profitability can significantly influence the income performance of sheep farms. It is important to note that farms classified as *Mainly Sheep* include both specialist sheep and also a sub category of farms on which sheep and cattle are combined. Of the total gross output on these mainly sheep farms for 2020 year, just under one third pertains to gross output from the various cattle enterprises. This proportion is down on earlier years where almost one half was attributable to the cattle enterprises, so that *Mainly Sheep* farms have been steadily increasing and retaining their sheep output. For the 2020 year the *Mainly Sheep* farm gross output will also be inclusive of direct payments to farmers under the various schemes, to include the Sheep Welfare scheme.

Direct payments to *Mainly Sheep* farms declined by 3 percent year on year to €18,885 on average. This was due to small reductions across the Basic payment, GLAS and exceptional payments (BFP) on the average sheep farm (with a cattle enterprise) in 2020. For farmers participating in the Sheep Welfare scheme, this typically resulted in a payment of circa €1,000 on average in 2020.

As alluded to earlier, in 2020 the value of cattle output on farms classified as *Mainly Sheep* farms by the Teagasc NFS as a proportion of total farm output declined in percentage terms. While overall farm gross output increased by 4 percent, the absolute value of cattle gross output increased marginally year on year by 1 percent, Crop output value increased by 55 percent year on year, albeit still comprising a small proportion (3 percent) of total farm gross output on these farms. The output value of sheep production remained relatively stable, increasing by 3 percent

In the remainder of this paper we focus exclusively on the mid-season lamb enterprise as the unit of analysis. This allows us to isolate the impact of developments in sheep output prices and related costs of production on the profitability of Irish sheep production. All enterprise margins are exclusive of direct payments that are decoupled from production. However, enterprise margins for mid-season lowland lamb do include coupled payments related to sheep production. In 2021 and 2022, payments to farmers participating in the Sheep Welfare Scheme will boost the value of gross output and margins per hectare.

3. Review Sheep Margins in 2020

Changes in the value of output, costs and gross margin per hectare for the mid-season lowland lamb enterprise in 2020 are shown in Table A1 of the Appendix to this paper. For 2020, the value of

gross output for mid-season lamb enterprises declined marginally by just over 1 percent. The main driver of this output value decline were lower output volume, with higher lamb prices as compared to 2019. The volume of carcass output per hectare decreased by circa 5 percent in 2020, due to a lower percentage of ewes lambed and a lower number of ewes per hectare in 2020. In 2020 the stocking rate of ewes per hectare decreased by 5 percent. When combined with a 1 percent decrease in the weaning rate per ewe, overall estimated lamb carcass per ha decreased by 5 percent.

In 2020, total direct costs per hectare on the average mid-season lamb enterprise increased by 5 percent. Pasture and forage costs increased by 3 percent relative to 2019, while expenditure on concentrate feed increased by 4 percent.

Gross margins in 2020 declined by 6 percent relative to 2019, due to growth in the direct costs of production which outpaced the decline in overhead costs and the lower output value. Gross output value per hectare declined marginally by just over 1 percent which were impacted by a 26 percent decline in coupled payments per hectare compared to 2019 year.

Historically, there has been a wide range in the profitability of sheep farms operating the mid-season lamb system. In part, this range in profitability is reflective of differing agronomic conditions such as soil quality which limit the capacity of some farms to increase their intensity of production

For comparison purposes, in Table A2 mid-season lowland lamb enterprises are ranked on the basis of gross margin per hectare, and assigned to three equally sized groups which we have termed least profitable, average and most profitable. The average levels of output, direct costs and gross and net margin per hectare, as well as indicators of technical performance across these three groups, can then be compared.

The most profitable one third of mid-season lamb enterprises earned an average gross margin per hectare of €1,098 per hectare in 2020, while farms in the bottom group earned an average gross margin of only €200 per hectare. Top producers earned, on average, 5.5 times more per hectare than their counterparts in the bottom group, which is equivalent to the differences as identified in previous years' analysis.

The large difference between the value of output per hectare across the three groups of farms is due to differences in their weaning and stocking rates. Higher levels of technical performance are reflected in an average carcass output per hectare of circa 279 kg on the most profitable mid-season lamb enterprises, versus 142 kg on the least profitable enterprises.

These very large differences in gross margin earned per hectare reflect a large variation in the intensity of production across the farm population, but also differences in direct costs per hectare (see Table A2 in the Appendix). Total direct costs per hectare are highest for the group with the highest level of profitability, but these are only circa 40 percent higher than the costs incurred by the bottom group (€609 versus €429). The total direct costs incurred on top groupings of farms are relatively on par for 2020 versus 2019 year (€609 versus €600), while the bottom grouping direct costs are circa 7 percent lower (€429 versus €461). However total direct costs incurred on middle group of farms increased by 22 percent to €554 in 2020.

When direct costs of production per kg of lamb carcass produced are compared, the impact of different levels of production intensity per hectare are apparent. Direct costs of production per kg of lamb carcass produced on the least profitable farms are over 38 percent higher than on the most profitable. This is an improvement on the previous year where the magnitude of difference was closer to 70 percent.

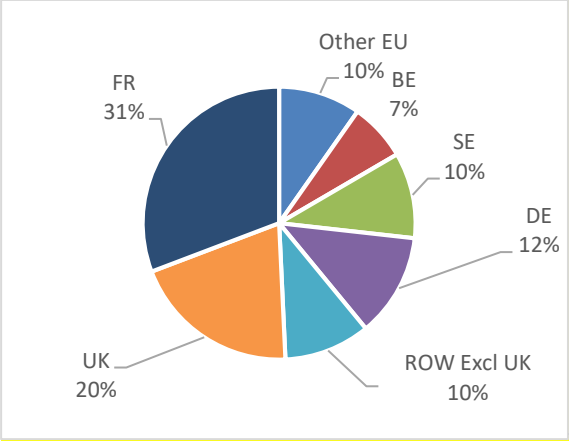
With the decline in gross margin earned in 2020 and with sheep enterprise overhead costs declining, the average net margin for the mid-season lamb enterprise also declined in 2020 to €104 per hectare. This represents a 10 percent decrease on the net margin earned in 2019. As the data in Table A2 indicate, the large variation in gross margin earned per hectare is also reflected in a variation in net margins earned. The most profitable mid-season lowland lamb enterprises, on average, earned a net margin of over €454 per hectare while the least profitable lowland lamb enterprises had on average negative net margins (i.e. losses) of €115 per hectare.

4. Sheep Meat Markets: Review of 2021 and Outlook for 2022

The bulk of Irish sheep meat production is destined for foreign markets with 57,000 tonnes (cwe) of sheep meat exported. In 2020, well over three quarters of Irish sheep meat production was exported (CSO, 2021d). The reliance on export markets means that understanding the outlook for lamb price developments on Ireland's export markets is critical in assessing the prices that Irish sheep farmers are likely to receive.

Sheep meat exports face an uncertain outlook as economic disruptions from the COVID-19 pandemic continue to impact consumer demand. Despite this, solid fundamentals continue to support demand for Irish sheep and lamb meat exports. France still remains the most important sheep meat export destination in 2021, with exports to that market accounting for the same share as in 2020. On a year to date basis, up to the end September, total exports were down by 4 percent, with exports to almost all destinations declining. Irish sheep meat export destinations in 2021 are illustrated in Figure 2.

Figure 2: Irish Sheep meat Exports (CWE) by Destination – 2021



Source: Eurostat COMEXT database, year to September 2021 (ROW = Rest of World)

In 2021, there was a modest increase in EU sheep meat production influenced by positive sheep prices. While the EU flock size has stayed relatively stable in the last five years, there has been some shifts in production shares between member states.

The EU sheep meat market in 2021 was affected by global supply shortages. A decline in imports, which has not been compensated by greater EU domestic production has resulted in heavy lamb prices being substantially higher in 2021 than in previous years. EU production is projected by the European Commission to grow by a modest 1.3 percent.

Overall EU imports of sheep meat were down in 2021, due to lower shipments from the UK and New Zealand. Frictions in EU trade relations with the UK have heavily influenced EU-UK sheep meat trade. Imports into the EU27 from New Zealand declined due to large increases in shipping costs and the relative attractiveness of East Asian markets (China principally).

In 2020, Ireland ranked 5th in the EU in terms of sheep production, comprising 9 percent of total heads slaughtered. Spain was the largest producer of sheep meat in Europe with a share of 26 percent.

Comparing EU sheep trade with the UK in 2021, exports declined by 30 percent on 2020 (January to July) while imports declined also by 23 percent.

Due to declining UK lamb slaughter and lower adult sheep culling UK sheep meat production is set to decrease by circa 7 percent in 2021 according to AHDB. UK export volumes have as a result also been lower in 2021. Logistical and customs related trade frictions arising as a result of Brexit have also negatively impacted on the volume of UK lamb exports

Imports are important in balancing demand in the UK, both in terms of cuts preferred by UK consumers and the timing of supply. While sheep meat volumes imported in 2020 by the UK from New Zealand and Australia were the lowest for some years, the 2021 year saw an increase albeit from lower levels observed in 2020.

At a global level Australia and New Zealand (NZ) maintain their dominance in 2021 as the largest exporters of sheep and goat products. With global shipping costs expected to remain, the competitiveness of Australian and NZ lamb on the European markets will remain suppressed.

NZ sheep numbers continue to contract, with a further decline of almost 1 percent forecast for 2022. As at 30 June 2021, total sheep numbers are estimated at 25.8 million, down almost 1 percent on the previous June 2020. Record sheep meat prices were experienced in 2021 and the expectation is that prices will stay above the 5 year average in 2022, but are likely to ease from the highs in the last quarter of 2021. Lower NZ sheep production will

assist in providing a price floor for international sheep meat markets in 2022.

In Australia, lamb production will continue to increase in 2022, off the back of an expected 5 percent increase in 2021. Favourable seasonal conditions have supported higher lambing rates. Lower sheep slaughter in 2021, which decreased by 10 percent reflects the re building of the sheep flock, which in turn will support lamb production growth in 2022 and 2023. ABARES forecast that the Australian sheep flock will grow to 68.2 million head by end 2021-22, with sheep meat production increasing by 8 percent (to 680kt)

China (incl. Hong Kong) continued in 2021 to be the largest importer of sheep meat globally. Chinese demand for all red meat has been buoyant in 2021, underpinned by African swine fever (ASF) driven pork shortages and an expanding economy. The impact of ASF on domestic pig herds drove Chinese consumer demand for other proteins, including sheep meat.

The expectation is that the current strong market fundamentals for red meat demand will continue into the 2022 year. China is the leading destination for NZ sheep meat, accounting for over 50 percent of NZ lamb exports and 85 percent of mutton exports. While China has the world's largest sheep flock, accounting for one third of global production, and 95 percent of Chinese consumption is domestically produced the scale of the Chinese market means that its import demand will continue to be a key driver of international markets for sheep meat.

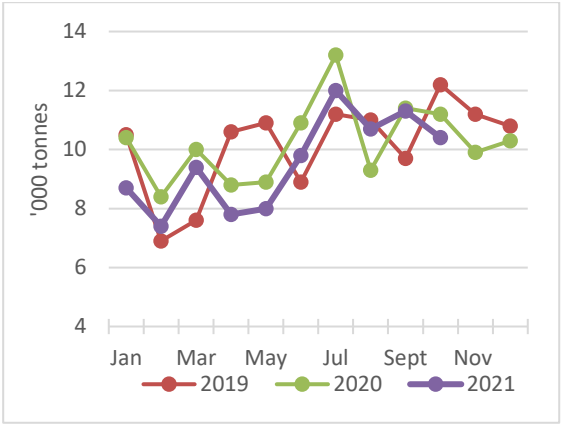
The number of sheep slaughtered in Ireland during the period January to end October decreased by just over 14 percent when compared with corresponding period in 2020.

The number of ewes slaughtered for the year to 15th November 2021 was 6 percent lower than in 2020 (DAFM 2021b), with cumulative lamb/hoggets slaughter down by 12%, while the volume of spring lambs slaughtered was marginally (+2 percent).

Monthly CSO sheep and lamb slaughter data for 2019, 2020 and 2021 are shown in Figure 3. These data are consistent with those reported by DAFM. With throughput in 2021 for the year to the end of October circa 7 percent lower than in 2020.

The June 2021 provisional Crops and Livestock Survey results (CSO, 2021) suggest that breeding inventories at the end of 2021 are likely to be up on those reported for 2020 due to both increased drafting of ewe lambs into the breeding inventory and reduced rates of ewe culling. With higher ending ewe numbers forecast for 2021, lamb production in 2022 in Ireland is forecast to grow in 2022 by more than 4%.

Figure 3: Monthly sheep and lamb slaughterings 2019 - 2021 ('000 tonnes)



Source: CSO Statbank, September 2021

5. Estimated Sheep Gross Margins 2021

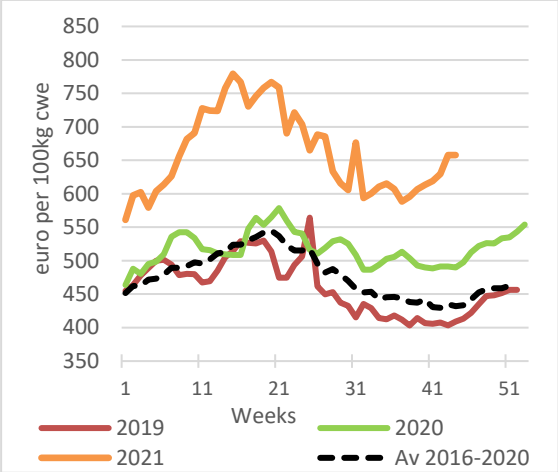
To obtain an estimate of farm profitability for 2021, it is necessary to estimate the volume and price of inputs likely to have been used in producing lambs, as well as the volume and value of the lamb produced. In our estimates for 2021 (and forecasts for 2022) we have assumed that the volume of spring lamb produced per hectare nationally remains unchanged and this is reflected in assumed stability in weaning rates and stocking rates in 2021 and 2022 relative to those observed in 2020. It is also assumed that in 2021 (and 2022) the Sheep Welfare Scheme will add approximately €50 per hectare to the value of gross output on the average mid-season lamb enterprise in 2021.

The level of lamb slaughterings and prices in March and April each year is greatly influenced by the timing of Easter. For 2021 Easter Sunday fell on 4th April, just over a week earlier than in 2020 so that this should be borne in mind when comparing prices.

Irish lamb prices for 2021 began very strongly and for Q1 2020 were circa 40 percent ahead of the same period in 2020 (Figure 4). By Q2, prices on

average were still 35 percent ahead of 2020 price levels.

Figure 4: Weekly Irish Lamb Price, 2019 – 2021, Average 2016-2020



Source: European Commission DG Agri

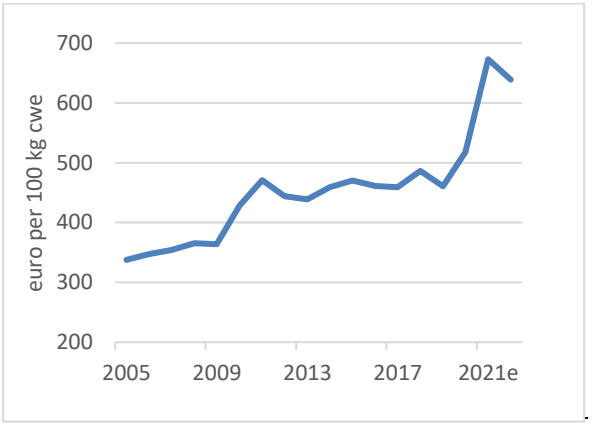
As of the end of November 2021, prices continued to remain over 35 percent higher than in 2020. As is evident from Figure. 4, the 2021 lamb prices when compared to the five year average prices, 2016-2020 (dotted line in graph) are at record levels. When weighted, to take account of throughput, Year to date average prices at the end November 2021 are reported by DAFM to be 27.5% higher than 2020 price levels.

This higher Irish price reflects higher prices in the EU for heavy lamb, which are expected to persist over the remainder of 2021. At the time of going to press, EU average weighted heavy lamb prices are on average almost 35 percent higher than in 2020. In comparison to other years where the seasonal reduction in lamb prices would currently be underway, the 2021 year as reflected in Figure 4 is still well ahead of previous years, showing an upward trend, so that it is estimated that the average prices for 2021 as a whole will be significantly higher than the 2020 level.

Our estimate is that Irish lamb prices in 2021 will be on average close to 30 percent higher than in 2020. While in aggregate output across the sector is back on average 5 percent, this will only marginally reduce the impact of strong prices on growth in sector output value. The volume of lamb output per hectare is assumed to remain stable in 2021. Consequently, our estimated higher lamb price is fully reflected in higher output value per hectare in 2021.

The main direct costs of production for Irish sheep farms are purchased feed, pasture and forage costs. Overall, input costs are estimated to have increased by over one fifth in 2021.

Figure 5: Irish Lamb Price, 2005 to 2021e, 2022f



Source: European Commission DG AGRI and author estimate 2021, forecast 2022

Purchased concentrate feed accounts for 40 percent of total direct input expenditure on the average mid-season lowland lamb system. Over the course of 2021, the trend in feed usage is up by one fifth on average on the 2020 year and this coupled with an estimated increase in concentrate feed prices, of approximately 16 percent, means that concentrate feed costs will be much higher than in 2020 on sheep farms. The Department of Agriculture, Food and Marine feed sales volume data for Q1 2021 show an increase of 17 percent compared to same period in 2020, while data for Q2 and Q3 show an increase of 35 and 18 percent respectively. Overall concentrate costs are estimated to increase by over 40 percent in 2021 on the average mid-season lowland lamb enterprise due to both higher prices and higher volumes of feed used.

Pasture and forage costs typically account for 30 percent of total direct costs on the mid-season lowland lamb system. Fertiliser prices are estimated to have increased by 10 percent in 2021 so that fertiliser costs on sheep farms in 2021 will be above 2020 levels. In our estimates for 2021, we have assumed the volume of fertiliser used by mid-season lowland enterprises in 2021 remains constant. Spending on contracting charges in 2021 is estimated to be circa 10 percent above previous year, with overall expenditure on pasture and forage estimated to have increased by 10 percent, compared to 2020.

In 2021, total direct costs of production on the mid-season lowland lamb enterprise are estimated to

have increased by just over 20 percent on 2020 levels. Fuel and electricity are the main items contributing to overhead cost changes in 2021. Prices of fuel and electricity are both estimated to have increased, with fuel increasing by between 13 and 29 per cent depending on fuel type, while electricity prices have increased by 10 percent. Usage of these inputs on mid-season lowland sheep farms is expected to remain on par with 2020 levels. Overall, overhead costs on the mid-season lamb enterprise are estimated to have increased by over 13 percent relative to 2020.

Higher costs of production coupled with the receipt of payments from the Sheep Welfare Scheme and higher marketed output values in 2021 are estimated to have resulted in significantly higher margins on the average mid-season lowland lamb enterprise.

The average gross margin earned in 2021 is estimated to have increased by over 26 percent to €748 per hectare (see Table A3 in the Appendix). The receipt of payments from participation in the Sheep Welfare Scheme boosted the estimated gross margin earned from the mid-season lowland lamb enterprise in 2021. In the absence of this coupled payment, the estimated increase in gross margins would have been closer to 19 percent.

Increases in overhead costs in 2021 mean that the enterprise net margin on the mid-season lowland lamb enterprise is also estimated to have increased strongly, with the net margin level in 2021 over 123 percent higher than that in 2020. The estimated average net margin per hectare on mid-season lowland sheep farms in 2021 is €232 per hectare.

6. Outlook for the Sheep Enterprise Gross Margin in 2022

In 2022, Irish lamb prices are forecast to decline from the record high levels received in 2021, albeit the price levels forecast will still remain above recent years' price levels. For 2022, prices are forecast to decline by 5%. Continental EU markets account for the majority of Irish lamb and although economic disruptions from the COVID-19 pandemic continue to impact consumer demand, tight global markets for sheep meat and export demand for Irish sheep are forecast to support Irish lamb at close to current price levels.

The outlook for input expenditure in 2022, from the perspective of Irish sheep farmers, is less positive than in 2021. Prices of the key inputs to sheep production are forecast to increase substantially. The volume of most inputs used in 2022 is forecast to remain unchanged (on a per hectare basis), but owing to the large forecast increase in fertiliser prices volumes used will decline by circa one fifth. Total direct and overhead costs of production are forecast to increase substantially relative to 2021.

Concentrate feed prices are forecast to increase in 2022. The volume of feed use is forecast to remain comparable with 2021 levels, when volume used increased by over 20 percent so as to meet the additional Easter demand and in response to what were exceptionally high prices. Overall expenditure on concentrates in 2022 is forecast to increase by 6 percent.

The price of fertiliser is forecast to increase dramatically in 2022, with prices forecast to increase by over 120 per cent on 2021 average price levels. Expenditure on contractor charges is also expected to also increase, with charges forecast to increase by 10 percent in 2022. Overall, pasture and forage costs on Irish lowland mid-season lamb enterprises are forecast to increase by up to 70 percent in 2022.

Table A3 (in the Appendix) summarises our forecasts of output, costs and margins for the mid-season lamb enterprise for 2022. Given the less positive outlook for lamb prices in 2022, coupled with a forecast increase in direct costs of production, combine to leave the average gross margin earned from sheep farming lower in 2022.

Our forecast for the 2022 gross margin per hectare for the mid-season lamb system is €634 per hectare, a 15 percent decline on our 2021 estimate. In 2022, as in 2021, margins earned on the mid-season lowland lamb enterprise will continue to be boosted by the receipt of the coupled Sheep Welfare Scheme payment.

Total overhead costs for the average mid-season lamb enterprise are also forecast to increase in 2022. As a result of the forecast increases in input prices for 2022, total costs of production are expected to be 14 percent higher in 2022 than in 2021. With a marginal increase in output value forecast, net margin per hectare for the average sheep enterprise is expected to decrease in 2022 to €88 per hectare.

7. Concluding Comments

The average gross margin earned by mid-season lamb producers in 2021 is estimated to have increased substantially compared to that earned in 2020.

Higher lamb prices resulted in higher gross output values. In 2021 higher output value per hectare more than offset higher total direct costs of production for the 2021 year and gross margins increased by over one quarter on the levels earned in 2020. Direct payment receipts associated with participation in the Sheep Welfare Scheme added to the positive margin story on sheep farms for 2021. This scheme is expected to continue to provide a significant financial boost at the individual farm level in February 2022.

Our forecast is that 2022 Irish lamb prices will be circa 5 percent below 2021 record levels. Output volume is assumed to increase by circa 7% based on 2021 levels due to higher volumes per hectare.

Gross margins earned by the average mid-season lamb enterprise forecast for 2022 is €634 per hectare, a 15 percent decrease on the estimated gross margin for 2021. Average net margins are also forecast to decrease, with the average mid-season lamb enterprise forecast to earn a net margin of €88 per hectare in 2022.

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Table A1: Average Mid-Season Lamb Output, Direct Costs, Gross Margin and Technical Performance

	2020	2021e
	€ per ha	
Gross output	1121	1,384
Coupled Payments (Sheep Grassland/Sheep Welfare)	44	45
Direct Costs	529	637
Concentrates	223	313
Pasture and Forage costs	146	161
Other direct costs	160	163
Gross Margin	592	748
Overhead Costs	488	516
Net Margin	104	232
Ewes per ha	7.3	7.3
Lambs per ewe	1.4	1.4
Lamb Carcass (kg) per ha	202	202

Source: Teagasc National Farm Survey and Authors' estimates for 2021
Note: In calculating the volume of lamb carcass output per hectare an average carcass weight of 20 kg has been used (Hanrahan, 2006)

Table A2: Mid-Season Lamb Output, Costs, Margins and Technical Performance in 2020 by gross margin grouping

	Most Profitable	Average Profitability	Least Profitable
		€ per ha	
Gross Output	1,707	1,053	629
Direct Costs			
Concentrates	220	272	179
Pasture and Forage	189	139	112
Other Direct Costs	200	143	138
Gross Margin	1,098	499	200
Net Margin	454	-14	-115
Ewe per ha	9.13	7.31	5.41
Lambs per ewe	1.53	1.34	1.31
Lamb carcass (kg) per ha	279	196	142
Dir. costs € per kg carcass	2.18	2.83	3.02

Source: Teagasc National Farm Survey
Note: In calculating the volume of lamb carcass output per hectare an average carcass weight of 20 kg has been used (Hanrahan, 2006).

Table A3: Average Mid-Season Lamb Enterprise Costs, Output, Gross and Net Margin, 2020 – 2022f

-	2020	2021e	2022f
		€ per ha	
Total Direct Costs	529	637	774
Concentrates	223	313	332
Pasture and Forage	146	161	275
Other Direct Costs	160	163	167
Gross Output	1,121	1,384	1,407
Sheep Grassland /Sheep Welfare Payment	44	45	45
Gross Margin	592	748	634
Overhead Costs	488	516	546
Net Margin	104	232	88

Source: Teagasc National Farm Survey. e Estimate, f Forecast

Table B1: Average Hill Sheep Output, Direct Costs, Gross Margin and Technical Performance

	2019	2020
	€ per ewe	
Gross output	93	99
of which Sheep welfare per ewe	8	7
Total Direct Costs	60	52
Gross Margin	33	47
Overhead Costs	55	46
Net Margin	-23	1
Ewes per ha	6.5	6.0
Lambs per ewe	1.1	1.1
Lamb Carcass (kg) per ha	143	135

Source: Teagasc National Farm Survey

Note: This analysis summarises results for farms with a hill sheep enterprise and only Hill sheep farms with more than 20 ewes are included in the analysis. For 2020 year, the data relate to 25 farms (31 farms in 2019), and is nationally representative of just over 2,000 farms (2,800 in 2019).
Note: In calculating the volume of lamb carcass output per hectare an average carcass weight of 20 kg has been used (Hanrahan, 2006) so as to allow direct comparisons with lowland lamb system.

Irish Cereal Enterprise 2020
Average Performance

Irish Cereal Production
1.96 million tonnes (down 16%)
adjusted for utilisable area

Irish Cereal Area
265.600 ha (no change)

Irish Barley Area
193,200 ha (up 8%)

Irish Wheat Area
47,000 ha (down 26%)

Spring Barley price
average €175 per tonne (up 7%)

Winter Wheat price
average €223 per tonne (up 25%)

Spring Barley Yield per ha
average 6.8 tonnes (down 4%)

Winter Wheat Yield per ha
average 9.0 tonnes (down 8%)

Total Production Cost per ha
Spring Barley
average €1,224 (down 9%)

Total Production Cost per ha
Winter Wheat
average €1,582 (down 3%)

Net Margin for Spring Barley
average €113 per ha (up slightly)

Net Margin for Winter Wheat
average €408 per ha (up significantly)

Target Yield for Spring Barley
7.4 tonnes per hectare
achieved on 36% of farms

Target Yields for Winter Wheat
10.2 tonnes per hectare
achieved on 42% of farms

Gross Margin Target Spring Barley
€540 per hectare
achieved on 59% of farms

Gross Margin Target Winter Wheat
€860 per hectare
achieved on 65% of farms

Source: Teagasc National Farm Survey and Central Statistics Office

Irish Cereal Farming in 2021

Increased EU Cereal Demand
relatively low ending stocks position for grains internationally

Irish Cereal Yields
25% for winter wheat and 11% for spring barley

Barley and Wheat prices
up 33% and 21% on 2020 level

Weather Conditions
favorable for sowing and harvest

Fertiliser Prices
up 9% on the 2020 level
Fertiliser Use
up on a whole farm basis

Seed Prices
up 2% on 2020

Other Direct Costs
up 2% on 2020

Fuel prices
green diesel up 29% on 2020

Total Direct Costs
input costs up 6% on 2020

Gross Margin
Spring Barley
up €580 per ha on 2020
Winter Wheat
up €950 per ha on 2020

Net Margin
Average Cereal Enterprise
€630 per ha (up €525)

Source: Teagasc Estimates for 2021 and Forecasts for 2022

Irish Cereal Farming in 2022

Slightly lower EU Cereal Production
assuming trend yields, no change EU winter plantings

Irish Cereal Yields
decrease in individual yields assuming trend yields

Cereal prices
up 2% on the 2021 harvest price

Weather Conditions
Normal weather assumed

Fertiliser Prices
up over 100% on the 2021 level
Fertiliser Use
down on a whole farm level

Seed Prices
up 5% on 2021

Other Direct Costs
up 3% on 2021

Fuel prices
green diesel up 20% on 2021

Total Direct Costs
input costs up 35% on 2021

Gross Margin
Spring Barley
down €315 per ha on 2021
Winter Wheat
down €610 per ha on 2021

Net Margin
Average Cereal Enterprise
€280 per ha (down by €350)

Review of Tillage Farming in 2021 and Outlook for 2022

Fiona Thorne

Agricultural Economics and Farm Surveys Department, Teagasc

Fertiliser Expenditure Assumptions for 2022:

At the time of writing, in December of 2021, an unprecedented escalation in fertiliser prices has occurred. There is considerable uncertainty as to whether fertiliser prices will remain at elevated levels for the duration of the 2022 production year and what the farmer response to these price changes might mean for the level of fertiliser usage in 2022. Therefore, it is necessary to set out assumptions in relation to the fertiliser price and farmer response to these price changes.

- For the crops sector it is assumed that fertiliser prices will stay at their elevated price levels, observed in December 2021, until at least the end of Q2 2022, which coincides with the end of the fertiliser application period for the crops sector
- Fertiliser prices, for fertiliser products used on crop farms, would be on average 100 percent higher in 2022, compared to 2021
- Tillage farmers will have less discretion in relation to fertiliser use, compared to grassland farmers, given the impact lower usage would have on tillage yields
- For each crop it is assumed that fertiliser usage on a per hectare basis will remain similar to the 2021 application rate.
- It is assumed that there will be some overall reduction in fertiliser application at a whole tillage farm basis. This is assumed to be associated with an increase in area devoted to legume crops, which have lower fertiliser requirements and a reduction in fertiliser applied on grassland for the subsidiary drystock enterprise on tillage farms.
- These forecasts are based on the assumption of normal weather conditions prevailing in 2022.

1. Introduction

Harvest prices in the cereals sector in 2021 were considerably higher than those achieved in 2020. Straw prices were also generally higher in 2021. Furthermore, yields for the major Irish cereal crops were also higher than those achieved at harvest 2020. Taken together these developments resulted in higher gross output values on a per hectare basis in 2021 relative to 2020.There was some expenditure increases in 2021, associated with the increase in winter cereal crops sown and an increase in fuel and fertiliser costs in particular.

The upward movement in cereal prices at harvest 2021 was associated with several factors, the most important of which was a decrease in the stocks to use ratio on the international balance sheet for some crops in 2021/22 compared to 2020/21.

This paper will consider whether the price increases of the 2021 harvest can be considered atypical or whether prices will continue at these levels into the 2022 harvest. The paper uses Irish Teagasc National Farm Survey (NFS) data to conduct a review of the financial performance of tillage farms in 2020. Following this, prices and costs are estimated for 2021 and these are used to produce an estimate of net margin for the 2021 harvest year. In the concluding sections of the paper, forecasts for 2022 are presented.

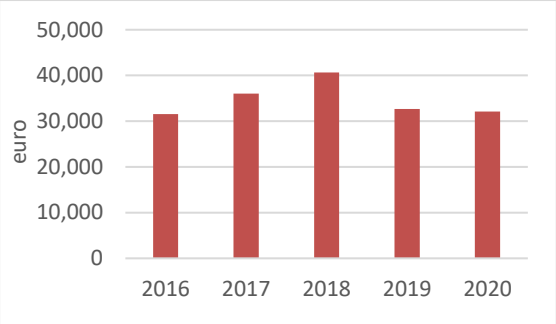
2. Review of the Economic Performance of Tillage Farms in 2020

Approximately 6,900 specialist tillage farms were represented by the Teagasc NFS in 2020. Income on tillage farms decreased by 2 percent year-on-year.

Gross output on a whole farm basis decreased by 7 percent. Direct costs and overhead costs decreased on a whole farm basis, by 12 percent and 5 percent respectively, despite a 3 percent increase in farm size reported in the sample represented by the Teagasc NFS. Overall, total costs on a whole farm basis decreased by 8 percent on average. These

changes resulted in an average Family Farm Income (FFI) in 2020 of €32,100, which is equivalent to a 7 percent decrease on the five year average FFI on tillage farms.

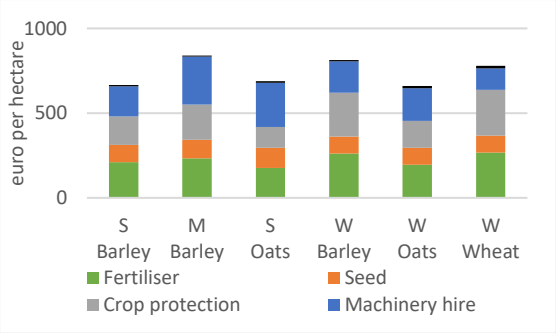
Figure 1: Average Income on Irish Specialist Tillage Farms 2016 to 2020



Source: Teagasc, National Farm Survey (various years).

To understand the economic performance of tillage farms in 2020, we begin with a review of the cost and return structure of the main cereal crops using NFS data. Figure 2 disaggregates the direct costs of production for the principal cereal crops grown on Irish farms in 2020.

Figure 2: Composition of Direct Costs for Cereal Crops, 2020

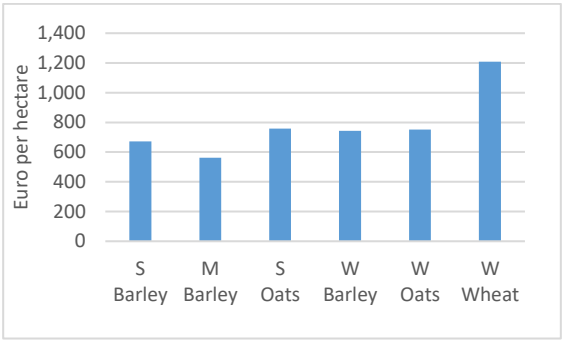


Source: Teagasc, National Farm Survey.

Figure 2 shows that in general, direct costs are higher for winter sown crops compared to spring sown crops, due to the higher fertiliser and crop protection costs incurred in growing winter crops. However, given that yields are generally higher in winter sown crops, the more appropriate comparative economic indicator is gross margin per hectare, as shown in Figure 3.

Figure 3 shows that the average gross margin per hectare for all winter crops is higher than the gross margin for equivalent spring sown crops. Winter wheat recorded the highest gross margin and malting barley the lowest margin of all cereal crops examined in 2020 (see Table A1 in the appendix to this paper for further details). The gross margin per hectare for the two main cereal crops, spring barley and winter wheat increased in 2020 relative to 2019, by approximately €80 and €260 respectively. While gross margin estimates are useful for comparative purposes, it is also worthwhile to examine the shift in net margin over time. However, for cereal crops it is particularly difficult to allocate overhead costs and straw output to individual crops using NFS data.

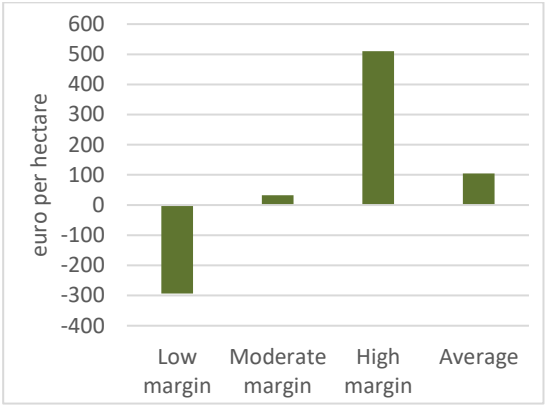
Figure 3: Gross Margins per hectare for Cereal Crops, 2020



Source: Teagasc, National Farm Survey Data.

For this reason, the analysis looks at the net margin of the cereal enterprise of the entire NFS specialist tillage farming population and this is shown in Figure 4.

Figure 4: Cereal Enterprise on Specialist Tillage System Farms: Net Margin Distributions, 2020



Source: Teagasc, National Farm Survey Data.

To examine the variation in net margins earned by tillage farms, the sample was divided into three groups. Farms were classified on the basis of net margin per hectare; the best performing one-third of farms labelled high margin, the middle one-third labelled moderate margin and the poorest performing one-third labelled as low margin. The variation in margins across Irish tillage farms is readily apparent from Figure 4. The net margin per hectare for the cereal enterprise on high margin

farms in 2020 was €510 compared to €33 on moderate margin farms and -€293 on low margin farms. It is important to remember that these margins include production output only; hence by definition the Basic Payment Scheme (BPS), which is decoupled from production, is not included in these figures.

3. Estimate of 2021 Performance

This section of the paper presents a review of the cereal sector in 2021. To provide an estimate of enterprise margins for the current year, it is necessary to estimate the volume and price of inputs that are likely to have been used as well as the volume and value of outputs produced in 2021. The ensuing sections of the paper discuss first, the movements in input prices and usage and second, the cereal market conditions, harvest yields, and production in 2021.

3.1 Estimated Input Usage and Price 2021

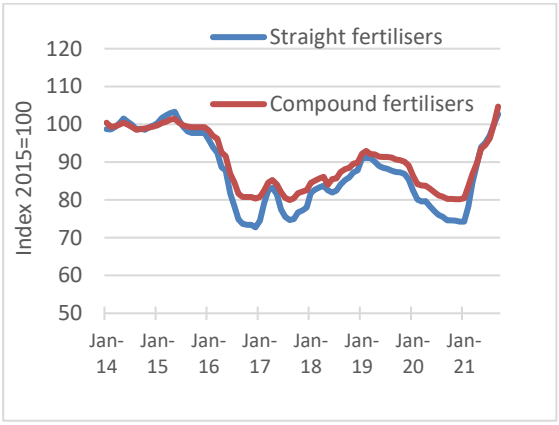
3.1.1 Fertiliser – Usage and Price 2021

In the early half of the noughties fertiliser costs typically comprised about 25 percent of direct costs and just over 10 percent of total costs on tillage farms. However, fertiliser types commonly used on tillage farms have increased substantially in price since 2006. Expenditure on fertilisers now represents a larger proportion of costs on tillage farms than previously. In 2020, fertiliser costs represented 28 percent of direct costs on tillage farms and approximately 14 percent of total costs. In particular, the price of natural gas is a key determinant of fertiliser price. Short run changes in the demand for natural gas (and fertiliser), coupled with relatively fixed production capacity has the potential to impact fertiliser prices to a large extent.

Following the significant peak in fertiliser prices in 2008 and 2009, the pressure on fertiliser prices has been mixed in more recent years. However, the COVID-19 pandemic altered the balance in demand and supply for natural gas which had a significant impact on fertiliser prices. Following a sharp decline in fertiliser prices in 2020, this was followed by a step increase in fertiliser prices during the course of 2021. On a calendar year basis, it is estimated that fertiliser prices for N based products are up about 60 percent, and up about 30 percent for NPK compounds, in 2021 compared to 2020. However, seasonality of purchase is very important, especially in the context of tillage crops, and when seasonality of purchase in factored into the calculation, it is estimated that N based products on cereal farms were up about 9 percent and NPK compounds up by 6 to 7 percent in 2021 compared to 2020, .for winter and spring cereal crops.

The pattern of fertiliser purchases on cereal farms is somewhat different from that on grassland farms, with applications being spread throughout the sowing and growing season from September of one year to May or June of the following year, depending on whether the crop is spring or winter sown. On this basis, it is sometimes the case that the fertiliser prices for cereal crops for a calendar year can be somewhat different to that experienced for grassland systems over the production year. During 2021 fertiliser price increases were somewhat different on grassland farms than on cereal farms due to the timing of the fertiliser price increase and also due to the use of different fertiliser products.

Figure 5: Irish Farm Gate Price Index of Fertilisers 2014 to 2021



Source: Central Statistics Office data for 2014 to 2021.

On the usage side, DAFM figures indicate that fertiliser purchases in the 2021 fertiliser year (October 2020/September 2021) were up by about 6 percent (for N based products)on those recorded for the previous year. Given that DAFM data on fertiliser purchases refers to all purchases for grassland and cropland it was necessary to consult with farm advisors and industry sources to evaluate the magnitude of change in fertiliser usage levels for Irish crop farms in 2021. Reports from a number of sources indicate that fertiliser usage per hectare increased in 2021 due to higher winter planting and a consequent decrease in spring planting, which has a lower requirement for fertiliser. With an increase in fertiliser usage on crop farms (per hectare) and upward movement in fertiliser prices, overall expenditure on fertiliser in 2021 is estimated to

have increased by about 10 percent on a whole farm basis.

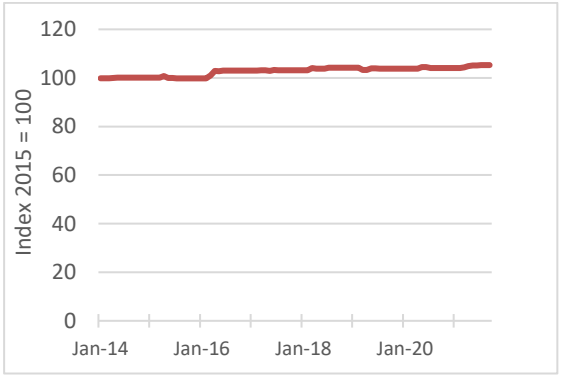
3.1.2 Seed – Usage and Price 2021

Expenditure on purchased seed on crop farms comprises between 12 and 17 percent of direct costs for cereal production. In terms of the composition of total costs, seed represented about 6 percent of total costs in 2020. In 2021, cereal farmers experienced an increase in seed costs relative to the previous year given that cereal prices at harvest increased in 2020 relative to 2019, this price increase has transmitted to seed prices, with blue label seed costing around €550 per tonne for wheat and €530 per tonne for barley, which was between 2 and 6 percent higher than 2020 seed prices.

3.1.3 Crop protection – Usage and Price 2021

The expenditure on crop protection by specialist tillage farms in 2020 accounted for 11 percent of direct costs and 6 percent of total costs. However, the contribution of crop protection to the composition of costs can vary significantly depending on the crop; the percentage spent on crop protection for winter crops is higher than that for spring crops. For example, for the winter wheat crop in 2020, crop protection costs accounted for 35 percent of direct costs, as compared to 25 percent for spring barley.

Figure 6: Price Index of Plant Protection products in Ireland 2014- 2020



Source: Central Statistics Office and Author's own estimates.

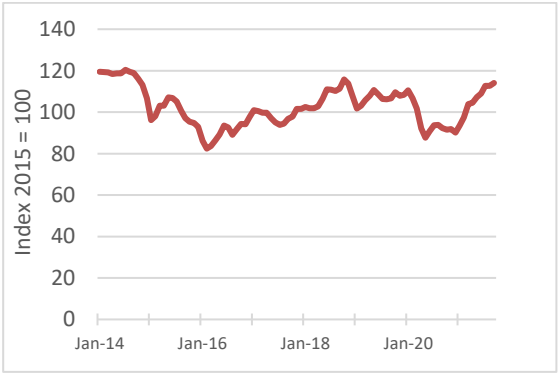
Compared to other significant costs on tillage farms, the increase in the prices of crop protection products listed by the CSO has been limited over the recent past. Figure 6 shows that the increase in the price of crop protection products from 2014 to 2021 was approximately 5 percent and that between 2020 and 2021 prices are estimated to have increased by less than 1 percent. However, on a whole farm basis, the expenditure on crop protection products is expected to have been slightly more than 1 percent in 2021, given the switch to more crop protection intensive winter crops.

3.1.4 Energy and Fuel – Usage and Price 2021

Energy and fuel are important inputs in crop production. Given that a number of direct and overhead costs are directly influenced by energy and fuel prices, the trend in energy prices is of significance for tillage farmers. In this analysis it is assumed that hired machinery/contracting and transport costs, which are components of direct costs, and fuel and lubricants which are components of overhead costs, are directly influenced by energy inflation. These cost items represented approximately 15 percent of total costs on tillage farms in 2020.

Based on the CSO estimates presented in Figure 7, the farm level price of fuel has increased by 9 percent between 2014 and 2020 (the last full year for which data is available). As a result of a sharp increase in Brent crude oil prices due to the demand recovery in 2021, following the COVID-19 induced demand shock in 2020, green diesel fuel prices on Irish tillage farms increased by about 30 percent in 2021 relative to 2020.

Figure 7: Price Index of Fuel products in Ireland 2014 – 2021



Source: Central Statistics Office and Author's own estimates.

The agricultural motor fuel index from the CSO for 2020 and the first nine months of 2021 is indicating a reduced level of fuel price inflation for 2021, than the aforementioned green diesel price inflation. However, it is assumed that green diesel represents a greater proportion of fuel sales compared to livestock farms. Hence, overall it is estimated that

fuel price inflation on tillage farms was up about 30 percent in 2021 compared to 2020. Demand for these input items tends to be relatively inelastic with respect to price and therefore it is assumed that usage in 2021 will have been similar to the 2020 level. Overall expenditure on fuel related items is likely to be 30 percent higher in 2021 relative to 2020.

3.1.5 All other direct and overhead costs – Usage and Price 2021

Based on CSO estimates for the first nine months of 2021 compared to the same time period in 2020, it is estimated that 'other direct costs' have increased marginally by about 2 percent.

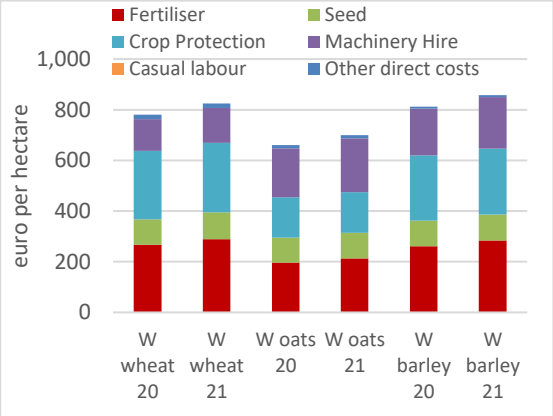
The average cost of land rental in 2021 on specialist tillage farms represented 7 percent of total costs. Given that farm gate cereal margins decreased in 2020, there could be some basis for assuming a slight decrease in land rental prices in 2021. However, the slight increase in dairy farm incomes in 2020 may have mitigated a decrease in land rental prices in 2021, with dairy farmers perhaps more likely to bid up the price of rented land. Hence, it is assumed that the average land rental price per hectare did not change in 2021. The methods employed here, which reflect costs per crop hectare, do not capture changes in the volume of land rented. For 2021, on a total farm basis, the actual impact of any changes to total cereal area (rented or otherwise) will only be fully reflected in the final Teagasc NFS figures for 2021, which will be published in mid-2022.

3.1.6 Estimate of Total Input expenditure for 2021

Total expenditure on all input items is estimated to have increased in 2021 relative to 2020. The most significant increase in expenditure on a per hectare basis occurred for fuel and fertiliser, which are estimated to have increased by 30 percent and 10 percent respectively. Seed prices also increased by about 5 percent in 2021 and feed prices are estimated to have increased by 20 percent (which is relevant for subsidiary enterprises on tillage farms). On average, the estimated increase in total direct costs was approximately 6 percent in 2021 relative to the 2020 level, on a per hectare, per crop basis.

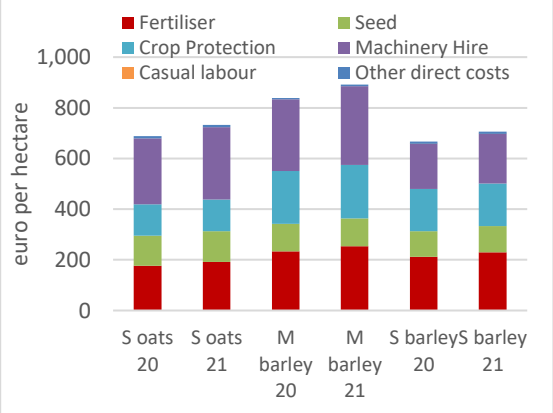
The estimates, provided on a per hectare basis for individual cereal crops, do not take into account changes in the area devoted to individual cereal crops. The significant shift to winter sown cereals and the related decline in spring sown cereals was also take into consideration, see Figure 8, where whole farm direct and overhead costs on specialist tillage farms in 2020 and the estimate for 2021 are presented. Overall, it is estimated that direct costs for the average cereal enterprise increased by over 6 percent whilst overhead costs increased by over 10 percent. A significant explanation for the increase in overhead costs for the cereal enterprise is due to the allocation methods used on a whole farm basis, which is based on a proportion of output based methodology.

Figure 8A: Direct Costs in Major Crops in Ireland 2020 and Estimates for 2021



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021.

Figure 8B: Direct Costs in Minor Crops Ireland 2020 and Estimates for 2021



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021.

3.2 Estimated Output Values 2021

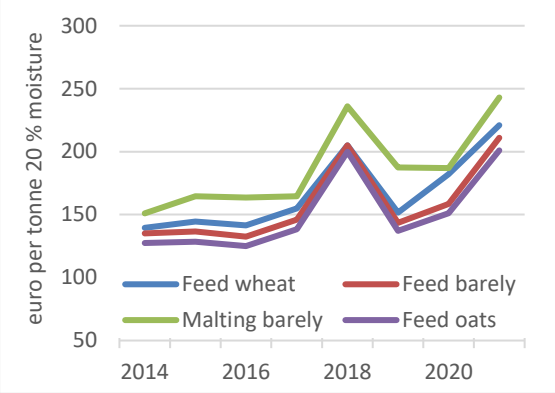
3.2.1 Price, yield and moisture levels in 2021

In 2020, despite a comfortable European balance sheet situation for barley in particular (Strategie

Grains, September 2020), the significant decrease in harvest yields in Ireland resulted in a significant increase in Irish farm gate cereal prices at harvest 2020 (see Figure 9).

In 2021, despite a significant increase in national cereal volumes, a decrease in the stocks to use ratio on the international balance sheet for wheat and barley in 2021/22 compared to 2020/21 resulted in a further upward movement in Irish farm gate harvest prices compared to 2020.

Figure 9: Farm Gate Cereal Prices (major crops), 2014-2021



Source: Teagasc, National Farm Survey Data and Author's estimate for 2021

While the majority of cereals in Ireland are still sold off farm at harvest time to a grain merchant on a green moisture basis, the ability of farmers to forward sell grain has introduced an additional element to the calculation of the average price received by farmers. For the past number of years the Teagasc NFS has collected data on the proportion of cereals forward sold before harvest. This research indicates that the majority of cereals are not forward sold before harvest, but are sold at harvest time, on a green moisture basis. In 2020, the NFS indicates that approximately 10 percent of total cereal production was forward sold by farmers prior to harvest.

Table 1 shows the average green yields obtained in 2020 and estimated yields for 2021. In general, for the 2021 harvested crops the yields are estimated to be higher than 2020. Yields of all cereals were well above the 5 year average. However, readers should note that these yields are green yields and are thus not adjusted for moisture content.

The last variable which must be assessed in calculating cereal output value per hectare and per farm is the value of straw. Following the increase in cereal yields, there was also an increase in volume of straw produced in 2021, this increase is driven by the increase in winter cereal area, good crop establishment and favourable weather conditions at harvest. It is estimated that straw volume is up between 20 and 30 percent in 2021, with an additional increase in straw prices Overall an increase in straw value of over 30 percent is assumed for 2021.

Table 1: Average Yield Levels, 2020 and 2021 Harvest

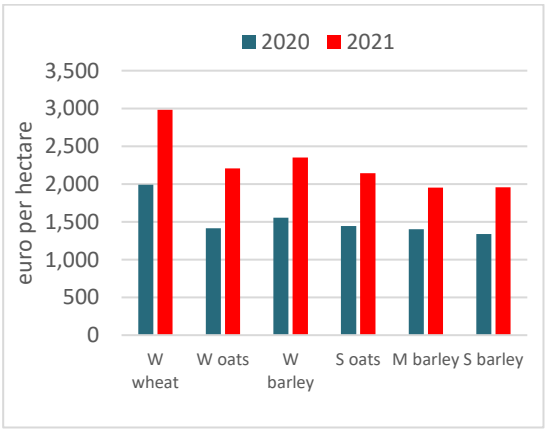
	Yield (tonne per ha.)	
	2020	2021*
Winter Wheat	8.66	10.80
Winter Barley	8.28	9.42
Winter Oats	8.20	9.32
Spring Wheat	7.42	8.21
Spring Barley	7.11	7.89
Spring Oats	7.15	7.72

Source: CSO (2020) & Teagasc Harvest report figures for 2021

3.2.2 Estimate of Total Output Value for 2021

Given the large number of variables that need to be considered in estimating output value, as outlined above, the estimated changes in crop output value between 2020 and 2021 are very crop specific.

Figure 10: Actual Gross Output per Hectare 2020 & Estimated Gross Output per Hectare 2021



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021.

However, in overall terms, the general trend has been an increase in output value in 2021 relative to 2020. This increase arises due to the increases in cereal yield, price and straw receipts plus receipts

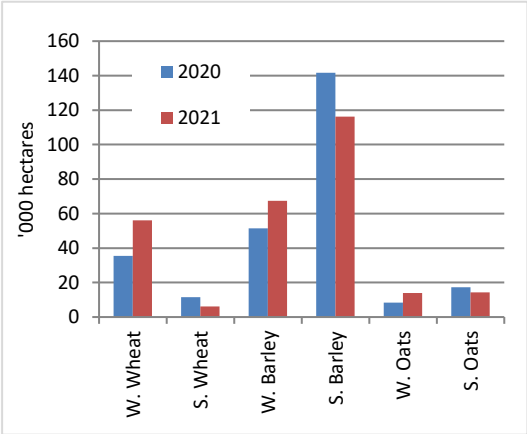
from the Straw Incorporation Measure (SIM), which together more than outweighed increases in input prices. Output value per hectare in 2021 is estimated to have increased by on average 49 percent across the crops examined.

3.2.3 Estimate of Total Production 2021

The figures presented in section 3.2.2 provide estimates of output value per hectare. However, these estimates do not take into consideration changes in area devoted to cereal crops in 2021. Figure 11 shows the area estimates for 2021 based on 2021 Teagasc Harvest Report data.

Figure 11 shows that the total area devoted to cereal production increased by 3.1 percent in the 2020/21 crop year compared to the 2019/20 crop year. There was also some switching between winter and spring sown crops which was weather related.

Figure 11: Change in Irish Crop Area from 2019/2020 to 2020/21 crop year in Ireland



Source: CSO and Teagasc Final Harvest Report 2021

Table 2 combines actual total cereal production for 2020, as reported by the CSO, with estimated total cereal production for 2021. The estimated 2021 production of wheat, barley and oats is based on 2021 yield estimates from the Teagasc harvest report. Overall cereal production is estimated to be up by approximately 407,000 tonnes or 21 percent on 2020 levels.

Table 2: Actual & Estimated Production 2020 & 2021 ('000 Tonnes)

	2020	2021	%Change
Wheat	372	621	67%
Barley	1362	1474	8%
Oats	182	228	25%
Total	1916	2323	21%

Source: CSO and Teagasc Final Harvest Report 2021

3.2.4 International Production Estimates for 2021

While production estimates for Irish cereals are important from a national supply, demand and balance sheet perspective, it is primarily developments in the EU and international supply and use balance for cereals that affect price developments in Ireland. For this reason a review of EU and international ending stocks for cereals are more informative when near term price developments are concerned.

Latest estimates for EU total grain production for the 2021/22 marketing year are up on the previous year's levels (Strategie Grains, November 2021). EU total production of wheat, barley and maize were up 4.5 percent on the previous year. Whilst total grain production on the international balance sheet is up by 3 percent on the previous year, what is most noteworthy is that there is a decline in the stocks to use ratio for wheat, and only a slight increase in stocks to use ratios for barley and maize. Furthermore, there is also an increase in demand for wheat and maize in the EU, which has contributed to relatively low ending stock positions for both crops. These factors have contributed to the increase in prices at harvest 2021 compared to 2020.

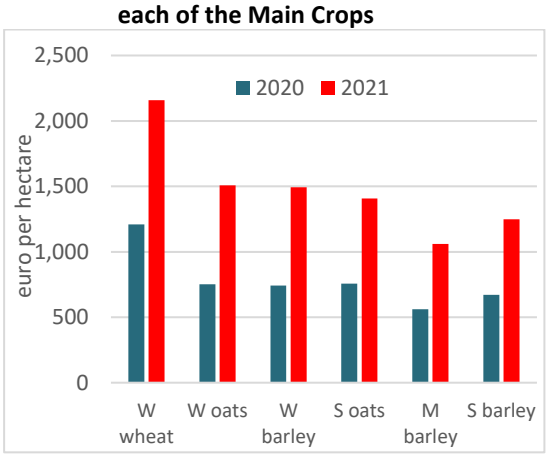
Another noteworthy point regarding production and stock estimates for 2021/22 is the upward revision in ending stocks, with revised figures produced for November. As harvest estimates were firmed up in the past few weeks, EU ending stocks were revised upwards. This upward revision in ending stocks since October can be attributed to a decrease in EU wheat and barley competitiveness in the animal feed sector, with indications that price increases witnessed over the past few months since harvest may have reached a peak.

3.3 Review of Tillage Enterprise Margins in 2021

The review of cereal output value showed that the average value of output received by farmers was significantly higher in 2021 compared to 2020. The review of input costs concluded that total direct costs were higher in 2021 compared to 2020, due mainly to an increase in fuel and fertiliser prices. Figure 12 presents the effect of these estimates on the estimated gross margin for each of the main Irish cereal crops.

Figure 12 shows a very positive story in terms of the relative change in gross margin in 2021 relative to 2020. The relative shift in yields, crop prices, straw returns and input expenditure has been positive for all cereal crops between 2020 and 2021. In terms of the major crops, the gross margin for spring barley was up by approximately €580 per hectare and the winter barley gross margin is estimated to be up by nearly €750 per hectare, while the gross margin for winter wheat is estimated to be up by nearly €950 per hectare. It should be noted that the average gross margin figures presented above are market based gross margins and therefore include coupled payments such as the Straw Incorporation Measure (SIM) but exclude all decoupled payments and overhead costs.

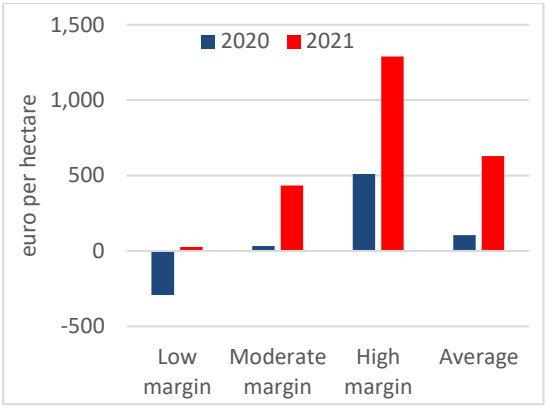
Figure 12: Actual Gross Margin in 2020 & Estimated Gross Margin for 2021 for each of the Main Crops



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021.

The estimated net margins for 2021 are presented for the average cereal enterprise on specialist tillage farms, with the NFS sample disaggregated into one-third groupings based on net margins per hectare obtained.

Figure 13: Actual Net Margin 2020 and Estimated Net Margin for 2021 for the Cereal Enterprise on Specialist Tillage Farms



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021.

Figure 13 shows the cereal enterprise net margin estimates for 2021 relative to 2020, for the average specialist tillage farm, in addition to the net margins for the low, moderate and high margin groupings of tillage farms.

The estimate of net margins for the typical cereal enterprise in 2021 is higher than in 2020 given upward movement in gross margins per hectare and less significant movement in overhead costs. For the best performing one-third of tillage farms, the estimated net margin for 2021 was approximately €1,290 per hectare compared to the average, where the net margin was approximately €630 per hectare. It is important to remember that these figures exclude decoupled direct payments, but do include the straw incorporation measure (SIM). Furthermore, it is important to note that owing to the methods employed in this estimation, changes in cropping choice or area cannot be fully captured and will only be clear when the final Teagasc NFS figures become available for 2021.

4. Outlook for 2022

In this section forecasts are provided for expenditure on various input items in 2022, the likely farm gate cereal price that will prevail at harvest 2022 and the likely net margin of tillage farms in 2022.

4.1 The Outlook for Input Expenditure

4.1.1 Fertiliser – usage and price 2022

A number of factors need to be considered when forecasting price and volume changes for fertiliser

on crop farms in 2022. Market report data coming from the fertiliser industry at present are suggestive of a very uncertain supply, demand and price situation for nitrogen based products in 2022. Market sources at the time of writing (November 2021) are indicating that the price of nitrogen based products are in excess of 100 percent higher than for the corresponding period last year, due in a large part to factors affecting supply of nitrogen based products and movement on energy costs. Taking all of these issues into account, including seasonality of purchases, it is forecast that the increase in fertiliser price for cereal crops in 2021/22 will be 100 percent higher than for 2020/21.

Holding all other things constant, fertiliser usage on a whole farm basis in 2022 on crop farms could be expected to increase due to slightly higher levels of winter crop sowing due to favourable autumn weather conditions. However, given the very significant upward movement in fertiliser prices, it is expected that at a farm level there will be efforts to improve the lime status of soils, soil Ph balance and reduce fertiliser application, if at all possible. Furthermore, there is some evidence that there is an increase in sowing rates of nitrogen fixing crops such as beans and peas at Autumn 2021, which have a lower demand for fertiliser. Finally, there should be some benefits evident from the straw incorporation measure on those farms that entered the scheme, which would have an effect on fertiliser demand in 2022. Overall, it can be expected that fertiliser expenditure will be about 100 percent higher per hectare for specific crops on cereal farms in 2022 relative to the 2021 level.

4.1.2 Seed – usage and price 2022

As mentioned previously, cereal farmers experienced an increase in seed costs in 2021 relative to the previous year due to cereal price increases at harvest 2020. Given that cereal prices at harvest increased in 2021 relative to 2020, this price increase has been transmitted to seed prices, with blue label seed costing around €570 per tonne for wheat and €560 per tonne for barley, which is between 4 and 6 percent higher than 2021 seed prices.

4.1.3 Crop protection – usage and price 2022

The increase in crop protection costs in 2022 relative to 2021 is forecast to be of a similar magnitude to the changes seen in each of the last three years. Price changes have been minimal, at about 1 percent per year. Taking volume and price changes into account, based on recent data from the Teagasc NFS, a 1 percent increase in crop protection expenditure per crop per hectare is forecast for 2022. This 1 percent increase on a per crop basis will be slightly higher on a whole farm basis, reflecting the increase in winter cereal planting, with a higher requirement for crop protection compared to spring sown cereal crops.

4.1.4 Energy and Fuel – usage and price 2022

Fuel costs in 2022 will depend mainly on the evolution of crude oil prices. Current futures prices suggest that crude oil prices will increase in 2022 relative to 2021 prices, leading to an 18 percent increase in farm level fuel prices on tillage farms.

4.1.5 All other direct and overhead costs 2022

All other direct costs are forecast to increase by about 3 percent in 2022, in line with projections for general inflation in 2022. At this early stage in the production season anecdotal evidence on land rental prices for 2022 is mixed. However, due to the increase in income on tillage farms in 2021, it is assumed that there will be some inflationary pressure on land rent in 2002, at about 5 percent.

4.2 The Outlook for Markets 2022

The cereals market has experienced significant volatility in recent years, and particularly so since harvest 2021. Planting decisions by farmers will be influenced by expected farm gate cereal prices (and margins) in 2022. A number of factors must be taken into consideration when making price forecasts for the coming harvest.

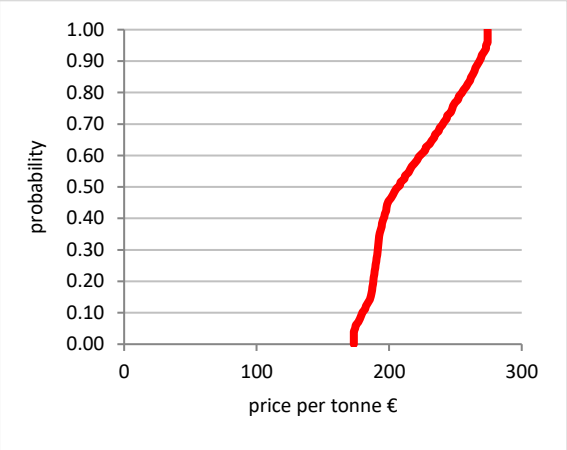
To formally evaluate the risk associated with predicting the 2022 harvest price, an econometric analysis was conducted to predict the probability that the 2021 farm gate price will be higher or lower than the 2020 price. This analysis was based on the November 2021 MATIFF futures prices for November 2022 contracts. The regression analysis examined the historic relationship between (i) predicted futures price for the following harvest, made from the previous November/December when planting decisions were being made, and (ii) the actual farm gate price paid at harvest one year hence. This regression analysis enables a forecast to be made of the 2022 Irish farm gate cereal price for wheat, taking into consideration the differences

between the historic predicted values (MATIFF) and the actual outcomes.

Figure 14 outlines the probability of achieving various harvest prices in September 2022. Based on the econometric model developed, it shows that there is significant uncertainty concerning the predicted harvest price for September 2022. This predicted range is based on current (MATIFF) futures trading prices (November 2021), and the spread around the mean value is based on how right or wrong futures markets have been in recent times in predicting prices one season ahead.

Based on market reports on forward prices and the probabilities of achieving different harvest prices, the average predicted value for the farm gate wheat price is approximately €215 per tonne at 20 percent moisture, which is approximately a 2 percent increase over harvest prices paid in 2021. However, there is a significant variance surrounding this figure. Based on a 90 percent confidence interval, it is forecast that the figure could be as low as €140 per tonne or as high as €270 per tonne (Figure 15).

Figure 14: Probability Distribution of the predicted 2022 Wheat Harvest Price



Source: Author's own estimates.

The latest edition of *Strategie Grains* (November 2021) outlines not much change in the EU area planted to winter crops for the 2022/23 marketing year compared to 2021/22. With favourable weather conditions for winter cereal sowing it is expected that the total change in cereal area will be minimal in the 2022 harvest year compared to the 2021 harvest year.

In total, soft wheat area in the EU27 is estimated to be virtually unchanged at 21.64 Mha compared to 21.69Mha in 2020/21. Total EU27 grain maize area is expected to decrease slightly (9.25 Mha in 2022/23 Mha compared to 9.06 Mha in 2021/22). Total EU27 barley area is forecast to increase slightly from 10.29 Mha (2021/22) to 10.43Mha (2022/23).

The change in cereal area (in the EU) is coupled with an assumption of achievement of trend yields in 2022 (see Appendix A3 for further details on forecast changes in arable crop areas in the EU27 for 2022/2023). An achievement of trend yields internationally, *ceteris paribus,* is assumed to have a relatively begin impact on cereal price at harvest 2022 compared to harvest price 2021. Overall, in the EU27 wheat, barley and maize production is expected to decline slightly, which will increase cereal prices in 2022, by about 2 percent compared to 2021 harvest prices.

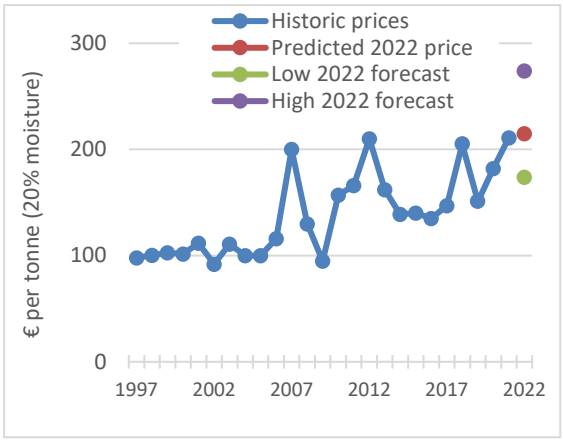
The very slight increase in farm gate cereal prices at harvest 2021 which is borne out in futures trading prices at the moment, is largely based on an anticipated decrease in supply in key growing regions internationally, due to the achievement of trend yields internationally in 2022. However, it also assumes that supply conditions, which are relatively more 'informed' at this time of the year, are more price bullish than demand conditions, which are less well informed at this time of the year.

Possible bullish and bearish factors which could impact on prices at harvest 2022 include:

- significant weather events,
- exchange rate movements,
- changes in demand from feed and food sources,
- supply chain and transport issues;
- input price inflation and availability of fertiliser impact on target yield achievement.

Whilst all of the afore mentioned supply and demand factors are assumed to be considered in the futures trading environment at the moment, the overriding supply side factors ae considered most important in determining the futures trading price for harvest 2022. But it is still very early to forecast what might happen to these additional variables, and futures markets tend to move closely in line with first production estimates and exchange rate forecasts, with improved reliability of estimates coming in late spring of the harvest year.

Figure 15: Historic, Estimated & Forecast Farm Gate Feed Wheat Price (1997– 2022)



Source: Author's own estimates, 2022 forecast, at 90 percent confidence interval.

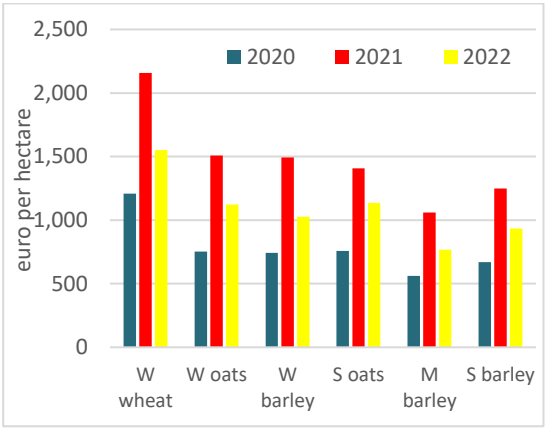
Based on the futures market forecast, average loyalty top ups in recent years from merchants, our forecast is that farm gate cereal prices will increase by about 2 percent at harvest 2022.

4.3 The Outlook for Tillage Enterprise Margin in 2022

Direct costs are forecast to be significantly higher in 2022 relative to 2021, due to the forecast increase in fertiliser expenditure, seed costs and fuel prices in 2022. Whilst all other direct costs of production are forecast to increase by smaller amounts in 2022, crop protection by 1 percent and all other direct inputs by 3 percent, overall direct costs in 2022 should be significantly higher than 2021 levels, on a per hectare basis. Furthermore, output value on average is forecast to be higher than 2020 levels, due to the forecast increase in cereal yields when trend yields are assumed, coupled with a less significant decrease in cereal prices. Figure 16 presents the actual gross margin for each of the main cereal crops in 2020, and the respective estimates and forecasts for 2021 and 2022.

The net effect of input price, output price and volume movements is on average, forecast to have a negative effect on gross margins for 2022. For example, gross margins for winter wheat and winter barley are forecast to decrease by approximately €610 and €470 per hectare respectively, while gross margins for spring barley are forecast to decline by a significantly less amount at approximately €315 per hectare. The overall story for the 2022 forecast is for a decrease in gross margins as a result of achievement of trend yields, a slight increase in cereal prices and a very significant increase in direct costs.

Figure 16: Actual 2020, Estimate 2021 and Forecast 2022, for Cereal Crop Gross Margins



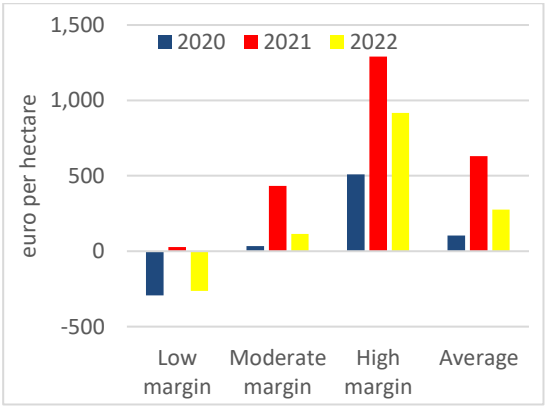
Source: Teagasc, National Farm Survey Data and Author's estimates for 2021 & forecast for 2022.

The main driver for the magnitude of gross margin change is the effect of direct cost outcomes in 2022, with fertiliser costs forecast to significantly affect gross margins in 2022.

Similar to the format used to present margins in 2020 and 2021 earlier in the paper, the forecast net margins for 2022, are presented for the cereal enterprise on specialist tillage farms, as well as the population of such farms disaggregated into one-third groupings based on margins obtained.

Figure 17 shows that the forecast net margins for the cereal enterprise in 2022 are lower than in 2021, but still higher than 2020.

Figure 17: Net Margin Actual 2020, Estimate 2021 and Forecast 2022 for the Cereal Enterprise on Specialist Tillage Farms



Source: Teagasc, National Farm Survey Data and Author's estimates for 2021 & forecast for 2022.

The downward movement in margins (compared to 2021) is associated with the yield estimates for 2022 and the significant increase in some key direct cost items.

Overall, the net margin for the average cereal enterprise in 2022 is forecast to decrease by about €350 per hectare relative to 2021.

This leaves net margins for the cereal enterprise significantly less than the dairy enterprise and ahead of beef and sheep margins.

5. Concluding Comments

The 2020/2021 production year saw upward movement in cereal gross margins and net margins for the main cereal crops. In 2021, there was a significant increase in winter cereal area and yields at harvest time, a significant increase in harvest price, straw receipts and returns from the newly introduced straw incorporation measure, coupled with a less significant increase in direct costs. T taken together these factors yielded very positive net margins on the average cereal enterprise in specialist tillage farms.

The gross margin per hectare for spring barley, winter barley and winter wheat are estimated to be up by approximately €580, €750 and €950 per hectare respectively.

The forecast for net margins on tillage farms in 2022 is for a significant decrease in margins, despite futures trading prices at the moment showing a 2 percent increase in cereal prices at harvest 2022, owing to a return to trend yields and a significant increase in whole farm direct costs. The overall picture for cereal crops is that in general average net margins will be positive in 2022, but significantly reduced on the record margins achieved in 2021. The downward movement in margins forecast for 2022 will mean that cereal based net margins will be negative on approximately 40 percent of specialist tillage farms in 2022.

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Table A1: Production Costs, Output and Gross Margin for Major Cereal Crops in 2020 (€ per ha)

	Gross Output	*Fertiliser*	*Seed*	*Crop protection*	*Machinery Hire*	*Other direct costs*	*Total direct costs*	*Gross Margin*
Winter Wheat	1,989	267	100	271	125	17	780	1,209
Winter Oats	1,412	196	99	159	193	13	660	752
Winter Barley	1,555	261	101	258	185	7	812	742
Spring Oats	1,445	177	119	124	260	9	688	757
Malting Barley	1,401	234	108	209	283	6	839	562
Spring Barley	1,338	211	101	167	178	9	667	671

Source: Teagasc National Farm Survey Data (2021)

Table A2: Variation in output and margin 2020: top and bottom performing spring barley producers

	Bottom	*Top*	*% Difference between Top and Bottom*
Average crop area (hectares)	18	14	-21%
Yield (tonnes per hectare)	6.4	7.2	12%
Price per tonne	161	191	18%
Gross output (€ per hectare)	1,164	1,513	30%
Fert., seed, spray (€ per hectare)	486	474	-3%
Machinery hire (€ per hectare)	236	118	-50%
Gross Margin (€ per hectare)	432	914	111%
Fixed Costs (€ per hectare)	589	526	-11%
Total Costs (€ per hectare)	1,321	1,125	-15%
Net Margin (€ per hectare)	-157	388	247%

Source: National Farm Survey Data (2021)

Table A3: Changes in arable crop areas in the EU27

	21/22 M Ha	22/23M Ha	% Change
Soft wheat	21.699	21.64	No change
Maize	9.25	9.06	-2%
Barley	10.29	10.43	+1%
Total wheat, barley, maize area	41.24	41.13	0%

Source: Strategie Grains (November 2021)

Irish Pig Sector in 2020

Sow population
148,000 head
unchanged on the 2019 level

Live Pig Exports
453,000 head
up 8% on the 2019 level

Pig Slaughter
3.83 million head
up 3.5% on the 2019 level

Feed Prices
€305 per tonne
down 2.2% on the 2019 level

Pig prices
€1.74 per kg
up 3.5% on the 2019 level

Margin over feed cost
66c cent per kg
up 14% on the 2019 level

Source: Teagasc Pig Development Unit, Central Statistics Office and Department of Agriculture, Environment and Rural Affairs Northern Ireland

Irish Pig Sector in 2021

Sow Population
146,000 head
down 1.4% on the 2020 level

Pig Slaughter
3.93 million head
up 2.6% on the 2020 level

Live Pig Exports
420,000 head
unchanged on the 2020 level

Pig prices
€1.58 per kg
down 9% on the 2020 level

Feed Prices
€337 per tonne
up 10% on the 2020 level

Margin over Feed Costs
41 cent per kg
down 38% on the 2020 level

Irish Pig Sector in 2022

Sow Population
146,000 head
unchanged on the 2021 level

Pig Slaughter
4.02 million head
up 2.3% on the 2021 level

Live Pig Exports
420,000 head
unchanged on the 2021 level

Pig Prices
€1.63 per kg
up 3% on the 2021 level

Feed Prices
€358 per tonne
up 6% on the 2021 level

Margin over Feed Costs
38 cent per kg
down 7% on the 2021 level

Source: Teagasc Pig Development Unit Estimates for 2021 and Forecasts for 2022

Review of Pig Sector in 2021 and Outlook for 2022

Michael McKeon

Pig Development Department, Teagasc

1. Introduction

The Irish pig industry enjoyed a buoyant period of profitability in 2019 and 2020. However, higher feed ingredient prices and lower international pigmeat demand reduced the sector's profitability in 2021.

2. Review of Irish Pig Sector in 2021

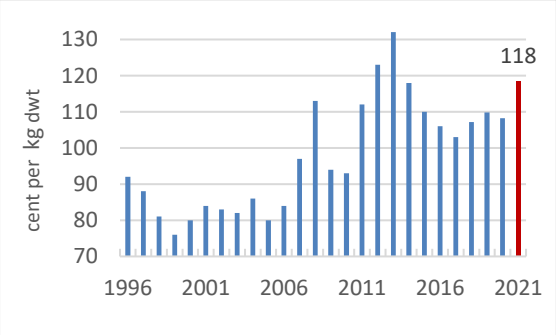
2.1 Pig Production Costs

The cost of producing pigs in Ireland can be broken into feed cost and non-feed costs. Feed currently constitutes seventy five percent of the total cost of producing a pig, with the non-feed inputs contributing the remaining twenty five percent.

2.2 Irish Pig Feed Costs 2021

Annual Irish composite pig feed prices are shown in Figure 1, expressed in terms of the cost per kg deadweight (dwt.). Feed prices started the year at a moderate level of 112c per kg, but continued to rise as the year progressed to reach an estimated peak in December of 127c per kg. At the start of the year it was expected that a good harvest in the northern hemisphere would reduce pig feed prices in Q3 & Q4 of 2021. However drought conditions in the US and wet harvesting conditions across much of Europe resulted in a poor harvest. The composite feed price rose from €316 per tonne in January to €363 per tonne in December (+€47), giving an estimated annualised price of €337 per tonne. The 2021 composite feed price represents a 10.5 percent increase when compared to 2020 (€305).

Figure 1: Irish pig feed cost 1996-2021



Source: Teagasc Pig Development Department

When the composite feed price is examined over a longer time period, the 2021 price of €337 is significantly higher than the 5 year average (2017-2021) and 10 year average (2012-2021), €309 and €314 respectively. The annualised feed cost of 118 cent per kg dwt., shown in Figure1, is higher than the 10 year average of 114 cent per kg. The highest feed cost in recent years was in 2012 at 132 cent per kg and the lowest was in 1999 at 76 cent per kg.

2.3 Non-feed costs in Irish Pig Production

There are currently 80,000 sows on the Teagasc Profit Monitor (PM) database from a national herd of an estimated 146,000 (55 percent of total). The non-feed costs quoted are based on the national 2020 PM data, (2021 full-year data is not yet available). Changes from year-to year are generally minimal. Non-feed costs (excluding building depreciation and financial costs) are itemised in Table 1.

Table 1: Non-Feed Costs in PM Recorded Herds

Cost Item	2020	2018-2020
	cent per kg dwt.	
Healthcare	6.6	6.2
Heat, Power Light	4.3	4.1
Transport	1.6	1.7
AI	1.9	1.9
Manure	1.8	1.8
Labour/Management	15.9	15.0
Repairs	3.2	2.8
Administration	1.4	1.3
Environment	0.4	0.4
Insurance	1.5	1.3
House rental	1.7	1.8
Contract Costs	2.5	2.4
Water	0.5	0.5
Dead Pigs Disposal	0.8	0.7
Stock Depreciation	2.3	2.2
Miscellaneous	1.3	1.3
Total	**43.5**	**43.9**

Source: Teagasc PM Report 2020

2.4 Financial Costs in Irish Pig Production in 2021

These costs include interest payments and building depreciation and vary greatly from unit to unit depending on the age of the unit and the level of capital investment undertaken in the business in recent years. Financial costs are itemised in Table 2.

We estimate that the cost of building depreciation and interest is significantly lower than the true level required for a healthy pig industry. This reflects the sector's reduced capital investment over a period of time, due to the low profitability of the sector.

Table 2: Financial Costs in PM recorded herds

Cost Item	2020	2016-2020
	cent per kg dwt.	
Interest	4.7	4.2
Building Depreciation	1.6	1.5
Total	6.3	5.7

Source: Teagasc Pig PM Report 2020

2.5 Total Cost of Irish Pig Production in 2021

The estimated annualised cost of production in 2021 (based on 2020 non-feed costs and 2021 feed costs) was 167.5 cent per kg dwt. for pigs delivered to the slaughter plant. This compared to a 158.6 cent per kg dwt. figure for 2020.

2.6 Irish Pig Prices in 2021

The estimated average pig price in 2021 was 159 cent per kg dwt., which was 14 cent per kg dwt. lower than in 2020 (173 cent per kg dwt) and 6 percent higher than 2019 (169 cent per kg dwt) and similar to the five year (2017-2021) and 10 year average (2011-2020) of 161 per kg dwt.

The monthly pig price in January 2021 was a moderate 158 cent per kg dwt. which was significantly lower than the 198 cent per kg dwt achieved in January 2020. The backlog of pigs for slaughter in Q4 2020 in Germany, Denmark and Netherlands put downward pressure on the EU pig price. After this backlog cleared in Q1 of 2021, the EU pig price market gradually increased to reach 172 cent per kg dwt. by mid-year. Unfortunately this upward trend was not to continue as the recovery in the Chinese domestic pig market supply, led to a decrease in EU pigmeat exports during the second half of 2021, with resultant downward pressure on EU pig prices. The Irish pig price slipped from its high in June to reach 146 cent per kg dwt. in November and December 2021.

Irish pig slaughter capacity was an issue during 2021. Traditionally a significant percentage of pigs (10-12% of annual output) produced in the Republic of Ireland (ROI) have been slaughtered in Northern Ireland. Unfortunately due to logistical and labour issues, the main pig slaughter plant in Northern Ireland was unable to process its normal volume of ROI born pigs in Q3 2021. This led to a temporary backlog of pigs on-farm, with a resultant higher average sale weight. This situation slowly improved during Q4, but continued to be an issue at year-end.

Table 3: Monthly Irish Pig Price in 2021

Month	Pig Price
	cent per kg dwt.
January	158
February	155
March	157
April	163
May	171
June	172
July	167
August	163
September	155
October	151
November*	146
December*	146
Average	159

Source: Teagasc Pig Development Department * Estimate

2.7 Irish Pig Production Profitability 2021

The margin over feed cost (MOF) is estimated at 41 cent per kg dwt. in 2021. This is significantly lower than the unusually high 65 cent per kg achieved in 2020 and lower than the 5 year (2017-2021) and 10 year (2012-2021) average of 51 and 47 cent per kg dwt respectively

While the 41 cent MOF for 2021 represented a low margin, the sector entered into 2021 in a favourable financial position. The high level of profitability achieved in 2019 and 2020 was broadly used by pig producers to reduce their debt burden. It is estimated that the average level of feed credit terms was reduced by 4 weeks (18 weeks to 14 weeks) over the 2018-2021 period. This financial prudence has resulted in the sector being better

able to withstand the current low level of profitability.

It is estimated that a MOF of 50c per kg is required to meet all production costs, including financial repayments. Therefore the MOF on a cent per kg achieved in 2021 was significantly below this target.

Table 4: Average Margin over Feed Costs from Compound Feed from 2012-2021

Year	Pig Price (Net)	Feed Cost	Margin over Feed
	Cent per kg dwt.		
2012	166	123	43
2013	176	132	44
2014	167	118	49
2015	148	111	37
2016	149	106	43
2017	162	104	58
2018	140	107	33
2019	168	110	58
2020	173	108	65
2021*	159	118	41

Source: Teagasc Pig Development Department *Estimate

The 2021 MOF is significantly below the norm when compared to the longer term trend shown in per Table 5. The higher five year average of 51 cent is a reflection of the high pig price in 2019 and 2020.

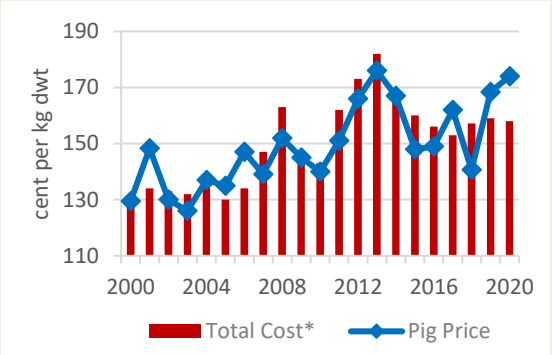
Table 5: Margin Over Feed in 2021 compared to the 5, 10, 15, and 20 year average

	Margin Over Feed	% Diff.
	cent per kg per dwt.	
2021*	41	-
5 Yr average	51	-20
10 Yr average	47	-13
15 Yr average	46	-11
20 Yr average	48	-15

Source: Teagasc Pig Development Department *Estimate

Figure 2 illustrates the pig price received and the total production cost (feed cost plus 50 cent) since 1997. While the pig price and the feed price fluctuate significantly from year-to-year, the MOF has remained surprisingly consistent over the longer term. Even when compared in consecutive 5 year blocks from 1997 to 2021 the MOF varies over a relatively narrow range of 43 cent to 52 cent.

Figure 2: Pig Price compared to estimated Total Production Cost



Source: Teagasc Pig Development Department
*Total cost = Feed cost + 50c

2.8 Irish Pig and Sow Numbers in 2021

The Irish commercial sow herd census in 2021 is estimated at 146,000 and this has remained very consistent over the last 5 years despite considerable financial fluctuations in the sector within this time.

The estimated number of pig slaughterings in 2021 is illustrated in Table 6. The 2021 disposals are estimated to be 3.93 million pigs which is 2.6 percent higher than in 2020, reflecting the continuing improvements in sow prolificacy.

Table 6: Irish born pigs slaughtered: 2018-2021

Year	2018	2019	2020	2021*
	million head			
Slaughter Pigs	3.84	3.70	3.83	3.93

Source: Teagasc Pig Department *estimate

The 10 year trend (Table 7) illustrates a 12 percent increase in slaughterings over this period, which reflects the increased efficiencies and output of the sector.

The decrease in pig exports to Northern Ireland (NI) in 2021 when compared to 2020 (430,000 vs 456,000) may reflect the backlog of pigs that are currently on farms in the ROI and also the difficulty in trading with NI. Slaughter plants during this period. The downward trend in NI exports had stabilised in recent years, but the volume is considerably down from the peak in 2012 when 612,000 pigs were exported from ROI to NI.

The difficulties in exporting to NI this year also highlighted potential logistical issues if Article 16 of the Northern Ireland Protocol was triggered. In 2021 NI pig processing plants slaughtered 11 percent of the total number of pigs from ROI which were slaughtered which could become an

important issue if Article 16 was invoked by the U.K. government and trade was disrupted between the ROI and NI.

Table 7: Slaughter and Live Export to N. Ireland of Irish Born Pigs from 2012-2021

Year	Licensed Export Plants in Ireland	Exports to Northern Ireland	Exports as % of Total
	million head		%
2012	2.907	0.612	17
2013	2.829	0.570	20
2014	2.940	0.519	18
2015	3.132	0.514	16
2016	3.221	0.414	13
2017	3.295	0.433	13
2018	3.337	0.463	14
2019	3.273	0.425	12
2020	3.343	0.456	13
2021*	3.350	0.430	11

Source: DAFM & DARDNI *estimate

The combination of high sow prolificacy and higher sale weight has led to a significant increase in the annual volume of Irish pigmeat being produced year-on-year. Table 8 illustrates a 12 percent increase in output over the last 5 years, while the national sow herd has varied relatively little in size.

Table 8: Irish annual pigmeat output 2017-2021

Year	Total Pigs Slaughtered	Ave Dead wt #	Total Pigmeat Produced
	Million Head	Kg	Tonnes
2017	3.68	84.6	311,328
2018	3.84	86.2	331,008
2019	3.70	86.7	320,790
2020	3.83	87.7	332,383
2021*	3.93	88.7	348,591

Source: DAFM & DARDNI * Estimated ^Irish born # PM

The continued upward trend in pig output urgently requires further expansion in slaughter and chill capacity to prevent this becoming a limiting factor for Irish pig production in the coming years. At the current trend, capacity to kill an extra 120,000 pigs per annum will be required to keep pace with increases in production.

The level of pig disposals in some of the principal pig exporting countries are shown in Table 9. The sow herd declined in Germany and the reduction of weaner pigs being imported for finishing from Denmark and the Netherlands has resulted in a significant decrease of German pig slaughter of 1.6 million. As a result, the Dutch and the Danish slaughter numbers have increased. When these three countries are taken as a group, there has been a total decrease in slaughter numbers of 0.6%. When the main five exporting countries are viewed together there has been an increase of 1.1% (1.1 million pigs).

The 'stand-out' data point in Table 9 is the continuing increase in the Spanish slaughter numbers. To illustrate this continuous increase, the Spanish slaughter volume (44 weeks) increased from 31.8 million pigs (2016) to 37.9 million pigs (2021), an extra 6.1 million pigs (19 percent) increase over a six year period.

Table 9: Selected European & North American Pig Disposals

	2020*	2021*	Change
Country	Million head		%
Germany	37.1	35.5	-4.3%
Spain	36.5	37.9	3.9%
France	15.8	16.0	1.2%
Denmark	14.3	15.2	5.9%
Netherlands	12.8	13.1	2.9%
Total	**116.4**	**117.7**	**1.1%**
U.S.	106.1	106.0	-0.9%
Canada	17.7	17.3	-2.2%

*Based on 44 weeks of production
Source: MPB 2021

This rate of expansion is the reason why Spain has now taken over from Germany, the Netherlands and Denmark, as the 'powerhouse' of European pig production. The integrated Spanish production system and collective price bargaining mechanism generates a lot of efficiencies for their industry.

2.9 Irish Pig and Sow Numbers in 2021

While the Spanish sow herd grew in 2021 at 4.2% (Table 10), other EU herds declined. The low pig prices in Germany, Poland and France and a combination of low prices and a government cessation scheme in Netherlands, has resulted in a substantial reduction in these national sow herds. Overall the total sow population from the largest EU sow herds shows a decrease of 1.8% (149,000 sows). However this survey was undertake in May-June 2021 before higher pig feed cost emerged. Anecdotal evidence suggests that the EU sow herd

reduction has intensified and may result in a decline of 300,000 sows by December 2021.

Table 10: Changes in selected European sow herds

	2020*	2021*	Change
Country	Million head		%
Germany	1.776	1.630	-7.4
Spain	2.583	2.692	4.2
France	0.955	0.938	-1.8
Denmark	1.261	1.285	1.9
Netherlands	1.008	0.951	-5.7
Poland	0.810	0.748	**-7.7**
Total	8.393	8.244	-1.8%

Source: Eurostat

2.10 EU Pigmeat Exports in 2021

The trend of EU pigmeat exports over the last 3 years has being largely influenced by the reduction and restoration of the Chinese sow herd as it emerged from African Swine Fever (ASF). As the largest consumer of pigmeat in the world, the deficit in Chinese domestic pigmeat supply led to a substantial EU pigmeat export volumes during 2019 (2.32 mt) and 2020 (3.34 mt). This high level of EU export volume continued through Q1 and Q2 of 2021. However from June 2021 onwards the EU export volume to China decreased substantially. The restoration of the Chinese pig herd in 2021 resulted in a reduction of pigmeat imports from the mid-year point onwards. This is demonstrated by a 41% year-on-year reduction in EU exports to China by August 2021. This lower trend continued through Q3 and Q4 of 2021. Overall the total EU pigmeat export volume (Table 11) showed a modest increase during the first 8 months of 2021 (latest available data).

Table 11: Pigmeat exports from selected countries

Country	2020*	2021*	change
	million tonnes		%
EU	3.416	3.714	8.7
USA	1.99	2.02	1.5
Canada	0.976	0.969	-0.8
Total	14.8	15.1	2.2

Source: MDP * Jan-Aug

3. Outlook for Irish Pig Sector in 2022

The outlook for the pig sector reflects expected global pig feed and pig price market developments.

3.1 Irish Pig Feed Price Outlook in 2022

The estimated composite compound pig feed price in December 2021 was €363 per tonne. The rapid increase in harvest cereal ingredient prices occurred as a result of a summer drought in the US and poor harvesting conditions in some European countries. Unusually, a further spike in ingredient prices occurred during October and November due to concerns about US winter crop ratings, Russian export taxes and the level of the Australian wheat harvest. This spike in ingredient prices was not fully reflected in compound feed prices during the last months of 2021. However, the increase in cereal prices will likely result in an increase in compound feed prices during January / February 2022, which would increase the feed cost per kg dwt. to an estimated 133c/kg dwt.

The high wheat price in Q4 2021 has resulted in less demand/usage than previously forecast, thereby improving the stock-to-use ratio (30.9%), bringing it close to the 5 year average of 31.8%. Therefore due to greater end-stock levels, it is forecast that wheat prices will gradually ease as 2022 progresses provided that northern hemisphere crops yields are in line with the five year average.

The soyabean planting season has now concluded in Brazil, the world's largest producer. The soil moisture level and planting conditions were good, which led to rapid planting and good seed germination conditions. Brazil's forecast is for a record harvest of 140 mt. This will be required if China's estimate of its import requirements for 2022 of 100 mt is correct. If the South American harvest returns an average five year yield, then the outlook is for a price drop during 2022 relative to the Q4 2021 level of €390 per tonne.

Overall, the outlook for the composite pig feed price is an increase during Q1 of 2022 of €20 per tonne, followed by a decline as the northern hemisphere cereal and soybean harvest arrives. However, the high feed price entering 2022 and the expected slow reduction in feed price as the year progresses suggests a forecast average pig feed price of 125 cent per kg dwt. in 2022, an increase of seven cent per kg dwt. on 2021.

3.2 Pig Prices in 2022

The outlook for the Irish pig price is going to be driven by two main factors; Chinese pigmeat demand and EU pigmeat supply.

The surprisingly rapid restoration of the Chinese sow herd, which has seen 12 million sows replaced in two years, has transitioned the Chinese pig sector from a 'boom to a bust' scenario. The profitability/margin per pig rose to €140 during 2020, but then, due to an oversupply of pigmeat, declined sharply to generate a loss of €140 per pig during 2021.

Some of the largest Chinese pig companies suffered massive losses in 2021. The Muyuan pig company (2.3 million sows) is forecast to have a suffered a monthly loss of €280 million in October alone. This has led to a liquidation of some of the more inefficient pig farms during Q2 and Q3 of 2021.

At the end of 2021 the Chinese domestic price had risen from 11 yuan to 19 yuan per kg (breakeven) as the effect of liquidation / lower pigmeat supply started to be felt on the domestic market. At this price point it becomes attractive for Chinese wholesalers to import pigmeat again. It is forecast that if the Chinese domestic price increases and remains above 20 yuan per kg then the level of EU and Irish pigmeat exports to China will increase again. The export volume will not reach the bumper levels of 2020, but will be more in line with the volumes recorded during the first half of 2021.

The other major influence on the pig price is the level of EU pig production. While the Spanish sow herd will continue to expand in 2022, indications are that the rate of expansion will be lower than in previous years. In conjunction with the slower growth in the Spanish herd, the sow herd decrease in the other main EU pig producers (Germany, Netherlands, France, Poland) will result in a lower supply of pigmeat on the EU market. This lower supply, allied to the increased demand from China, will help to raise EU pig prices during 2022.

It is expected that the effect of reduced EU supply and increased Chinese demand will be felt in the market from April 2022 onwards. Therefore the EU and Irish pig price should see a steady rise in Q2 of 2022 to reach a plateau by mid-summer with a further moderate increase in Q3-Q4.

These combined factors make it difficult to predict a pig price for 2022. However, it is forecast it will be in the region of 163c per kg which is marginally higher than the 2021 level of 159c per kg.

3.3 Pig Sector Profitability in 2022

The pig price is not forecast to meaningfully increase until Q2, which indicates that the margin-over-feed (MOF) for Q1 will be extremely tight and estimated to be one of the lowest in the last 20 years, at 13-15c per kg

As the pig price increases in Q2, the MOF will improve. In addition, an easing of high feed ingredient prices is expected during Q2 of 2022, which will produce a breakeven situation by mid-year. The continued downward trend in feed ingredient prices and relatively high pig price in Q3 and Q4 will lead to a return to profitability in the pig sector. However the substantial losses anticipated in the first half of 2022 will not be fully recouped by the modest profit margin expected in the second half of 2022

The forecast margin-over-feed of 38 c/kg dwt. indicates that margins will be very tight in 2022. While the pig price is forecast to increase in 2022, the increase is forecast to be insufficient to cover high composite feed prices in 2022.

Table 12: Pig & Feed Price Forecast 2022

Year	Pig Price (Net)	Feed Cost	Margin over Feed
	cent per kg dwt.		
2021*	159	118	41
2022^	163	125	38

Source: Teagasc Pig Development Department
*Estimate
^ Forecast

4. Conclusion

The Irish pig sector enjoyed high profitability in 2019 & 2020, with a breakeven/marginal loss position experienced in 2021. The outlook for 2022 is for a much tighter margin, due to significantly higher feed prices outweighing the modest increase in pig prices.

Review and Outlook for Forestry 2022

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1. Introduction

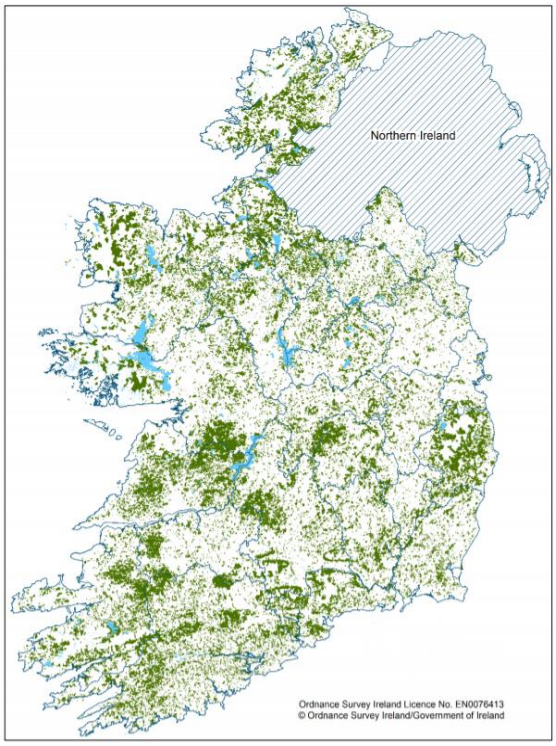
The evolving Irish forest sector is highly important to rural economies and at a national level. Since 1980, almost 23,500 private forest owners, including over 19,000 farmers, have received support to establish forests (DAFM, 2021). Figure 1 outlines the extent of overall forest cover.

Many private forests established during the 1980s and 1990s are now approaching maturity. With an adequate level of timber mobilisation capacity, this timber resource is projected to result in a major increase in supply to the market in the coming years. This projected increase will be a driver for many associated benefits in terms of sectoral growth and wider employment potential (Teagasc 2020). The challenge is to ensure that measures contributing towards these targets equitably address the economic, environmental and social benefits that forestry can deliver.

Forests and forest products play an important role in mitigating climate change. Using wood and wood-based products is a sustainable alternative to conventional carbon heavy construction products, such as concrete, brick and steel. The Climate Action Plan 2021 (DECC, 2021) describes afforestation as the single largest land-based climate change mitigation measure available to Ireland, while managing our exiting forests also provides opportunities to increase carbon stores. COFORD (2021) sets out recommendations for afforestation rates and the silvicultural management needed to secure the long term climate change mitigation benefits of forests.

Afforestation, well planned and executed, can also enhance biodiversity, improve water quality, provide shade and shelter for farmed animals and amenity opportunities for citizens. Forests play an important role in supporting economic development and employment creation in rural areas and provide alternatives to fossil fuel-based materials in construction and energy generation (DAFM, 2021).

Figure 1: Forest Cover in Ireland



Sources DAFM and OSI (2017)

2. Financial Supports

In 2020, €77.6 million in capital expenditure was invested by the Department of Agriculture, Food and the Marine (DAFM) in forestry development, 92 percent of which went towards afforestation grants and premiums. An additional €6 million was spent on other support schemes for forestry and woodland reconstitution and development projects (DAFM, 2021a).

In December 2020, the European Commission approved an extension of the State Aid approval for the current Forestry Programme (2014-2020) to the end of 2022, in accordance with timeframes that apply to the CAP transition period (DAFM, 2021a). The Government, in its 2021 budget, announced an allocation of over €100 million for the Forestry Programme for 2022 (DAFM 2021b). This provides

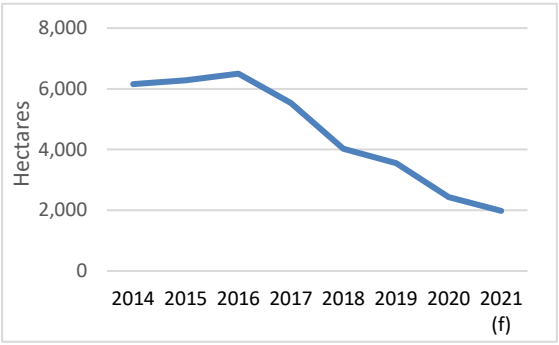
funding to establish a minimum of 8,000 hectares (ha) of new forests in 2022, as set out in the Food Vision 2030 Strategy (Government of Ireland, 2021). However, achieving this annual target continues to represent a major challenge, as afforestation levels have steadily decreased over the last number of years (DAFM 2021).

3. Planting in 2020/2021

In 2020, DAFM made payments relating to the planting of 2,434 hectares (ha) of land, down from 3,550ha in 2019 (Figure 1). Cork had the highest afforestation area at 293 ha followed by Kerry at 289 ha. The proportion of broadleaves in new forests created during 2020 was 34 percent, up from 25 percent in 2019 (DAFM 2021a).

Based on planting levels to date (DAFM 2021c), the projected total area that will be planted in 2021 is 2,000ha (Figure 2). This downward trend in afforestation continues to be a major source of concern across the forest sector. The declining trend in recent years also frames the serious challenge in progressing towards the achievement of stated national planting targets over future years.

Figure 2: Annual planting 2014 to 2020, with projection for 2021



Source: DAFM (2021)

Ryan *et al*., (2016) highlighted the significant gains from planting that could be generated on land classified as limited or very limited for agricultural use. The current average forest size of 6.4 ha indicates that, where farmers consider the forestry option, they are planting part, but not all, of their holdings. Forest creation, incorporating the right trees in the right place with appropriate objectives, can provide a complementary enterprise on many farms. The potential returns from forest enterprises are explored further in section 5.

3.1 The Decision to Plant

The Teagasc National Farm Survey (NFS) collects information annually on a sample of farms with a forest enterprise. The sample is statistically weighted to represent the national farming population. Of the 92,528 farms represented by the 2020 survey (Dillon *et al*., 2021), 8,896 farms (9.3 percent) contain forests, with an average ownership of 10.2 ha per farm. Those farmers participating in the Teagasc NFS have forests spread over a range of age classes. An analysis by NFS farm system, indicating the extent to which farms and farming systems include forests (Table 1).

The 2020 Teagasc NFS data indicate that the largest populations of farms with forests continue to be those with cattle systems (cattle rearing/cattle other). It is evident that farms with cattle other and sheep enterprises contain the highest average forest area per farm. Forestry is also shown to have significant representation in sectors such as tillage and dairy within the 2020 Teagasc NFS. Sixteen percent of tillage farms contain a forest enterprise with an average forest area of 10.6 ha. (Table 1).

Table 1: Teagasc National Farm Survey 2020 - Forestry Representation on Irish Farms

System	Farm Population	Farms with forest	% with forest	Average forest area per farm (ha)
Dairy	16,077	1,162	7.0	8.3
Cattle Rearing	25,128	2,328	9.0	8.5
Cattle Other	28,292	3,053	11.0	11.6
Sheep	14,149	1,194	8.0	11.5
Tillage	6,879	1,122	16.0	10.6
Mixed Livestock	1,877	37	2.0	6.1
ALL	**92,528**	**8,896**	**9.3**	**10.2**

Source: Dillon *et al*. 2021

The conversion of land from agriculture to forest involves a complex decision making process (Ryan and O'Donoghue, 2016). Physical, economic and behavioural drivers are relevant to this land use change decision. These drivers include the permanence of the land use change from agriculture to forestry and socio-cultural attitudes towards the decision, soil quality and the opportunity cost of planting. The potential relative returns to agriculture and forestry is also a significant driver of the afforestation decision.

The Forest Land Availability Implementation Group Report (COFORD, 2018b) identifies factors perceived as impacting (both negatively and positively) on afforestation and overall confidence in the sector. Factors identified included the following:

- Agri-environment schemes which favour short-term decisions and depending on land parcel selection, may result in penalties for those wishing to move between schemes;
- Measures encouraging long-term land leasing for agriculture (although this may be desirable from a land mobility/agriculture expansion perspective);
- Financial claw-backs on land already planted in certain cases;
- The requirement for forestry site notices;
- Ash dieback and associated publicity
- CAP post-2020 implications and the perceived need to continue to 'farm actively';
- Current negative narrative in relation to certain types of afforestation;
- Prevailing timber prices.

The Food Vision 2030 strategy (Government of Ireland, 2021) has outlined how Ireland's agri-food sector can become a "world leader in sustainable food systems". It sets out 22 goals under four high-level missions that the sector must achieve if it is to fulfil this ambition, including a "climate smart, environmentally sustainable agri-food sector". This strategy confirms the commitment to climate neutrality by 2050, with verifiable progress by 2030. One of the goals of that mission is to "develop diverse, multi-functional forests", with eight specific recommended actions.

These actions include developing a new Forestry Strategy for Ireland and placing farmers at the centre of a future afforestation scheme. A further action is to implement Project Woodland, to ensure that the licensing system for tree felling, thinning, roads and afforestation provides a predictable and efficient service for applicants and to ensure that forests continue to play a positive role in the environment.

4. Licensing of Forest Operations

Project Woodland was established in February 2021 to address the issues in forestry in Ireland and progress woodland creation as well as other licencing activities. It involves four workstreams working concurrently.

The Project Woodland Interim Report, July 2021 outlined requirements to maximise the range of opportunities presented by the forest sector. These include a coherent and broadly accepted vision for development of the sector. The report identified a need to ensure that licencing and consent systems operate efficiently and comply with the highest regulatory standards. It also encompassed building of a positive narrative, so that farmers and landowners view forestry as an attractive and economically viable option that can supplement their farm income (DAFM, 2021d)

The second interim report on the implementation of Project Woodland was published in early November 2021. It provided updates on developments across the scope of Project Woodland implementation, including a full regulatory review of forest licencing, a Vision and Strategy for Irish Forestry and proposals on pre-application discussions and planning grants for new forest creation. The need for an urgent uplift in afforestation licensing was also highlighted.

The forest industry is reliant on a continuous flow of approvals through the licencing system. Feedback from stakeholders across the forest sector highlights the critical need for sustained progress and momentum in addressing the licencing backlog and the need to dramatically increase the supply of licences for the key forestry activities during 2022. There is also a need to support farmers and landowners in terms of re-engaging with the forestry option as a viable and complementary land use and building confidence on the merits of planting. Improved alignment between agricultural support schemes and afforestation, to remove any barriers to planting, is also highlighted (DAFM, 2021a).

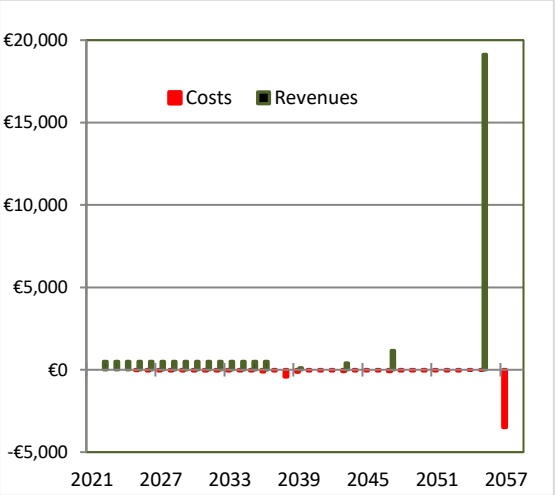
Teagasc, in conjunction with the DAFM and the forest industry, continues to actively engage in awareness-raising of the benefits of well-planned and sustainable farm, through a multi-faceted promotional effort. A sustained and co-ordinated approach from all stakeholders is an essential requirement in terms of helping achieving desired impacts.

5. Forestry Returns

The Teagasc Forest Investment Valuation Estimator (FIVE) can inform decision making in relation to potential land use and forestry. The application uses discounted cash flow (DCF) analysis to model indicative financial returns for forestry land-use

options and management options such as forest thinning. FIVE provides decision support, particularly in relation to reviewing pre-planting options and comparing criteria such as species, yield classes and forest rotation lengths according to landowners' preferences and objectives.

Figure 3: Indicative Forest Returns for 1 ha of Mainly Conifer Forest (GPC 3)



Source: Teagasc, FIVE (2021)

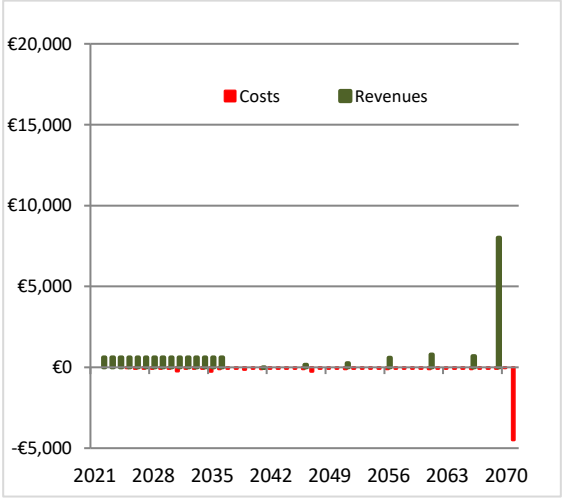
Assumptions: Grant and Premium Category 3 (70% spruce (yield class 24), 15% broadleaf species, 15% retain area for biodiversity enhancement), forest cycle 34 years, discount rate 4.5%, 7-year average timber prices used.

Potential timber revenues are generated by FIVE through the selection of forest criteria and management regimes. A range of variables are used as inputs in a typical financial analysis. These include species, site productivity, rotation length, relevant premium payments, establishment and on-going management costs as well as potential thinning and clearfell timber volumes and revenues. Future cost and revenue streams from forestry are generated in FIVE and are discounted to present day values and presented as net present values (NPVs).

The NPV refers to the net returns to forestry over one (or more) forest rotation(s). In order to compare forestry with other farm enterprise options (at an indicative level), the FIVE tool expresses different forest crop rotations on an annual per hectare basis by generating the Annual Equivalent Value (AEV) for each forest scenario. The AEV expresses the NPV as a series of equal cash flows over the forest rotation.

Figures 3 and 4 present indicative financial returns for one hectare of a mainly conifer (GPC 3) and broadleaf forest (GPC 5) respectively, based on FIVE analysis. GPC refers to the relevant Grant and Premium Category of the DAFM Afforestation Scheme. A summary of the comparative financial outputs for these two afforestation categories is presented in Table 2. The respective AEVs are €491 /ha/year for GPC 3 and €292 /ha/year for GPC 5.

Figure 4: Indicative Forest Returns for 1 ha of Broadleaf Forest (GPC 5)



Source: Teagasc, FIVE (2021)

Assumptions: Grant and Premium Category 5 (85% sycamore (yield class 8), 15% retain area for biodiversity enhancement), forest cycle 50 years, discount rate 4.5%, 7-year average timber prices used.

If all costs and revenues associated with forestry land use are compared with all costs and revenues associated with agricultural land use (after adjusting to present values and the one-year cycle per annum basis) then the Forestry AEV per ha and family farm income are conceptually equivalent.

Table 2: Comparative per Hectare Financial Outputs for GPC's 3 and 5

GPC / Financial outputs	Grant and Premium Category 3	Grant and Premium Category 5
Total revenues (€)	28,485	16,075
Total costs (€)	5,955	7,784
Net Present Value (€/ha)	8,471	5,556
Annual Equivalent Value* (AEV) €/ha/year	491	292

Source: Teagasc, 2021

It should also be borne in mind that this analysis compares observed agricultural incomes with projected future forestry income flows discounted to today's values and converted to annual equivalent. This allows indicative rather than absolute comparison.

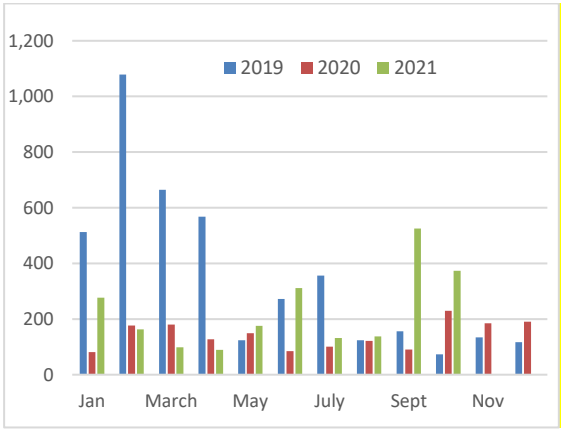
On that basis, forestry returns can be very competitive when compared to some agricultural enterprises. FIVE cannot account for uncertainties such as potential subsidies that agricultural and forestry land will attract in the future or what new values may emerge for the services produced by agricultural and forestry land uses.

6. Timber Harvest and Supply

6.1 Felling Licence Approvals

The DAFM have responsibility for regulation and licencing of tree felling in Ireland. The Forestry Act (2014) requires applicants to provide notice of intention to fell trees and provides for a single felling licencing process. Felling licences may be valid for up to 10 years duration; this may be extended by the DAFM for one or more further periods, as appropriate.

Figure 5: Monthly Felling Licences issued 2019 - 2021



Source: DAFM, Forestry Section Monthly Reports (2019/2/21) and Forestry Dashboard

The number of felling licences issued annually is reported as a sectoral figure, combining licence numbers issued for Coillte and private forest owners (DAFM, 2020c). The total number of felling licences issued to October 31, 2021 was 2,283. In comparison, the total number of felling licences issued for 2020 and 2019 was 1,717 and 4,180 respectively (Figure 5). The 2021 felling licence approvals issued (to October inclusive) represent a thinning area of 10,760ha and clearfell area of 16,373 ha. This compares to an approved thinning area of 7,605 ha (7,604 private) and clearfell area of 11,870 ha (4,725 private) for the full year of 2020. It should be borne in mind that applicants for felling licences may apply for multiple harvest events on the same forest plot in a felling licence application.

Similar to the sectoral requirement for a sustained flow of afforestation licences, feedback from the sector also highlights the need to sustain progress in increasing the flow of approvals for both forest road construction and harvesting operations in 2022. These are essential elements required to maintain a well-functioning timber supply chain.

6.2 Domestic Timber Harvest/Supply

Coillte reported log sales in its forestry division at 2.31 million m^3 in 2020, down 400,000 m^3 from 2019 output due to licensing issues. Reported sales of sawlog to sawmill customers were down 230,000 m^3 and sales of pulpwood (primarily to Coillte's MEDITE SMARTPLY business) were down by 170,000 m^3 (Coillte, 2021).

Wood input purchases by industry for 2020/21 are currently being compiled and validated by the Central Statistics Office. Feedback from the industry suggests that that the volume of private timber harvested in 2021 will be similar to 2020 levels. Irish wood processors have, in 2020 and into 2021, significantly increased volumes of roundwood imported from the southwest of Scotland (DAFM, 2021d) which is deemed a Pest Free Area. These imports were reported as necessary to address ongoing domestic timber supply deficits.

6.3 Global Timber Supply Trends

The price of log imports remained high due to buoyant demand at European level and globally in 2021. For example, European exporters have entered the Chinese market in recent years, with exports to China increasing from less than 500,000 m^3 of softwood logs in 2017 to an estimated 14 million m^3 for the entire year in 2021 (Global Wood Markets Info, 2021). Europe's share of the total Chinese import volume is currently 30 percent, with Germany being the second-largest supplier to China. Central European countries exported large surplus log volumes, harvested as a result of bark beetle challenges in the first half of 2021. China is also identified as a major export destination for Finnish lumber.

In the first three quarters of 2021, Germany was the main European supplier to the U.S. timber market with 1.53 million m^3. This represented a 52 percent share of overall European exports to the US. Sweden ranked second, with over 500,000 m^3. Significant growth rates were also registered in U.S. imports from Romania (Global Wood Markets Info, 2021a).

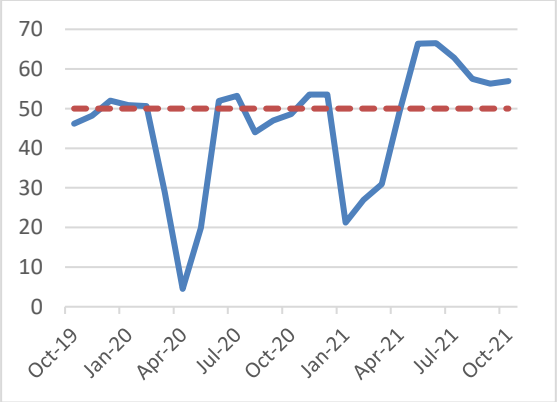
Reports suggest that the central European timber industry now requires more of their own logs to feed domestic sawmills to develop capacity. Less of the beetle-damaged log supply is forecast to be exported from Germany and the Czech Republic to countries such as China.

7. Timber Demand Drivers

7.1 Domestic Timber Demand

The Ulster Bank Purchasing Managers Index (PMI) is a seasonally adjusted index which tracks changes in total construction activity over time. Index readings above 50 signal increased growth (Figure 6). The index posted an index of 56.9 in October 2021. This indicates the sixth straight month of growth as the sector continues to rebound following the easing of Covid-19 restrictions. The PMI also indicated faster growth than signalled in the latest construction PMIs for both the Eurozone and UK.

Figure 6: Construction PMI Oct 2019 to Oct 2021



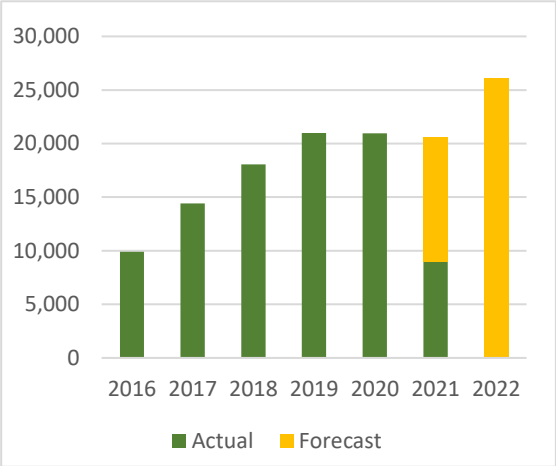
Source: Ulster Bank

The Ulster Bank Construction PMI Report (October 2021) outlines how construction activity, orders and employment levels continue to benefit from the strengthening of demand conditions which accompanied the easing of Covid-19 restrictions on the construction sector itself as well as the wider economy. Despite supply side challenges, partly linked to the pandemic and Brexit, there was a reported confidence about the 12-month outlook as sentiment was again above the long-run average level. Almost half of surveyed respondents anticipate activity gains in 2022. This optimism is linked to expectations that the ongoing release of pent-up demand will support continued growth in construction (IHS Markit, 2021).

The Economic and Social Research Institute outlines how, construction in Ireland has displayed considerable volatility since the onset of the pandemic due to the direct impact of required public health measures on the sector's operations (McQuinn et *al*., 2021). In line with the limitations on the sector in Q2 2020 and Q1 2021, large drops in housing completions were recorded in these quarters. However, output rebounded towards Q4 2020 and in Q2 2021 when measures were eased.

Figure 7 shows the number of dwelling completions in the State since 2015 with forecasts for 2022. A total of 20,353 dwelling completions were reported in 2020, which was marginally below 2019 levels (21,075). On the back of the rebound in construction activity in Q2, 2021, and the continued and sustained economic growth outlook, an outturn in the order of 21,000 is expected for 2021 (McQuinn et *al*., 2021). Supply is also forecast to increase further in 2022 with expected completion levels of just over 26,000 units (Figure 7).

Figure 7: Dwelling Completions RoI (actual and forecast) 2016-2022



Source: CSO and ESRI 2021

An increase in construction activity over the coming years is also likely to be facilitated by recent policy measures. The *Housing for All* Plan (Government of Ireland, 2021a) reaffirms the need for an average of 33,000 homes constructed per annum until 2030 to meet targets set out for additional householders, as outlined in the National Planning Framework. Achievement of such targets would represent a major opportunity for the Irish forestry sector to avail of increased market share.

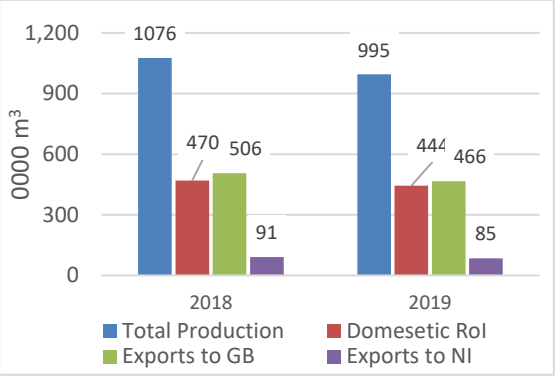
7.2 UK and Other Markets

7.2.1 UK Imports, Production and Consumption

Seven of the main sawmills provide an estimated sawnwood production in their processing facilities of just under 1.0 million m^3 for 2019, with

sawnwood exports to the UK being estimated at 551,000 m^3. These figures do not include all mills. Industry sources projected an overall sawnwood production forecast of 1.2 - 1.3 million m^3 for 2019 (Figure 8).

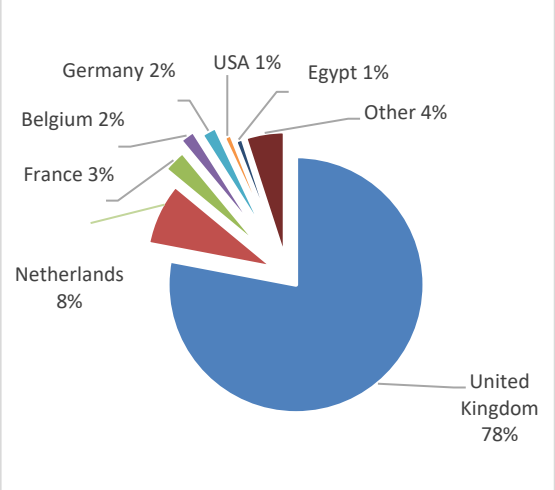
Figure 8: Irish Sawnwood Production and Trade to the UK in 2018/2019



Source: based interviews with 7 of main sawmills in RoI

The UK is the largest single importer of timber in Europe and is the key market for Irish timber products. Wood imports to the UK in 2020 included an estimated 7.2 million m^3 of sawnwood (a 3 percent increase from 2019) and 3.3 million m^3 of wood-based panels (10 percent decrease). Apparent consumption (timber used as wood and wood products by people and industries) was estimated at 54.8 million m^3 of wood raw material equivalent (underbark) in 2020, representing a one percent decrease from 2019 figures (Forestry Commission, 2021).

Figure 9: Top destination countries for forest and wood-based exports in 2020

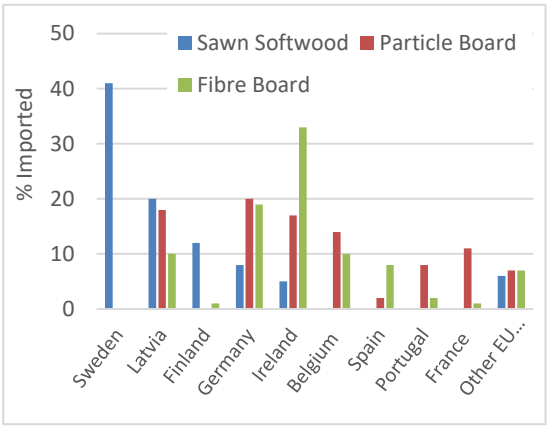


Source: Central Statistics Office, Trade Statistics 2020

The United Kingdom is by far our largest export market, accounting for 78 percent of forestry and wood-based product exports (Figure 9). An estimated 58 percent of these products are exported to Great Britain, with the remaining 20 percent exported to Northern Ireland (DAFM 2021a). In 2020, exports of forest and wood based products (1.39 million tonnes) were values at €446 million. This was a reported decline of €20 million in value (just over 4 percent) compared to 2019 (DAFM, 2021a).

The Forestry Commission trade statistics for 2020 show that Ireland supplied 5 percent of the UK sawn timber products market, down from 6 percent in 2019. Sweden, with 41 percent, Latvia, with 20 percent and Finland with 12 percent provided the majority of sawn softwood imports (Figure 10). Ireland supplied 14 percent of the fibreboard and 33 percent of the particleboard imports to the UK in 2020.

Figure 10: Country of origin of wood imports (per cent) to the UK, 2020



Source: Forestry Commission, 2021

7.2.2 Current UK Timber Market

The UK timber products market is subject to cyclical price fluctuations, reflecting trends in the UK economy. Sawn softwood, particleboard, fibreboard, paper and paperboard were overwhelmingly imported from EU countries in 2020 (Forestry Commission, 2021).

Issues such as timber supply uncertainly and exchange rate fluctuations also affect margins in a market which is extremely competitive at the best of times. Figure 11 presents the Euro-Sterling (€/UK£) relationship between January 2016 and September 2021.

Sterling has maintained a course of appreciation against the Euro in 2021, having gained 5.5 percent up to October. A stronger Sterling will continue to

favour the competitiveness of Irish timber exports to the UK.

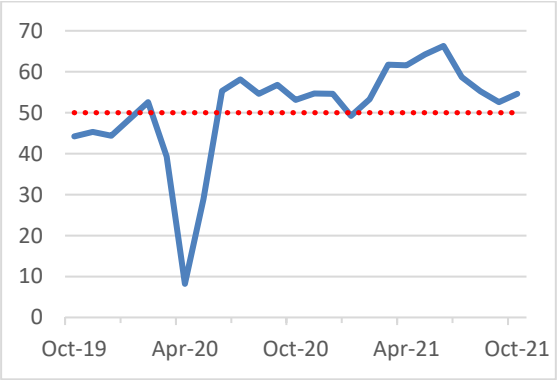
Figure 11: Euro - Sterling Exchange Rate Jan 2016 to September 2021

Source: European Central Bank, 2021

7.2.3 UK Economy

Figure 12 presents the IHS Markit/CIPS Construction PMI between October 2019 and October 2021. Readings over 50 indicate growth. The index rose to 54.6 in October, from 52.6 the previous month and easily beating market expectations of 52.0. The latest 2021 reading pointed to an acceleration in business activity growth across the construction sector, although it remained much softer than the 24-year high seen in June 2021, amid reports of widespread constraints and rapidly increasing purchasing prices (Trading Economics, 2021).

Figure 12: IHS Markit/CIPS UK Construction PMI Oct 2019 to Oct 2021



Source: Tradingeconomics.com

More than seven million m^3 of timber and panel products were imported by the UK between January and July 2021, according to the October Timber Trade Federation (TTF) Market Statement. This is nearly two million m^3 above the same period in 2020, and half a million m^3 above 2019 levels – the UKs last 'regular year' before Covid-19 – which represents an 8 percent increase. These record-breaking volumes of imports reflect high demand for timber products with a strong repairs maintenance and improvements (RM&I) sector and a resurgent private housing market. UK Timber Trade Federation statistics show the average price of sawn and planed softwood in May, June and July rose by 55 percent, 65 percent and 88 percent respectively over their corresponding months in 2020.

The UK Construction Products Association (CPA) predicts continued growth into 2022. In its October 2021 industry prediction, the CPA has revised its growth forecast down from 6.3 percent in 2022 to 4.8 percent, largely due to continuing supply chain constraints. Despite this revision, robust growth is predicted in 2022 with output likely to be 3.0 percent higher than pre-Covid levels in 2019. A core driver of timber demand, private housing, is predicted to grow by 7.0 percent, however, down from 10 percent in the CPA summer forecast. The CPA also predicts private RM&I growth is likely to remain flat in 2022, from an initial CPA summer 2021 prediction of 3.0 percent growth (CPA 2021a).

8. Timber Prices

Published timber price information for both Coillte and private sales has not been available during 2021. Magner (2021) suggests commercial sensitivities and considerations of changing positions in the market as being factors in relation to the reporting of Coillte prices. He also reports how producers of Wood Price Quarterly (WPQ), which provides private standing timber prices, were not in a position to provide price data in 2021 due to insufficient data supply.

Despite the overall lack of published timber price data, industry sources reported record high prices for logs during 2021 lined to the prevailing market situation. Magner (2021) described private forest owners, with felling licences in place, as price makers at the thinning and clearfell stage and with the potential command prices similar to those achieved by Coillte. He suggested a private standing clearfell (comprising 70 percent large sawlog and 30 percent small sawlog and pulpwood) should average €85 to €95 per m^3 or approximately €77 to €86 per tonne.

It should be noted that private timber prices are indicative and can fluctuate according to factors such as region, forest type, harvest type, timber quality, woodlot size and access in the prices

offered for private timber sales. The breakout of product assortments at clearfell will vary significantly based on factors such as forest age, timber quality and the extent and quality of previous management interventions including forest thinning.

Table 3 presents indicative timber assortment (**mill gate**) prices for the period July to September 2021. These figures were compiled by Teagasc, based on feedback from industry sources. Mill gate prices are those paid by the buyer for timber delivered to the yard/sawmill. In this scenario, the forest owner pays for the costs of harvesting and haulage to the sawmill or processing point. Indicative costs for such harvesting and extraction range from €18 to €24 per tonne for thinning and €12 to €14 per tonne for clearfell. Haulage costs (to mill gate) would be in the order of €10 to €14 per tonne but may vary according to outlined factors.

Table 3: Indicative timber assortment prices July-Sept 2021 delivered to mill gate

Product	Length (m)	Diameter (cm)	Mill Gate prices July - Sept 2021 (€/tonne) (ex VAT)
Pulp	3		35 - 40
Stake	1.6+	>8 <15	50 - 55
Pallet	3.1	14+	76 - 96
Pallet	3.7	14+	86 - 105
Sawlog	3.7+	18 - 20+	115 - 134

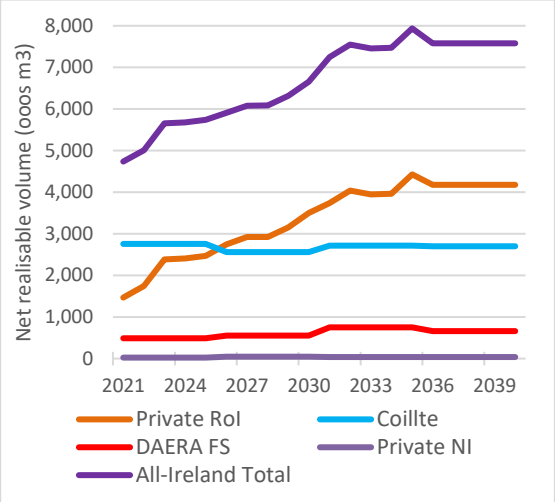
Source: Industry sources during 2021
Note: Prices are indicative **mill gate** (delivered in), expressed as € per tonne, and can vary according to a range of factors

Industry feedback indicates a recent drop in timber prices. Magner (2021a) reported timber prices fell back in October/November period by between 15 percent and 20 percent from earlier levels during 2021. Market prices generally reflect the market situation created by restricted timber availability due to licencing issues, combined with strong timber demand across markets.

9. Realisable Future Timber Volumes

The recently updated All Ireland Roundwood Production forecast 2021-2040 (COFORD 2021 includes both private and public forests. The forecast for net realisable volume (NRV) totals 133.45 million m^3 over the forecast period. The NRV increases from 4.74 million m^3 in 2021 to 7.94 million m^3 in 2035 followed by a small decrease of 0.35 million m^3 and then remains constant at circa 7.6 million m^3 up to 2040. When compared with the previous forecast over the common reporting period 2021 - 2035, the volumes are broadly similar (Figure 13).

Figure 13: Forecast of Total Net Realisable Volume Production by ownership category to 2040 (≥ 7cm top diameter)



Source: All-Ireland Roundwood Production Forecast 2021-2040 (COFORD, 2021)

Figure 13 also indicates that any real increase in the timber volume produced in Ireland to 2040 will necessitate a significant mobilisation of the private forest timber resource. Forecasted net realisable volumes increase by a factor of 2.4, from 1,742m^3 in 2022 to 4,177m^3 in 2040. In contrast, the roundwood supply forecasted from state-owned (Coillte) forests remains relatively stable, only varying between 2,560m^3 and 2,727m^3 over the same period.

The forecast increase in domestic demand for Irish construction timber will, if realised, provide a welcome additional outlet for increasing supply. It is likely to take significant pressure off exports in the medium term, with a range of potential benefits accruing.

10. Renewable Energy

The Renewable Energy Directive is the legal framework for the development of renewable energy across all sectors of the EU economy. The directive establishes common principles and rules to remove barriers, stimulate investments and drive cost reductions in renewable energy technologies, and empowers citizens, consumers and businesses to participate in the clean energy transformation (European Commission, 2021).

In December 2018, the recast Renewable Energy Directive 2018/2001/EU entered into force, as part of the *Clean Energy For All* European package, aimed at keeping the EU a global leader in renewables and, more broadly, helping the EU to meet its emissions reduction commitments under the Paris Agreement.

Building on the 20 percent target for 2020, the Directive established a new binding renewable energy target for the EU for 2030 of at least 32 percent, with a clause for a possible upwards revision by 2023, and comprises measures for the different sectors to make it happen. This included in particular new provisions to enable citizens to play an active role in the development of renewables - enabling renewable energy communities and self-consumption of renewable energy, an increased 14 percent target for the share of renewable fuels in transport by 2030 and strengthened criteria for ensuring bioenergy sustainability.

The European Commission proposed a revision of the Directive in July 2021, as part of the package to deliver on the European Green Deal. The proposal raises the ambition of the existing legislation to align it with EU's increased climate ambition. It also seeks to introduce new measures to complement the already existing building blocks established by the 2009 and 2018 directives, to ensure that all potentials for the development of renewable energy are optimally exploited – which is the necessary condition to achieve the EU's objective of climate neutrality by 2050.

The proposed revision aims to ensure that renewable energy fully contributes to achieving a higher EU climate ambition for 2030, in line with the 2030 Climate Target Plan. It seeks to convert into EU law some of the concepts outlined in the energy system integration and hydrogen strategies, published in 2020. The 2 strategies outlined ways of creating an integrated energy system, based on renewable energy and fit for climate neutrality, and turning hydrogen into a viable solution to help reach the objectives of the European Green Deal (European Commission, 2021).

The Climate Action Plan 2021 identified the supply of sustainable biomass as a measure to reduce carbon emissions and increase removals. It proposed a doubling of the indigenous biomass as a fossil fuel substitution to generate heat and electricity (DECC, 2021). The doubling of biomass supply will mainly come from commercial forests planted since the 1980's.

The Support Scheme for Renewable Heat (SSRH) is a government funded initiative designed to increase the energy generated from renewable sources in the heat sector. The second phase of the SSRH was launched in June 2019. It provides ongoing operational support/tariffs for businesses, farms and other non-domestic heat users for the ongoing use of biomass as well as anaerobic digestion systems. The scheme is designed to support up to 1,300GWh of renewable heat per year (DCCAE, 2019).

The SSRH is stimulating demand for small logs and wood chip with increasing interest in the SSRH Scheme in 2020. While there is a growing supply of forest-based biomass forecast to become available over the period to 2040, a key challenge in future years will be to develop and ensure a balanced approach that optimises development of the country's wood resource. This approach is one which best meets the needs of both the wood processing and energy sectors. This challenge comes against the backdrop of an increasing overall wood supply deficit (CWMPFG, 2018).

11. Brexit

With effect from 1st January 2021, a range of forest products, including forestry plants, wood and bark, moving between Ireland and Great Britain are now subject to phytosanitary and custom controls. New infrastructure, staff and IT systems have been put in place by DAFM in order to handle new import control and export certification requirements (DAFM 2021a).

Prior to 31st December 2020, roundwood from the southwest of Scotland (Pest Free Area) could be imported with a plant passport, but without official border controls and mandatory inspections. New requirements in place include the need for a phytosanitary certificate from UK authorities and advance notification of the import. The UK (Great Britain) market is hugely important for Irish sawmills. Exports of coniferous sawnwood produced in Ireland and which is not bark free must now be accompanied by a phytosanitary certificate and are now also subject to mandatory controls.

In addition to these new phytosanitary requirements, Irish exporters require an Economic Operator Registration and Identification (EORI) number. A further requirement is that businesses need to forward plan for custom declarations

duties. Business now need to efficiently administer the sale of goods and services across borders as well as considering potential VAT implications, due diligence requirements and administrative burdens.

Feedback from the sector suggests that timber exports post Brexit are running relatively smoothly, but with additional administration costs. Exporters are required to declare goods traded between Ireland and Great Britain with a custom declaration form. Documentary identity and physical checks now form part of new regulations.

The Forestry Inspectorate is responsible for implementation of Council Directive 1999/105/EC on the marketing of Forest Reproductive Material (FRM). The latter collectively describes seeds, plants and cuttings. FRM must be derived from approved suitable sources, clearly labelled and identifiable along the supply chain (DAFM 2021d). The Forest Inspectorate is also responsible for implementation of the OECB Forest Seed and Plant Scheme. This recognises equivalence between FRM production systems in participating counties and is essential in facilitating trade of such commodities between Ireland and Great Britain (DAFM pers. comm.).

12. Developments in the Bioeconomy

The substitution of fossil resources with sustainably produced biomass to facilitate decarbonisation and continued economic growth is central to the concept of the bioeconomy. The 2018 *European Bioeconomy Strategy* aims to link sustainable use of renewable biological resources with the protection and restoration of biodiversity, ecosystems and natural capital across land and water.

The 2017 COFORD report, '*Growing the Irish Forest Bioeconomy*', brings forward 12 proposals for the development of a vibrant bioeconomy in Ireland. These include positioning forestry as a central pillar of Ireland's National Policy for the Bioeconomy, embedding the cascading use principle for wood resource management, developing an integrated carbon and land-use policy and ensuring a long-term, consistent and growing supply of roundwood to the processing industry.

The Irish forestry/wood sector is a key contributor to Ireland's economy and a critical component of our climate strategy. There is a considerable opportunity to improve its economic benefit by developing high value products, such as polymers, chemicals and nutrients, from a range of forestry feedstocks and lower value materials. This could transform the industry, boost the rural economy and deliver a green vision for new technologies in Ireland, but requires significant R&D.

There has been a low level of research in relevant areas in Ireland. The NXTGENWOOD project, funded by DAFM through its Competitive Call for Research Proposal (2019) focuses on development of a research ecosystem with the following objectives.

- Launch higher value wood and wood derived products into the market;
- Generate innovation and unique wood materials/biochemicals that can be exploited;
- Develop a highly trained work force that can enter the Irish workforce and foster the uptake of those emerging technologies and
- Sponsor development of science to help fulfil Ireland's sustainability targets.

The lead institute in NXTGENWOOD is Trinity College Dublin with a range of collaborating institutions. AMBER (Advanced Materials and Bioengineering Research) is a Science Foundation Ireland-funded centre that provides a partnership between leading researchers in material science and Industry. AMBER is jointly hosted in Trinity College Dublin by CRANN and the Trinity Centre for Biomedical Engineering, in collaboration with UCC and RCIS University of Medicine and Health Sciences.

13. Forests and Climate Change

The forest sector provides opportunities to mitigate greenhouse gas emissions not only through the sustainable management of existing forests and the creation of new ones, but also in the active storage of carbon in harvested wood products. COFORD (2021a) recently issued a series of statements informing the general public and policy makers of the critical importance of both forests and forest products in achievement of commitments with regard to climate change mitigation and adaptation.

13.1 Forests, Land Use and Climate Change Mitigation

In its *Statement on Forests, Land Use and Climate Change*, COFORD describes how Ireland can contribute to its climate commitments through the expansion of the forest resource, in the context of sustainable forest management. It concludes that a greatly expanded and sustained afforestation programme of between 8,000 ha and 16,000 ha per

year, coupled with a significant reduction in carbon emissions and increased carbon removals in other land uses over the coming three decades will be necessary in order for Ireland to approach carbon neutrality in land use by mid-century.

Allied to such challenging targets for the afforestation programme, COFORD outlines the need to greatly expand the use of wood products in the built environment, while increasing ambition in terms of using wood to substitute for carbon intensive building and other materials. The expansion of sustainable wood fuels in displacing fossil fuels in heating also provides additional opportunity.

The Climate Action Plan (DECC, 2021) indicates that increased afforestation will be one of a range of measures supported across the land use sector and a new forestry programme will be prepared for launch in 2023. Targets also include promoting forest management initiatives to increase carbon sinks and stores. A land use review is underway, led by the Department of Environment, Climate and Communications (DECC) and the Department of Agriculture Food and the Marine (DAFM). Appraisals for income and land use diversification for farmers, including areas such as biomethane and energy production, agroforestry and woodland creation, will be carried out following publication of this review (DECC 2021).

The Climate Action Plan 2021 also outlines targets to double the indigenous biomass supply as a fossil fuel substitution to generate renewable heat and electricity. The felling of trees is regulated by the Forestry Act 2014 which ensures that harvested areas are managed sustainably and environmental requirements apply. The doubling of biomass supply is targets to mainly come from commercial forests planted since the 1980s (DECC, 2021).

The Climate Change Advisory Council (CCAC), in its advice to the Minister on approaches to carbon budgets, notes that the setting and accounting for targets 'in the period to 2030 should take account of the unavoidable delay between actions and outcomes in terms of actual reduction in emissions or enhanced removals, with the understanding that many of the actions taken will bear fruit in the post 2030 period. In order to incentivise activity, it suggests provision could be made in regulation to account for the committed emissions savings in a shorter time frame, while avoiding double counting'. Regulations approved by government will provide for the means to account for an earlier realisation of such removals, and how they can be utilised for sectoral ceiling compliance (DECC, 2021).

13.2 Climate Change Adaptation

COFORD (2021a) describes the urgent need to develop adaptation measures to future-proof the outputs of goods and services from Irish forests. It recommends a range of measured and evidence-based initiatives, supported by ongoing research, as well as frequent and careful monitoring and review. The COFORD Statement on the Impacts and Adaptation to Climate Change outlines key recommendation in areas such as tree species/breeding/genetics, forest design, forest management, forest protection and a focus on cross-sectoral interdependencies.

13.3 Use of Wood Products

The increased use of wood products provides a pathway and opportunity to significantly reduce the embodied emissions of buildings. COFORD (2021a) outlines how both sawn wood and more advanced engineered wood construction products (e.g. oriented strand board, cross laminated timber and laminated veneer lumber) offer a sustainable alternative to site-based high CO_2-producing construction materials such as masonry, concrete and steel. This COFORD statement outlines how such high performance wood products are now deployed in multi-storey construction up to 24 storeys in height. Light timber frame is also a sustainable alternative to conventional masonry construction.

House building in Ireland is mostly low rise with timber frame accounting for only 24 percent, which is low by European standards. Analysis shows that increasing the use of timber frame construction and adopting new engineered wood technologies for high rise applications has the potential to reduce CO_2 equivalent emissions by an estimated 3.4 million tonnes by 2050 (COFORD 2021a).

This COFORD statement also highlights the importance of a whole life cycle approach to the evaluation of building emissions. This is now accepted as increasingly necessary to access the true carbon footprint of buildings and to achieve the current and future emissions reduction targets.

14. Forest Certification

Forest certification is a mechanism by which the quality of forest management is judged against a set of agreed standards and how forest monitoring, tracing and labelling of timber, wood products and non-timber forest products is carried out (Teagasc 2021).

Voluntary forest certification schemes are run by international non-governmental organisations to promote good forest practice. There are currently two certifying schemes available in Ireland - the Programme for the Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC). Voluntary forest certification links the demand for forest products to environmental and social standards to producers who to show that wood or wood products come from certified forests. All major Irish sawmills are certified.

The management of the Coillte estate, which comprises just over 50 percent of the national forest estate, is certified by both the FSC and PEFC. As harvesting in the private sector increases, certification is predicted to be an issue for private forest owners in the near future. Currently 11,181ha of private forest is certified; of which 4,741ha is certified by PEFC and 7,219ha by FSC. There are 330ha certified by both schemes (DAFM, 2021).

Barriers to forest certification for private forest owners include the cost and complexity of achieving this accreditation (DAFM 2018a). Many thousands of hectares of private woodland are approaching the stage of first and subsequent thinning, resulting in a sharp increase in supply of logs from this source in the near future. There is a current limit of 30 percent of uncertified material that sawmills and panel mills can absorb and the supply of timber coming from private uncertified forests means that mills are now close to exceeding this figure (DAFM, 2018).

A forest certification initiative by DAFM resulted in the establishment of two certification groups to help foster a national certification network. This initiative also provided certification templates. Mechanisms for on-going progress and the need for growing membership of further certification groups are now essential for forest owners.

Meeting certification standards involves a chain of custody recording and compliance with environmental and social principles. There are financial costs associated with certification, both in terms of administration and changes in management practices. Although certification may not translate into higher timber prices, it will provide better access to national and international markets, providing a competitive advantage.

15. Forest Health

The Plant Health Regulation EU 2016/2031 and Official Controls Regulation EU 2017/625 came into effect on the 14th December, 2019. This Plant Health Regulation replaces Council Directive 2000/29/EC and provides more effective measures for the protection of the EU territory and its plants from destructive pests. DAFM's Forestry Inspectorate have responsibility for implementation of the forestry aspects of the new Regulations through a range of relevant measures (DAFM, 2021a). These include appropriate import controls, requirements for the implementation of Plant Passport systems, health surveys and contingency planning and requirements in relation to wood packaging materials.

Ireland's Plant Health and Biosecurity Strategy 2020-2025 (DAFM, 2019) outlines the importance of plant health biosecurity as well as highlighting risks to plant health and the roles and responsibilities of stakeholders in terms of risk reduction. It sets out Ireland's response to a number of critical factors including emerging threats from growing global trade in plants and plant products with the associated movement of new and emerging plant pests and diseases.

Ireland has a relatively good overall forest health status in that the forest resource is not subject to the range of pests and diseases that are endemic in Continental Europe and further afield. However, specific tree species remain seriously challenged by fungal based disease. The following updates exemplify such challenges.

15.1 Ash Dieback

Ash Dieback, the disease caused by the fungus, *Hymenoscyphus fraxineus*, continues to develop rapidly across the island of Ireland. By the end of 2020, there had been findings in ash in all 26 counties in over 660 locations in various settings – forests, nurseries and garden centres, on farm planting, roadside and motorway planting, hedgerows and private gardens (DAFM 2021). Evidence of significant further disease spread during 2021 is clear in all of the above contexts.

A proactive approach will be required to minimise the economic, ecological and social impact of the disease. In order for this to happen, forest owners will also require clear guidance and appropriate supports to facilitate positive management interventions

Teagasc continues to actively support this essential effort and support the transfer of knowledge on best methods and practices for the thinning of an ash crop and as well as management option for woodlands affected by Ash Dieback based on ongoing research. A national event to support such efforts is planned in 2022 along with the ongoing provision of advisory supports.

Teagasc is also working with research partners to identify individual ash trees which show a high level of tolerance to Ash Dieback and use them to bulk up stocks of tolerant trees vegetatively, as well as for establishing seed producing orchards with tolerant parent trees.

15.2 Phytophthora Ramorum

The fungal agent *Phytophthora ramorum* was first detected on Japanese larch in Ireland in 2010 in trees showing extensive dieback from the crown and along the stem. At the start of 2020, the disease had been confirmed present in Japanese larch at 56 forest locations affecting approximately 337 ha of forestry. The DAFM forestry inspectorate continued to conduct surveys of larch for the presence of *Phytophthora ramorum* in 2021 (DAFM 2021).

At an EU level, the review of the regulatory status of *P. ramorum* continued in 2020 at the Standing Committee on Plant Health and other Commission Working Groups as part of the wider discussions finalising the Annexes to the new Plant Health Regulation. The pathogen has been regulated under EU-wide emergency measures since 2002.

There is an ongoing debate as to whether this pathogen should be permanently listed as a quarantine organism under the EU Plant Health regime or whether it should be downgraded to regulated non-quarantine pest (RNQP) status or even deregulated. In 2020, it was determined that non-EU isolates of P. ramorum will be treated as Union quarantine pests while EU-isolates will be regarded as RNQPs. This will impact on DAFM policy in relation to the disease (DAFM, 2021a).

15.3 Dothistroma Needle Blight

Dothistroma Needle Blight (DNB) is a significant disease of pine species. Its causal agents include two fungal pathogens, *Dothistroma septosporum* and *Dothistroma pini*. In September 2016, DNB was confirmed in Ireland for the first time. Surveys during 2019 brought the number of findings of DNB to 38. These findings were across 15 counties, affecting Scot's pine (*Pinus sylvestris*), Lodgepole pine (*Pinus contorta*) and Corsican pine (*Pinus nigra*) (DAFM, 2020).
In January 2018, another needle blight of pine, Brown Spot Needle Blight (BSNB) caused by the fungal pathogen *Lecanosticta acicola* was detected in Ireland for the first time in an arboretum in Co. Wexford on Mountain pine (*Pinus mugo*) and Scots pine. Follow-up surveys for this needle blight led to a second finding in a forest in Co. Wexford. There were no further findings of *L. acicola* in 2019.

Pine species account for an estimated 10.7 percent of the stocked forest area in Ireland. These species include Lodgepole pine (9.6 percent) with the remainder being made up of Scots pine (1.1 percent) and small areas of Monterey and Corsican pine (DAFM 2018a). Sitka spruce, the most common species in commercial forests, is deemed to have a low susceptibility to the disease. The DAFM carries out on-going surveys for DNB presence within pine forests and in pine-producing nurseries.

15.4 Pest Risk Analysis

Pest risk analysis (PRA) is an essential tool to help assess the potential risk that future pests can pose, identify suitable measures to exclude them and, where appropriate, provide the necessary evidence direct to the EU to support the regulation of such pests and pathways.

In her paper '*Pest risk analysis in protecting commercial forests*' at the 2020 National Forestry Conference, Dr. Melanie Tuffin draws upon her relevant work within Teagasc on the DAFM-funded FORM project. The introduction of pests and diseases to new regions globally is directly linked to the globalisation of trade. Most introductions are likely to occur in association with imported commodities such as plants, timber, packaging material and seeds. The impacts of new pest arrivals can have serious consequences from an economic, environmental or social perspective (Magner, 2020).

The FORM (FORest Management) project was funded by the Department of Agriculture, Food and the Marine to build capacity in the areas of tree improvement and forest health research in Ireland. The project identified pest risks in relation to Sitka spruce. Its outputs included the development of an appropriate PRA scheme and the production of the first Irish pest risk analysis for Sitka spruce. This PRA is a very valuable resource and can act as a template for other forestry species.

16. Programme for Government

The *Programme for Government – Our Shared Future* was published in June 2020. The Programme highlights the multiple functions that forests can fulfil and a range of supports and initiatives that will be provided to the sector. These include publishing a successor forestry programme to deliver an ambitious afforestation plan and reviewing grant and premium rates across all categories in this area, with a particular focus on an increased farmer rate of support. It also includes the incorporation of afforestation into the new CAP to provide incentives for farmers to plant woodlands on their farm, acting as a carbon store, helping to promote wildlife corridors and providing a fuel source for households.

The Programme also seeks to actively promote and support farm forestry and incentivise the option of small scale forestry. It also puts a focus on protection forests (e.g. providing a buffer that can mitigate sediment or nutrient runoff to rivers and lakes), increased support for agroforestry/ silvopasture on Irish farmlands and the potential of afforestation on state-owned and public lands as urban tree planting and community forests.

17. Knowledge Transfer Groups (KTGs)

Over 600 forest owners participated in an ongoing Forestry Knowledge Transfer Group Scheme throughout the country in 2019 (DAFM, 2020). The operation of the Scheme was reviewed prior to its re-opening in 2020. This served to gauge the effect of participation on decision making by owners. Feedback indicated that participants gained significant practical knowledge to better manage their forest(s) and optimise benefits from their resource.

The KTG Scheme was re-opened in May 2020. This was a conditional reopening in light of the existing public health restrictions on group meetings prevailing at the time. It served to facilitate organisers in securing KTG participants and completing the necessary preparations to be ready to commence meetings, as appropriate, if and when public health guidelines allowed. Forty three KTG groups, with a maximum of 809 participants, were approved in July 2020. However, due to the impacts of ongoing Covid-19 restrictions, only a limited number of KTG meetings and events took place. The Scheme was extended to May 2021 (DAFM, 2021a) with consideration being given to extending the Scheme up to December 2021.

18. Outlook for 2021 and Beyond

18.1 EU Outlook

The European Commission's publication of the European Green Deal in December 2019 sets out its aims regarding several forest-relevant initiatives. The new EU Forest Strategy for 2030 is one of the flagship initiatives of the European Green Deal. It also builds on the EU Biodiversity Strategy for 2030. The EU Forest Strategy seeks to contribute to achieving the EU's biodiversity objectives as well as greenhouse gas emission reduction target of at least 55 percent by 2050. It recognises the central and multifunctional role of forests, and the contribution of foresters and the entire forest-based value chain in achieving a sustainable and climate neutral economy by 2050 and preserving lively and prosperous rural areas (Ec.europa.eu, 2021).

The EU Forest Strategy seeks to develop the socio-economic functions of forests for thriving rural areas and boost the forest-based bio-economy within sustainability boundaries. It also seeks to protect, restore and enlarge the EU's forests to combat climate change, reverse biodiversity loss and ensure resilient and multifunctional forest ecosystems.

18.2 New CAP 2023-2027

The structure of the new CAP is current being finalised. It provides an opportunity to ensure that a strong and positive framework is in place to support afforestation at national and farm level in the coming years. CAP 2023-2027 and the review of State Aid rules will have a significant influence on measures and targets contained in the next forestry programme. Feedback from the sector highlights the critical need for maintenance and enhancement of provisions supporting Ireland's forestry sector.

This is particularly so in relation to sustainable farm forestry and timber mobilisation objectives.

In its forestry submission to DAFM with regards to CAP post- 2020, the COFORD Promotion and Afforestation Working Group (PAW) highlights the essential need for appropriate integration of forestry with CAP as well as its strong representation in order to deliver a range of key national and international objectives. The Group emphasised the benefits of setting ambitious targets for forestry, addressing barriers to forestry uptake and outlined a range of proposed measures to structure and flexibility to allow for the future design of national schemes that support forestry in conjunction with the other elements of Ireland's agriculture and rural economy.

18.3 Food Vision 2030

The Food Vision 2030 Strategy (Government of Ireland, 2021) sets out a new strategy for the Irish agri-food sector to ensure its economic, environmental and social sustainability to 2030. Mission 1 sets out goals to achieve a climate smart, environmentally sustainable agri-food sector. Goal 4 describes a range of actions to develop diverse and multifunctional forests. Action 1 of this goal concerns the development of a new forest strategy, currently in train under the auspices of Project Woodland. The key needs of this strategy identified in Food Vision 2030 include:

- Maintaining and protecting the existing forest estate and reduce deforestation
- Increasing forest cover including continuous cover forestry and agroforestry
- Enhancing delivery of ecosystem services from new and existing forests, including climate change mitigation, adaptation and biodiversity
- Growing the circular bioeconomy by supporting actions that underpin the importance of forest biomass.

In meeting these needs, the Food Vision 2030 Strategy highlights that the direction should be towards diverse multifunctional forests that strengthen the economic viability of rural communities, protect our environment and are resilient in the face of climate change.

18.4 Afforestation

There is a clear urgency to sustainably increase afforestation rates and make progress towards stated planting targets in 2022 and future years. This is critical not only to our forestry sector but also in terms of forests' vital role in climate change mitigation, rural development and renewable energy provision. The Government budget allocation for the Forestry Programme in 2021 of €100 million reflects funding to establish 8,000 ha of new forests, a challenging target set out in the Food Vision 2030 strategy.

The need to substantially increase the flow of afforestation approvals to support the 2021/22 planting programme is a key priority identified by stakeholders. A range of supportive actions and a fully co-ordinated approach by all stakeholders is required to help initiate an upward trend in planting levels. There is also an identified need to support farmers and land-owners in building confidence in the merits new planting and re-engaging with the forestry option as a viable and complementary land use.

The Food Vision 2030 Strategy emphasises the need to place farmers at the centre of a new and improved afforestation scheme. It also outlines that if afforestation targets are to be met, there needs to be greater flexibility in how trees are planted on farms in order to provide farmers with more options that complement their existing model. It also describes the need for harmonisation and coherence with other agricultural support measures.

All forest types (conifer, broadleaf and mixed forests) have a role to play in contributing to the full range of ecosystem services required by society. The challenge is to enable the many services that these forests provide at the landscape level to be realised over the period to 2050 and beyond (COFORD, 2021).

The FLAIG Report (COFORD 2018) proposes a range of actions to enhance future afforestation rates. These include actions relating to promotion and education, environmental actions and relevant measures on income and future land use. In addition to the above, a number of research actions with potential to impact on planting rates are proposed.

18.5 Timber Mobilisation

The export-oriented sawmilling sector will continue to compete in a challenging market environment, with EU/UK-related developments likely to have significant impacts post 2020. Strategic investments in processing capacity continues to be made. Net realisable private timber production from Irish

forests is forecast to increase from 1.74 million m^3 in 2022 to over 3.49 million m^3 by the end of the decade (COFORD, 2021).

The prediction that, by and large, growth in the sawmill and wood based panel demand can be met on the island of Ireland by 2025 is based on an increase state investment in forestry and country roads, as well as continued and sharp focus on the reduction or elimination of other barriers to identified wood mobilisation (COFORD, 2018c). Engagement with the timber processing sector indicates strong confidence in their ability to process the available timber forecast to come on the market in future years. However, by far the biggest current challenge has been the slowdown in granting of felling and roading licences to both Coillte and private forest owners. These are essential to enable sustainable wood mobilisation and supply to domestic and export timber markets.

Timber harvest and mobilisation from first and subsequent thinnings is likely to continue to be the major component of the wood-based panel (WBP) sector and the growing wood biomass sector. It is essential that appropriate and timely thinning continue to be facilitated in private forests that are suitable for this important silvicultural practice. Teagasc, in co-operation will all sectors of the forestry industry, seeks to encourage and support appropriate mobilisation of the private forest resource. This is facilitated through dissemination of research, training and the building of familiarity with, and confidence in, the harvesting and marketing of the timber resource. The empowerment of private forest owners through a range of knowledge transfer events and initiatives, capacity building and a sense of ownership is central to the realisation of private timber mobilisation, achievement of its production potential and the optimisation of ecosystem services.

While domestic sawmilling demand is forecast to increase by 3.5 percent year-on-year, the sawmilling sector will continue to be dependent on its strong presence in the highly competitive UK market, as well as in Europe. The Irish forest products sector is largely export oriented. The Irish timber sector remains dependent on the export market, worth €446 million in 2020 (DAFM, 2021a). Key markets are Northern Ireland, the Great Britain and the Benelux Countries. The UK is the single most important export market for sawn timber and this situation is likely to continue into the future.

Engagement with timber buyers provides insights into the continued demand for timber to meet the on-going requirements of the processing sector. Competitive timber prices can be paid for well managed forests with good quality timber, adequate road access and felling licences in place, proximity to markets, and economically advantageous plantation size. The on-going development of forest owner entities will continue to help facilitate additional thinning and harvesting capacity and supply. The current DAFM-supported Knowledge Transfer Group (KTG) scheme aims to increase the level of forest management activity among participating forest owners and to increase their awareness of the value of their forests. Mechanisms and funding to progress private certification following the successful pilot project to develop a group certification template for private forest owners are now required.

The wood energy market continues to develop as technologies are adapted or introduced to optimise the contribution of forestry to the bioeconomy. The forecasted deficits in wood biomass supply to 2020 and 2025 present a significant challenge to existing timber processing sectors. Other non-timber benefits of forestry such as ecosystem services, tourism and recreation have potential added-value in the longer term.

18.6 Potential Carbon Farming

The Food Vision 2030 Strategy (Government of Ireland, 2021) proposes actions to facilitate the roll out of 'Carbon Farming'. It outlines the benefits of carbon trading especially when it can mobilise greater positive action and support innovation at farm level that can result in verifiable reductions and CO_2 removals in the agricultural and LULUCF inventory. It also outlines scope for the consideration of the role of forests and voluntary carbon markets. It describes how this should be aligned with the EU Carbon Farming initiative as set out in the Farm to Fork strategy, whereby a new regulatory framework for certifying carbon removals may underpin a payment to farmers.

18.7 UK Markets

From a positive viewpoint and despite challenges, Ireland is well positioned geographically to capitalise on existing and future market opportunities in the UK, which imported 7.2 million m^3 of sawnwood and 3.3 million m^3 of wood based panels in 2019 (Forestry Commission, 2021). A flexible, responsive and market focused approach will be required to guide the industry through

current market challenges but there is a positivity from processors that these challenges can be met if required Irish timber supplies can resume.

18.8 Forest Investment Scenarios

There is continued evolution in the trading of semi-mature forest properties and related investment packages. Such packages include propositions on the forward selling of timber harvest rights. This is a relatively new development in the private forest sector and may involve a range of investment scenarios and options for private forest owners. A robust analysis of such investment scenarios from economic, legal and taxation perspectives is central to weighing the merits of this expanding forest investment sector and to ensure that the considerable value underpinning productive forests can be fully realised by owners. In certain cases, interest in semi-mature plantations may provide options to address landowners concerns over the perceived long production cycles and reduced asset liquidity associated with forestry.

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Review and Outlook of Farm Level Environmental Sustainability

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1. Introduction

As depicted in Figure 1 the sustainability of a farm is based on the intersection between the economic, environmental, social and innovation dimensions of that farm's performance. The sustainability of a farm is dependent on strength of these dimension. Failure on a single dimension can threaten the long term sustainability of a farm.

Figure 1: Dimensions of Sustainability

Other chapters have focused on the economic outlook for different farm types. This chapter looks at the sustainability of farms on the environmental dimension with specific focus on gaseous emissions. This cover the greenhouse gas (GHG) and ammonia (NH_3) emissions emitted at farm level.

Farm level emissions of GHG and NH_3 are estimated based on activity data multiplied by an emission factor. The 2020 Teagasc sustainability report (Buckley & Donnellan, 2021) sets this out in greater detail and reports results for 2020 and as well as a number of preceding years. This sustainability analysis uses activity data from the Teagasc National Farm Survey (Dillon et al., 2021) and emission factors from national inventory accounting methods for GHG (Duffy et al., 2021) and ammonia (Duffy et al., 2020). Emission factors tend to remain static over the short to medium term until new scientific evidence emerges. Hence, GHG and NH_3 emission projections for 2021 in this chapter are based on changes in farm activity levels. Farm based activity levels in 2021 are estimated with reference to the Teagasc National Farm Survey using 2020 as the base year.

The Teagasc National Farm Survey (NFS) which is part of the EU Farm Accountancy Data Network (FADN) is a representative sample of almost 900 farms across Ireland. The survey collects data on an annual basis on livestock numbers, cropping area, inputs and outputs, assets and liabilities, direct payments under the CAP. This dataset is primarily collected to report on farm incomes to the EU Commission (as per EU member state requirements) but has been expanded in Ireland in recent times to report on the environmental sustainability of Irish farms.

The Teagasc NFS is based on a nationally representative random sample which is selected in conjunction with the Central Statistics Office (CSO). Each farm is assigned a weighting factor so that the results of the survey are representative of the national population of farms (a total of 91,367 farms are represented in this study for 2020). Within the Teagasc NFS, farms are classified into major farming systems according to the standardised EU typology as set down by EU Commission. Results on the GHG and ammonia emission of the four main land based farm systems in Ireland, namely, dairy, cattle, tillage and sheep are reported here.

2. Methodological approach to estimating 2021 farm level gaseous emissions

From an activity level perspective two things that can significantly influence emissions and where data is available for 2021 are animal numbers, and type and quantity of chemical N fertiliser applied to land.

Animal Number Projections for 2021: The Central Statistics Office (CSO, 2021) publish bovine animal numbers held on farms each June. Results from the CSO June 2021 survey were compared with those from 2020 and this showed an increase in overall cattle numbers of 0.61% as seen by Table 1. However, this increase was not uniform across the different categories of cattle. Dairy cow numbers and cattle under 1 years of age increased by 2.35% and 5.79% respectively. This suggests that increases in livestock numbers are driven by the dairy sector as other cows declined by 4.37% between 2020 and 2021.

Table 1: Changes in cattle numbers 2020 vs 2021

Animal inventories	2019 vs 2020
Total cattle	0.61%
Dairy cows	2.35%
Other cows	-4.37%
Bulls	-3.45%
Cattle: 2 years and over	-10.06%
Cattle: 1-2 years	5.79%
Cattle: under 1 year	1.36%

Source: CSO (2021)

For the ovine numbers, overall numbers are shown to have increased by 1.4% between 2020 and 2021 with ewe number having increased by 4.3% over this period.

Table 2: Changes in sheep numbers 2020 vs 2021

Animal inventories	2020 vs 2021
Total sheep	1.4%
Ewes	4.3%
Rams	0.2%
Other sheep	-1.4%

Source: CSO (2021)

These national level changes in livestock inventories (by category) are applied proportionately across farms with dairy, cattle and sheep animals within the 2020 base year to generate a 2021 estimate of farm level livestock numbers. Land area per farm is assume to remain static.

Chemical N Projections for 2021: The second major element that could likely impact farm level emissions is volume and type of chemical fertiliser applied. Different emission factors are associated with different fertiliser types (e.g. CAN versus urea) and a higher level of application of a given fertiliser will lead to higher levels of overall emissions. Table 3 is constructed from sales data (DAFM, 2021) based on a September to October fertiliser sales year. This indicates that total N (elemental) increased by 5.2% year on year between 2020 & 2021. Straight CAN and NPK compounds were the most common fertilisers purchased in volume terms and the volume of each purchased increased between 2020 and 2021. Sales of protected urea fertiliser increased marginally between 2020 and 2021, but this fertiliser product still only accounts for less than 3% of total chemical N applied. Protected urea is associated with lower GHG emission (vs CAN) and lower ammonia emission (versus straight urea) and its increased use will be an important element of actions to mitigate farm level emissions of both GHG and NH_3.

Changes in chemical N fertiliser applied at farm level are assumed to be reflective of the national level changes as outlined in Table 3. However, additional adjustments were undertaken based on changes in farm level stocking rates as estimated from the animal numbers projection phase and based on historical rates of fertilisation at farm level.

Table 3: Total tonnes of Chemical N sold 2020-2021

	2020*	2021*	% change
Straight CAN	122,167	140,127	14.7%
Straight Urea	43,976	40,687	-7.5%
Protected Urea	19,984	20,540	+2.8%
NK Compounds	3,600	2,947	-18.1%
NP Compounds	2,003	2,404	+20%
NPK Compounds	184,625	189,071	+2.4
Other N Fertilisers	3,162	3,384	+7.0
Total	379,517	399,160	+5.2%

*September to October sales year (Source: DAFM 2021)

Technology Adoption for 2021: The adoption of certain technologies can help reduce gaseous emissions at farm level. Teagasc through the publication of its GHG MACC report (Lanigan et al, 2018) and NH_3 MACC Report (Buckley et al., 2020) have highlighted technologies that are effective in reducing gaseous emissions. The use of protected urea in 2021 is covered in the aforementioned section but assumptions around the transition to the use of low emissions slurry spreading technology are included in this analysis. Results of the 2020 sustainability report (Buckley & Donnellan, 2021) indicated an increase in the share of aggregate slurry spread with LESS, from of 16% in 2019 to 36% in 2020. It is assumed that this transition continues in 2021 and that a similar proportional increase in slurry applied by LESS is realised in 2021.

3. Results

It is important to appreciate that some factors influencing the various indicator measures presented here are partially within the control of an individual farmer (e.g. input use efficiency, technology adoption), while other factors are outside of an individual farmer's control (e.g. farm output prices, weather conditions, soil quality). Since farming is influenced by weather conditions, which vary from year to year, and which therefore may affect the level of production or the level of input utilisation in a given year, this limits the inferences that can be drawn from one year movements in such time series, as any on year's observation contains both the signal and the noise components. The use of a three year rolling average based measure allows for the signal component of the indicator (as opposed to the noise) to be more apparent and is the approach adopted here when reporting results through time.

3.1 GHG Emissions

Agriculture is the largest contributor to Irish greenhouse gas emissions by sector, with 37.1% of the national emissions total in 2020 (Environmental Protection Agency, 2021a). The agricultural sector is required to reduce its emissions in the context of Ireland's commitment to reduce national GHG emissions. The Climate Action and Low Carbon Development (Amendment) Act 2021 (Government of Ireland, 2021a) sets Ireland an objective of a climate neutral economy to be achieved by 2050. Under the Climate Action Plan 2021, agriculture has a sectoral target of between a 21-30% reduction by 2030 (Government of Ireland, 2021b).

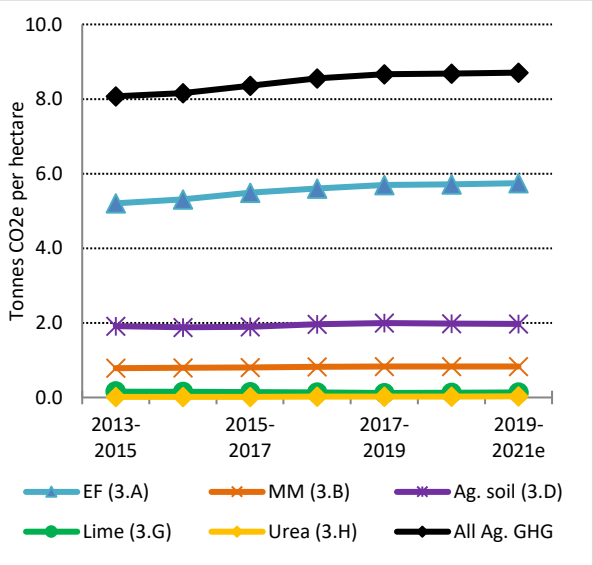
The GHG emissions indicators in this analysis are estimated following the IPCC methodology accounting conventions and Irish emission factors as employed in the 2019 National Inventory Report for Ireland (Duffy et al., 2021). The main sources of agricultural GHG emissions are methane (CH_4) emissions from enteric fermentation (EF) by ruminant livestock, CH_4 and nitrous oxide (N_2O) emissions from manure management (MM) (production and storage of livestock manures) and N_2O emissions resulting from the application of manures and chemical fertilisers to agricultural soils. Additionally, direct CO2 emissions associated with lime and urea application are also included in this analysis but each represent minor elements. For reporting purposes, all non-carbon dioxide (CO2) emissions are converted to CO2 equivalents (CO2e) using appropriate IPCC based global warming potentials (GWP100) for CH_4 and N2O.

3.1.1 GHG on Dairy Farms

Figure 2 presents results by emission category between 2015 and 2021e on a 3 year rolling average basis (e.g. 2015-2017 is the average of the years 2015, 2016 and 2017). The 2019-2021e results includes an estimate for emissions in 2021 based on the projected changes in activity levels as set out in section 2 above.

Results show an increasing trend in per hectare GHG emissions across dairy farms at the start of the study period, with a levelling off towards the end. As outlined by Buckley & Donnellan (2021) average dairy herd sizes has increased over the study period and tended to override efficiency gains in the area of carbon footprint and output per cow. This is reflected in the general increasing trend in per hectare CO2e emissions from Enteric Fermentation (EF) over the study period which is directly reflective of growth in animal numbers. Animal number increases are also reflected in manure management (MM) and fertilisers applied to agricultural soils categories.

Figure 2: Dairy Farm GHG Emissions by emission category - Rolling 3 year average

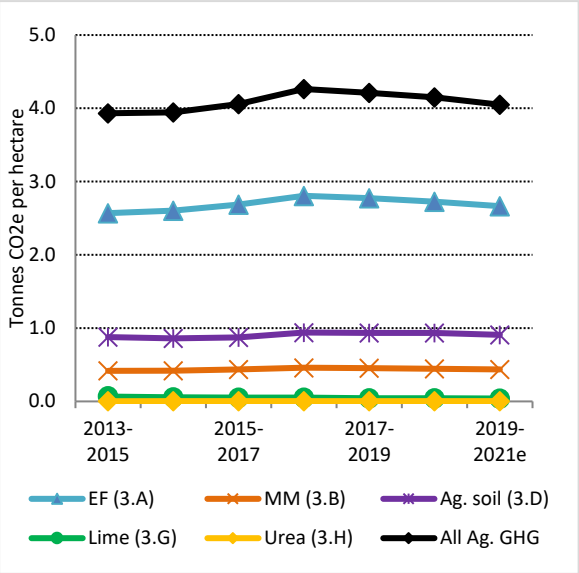


Source: Teagasc NFS Sustainability Report 2020

3.1.2 GHG on Cattle Farms

Figure 3 presents GHG emissions per hectare results by category on cattle farms. In contrast to dairying, results indicate that per hectare GHG emission have been declining on cattle farms since the middle of the study period as seen in Figure 3.

Figure 3: Cattle Farm GHG Emissions by emission category - Rolling 3 year average



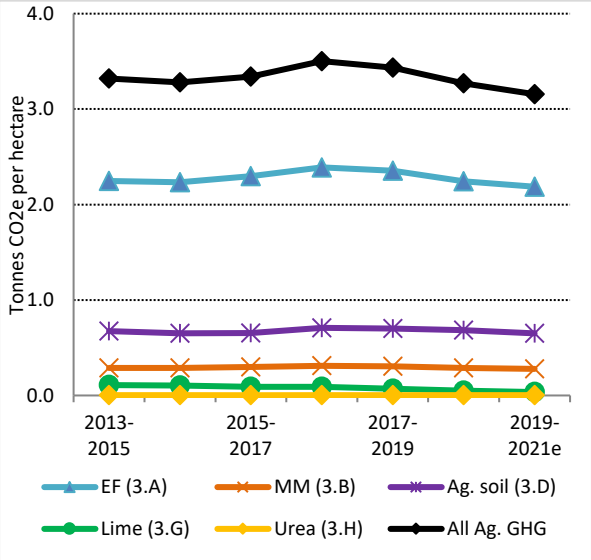
Source: Teagasc NFS Sustainability Report 2020

A reduction in animal numbers on cattle farms, as reflected through lower level of Enteric Fermentation is the main driver behind this trend.

3.1.3 GHG on Sheep Farms

Figure 4 reports GHG per hectare results by emissions category on sheep farms. Similar to cattle farms results indicate that per hectare GHG emissions have been declining on sheep farms since the middle of the study period. This has again been primarily driven by reductions in the Enteric Fermentation component.

Figure 4: Sheep Farm GHG Emissions by emission category - Rolling 3 year average

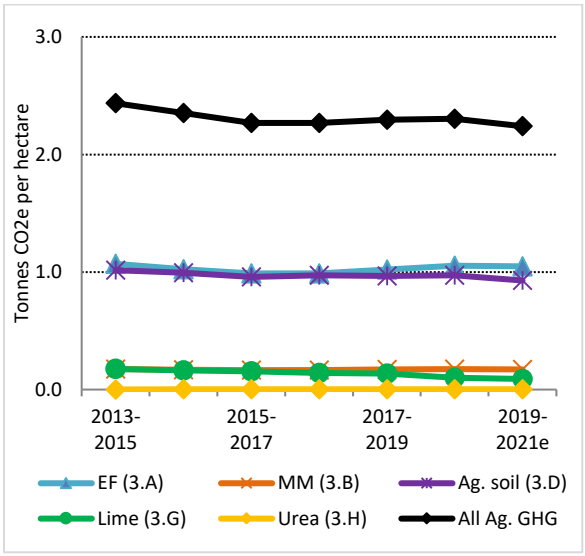


Source: Teagasc NFS Sustainability Report 2020

3.1.4 GHG on Tillage Farms

GHG per hectare results by emission category on tillage farms are presented in Figure 5.

Figure 5: Tillage Farm GHG Emissions by emission category - Rolling 3 year average



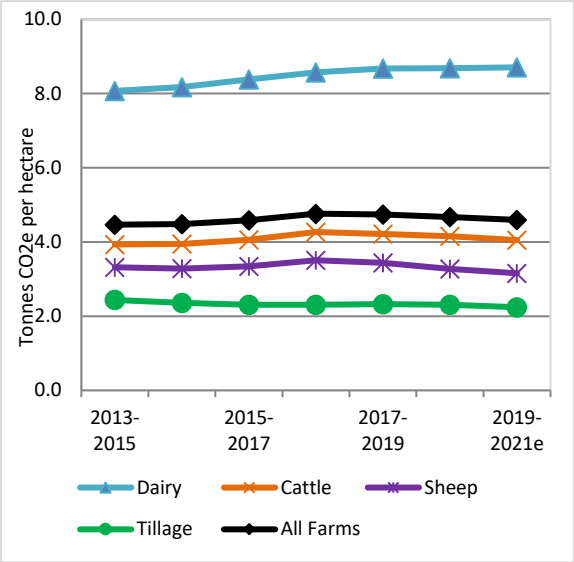
Source: Teagasc NFS Sustainability Report 2020

In contrast to other farm system types, GHG per hectare emissions have been steadily declining on tillage farms over the entire study period. It should be noted as outlined by Buckley and Donnellan (2021) that the majority of GHG emissions on tillage farms is generated from livestock enterprises on the farm and these declines primarily reflect developments in animal activity levels on these farms.

3.1.5 GHG on All Farms

Figure 6 illustrates trends in total GHG emission per hectare across the different farm types. On average over the study period dairy farms tended to emit per hectare GHG emissions that were 2-2.5 times higher than cattle and sheep farms respectively and 4 times that of tillage farms. As seen in Figure 6, emission have been increasing on dairy farms over the study period, whereas for the other farm types GHG emissions have tended to be declining since the start/middle of the study period. Hence, in an all farm situation increases on dairy farms have been offset by declines in the other farm systems.

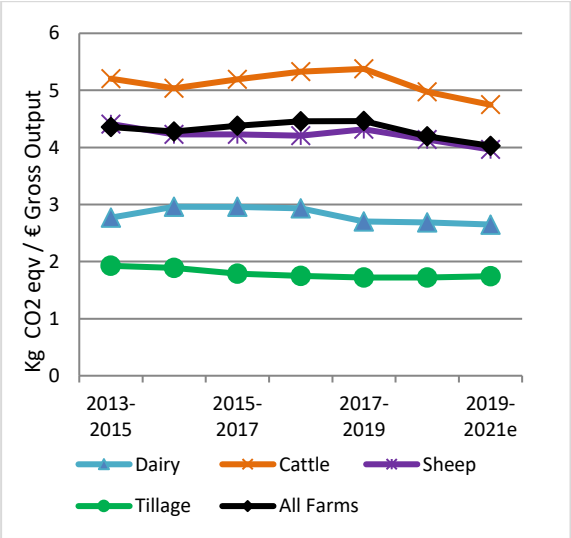
Figure 6: Total GHG Emissions (CO2e) per hectare by farm type - Rolling 3 Year average



Source: Teagasc NFS Sustainability Report 2020

Figure 7 interacts the economic and environmental dimensions of sustainability by exploring the kg of CO2e per € of gross output generated across the different farm types. Due to the lower revenue generating capacity of cattle and sheep farms they have higher level of GHG emission per € of output generated over the study period. Although dairy farms generate the highest level of absolute emissions (as seen in Figure 6) they also have high revenue generating capacity which mean they are only second behind tillage when assessed on a GHG emission per € of output basis.

Figure 7: Total GHG Emissions (CO2e) per euro of gross output by farm type - Rolling 3 Year average



Source: Teagasc NFS Sustainability Report 2020

Tillage have the lowest absolute levels of GHG emission per hectare and have the second highest revenue generating capacity (behind dairying), hence, this combination leads to the lowest GHG emission per € of output.

3.1 Ammonia Emissions

Ammonia (NH_3) is an air pollutant contributing to eutrophication and acidification of terrestrial and aquatic ecosystems. It is also an indirect source of a potent greenhouse gas nitrous oxide (Sutton et al., 1992). The EU and its Member States are parties to the Convention on Long-Range Transboundary Air Pollution, which regulates trans-boundary air pollutants, including ammonia (NH_3). Within the EU, NH_3 emissions are regulated through the National Emissions Ceiling (NEC) Directive (EU, Commission 2016). Over 99.4% of Ireland's NH_3 emissions originate within agriculture, principally from animal waste and the application of synthetic fertilisers (EPA, 2021b). The fact that ammonia emissions in Ireland come almost exclusively from agriculture means that any future national ammonia reduction target for Ireland de facto represents a reduction target to be achieved by the agricultural sector.

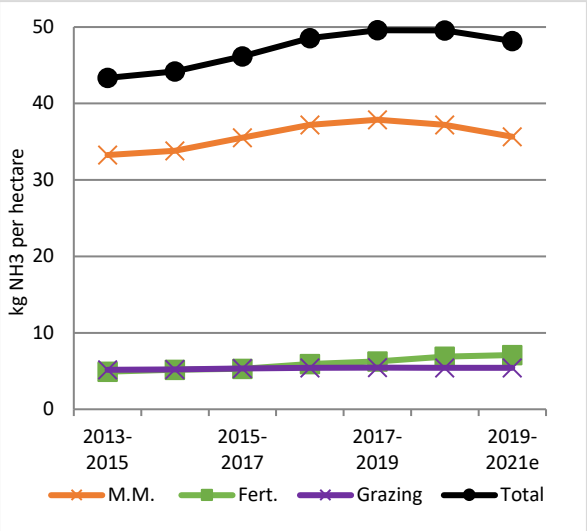
The national inventory accounting methodology as applied by the Environmental Protection Agency (Duffy et al., 2020) in conjunction with the projected activity data for NFS farms in 2021 (as set out in section 2) is used for estimating NH_3 emission indicators across different farm type for 2021. Results are again presented on a 3 year rolling average basis.

3.2.1 NH_3 on Dairy Farms

Figure 8outlines kg of NH_3 emission per hectare on dairy farms. The manure management (MM) category linked to manure generated from animals during the winter housing period is the largest category of NH_3 emissions. This covers the housing, storage and land spreading phases of manure management. This category of emissions and that associated with the application of chemical N fertilisers increased over the study period but levelled off and decline somewhat at the end.

Figure 8 shows an increase in NH_3 emissions until the end of the study period. The transition to Low Emissions slurry spreading is having an impact and reducing emissions at the end of the study period.

Figure 8: Dairy Farm NH3 emissions by category - Rolling 3 Year average

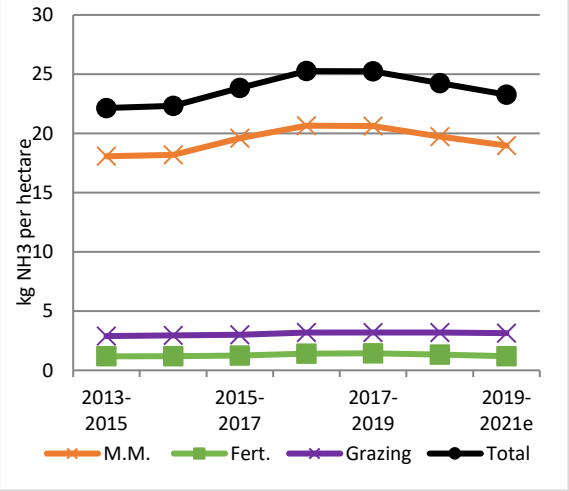


Source: Teagasc NFS Sustainability Report 2020

3.2.2 NH_3 on Cattle Farms

NH_3 emissions on cattle farms are outlined in Figure 9. The emission profile is similar to that on dairy farms in terms of the relative contribution of different emission categories (all be it total emission are significantly lower). In contrast to dairy farms, total per hectare NH_3 emissions have been in decline since the middle of the study period.

Figure 9: Cattle Farm NH3 emissions (kg NH3 ha^{-1}) by category - Rolling 3 Year average

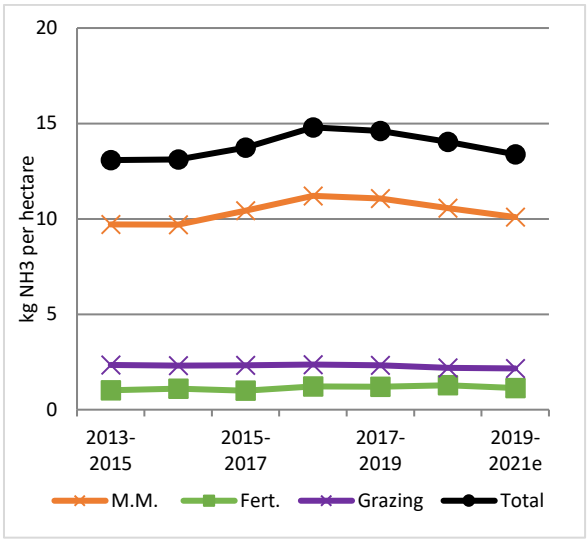


Source: Teagasc NFS Sustainability Report 2020

3.2.3 NH_3 on Sheep Farms

Figure 10 reports kg of NH_3 emission per hectare on sheep farms. The emissions profile is similar to that of cattle farms (overall per hectare emissions are however lower). Again, similar to cattle farms, average per hectare NH_3 emissions were seen to be on the decline since the middle of the study period.

Figure 10: Sheep Farm NH3 emissions by category - Rolling 3 Year average

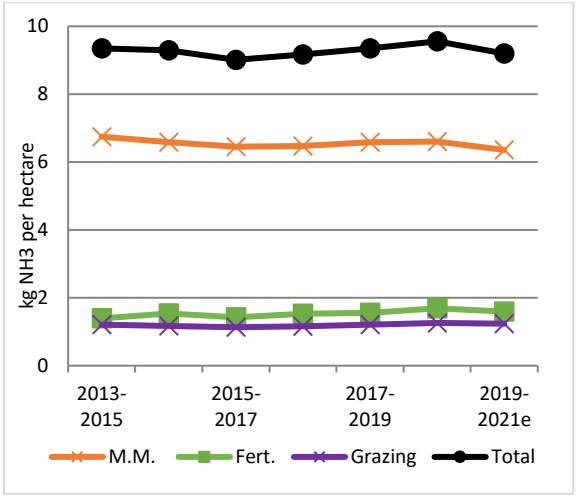


Source: Teagasc NFS Sustainability Report 2020

3.2.4 NH_3 on Tillage Farms

NH_3 emissions on tillage farms are reported in Figure 11. Although these farms are classified as specialist tillage farms, on average, they have a significant cattle or sheep enterprises (or both) and this is reflected in the emission profile in Figure 11. In contrast to the other farm types, NH_3 per hectare has tended to be relatively stable over the study period.

Figure 11: Tillage Farm NH3 emissions by category - Rolling 3 Year average

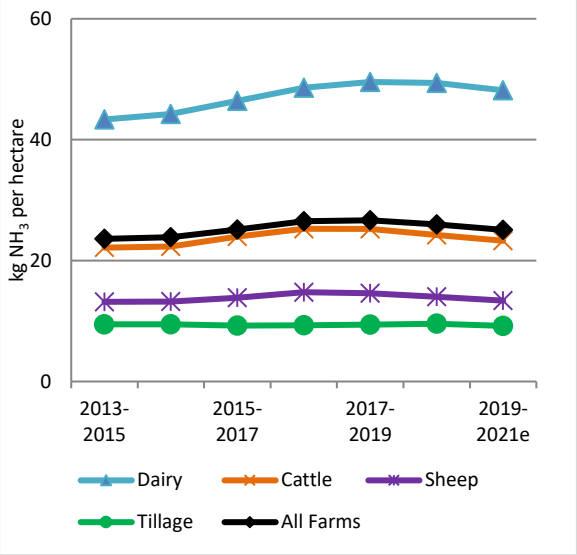


Source: Teagasc NFS Sustainability Report 2020

3.2.5 NH_3 on All Farms

Figure 12 illustrates trends in total NH_3 per hectare across the different farm types. Dairy farms on average tended to have NH_3 per hectare emissions that were twice that of cattle farms, 3.5 times that of sheep farms and 5 times that of tillage farms. As seen from Figure 12, NH_3 emission have been generally increasing on dairy farms over the study period until recent years, whereas for the other farm types emission have tended to be declining (or stable) since the start/middle of the study period.

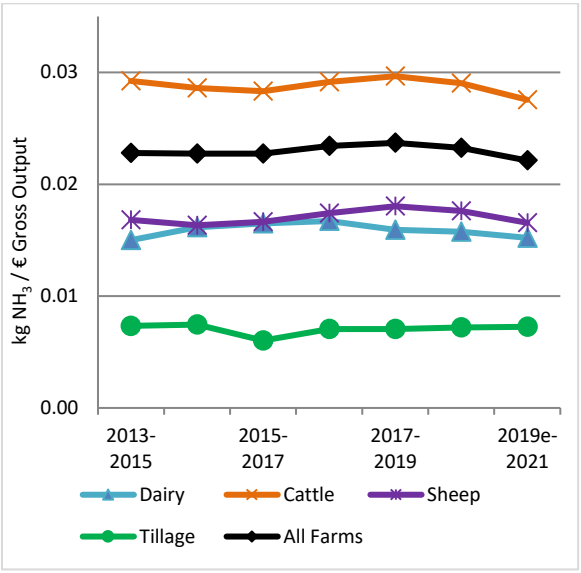
Figure 12: Total NH3 Emissions (kg per hectare) by farm type - Rolling 3 Year average



Source: Teagasc NFS Sustainability Report 2020

Figure 13 again interacts the economic and environmental dimensions by examining the kg of NH_3 per € of gross output generated across the different farm types. Due to the lower revenue generating capacity on cattle farms and relatively higher levels of NH_3 emissions (compared to sheep and tillage farms as seen by Figure 12), cattle farms have the highest level of NH_3 emissions per € of output over the study period. Similar to that seen with GHG, dairy farms generate the highest level of absolute NH_3 emissions (Figure 12) but they also have the highest revenue generating capacity. Consequently, dairy farms had significantly lower NH3 emissions per € of output versus cattle farms and were at a level similar to sheep farms. Tillage farms again had the lowest levels of NH_3 emission per € of output generated.

Figure 13: Total NH3 Emissions per € output by farm type - Rolling 3 Year average



Source: Teagasc NFS Sustainability Report 2020

4. Summary conclusion

- Per hectare GHG and NH_3 emissions across dairy farms tended to increase across the study period until stabilizing / decreasing towards the end.
- Per hectare GHG and NH_3 emissions on cattle and sheep farms tended to decline from the middle of the study period.
- GHG and NH_3 emission per hectare on tillage farms were stable or declined over the course of the study period.
- Dairy farms on average had GHG per hectare emissions that were 2-4 times higher than cattle, sheep and tillage farms respectively over the period examined.
- Cattle farms generated the highest level of GHG emission per € of output generated, followed by sheep farms. On average dairy farmers had the second lowest level of GHG emission per € of output with tillage farms being the lowest.
- NH_3 emission per hectare on dairy farms were 2, 4 and 5.5 times higher than cattle, sheep and tillage farms respectively.
- Cattle farms had the highest level of NH_3 emission per € of output generated. Conversely, tillage farms generated the lowest level per € of output, with sheep and dairy farms falling between cattle and tillage farms on this metric.

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NOTES