Outlook 2023
Economic Prospects for Agriculture

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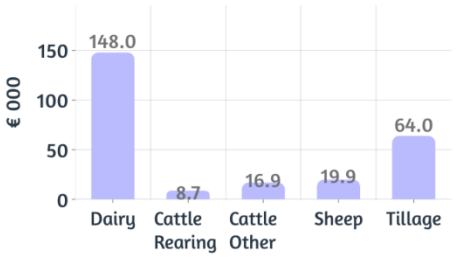
Summary Review of 2022

Global Economy
- High inflation
- Rising interest rates
- Slow down in global growth

Average Family Farm Income Estimates 2022



Margins (relative to 2021)

- Dairy: up substantially, due to very high milk prices
- Beef: down on both cattle finishing and cattle rearing
- Sheep: down, due to higher costs
- Tillage: up substantially, due to higher harvest prices and yields
- Pigs: down substantially, due to higher costs

Support Payments (relative to 2021)

- Total payments up 5%

Average NFS Farm Income 2022e vs 2021

Input Costs
Up on the 2021 level
Higher feed, fertiliser and fuel prices

Fertiliser Prices
Up 195% for grassland vs 2021
Up 155% for tillage vs 2021

Feed Prices
up 28% relative to 2021

Oil Prices
Up relative to 2021, averaging US$100 in 2022 (up 60% in euro terms)

Average Annual Exchange Rate in 2022e
$ 1.05 / Euro
£ 0.85 / Euro

Eurozone inflation
At highest level in decades

Irish Unemployment
<5% in 2022

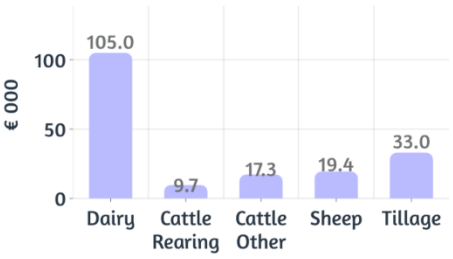
Weather Conditions
Grassland: Unfavourable
Tillage: Favourable

Summary of Prospects for 2023

Global Economy

- Lower inflation rate
- Lower economic growth
- Some economies in recession

Average Family Farm Income Forecast 2023



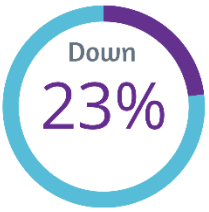
Margins in 2023 (relative to 2022)

- **Dairy:** lower, due to falling milk prices
- **Beef:** stable on cattle finishing and up on cattle rearing
- **Sheep:** lower, due to input costs outpacing output gains
- **Tillage:** down, due to lower harvest prices and yields
- **Pigs:** higher, due to higher pig prices

Support Payments (relative to 2022)

- Total Payments up 12%
- Increased Pillar II receipts under the new CAP

Average NFS Farm Income 2023f vs 2022e



Input Costs
Up slightly in aggregate

Fertiliser Prices
Unchanged for grassland and up slighlty on tillage area

Feed Prices
Up 10% on the 2022 level

Oil Prices
Expected to average lower than in 2022 (US$85) with carbon tax to increase also

Average Annual Exchange Rate
$ 1.02/ Euro
£ Stg 0.86/ Euro

Eurozone inflation
To ease from 2022 level

Irish Unemployment
to remain <5%

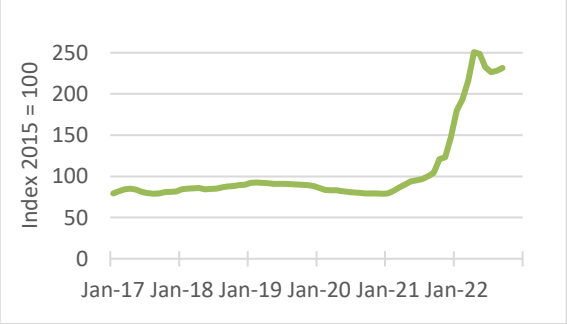
Weather conditions
Normal weather assumed

Overall Sector: Summary Review of 2022

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

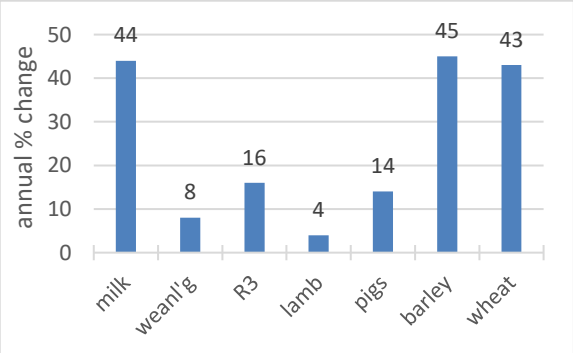
- Weather conditions in 2022 were unfavourable during the summer months for grassland systems but excellent for tillage.
- Driven by the consequences of the illegal invasion of Ukraine, total production costs increased dramatically in 2022, with higher feed, fertiliser and fuel prices observed. Fertiliser use fell considerably.
- Averaged over the year, there was a 44 percent increase in milk prices in 2021, with VAT inclusive prices averaging close to 58 cent per litre (actual fat and protein). Irish milk production is estimated to have remained relatively stable in 2022.
- In 2022 the increase in milk prices surpassed the increase in milk production costs. The average dairy net margin rose by almost 70 percent, to an estimated 23.9 cent per litre.
- Prices for finished cattle increased by 16 percent in 2022. Weanling prices increased by 8 percent, while prices of store cattle increased by 11 percent relative to the 2021 level.
- The average gross margin on the cattle finishing enterprise increased by 7 percent in 2022. The average gross margin on the single suckling enterprise decreased by 15 percent in 2022.
- The average net margin on the cattle finishing enterprise decreased slightly to -€33 per hectare in 2022. The average net margin on the single suckling enterprise decreased to -€125 per hectare in 2022.
- Higher marketed output values in 2022 resulted in higher margins on the average mid-season lowland lamb enterprise, up 7 percent on average. The positive margins were further influenced by the receipt of payments from the Sheep Welfare Scheme, while total costs increased by 28 percent more than eroding any output value gains.
- The gross margin for Irish mid-season lowland lamb producers in 2022 is estimated to have decreased by 14 percent.
- In 2022 Irish cereal yields for most major crops were up on the 2021 yields, with the magnitude of change varying by crop. Cereal prices at harvest in Ireland in 2022 were up significantly on the 2021 level, due to reduced production levels in the EU market and uncertainty regarding Ukraine exports.
- Direct costs for cereal production increased significantly in 2022, due mainly to an increase in fuel, fertiliser and seed expenditure. Whilst direct costs were higher in 2022, the substantial increase in gross output led to a further increase in cereal margins in 2022.
- Sharply, higher pig production costs were a feature of 2022. While pig prices rose in 2022 to reach an average of 182 cent per kg, pig production costs were up 30 percent.
- The key pig production profitability measure, margin over feed, was at an extremely low level of 26c in 2022, leaving pig farms in a loss making situation.

Figure E1: Monthly Price Index of Fertiliser in Ireland from 2015 to 2022



Source: CSO (various years)

Figure E2: Change in Output Prices 2022 vs 2021



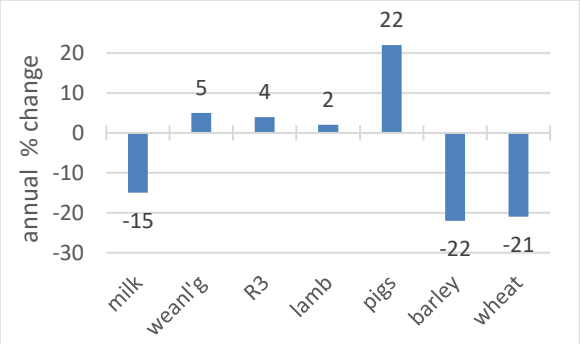
Source: Authors' estimates

Overall Sector: Outlook for 2023

Output Value	Input Spend	Support Payments	Income
Down	Up	Up	Down

- The outlook for Irish agriculture in 2023 is conditional on a normal weather assumption.
- The cost inflation of 2021 and 2022 will leave overall production costs at a high level in 2023.
- Fertiliser prices are forecast to remain unchanged in 2023. No change in usage levels is anticipated.
- For the year as a whole, feed prices are forecast to increase by about 10 percent in 2023.
- Fuel prices are forecast to fall by 14 percent in 2023.
- In 2023 average Irish milk prices are projected to decline by about 15 percent compared to the record prices of 2022. An average price of 49 cent per litre (actual constituents VAT incl.) is forecast. However, with expenditure on feed, fertiliser and energy remaining elevated, the margin per litre is expected to fall in 2023 to more normal levels.
- Despite this, an increase in milk production of approx. 4 percent is forecast.
- In 2023 the average dairy net margin is forecast to fall by 40 percent to 14.3 cent per litre.
- The annual average for finished cattle prices is forecast to be four percent higher in 2023 relative to 2022. Young cattle prices are forecast to be five percent higher in 2023 relative to 2022.
- The average gross margin on the cattle finishing enterprise is forecast to be €626 per hectare in 2023 and therefore similar to 2022.
- Due to the introduction of the Suckler Carbon Efficiency Programme (SCEP) and the forecast increase in young cattle prices, the average gross margin on the single suckling enterprise is forecast to increase by 11 percent in 2023.
- While an increase in lamb prices is forecast for 2023, this coupled with a somewhat less positive outlook for costs, notably concentrate feed and electricity costs, will result in slightly lower margins on sheep farms for 2023.
- Sheep gross margins are forecast to fall by about 1 percent on average, to €800 per hectare.
- Payments to farmers participating in the Sheep Improvement Scheme will boost the value of gross output and margins per hectare on sheep farms in 2023.
- EU winter planted area figures for the 2023 harvest are forecast to be similar to the 2022 harvest levels. Irish cereal prices at harvest in 2023 will be highly dependent on supply and demand conditions globally.
- On the assumption that EU yields are higher than 2022, supply and stock levels in 2023 are forecast to increase relative to the 2022 level. Irish cereal prices are forecast to decrease relative to harvest 2022.
- Overall, costs on cereal farms look set to increase again in 2023. With a normal yield forecast and a decrease in prices, margins for all crops in 2023 will decrease significantly on the 2022 levels.
- In 2023, the Irish pig price is forecast to increase to 222c per kg, representing an increase of 22 percent.
- The annualised composite pig feed price is forecast to increase by 3 percent in 2023 relative to 2022. This represents an increase to 161 cent per kg dwt in 2023, compared with 156 cent per kg dwt in 2022.
- The Irish pig sector will experience improved margins in 2023, with a return to profitability in prospect.

Figure E3: Forecast Change in Output Prices 2023 vs 2022



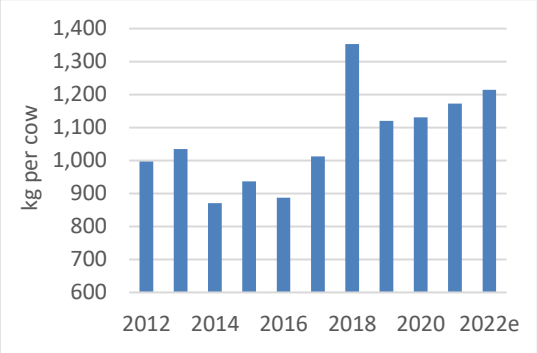
Source: Authors' forecasts

Dairy: Review of 2022

Output Value	Input Spend	Income
↑ Up	↑ Up	↑ Up

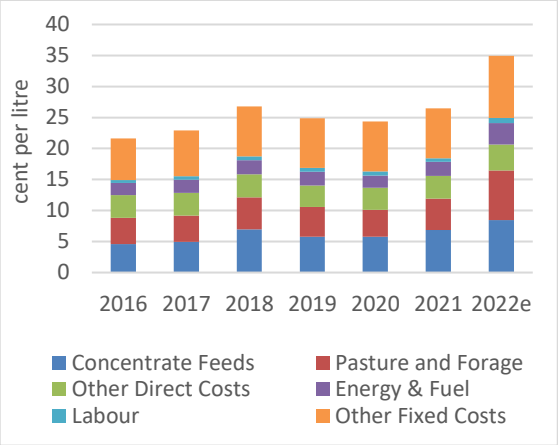
- While the dairy sector experienced a sharp increase in production costs in 2022, this was more than offset by record farm milk prices.
- High production costs and unfavourable weather in some key production regions curtailed the growth in global milk production in 2022.
- Butter and SMP prices in particular rose sharply and given their importance in the Irish dairy product mix, Irish milk prices were among the highest in the EU in 2022.
- The annual average Irish milk price for 2022 is estimated to have risen by 44 percent to 57.8 cent per litre (vat incl. actual fat and protein).
- In aggregate, Irish milk production remained relatively unchanged in 2022 (up 0.4 percent) with poor grass growth observed through some of the peak milk production months.
- Dairy cow numbers are estimated to have increased by 1.4 percent to 1.63m in June of 2022.
- On a per cow basis, dairy feed usage is estimated to have increased by 3 percent in 2022 to about 1,214 kg.
- Due to an increase in feed prices and feed usage, concentrate feed expenditure increased in 2022 by 33 percent, on both a per hectare and per litre basis.
- Fertiliser prices rose to unprecedented levels in 2022. As a result usage generally declined. However, there was an overall increase in pasture and forage costs of close to 80 percent.
- Driven by higher direct costs, it is estimated that total production costs increased by 30 percent on both a per hectare and per litre basis (to an average of 34.9 cent per litre) in 2022.
- Despite the higher production costs, the increase in milk prices resulted in an estimated net margin of 23.9 cent per litre in 2022. This represents an almost 70 percent increase on the 2021 level.
- With an elevated milk prices and production per hectare assumed to be unchanged in 2022, it is estimated that the net margin per hectare increased by approx. 70 percent to a national average of €2,950 in 2022.

Figure E4: Irish Dairy Cow feed use 2012 to 2022



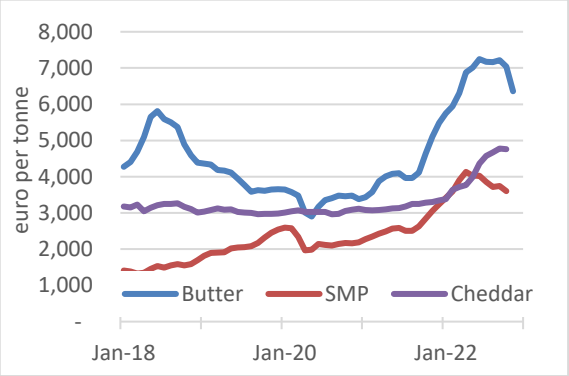
Source: Authors' estimates derived from DAFM and CSO data.
Note: e = estimate.

Figure E5: Average Total Milk Production Costs (cent per litre) in Ireland: 2016 to 2022



Source: Teagasc National Farm Survey and Authors' Estimate.

Figure E6: Monthly European Dairy Product Prices Jan 2018 to Nov 2022



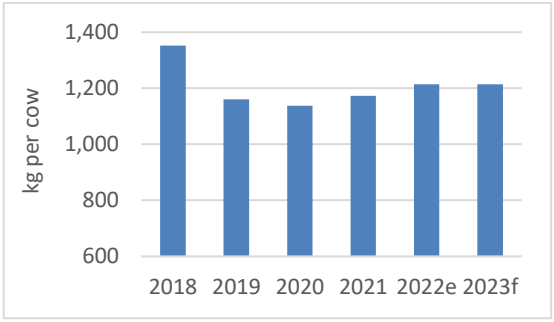
Source: MMO

Dairy: Outlook for 2023

Output Value	Input Spend	Income
Down	Up	Down

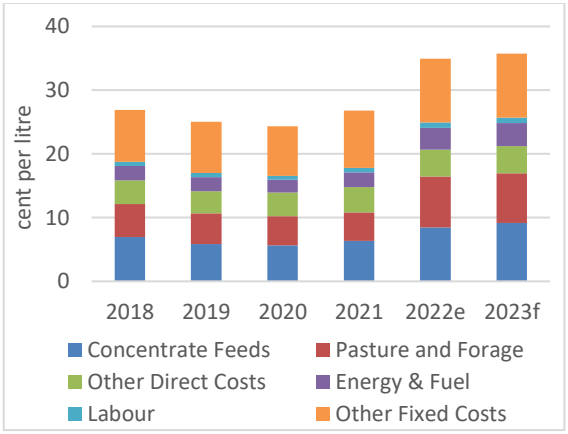
- The market outlook for 2023 is less positive. International dairy demand is expected to ease in 2023, but milk supply growth in the main dairy export regions is still expected to be sluggish.
- International dairy prices for butter and powders are expected to decrease. However, prices will still be at levels that are above normal.
- The annual average Irish milk price in 2023 is forecast to decline by approx. 15 percent. This would represent an annual average milk price of approx. 49 cent per litre (actual fat and protein VAT inclusive).
- Expenditure on fertiliser is expected to remain at the elevated level observed in 2022, with no change in fertiliser use anticipated in 2023.
- Assuming normal weather conditions in 2023, feed use per head on Irish dairy farms is expected to increase only marginally. Feed prices are expected to increase by 10 percent.
- With oil prices expected to average a little lower in 2023 compared with 2022, fuel prices are forecast to decrease by 14 percent in 2023.
- Growth in Irish milk production of 4 percent is forecast in 2023, with a return to milk yield growth and a further increase in cow numbers.
- In 2023, total milk production costs are expected to remain high, with an increase of 4 percent per hectare and 2 percent per litre in prospect.
- With output value per hectare expected to decrease by 12 percent in 2023, and allowing for a slight rise in costs, lower margins are anticipated. The forecast average net margin per hectare in 2023 is €1,928 a decrease of 35 percent relative to 2022.
- On a per litre basis, the average net margin is forecast to decrease by 40 percent in 2023 relative to the 2022 level, to an average of 14.3 cent per litre.
- While a significant decline in dairy farm income is forecast for 2023, of the order of 30 percent, it should be recognised that this decrease is relative to the record high incomes achieved in 2022.

Figure E7: Irish Dairy Cow feed use: 2018 to 2023



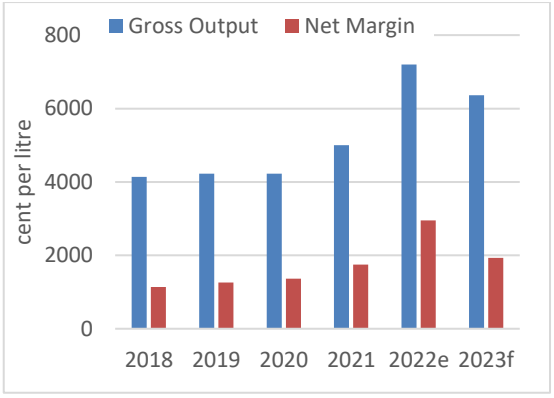
Source: Authors' estimates derived from DAFM and CSO data.
Note: e = estimate. f= forecast

Figure E8: Average Total Milk Production Costs (cent per litre) in Ireland: 2018 to 2023



Source: Teagasc National Farm Survey, Authors' Estimate for 2022 and Authors' Forecast for 2023.

Figure E9: Dairy Gross Output and Net Margin 2018 to 2023



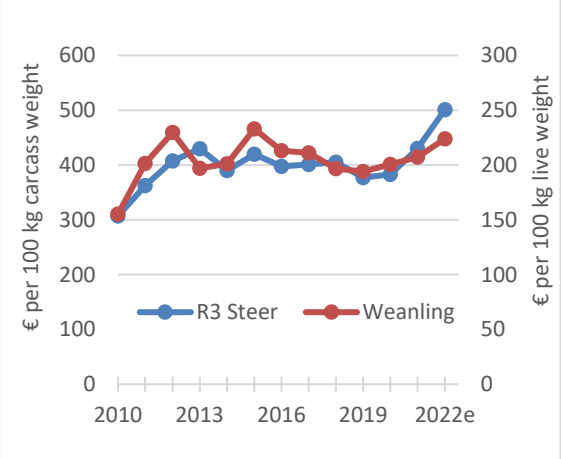
Source: Teagasc National Farm Survey, Authors' Estimates for 2022 and Authors' Forecast for 2023

Cattle: Review of 2022

Output Value	Input Spend	Income
Up	Up	Down

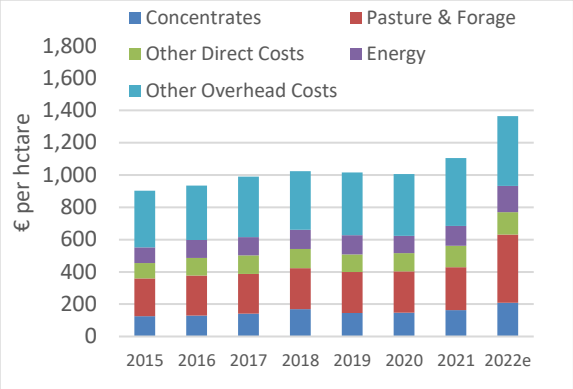
- In 2022, average prices for prime finished cattle were 16 percent higher than the average levels in 2021.
- In 2022, prices for younger cattle were 8 to 11 percent higher relative to 2021, leading to an increase in output value on Single Suckling enterprises.
- The output value on the average Cattle Finishing enterprise increased in 2022, as a result of higher prices for finished cattle and larger volumes of beef production.
- The BEEP-S and BDGP schemes continued to contribute positively to gross output on Single Suckling farms.
- Large increases in feed and fertiliser prices have contributed towards much higher input expenditures on Cattle enterprises.
- In 2022, the average gross margin per hectare earned on Single Suckling enterprises is estimated to be €470 per hectare, a 15 percent decrease on the 2021 level.
- In 2022, the average gross margin per hectare earned on Cattle Finishing enterprises is estimated to be €622 per hectare, a 7 percent increase on the 2021 level.
- For both cattle enterprises, the bottom one-third of farms have a lower gross margin per hectare in 2022 relative to 2021.

Figure E10: Finished Cattle and Young Cattle Prices



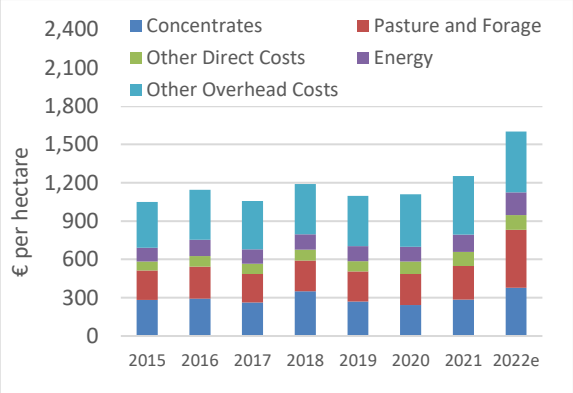
Source: 2009-2021 DG Agri, CSO, 2022 Authors' estimate

Figure E11: Costs of Production Single Suckling (SS)



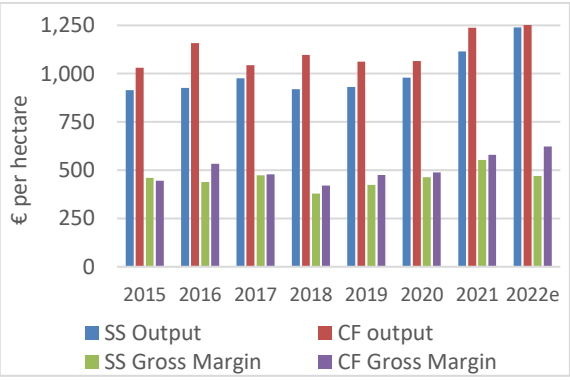
Source: 2015-2021 Teagasc NFS, 2022 Authors' Estimate

Figure E12: Costs of Production Cattle Finishing (CF)



Source: 2015-2021 Teagasc NFS, 2022 Authors' Estimate

Figure E13: Output and Gross Margin



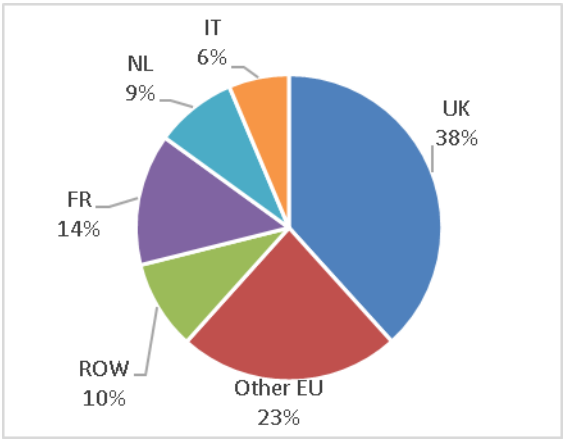
Source: 2015-2021 Teagasc NFS, 2022 Authors' Estimate

Cattle: Outlook for 2023

Output Value	Input Spend	Income
↑ Up	↑ Up	↑ Up

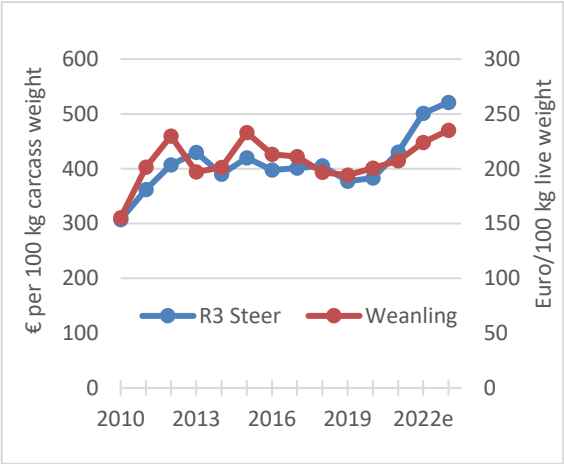
- EU beef supply is forecast to decline in 2023.
- UK beef supply is forecast to increase in 2023.
- Average Irish finished cattle prices in 2023 are forecast to be 4 percent higher relative to 2022.
- Average Irish young cattle prices in 2023 are forecast to be 5 percent higher relative to 2022.
- Input expenditure in 2023 is forecast to increase on 2022 levels due to higher feed prices.
- Direct costs of production on Single Suckling enterprises are forecast to increase by approximately 3 percent in 2023.
- Direct costs of production on Cattle Finishing enterprises are forecast to increase by approximately 5 percent in 2023.
- In 2023, the average gross margin per hectare on Single Sucking enterprises is forecast to increase by 11 percent to €520 per hectare.
- In 2023, the average gross margin per hectare on Cattle Finishing enterprises is forecast to remain unchanged at approximately €626 per hectare.
- The introduction of the Suckler Carbon Efficiency Programme, the ACRES programme and other policy supports can contribute to increases in farm income on cattle farms in 2023.

Figure E14: Irish Beef Export by Volume in 2022



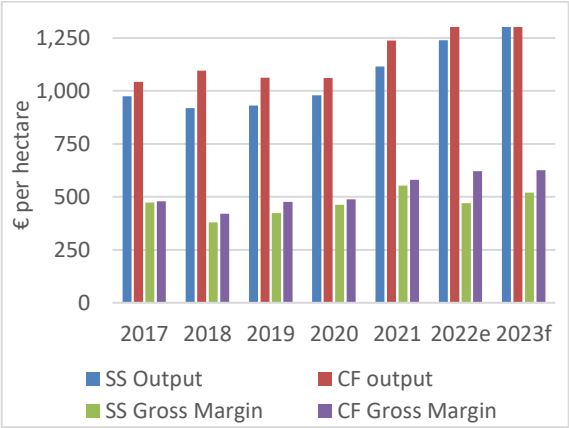
Source: Eurostat COMEXT (year through August)

Figure E15: Cattle prices with forecast for 2023



Source: Authors' forecast

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



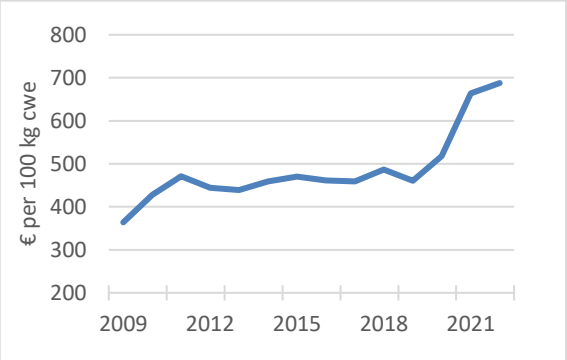
Source: 2017 to 2021 Teagasc NFS, 2022 Authors' estimate, 2023 Authors' forecast

Sheep: Review of 2022

Output Value	Input Spend	Income
Up	Up	Down

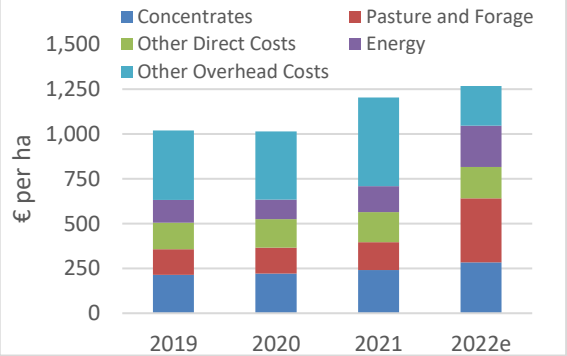
- EU sheep meat exports have increased by circa 15 percent up to August 2022. Continued high EU prices and tight EU domestic supply are expected to continue.
- EU sheep meat production in 2022 is estimated to grow by just over 1 per cent.
- With high prices, EU sheep meat exports have declined by 3% in 2022. Continued high EU prices and tight EU domestic supply are expected to continue, and no recovery in exports is forecast for 2023.
- Prices on the European lamb market in 2022 are higher than in 2021, with prices for heavy lamb up on average 7 percent in the year to the end of November 2021.
- It is expected that the average lamb price in Ireland for 2022 for the year as a whole will be higher than in 2021. The year on year price change is estimated at 4 percent.
- Total direct costs of production for Irish mid-season lowland lamb enterprises are estimated to have increased in 2022, up by over 40 percent in 2022.
- Overhead costs of production are estimated to have increased by 17 percent.
- Gross margins per hectare for Irish mid-season lowland lamb producers are estimated to have declined in 2022 by 14 percent, owing to much higher costs of production in 2022, which increased 41 percent on average.
- The receipt of Sheep Welfare Scheme, under CAP Pillar II, boosted margins on sheep farms in 2022.
- In the absence of the coupled payment received from the Sheep Welfare Scheme, margins in 2022 would have decreased by 20 percent relative to 2021. In 2022 the average gross margin on mid-season lowland enterprises is estimated to be €803 per hectare.

Figure E17: Irish Lamb price 2009 – 2021 with estimate for 2022



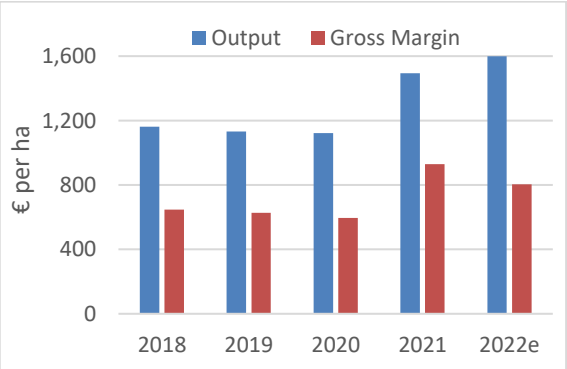
Source: European Commission DG AGRI and author estimate 2022

Figure E18: Average Sheep production costs 2019 -- 2021 and estimate for 2022



Source: Teagasc NFS 2019 - 2021, Authors' Estimate for 2022

Figure E19: Average Sheep output 2018-2021 & margin estimate for 2022



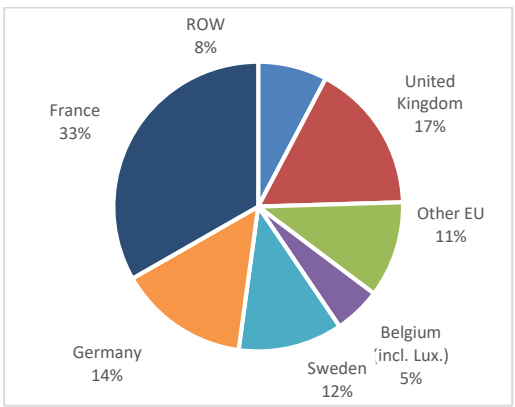
Source: Teagasc NFS 2018-2021, 2022 Authors' Estimate

Sheep: Outlook for 2023

Output Value	Input Spend	Income
↑ Up	↑ Up	↓ Down

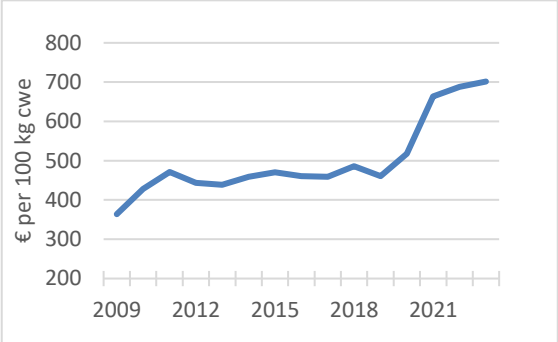
- The outlook for Irish and EU lamb prices for 2023 is positive. Continued high EU prices and tight EU domestic supply are expected to continue.
- Global sheep meat prices are forecast to remain high, but somewhat down on 2022 price levels.
- Export opportunities for Irish sheep meat will continue to support Irish prices in 2023.
- Sheep feed expenditure is forecast to increase by circa 10 percent. Concentrate prices are forecast to increase by 10 percent, with feed use forecast to remain stable.
- Fertiliser prices are forecast to remain on par with 2022 price levels. With fertiliser usage remaining as per 2022, pasture and forage costs in 2023 are expected to remain stable. .
- With high costs of production persisting into 2023 and a less positive lamb price outlook, albeit still a small positive increase forecast, gross margins for mid-season lowland lamb enterprises in 2022 are expected to fall by less than 1 percent.
- The newly launched Sheep Improvement Scheme, under CAP Pillar II will provide a financial boost at the individual farm level in 2023 and will continue to support margins for lowland lamb producers.
- In 2023, the average gross margin per hectare earned by Irish mid-season lowland lamb enterprises is forecast to decline to €800 per hectare.

Figure E20: Irish Sheep and Lamb Meat Exports (Volume) by Destination in 2022



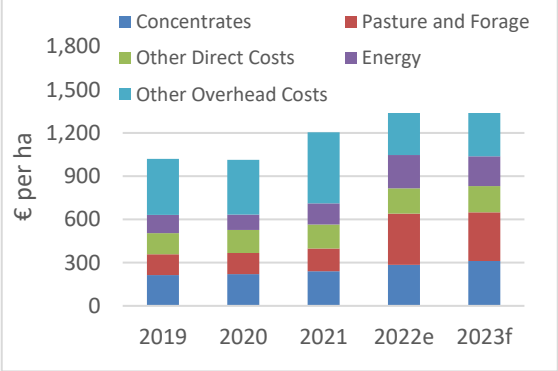
Source: Eurostat COMEXT (Volume, year to end August 2022)

Figure E21: Irish Lamb price forecast for 2023



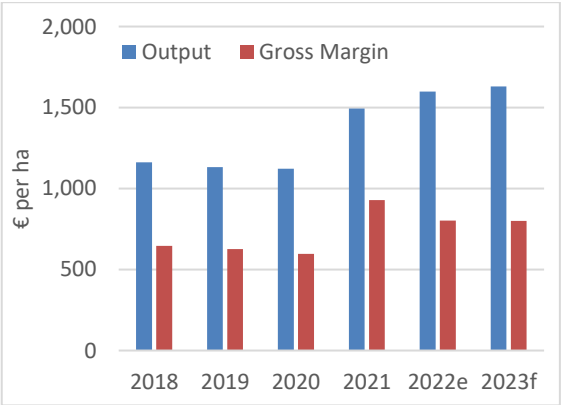
Source: DG Agri 2009-2021; Authors' Estimate 2022; Authors' forecast 2023

Figure E22: Sheep production costs forecast 2023



Source: Teagasc NFS 2019-2021, Authors' Estimate 2022, Authors' Forecast 2023

Figure E23: Average Sheep output & margins with forecast for 2023



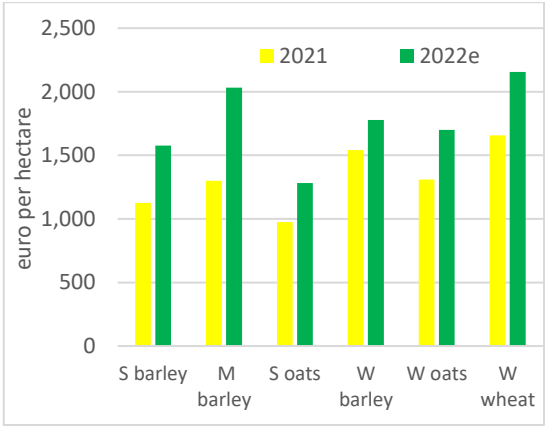
Source: Teagasc NFS 2018-2021, Authors' Estimate 2022, Authors' Forecast 2023

Cereals: Review of 2022

Output Value	Input Spend	Net Margin per ha
Up	Up	Up

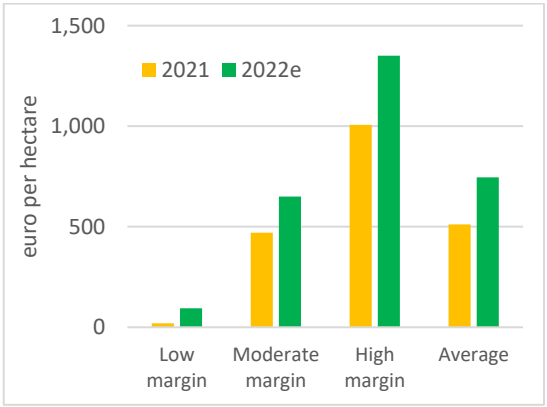
- Despite an increase in soft wheat and barley production on the international balance sheet in 2022/23, the decrease in maize production internationally was enough to reduction overall production on the international balance sheet.
- These supply factors, coupled with severe anxiety regarding potential exports from Ukraine led to a significant increase in cereal prices at harvest 2022, with on account Irish harvest prices increasing by over 40 percent.
- There was also an increase in yields of the main cereal crops in Ireland in 2022. Irish spring barley yields increased by 3 percent on a per hectare basis, while winter wheat yields increased by 2 percent per hectare, compared to 2021.
- Direct costs of production on Irish cereal farms increased in 2022 compared to 2021. The largest increases were for, fertiliser, fuel related costs and seed, at 155 percent, 70 percent and 6 percent respectively.
- On average direct costs of production increased by 57 percent in 2022 on a per crop basis. Overhead costs allocated to cereal enterprises on tillage farms also increased in 2022.
- 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 2022. The gross margin per hectare for spring barley, winter barley and winter wheat increased by €450, €235 and €500 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 2022.
- 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 €95, while the top one third of farms earned nearly €1,350 per hectare.
- Overall, there was a €240 per hectare increase in the average market based net margin in 2022, relative to 2021. This can be attributed to significant increases in cereal price and yields 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 2022

Figure E25: Cereal Enterprise Net Margin on Specialist Tillage Farms



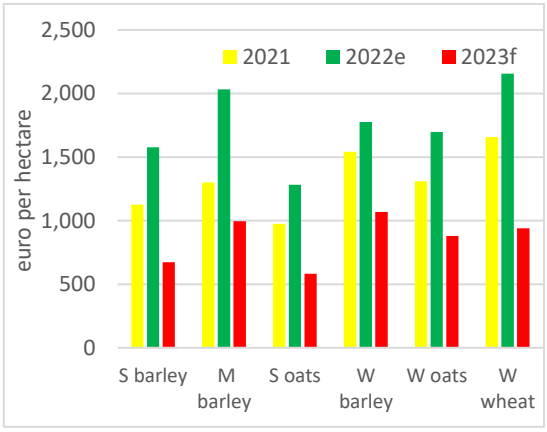
Source: Teagasc, National Farm Survey Data & Author's estimates for 2022

Cereals: Outlook for 2023

Output Value	Input Spend	Net Margin per ha
Down	Up	Down

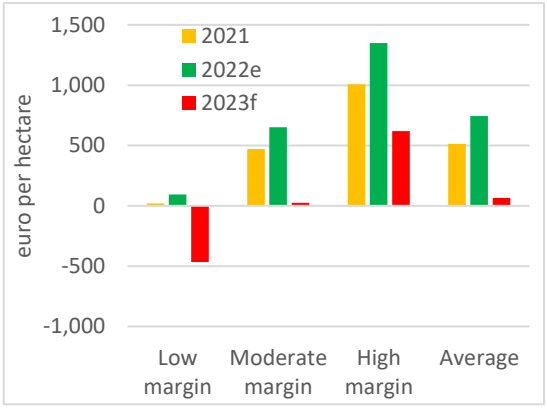
- EU grain production decreased in 2022. In terms of market supply and demand, there is a lot of uncertainty at present, as stocks to use ratios are variable across wheat, barley and maize.
- Current (December 2022) futures markets indicate that 2023 harvest prices will be lower than those that prevailed at harvest 2022, by over 20 percent.
- This downward movement in prices can be explained by an expected reversion to trend yields in the EU for 2023 and a forecast for a higher ending stock position for the 2023 harvest.
- A return to 5 year trend yields in Ireland in 2023 would mean a slight yield decrease for most cereal crops in 2023.
- Direct costs of production on cereal farms are expected to increase again in 2023, with key inputs such as fertiliser, seed and crop protection expected to increase.
- Whilst fuel related costs are expected to decrease in 2023, by about 16 percent on tillage farms, other overhead costs are expected to increase further in 2023, by about 4 percent compared to 2021.
- The net effect of the forecast changes in output value and input expenditure mean that 2023 gross margins for cereals are forecast to decrease over 2022 levels.
- The average gross margin for spring barley in 2023 is forecast to decrease by approximately €900 per hectare compared to 2022. The average winter barley and winter wheat gross margins are forecast to decrease by about €1215 and €710 per hectare respectively in 2023.
- The cereal enterprise market based net margin on specialist tillage farms in 2023 is forecast to decrease on the 2022 level. It is forecast that the average specialist tillage farm will return approximately €65 market based net margin in 2023.
- It is forecast that approximately 50 percent of specialist tillage farmers will return a negative market based net margin in 2023.

Figure E26: Gross Margin for Main Cereal Crops (2022 estimate & 2023 forecast)



Source: Teagasc, National Farm Survey Data & Author's estimate for 2022 & forecast for 2023

Figure E27: Cereal Enterprise Net Margin on Specialist Tillage Farms, 2023 forecast



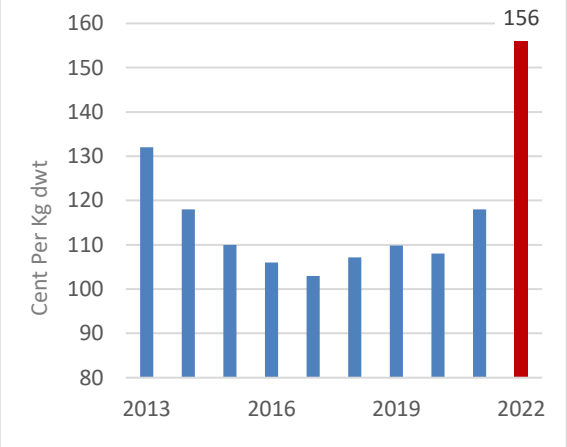
Source: Teagasc, National Farm Survey Data & Author's estimate for 2022 & forecast for 2023

Pigs: Review of 2022

Output Value	Input Spend	Income
Up	Up	Down

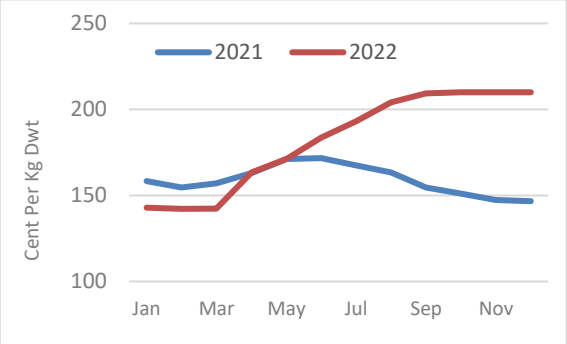
- The composite feed price per tonne entered 2022 on a high level and increased rapidly with the outbreak of the Ukrainian war.
- The annual average feed cost in 2022 is estimated to be 156 cent per kg dwt. This is 32 and 30 percent higher than the 2021 figure (118 cent) and the 5 year average (120 cent) respectively.
- At 182 cent per kg, the 2022 Irish pig price was significantly higher than the 159 cent per kg average for 2021. This increase is primarily attributable to the input cost inflation following the outbreak of the Ukrainian war.
- The estimated 2022 average pig price of 182 cent per kg is significantly higher than the five year average (2018-2022) of 165 cent per kg.
- The 2022 'Margin Over Feed' (MOF) per kg is estimated to be 26 cent per kg dwt. This is the joint lowest margin in nearly 40 years. During March 2022 the monthly MOF reached a low of 4 cent per kg before gradually improving to 46c per kg in September 2022.
- The volume of Irish pigs slaughtered decreased marginally to 3.84m in 2022, which was a decrease of 90,000 pigs on the 2021 level and similar to the 2020 level. In 2022, of the 3.84m pigs of Irish origin that were slaughtered, 0.41m were slaughtered in Northern Ireland, a decline on the 2021 level.
- In 2022, pig slaughter volumes in the principal European pig producing countries decreased by 2.5 percent when compared to 2021. The countries with the largest decrease were Germany, Poland, UK and Denmark.
- The average Irish pig slaughter weight is forecast to have stabilised, with an estimated average sale weight of 118c kg. This is an increase of 14 kg since 2010 and an FCE improvement of 0.17 (2.77 vs 2.60)

Figure E28: Irish Compound Pig Feed Price 2013 to 2022



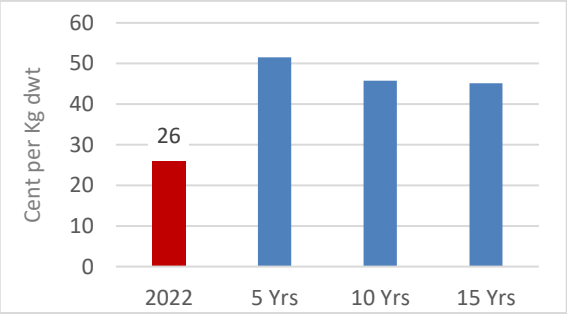
Source: Teagasc Pig Development Department, estimate for 2022

Figure E29: Monthly Irish Pig Prices 2021 – 2022



Source: Teagasc Pig Development Department, estimate for 2022

Figure E30: Margin Over Feed: Historical Comparison with 2022



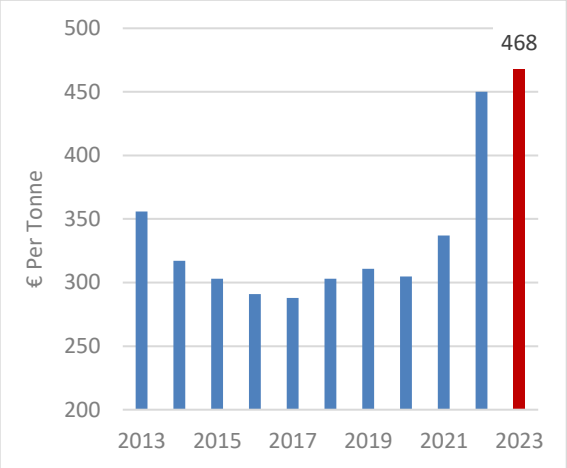
Source: Teagasc Pig Development Department

Pigs: Outlook for 2023

Output Value	Input Spend	Income
↑ Up	↑ Up Slightly	↑ Up Significantly

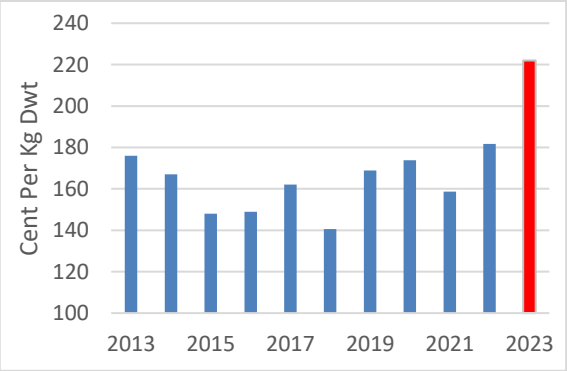
- The December 2022 composite pig feed price of €476 per tonne will increase in Q1 of 2023 by €10 to €20.
- In Q2 and Q3 of 2023, feed ingredient prices are forecast to decrease, with expectations of higher harvest yields in the northern hemisphere.
- Forecasts for the 2022 South American (SA) soyabean harvest suggest it will increase relative to 2022 to reach 145 mt.
- An increased SA harvest in Q1 2023, will reduce soyabean prices for the remainder of 2023.
- The annualised composite pig feed price is forecast to increase by 3 percent in 2023 relative to 2022. This represents an increase to 161 cent per kg in 2023 compared with 156 cent per kg in 2022.
- In 2023 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 stabilise or marginally increase by 1 percent.
- In 2023, the size of the Irish sow herd is expected to stabilise after a significant reduction in 2022, but the volume of Irish pigs slaughtered is expected to decrease by 8-10 percent from the peak in 2021.
- The average Irish pig sale weight is expected to increase by 1 percent in 2023 to 119 kg.
- The volume of exports of pigmeat from the EU to China will have an important influence on the EU & Irish pig price in 2023. It is expected that China's import requirements will increase as 2023progresses, with a higher Chinese domestic price making imports attractive.
- African Swine Fever (ASF) will continue to feature in 2023, with Germany struggling to prevent further cases due to infected wild boars crossing their border from Eastern Europe
- In 2023, the Irish pig price is forecast to be 222 cent per kg, but this forecast is highly influenced by ASF developments and Chinese import demand.
- Following high profitability in 2019 and 2020, and negative profitability in 2021 and 2022, the Irish pig sector is expected to return to moderate profitability in 2023.

Figure E31: Historical Compound Pig Feed Price and forecast for 2023



Source: Teagasc Pig Development Department estimate for 2022 & forecast for 2023

Figure E32: Historical Irish Pig Prices & 2023 forecast



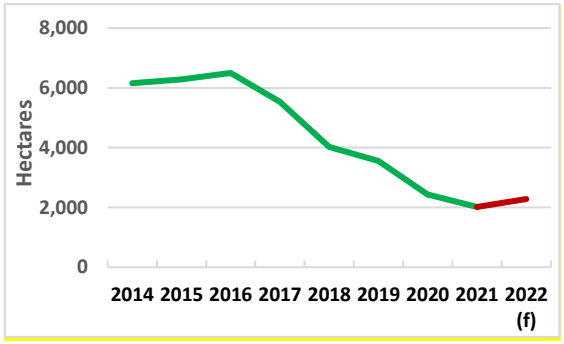
Source: Teagasc Pig Development Department est. 2022 & forecast for 2023

Forestry Sector: Review of 2022

Afforestation levels	Actual Timber demand	Timber prices
↑ Marginally above 2021 levels	↓ Down due to national and international economic uncertainties / consumer confidence	↓ Down from record prices in 2021, reflecting reduced timber demand

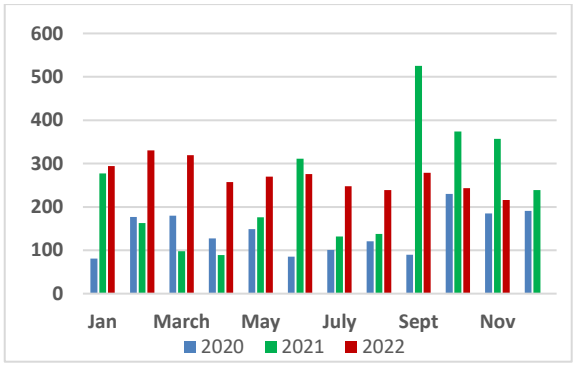
- The projected planting level for 2022 is approximately 2,340 ha, marginally above the 2021 level of 2,016 ha.
- The forestry licencing backlog reduced from a reported 6,000 in August 2021 to just over 1,600 by October 2022. Improved licencing outputs were reported as being achieved through commitment to implementation of measures recommended under Project Woodland. The latter continues its work to address key issues in forestry in Ireland.
- The total number of felling licences issued to Week 1, December, 2022 was 3,107, compared to a total of 2,879 for the full year in 2021.
- A total of 72 km of forest roads were completed and funded in 2021. The year to date estimate up to Week 1, December 2022 is 68 km.
- Timber markets tightened during 2022, reflecting the demand/supply situation.
- Exports of all forest and wood based products totalled €682 million in 2021, a 53 percent increase in value but 1.0 decrease in volume on 2020 figures.
- The United Kingdom remains our largest export market, accounting for 82 percent of forestry and wood-based product exports by value.
- The total volume of roundwood input purchases by industry in 2021 was reported as 3.2 million m^3, an increase of 4.8 percent from 2020. Thirty six percent of purchases was from privately owned forests, an increase of 6 percent from 2020 levels.
- The level of Irish dwelling completions for 2021 is forecast to be almost 28,000 units.
- Approximately half of Ireland's forest estate is certified as sustainably managed by international non-governmental organisations. Currently there are 15,680 ha of privately-owned forests certified, representing only 5.7 percent of the private estate.

Figure E34: Annual planting 2014 to 2021, with projection for 2022



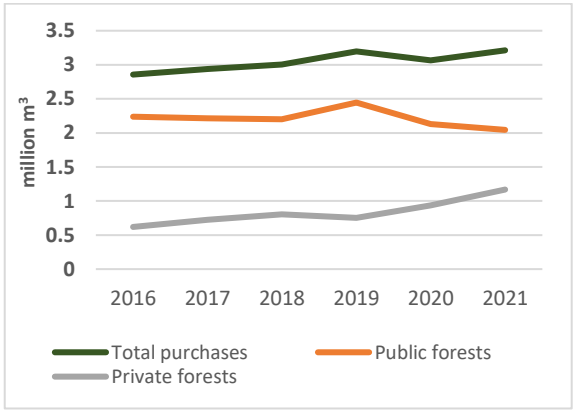
Source: DAFM (2022)

Figure E35: Monthly Felling Licences issued 2020 - 2022



Source: DAFM, Forestry Section Monthly Reports (2020/21/22) and Forestry Dashboard

Figure E36: Roundwood Purchases from public and privately owned forests



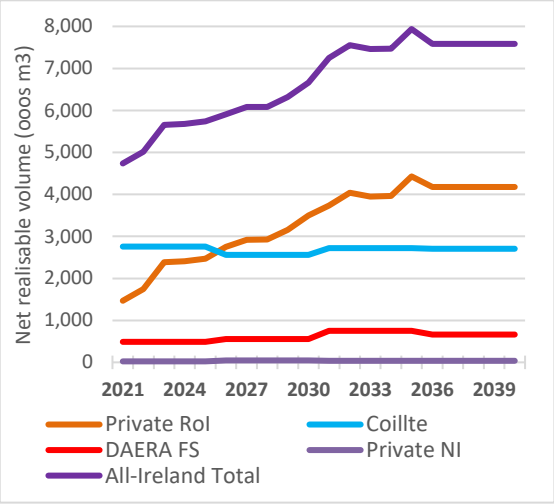
Source: CSO 2022

Forestry Sector: Outlook for 2023

Afforestation levels	Timber demand	Timber prices
↑ Up	↑ → Anticipated stable or modest demand increases	↑ → Linked to demand / supply issues

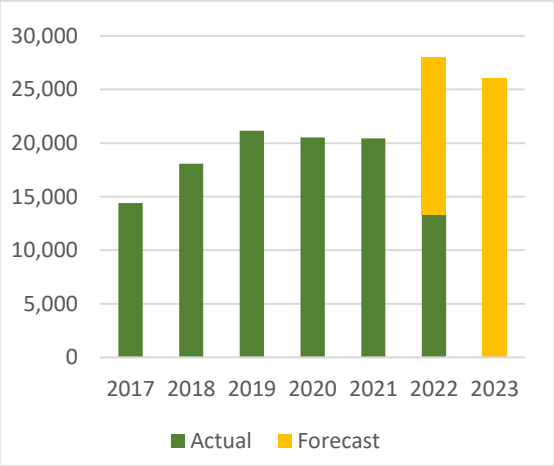
- The Government budget allocation for the New National Forestry Programme in 2023 is €112 million. This allocation reflects funding to establish a minimum of 8,000 ha of new forests, an ambitious target set out in the Food Vision 2030 Strategy.
- Increasing planting rates towards target levels remains a priority. Strong positivity around the proposed new Forestry Programme 2023-2027 will need to be combined with provision of strong support to farmers and landowners in re-engaging with forestry and building confidence regarding its many benefits.
- Forecasts indicate that the net realisable timber volume (NRV) from private sector forestry in Ireland will increase from 1.74 million m^3 in 2022 to 2.39 million m^3 in 2023.
- The export-oriented sawmilling sector will continue to compete in a challenging market environment, but has significant potential to enhance its market position with a sufficient level of timber mobilisation capacity.
- The level of Irish house completions for 2023 is estimated at approximately 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 E37: 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 E38: Irish Housing Completions (actual and forecast) 2017-2023



Source: CSO and ESRI 2022

Irish Dairy Farming Factsheet 2021
Average Performance

Milk Sales per ha
11,827 litres (up 4%)

Days at Grass
241 days (up 7 days)

Milk Production per cow
5,790 litres (up 2%)

Stocking Rate
2.10 lu/ha (up 2%)

Milk price actual fat/protein
40.11 cent per litre (up 14%)

Dairy Enterprise* area
43.8 ha (unchanged)

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

Milk Fat Content
average 4.22% (up 0.03 points)

Concentrates Fed/Dairy Cow
average 1,173 kg (up 3%)

Milk Protein Content
average 3.54% (down 0.01 point)

Concentrates fed/litre of milk
average 0.20 kg (down 8%)

Milk Solids per Cow
average 447 kg (up 2%)

Nitrogen per ha of grassland
173 kg (down 6%)

Basic Payment Scheme
per farm € 17,333 (down 1%)

Total Production Costs
26.80 cent per litre (up 10%)
€3,251 per hectare (up 14%)

Somatic Cell Count
166,000 cells/ml (up 4%)

Gross Margin Dairy Enterprise
26.1 cent per litre (up 19%)
€3,200 per hectare (up 24%)

Net Margin Dairy Enterprise
14.07 cent per litre (up 22%)
€1,748 per hectare (up 28%)

Source: Teagasc National Farm Survey 2021
Note: Percentage changes are relative to 2020
*Dairy Enterprise area refers to area for dairy cows only

Reweighting of the NFS Sample: Data from the Census of Agriculture 2020 have led to a reweighting of the NFS sample. As a result the average dairy farm size in larger than previously reported in the NFS.

Irish Dairy Farming in 2022

Buoyant dairy prices
sluggish global milk production growth

Irish Milk Production
unchanged on the 2021 level

Irish Milk Price
up 44% on the 2021 level

Weather Conditions
Dry summer period

Grass Availability
lower than normal over the summer

Fertiliser Prices up 190%
Fertiliser Use down 14%

Feed Prices up 28% in 2022
Feed Use up 4% per head

Other Direct Costs per litre
up 5% on the 2021 level

Fuel Prices (Farm Diesel)
up 80% on the 2021 level

Total Costs per litre of milk
up 30% on the 2021 level

Net Margin for Dairy Enterprise
up 70% per litre on 2021

Source: Teagasc Estimates for 2022 and Forecasts for 2023

Irish Dairy Farming in 2023

Weaker demand
Lower prices for butter and powders

Irish Milk Production
up 4% on the 2022 level

Irish Milk price
down 15% on 2022 level

Weather Conditions
Normal weather assumed

Grass Availability
normal conditions

Fertiliser Prices unchanged
Fertiliser Use unchanged

Feed Prices up 10%
Feed Use up 1% per head

Other Direct Costs per litre
up 4%

Fuel prices (Farm Diesel)
down 18% on 2022 level

Total Costs per litre of milk
up 2% on the 2022 level

Net Margin for Dairy Enterprise
down 40% per litre on 2022

Note: percentage changes are relative to previous year

Review of Dairy Farming in 2022 and Outlook for 2023

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1. Introduction

This paper looks back on dairy farm performance in 2021, reviews the outcomes for 2022 and looks ahead to the prospects for 2023. Data from the Teagasc National Farm Survey (NFS) are used in our review of 2021. The milk price and key input cost estimates for 2022 are used to produce an overall estimate of dairy enterprise margins for 2022. Finally, in the closing sections of the paper, the forecast for milk price, production costs and dairy farm margins in 2023 are presented.

Dairy farm income increased substantially in 2021. While there was an increase in production costs, milk prices also rose considerably. On dairy farms, weather conditions were reasonable for grass production and there was a further increase in milk production at the national level. These factors together contributed to a large increase in Dairy farm income. On average, there was a 25 percent increase in Family Farm Income (FFI) in 2021 to €98,745, as recorded through the Teagasc NFS.

Driven mainly by increases in expenditure relating to feed and energy, production costs increased significantly on the average Dairy farm enterprise in 2021. On a cent per litre basis, average direct costs increased by 6 percent. A large increase in fixed costs of over 15 percent (primarily due to increased depreciation for both machinery and buildings), resulted in a 10 percent increase in total production costs.

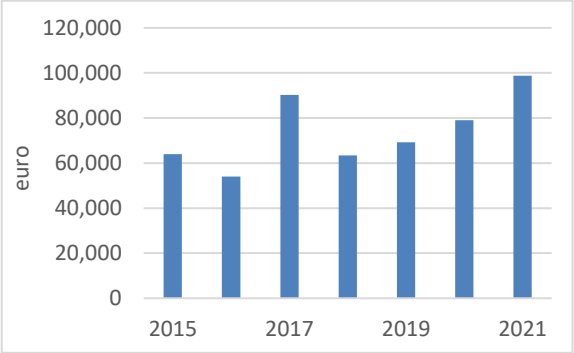
On average, purchased concentrate expenditure increased by 13 percent per litre of milk.—Average feed volumes per cow have generally been trending upwards since the abolition of EU milk quota. However, feed use on individual farms, are influenced by factors such as location, land type and stocking rate. In 2021, the average feed volume per dairy cow increased marginally to 1,173kg.

Pasture and forage costs on dairy farms decreased slightly in 2021, down 3 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 also increased in 2021, perhaps reflecting the easing of restrictions around COVID-19, allowing non family members back on to farms. Expenditure on energy also increased due to rising fuel and electricity prices in 2021.

2. Review of the Economic Performance of Dairy Farms in 2021

Results from the Teagasc NFS 2021 for Dairy farms are summarised here. Figure 1 presents the average FFI on *Specialist Dairy* farms over the years 2015 to 2021. The chart shows that there has been a substantial increase in average dairy farm income in the years since milk quota removal.

Figure 1: Average Income on Irish Specialist Dairy Farms 2015 to 2021



Source: Teagasc National Farm Survey (various years).

To further explore the economic performance of dairy farms in 2021, 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 2020 and 2021. Farms producing mainly liquid milk are excluded from the sample, as are herds of 10 cows or less.

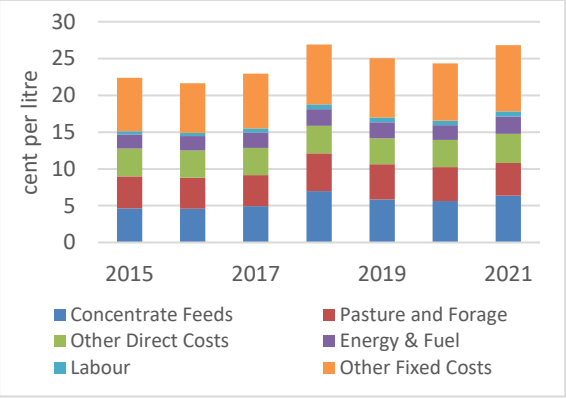
The gross output measure includes the value of milk and calf sales minus replacement costs. The data indicates that gross output per litre increased by 14 percent in 2021 relative to 2020, due to the strong milk price. On average, on a cent per litre basis, feed related costs increased by 13 percent and along with an increase in other direct costs, total direct costs (per litre) increased by 6 percent year-on-year. The average Dairy gross margin in 2021 increased by 19 percent to 26.1 cent per litre. Due to increased expenditure on fixed costs relating to buildings and machinery, an increase in total costs of 10 percent was reported year-on-year. This resulted in a 23

percent increase in average net margin in 2021, to 14.1 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 2020 and 2021. In 2021, milk production per hectare increased by close to 4 percent. Net margin, on a per hectare basis, increased by 28 percent for the average Dairy enterprise in 2021, due mainly to milk price growth, and increased production, in spite of the rise in 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 2021. 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 (29.0 cent) were 16 percent higher than for the Top group (25.0 cent). The net margin for the Bottom group (10.8 cent) is approximately 65 percent of that of the Top group (16.7 cent). This reflects a narrowing in the profitability differential between the Top and Bottom groups over the last 4 years. Figure 2 indicates that total milk production costs increased by 10.1 percent on average in 2021 to 26.8 cent per litre.

Figure 2: Total Milk Production Costs (cent per litre) in Ireland: 2015 to 2021



Source: Teagasc National Farm Survey Data.

3. Review of 2022 Estimated Performance

This section of the paper presents a review of Irish dairying in 2022. Actual Teagasc NFS results for 2022 will not be available until the middle of 2023. Therefore, it is necessary to estimate the price and volume of inputs and outputs in 2022, in order to estimate the outcome for margins in 2022. The following section of the paper first addresses production cost estimates for 2022, looking at both input prices and input usage volumes. A cost assessment based on the average dairy farm nationally is then given. Finally, the development of dairy product markets in 2022, in terms of both price and volume changes, is discussed.

3.1 Estimated Input Usage and Price 2022

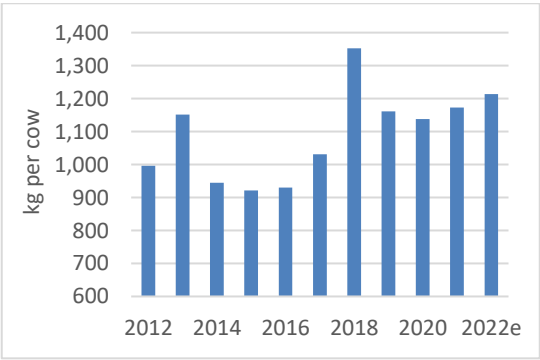
It is not yet possible to offer a comprehensive assessment of the precise changes in production costs for every farm in 2022. In this analysis, it is assumed that there was no change in the volume of milk production on the average dairy farm in 2022.

3.1.1 Feedstuff – usage and price 2022

Purchased feed (concentrates) is an important element of dairy production costs in Ireland, typically accounting for about 25 percent of total production costs in recent years.

Although official aggregate feed sales data for the full year are not yet available, the trend in dairy feed use in 2022 is up slightly on the 2021 level. Department of Agriculture, Food and the Marine (DAFM) feed sales data for dairy farms for Q1 and Q2 of 2022 were quite close to the levels reported in the same period in 2021. However, data for Q3 2022 indicate an increase of 14 percent relative to the same period in 2021, meaning that dairy feed sales were 6 percent higher in the first 9 months of 2022. The Irish dairy cow population is estimated to have increased by just over 1 percent in 2022. The average milk yield per cow in 2022 is estimated to have fallen by 1 percent on the 2021 level. Figure 3 shows the average volume of compound feed use per cow in recent years, including an estimate for 2022.

Figure 3: Compound Feed Purchases per Dairy Cow in Ireland: National Average for 2012 to 2022



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

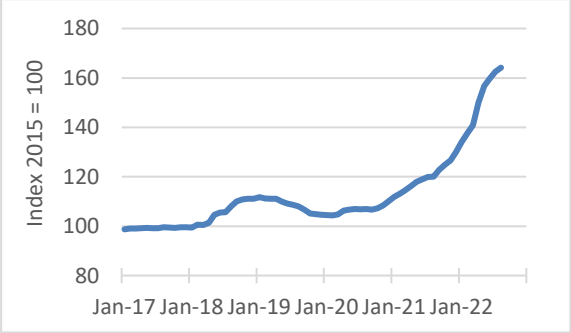
These data are derived from DAFM figures on feed sales to the end of Q3 and estimates for Q4 2021 by the authors, along with Central Statistics Office (CSO) data on animal numbers. For the average dairy farm, with no change in milk production in 2022, feed use per cow, is estimated at approximately 1,214 kg, a 3 percent increase in volume terms relative to 2021.

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 2021, while 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 contributed to relatively low ending stock positions for both crops, and an increase in harvest prices for cereals in 2021. This increase in harvest prices for 2021, transmitted with a lag effect into the feed market in 2022.

Furthermore, in 2022, despite an increase in national cereal volumes, a decrease in the production of wheat, barley and maize on the European balance sheet in 2022/23 compared to 2021/22, coupled with the uncertainty of supply due to the evolving situation in Ukraine, resulted in further significant upward movement in Irish farm gate harvest prices. This upward pressure also further contributed to feed price inflation as 2022 progressed.

Figure 4 shows an index of monthly Irish cattle feed prices from 2017 to 2022. Due to the illegal invasion of Ukraine and poor international production conditions, in 2021 and 2022, feed prices are estimated to be up 28 percent in 2022, for the year as a whole.

Figure 4: Monthly Price Index of Cattle Meal in Ireland 2017 to 2022



Source: Central Statistics Office (Various Years).

On a per litre basis, the expenditure on feed is estimated to have increased by almost 33 percent in 2022 compared to the 2021 level. Feed costs, measured on a per hectare basis, are estimated to have increased by the same magnitude on the average farm, with no change in milk production or farm area in 2022.

3.1.2 Fertiliser – usage and price 2022

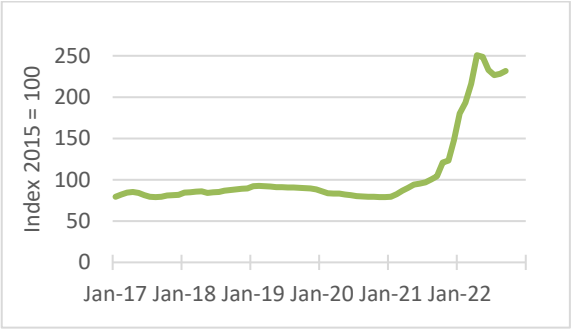
Pasture and forage costs typically comprise about 20 percent of total production costs on Dairy farms. This cost item is made up of fertiliser purchases and contracting charges. Figure 5 charts the Irish monthly index of farm level fertiliser prices from 2017 through to 2022.

As a result of the invasion of Ukraine, energy prices have increased dramatically in 2022, driving the price of nitrogen based fertilisers sharply upwards. While the increase in fertiliser prices began in H2 of 2021, it is really only in 2022 that it has hit dairy farm production costs. A 195 percent increase in fertiliser prices in 2022 is estimated relative to 2021.

Fertiliser use on dairy farms followed an upward trend in the aftermath of quota removal and the difficult weather conditions experienced in 2018. However, it has been in decline in recent years, with a significant fall in usage expected in 2022 driven in part by the high price level and availability issues.

DAFM sales figures for 2022, as reported in Figure 6, indicate in volume terms a 14 percent decrease in the national level of nitrogen (N) sales, a 26 percent decrease in phosphorus (P) sales and a 24 percent decrease in potassium (K) sales relative to 2021. The precise decrease in sales on dairy farms cannot yet be determined, but is likely to be similar.

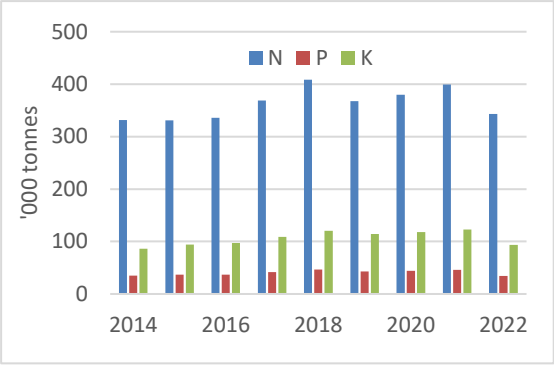
Figure 5: Monthly Price Index of Fertiliser in Ireland for 2017 to 2022



Source: Central Statistics Office (Various Years).

Overall, taking account of the decreased level of fertiliser sales and the 195 percent increase in price, fertiliser expenditure per hectare on the average dairy farm in 2022 is estimated to have more than doubled compared to 2021, with the precise figure depending on any drop in usage that has occurred.

Figure 6: Irish Fertiliser Sales by Compounders 2014 to 2022 (Oct-Sept)



Source: DAFM (various years).

3.1.3 Contractor Costs - usage and price 2022

Contractor costs comprise the remainder of the pasture and forage cost element. While no official figures are available, the increase in input prices in 2022 will have affected the cost base in contracting significantly. It is assumed that there has been a 30 percent increase in contractor prices in 2022, reflecting the increase in fuel and associated inputs. Some reduction in the volume of silage making is also likely to have occurred.

3.1.4 Pasture and Forage – usage and price 2022

With the increased spending on fertiliser and contracting in 2022, expenditure on pasture and forage is estimated to have increased by about 80 percent on a per hectare or per litre basis, on farms where milk production has remained unchanged.

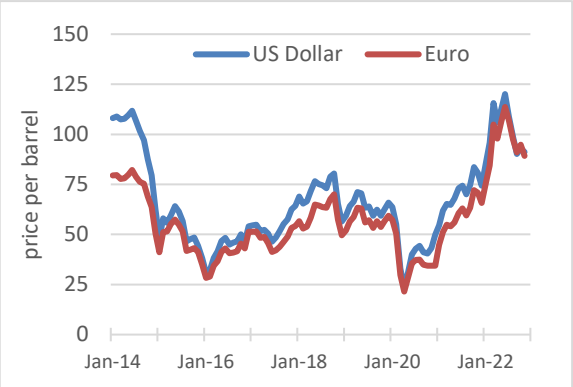
3.1.5 Electricity and Fuel – usage and price 2022

Energy (electricity and fuel) is a relatively less important input compared to feed and fertiliser, comprising less than 10 percent of total costs on dairy farms, on average.

Crude Oil and Fuel Prices:
The global energy market has seen dramatic price movements in 2022, reflecting the illegal invasion of Ukraine and supply decisions made by major energy exporters. Brent crude oil prices began 2022 at US$86 per barrel (pb). Monthly prices rose as high as US$120 in June and fell back below US$100 in Q4.

Crude oil prices are presented in Figure 7. The annual average Brent price for 2022 was US $101 pb, which represents a 43 percent increase on the average oil price in 2021 of US $70 pb.

Figure 7: Monthly Average Brent Crude oil prices in Euro and US dollar from 2014 to 2022



Source: St Louis Fed

In 2022 the euro has depreciated significantly in value relative to the US dollar. The euro was valued at US$1.13 in January 2022 but had fallen towards parity with the US$ by September, averaging US$1.05 for 2022 overall, compared with US$1.18 in 2021.

For 2022 on average, there was a 12 percent decrease in the value of the euro against the US dollar compared with its 2021 level. This depreciation of the euro magnified the rise in crude oil prices when expressed in euro terms. Hence, the estimated average crude oil price for 2022 was about €96 pb, an increase in euro terms of about 61 percent on the 2021 value of €60 pb. Overall, farm level fuel costs in Ireland increased in 2022, with marked (duty free) fuel prices approximately 80 percent higher in 2022 relative to the average level in 2021. Duty paid fuel prices increased by about 40 percent.

Electricity Prices: The escalation in fossil fuel prices has driven a sharp rise in electricity prices in 2022. Over the course of 2022, prices are likely to be at least 44 percent higher than in 2021.

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 been unchanged nationally, this suggests that the volume of electricity and fuel use is not likely to have changed in 2022. Due to increased prices, for the average dairy farm the overall expenditure on both electricity and fuel is estimated to be up about 50 percent on a per hectare or per litre basis in 2022.

3.1.6 Other Direct and Fixed Costs– usage and price 2022

It is estimated that there was a 5 percent increase in agricultural wages in Ireland in 2022. It is assumed that the quantity of hired labour used on farms is likely to have been unchanged given that there was no change in increased milk production.

The price of other input cost items increased by 5 percent in 2022. It is assumed that usage volume of these input items remained unchanged.

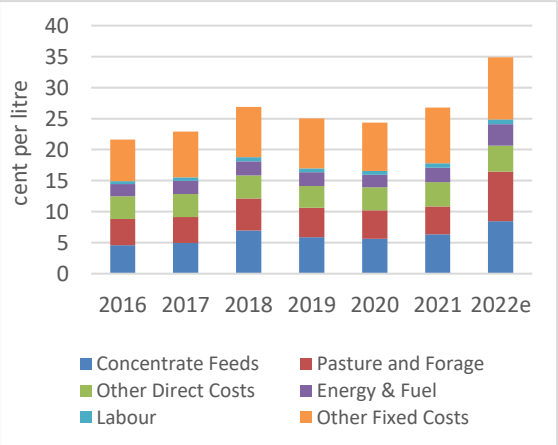
The assessment of fixed costs in the Teagasc NFS is quite complex and definitive information on how fixed costs have changed in 2022 will not be available until the Teagasc NFS results for 2022 are published in 2023. Factoring in the improved milk price in 2022 and unchanged milk production, the value 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 2022.

3.1.7 Estimate of Total Input expenditure for 2022

With a little over 1 percent increase in dairy cow numbers, and no change in milk production in 2022, it follows that milk yield per cow dropped slightly in 2022. The assessment of production costs for the average dairy farm is considered here on the basis that the farm experienced no change in milk production in 2022.

Figure 8 charts the average total cost of production and its subcomponents from 2016 to 2021 and the associated estimate for 2022.

Figure 8: Total Cost of Milk Production in Ireland from 2016 to 2022e



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

The fall in production costs in 2019 and 2020 has been followed by an increase in 2021 and a dramatic increase to an unprecedented level in 2022.

It is estimated that the average total cost of milk production in Ireland in 2022 was 34.9 cent per litre, compared to an average of 26.8 cent per litre in 2021. This represents an increase of 30 percent.

3.2 Review of Dairy Market in 2022

In aggregate no production growth has been observed across the main dairy export regions in 2022 relative to 2021. In the context of extremely high dairy prices, international dairy product demand remained robust throughout 2022. The high price of dairy alternatives meant that substitution away from dairy products was not really feasible.

Dairy commodity prices increased in Q1 and Q2 and stabilised at record levels in Q3 of 2022. For the year as a whole, dairy product prices will be up considerably relative to the 2021 price levels.

European butter prices rose significantly in Q4 of 2021. By November of 2021 European butter prices had reached over €5,000 per tonne. Prices for butter reached over €6,000 by March 2022 and €7,000 by May of 2022. In November of 2022 butter prices fell below the €7,000 level for the first time in 6 months.

European SMP prices also increased in Q4 of 2021, trading at over €3,000 per tonne. By April 2022 SMP prices reached over €4,000 per tonne and remained at that level for a couple of months. However, SMP prices have been gradually declining over Q3 and Q4 of 2022 and are now closer to €3,100.

Even European Cheese prices, which normally move over a narrower price range than Butter and SMP, have seen a sharp increase in 2022. Cheddar reached almost €4,000 per tonne by May of 2022 and continued to rise towards €5,000 territory in Q3 and Q4 of 2022. In November of 2022 there were the first signs that Cheddar prices may have peaked.

In the EU, there has been no milk production growth in 2022. In fact EU production is likely to decrease by about 0.5 percent. This represents a decrease in EU milk production of about 0.8 mt relative to the 2021 level.

Milk production in New Zealand (NZ) has exhibited very little growth over the last decade. In the 2021/22 season production fell by over 4 percent, due to drought conditions late in the season, which also affected winter fodder supplies. The early months of the 2022/2023 season have also been adversely impacted by poor weather conditions. It is

estimated that production in the 2022 calendar year will be down by 3 percent (0.8 mt).

US milk production is likely to be up marginally in 2022. Higher yields will more than offset a decline in cow numbers. For the full calendar year, US milk production should be up by close to 0.3 percent (0.3mt) in 2022.

Overall, for the calendar year 2022 Australian milk production should show a significant decrease of about 6 percent (0.5 mt). Despite elevated milk prices, weather conditions were challenging across some regions with labour constraints and price pressures also an issue.

Milk production grew strongly in Argentina in 2020 and in 2021, but little growth is likely for 2022. For the calendar year 2022 it is expected that Argentinian milk production could increase by less than 0.4 percent (0.05mt).

Overall, there has been no milk production growth across the major dairy export nations in 2022.

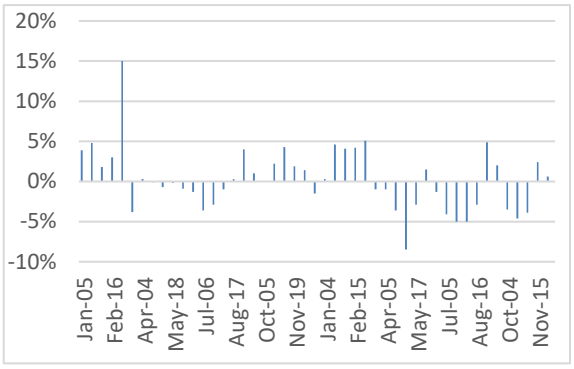
Chinese import demand has weakened in 2022, but this was consistent with expectations. In the period from January to September 2022 China's imports of SMP and WMP were down by 25 percent and 17 percent respectively relative to the same period in 2021. China's imports of whey powder were also down by 30 percent in this period.

Total EU exports of SMP to third countries were down 15 percent in the period January to September 2022, relative to the same period in 2021. A decline in EU butter exports has also been experienced in 2022. For the period January to September, EU butter exports to third countries declined by 8 percent on the same period in 2021. EU exports of cheese to third countries also fell slightly, decreasing by 3 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 Q1 of 2022. However, these have been followed by mainly negative price movements in Q2 and Q3 and into Q4.

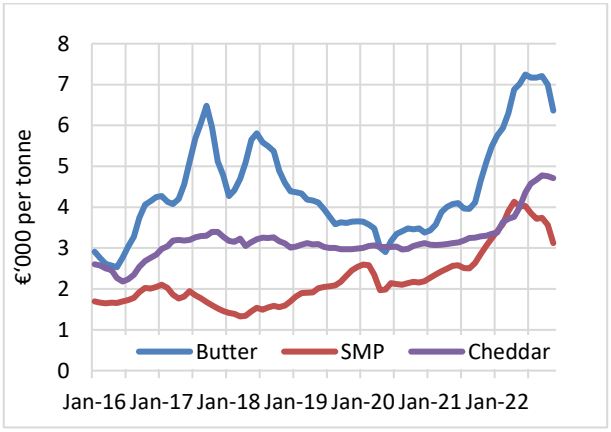
European wholesale dairy product prices are shown in Figure 10. In 2022 prices for butter and powders have trended upwards very strongly to record levels during the year but are now declining in Q4. For 2022 as a whole, butter prices could be up about 60 percent and SMP prices up 40 percent relative to the 2021 level. Cheddar price increases in 2022 have not been as large, at about 33 percent.

Figure 9: Monthly GDT Auction Index Price movements in 2021 and 2022



Source: GDT Auction 2022.

Figure 10: European Dairy Product Prices 2016-22

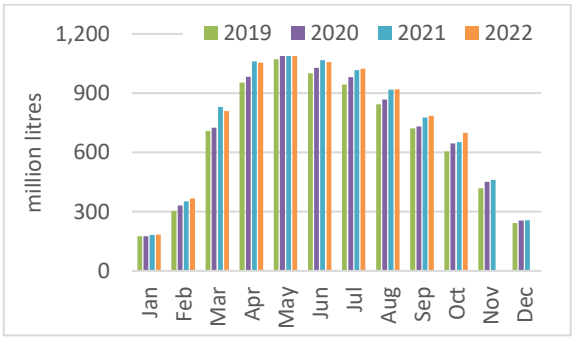


Source: MMO 2022.

3.3 Estimated Output Values 2022

Irish milk production has been stable in 2022. Monthly milk deliveries are shown in Figure 11.

Figure 11: Monthly Irish Milk Deliveries 2019 to 2022



Source: CSO, 2022.

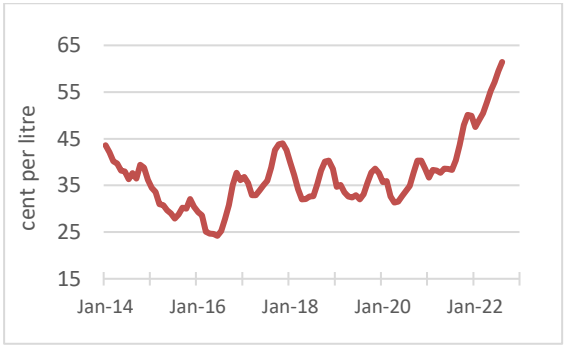
While there has been a continuing growth in dairy cow numbers in 2022, this has been offset by lower milk yields.

Irish dairy cow numbers, as recorded in June 2022 increased to 1.627 million, compared with 1.605 million in June 2021, an increase of 1.4 percent (CSO, 2022). In the year to October 2022, milk production was marginally up by 0.4 percent (CSO, 2022).

Figure 12 presents monthly Irish milk prices recorded by the CSO from January 2014 through to October 2022. In Ireland the average 2022 manufacturing milk price is estimated to be up about 44 percent on the 2021 level. Some farmers will have milk in fixed price contracts and therefore may not obtain the spot prices quoted.

In 2022, Irish farm gate milk prices rose as the year progressed, reflecting the rise in dairy commodity prices. The annual average national milk price (CSO definition) is estimated to be approximately 58 cent per litre (vat inclusive) in 2022 on an actual fat and protein basis (estimated to be 4.26 percent fat and 3.54 percent protein).

Figure 12: Irish Farm Gate Milk Prices Actual fat (vat incl.) Jan 2014 – Sept 2022

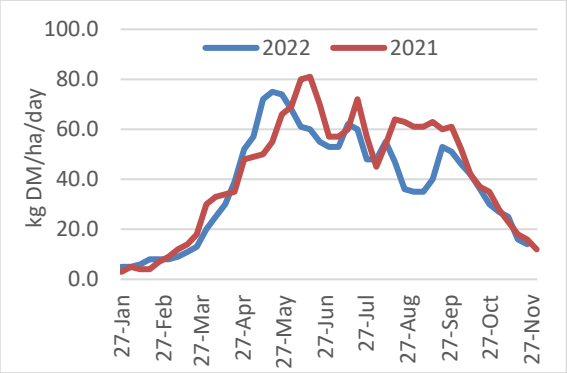


Source: CSO. Note: Actual fat (VAT inclusive).

The general upward trend in milk price is driven by the absence of supply growth internationally and continuing robust demand. This has resulted in a continued increase in key international dairy product prices.

Figure 13 illustrates the evolution in national grass growth in 2022 compared to 2021, as measured by the PastureBase Ireland system. While grass growth over H1 of 2022 was relatively normal, an unusually dry summer followed. Over the course of June, July and August, rainfall levels were well below normal for the time of year. This resulted in soil moisture deficits towards the end of the summer across some regions. As a result, grass growth levels were below normal through the main part of the milk production season. More favourable weather re-emerged in September of 2022 and grass growth reverted to more normal levels at the back end of the season. The poor season for grass growth will have affected silage production on some farms.

Figure 13: National Grass Growth 2021 & 2022



Source: Pasturebase Ireland.

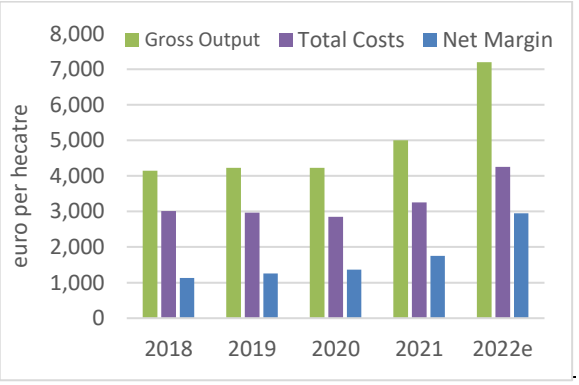
3.4 Review of Dairy Enterprise Net Margins in 2022

The review of milk prices showed that the average milk price for 2022 was up approximately 44 percent on the 2021 level. The review of input costs concluded that for the average farm, experiencing no growth in milk production, total production costs on a per litre basis are estimated to have increased by about 30 percent in 2022 relative to 2021.

The margin per hectare is first 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 2022 in comparison to recent years, on the basis of no change in milk production in 2022.

For 2022 the net margin for milk production is estimated to have averaged €2,950 per hectare. This means that the average net margin in 2022 has risen by over €1,200 per hectare relative to 2021. This represents an increase of 69 percent year-on-year.

Figure 14: Average Gross Output, Costs & Margins per hectare for Irish Milk Production in 2018-2021 & estimate for 2022e

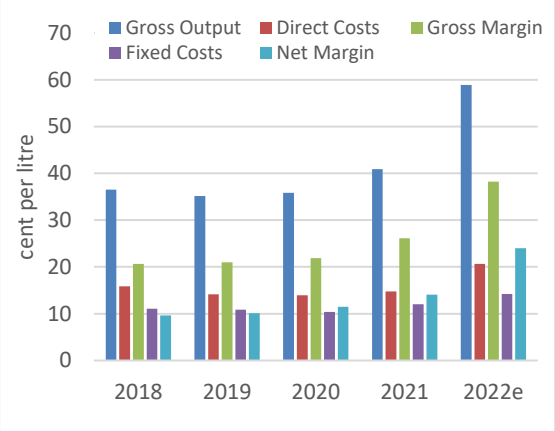


Source: Teagasc National Farm Survey Data and Authors' estimates. Note: e = estimate.

Estimated average gross output per litre in 2022 is shown in Figure 15, on the basis of no change in milk production in the year. Average gross output per litre is estimated to be 58.9 cent per litre in 2022, representing a 44 percent increase on 2021. Total costs are estimated to be 34.9 cent and net margin 24.0 cent.

See Table A5 (in the appendix) for estimates of output, costs and margins on a per litre basis for a farm that has no expansion in milk production in 2022.

Figure 15: Average Gross Output, Costs & Margins per litre for Irish milk production in 2018-2021 and estimates for 2022e



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

4. Dairy Outlook for 2023

For the purposes of this analysis, a 3 percent increase in total Irish milk production in 2023 is forecast, with a 1 percent increase in the dairy enterprise's land base. Production costs are forecast to remain elevated due to continued input cost inflation.

4.1 Outlook for Input Expenditure 2023

In this analysis of likely changes in production costs in 2023, for simplicity it is assumed that the average farm produces 4 percent more milk in 2023 than it did in 2022. This is in line with the forecast increase in Irish national milk production in 2023.

4.1.1 Feed - usage and price 2023

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 2022 were up by between 40 and 50 percent on the 2021 level. In 2022, despite a significant increase in national cereal volumes, a decrease in the production of wheat, barley and maize on the European balance sheet in 2022/23 compared to 2021/22 (by about 24 Mt), coupled with much uncertainty of supply due to the evolving situation in Ukraine, resulted in a further significant upward movement in Irish farm gate harvest prices compared to 2021.

Feed prices in 2023 will depend in part on cereal prices for harvest 2023, but the main determinant will be harvest prices in 2022. On a monthly basis there has been upward movement in feed prices over the course of 2022, with prices in early 2023 set to be higher than at the outset of 2022. Cereal prices at harvest 2023 are forecast to decrease on 2022 prices harvest prices. Averaging across the full year, feed prices are forecast to increase by 10 percent in 2023 relative to the average price for 2022.

The volume of dairy feed used in Ireland increased slightly in 2022 on a per head basis. With the assumption of normal weather in Ireland in 2023, and with a 4 percent increase in milk production forecast, feed volume requirements per head for grassland enterprises would be expected to remain largely unchanged in 2023. However, fertiliser prices are forecast to remain at unprecedentedly high levels in 2023 (as detailed in Section 4.1.2) which could incentive feed use. It is assumed that feed use will remain relatively stable on Irish farms (up 1 percent), with further price increases envisaged (up 10 percent). This will result in an estimated increase in concentrate feed expenditure of 8 percent on a per litre basis in 2023.

4.1.2 Fertiliser & Contracting Costs– usage and price 2023

Fertiliser prices reached record levels in 2022 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 2023. For 2023 as a whole fertiliser prices are forecast to remain at elevated levels. On the assumption of normal weather, it is forecast that fertiliser expenditure in 2023 will remain relatively stable (up 1 percent) relative to the 2022 level.

Similarly, due to elevated prices for fuel and other inputs, agricultural contracting charges are forecast to remain at levels reported in 2022. Given the need to build fodder stocks in 2023, it is expected that pasture and forage costs will remain relatively unchanged on a per hectare basis.

4.1.3 Electricity and Fuel – usage and price 2023

As of November 2022, prospects for the US$/euro exchange rate in 2023 are not clear. The US$ strengthened considerably in 2022, due to interest

rate rises, better US growth prospects and demand for the currency as a safe haven in uncertain times. For the purposes of this outlook, a rate of $1.02 to the euro is assumed for 2023, an appreciation of the US$ of 3 percent on the 2022 average level of $1.05. An analysis of futures prices indicates that Brent crude oil could average US$85 in 2023. This would represent a decrease of about 16 percent on the 2022 level.

At a US$/euro exchange rate of $1.02, the forecast annual Brent crude oil price for 2023 would be €83 pb, which would leave the annual average Brent crude oil price down 13 percent in euro terms in 2023 relative to the average for 2022. Although a carbon tax increase is planned for 2023, farm fuel prices are forecast to decline by 14 percent on average, from very elevated levels in 2022, with a larger decrease for farm diesel than for duty paid fuels. Electricity prices are forecast to increase in 2023. This would mean expenditure per hectare on electricity and fuel in 2023 would be up 8 percent.

4.1.4 Other Direct and Fixed Costs – usage and price 2023

Projections relating to the macroeconomy in 2023 are conditioned by a significant uncertainty relating to global growth prospects. Economic growth rates are expected to be lower internationally in 2023 than in 2022, with some economies moving into recession. General inflation is expected to be lower in 2023, but still well above what central bankers would prefer.

An increase in wage rates in 2023 of 4 percent is forecast. The increase in general inflation affecting other direct costs in 2023 is forecast to be up 5 percent on a per hectare basis.

At an overall farm level, fixed costs on dairy farms are forecast to increase by 2 percent, on average in 2023.

4.1.5 Estimate of Total Input expenditure for 2023

Overall, direct costs per hectare are forecast to increase by 6 percent in 2023, with a 3 percent increase on a per litre basis. Fixed costs are forecast to increase by 2 percent on a per hectare basis. Overall, total production costs per hectare are forecast to increase by 4 percent per hectare in 2023.

4.2 The Outlook for Dairy Markets in 2023

An exceptional supply and demand situation in 2022 resulted in extraordinarily high milk prices. In a European context the increase in milk prices in Ireland was among the highest across the EU. The Irish dairy market benefitted from high international butter and powder prices, with cheese prices also moving upwards.

However, the dairy market situation in 2023 is likely to involve an easing of international demand growth and greater global milk availability on the supply side. While dairy commodity prices moved upwards over most of 2022, there were already signs in Q4 of 2022 that prices had moved past their peak. Falling prices have begun to be observed for butter and milk powders, albeit from a very high level.

Movement in the GDT auction are usually indicative of short term developments in global dairy commodity prices and in farm milk prices. The GDT auction has generally been reporting negative price movements in the last few months, indicating that lower milk prices are in prospect entering 2023.

Chinese demand for milk powders has helped to give dairy markets buoyancy over the last couple of years. However, as the growth rate in the Chinese economy eases, this is expected to lead to lower imports of milk powder by China. More generally prospects for economic growth around the world in 2023 have become more negative in recent months, which would also be suggestive of a slowdown in dairy demand growth.

EU milk production was static in 2022, but, in spite of lower margins, a return to modest growth is possible in 2023, assuming more favourable production conditions. It is possible that EU milk production could increase in 2022 by 0.6 percent (0.8mt), with lower dairy cow numbers offset by stronger growth in milk yields. However, the European Commission in its forecasts is a little bit more pessimistic, suggesting that production in 2023 will be down slightly on the 2022 level (European Commission, 2022).

The US dairy market remains a bit more insulated from global dairy prices developments than other major export regions. While margins will be lower in 2023, latest forecasts suggest a further 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, 2022).

There has been a relatively poor start to the 2022/23 milk production season in New Zealand. Unfavourable weather conditions, brought about by the La Niña weather pattern, have adversely affected grass growth and milk production. High production costs and falling milk prices will lead to lower margins in 2023. Cow numbers are also expected to fall slightly. As a result, it is likely that New Zealand milk production will be static in 2023, with lower

production in H2 of the 2022/23 season being offset by higher production in H1 of the 2023/24 season.

Given that the Irish milk price benefitted disproportionately from the buoyant international dairy market in 2022, it is likely that it will also feel a disproportionate impact from the fall in international dairy commodity prices in 2023. It is forecast that the annual average Irish milk price in 2023 will be down 15 percent on the 2022 level, giving an annual average milk price (actual fat and protein vat inclusive) of about 49 cent per litre in 2023 (VAT inclusive actual fat and protein basis). While this would still represent a high milk price in historical terms, the extent to which costs have risen over the past year needs to be borne in mind.

4.3 The Outlook for Milk Production in 2023

Irish milk production did not increase substantially in 2022 as higher cow numbers were offset by lower yields. Even though the milk price outlook for 2023 remains relatively favourable, cost pressures will continue to be substantial. A 4 percent increase in milk production is forecast for 2023, with a further increase in cow numbers and a return to growth in milk yields.

4.4 The Outlook for Dairy Enterprise Net Margins in 2023

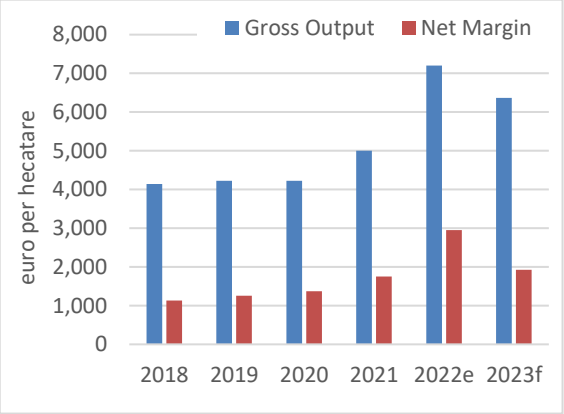
This section considers the impact of changes in milk prices and production costs on gross and net margins on dairy farms in 2023. Price increases for feed, and energy are forecast for 2023, with fertiliser prices remaining high. A 3 percent increase in milk output per hectare is assumed for 2023.

In 2023, profitability per hectare, as measured by net margin on the average dairy farm, is forecast to fall by 35 percent. Average net margin per hectare is estimated to be €2,950 for 2022, but is forecast to fall to €1,928 in 2023, as illustrated in Figure 16.

Figure 17 presents a margin forecast on a per litre basis for the average dairy farm, based on a 3 percent increase in milk production in 2023.

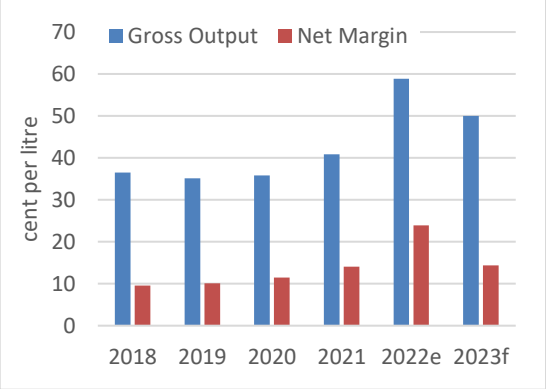
Given the forecast decrease of 15 percent in the average milk price in 2023, and with production costs remaining high (up 2 percent in 2023), this would mean that gross and net margins are forecast to decrease in 2023 to more normal levels. Net margin per litre is forecast to decrease by 40 percent in 2022, to an average of 14.4 cent per litre.

Figure 16: Average Gross Output and Net Margin per hectare for 2018 to 2022 with forecast for 2023



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

Figure 17: Average Gross Output and Net Margin per litre in Ireland 2018 to 2022, with Forecast for 2023



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

5. Concluding Comments

Production costs increased sharply in 2022, largely due to sharp inflation in the general economy resulting from the invasion of Ukraine. However, this increase in costs was more than offset by an unprecedented increase in milk prices.

There was a major increase in net margin per hectare and per litre of milk produced in 2022. On average, it is estimated that dairy enterprise net margin per hectare increased by 69 percent in 2022 to €2,950.

In 2023 the annual average milk price is forecast to decrease by 15 percent relative to the 2022 level. On the assumption that normal weather is experienced in 2023, production cost will remain very high, but will not accelerate further.

In spite of the persistently high cost environment in which farms will operate in 2023, a favourable (although declining) milk price will mean that margins return to more normal levels in 2023. It is forecast that total production costs will remain elevated, up approx. 2 percent to reach 35.7 cent per litre. The average net margin per hectare and per litre in 2023 are likely to be down 35 and 40 percent respectively on the 2022 level at €1,928 per hectare and 14.4 cent per litre.

References

AHDB (2022) AHDB Dairy www.dairy.ahdb.org.uk

Central Statistics Office (2022) Statbank [accessed at www.cso.ie on various dates]

DAFM (2022) Quarterly Summary Report for Feed Usage (Various Issues).

DAFM (2022) Quarterly Fertiliser Sales (Various Issues).

Dillon, E, Donnellan, T., Moran B. and Lennon, J. (2022) Teagasc National Farm Survey 2021. Teagasc, Rural Economy Development Programme, Athenry, Ireland. https://www.teagasc.ie/media/website/publications/2022/Teagasc-National-Farm-Survey-2021.pdf

ESRI (2022) ESRI Quarterly Economic Commentary, Autumn 2022, Dublin.

European Commission (2022). EU Milk Market Observatory: https://ec.europa.eu/agriculture/market-observatory/milk_en

Global Dairy Trade (2022). Event Results. https://www.globaldairytrade.info/en/product-results/

PatureBase Ireland (2022). https://pasturebase.teagasc.ie/

St. Louis Fed (2022). FRED database: https://fred.stlouisfed.org/

Teagasc (2022). Teagasc National Farm Survey Results 2021: Dairy Enterprise Fact Sheet.

USDA (2022). World Agricultural Supply and Demand Estimates Report https://www.usda.gov/oce/commodity/wasde

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Table A1: Average Gross and Net Margin of Milk Produced in 2020 and 2021

	2020	2021	% Change
	cent/litre		
Total Gross Output	35.83	40.87	14.1%
Concentrate Costs	5.64	6.36	12.7%
Pasture and Forage Costs	4.60	4.47	-2.8%
Other Direct Costs	3.70	3.96	7.1%
Total Direct Costs	13.93	14.78	6.1%
Gross Margin	21.90	26.09	19.1%
Electricity and Fuel	2.02	2.31	14.5%
Labour	0.60	0.72	19.2%
Other Fixed Costs	7.78	8.99	15.5%
Total Fixed Costs	10.40	12.02	15.5%
Total Costs	24.33	26.80	10.1%
Net Margin	**11.50**	**14.07**	**22.4%**

Source: Teagasc National Farm Survey Data

Table A2: Average Net Margin per hectare* in 2020 and 2021

		2020	2021	% Change
Milk Produced	litres/ha	11,781	12,221	3.7%
Total Gross Output	€/ha	4,222	4,999	18.4%
Total Costs	€/ha	2,853	3,251	13.9%
Net Margin	€/ha	**1,368**	**1,748**	**27.8%**

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

Table A3: Output, costs and margin (cent per litre) for Top, Middle and Bottom one-third of farms in 2021

	Top	Middle	Bottom
	cent per litre		
Gross Output	41.63	41.12	39.88
Concentrate Feeds	5.65	6.32	7.08
Pasture & Forage	4.02	4.18	5.21
Other Direct Costs	3.75	4.07	4.04
Electricity & Fuel	1.91	2.25	2.78
Labour	1.07	0.43	0.67
Other Fixed Costs	8.57	9.13	9.25
Total Costs	24.98	26.38	29.04
Net Margin	**16.66**	**14.75**	**10.84**

Source: Teagasc National Farm Survey Data

Table A4: Output and profit per hectare for Top, Middle and Bottom one third of farms in 2021

		Top	Middle	Bottom
Stocking rate	cows/ha	2.52	2.07	1.72
Milk sold	litres per ha	15,809	12,091	8,803
Concentrates fed per cow	kg	1,140	1,223	1,154
Concentrates fed per litre of milk produced	kg	0.18	0.20	0.22
Gross output	€ per ha	6,570	4,954	3,492
Direct Costs	€ per ha	2,140	1,812	1,451
Gross Margin	€ per ha	**4,431**	**3,142**	**2,041**

Source: Teagasc National Farm Survey Data

Table A5: Average Gross and Net Margin per litre of Milk Produced 2020-2023f

	2020	2021	2022e	2023f
	cent per litre			
Total Gross Output	35.83	40.87	58.86	50.03
Concentrate Costs	5.64	6.36	8.48	9.15
Pasture and Forage Costs	4.60	4.47	7.97	7.82
Other Direct Costs	3.70	3.96	4.19	4.27
Total Direct Costs	13.93	14.78	20.64	21.24
Gross Margin	21.90	26.09	38.21	28.79
Electricity and Fuel	2.02	2.31	3.44	3.61
Hired Labour	0.60	0.72	0.77	0.80
Other Fixed Costs	7.78	8.99	10.02	10.02
Total Fixed Costs	10.40	12.02	14.23	14.43
Total Costs	24.33	26.80	34.87	35.67
Net Margin	**11.50**	**14.07**	**23.99**	**14.36**

Source: Teagasc National Farm Survey Data. Figures for 2022 are estimates, Figures for 2023 are forecasts.

Cattle Farming in 2021
Average performance

Irish Cattle Slaughter
1.792 million head (down 4.8%)

Live Exports
247,163 head (down 7%)

Irish Suckler Cow Numbers
0.89 million (down 3.6%)

Weanling purchase price
average €766/head (down 1%)

Male Store purchase price
average €998/head (up 8%)

Female Store purchase price
average €865/head (up 5%)

Male Finished Animals Price
average €1,557 per head (up 12.7%)

Female Finished Animals Price
average €1,322 per head (8.8%)

Gross Margin
(Single Suckling)
average €553 per hectare (up 19.7%)

Gross Margin
(Cattle Finishing)
average €581 per hectare (up 19.3%)

Stocking Rate (Calf to Weanling)
average of 1.16 LU/ha (down 4.9%)

Stocking Rate (Calf to Store)
average of 1.57 LU/ha (up 8.8%)

Stocking Rate (Calf to Finishing)
average of 1.57 LU/ha (up 1.2%)

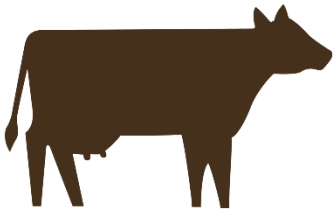
Stocking Rate (Cattle Finishing)
average of 1.4 LU/ha (down 4%)

Concentrate Fed/LU
(Cattle Finishers)
average 653 kg (7.7%)

Slaughter Weight/Head
average 331.7 kg (down 1.4%)

Total Production Costs
(Single Suckling)
average €1,104 per hectare (up 10.2%)

Total Production Costs
(Cattle Finishing)
average €1,252 per hectare (up 13.3%)



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

Irish Cattle Farming in 2022

R3 Steer price
16% on the 2021 level

Weanling and Store prices
8% and 11% respectively

higher/lower beef calf prices
10% on the 2021 level

Weather Conditions
Relatively normal weather

Grass Availability
Lower than normal in summer and autumn

Fertiliser Prices
195% on the 2021 level
Fertiliser Use
18% on the 2021 level

Feed Prices 28% on 2021
Feed use 2% on 2021

Other Direct Costs
5% on the 2021 level

Fuel prices
60% on the 2021 level

Total Input Costs (Suckler)
24% on the 2021 level
Total Input Costs (Finisher)
28% on the 2021 level
Gross Margin (Suckler)
15% on the 2021 level
Gross Margin (Finisher)
7% on the 2021 level

Source: Teagasc Estimates for 2022 and Forecasts for 2023

Irish Cattle Farming in 2023

R3 Steer prices
4% on the 2022 level

Weanling and Store prices
5% on the 2022 level

Lower/higher beef calf prices
5% on the 2022 level

Weather Conditions
Normal weather assumed

Grass Availability
normal conditions

Fertiliser Prices
no change on the 2022 level
Fertiliser Use
no change on the 2022 level

Feed Prices 10% on 2022
Feed use no change on 2022

Other Direct Costs
4% on the 2022 level

Fuel prices
14% on 2022 level

Total Input Costs
3% on the 2022 level

Gross Margin (Suckler)
11% on the 2022 level
Gross Margin (Finisher)
no change on the 2022 level

Review of Cattle Farming in 2022 and Outlook for 2023

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1. Introduction

This paper presents estimates for the returns from cattle production in 2022. The paper contains a review of the economic performance of Irish cattle farms in 2021 based on data provided by the Teagasc National Farm Survey (Dillon et al. 2022). The paper also includes forecasts for the economic situation on Irish cattle farms in 2023.

Finished cattle prices increased significantly in 2022 relative to 2021. In 2022, average steer and heifer prices increased by 16 percent. Prices for store animals and weanlings increased by approximately 11 percent and 8 percent respectively.

Input prices also increased dramatically in 2022 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 varies between different cattle farming enterprises.

In 2022, the volume of prime cattle slaughtered increased by 6 percent relative to 2021. The average weight of finished prime cattle decreased by 2 percent relative to 2021 thereby leading to a 4 percent increase in prime beef production. The volume of cows slaughtered increased by 16 percent in 2022. As a result, total national beef production increased by approximately 6 percent in 2022. The total volume of beef production is therefore significantly higher in 2022 relative to 2021.

Grass-growing conditions varied by region during the course of 2022. Grass growth rates performed very well in the spring. In the south and east of the country, the grass-growth rates were relatively low during the summer. High rainfall levels affected grass conditions in the autumn with a negative impact in much of the country. Grass-growing conditions influenced the demand for concentrate feed in the last quarter with an estimated 3 percent increase in the quantity of concentrates used on the average Cattle finishing enterprise.

The average gross margin on Single Suckling farms is estimated to have decreased by 15 percent in 2022 to an estimated €470 per hectare. Large increases in energy prices have further eroded margins. The average Single Suckling enterprise is estimated to have earned an average negative net margin per hectare of -€125 in 2022. The gross margin per hectare on the average Cattle Finishing enterprise is estimated to have increased by 7 percent in 2022 with an estimate of €622 per hectare. Increases in energy prices have contributed to rising overhead costs. On average, Cattle Finishing farms are also estimated to have earned negative net margins in 2022. The average Cattle Finishing enterprise net margin is estimated to be -€33 per hectare in 2022. This is lower than the average net margin of -€14 per hectare reported in 2021.

Margins earned on cattle farms in Ireland are influenced by beef supply and demand. The quantity of beef consumed in the EU is estimated to be slightly higher in 2022 (European Commission 2022b). EU beef supplies declined in 2022 and are forecast 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, beef retail consumption has declined in 2022 with demand switching back towards the foodservice options (AHDB 2022c). In 2022, UK consumer prices for sirloin/rump steak continued to increase and have reached record levels in sterling terms during the second half of the year (Office for National Statistics 2022a). 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 2022, the domestic consumption of beef and veal is estimated to have increased by 2.5 percent in China, with smaller changes in other parts of the world. Global consumption of beef and veal is similar in 2022 relative to 2021 (USDA, 2022).

Global beef consumption and Global beef production in 2023 are expected to be similar to that in 2022. Beef production in China is expected to increase by 5 percent but declines are forecast elsewhere and particularly in the United States

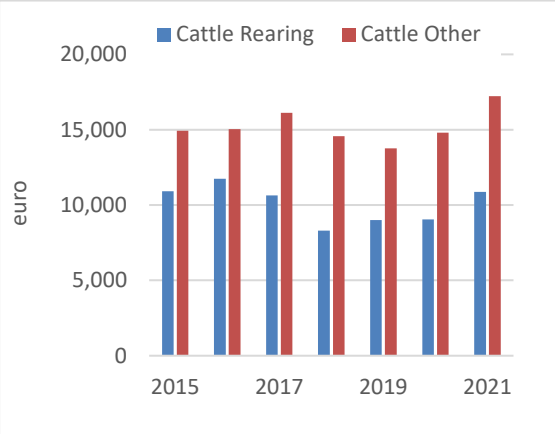
where a 10 percent reduction is forecast (USDA, 2022).

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 2021

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 2021 are shown in Figure 1. In 2021, the average FFI on Teagasc NFS *Cattle Other* farms increased by 11 percent compared with 2020 levels while the average FFI on Teagasc NFS *Cattle Rearing* farms increased by 29 percent compared to 2020.

Figure 1: Average Family Farm Income on Cattle Rearing and Cattle Other Farm Systems: 2015 to 2021



Source: 2021 Teagasc National Farm Survey (2022)

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, 2022a and 2022b).

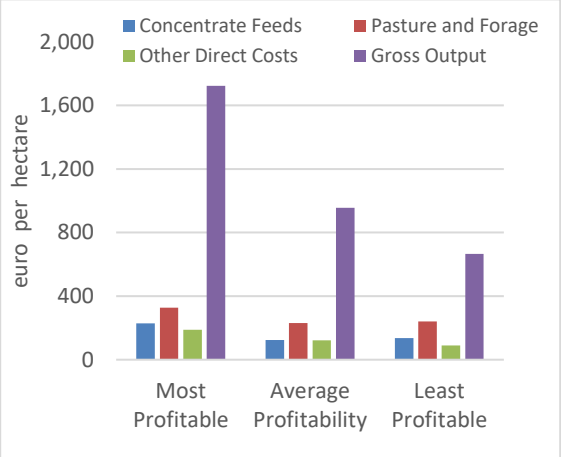
Single Suckling enterprises in the analysis that follows are enterprises with more than 10 cows, while the Cattle Finishing enterprises analysed are those with more than 10 livestock units where more than 70 percent of the animals sold off the farm were sold for slaughter. In total, these two enterprises were present on more than 38,000 farms nationally.

2.1 Irish Beef Enterprise Performance in 2021

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 2021, the average direct costs of production per hectare for Single Suckling enterprises varied from €467 on those farms with the lowest average gross margin to €745 on the top one-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 €123 per hectare on the middle third of farms to €229 per hectare on the most profitable farms.

Figure 2: Variation in Total Production Costs and Gross Output on Single Suckling enterprises in 2021



Source: 2021 Teagasc National Farm Survey (2022)

There was considerably more variability in the average gross output per hectare between the least profitable and most profitable farms. The most profitable one-third of Single Suckling enterprises earned an average gross output of €1,723 per hectare, compared with an average gross output of €665 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 rates on the more profitable farms. In 2021, the most profitable Single Suckling enterprises had an average stocking rate of 1.9

livestock units (LU) per hectare compared with 1.07 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 in part determined by the quality of the land farmed. In 2021, 58 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 23 percent.

The most profitable one-third of Single Suckling enterprises in 2021 had an average gross output per hectare that was over 150 percent higher than the average output per hectare on the least profitable one-third of enterprises, while average direct costs per hectare were 60 percent higher.

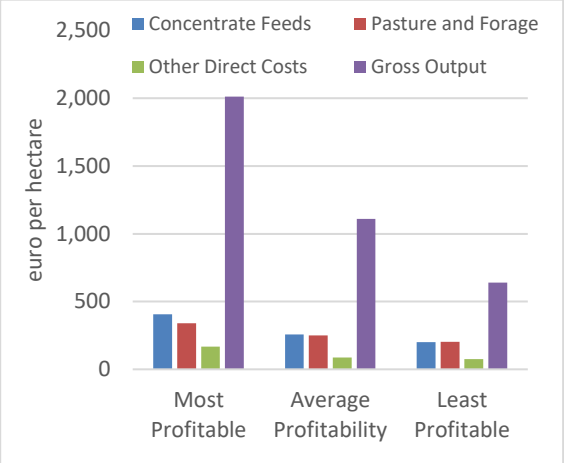
Cattle Finishing: The second cattle enterprise category analysed is the Cattle Finishing enterprise. The enterprises analysed were again ranked on the basis of gross margin per hectare and assigned to three equally sized groups in terms of profitability termed *least, average* and *most profitable*.

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 €2,013 per hectare compared with €639 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 1.04 LU per hectare, while the average stocking rate on the most profitable one-third of Cattle Finishing enterprises was 1.91 LU per hectare.

In general, more profitable Cattle Finishing enterprises were on farms with better soils, 74 percent of the most profitable Cattle Finishing enterprises farmed very good soils compared to 54 percent of the least profitable farms.

Figure 3: Variation in Total Production Costs and Gross Output on Cattle Finishing Enterprises in 2021



Source: 2021 Teagasc National Farm Survey (2022)

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 higher 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.

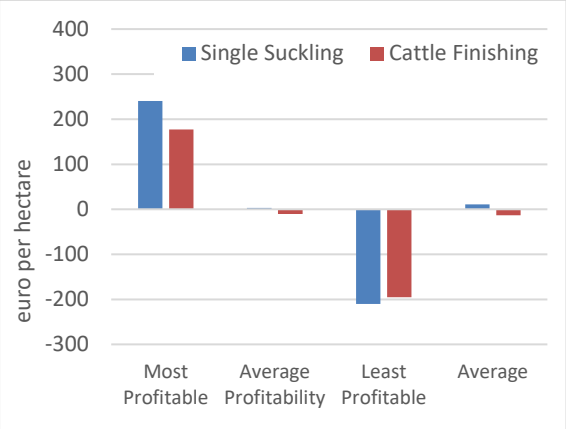
Average overhead costs per hectare on the Cattle Finishing and Single Sucking enterprises were €594 and €542 per hectare respectively (see Appendix Table A1 and Table A2 at the end of this paper). On a whole farm basis, the total overhead expenditures tend to be higher on Cattle Finishing enterprises due to their relatively larger farm size.

On Single Suckling farms, the net margins improved in 2021 relative to 2020. In 2021, the improvement in the performance of Cattle Finishing enterprises can largely be attributed to rising finished cattle prices. On average, Single Suckling enterprises in 2021 earned a better net margin per hectare relative to the average Cattle Finishing enterprise. The average net margin is reported as positive for the Single Suckling enterprise in 2021 (+€11 per hectare) but is reported as negative for the average Cattle Finishing enterprise (-€14 per hectare).

Figure 4 shows the net margins earned on the two cattle enterprises analysed and illustrates that in 2021 only the most profitable one-third 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 2021



Source: 2021 Teagasc National Farm Survey (2022)

3. Estimated Performance of Irish Cattle Farms in 2022

This section of the paper presents a review of the economic performance of Irish cattle enterprises in 2022. A discussion of the estimated changes in input usage and input costs in 2022 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 2022 are then presented.

Estimates for 2022 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 2022, aggregate production of beef increased in Ireland. Suckler cow inventories declined in 2022 relative to 2021 (DAFM 2022c).

3.1 Estimated Input Usage and Price 2022

3.1.1 Feedstuffs

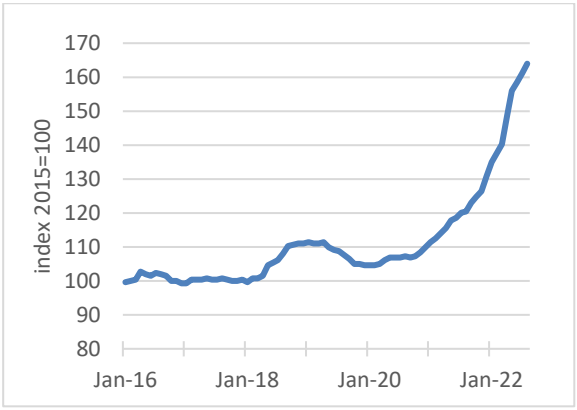
Purchased feed is an important element of the direct costs of beef production in Ireland. Typically, this cost item accounts for approximately 30 percent of total direct costs on Single Suckling enterprises and 45 percent of direct costs on Cattle Finishing enterprises.

Weather conditions varied during 2022 with favourable grass-growing conditions during April and May leading to higher than normal rates of grass-growth. A relatively dry summer contributed to lower than normal grass–growth in some parts of the country and particularly in the south and east. Over 2022 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 2022 contributed to higher volumes of concentrate feed purchases by Irish beef farmers but this increase is likely to be small and concentrated among cattle finishers. Overall, it is estimated that feed use increased by 3 percent on cattle finishing enterprises in 2022 relative to 2021 with no change estimated for cattle rearing systems.

Figure 5 presents the CSO monthly price index for cattle feed stuffs for the period January 2015 to September 2022. In September 2022, cattle feed prices were 36 percent higher relative to the prices reported in September 2021. For 2022 as a whole and accounting for the final quarter of the year, we estimate that cattle feed prices increased by 28 percent relative to 2021.

Figure 5: Monthly Price Index of Cattle Meal in Ireland 2015 to 2022



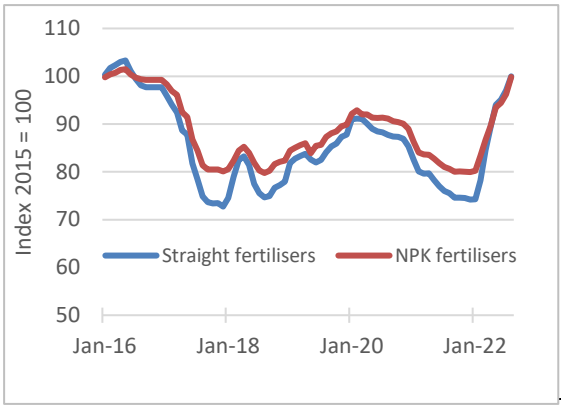
Source: CSO (2022)

We estimate that expenditure on concentrates by cattle finishing farms in 2022 increased by 32 percent relative to 2021 and that expenditure on concentrates by cattle rearing farms increased by 28 percent over the same period.

3.1.2 Fertiliser in 2022

Figure 6 presents monthly data on fertiliser prices since 2016. Fertiliser prices increased dramatically in early 2022. The large increase in Irish fertiliser prices means that overall fertiliser expenditure on Irish cattle farms is significantly higher in 2022.

Figure 6: Monthly Price Index of Fertiliser in Ireland from 2016 to 2022



Source: CSO (2022)

3.1.3 Energy and Fuel in 2022

As a result of the increase in global oil prices and the inelastic nature of agricultural demand for fuel, fuel expenditure on Irish cattle farms is estimated to have increased by approximately 60 percent in 2022 relative to the 2021 level.

We estimate that for 2022, contracting charges on cattle farms will have increased by 30 percent compared to 2021. When combined with higher expenditure on fertiliser, this means that overall expenditure on pasture and forage by cattle farmers in 2022 is estimated to have been much higher than in 2021. Electricity prices are estimated to have increased by 44 per cent and contributed to rising total overhead costs during 2022.

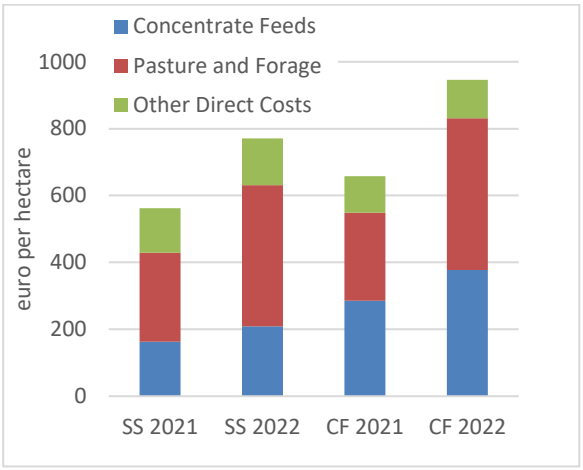
3.1.4 All Other Direct and Overhead Costs– usage and price 2022

Wages in Ireland are estimated to have increased by 3 percent in 2022; 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 4 percent increase in other direct costs for 2022.

3.1.5 Estimate of Total Direct Costs for 2022

Figure 7 compares the average direct costs of production for the Single Suckling and Cattle Finishing enterprises in 2021 with the estimated direct costs for 2022.

Figure 7: 2021 Direct Costs and Estimated 2022 Direct Costs for Single Suckling (SS) and Cattle Finishing (CF) Enterprises



Source: Teagasc National Farm Survey (2022) and Author's Estimates

On average, total direct costs increased by 37 percent on Single Suckling farms and by 44 percent on Cattle Finishing farms. Higher fuel costs in 2022 contributed towards increasing overhead costs. The overall costs of production in 2022 are estimated to have increased by 24 percent on Single Suckling farms and by 28 percent on Cattle Finishing farms.

3.2 Estimated Output Values 2022

The value of gross output on Single Suckling enterprises is estimated to have increased in 2022, with higher average prices for weanlings and store cattle observed throughout most of the year including the important autumn months. The average gross output is estimated to be higher than the levels observed in 2021. In 2022, the value of output per hectare on Single Suckling farms is estimated to be €1,240.

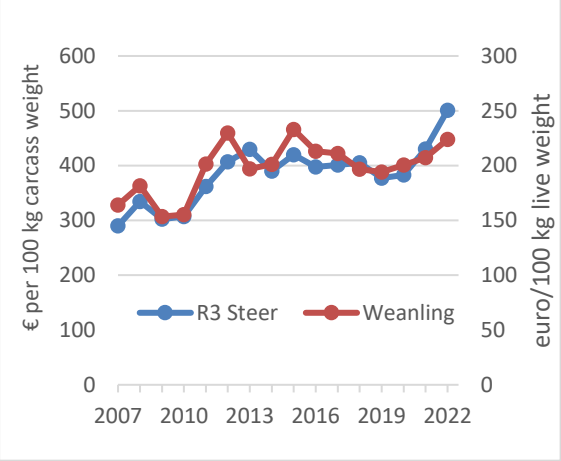
In our estimates for 2022, we have incorporated the payments made to cattle farmers under the Beef Data Genomics Programme (BDGP) and Beef Environmental Efficiency Programme - Suckler (BEEP-S) schemes. The payments under these schemes are contingent on farmers undertaking specified measures.

In 2022, 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 2022. We estimate that such coupled payments provide €87 per hectare in 2022 to the average Single Suckling enterprise. This estimate represents the average 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.

On both cattle rearing farms and cattle finishing farms, the changes in Gross Output are largely due to changes in output prices rather than volumes of production. Figure 8 presents average R3 steer and weanling prices for the period 2007 to 2021 and an estimate for 2022. The weanling price refers to the value of bullocks in the 300-349 kg weight bracket.

Figure 8: Irish Cattle Prices 2007 to 2022



Source: DG Agri. and CSO; * Author's estimate 2022.

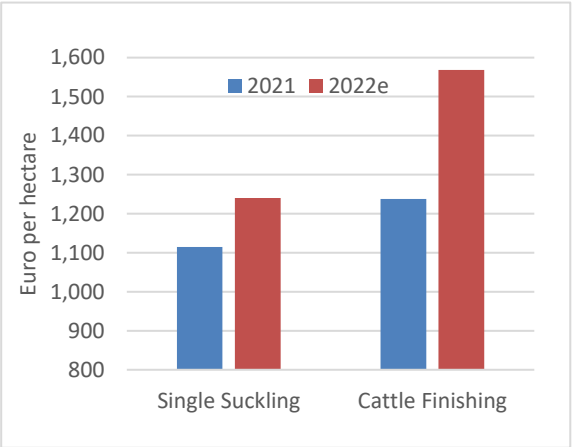
The estimated average R3 base steer price for 2022 of around €500/100kg (including VAT) represents a 16 percent increase on the price level in 2021. The estimated average weanling price (300-349kg) is estimated to be approximately 8 percent higher in 2022 relative to 2021.

The decline in EU beef production is one of the factors which influenced the increase in beef prices during the first six months of 2022. EU beef production was 1.5 percent lower in the first eight months of 2022 relative to the equivalent period in 2021 (European Commission 2022c). During the first nine months of 2022, beef production in the UK was unchanged relative to the same period in 2021 (DEFRA 2022).

The value of gross output on Cattle Finishing enterprises is estimated to be higher in 2022 relative to 2021. 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 in 2022 relative to 2021. However, the rate of price increase was notably higher for finished cattle and this increased gross output value on cattle finishing farms.

Steer and heifer prices increased by 16 percent in 2022 relative to 2021. In 2022, the average value of output per hectare on Cattle Finishing farms is estimated to be €1,568 (an increase of 26.5 percent on the level in 2021). Gross output per hectare in 2022 was on average higher on Cattle Finishing enterprises than for Single Suckling enterprises. This largely reflects the higher stocking density per hectare on these farms.

Figure 9: 2021 Gross Output for Single Suckling (SS) and Cattle Finishing (CF) Enterprises and Estimate for 2022



Source: 2021 National Farm Survey (2022) and Author's Estimates 2022

There is a large degree of variation in the value of gross output per hectare between the least profitable, those with average profitability and most profitable groups of Cattle Finishing enterprises. Table A2 shows that the most profitable Cattle Finishing enterprises in 2022 are estimated to have produced an average level of gross output per hectare (€2,555 per hectare) that was 315 percent higher than the average value of output per hectare on the least profitable group of Cattle Finishing enterprises (€811 per hectare).

3.3 Beef Enterprise Margin Estimates for 2022

As shown in Figure 7, the estimated expenditure on concentrate feed by finished cattle enterprises increased substantially in 2022. On both the Single Suckling and Cattle Finishing enterprises, expenditure on pasture and forage also increased significantly in 2022. Total direct costs on both enterprises are estimated to have increased in 2022.

On Single Suckling enterprises in 2022, the margins are lower relative to 2021 and the average net margin therefore returns to being negative. Single Suckling enterprises in 2022, are on average estimated to have earned a negative net margin of - €125 per hectare.

For the average Cattle Finishing enterprise, net margins are estimated to have also decreased in 2022. Cattle Finishing enterprises are estimated to have earned an average negative net margin of -€33 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 2022.

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 2022. For both the Cattle Finishing and Single Suckling enterprises, the middle and bottom one-third of farmers experienced negative net margins. This highlights the persistent profitability challenges in Irish beef production.

4. Outlook for 2023

In this section, we forecast the expenditure for various input items and the beef price that is most likely to prevail in 2023. We provide a forecast of the incomes from the production of cattle in 2023.

4.1 The Outlook for Input Expenditure

4.1.1 Feedstuffs in 2023

Global cereal and oilseed futures market prices point to some increases in feed prices in 2023. Cereal and other feed ingredient input prices began increasing in H2 2020 with much more significant price increases in 2021 and 2022. The 2022 harvest price for cereals and oilseeds will affect the price of feed in the back end of 2023. At this stage, our estimate for world cereal and oilseed prices in 2023 is for a decrease relative to 2022.

Cattle feed prices are forecast to be 10 percent higher in 2023. No change in feed volume on Cattle finishing enterprises is forecast for 2023. Our forecast is for an average 10 percent increase in overall feed expenditure on Cattle Finishing enterprises and Single Suckling enterprises during 2023.

4.1.2 Fertiliser in 2023

Given the developments in global supply and demand, the outlook for international fertiliser prices in 2023 is for the price of most fertilisers to be unchanged relative to the exceptionally high levels of 2022. In our 2023 forecast, we forecast that total expenditure on pasture and forage by Irish cattle farmers will be unchanged relative to the 2022 level.

4.1.3 Energy and Fuel in 2023

Fuel costs in 2023 will depend mainly on the evolution of crude oil prices. Current futures prices suggest that crude oil prices will decrease in 2023 relative to 2022 prices. Our forecast is that fuel prices in 2023 will be 14 percent lower than in 2022.

4.1.4 Other Direct and Fixed Costs in 2023

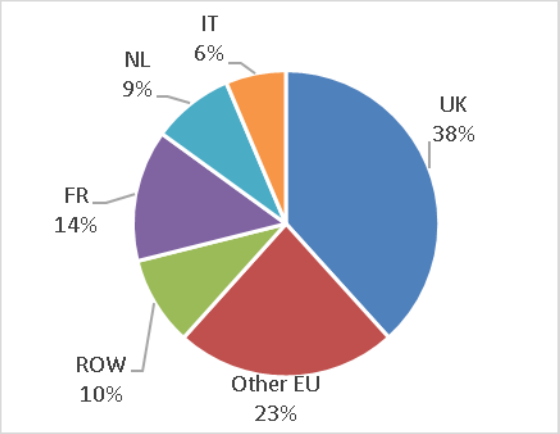
The cost of labour is forecast to increase by 4 percent in 2023. However, on the average Irish cattle enterprise hired labour costs are very small and inflation in labour costs is not expected to have a major impact on overall costs of production. General inflation is likely to be higher than during most recent years and lead to an increase in other direct costs of 4 percent. Other overhead (fixed) costs are forecast to increase by 2 percent in 2023.

4.2 The Outlook for Cattle and Beef Markets 2023

Ireland exports close to 90 percent of its beef production (CSO 2022b). 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 2022 (year to the end of August). The importance of the EU in Ireland's beef exports is now clearly evident. The UK remains an important export destination for Irish beef although the UK export share appears to have declined in recent years with a current export share of 38 per cent. This represents a 9 percent decrease relative to the UK export share reported for the same period in 2020 (Loughrey and Hanrahan, 2020). 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.

Figure 10: Estimate of Irish Beef Export Markets by Volume in 2022



Source: Eurostat COMEXT, January to August (2022)

Exports to EU markets have increased in recent years. In the medium-term, consumer demand for beef in the other EU27 member states will increasingly determine Irish cattle prices. The demand for beef has stabilised in the EU after declining consumption in some recent years (European Commission 2022c). There is evidence of rising consumer prices for beef within EU member states. In France, significant increases are observed for consumer beef prices (INSEE France 2022a, 2022b). In Germany, beef and veal prices have increased substantially in 2022 (Federal Statistics Office Germany 2022). A similar pattern is evident in Italy (ISTAT 2022). In the Netherlands, there is evidence of very strong increases in beef and veal consumer prices during 2022 (Statistics Netherlands 2022). In the UK, the rise in consumer prices continued in 2022.

According to the Office for National Statistics, average consumer prices for steak and mince increased strongly in 2022 (ONS 2022a; ONS 2022b). Beef prices in the UK increased in sterling terms but to a lesser extent in euro terms. Sterling weakened notably against the euro in H2 2022. This exchange rate factor has contributed negatively to beef prices in Ireland.

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 similar to the levels observed 12 months previously. Overall, we forecast no change in prime beef production for 2023.

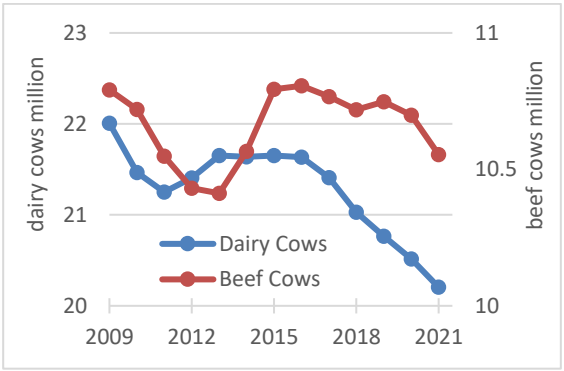
In the rest of the EU, supplies of cattle for slaughter in 2023 are likely to be lower than 2022. Overall EU production of beef in 2023 is forecast to be approximately 0.2 percent lower in 2023 (European Commission 2022b).

In the UK, the inventories for animals aged 12-24 months of age are higher in June 2022 relative to June 2021 (DEFRA 2022b). This points to an increase in UK beef production during 2023. Overall, a relatively small increase in UK beef production is expected in 2023.

In the medium term (beyond 2022) inventories of breeding animals are the key determinant of future beef supply. Figure 11 illustrates the recent trends in dairy and beef cow inventories in the EU (readers should note the different scales on the left and right axes). In anticipation of the abolition of EU milk quota in April 2015, the numbers of dairy cows in the EU increased, however low levels of profitability in many member states in recent years 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 some of the impact of on-going low levels of profitability on cow numbers. Beef cow numbers declined in 2021 in a number of EU member states including Ireland, France and Italy.

Figure 11: EU27 Cow Numbers 2009 - 2021



Source: Own elaboration based on Eurostat (2022)

Our forecast is that the average price for finished cattle in 2023 will be 4 percent higher than the average for 2022. Rising input prices will impact on the decision-making of cattle finishers and particularly those focused on finishing cattle in spring 2023. There is a strong likelihood of significant output price growth in the opening months of the year.

At the same time, there does not appear to be a positive influence from consumer demand given the macroeconomic outlook in key export destinations (European Commission 2022d; HM Treasury 2022). Supply side factors appear likely to dominate in the short-term. The overall EU supply and use balance projected for 2023 suggests that current price levels are unlikely to be reduced. The decline in EU beef consumption appears to have halted for now. Overall, a 4 percent increase in finished prices can be expected due to the economics of supplying beef and particularly during the first quarter of 2023.

In 2022, most of the rise in costs at the farm-level were passed through into retail prices and farm-level output prices. The extent of the input price increases was strongly influenced by the invasion of Ukraine. Consumer prices for beef in Ireland are still below historical highs (CSO 2022c). However, this is not the case in key export destinations where consumer prices have continued to reach historically high levels (INSEE 2022a; Statistics Netherlands 2022b; Rabobank 2022b).

In 2023, a further increase in costs is expected to impact on Cattle Finishing enterprises. However, a 4 per cent increase in finished cattle prices can translate into an increased demand for the purchase of weanlings and store animals. Our forecast is that prices for weanling and store cattle will increase by 5 percent in 2023 relative to the 2022 levels. Gross output for the average Single Suckling enterprise is therefore forecast to be higher relative to the estimated 2022 levels.

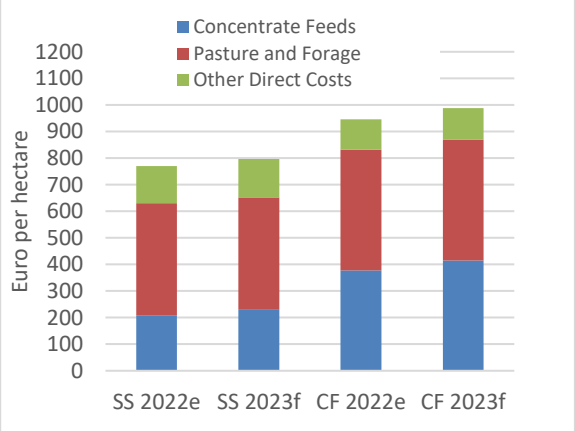
4.2.1 Outlook for Beef Enterprise Net Margins in 2023

In addition to cattle sales and input expenditures, cattle farm enterprise net margins are influenced by the receipt of coupled payments. Total BDGP payments were approximately €33.4 million in 2021 with 17,017 farmers paid under the programme (DAFM 2022b). This represents an average value of €1,963 per recipient. The BDGP programme is being replaced by a Suckler Carbon Efficiency Programme (SCEP). This involves an increase in funding to €52 million. For this analysis, we have estimated that the average suckler farmer will receive a payment of €71 per hectare from the SCEP in 2023. This estimate accounts for the fact that some farmers may not participate in this scheme.

In recent years, the BEEP-S scheme has targeted the economic and environmental efficiency of the suckler herd. A replacement scheme is planned for 2023 to continue to support beef welfare measures (DAFM 2022e). Taking all available information into account, we have estimated that the average suckler farmer will earn €30 per hectare from this or a follow-on scheme in 2023.

Figure 12 compares the estimated and forecast average direct costs per hectare in 2022 and 2023 for the Single Suckling and Cattle Finishing enterprises. On both enterprises, the level of expenditure on pasture and forage is expected to be similar in 2023 relative to 2022. This is based on the forecast of no change in either the price of fertiliser or the quantity of fertiliser used. Concentrate feed prices are forecast to increase by 10 percent with some increase in the quantity of concentrate feed usage on Cattle Finishing farms. As a result, expenditure on concentrate feed is forecast to be 10 percent higher on Cattle Finishing enterprises and Single Suckling enterprises in 2023.

Figure 12: Estimated Direct Costs for 2022 and Forecast Direct Costs for 2023

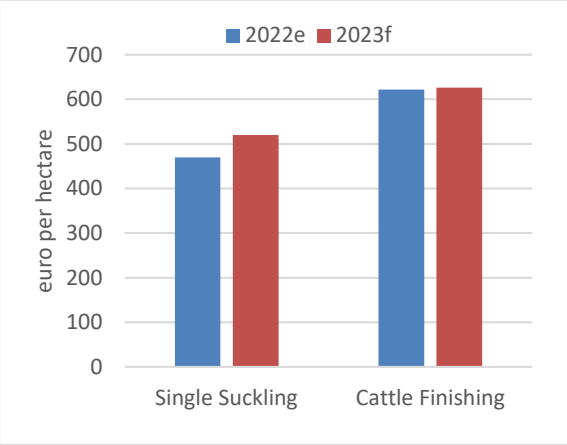


Source: Author's Estimates 2022 and Forecasts 2023

Figure 13 shows the estimated gross margin on both cattle enterprises in 2022 and the forecasted gross margins for 2023. For 2023, the gross margin for the average Single Suckling enterprise is forecast to increase by approximately 11 percent. The gross margin for the average Cattle Finishing enterprise is forecast to remain stable in 2023.

Net margins on average Cattle Finishing farms are forecast to be very similar in 2023 relative to 2022 with a forecast average negative net margin of -€36 per hectare. Net margins for the Single Suckling enterprise are forecast to improve in 2023 relative to 2022. However, a negative net margin per hectare of -€82 is forecast for 2023.

Figure 13: 2022 Gross Margin for Single Suckling (SS) and Cattle Finishing (CF) Enterprises and Forecasts for 2023



Source: Author's Estimates for 2022 and Forecasts for 2023

5. Concluding Comments

The sharp rise in input prices is challenging the economics of beef production and the decision-making of cattle farmers in Ireland. For most cattle farms in Ireland, the main conclusion with respect to 2022 is that the impact of rising output prices was more than offset by the impact of rising input prices. The introduction of the Fodder Scheme has had an important impact on farm incomes and may have helped prevent a decline in income on some cattle farms. However, the average cattle farm in Ireland is estimated to have a lower farm income in 2022 relative to 2021.

On cattle rearing farms, the rise in output prices was certainly more than offset by the impact of rising input prices. On the cattle finishing farms, the situation is more nuanced due to the volatility in beef prices. On the average cattle finishing farm, the rise in output prices was insufficient to offset the impact of rising input prices. However, some cattle finishing farms may have gained and particularly those finishing cattle in the second quarter of 2022. On the most profitable cattle finishing enterprises, the net margin has probably increased due to the lower ratio between inputs and outputs on these farms.

Prices for younger cattle increased in 2022 following significant increases in 2020 and 2021. In 2022, prices for finished steers and heifers increased to a greater extent. Overall, the gap between factory sales prices and purchased mart prices widened further in 2022. The BEEP-S and BDGP schemes continued to support gross output and gross margins particularly on Single Suckling farms.

Fertiliser and Feed costs played crucial roles in influencing farm incomes in 2022. We estimate a significant increase in fertiliser and feed expenditure on both Cattle Finishing and Cattle Rearing farms. In 2022, we estimate that the net margin earned on the average Cattle Finishing enterprise remained negative at approximately -33 per hectare. In addition, we estimate that the net margin earned on the average Single Suckling enterprise returned to being negative in 2022 at approximately -€125 per hectare.

Our forecast for 2023 is for a 4 percent increase in Irish finished cattle prices. The prospects for young cattle prices will partly depend on the profitability and expectations of cattle finishing enterprises. Our forecast is that young cattle prices will increase by 5 percent in 2023.

The levels of profit forecast for both Cattle enterprises in 2023 are similar to 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.

There is a continued challenge facing 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 consumers for beef sourced in Britain. Rising consumer prices in key EU export destinations are also offering opportunities in terms of exports and particularly with the continued decline in beef production at the EU level. Our analysis of trade data indicates that the EU export share is rising significantly and this development can contribute to the future viability of the beef sector in Ireland.

Prospects for the Irish beef industry in 2023 will partly depend on the evolution of input prices. This is the first full winter coinciding with the invasion of Ukraine. A further round of meat price inflation appears highly probable. However, the outlook for the longer term is more uncertain. Looking ahead to 2023, there are downside risks associated with weak macroeconomic growth, a potential influence

from declining milk prices and the potential for further input price inflation. However, the general outlook is for moderate changes in the profitability of beef production in Ireland.

References

AHDB (2022a) Outlook for the UK beef market, July 2022, Issue 2. Available to view at https://ahdb.org.uk/beef-market-outlook-july-2022

AHDB (2022b) EU cattle prices rise against background of reduced supply. Available to view at https://ahdb.org.uk/news/eu-cattle-prices-rise-against-background-of-reduced-supply

AHDB (2022c) GB household beef purchases. Available to view at https://ahdb.org.uk/beef/consumer-insight-gb-household-beef-purchases

Breen, J.P. and K. Hanrahan (2012) "Situation and Outlook for Cattle 2012/2013" in Outlook 2013: Economics of Agriculture. Edited by A. Kinsella. Teagasc. Available to download at https://www.teagasc.ie/media/website/publications/2010/outlook2013.pdf

CSO (2022a) Agricultural Price Indices 2022. Available to download at https://www.cso.ie/en/statistics/agriculture/agriculturalpriceindices/

CSO (2022b) Meat Supply Balance Sheet 2021 Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-msb/meatsupplybalance2021/

CSO (2022c) National Average Price by Consumer Item and Month, Available to download at https://statbank.cso.ie/px/pxeirestat/statire/SelectVarVal/Define.asp?Maintable=CPM12&PLanguage=0

DAFM (2015) "2015 – 2020 Beef Data Genomics Programme" Department of Agriculture, Food and the Marine Information Presentation, October and November, 2015. Available to download at http://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/beefdataprogrammebdp/2015/BDGPPresentation20150511115.pptx

DAFM (2022a) Quarterly Summary Report for Feed Usage (Various Issues).

DAFM (2022b) Meat Market Report- various weeks. Meat and Milk Policy Division, Department of Agriculture, Food and the Marine. https://www.gov.ie/en/collection/b8452-meat-market-report/#2022

DAFM (2022c) Age Profile for Dairy and Beef animals. Available to download at https://www.gov.ie/en/collection/f55f2-bovine-birth-and-movements-monthly-reports/#age-profile-for-dairy-and-beef-animals

DAFM (2022d) Scheme Payments Update. Available to download at https://www.gov.ie/en/publication/ceea9-scheme-payments-update/

DAFM (2022e) Minister McConalogue announces 13% Budget increase. Available to download at https://www.gov.ie/en/press-release/95bf9-minister-mcconalogue-announces-13-budget-increase/

DEFRA (2022a) United Kingdom Slaughter Statistics – September 2022. Available to download at https://www.gov.uk/government/statistics/cattle-sheep-and-pig-slaughter

DEFRA (2022b) Livestock numbers in England and the UK – June 2022. Available to download at https://www.gov.uk/government/statistical-data-sets/structure-of-the-livestock-industry-in-england-at-december

Donnellan T., Moran B., Lennon J. and E. Dillon (2022) Teagasc National Farm Survey Preliminary Results 2021. Agricultural Economics and Farm Surveys Department, Teagasc. Available to download at https://www.teagasc.ie/publications/2022/teagasc-national-farm-survey-2021.php

European Commission (2022a) Short-Term Outlook for EU Agricultural Markets in 2022, Autumn 2022, Edition No. 31. Available to download at https://agriculture.ec.europa.eu/data-and-analysis/markets/outlook/short-term_en#latestedition

European Commission (2022b) Short-Term Outlook for EU Agricultural Markets in 2022, Autumn

2022, Edition No. 31– EU statistical annex. Available to download at https://agriculture.ec.europa.eu/data-and-analysis/markets/outlook/short-term_en#latestedition

European Commission (2022c) Beef and Veal Market situation. Available to download at https://agriculture.ec.europa.eu/data-and-analysis/markets/overviews/market-observatories/meat_en

European Commission (2022d) Autumn Forecast 2022. Available to download at https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts/autumn-2022-economic-forecast-eu-economy-turning-point_en

HM Treasury (2022) "Forecasts for the UK economy: a comparison of independent forecasts" No. 424, November 2022. Available to download at https://www.gov.uk/government/statistics/forecasts-for-the-uk-economy-november-2022

INSEE France (2022a) Consumer Price Index – Beef and Veal, Available at https://www.insee.fr/en/statistiques/series/102342213?COICOP2016=2318949

INSEE France (2022b) Average Retail Prices - Results by product, Available at https://www.insee.fr/en/statistiques/series/103157792

ISTAT Italy (2022) Consumer Prices for the Whole Nation – Beef and Veal, Available at http://dati.istat.it/Index.aspx?QueryId=23048&lang=en

Office for National Statistics (2022a) RPI: Ave price -Beef: home-killed, rump steak, Available to download at https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/czpf/mm23

Office for National Statistics (2022b) RPI: Ave price - Beef: home-killed, best beef mince, per Kg, Available to download at https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/czpi/mm23

Federal Statistical Office of Germany (2022) Consumer Prices – Beef and Veal. Available to download at https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/_node.html#sprg266060

Loughrey J. and Hanrahan K. (2020) Review of Cattle Farming in 2020 and Outlook for 2021. Available to download at https://www.teagasc.ie/publications/2020/outlook-2021--economic-prospects-for-agriculture.php

Rabobank (2022a) Beef Quarterly Q3 2022. Available to download at https://research.rabobank.com/far/en/sectors/animal-protein/beef-quarterly-q3-2022.html

Rabobank (2022b) Beef Quarterly Q4 2022. Available to download at https://research.rabobank.com/far/en/sectors/animal-protein/beef-quarterly-q4-2022.html

Statistics Netherlands (2022a) Consumer prices; average prices of consumer goods, 2000 – 2018. Available to download at https://opendata.cbs.nl/#/CBS/en/dataset/80346eng/table?ts=1605631989632

Statistics Netherlands (2022b) Consumer prices-Beef and Veal, Available to download at https://opendata.cbs.nl/#/CBS/en/dataset/83131ENG/table

Teagasc (2022a) Teagasc National Farm Survey Results 2021: Single Suckling Enterprise Fact Sheet. Available to download at https://www.teagasc.ie/media/website/publications/2022/Single-Suckling-Enterprise-Factsheet-2021.pdf

Teagasc (2022b) Teagasc National Farm Survey Results 2021: Cattle Finishing Enterprise Fact Sheet. Available to download at https://www.teagasc.ie/media/website/publications/2022/Cattle-Finishing-Enterprise-Factsheet-2021.pdf

USDA (2022) Livestock and Poultry: World Markets and Trade. United States Department of Agriculture – Foreign Agricultural Service. October 2022. Available to download at https://apps.fas.usda.gov/psdonline/circulars/livestock_poultry.pdf

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Table A1: 2021 and Estimated 2022 Financial Performance per hectare: Single Suckling Enterprise

	Most Profitable	*Average Profitability*	*Least Profitable*	*Average*
		euro per hectare		
Gross Output 2021	1,723	957	665	1,115
Direct Costs 2021	745	474	468	562
Concentrate Costs	229	123	136	163
Pasture and Forage Costs	328	230	241	266
Other Direct Costs	188	122	90	133
Gross Margin 2021	979	483	197	553
Overhead Costs 2021	739	480	407	542
Net Margin 2021	**240**	**3**	**-210**	**11**
Gross Output 2022	1,918	1,064	741	1,240
Direct Costs 2022	1,011	649	652	770
Concentrate Costs	293	157	174	209
Pasture and Forage Costs	520	364	383	422
Other Direct Costs	197	128	95	140
Gross Margin 2022	907	414	89	470
Overhead Costs 2022	810	527	446	595
Net Margin 2022	**97**	**-113**	**-358**	**-125**

Source: Teagasc National Farm Survey Single Suckling Enterprise Fact Sheet 2021 (Teagasc NFS, 2022a) and Authors' Estimates 2022

Table A2: 2021 and Estimated 2022 Financial Performance per hectare: Cattle Finishing Enterprise

	Most Profitable	Average Profitability	Least Profitable	Average
		euro per hectare		
Gross Output 2021	2,013	1,110	639	1,238
Direct Costs 2021	914	597	478	658
Concentrate Costs	407	258	200	286
Pasture and Forage Costs	339	251	203	263
Other Direct Costs	167	88	75	109
Gross Margin 2021	1,100	514	161	581
Overhead Costs 2021	922	524	356	594
Net Margin 2021	**177**	**-10**	**-195**	**-14**
Gross Output 2022	2,555	1,409	811	1,568
Direct Costs 2022	1,299	866	693	946
Concentrate Costs	537	339	263	377
Pasture and Forage Costs	586	434	350	454
Other Direct Costs	176	93	79	114
Gross Margin 2022	1,256	543	118	622
Overhead Costs 2022	1017	578	393	655
Net Margin 2022	**239**	**-35**	**-275**	**-33**

Source: Teagasc National Farm Survey Cattle Finishing Enterprise Fact Sheet 2021 (Teagasc NFS, 2022a) and Authors' Estimates 2022

Table A3: Forecast 2023 Single Suckling Enterprise Financial Performance per hectare

	Average
	euro per hectare
Gross Output 2023	1,317
Direct Costs 2023	797
Concentrate Costs	230
Pasture and Forage Costs	422
Other Direct Costs	145
Gross Margin 2023	520
Overhead Costs 2023	603
Net Margin 2023	**-82**

Source: Authors' forecasts for 2023

Table A4: Forecast 2023 Cattle Finishing Enterprise Financial Performance per hectare

	Average
	euro per hectare
Gross Output 2023	1,615
Direct Costs 2023	988
Concentrate Costs	415
Pasture and Forage Costs	454
Other Direct Costs	119
Gross Margin 2023	626
Overhead Costs 2023	662
Net Margin 2023	**-36**

Source: Authors' forecasts for 2023

Mid Season Lowland Lamb Average Performance 2021

Irish Sheep Slaughter
2.97 million head (down 4.5%)

Irish Lamb Slaughter
2.59 million (down 4.7%)

Sheep Meat Exports
54,500 tonnes cwe (down 5%)

Irish Breeding Sheep
2.9 million (up 2%)

Lamb price
€664/100kg (up 28%)

Lamb Carcass kg per ha
up 5% on 2020 level

Total Production Costs
(Mid Season Lowland)
€165 per ewe (up 13%)
€1,204 per ha (up 19%)

Gross Margin
(Mid Season Lowland)
€929 per hectare (up 56%)

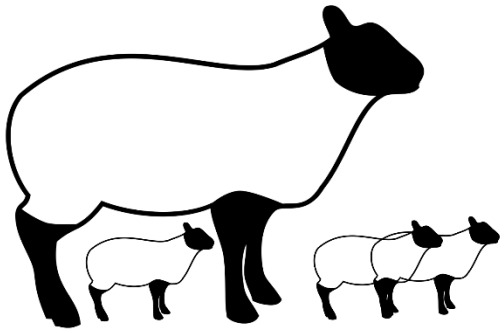
Net Margin
(Mid Season Lowland)
€288 per hectare (up 168%)

Stocking Rate
(Mid Season Lowland)
7.45 ewes/ha (up 3%)

Weaning Rate
(Mid Season Lowland)
1.39 lambs/ewe (unchanged)

Lamb Mortality
(Mid Season Lowland)
6% (unchanged)

Lambs Weaned/ ha
(Mid Season Lowland)
10.43 lambs/ha (up 5%)



Source: Teagasc National Farm Survey 2021 and Central Statistics Office
Note: Percentage changes are relative to 2020

Irish Sheep Farming in 2022

Higher lamb prices
higher EU prices

Lamb/Sheep Slaughter
up 5%

Lamb Prices
up 4%

Weather Conditions
normal

Grass Availability
normal

Fertiliser Prices
up 195% on the 2021 level
Fertiliser Use
down 25% on the 2021 level

Feed Prices up 28% on 2021
Feed use down 8% on 2021

Other Direct Costs
up 5% on 2021

Fuel prices (Farm Diesel)
up 80% the 2021 level

Total Direct Costs
up 40% on the 2021 level

Gross Margin per ha
(Mid Season Lowland Lamb)
€803 (down 14% on 2021)

Irish Sheep Farming in 2023

Relatively stable lamb prices
Slight increase in EU prices

Lamb/Sheep Slaughter
no change in lamb slaughter

Lamb prices
up 2% on 2022

Weather Conditions
normal weather assumed

Grass Availability
assumed normal

Fertiliser Prices
unchanged on the 2022 level
Fertiliser Use
unchanged on the 2022 level

Feed Prices up 10% on 2022
Feed use unchanged on 2022

Other Direct Costs
up 4% on the 2022 level

Fuel prices (Farm Diesel)
down 18% on the 2022 level

Total Direct Costs
up 4% on the 2022 level

Gross Margin per ha
(Mid Season Lowland Lamb)
€800 (down 1% on the 2022 level)

Source: Teagasc Estimates for 2022 and Forecasts for 2023

Review of Sheep Farming in 2022 and Outlook for 2023

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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 2022 are based on 2021 Teagasc NFS data and on CSO price indices for the year to date (CSO, 2022a) and preliminary CSO estimates for 2022 (CSO, 2022b). Forecasts for sheep enterprise margins for 2023 are based on our estimates of margins for 2022, and our forecasts of input and output price and volume changes in 2023.

We begin the paper with a brief review of the outturn for Family Farm Income (FFI) for the Teagasc NFS mainly sheep farms in 2021. A detailed assessment of the 2021 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 2022 and 2023 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 2023 we have included payments per breeding ewe for sheep welfare measures completed under the Sheep Improvement Scheme (SIS), a scheme which will run from 1 February 2023 to 31 December 2023 funded under Ireland's CAP Strategic Plan (DAFM, 2022). This scheme builds on the progress made by the Sheep Welfare Scheme (SWS), which has now come to an end. The reference number of ewes on participating farms will be based on the number of breeding ewes declared on sheep census returns over the period 2016 to 2021. Where three or more census returns have been submitted over this period, the reference number for the SIS will be the average of the three years with the highest number of breeding ewes declared. With regard to farmers who have only two years census returned over this period, the reference number will be based on the average of the number of breeding ewes declared over those two years and likewise if only one census returned in this period, the number will be based on that census return. The previous census returns will also determine your flock type (lowland or hill). As in previous years, there will also be a provision for new entrants to sheep farming to apply and to join the Sheep Improvement Scheme.

The Sheep Improvement Scheme, funded under Ireland's CAP Strategic Plan, provides support to sheep farmers for carrying out actions that improve animal health and welfare in the sheep sector. It will build on the progress made by the SWS, which has now come to an end. We have assumed that the SIS payment will be paid on a per ewe basis, at a rate of €12 per ewe for 2023 year. At an average stocking rate of approximately 7 ewes per hectare, this is equivalent to €84 per hectare. However, based on average actual payments per hectare under the Sheep Welfare Scheme over the past number of years a lower estimate of €60 per hectare is applied. This payment, relating to the SWS in 2022 and the Sheep Improvement Scheme in 2023, is incorporated in estimates of enterprise output for 2022 and forecasts for 2023 as it is linked to production (ewe numbers).

2. Review of the Economic Performance of Sheep Farms in 2021

FFI on those farms classified by the Teagasc NFS as *Mainly Sheep* farms increased by 16 percent in 2021, to an average of €20,794. The average FFI earned on these farms for the period 2015 through 2021 is shown in Figure 1.

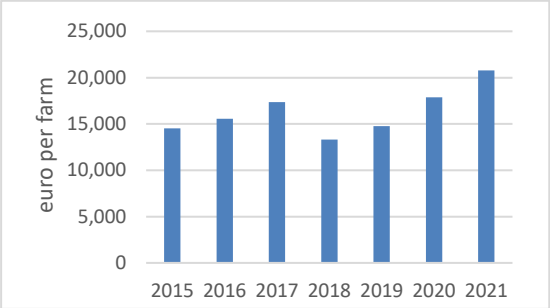
Sheep farm incomes have been on an upward trajectory for several years, following an increase of 21 percent in 2020 year. This latest increase in FFI on sheep farms in 2021 sets a new record for sheep farm incomes. This income increase is due to an increase in the gross output on Irish sheep farms. In 2021 gross output increased by 16 percent to €61,164, driven by a strong improvement in lamb prices due to better market conditions and increased opportunities for Irish lamb exports.

Higher prices for farm inputs in 2021 were more than offset by the strong lamb and ewe prices, leading to an overall improvement in Sheep FFI. Financial assistance through the SWS (which will continue through SIS) has been significant in recent years, as have cattle related scheme payments (many sheep farms have a secondary cattle enterprise).

As expected, in line with the record high FFI year, there was a 5 percentage point increase in the proportion of specialised sheep farms earning above €50,000, with 10 percent of farms in 2021 earning FFI €50,000 euro or more. However, at the other end of the income distribution, the proportion of sheep farms earning a FFI less than €5,000 increased by 4 percentage points in 2021, to 26 percent. A further 14 percent reported an income of between €5,000 and €10,000 in 2021, a decline of 9 percent compared to the previous year. The proportion of farms earning on average between €10,000 and €20,000 increased by 4 percentage points to 24 percent, with the proportion earning between €20,000 and €50,000 declining by 4 percentage points to 26 percent.

In 2021 direct costs on Irish sheep farms increased by 15 percent, averaging €21,036, while overhead costs rose by 17 percent to €19,334. The largest component, of direct costs was expenditure on concentrate feed, which increased by 15 percent to €7,530 in 2021 while expenditure on purchased bulky feed also increased considerably. Fertiliser expenditure on the average Sheep farm increased by 19 percent year-on-year to €3,177.

Figure 1: Average Income on Mainly Sheep Farms in Ireland: 2015 to 2021



Source: Teagasc National Farm Survey (various years)

As with the other farm systems, an increase in depreciation costs was an important factor in the increase in overhead costs on *Mainly Sheep* farms in 2021. Machinery depreciation increased by 28 percent on average, to €2,801, while average building depreciation rose by 76 percent to €2,321. Maintenance costs for buildings remained relatively unchanged, as did spending on land improvement on the average farm in 2021. The Utilised Agricultural Area (UAA) remained relatively unchanged, at 45 hectares on average in 2021.

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 2021, just under 30 percent pertains to gross output from the various cattle enterprises. This proportion is down on earlier years where typically almost one half was attributable to the cattle enterprise activities. *Mainly Sheep* farms have been steadily increasing and retaining their sheep output. *Mainly Sheep* farm gross output is also inclusive of direct payments to farmers under the various CAP Pillar I and Pillar II schemes.

Direct payments to *Mainly Sheep* farms remained stable year-on-year at €18,768 in 2021 year, on average. Payments through GLAS and the Areas of Natural Constraint (ANC) remained important on the average sheep farm in 2021. Typically, for farmers participating in the SWS received a payment of over €1,000 in 2021.

While overall farm gross output on Mainly Sheep farms increased by 16 percent, the value of cattle gross output on these farms decreased by 1 percentage point in 2021. Crop output value increased by 46 percentage points but still accounts on average for a small proportion (4 percent) of total farm gross output. The share of output value from sheep production increased by 5 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 2022 and 2023, payments to farmers participating in the Sheep Welfare Scheme (SWS) and Sheep Improvement Schemes (SIS) respectively, will boost the value of gross output and margins per hectare.

3. Sheep Margins in 2021

Changes in the value of output, costs and gross margin per hectare for the mid-season lowland lamb enterprise in 2021 are shown in Table A1 of the Appendix to this paper. For 2021, the value of gross output for mid-season lamb enterprises increased by one third. The main driver of this output value gain was higher lamb prices. The volume of carcass output per hectare also increased by circa 5 percent in 2021. In 2021 the stocking rate of ewes per hectare increased by 3 percent. When combined with a relatively static weaning rate per ewe, overall estimated lamb carcass per ha increased by 5 percent.

In 2021, total direct costs per hectare on the average mid-season lamb enterprise increased by 7 percent. Pasture and forage costs increased by 7 percent relative to 2020, while expenditure on concentrate feed increased by 9 percent.

Gross margins in 2021 increased by 56 percent relative to 2020, due to growth in gross output which outpaced the direct costs of production increases. Gross output value per hectare increased by 33 percent, with higher prices and physical output per hectare augmented by a 13 percent increase in coupled payments per hectare in 2021.

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 €1,585 per hectare in 2021, while farms in the bottom group earned an average gross margin of only €306 per hectare. Top producers earned, on average, 5.2 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 260 kg on the most profitable mid-season lamb enterprises, versus 155 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 10 percent higher than the costs incurred by the bottom group (€586 versus €529), which is less of a differential than reported in 2020 year and earlier years analysis. The total direct costs incurred on top groupings of farms are slightly lower for 2021 versus 2020 year (€586 versus €606), while the bottom grouping direct costs are 24 percent higher (€529 versus €428). However total direct costs incurred on the middle group of farms increased by 7 percent to €564 in 2021.

When direct costs of production per kg of lamb carcass produced are compared, the impact production intensity per hectare is apparent. Direct costs of production per kg of lamb carcass produced on the least profitable farms are over 50 percent higher than on the most profitable farms..

With a substantial increase in gross margin earned in 2021, the average net margin for the mid-season lamb enterprise also increased in 2021 to €288 per hectare. This represents a 168 percent increase on the net margin earned in 2020, rising from €107 to €288 per hectare. 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 €776 per hectare while the least profitable lowland lamb enterprises had on average a negative net margin (i.e. a loss) of €134 per hectare.

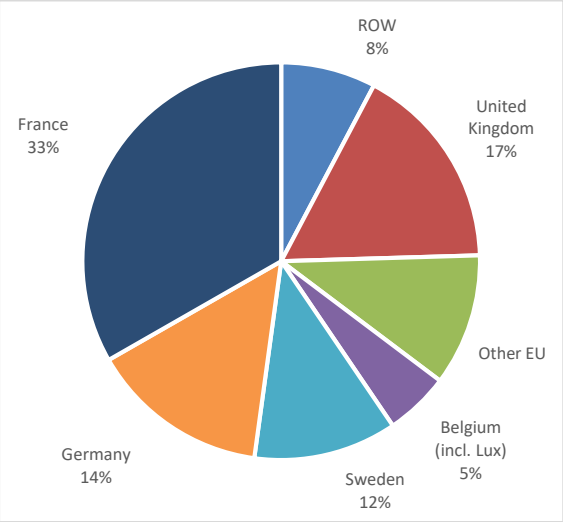
4. Sheep Meat Markets: Review of 2022 and Outlook for 2023

The vast majority of Irish sheep meat production is destined for foreign markets with 54,500 tonnes (cwe) of sheep meat exported in 2021, a decline of 5 percent on previous year (CSO, 2022d). 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.

Solid fundamentals continue to support demand for Irish sheep and lamb meat exports. France remains the most important sheep meat export destination in 2022, with exports to that market accounting for the largest share as in previous years, at 33 percent. On a year to date basis (to end of August), total sheep meat exports were up by 15 percent, with exports to almost all destinations increasing slightly. Irish sheep meat export destinations in 2022 are illustrated in Figure 2.

Figure 2: Irish Sheep meat Exports (CWE) by Destination – 2022



Source: Eurostat COMEXT database, year to August 2022

(ROW = Rest of World)

Ireland's rate of self-sufficiency in sheep meat increased by 3 percent to 361 per cent in 2021, which compares to a self-sufficiency rate of 267 percent across total meat. For 2021, sheep slaughtering decreased by 3,000 tonnes, down 4 percent on 2020 levels.

Despite the historically low sheep (and goat) flock in the EU in 2022, in the period Jan-Jun 2022, EU sheep/goat slaughterings were up 2.7% year-on-year. Slaughterings in the EU as a whole are not expected to decline (but large difference exist across different EU countries in this regard). EU heavy lamb prices remain at unprecedented high levels but the substantial reduction of the flock over recent years limits the possibility for production increases in certain EU countries, despite the favourable prices that exist.

However some additional slaughterings may be favoured, albeit some at lighter slaughter weights owing to the lower availability of forage crops and sustained higher feed prices. Overall, the expectation is that a slowdown in slaughterings in the second half of 2022 will result in a small production increase of circa less than 1 per cent for the year as a whole.

Following a price decline at the beginning of 2022, prices reached record levels during Easter and up until July, followed by a slight decline. The high price level is driven mainly by the low rates of growth in domestic supply and the sustained demand level in the EU.

EU demand for lamb has not been eroded, despite the high prices for sheep meat that prevail. Owing to increased costs of production, driven by higher animal feed and fertiliser prices, this has impacted on increasing prices for other meats also. High prices in the EU are forecast to still prevail in 2023, due to stable demand coupled with the limited capacity to increase production in the EU (after years of declining sheep numbers).

EU imports of sheepmeat are expected to recover in the short term and increase by circa 10 percent in 2022, with a further increase of 4 percent forecast for 2023 (EC, 2022). But even with these increases, imports will remain well below pre COVID-19 levels, and lower overall supplies will continue to support high EU domestic prices.

Following a decline in EU imports of sheep meat in 2021, due to lower shipments from the UK and New Zealand, overall EU imports of sheep meat increased through the first half of 2022. Frictions in EU trade relations with the UK heavily influenced EU-UK sheep meat trade in the previous year, but in 2022 trade recovered with shipments up by over one third. Imports into the EU27 from New Zealand had also declined in 2021 year due to large increases in shipping costs and the relative attractiveness of East Asian markets (China principally). However for 2022 year, despite the continuation of high shipping costs, imports by the EU from New Zealand increased by circa 17 percent. Assuming no change in trade frictions with the UK, it is estimated that total EU imports could increase by 10 percent in 2022, with an additional 4 percent increase forecast for 2023.

With high prices, EU sheep meat exports have declined by 3% in 2022. Continued high EU prices and tight EU domestic supply are expected to continue, and no recovery in exports is forecast for 2023.

In 2021, Ireland ranked 5th in the EU in terms of sheep production, comprising 8 percent of total heads slaughtered. Spain was the largest producer of sheep meat in Europe with a share of 27 percent.

Production of sheep meat in the UK is set to increase in 2022 (AHDB, UK Sheep Outlook, July 2022). For the year to the end October 2022 production is up circa 4 percent on the same period last year.

With the Australia - UK free trade deal, signed in December 2021, and set to come into force in 2022, this could lead to a large increase of Australian lamb into the UK in percentage terms While higher lamb volumes may arrive from Australia, these are expected to first displace volumes from elsewhere rather than lead to an increase in total UK imports.

Imports are important in balancing demand in the UK, both in terms of meat cuts that are preferred by UK consumers and the timing of supply. In the first half of 2021 year, Brexit severely hindered trade but for 2022 year trade friction caused by Brexit has somewhat been overcome so that imports have been rising, up over one quarter up to end of August. However, shipping disruption including both delays and higher freight prices will continue to impact in the short to medium term.

Up to end Sept, the UK produced 5% more sheep meat than at the same point last year, with lamb slaughter up 4 percent over the same period. Exports were also up year on year, to end August. Competitive pricing, which was bolstered by a weakening sterling, is expected to support growth over the short term,

At a global level Australia and New Zealand (NZ) maintain their dominance in 2022 as the largest exporters of sheep and goat products. With global shipping costs expected to remain at elevated levels, the competitiveness of Australian and NZ lamb on the European markets will remain suppressed. Despite volumes of exports to China starting to decline Asia remains the key market for both New Zealand and Australia.

Demand for New Zealand lamb remains strong. Total NZ export receipts for sheepmeat are forecast to be slightly down on 2021-22, with the weaker NZ$ value impacting on average export values and somewhat off-setting the negative lamb result. The forecast for a weakening NZD is the major factor mitigating against the forecast decline in market prices in 2022-23. NZ Beef and Lamb forecast that market prices for lamb and mutton will decrease from the levels achieved in 2021-22 when markets were strong. Therefore, the NZ outlook, is sensitive to changes in the currency market.

In Australia,-the value of sheep meat production is forecast to decline in 2023, mainly as a result of falling prices. Strong international demand for Australian sheep meat is expected to sustain demand for finished animals, but demand for restocking animals is expected to fall. The value of Australian sheep meat exports in the period 2022–23 is forecast by ABARES to fall by 3 percent, due to declining lamb and mutton prices. Though prices are expected to decline relative to the record levels observed in 2021–22, export prices will continue to be supported by continuing strong demand from the United States and China. Constrained supply of sheep meat from New Zealand due to unfavourable spring and summer conditions is also expected to support Australian exports.

Slowing economic growth in China is expected to drag on household spending and cause consumers to be more price conscious on expensive purchases such as sheep meat. Chinese demand for imported sheep meat is expected to decline in 2023. Due to the greater availability and cheaper prices of pork in China, the share of imported meat in overall meat consumption is expected to fall. This also coincides with a period during which the Chinese pig industry continues to improve on containing outbreaks of African Swine Fever. The Chinese government is also working on diversifying its import sources with the aim of lowering the cost for their domestic industries over the longer term, including taking steps to review protocols for imports, to include imports of corn from Brazil, which will provide valuable feed source.

In the short term, high inflation in the United States and slowing economic growth in China cast greater uncertainty over international demand for Australian sheep meat exports. These downside risks could quickly translate to reduced demand, placing further downward pressures on sheep and lamb prices. However, on the other hand, an easing of lockdowns in China could provide some temporary increases in international demand. Following on from COVID-19, the confidence of Chinese consumers and the unfolding economic prospects will be important in determining spending decisions.

China (incl. Hong Kong) continued in 2022 to be the largest importer of sheep meat globally. Chinese demand for all red meat has been buoyant, with increases in beef and sheep meat demand driven by income growth. 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.

China's meat import demand profile has changed over the last decade. This is expected to continue through the years ahead. China's demand for meat has increased faster than its domestic production, resulting in China increasing its meat imports, a trend that is expected to continue through the medium term. More recent increases have been driven by changes in the relative prices of other meats, notably, pork. Demand increases have outpaced China's domestic beef and sheep meat production. This is likely to continue in the medium term with imports continuing to play a significant role in meeting the difference between demand and domestic supply. Under China's responses to the COVID-19 pandemic, the country's meat demand profile has changed, with these trends expected to continue in the medium term.

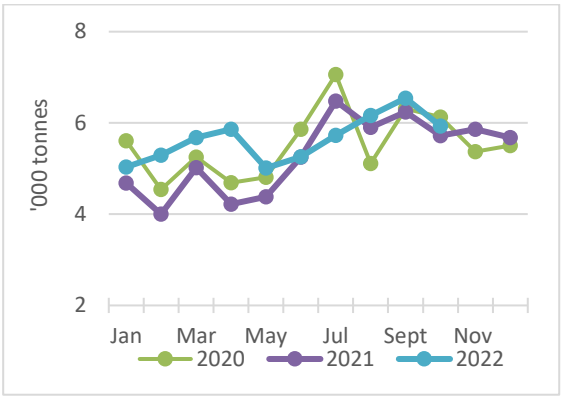
The number of sheep slaughtered in Ireland during the period January to end November increased by just over 7 percent when compared with corresponding period in 2021.

The number of ewes slaughtered for the year to 21th November 2022 was 8 percent higher than in 2021 (DAFM 2022b), with cumulative lamb/hogget slaughter up by 30%, while the volume of spring lambs slaughtered was marginally down (-4 percent).

Monthly CSO sheep and lamb slaughter data for 2020, 2021 and 2022 are shown in Figure 3. These data are consistent with those reported by DAFM. With throughput in 2022 for the year to the end of October circa 9 percent higher than in 2021.

The June 2022 provisional Crops and Livestock Survey results (CSO, 2022) show that when compared to June 2021, sheep numbers increased by 6.4 percent to almost 5.968 million. Breeding sheep and other sheep increased by 5.3 percent and 7.6 percent respectively, while ram numbers decreased by 1.7 percent. This growth indicates that that breeding inventories at the end of 2022 will be well up on those reported for 2021. With higher ending ewe numbers forecast for 2022, lamb production in 2023 in Ireland is forecast to grow in 2023 by more than 5 percent.

Figure 3: Monthly sheep and lamb slaughterings 2020 - 2022 ('000 tonnes)



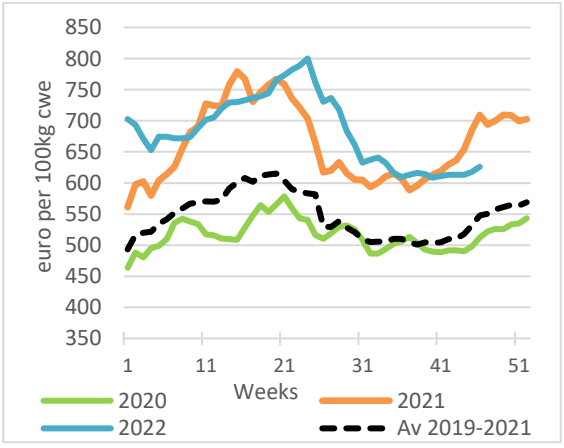
Source: CSO Statbank, October 2022

5. Estimated Sheep Gross Margins 2022

To obtain an estimate of farm profitability for 2022, 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 2022 (and forecasts for 2023) 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 2022 and 2023 relative to those observed in 2021. It is also assumed that in 2022 (and 2023) the Sheep Welfare Scheme for 2022 and Sheep Improvement Scheme for 2023 will add approximately €60 per hectare to the value of gross output on the average mid-season lamb enterprise in 2022 and 2023.

Irish lamb prices for 2022 began very strongly and for Q1 2022 were circa 7 percent ahead of the same period in 2021 (Figure 4). By Q2, prices on average were still 5 percent ahead of 2021 price levels.

Figure 4: Weekly Irish Lamb Price, 2019 – 2022, Average 2019-2021



Source: European Commission DG Agri

As of the end of November 2022, prices continued to remain over 4 percent higher than in 2021. As is evident from Figure 4, the 2022 lamb prices when compared to the previous three year average prices, 2019-2021 (dotted line in graph) remain at record levels, well ahead of 2020 year and earlier year lamb prices.

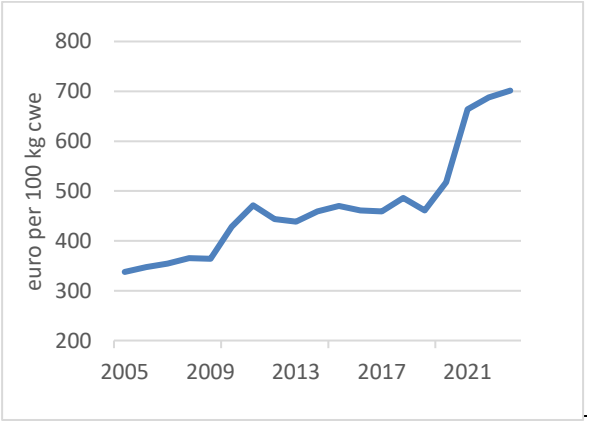
This higher Irish price reflects higher prices in the EU for heavy lamb, which are expected to persist over the remainder of 2022. At the time of going to press, EU average heavy lamb prices are on average 7 percent higher than in 2021.

Our estimate is that Irish lamb prices in 2022 will be on average close to 4 percent higher than in 2021. While in aggregate output across the sector is up circa 3 percent, this will further impact with the strong prices on the growth in sector output value.

The volume of lamb output per hectare is estimated to have increased by 3% in 2022. Consequently, our estimated higher lamb price is coupled with higher output volume and our estimate is that output value per hectare in 2022 increases by 7% when compared with 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 40 percent in 2022.

Figure 5: Irish Lamb Price, 2005 to 2022e, 2023f



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 2022, the trend in feed usage on sheep farms is down by circa 8 percent on average on the 2021 year and this coupled with an estimated increase in concentrate feed prices, of approximately 28 percent, means that concentrate feed costs in 2022 will be much higher than in 2021 on sheep farms. The Department of Agriculture, Food and Marine feed sales volume data for Q1 2022 show an increase of circa 1 percent compared to same period in 2021, which is the highest use period for concentrate feed on sheep farms. While data for Q2 and Q3 show a decline of 24 and 9 percent respectively. This equates to a circa 7 percent decline in feed use up to Sept 2022 compared to same period in 2021. Overall concentrate costs are estimated to increase by over 18 percent in 2022 on the average mid-season lowland lamb enterprise due to higher prices. A lower volume of feed used compared to 2021 year of circa 8 percent was not sufficient in reducing the overall cost increase for this input.

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 195 percent in 2022. Fertiliser costs on sheep farms in 2022 will be dramatically higher than 2021 levels. In our estimates for 2022, we have assumed that owing to the large forecast increase in fertiliser prices that volumes used by mid-season lowland enterprises in 2022 will decline by circa one quarter. Spending on contracting charges in 2022 are estimated to be circa 30 percent above previous year, with overall expenditure on pasture and forage estimated to have more than doubled, (+116 percent) when compared to 2021.

In 2022, total direct costs of production on the mid-season lowland lamb enterprise are estimated to have increased by just over 40 percent on 2021 levels. Fuel and electricity are the main items contributing to overhead cost changes in 2022. Prices of fuel and electricity are both estimated to have increased, with fuel increasing by between 40 and 80 per cent depending on fuel type, while electricity prices have increased by over 40 percent. Usage of these inputs on mid-season lowland sheep farms is expected to remain on par with 2021 levels. Overall, overhead costs on the mid-season lamb enterprise are estimated to have increased by over 17 percent relative to 2021.

Growth in the costs of production in 2022 have outpaced growth in the value of marketed output and despite receipt of payments from the Sheep Welfare Scheme in 2022, we estimate that margins on the average mid-season lowland lamb enterprise will be lower in 2022 when compared to 2021.

The average gross margin earned in 2022 is estimated to have declined by 14 percent to €803 per hectare (see Table A3 in the Appendix). The receipt of payments from participation in the Sheep Welfare Scheme boosted the estimated gross

output earned from the mid-season lowland lamb enterprise in 2022 but was not sufficient to cover the input cost increases. In the absence of this coupled payment, the estimated decrease in gross margins would have been closer to 20 percent.

Increases in overhead costs in 2022 mean that the enterprise net margin on the mid-season lowland lamb enterprise is also estimated to have decreased strongly, with the net margin level in 2022 over 80 percent lower than that earned in 2021. The estimated average net margin per hectare on mid-season lowland sheep farms in 2022 is €54 per hectare.

6. Outlook for the Sheep Enterprise Gross Margin in 2023

In 2023, Irish lamb prices are forecast to marginally increase on the record high levels received in 2021 and 2022 years and will remain significantly higher than five year average years' price levels. For 2023, prices are forecast to increase by circa 2%. 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 2023, from the perspective of Irish sheep farmers, is more positive than in 2022. Prices of the majority of the key inputs to sheep production are forecast to either remain constant or decline slightly, with electricity and concentrate feed prices two inputs forecast to increase in 2023 year. Input volumes used in 2023 are forecast to remain unchanged (on a per hectare basis). Total costs on Irish sheep farms are forecast to increase by 1 per cent in 2023. Direct costs of production are forecast to increase by circa 4 percent while overhead costs of production are forecast to decline by circa 3 percent relative to 2022.

Concentrate feed prices are forecast to increase in 2023. The volume of feed use is forecast to remain comparable with 2022 levels, a year in which volume used decreased by circa 8 percent in response to the higher concentrate feed prices. Concentrate feed is required to meet the additional Easter demand expected in 2023. Overall expenditure on concentrates in 2023 is forecast to increase by 10 percent.

The price of fertiliser and expenditure on contractor charges in 2023 are both forecast to remain relatively stable at the high levels estimated for 2022, Overall, pasture and forage costs on Irish lowland mid-season lamb enterprises are forecast to remain unchanged in 2023.

Table A3 (in the Appendix) summarises our forecasts of output, costs and margins for the mid-season lamb enterprise for 2023. Our positive outlook for lamb prices in 2023, when coupled with a forecast increase in direct costs of production, leave our estimate of the average gross margin earned from sheep farming slightly lower in 2023 than in 2022.

Our forecast for the 2023 gross margin per hectare for the mid-season lamb system is €800 per hectare, a less than 1 percent decline on our 2022 estimate. In 2023, as in 2022, margins earned on the mid-season lowland lamb enterprise will continue to be boosted by the receipt of payments from CAP Pillar II schemes, in 2023 these payment will be from the new Sheep Improvement Scheme.

Total overhead costs for the average mid-season lamb enterprise are forecast to decline in 2023. In 2023 these lower overhead costs largely offset the forecast increase in direct costs. Total costs of production are expected to increase marginally in 2023. With a small increase in output value forecast for 2023, net margin per hectare for the average sheep enterprise is expected to increase in 2023 to €74 per hectare.

7. Concluding Comments

The average gross margin earned by mid-season lamb producers in 2022 is estimated to have decreased compared to that earned in 2021.

Higher lamb prices resulted in higher gross output values. However, the higher output value per hectare in 2022 was insufficient to offset higher total direct costs of production for the 2022 year and gross margins decreased by 14 percent on the levels earned in–2021. Direct payment receipts associated with participation in the Sheep Welfare Scheme added to the margin on sheep farms for 2022, but was not sufficient to cover the escalating input cost situation that prevailed during 2022 year. This scheme ceased in 2022 year, but the newly launched Sheep Improvement Scheme will provide a financial boost at the individual farm level in 2023.

Our forecast is that 2023 Irish lamb prices will be circa 2 percent above 2022 record levels. Output

volume is assumed to remain relatively constant following on from a positive 2022 output year.

Gross margins earned by the average mid-season lamb enterprise forecast for 2023 is €800 per hectare, a 1 percent decrease on the estimated gross margin for 2022. Average net margins are forecast to increase, with the average mid-season lamb enterprise forecast to earn a net margin of €74 per hectare in 2023.

References

ABARES (2022). Agricultural Commodities: September Quarter 2022, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. Available to download at https://www.agriculture.gov.au/abares/research-topics/agricultural-outlook/data#agricultural-commodities

AHDB (2022). UK Sheep Outlook, July 2022 Available to download at

https://ahdb.org.uk/knowledge-library/sheep-market-outlook

https://projectblue.blob.core.windows.net/media/Default/Market%20Intelligence/Agri%20Market%20Outlook/July%202021/Sheep%20outlook%20JUL%2021.pdf

Beef & Lamb New Zealand (2022). New Season Outlook 2022-23. Beef + Lamb New Zealand Economic Service P19019B https://beeflambnz.com/sites/default/files/data/files/New-Season-Outlook-2022-23.pdf

Beef & Lamb New Zealand (2022). Stock Number Survey. 30 June 2022 Beef + Lamb New Zealand Economic Service P19019B https://beeflambnz.com/sites/default/files/data/files/New-Season-Outlook-2022.pdf

CSO (2022a). Agricultural Price Indices November 2022. Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-api/agriculturalpriceindicesseptember2022/

CSO (2022b). Livestock slaughterings, October 2022. Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-ls/livestockslaughteringsoctober2022/

CSO (2021c). Meat supply balance, October 2022. Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-msb/meatsupplybalance2021/

CSO (2022d). Crops and Livestock Survey, June 2021 Final. Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-clsjf/cropsandlivestocksurveyjunefinalresults2021/

CSO (2022e). Crops and Livestock Survey, June 2022 Provisional. Available to download at https://www.cso.ie/en/releasesandpublications/ep/p-clsjp/cropsandlivestockprovisionaljune2022/

CSO (2022f) Livestock Survey, December 2021. Available to download at https://www.cso.ie/en/releasesandpublications/er/lsd/livestocksurveydecember2021/

DAFM (2022a). Quarterly Summary Report for Feed Usage (Various Issues).

DAFM (2022b). Meat Market Report (various issues). Department of Agriculture, Food and the Marine. Available to download at https://www.gov.ie/en/collection/b8452-meat-market-report/#2022

https://www.agriculture.gov.ie/farmingsectors/beef/beeffactorypricesweeklyreports/2022/meatmarketreportsweeklyupdates/

DEFRA (2022). United Kingdom Slaughter Statistics, Nov 2022. Available to download at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1116487/livestockslaughter-dataset-10nov22i.ods

Buckley, C., Dillon, E., Donnellan T., Hanrahan K., Houlihan T, Kinsella A. Lennon, J., Loughrey, J., McKeon M., Moran B. and Thorne F (2022). Outlook 2022 Economic Prospects for Agriculture, Teagasc. https://www.teagasc.ie/publications/2022/outlook-2022.php

Donnellan, T., and Kinsella, A. (2019). Outlook 2020, TResearch , Winter 2019, volume 14 no.4 . Available to download at https://www.teagasc.ie/media/website/publications/2019/TResearch_Winter2019_Outlook2020_Web.pdf

Dillon, E., Donnellan, T., Moran B., and Lennon, J., (2022). Teagasc National Farm Survey 2021.

Teagasc, Rural Economy Development Programme Athenry Ireland. Available to download at: https://www.teagasc.ie/media/website/publications/2022/Teagasc-National-Farm-Survey-2021.pdf

Donnellan T., Hanrahan K., Kinsella A. Loughrey, J., Lennon, J., Moran B. Thorne F and Dillon, E., (2022). Situation and Outlook for Irish agriculture, September 2022, Teagasc. https://www.teagasc.ie/media/website/publications/2022/Situation-and-outlook-for-Irish-Agriculture.pdf

EC (2022), Short-term outlook for EU agricultural markets, Autumn 2022. European Commission, DG Agriculture and Rural Development, Brussels. https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/markets/outlook/short-term_en

Hanrahan, J.P. (2006). "Observations on variation in weight and classification of carcasses for Irish lambs" *Irish Grassland Association Journal*, 2006.

Kinsella, A. and Hanrahan, K. (2021). "Review of Sheep Farming in 2021 and Outlook for 2022" In Outlook 2022: Economic Prospects for Agriculture. Teagasc. Available to download at https://www.teagasc.ie/publications/2021/outlook-2022---economic-prospects-for-agriculture.php

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

	2021	2022e
	€ per ha	
Gross output	1493	1,599
Coupled Payments (Sheep Grassland/Sheep Welfare)	50	60
Direct Costs	564	796
Concentrates	241	284
Pasture and Forage costs	156	337
Other direct costs	167	175
Gross Margin	929	803
Overhead Costs	640	750
Net Margin	288	54
Ewes per ha	7.45	7.45
Lambs per ewe	1.4	1.4
Lamb Carcass (kg) per ha	209	209

Source: Teagasc National Farm Survey and Authors' estimates for 2022
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 2021 by gross margin grouping

	Most Profitable	Average Profitability	Least Profitable
		€ per ha	
Gross Output	2,171	1,497	835
Direct Costs			
Concentrates	231	225	266
Pasture and Forage	167	174	127
Other Direct Costs	188	178	136
Gross Margin	1,585	919	306
Net Margin	776	239	-134
Ewe per ha	8.67	7.76	5.96
Lambs per ewe	1.48	1.41	1.29
Lamb carcass (kg) per ha	260	220	155
Dir. costs € per kg carcass	2.25	2.62	3.41

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, 2021 – 2023f

	2021	2022e	2023f
		€ per ha	
Total Direct Costs	564	796	831
Concentrates	241	284	312
Pasture and Forage	156	337	336
Other Direct Costs	167	175	182
Gross Output	1,493	1,599	1,631
Sheep Grassland /Sheep Welfare Payment	50	60	60
Gross Margin	929	803	800
Overhead Costs	640	750	726
Net Margin	288	54	74

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

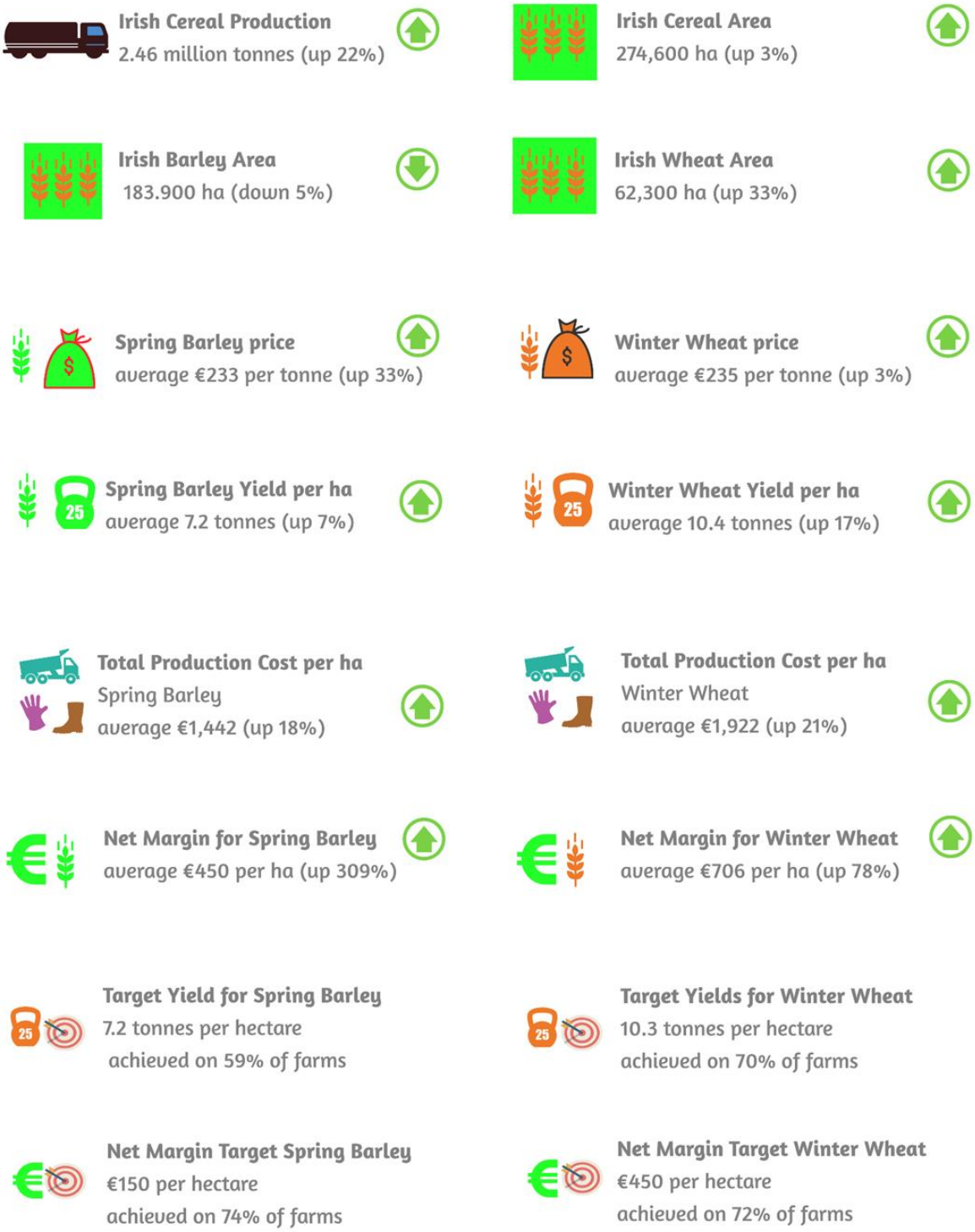
Table B1: Average Hill Sheep Output, Direct Costs, Gross Margin and Technical Performance, 2020 - 2021

	2020	2021
	€ per ewe	
Gross output	97	123
of which Sheep welfare per ewe	7	9
Total Direct Costs	51	61
Gross Margin	46	62
Overhead Costs	44	58
Net Margin	-1	4
Ewes per ha	6.5	6.1
Lambs per ewe	1.1	1.1
Lamb Carcass (kg) per ha	130	122

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 and 2021 year, the data relate to 25 and 21 farms respectively, and is nationally representative of just over 2,200 farms in 2021 year.

Irish Cereal Enterprise 2021
Average Performance



Source: Teagasc National Farm Survey and Central Statistics Office

Irish Cereal Farming in 2022

Decreased EU Cereal Production
coupled with decreased feed demand

Irish Cereal Yields
Up 2% for winter wheat and
up 3% for spring barley

Barley and Wheat prices
Up over 40% on 2021 level

Weather Conditions
favorable for sowing and harvest

Fertiliser Prices
Up 155% on the 2021 level
Fertiliser Use
Little change on whole farm

Seed Prices
Uo 6% on 2021

Other Direct Costs
Up 5% on 2021

Fuel prices
Green diesel up 80% on 2021

Total Direct Costs
Up 57% on 2021

Gross Margin
Spring Barley
Up €450 per ha on 2021
Winter Wheat
Up €500 per ha on 2021

Net Margin
Average Cereal Enterprise
€745 per ha (up €235 per ha)

Source: Teagasc Estimates for 2022 and Forecasts for 2023

Irish Cereal Farming in 2023

Increase EU Cereal Production
assuming trend yields

Irish Cereal Yields
Decrease in individual yields
assuming trend yields

Cereal prices
Down 20% on the 2022 harvest
price

Weather Conditions
Normal weather assumed

Fertiliser Prices
Up 10% on the 2022 level
Fertiliser Use
Little on a whole farm level

Seed Prices
Up 30% on 2022

Other Direct Costs
Up 8% on 2022

Fuel prices
Green diesel down 18% on 2022

Total Direct Costs
Input costs 8% on 2022

Gross Margin
Spring Barley
Down €900 per ha on 2022
Winter Wheat
Down €1215 per ha on 2022

Net Margin
Average Cereal Enterprise
€65 per ha (down €680)

Review of Tillage Farming in 2022 and Outlook for 2023

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1. Introduction

Harvest prices in the cereals sector in 2022 were considerably higher than those achieved in 2021. Moisture bonuses were also paid at higher rates due to favourable weather at harvest and energy prices. Furthermore, yields for the major Irish cereal crops were also higher than those achieved at harvest 2021. Taken together these developments resulted in higher gross output values on a per hectare basis in 2022 relative to 2021.There was significant expenditure increases in 2022, associated with an increase in fuel and fertiliser costs in particular.

The upward movement in cereal prices at harvest 2022 was associated with several factors, the most important of which was the war in Ukraine which has severely disrupted international grain markets.

The international balance sheet for 2022/23 is projected to have low ending stocks in the main export regions internationally.

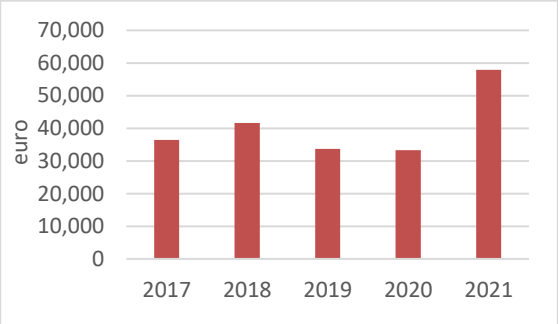
This paper will consider whether the price increases of the 2022 harvest can be considered atypical or whether prices will continue at these levels into the 2023 harvest. The paper uses Irish Teagasc National Farm Survey (NFS) data to conduct a review of the financial performance of tillage farms in 2021. Following this, prices and costs are estimated for 2022 and these are used to produce an estimate of net margin for the 2022 harvest year. In the concluding sections of the paper, forecasts for 2023 are presented.

2. Review of the Economic Performance of Tillage Farms in 2021

Approximately 6,900 specialist tillage farms were represented by the Teagasc NFS in 2021. Income on tillage farms increased by over 70 percent year-on-year.

Gross output on a whole farm basis increased by 44 percent. Direct costs and overhead costs decreased on a whole farm basis, by 29 percent and 33 percent respectively. Overall, total costs on a whole farm basis increased by 31 percent on average. These changes resulted in an average Family Farm Income (FFI) in 2021 of €57,939, which is equivalent to a 43 percent increase on the five year average FFI on tillage farms.

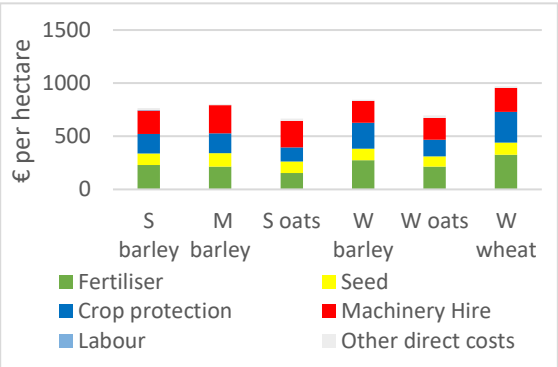
Figure 1: Average Income on Irish Specialist Tillage Farms 2017 to 2021



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

To understand the economic performance of tillage farms in 2021, 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



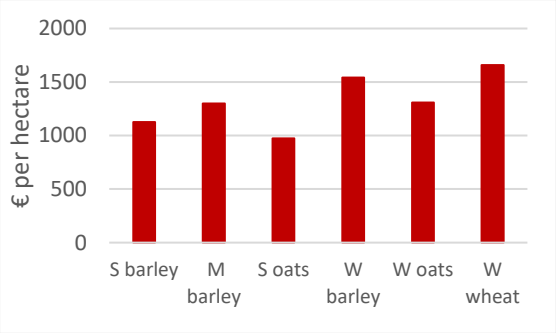
Source: Teagasc, National Farm Survey.

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 spring oats the lowest margin of all cereal crops examined in 2021 (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 2021 relative to 2020, by approximately €450.

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.

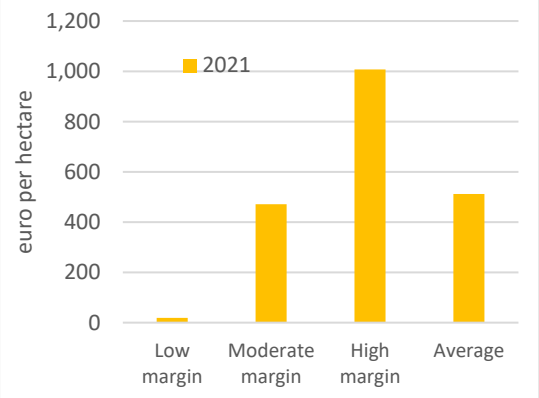
Figure 3: Gross Margins per hectare for Cereal Crops, 2021



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, 2021



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 2021 was €1007 compared to €471 on moderate margin farms and €19 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 2022 Performance

This section of the paper presents a review of the cereal sector in 2022. 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 2022. 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 2022.

3.1 Estimated Input Usage and Price 2022

3.1.1 Fertiliser – Usage and Price 2022

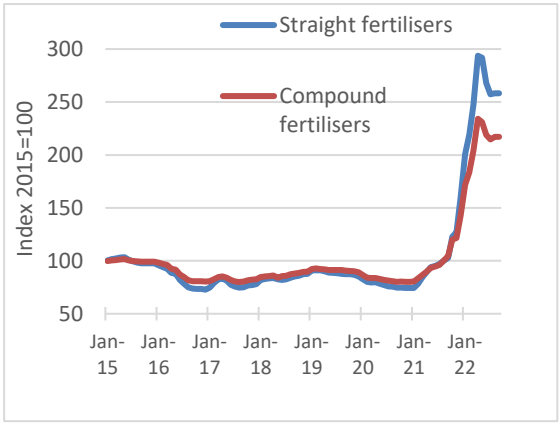
In the early half of the noughties, fertiliser costs typically comprised about 25 percent of direct costs and just over 10 percent of total costs on tillage farms. However, fertiliser types commonly used on tillage farms have increased substantially in price since 2006. Expenditure on fertilisers now represents a larger proportion of costs on tillage farms than previously. In 2021, fertiliser costs represented 28 percent of direct costs on tillage farms and approximately 13 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 and the illegal invasion of Ukraine has significantly altered the balance in demand and supply for natural gas which has had a

very significant impact on fertiliser prices. Following a sharp decline in fertiliser prices in 2020, a step increase in fertiliser prices occurred during the course of 2021 and again in 2022. On a calendar year basis, it is estimated that fertiliser prices for N based products are up about 150 percent, and up about 100 percent for P and K compounds, in 2022 compared to 2021. 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 170 percent and NPK compounds up by 120 percent in 2022 compared to 2021 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 2022 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 2015 to 2022



Source: Central Statistics Office data for 2015 to 2022.

On the usage side, DAFM figures indicate that fertiliser purchases in the 2022 fertiliser year (October 2021/September 2022) were down by about 18 percent, 25 percent and 24 percent for N, P and K based products respectively, 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 2022. Reports from a number of sources indicate that there is much more limited opportunity for nutrient reductions on crop farms compared to grassland farms, in response to rising fertiliser prices, with individual crops having specific nutrient requirements to achieve target yields. Notwithstanding nutrient requirements it is estimated that there was some substitution away from chemical fertiliser in favour of animal manures to fulfil crop nutrient requirements in 2022. Overall expenditure on chemical based fertiliser in 2022 is estimated to have decreased by about 5 percent on a whole farm basis.

3.1.2 Seed – Usage and Price 2022

Expenditure on purchased seed on crop farms comprises between 12 and 16 percent of direct costs for cereal production. In terms of the composition of total costs, seed represented about 5 percent of total costs in 2021. In 2022, cereal farmers experienced an increase in seed costs relative to the previous year given that cereal prices at harvest increased in 2021 relative to 2020, this price increase has transmitted to seed prices, with blue label seed costing around €570 per tonne for wheat and €560 per tonne for barley, which was between 4 and 6 percent higher than 2021 seed prices.

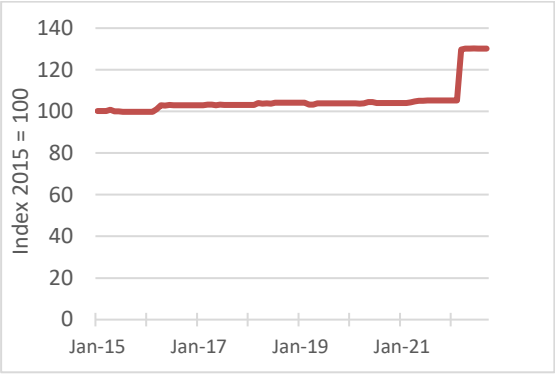
3.1.3 Crop protection – Usage and Price 2022

The expenditure on crop protection by specialist tillage farms in 2021 accounted for 20 percent of direct costs and 10 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 2021, crop protection costs accounted for 30 percent of direct costs, as compared to 24 percent for spring barley.

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, until the trend break which has appeared in the data in February 2022. Figure 6 shows that the increase in the price of crop protection products from 2014 to 2021 was approximately 5 percent and that from February 2022 there has been a very significant increase in crop protection products. The annual average

increase in crop protection products in 2022 compared to 2021 is 20 percent, which indicates a very significant increase in prices compared to the previous trend. This increase in prices is attributed to inflation in the energy market, which is important for the manufacture of products and also supply and demand issues associated with post pandemic supply shortages globally.

Figure 6: Price Index of Plant Protection products in Ireland 2015- 2021



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

3.1.4 Energy and Fuel – Usage and Price 2022

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 2021.

Based on the CSO estimates presented in Figure 7, the farm level price of fuel has increased by 17 percent between 2020 and 2021 (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 following the COVID-19 induced demand shock, coupled with gas prices increases associated with supply issues coming from the war in Ukraine, green diesel fuel prices on Irish tillage farms increased by about 80 percent in 2022 relative to 2021.

The agricultural motor fuel index from the CSO for 2021 and the first nine months of 2022 is indicating a reduced level of fuel price inflation for 2022, than the aforementioned green diesel price inflation.

Figure 7: Price Index of Fuel products in Ireland 2015 – 2022

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

However, it is assumed that green diesel represents a greater proportion of fuel sales on tillage farms compared to livestock farms. Hence, overall it is estimated that fuel price inflation on tillage farms was up about 70 percent in 2022 compared to 2021. Demand for these input items tends to be relatively inelastic with respect to price and therefore it is assumed that usage in 2022 will have been similar to the 2021 level. Overall expenditure on fuel related items is likely to be 70 percent higher in 2022 relative to 2021.

3.1.5 All other direct and overhead costs – Usage and Price 2022

Based on CSO estimates for the first nine months of 2022 compared to the same time period in 2021, it is estimated that 'other direct costs' have increased on an annual basis by about 5 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 increased significantly in 2021, there could be some basis for assuming a slight increase in land rental prices in 2022. Furthermore, significant increases in dairy farm incomes in 2021 may have further contributed to an increase in land rental prices in 2022, with dairy farmers perhaps more likely to bid up the price of rented land. However, some of the afore mentioned buoyancy in the market may have been negated by significant cost price inflation on other input items. Hence, it is assumed that the average land rental price per hectare increased by the average rate of inflation on other agricultural inputs, at 5 percent. The methods employed here, which reflect costs per crop hectare, do not capture changes in the volume of land rented. For 2022, on a total farm basis, the actual impact of any changes to total cereal area (rented or otherwise) will only

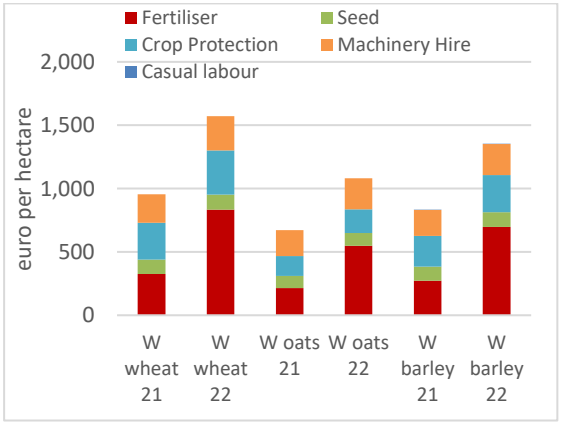
be fully reflected in the final Teagasc NFS figures for 2022, which will be published in mid-2023.

3.1.6 Estimate of Total Input expenditure for 2022

Total expenditure on all input items is estimated to have increased in 2022 relative to 2021. The most significant increase in expenditure on a per hectare basis occurred for fertiliser and fuel, which are estimated to have increased by 155 percent and 70 percent respectively. Seed prices also increased by about 5 percent in 2022 and feed prices are estimated to have increased by 28 percent (which is relevant for subsidiary enterprises on tillage farms). On average, the estimated increase in total direct costs was approximately 57 percent in 2022 relative to the 2021 level, on a per hectare, per crop basis.

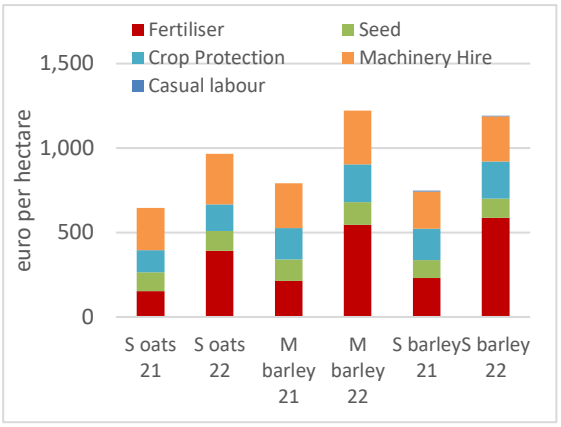
The estimates, provided on a per hectare basis for individual cereal crops, do not take into account changes in the area devoted to individual cereal crops. Overall, it is estimated that direct costs for the average cereal enterprise increased by over 55 percent whilst overhead costs increased by over 15 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 Winter Crops in Ireland 2021 and Estimates for 2022



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

Figure 8B: Direct Costs in Spring Crops Ireland 2021 and Estimates for 2022



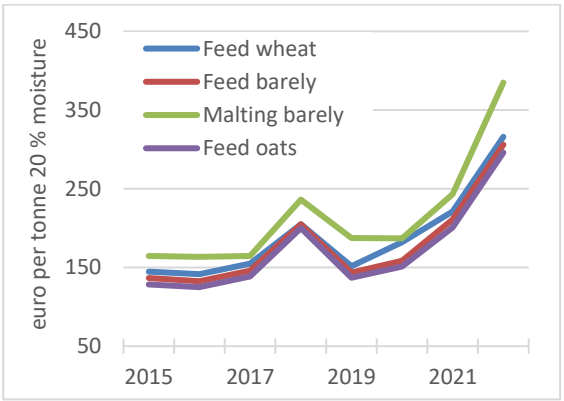
Source: Teagasc, National Farm Survey Data and Author's estimates for 2022.

3.2 Estimated Output Values 2022

3.2.1 Price, yield and moisture levels in 2022

In 2022, despite a significant increase in national cereal volumes, a decrease in the production of wheat, barley and maize on the European balance sheet in 2022/23 compared to 2021/22, coupled with much uncertainty of supply due to the evolving situation in Ukraine, resulted in a further significant upward movement in Irish farm gate harvest prices compared to 2021 (Figure 9).

Figure 9: Farm Gate Cereal Prices (major crops), 2015-2022



Source: Teagasc, National Farm Survey Data and Author's estimate for 2022

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 2021, 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 2021 and estimated yields for 2022. In general, the yield achieved in 2022, compared to 2021 were mixed, with some yields higher and some yields lower than 2021. However, readers should note that these yields are green yields and are thus not adjusted for moisture content, which were well below the 5 year average, due to favourable harvest conditions.

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 2022, this increase is driven by the increase in winter cereal area, good crop establishment and favourable weather conditions at harvest. It is estimated whilst volume of straw was increased in 2022, the price for straw was less favourable in 2022 compared to 2021. Uptake of the straw incorporation measure was very positive in 2022. Overall a slight decrease in direct straw receipts value of about 10 percent is assumed for 2022.

Table 1: Average Yield Levels, 2021 and 2022 Harvest

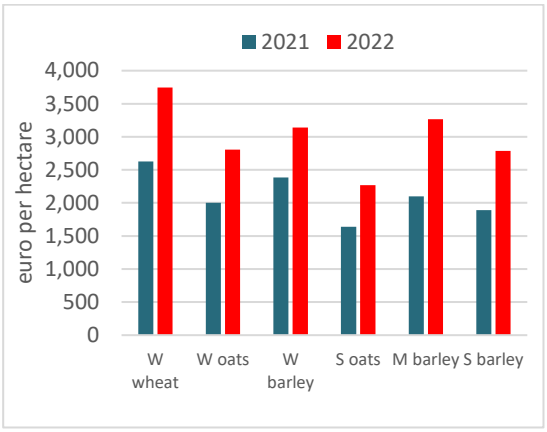
	Yield (tonne per ha.)	
	2021	2022*
Winter Wheat	10.8	11.02
Winter Barley	9.42	8.68
Winter Oats	9.32	9.2
Spring Wheat	8.21	7.91
Spring Barley	7.89	8.1
Spring Oats	7.72	7.9

Source: CSO (2021) & Teagasc Harvest report figures for 2022

3.2.2 Estimate of Total Output Value for 2022

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 2021 and 2022 are very crop specific.

Figure 10: Actual Gross Output per Hectare 2021 & Estimated Gross Output per Hectare 2022



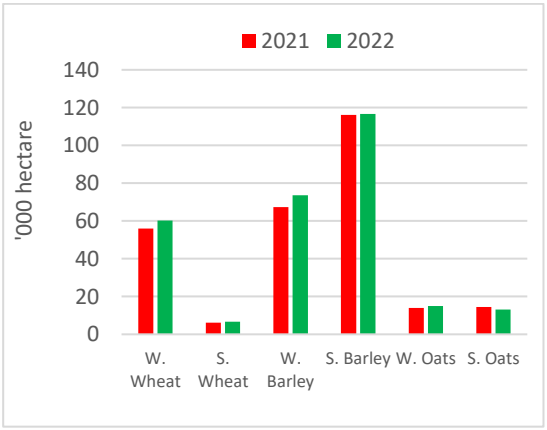
Source: Teagasc, National Farm Survey Data and Author's estimates for 2022.

In overall terms, the general trend has been a significant increase in output value in 2022 relative to 2021. This increase arises due to the favourable cereal yields and price of cereals paid at harvest 2022. Output value per hectare in 2022 is estimated to have increased by on average 43 percent across the crops examined.

3.2.3 Estimate of Total Production 2022

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 2022. Figure 11 shows the area estimates for 2022 based on 2022 Teagasc Harvest Report data.

Figure 11: Change in Irish Crop Area from 2020/2021 to 2021/22 crop year in Ireland



Source: CSO and Teagasc Final Harvest Report 2022

Figure 11 shows that the total area devoted to cereal production increased by 4.3 percent in the 2021/22 crop year compared to the 2020/21 crop year. There was also some switching between winter and spring sown crops which was weather related.

Table 2 combines actual total cereal production for 2021, as reported by the CSO, with estimated total cereal production for 2022. The estimated 2022 production of wheat, barley and oats is based on 2022 yield estimates from the Teagasc harvest report. Overall cereal production is estimated to be up by approximately 93,200 tonnes or 4 percent on 2021 levels.

Table 2: Actual & Estimated Production 2021 & 2022 ('000 Tonnes)

	2021	2022e	%Change
Wheat	622	681	9%
Barley	1472	1505	2%
Oats	229	229	0%
Total	2323	2415	4%

Source: CSO and Teagasc Final Harvest Report 2022

3.2.4 International Production Estimates for 2022

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 2022/23 marketing year are down on the previous year's levels (Strategie Grains, November 2022). EU total production of wheat, barley and maize were down 10 percent on the previous marketing year, whilst total grain production on the international balance sheet is down by 2 percent on the previous marketing year. However, it is noteworthy that there is an increase in the stocks to use ratio for wheat and barley, and only a slight decrease in stocks to use ratios for maize on the international balance sheet. These figures must be interpreted with caution however given very different ending positions between the various export regions of the world.

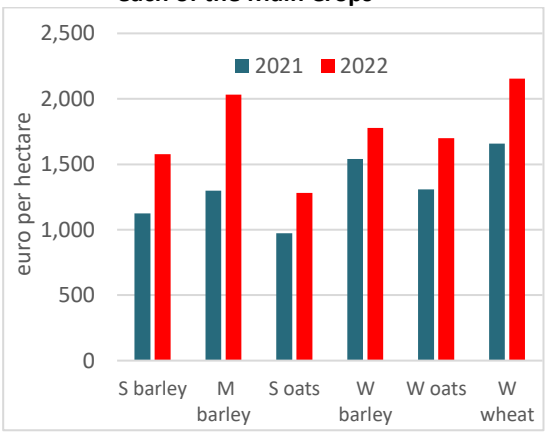
Much of the volatility in cereal prices during the 2022 calendar year have been linked to severe uncertainties regarding export potential from Ukraine and Russia. It is expected that this uncertainty will continue to prevail into the 2023 calendar year, with uncertainty regarding sowing levels in Ukraine.

3.3 Review of Tillage Enterprise Margins in 2022

The review of cereal output value showed that the average value of output received by farmers was significantly higher in 2022 compared to 2021. The review of input costs concluded that total direct costs were significantly higher in 2022 compared to 2021, due mainly to an increase in fertiliser, fuel and crop protection 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 positive story in terms of the relative change in gross margin in 2022 relative to 2021. The relative shift in yields, crop prices, straw returns and input expenditure has been positive for most cereal crops between 2021 and 2022. In terms of the major crops, the gross margin for spring barley was up by approximately €450 per hectare and the winter barley gross margin is estimated to be up by nearly €235 per hectare, while the gross margin for winter wheat is estimated to be up by nearly €500 per hectare. It should be noted that the average gross margin figures presented above are market based gross margins and therefore exclude all decoupled payments and overhead costs.

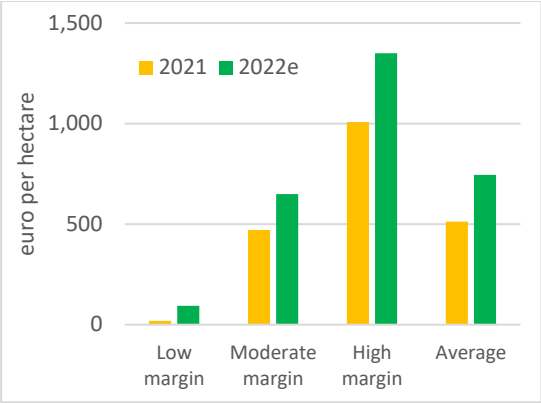
Figure 12: Actual Gross Margin in 2021 & Estimated Gross Margin for 2022 for each of the Main Crops



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

The estimated net margins for 2022 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 2021 and Estimated Net Margin for 2022 for the Cereal Enterprise on Specialist Tillage Farms



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

Figure 13 shows the cereal enterprise net margin estimates for 2022 relative to 2021, 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 2022 is higher than in 2021 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 2022 was approximately €1350 per hectare compared to the average, where the net margin was approximately €745 per hectare. It is important to remember that these figures exclude decoupled direct payments. 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 2022.

4. Outlook for 2023

In this section forecasts are provided for expenditure on various input items in 2023, the likely farm gate cereal price that will prevail at harvest 2023 and the likely net margin of tillage farms in 2023.

4.1 The Outlook for Input Expenditure

4.1.1 Fertiliser – usage and price 2023

A number of factors need to be considered when forecasting price and volume changes for fertiliser on crop farms in 2023. Market report data coming from the fertiliser industry at present are suggestive of a very uncertain supply, demand and price situation for products in 2023. Market sources at the time of writing (December 2022) are indicating that the price of CAN is approximately 70 percent higher and P and K products approximately 50 percent higher than for the corresponding period last year, due in a large part to factors affecting supply of fertiliser 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 2022/23 will be 10 percent higher than for 2021/22, given that fertiliser on crop farms is purchased over the number of months from Autumn in one year through to June in the following year..

Holding all other things constant, fertiliser usage on a whole farm basis in 2023 on crop farms could be expected to decrease slightly due to lower levels of winter crop sowing due to autumn weather conditions. In addition, given the very significant upward movement in fertiliser prices over the past 12 months, it is expected that at a farm level there will be further efforts to improve the lime status of soils, soil Ph balance and reduce fertiliser application, if at all possible. 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 2023. Overall, it can be expected that fertiliser expenditure will be about 10 percent higher per hectare for specific crops on cereal farms in 2023 relative to the 2022 level.

4.1.2 Seed – usage and price 2023

As mentioned previously, cereal farmers experienced an increase in seed costs in 2022 relative to the previous year due to cereal price increases at harvest 2021. Given that cereal prices at harvest increased in 2022 relative to 2021, this price increase has been transmitted to seed prices, with blue label seed costing around €740 per tonne for wheat and €730 per tonne for barley, which is approximately 30 percent higher than 2022 seed prices.

4.1.3 Crop protection – usage and price 2023

The increase in crop protection costs in 2023 relative to 2022 is forecast to be of a smaller magnitude to the changes seen in 2022, much of which were related to energy price hikes and supply constraint post COVID. Assuming no further significant price changes on a monthly basis, from the current prices in December 2022, it is likely that price increases for plant protection products will be about 3 percent in 2023, on an annual average

basis. Taking volume and price changes into account, based on recent data from the Teagasc NFS, a 3 percent increase in crop protection expenditure per crop per hectare is forecast for 2023. This 3 percent increase on a per crop basis will be slightly lower on a whole farm basis, reflecting the decrease 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 2023

Fuel costs in 2023 will depend mainly on the evolution of crude oil prices. Current futures prices suggest that crude oil prices will decrease in 2023 relative to 2022 prices, leading to a 16 percent decrease in farm level fuel prices on tillage farms, on an annual average year basis.

4.1.5 All other direct and overhead costs 2023

All other direct costs are forecast to increase by about 4 percent in 2023, in line with projections for general inflation in 2023 and basing the forecast on an annual average basis. At this early stage in the production season anecdotal evidence on land rental prices for 2023 is mixed. However, due to the increase in income on tillage farms in 2022, it is assumed that there will be some inflationary pressure on land rent in 2023, at about 4 percent.

4.2 The Outlook for Markets 2023

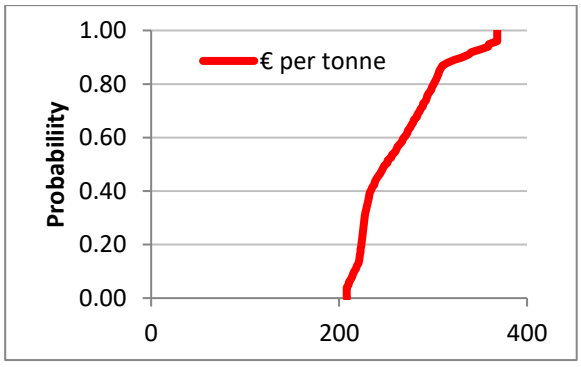
The cereals market has experienced significant volatility in recent years, and particularly so during 2022. Planting decisions by farmers will be influenced by expected farm gate cereal prices (and margins) in 2023. A number of factors must be taken into consideration when making price forecasts for the coming harvest.

To formally evaluate the risk associated with predicting the 2023 harvest price, an econometric analysis was conducted to predict the probability that the 2023 farm gate price will be higher or lower than the 2022 price. This analysis was based on the November 2022 MATIFF futures prices for November 2023 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 2023 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 2023. Based on the econometric model developed, it shows that there is significant uncertainty concerning the predicted harvest price for September 2023. This predicted range is based on current (MATIFF) futures trading prices (November 2022), 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.

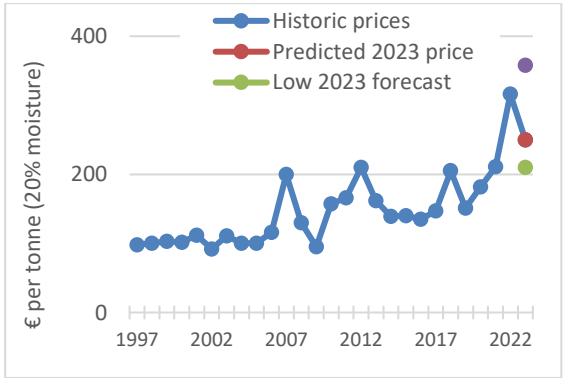
Based on market reports on forward prices and the probabilities of achieving different harvest prices, the average predicted value for the farm gate wheat price is approximately €250 per tonne at 20 percent moisture, which is approximately a 20 percent decrease over harvest prices paid in 2022. However, 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 €210 per tonne or as high as €358 per tonne (Figure 14).

Figure 14: Probability Distribution of the predicted 2023 Wheat Harvest Price



Source: Author's own estimates.

Figure 15: Historic, Estimated & Forecast Farm Gate Feed Wheat Price (1997– 2023)



Source: Author's own estimates, 2023 forecast, at 90 percent confidence interval.

The latest edition of *Strategie Grains* (November 2022) outlines very little change in the EU area planted to winter crops for the 2023/24 marketing year compared to 2022/23.

In total, soft wheat area in the EU27 is estimated to be virtually unchanged at 21.7 Mha compared to 21.8Mha in 2022/23. Total EU27 barley area is expected to increase slightly (10.4 Mha in 2023/24 Mha compared to 10.3 Mha in 2022/23). Total EU27 maize area is forecast to decrease slightly from 8.9 Mha (2022/23) to 8.8Mha (2023/24).

The change in cereal area (in the EU) is coupled with an assumption of achievement of trend yields in 2023 (see Appendix A3 for further details on forecast changes in arable crop areas in the EU27 for 2023/2024). An achievement of trend yields within the EU27, *ceteris paribus,* would yield better yields than the disappointing results of 2022 in the Eu-27. However, the fertiliser market will continue to create additional uncertainties in terms of 2023-crop yields in the EU27, whilst the low expected areas for 2023-crop cereals in Ukraine will also bring significant uncertainty in 2023/24, at both world and European levels.

The decrease in farm gate cereal prices at harvest 2023 which is borne out in futures trading prices at the moment, also reflects an anticipated increase in carry out stock levels from the current marketing year. Other supply side bearish factors include higher Russian exports in recent months and a confirmation of a bumper Australian harvest in recent weeks. Other price bearish factors include demand factors where there has been a decrease in demand for cereals, in response to elevated feed prices.

Possible bullish and bearish factors which could impact on prices at harvest 2023 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 bearish factors are considered most important in determining the futures trading price for harvest 2023. 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.

Based on the futures market forecast and average loyalty top ups in recent years from merchants, our forecast is that farm gate cereal prices will decrease by about 20 percent at harvest 2023.

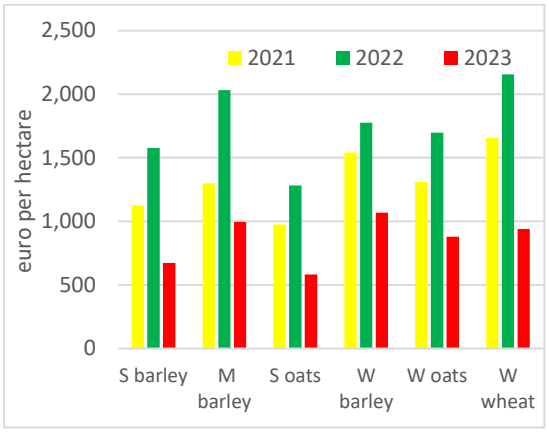
4.3 The Outlook for Tillage Enterprise Margin in 2023

Direct costs are forecast to be higher in 2023 relative to 2022, due to the forecast increase in fertiliser expenditure and seed costs. Some other direct costs of production are forecast to increase by smaller amounts in 2022, crop protection by 3 percent and all other direct inputs by 4 percent. Whilst fuel related costs will likely decrease during the course of the year in 2023, overall direct costs in 2023 should be higher than 2022 levels, on a per hectare basis. Furthermore, output value on average is forecast to be lower than 2022 levels, due to the forecast decrease in cereal yields when trend yields are assumed, coupled with a decrease in cereal prices. Figure 16 presents the actual gross margin for each of the main cereal crops in 2021, and the respective estimates and forecasts for 2022 and 2023.

The net effect of input price, output price and volume movements is on average, forecast to have a very significant negative effect on gross margins for 2023. For example, gross margins for winter wheat and winter barley are forecast to decrease by approximately €1,200 and €690 per hectare respectively, while gross margins for spring barley are forecast to decline by approximately €880 per hectare. The overall story for the 2023 forecast is for a decrease in gross margins as a result of achievement of trend yields, a significant decrease in cereal prices and a further increase in direct costs.

The main driver for the magnitude of gross margin change is the effect of forecasted decline in gross output in 2023, with green prices for wheat and barley to decline by over 20 percent and the achievement of trend yields to result in a decline in yields for most cereal crops.

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

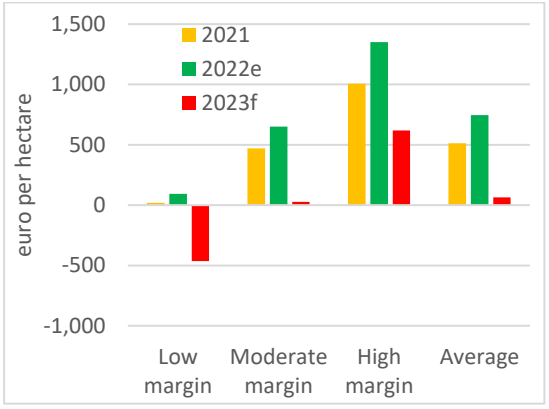


Source: Teagasc, National Farm Survey Data and Author's estimates for 2022 & forecast for 2023.

Similar to the format used to present margins in 2021 and 2022 earlier in the paper, the forecast net margins for 2023, 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 2023 are lower than in 2022 and 2021.

Figure 17: Net Margin Actual 2021, Estimate 2022 and Forecast 2023 for the Cereal Enterprise on Specialist Tillage Farms



Source: Teagasc, National Farm Survey Data and Author's estimates for 2022 & forecast for 2023.

The downward movement in margins (compared to 2022) is associated with the yield and price forecasts for 2023 and a further increase in some key direct cost items.

Overall, the net margin for the average cereal enterprise in 2023 is forecast to decrease by about €680 per hectare relative to 2022.

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

5. Concluding Comments

The 2021/2022 production year saw further upward movement in cereal gross margins and net margins for the main cereal crops. In 2022, there was an increase in winter cereal area and yields at harvest time, a significant increase in harvest price, straw returns from the straw incorporation measure, which overall were more than sufficient to outweigh significant increase in direct costs. 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 €1575, €1775 and €2155 per hectare respectively.

The forecast for net margins on tillage farms in 2023 is for a significant decrease in margins, owing to a return to trend yields, a significant decrease in harvest prices and a further increase in whole farm direct costs. The overall picture for cereal crops is that in general average net margins will once again struggle to return a positive margin in 2023, which is a stark difference in fortunes to those witnessed in 2021 and 2022, where record margins were witnessed. The downward movement in margins forecast for 2023 will mean that cereal based net margins will be negative on approximately 50 percent of specialist tillage farms in 2023.

References

Central Statistics Office (2022). Statbank various series accessed at: www.cso.ie

Dillon, E., Donnellan, T., Moran B. and Lennon, J. (2022). National Farm Survey 2021. Teagasc, Rural Economy Research Centre Athenry Ireland. Available to download at: http://www.teagasc.ie/publications

Teagasc (2022). Teagasc Harvest Report 2022, November 2022.

Strategie Grains (2022). November 2022 Bulletin.

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Table A1: Production Costs, Output and Gross Margin for Major Cereal Crops in 2021 (€ per ha)

	Gross Output	Fertiliser	Seed	Crop protection	Machinery Hire	Other direct costs	Total direct costs	Gross Margin
S barley	1,892	230	107	184	221	19	766	1,125
M barley	2,101	214	126	186	265	10	802	1,299
S oats	1,640	153	111	132	250	21	666	974
W barley	2,385	274	109	243	206	9	844	1,541
W oats	2,004	215	96	155	206	23	695	1,309
W wheat	2,628	327	114	290	225	16	971	1,657

Source: Teagasc National Farm Survey Data (2022)

Table A2: Variation in output and margin 2021: top and bottom performing spring barley producers

	Top	*Bottom*	*% Difference between Top and Bottom*
Average crop area (hectares)	16	13	18%
Yield (tonnes per hectare)	8	7	15%
Price per tonne	238	229	4%
Gross output (€ per hectare)	2,124	1,667	22%
Fert., seed, spray (€ per hectare)	531	512	4%
Machinery hire (€ per hectare)	148	292	-97%
Gross Margin (€ per hectare)	1,427	833	42%
Fixed Costs (€ per hectare)	603	747	-24%
Total Costs (€ per hectare)	1,300	1,580	-22%
Net Margin (€ per hectare)	824	86	90%

Source: National Farm Survey Data (2022)

Table A3: Changes in arable crop areas in the EU27

	22/23 M Ha	23/24M Ha	% Change
Soft wheat	21.8	21.7	No change
Maize	8.9	8.8	-2%
Barley	10.3	10.4	+1%
Total wheat, barley, maize area	41.0	40.9	0%

Source: Strategie Grains (November 2022)

Irish Pig Sector in 2021

Sow population
146,000 head
down 1.4% on 2020 level

Live Pig Exports
429,000 head
down 5.9% on the 2020 level

Pig Slaughter
3.95 million head
up 3.1% on the 2020 level

Feed Prices
€336 per tonne
up 10.2% on the 2020 level

Pig prices
€1.59 per kg
down 8% on the 2020 level

Margin over feed cost
41 cent per kg
down 36% on the 2020 level

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

Irish Pig Sector in 2022

Sow Population
133,000 head
down 8.9% on the 2021 level

Pig Slaughter
3.84 million head
down 2.8% on the 2021 level

Live Pig Exports
402,000 head
down 6.3% on the 2021 level

Pig prices
€1.82 per kg
up 14% on the 2021 level

Feed Prices
€450 per tonne
up 34% on the 2021 level

Margin over Feed Costs
26 cent per kg
down 36% on the 2021 level

Irish Pig Sector in 2023

Sow Population
133,000 head
unchanged on the 2022 level

Pig Slaughter
3.65 million head
down 5% on the 2022 level

Live Pig Exports
394,000 head
down 2% on the 2022 level

Pig Prices
€2.22 per kg
up 22% on the 2022 level

Feed Prices
€468 per tonne
up 3% on the 2022 level

Margin over Feed Costs
61 cent per kg
up 135% on the 2022 level

Source: Teagasc Pig Development Unit Estimates for 2022 and Forecasts for 2023

Review of Pig Sector in 2022 and Outlook for 2023

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, lower international pigmeat demand and the outbreak of the Ukrainian war has severely affected the sector's profitability in 2022.

2. Review of Irish Pig Sector in 2022

The review of the sector can be broken into the input costs incurred and the income generated in 2022.

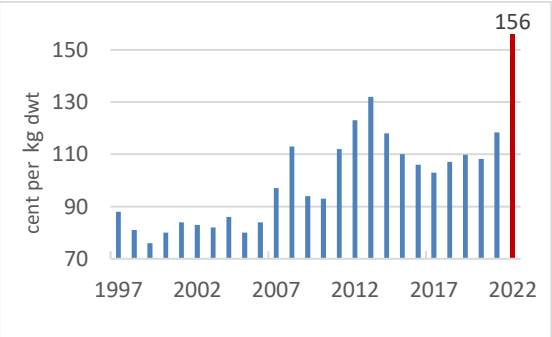
2.1 Pig Production Costs

The cost of producing pigs in Ireland can be decomposed into feed cost (75 percent) and non-feed costs (25 percent).

2.2 Irish Pig Feed Costs 2022

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 on a high plateau of 133c per kg due to the previous poor wheat and maize global harvests. Unfortunately feed ingredient prices escalated rapidly with the outbreak of the Ukrainian war. As the war involved two of the 'top five' global wheat and maize exporting nations, it created considerable uncertainty with resultant speculation on global markets. The composite feed price rose from €382 per tonne in January to €476 per tonne in June (+€94), giving an estimated annualised price of €450 per tonne – an estimated 34 annual increase.

Figure 1: Irish pig feed cost 1997-2022



Source: Teagasc Pig Development Department

When the composite feed price is examined over a longer time period, the 2022 price of €450 per tonne is the highest since 1984 when the Teagasc Pig feed database was created. It is significantly higher than the 5 year average (2018-2022) and 10 year average (2013-2022), €341 and €326 respectively. The previous highest feed cost 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 70,000 sows on the Teagasc Profit Monitor (PM) database from a national herd of an estimated 134,000 (52 percent of total). The non-feed costs quoted are based on the national 2021 PM data, (2022 full-year data is not yet available). 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	2021	2018-2021
	cent per kg dwt.	
Healthcare	5.9	**6.1**
Heat, Power Light	7.1	**4.8**
Transport	1	**1.5**
AI	1.7	**1.8**
Manure	1.6	**1.8**
Labour/Management	13	**14.5**
Repairs	3.3	**2.9**
Administration	0.9	**1.2**
Environment	0.4	**0.4**
Insurance	1.4	**1.4**
House rental	2.5	**2.0**
Contract Costs	2.3	**2.4**
Water	0.5	**0.5**
Dead Pigs Disposal	0.9	**0.8**
Stock Depreciation	2.5	**2.3**
Miscellaneous	1.3	**1.3**
Total	41.5	**43.3**

Source: Teagasc PM Report 2021

2.4 Financial Costs in Irish Pig Production in 2022

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 based on 2021 data 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 at various points.

Table 2: Financial Costs in PM recorded herds

Cost Item	2021	2018-2021
	cent per kg dwt.	
Interest	4.7	4.3
Building Depreciation	1.2	1.4
Total	5.9	5.9

Source: Teagasc Pig PM Report 2021

2.5 Total Cost of Irish Pig Production in 2022

The estimated annualised cost of production in 2022 (based on 2021 non-feed costs and 2022 feed costs) was 203.4 cent per kg dwt. for pigs delivered to the slaughter plant. This compared to a 167.5 cent per kg dwt. figure for 2021

2.6 Irish Pig Prices in 2022

The estimated average pig price in 2022 was 182 cent per kg dwt., which was 23 cent per kg dwt. higher than in 2021 (159 cent per kg dwt) and 8 cent higher than 2020 (174 cent per kg dwt) and significantly higher than the five year (2018-2022) and 10 year average (2013-2022) of 165 and 163 per kg dwt respectively.

The monthly pig price in January 2022 was a moderate 143 cent per kg dwt. which was marginally lower then January 2021 (158c) and significantly lower than the 198 cent per kg dwt achieved in January 2020. The backlog of pigs for slaughter in Q4 2021 in N. Ireland and in Britain put downward pressure on the Irish pig price. This backlog gradually began clearing in Q1 of 2022. The outbreak of the Ukraine war and resultant feed price spike resulted in a rapid escalation of the EU pig price in Q2 2002. Unfortunately this upward price surge was more gradual in Ireland and Irish pig price did not reach the French or Spanish peak (€2.44 and €2.23 respectively). The Irish price peaked at 209c/kg in September 2022 and has continued at this level since.

Table 3: Monthly Irish Pig Price in 2022

Month	Pig Price
	cent per kg dwt.
January	143
February	142
March	142
April	163
May	171
June	184
July	193
August	204
September	209
October	210
November	210
December*	210
Average*	182

Source: Teagasc Pig Development Department * Estimate

While the pig price in 2022 was higher than in 2021 it was not high enough the offset the significant escalation in feed and energy costs during the year.

2.7 Irish Pig Production Profitability 2022

The margin over feed cost (MOF) is estimated at 26 cent per kg dwt. in 2022 This was the joint lowest MOF in the last 40 years. The only other year to reach this low was in 1999 which occurred as a result of a fire at a pig processing plant. The 2022 MOF was significantly lower than the 41 cent per kg achieved in 2021 and lower than the 5 year (2018-2022) and 10 year (2013-2022) average of 51 and 46 cent per kg dwt respectively

The low MOF margins in 2022 (26c) and 2021 (41c) have completely eliminated the benefit of the relatively high level of profitability achieved in 2019 and 2020. However the profitability of these years was very prudently used by pig producers to reduce their debt burden. This subsequently allowed pig producers to be relatively well-structured financially prior to incurring the financial losses of the last 2 years.

It is estimated that a MOF of 56c per kg is currently required to meet all production costs, including financial repayments. The MOF on a cent per kg achieved in 2021 and 2022 was significantly below this target.

Table 4: Average Margin over Feed Costs from Compound Feed from 2012-2022

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
2022	182	156	26

Source: Teagasc Pig Development Department *Estimate

The 2022 MOF is significantly below the norm when compared to the longer term trend shown in Table 5. The higher five year average of 51 cent is a reflection of the high pig price in 2019 and 2020.

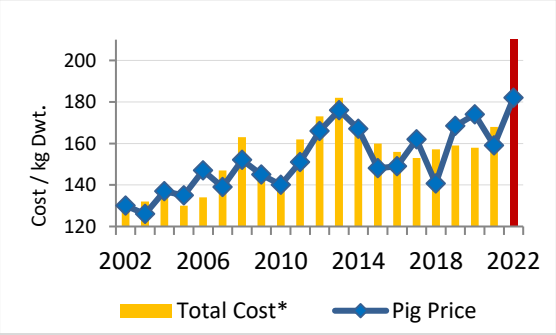
Table 5: Margin Over Feed in 2022 compared to the 5, 10, and 15 year average

	Margin Over Feed	% Diff.
	cent per kg per dwt.	
2022	26	-
5 Yr average	51	-51
10 Yr average	46	-57
15 Yr average	45	-58

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.

Figure 2: Pig Price compared to estimated Total Production Cost



Source: Teagasc Pig Development Department
*Total cost 2022 = Feed cost + 56c

While the pig price and the feed price fluctuate significantly from year-to-year, the MOF has previously 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.. However in 2022 the high feed prices produced an extremely high cost of production and a resultant negative margin.

2.8 Irish Pig and Sow Numbers in 2022

The Irish commercial sow herd census in 2021 was estimated at 146,000 and had remained very stable over the previous 5 years despite considerable financial fluctuations in the sector during this time. However the poor profitability in 2022 resulted in approximately 13,500 sows being permanently destocked, thereby reducing the national sow herd size to an estimated 133,000.

The estimated number of pig slaughterings in 2022 is illustrated in Table 6. The 2022 disposals are estimated to be 3.84 million pigs which is 3.1 percent lower than in 2021, reflecting the first reduction in slaughter numbers since 2018 and a return to 2020 levels.

Table 6: ROI born pigs slaughtered: 2019-2022

Year	2019	2020	2021	2022*
	million head			
Slaughter Pigs	3.70	3.83	3.95	3.84

Source: Teagasc Pig Department ^ Includes. N.Ire. plants *Est

The quarterly disposals (Table 7) illustrates an increasing rate of decline in the latter half of 2022 and this is expected to accelerate in Q1and Q2 of 2023.

Table 7: ROI born^ pig disposals 2022*

	Disposals (hd)	% Diff. vs Q1
Q1	998,359	-
Q2	983,336	-1.6
Q3	927,672	-7.2
Q4	928,667	-7.0
Total	**3,838,034**	-

Source: Teagasc Pig Department ^ Includes. N.Ire. plants *Est.

The percentage of ROI born pigs has declined considerably since the peak in 2013. The number being exported has declined in percentage terms of national production and numerical size from 20 percent (570,000 pigs) to an estimated 10 percent (402,000 pigs) in 2022.

Table 8: Slaughter and Live Export to N. Ireland of ROI Born Pigs from 2012-2022

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	3.523	0.429	11
2022*	3.436	0.402	10

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. The output increased by 15 percent over a 5 year period from 2017-2021 (Table 9). However, 2022 reversed this trend due to the decline in the national sow herd.

Table 9: Irish annual pigmeat output 2017-2022

Year	Total Pigs Slaughtered	Ave Dead weight #	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	335,891
2021	3.95	90.7	358,265
2022*	3.84	89.0	341,582

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

The reduced volume of slaughter pig disposals in 2022 and expected further declines in 2023 has increased the spare kill capacity in the principal pig processing plants. This gives greater flexibility to the sector in the event of one of the main processing plants being temporary off-line e.g. experiencing breakdowns etc.

The level of pig disposals in some of the principal pig exporting countries are shown in Table 10. 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 in German pig slaughtering of 3.07 million pigs. The Danish industry has also been affected by the low profitability and the difficulties exporting pigs to Germany for finishing and slaughter. It is estimated that the current slaughter throughput is down 9 percent and the Danish October 2022 pig census estimates the finisher population down 11.5 percent year-on-year.

The 'stand-out' data point in Table 10 is the stability of the Spanish slaughter numbers despite reduction in most of the other major EU producers. The integrated and cohesive nature of the Spanish pig sector has enabled continued growth in recent years. To illustrate this continuous increase, the Spanish slaughter volume (44 weeks) increased from 31.8 million pigs (2016) to 37.9 million pigs (2021), a 6.1 million pigs (19 percent) increase over a six year period.

Table 10: Selected European & North American Pig Disposals

	2021*	2022*	Change
Country	Million head		%
Germany	34.53	31.46	-8.8
Spain	37.85	37.57	-0.08
France	15.96	15.78	-1.1
U.S.	105.9	103.1	-2.6

*Based on Jan-Aug
Source: MPB 2022

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 substantial efficiencies for their industry.

2.9 EU Pig and Sow Numbers in 2022

While the Spanish sow herd remained virtually stable in 2022, down just 0.5 percent (Table 11), other EU herds declined dramatically. The Irish sow herd declined by an estimated 8 percent (145,000 to 133,000) and there were similar scenarios in Germany, Poland and Denmark. The six month data (from Dec 2021 to Jun 2022) illustrates a decline of 283,000 sows in these selected countries. This table does not include the UK herd which is estimated to have fallen by 18 percent (70,000 sows) year-on-year to approximately 330,000 sows.

It is forecast that over a 3 year period (2021-2023) the reduction in the EU & UK sow herd may be

600,000 sows, due to African Swine Fever and the pressure of poor profitability.

Table 11: Changes in selected European sow herds

	Dec 21	Jun 22	Change
Country	Million head		%
Germany	1,602	1,510	-6
Spain	2,712	2,699	-0.5
France	941	917	-3
Denmark	1,245	1,201	-4
Netherlands	918	925	0.8
Poland	665	617	-7
Total 13 MS*	10,092	9,809	-3

Source: Eurostat * 13 selected member states

2.10 EU Pigmeat Exports in 2022

Ireland's pigmeat exports decreased in 2022 by an estimated 12 percent (102,861 vs 90,588 tonnes) year-on-year in the January to August period. There was a similar trend across the rest of the EU, US and Canada.

Table 12: Pigmeat exports from selected countries

Country	2021*	2022*	change
	million tonnes		%
EU	3.721	2.946	-21
USA	2.02	1.72	-15
Canada	0.971	0.947	-3
Total	6.71	5.61	-16

Source: MDP * Jan-Aug

This decline was predominantly due to the reduction in the volume of Chinese imports. The recovery in the Chinese sow herd in 2021 led to a severe reduction in their pigmeat import volumes (-60 percent).

Irish exports to China fell by an estimated 47 percent YOY, closely matched by the EU and US decline of 46 percent and 44 percent respectively.

Table 13: Pigmeat exports to China

Country	2021*	2022*	change
	million tonnes		%
EU	2.020	0.923	-46
USA	0.570	0.317	-44
Canada	0.224	0.096	-57
Total	3.021	1.210	-60

Source: MDP * Jan-Sept

3. Outlook for Irish Pig Sector in 2023

The 2023 outlook for the pig sector is predicated on the expected global pig feed and pig price market developments.

3.1 Irish Pig Feed Price Outlook in 2023

The forecast for 2022 were significantly altered once Russia invaded Ukraine. The knock-on effects of feed ingredient volatility, supply chain difficulties for fertiliser and market speculation will continue to be felt into 2023.

The extension of the Ukraine grain export corridor until April 2023 has helped to pacify market speculation, but the slower pace of shipments when compared to pre-war and the continued risk associated with the agreement, has resulted in grain prices remaining elevated. It is expected this higher price plateau (€280- €300/tonne) will continue in the early months of 2023, barring moves towards a ceasefire / peace agreement.

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 145 mt. A harvest of this size will be required to significantly reduce the current high price plateau. If the South American harvest returns an average five year yield, then the outlook is for a price drop during 2023, relative to the Q4 2022 level of +€500 per tonne.

Overall, the outlook for the composite pig feed price is an increase during Q1 of 2023 of €10 to €20 per tonne, followed by a decline as the northern hemisphere cereal and soybean harvest arrives. However, the high feed price entering 2023 and the expected slow reduction in composite feed price as the year progresses, generates an average 2023 pig feed cost forecast of 161 cent per kg dwt. (a feed price of €468/t), an increase of 3 percent on 2022.

3.2 Pig Prices in 2023

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 followed by the liquidation of many herds, a bust-boom-bust scenario, has resulted in the Chinese requiring significant pigmeat imports.

The largest Chinese pig companies suffered massive losses in 2022, with the largest 9 companies reported to have accumulated losses of >€2billion.

This has led to a liquidation of some of the more inefficient pig farms during 2022, which has reduced the volume of domestic pigmeat supply with a resultant increase in domestic pig price. The price increased from 12 Yuan/kg in March 2002 to a peak of 28 Yuan in October.

Currently (December 2022) there has been reported increased Chinese interest in resuming higher volumes of pigmeat imports from the EU and US. How long higher exports to China may last is difficult to ascertain as the statistical data on the Chinese sow herd population is difficult to interpret. However, a modest increase in Chinese demand in 2023, in an already tightening pig market supply, will lead to upward EU pig price pressure.

The other major influence on the pig price is the level of EU pig production. While the Spanish sow herd did not decline in 2022, indications are that the rate of expansion in 2023 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, UK) will result in a lower supply of pigmeat on the EU market. This reduced supply will continue to support the pig price through 2023 and into 2024. The Irish pig supply has begun to decline and it is forecast that the net ROI supply will decrease by 5,000-6,000 pigs per week by mid-2023 when compared to 2022.

It is forecast that the effect of reduced EU supply and increased Chinese demand will be felt in the market from March or April 2023 onwards. Therefore the EU and Irish pig price should see a steady rise in Q2 of 2023 to reach a plateau by mid-summer, with a further moderate increase in Q3-Q4.

3.3 Pig Sector Profitability in 2023

The pig price is not forecast to meaningfully increase until Q2, which indicates that the margin-over-feed (MOF) for Q1 will tighten until the pig price begins to rise.

As the pig price increases in Q2, the MOF will improve. In addition, an easing of the high feed ingredient prices is expected to begin during Q2 of 2023, which will produce moderate profitability by mid-year. The continued downward trend in feed ingredient prices and relatively high pig price in Q3 and Q4 will lead to a strong return to profitability in the pig sector in the latter half of 2023

The forecast margin-over-feed of 61 c/kg dwt. indicates that 2023 will be profitable with profitability increasing as the year progresses

Table 13: Pig & Feed Price Forecast 2023

Year	Pig Price (Net)	Feed Cost	Margin over Feed
	cent per kg dwt.		
2022*	182	156	26
2023^	222	161	61

Source: Teagasc Pig Development Department
*Estimate
^ Forecast

4. Conclusion

The Irish pig sector enjoyed high profitability in 2019 and 2020, with a negative profitability in 2021 and 2022. The outlook for 2023 is for modest profitability, with margins improving as the year progresses

Review and Outlook for Forestry 2023

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1. Introduction

The Irish forestry sector continues to be a highly important national socio-economic driver, particularly in rural areas. The economic contribution of the forestry sector to the economy was estimated at over €2 billion per annum (DAFM 2022). A recent study from COFORD found that the combined estimate for direct and indirect employment levels is 3,500 for the forestry and harvesting sector and 5,900 for the manufacturing of wood and wood products sector (Forestry Services and Phillips, 2022).

The Shared National Vision for Forestry, published in September 2022, underpins a commitment to sustainably expand and manage the forest resource and to increase the environmental, economic and social benefits of forests (DAFM, 2022a). A new Forest Strategy to 2030, currently being finalised, will underpin a new Forestry Programme for the period 2023-2027.

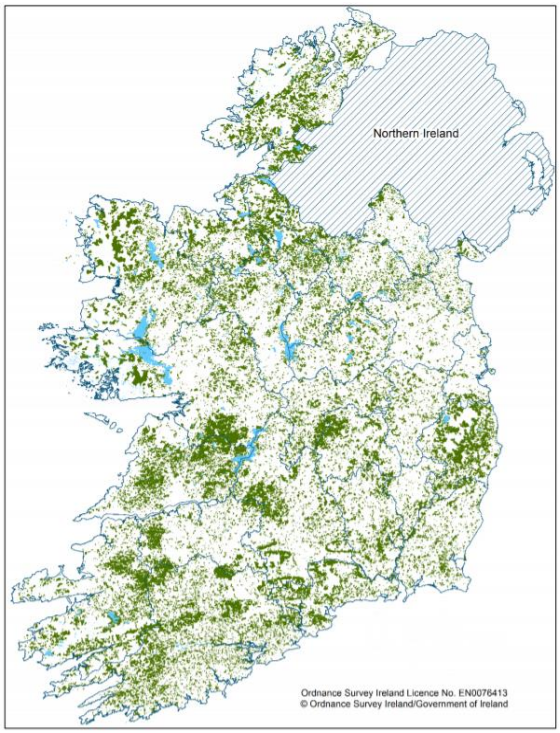
In November 2022, The Taoiseach, Micheál Martin TD, Minister of State with responsibility for Forestry, Senator Pippa Hackett and Minister for Agriculture, Food and the Marine, Charlie McConalogue T.D announced a proposed investment by the Government of €1.318 billion in Irish forestry. This includes support for the national Forestry Programme 2023-2027. It represents the largest ever investment by an Irish Government in tree-planting. The announcement reflects the importance of forestry in terms of delivering on sustainability goals and the recognition that "planting of trees is one of the most effective methods of tackling climate change as well as contributing to improved biodiversity and water quality" (DAFM, 2022b).

In 2022, the fourth National Forestry Inventory estimated that area of forest cover in Ireland is estimated to be 808,848 hectares (ha) representing 11.6 percent of the total land area, excluding inland water bodies (DAFM 2022c).

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.

Ireland's forests removed almost 3 million tonnes of carbon dioxide equivalents (CO_2-e) in 2020 (DAFM, 2022c). In its series of statements, COFORD (2021) set out recommendations for afforestation rates and the silvicultural management needed to secure the long term climate change mitigation benefits of forests. It also described how the increased use of wood products, including sawn wood and advanced engineered wood construction products offer a sustainable alternative to high CO_2-producing construction materials and provides an opportunity to reduce the embodied emission of buildings.

Figure 1: Forest Cover in Ireland 2022



Sources DAFM (2022)

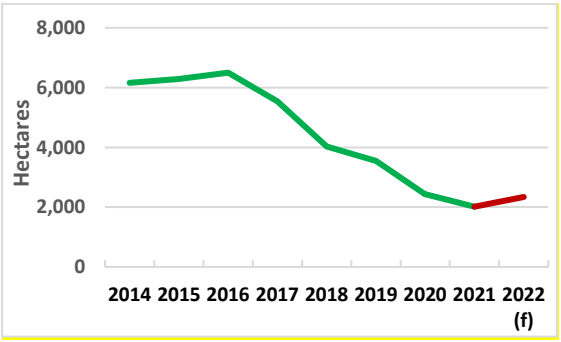
2. Forestry Financial Supports

In 2021, €68 million in capital expenditure was invested by the Department of Agriculture, Food and the Marine (DAFM) in forestry development. Of that total, 94 four percent went towards afforestation grants and premia (DAFM, 2022c). The Government, in its 2022 budget, announced a 12 percent funding increase from 2021 levels, providing €112 million to support the new National Forestry Programme 2023-2027 (DAFM, 2021d). This provides funding to establish 8,000 hectares (ha) of new forests in 2022, as set out in the Food Vision 2030 Strategy (Government of Ireland, 2021).

3. Planting in 2021/2022

In 2021, DAFM made payments relating to the planting of 2,016 hectares (ha) of land, down from 2,434ha in 2020 (Figure 2). Cork had the highest afforestation area by county at 343ha, followed by Roscommon at 190ha. The proportion of broadleaves in new forests created during 2021 was 41 percent, up from 34 percent in 2020 (DAFM 2022e).

Figure 2: Annual planting 2014 to 2021, with projection for 2022



Source: DAFM (2022)

Based on planting levels to date, the projected total area that will be planted in 2022 is 2,340ha. This is a marginal increase on the 2021 level. Key to the success of substantially increasing afforestation rates and progressing towards planting targets is to build confidence among landowners of the benefits of forestry as a viable option to complement existing farm enterprises (DAFM, 2022c).

The proposed Forestry Programme 2023-2027 sets out new Forest Type options, with associated premium increases between 46 and 66 percent over current levels and the extension of annual payments from 15 to 20 years for farmers. Magner (2022) reports generally positive reaction to the proposed new premium changes, with potential to encourage farmers to re-examine forestry as a viable farm option.

The proposed Forestry Programme, part of the draft Implementation Plan for the New Forestry Strategy (DAFM, 2022f), is currently being finalised following a six-week public consultation period. The Programme must also be completed in accordance with the EU Guidelines on State Aid for agriculture and forestry and discussions with the EU Commission are ongoing in this regard. A summary analysis of two of the proposed Forest Type options in the Forestry Programme 2023-2027 is included in section 4.

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 85,663 farms represented by the 2021 survey (Dillon *et al*., 2022), 8,178 farms (9.5 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. A summary NFS table, indicating the extent to which farms and farming systems include forests is presented in Table 1.

Table 1: Teagasc National Farm Survey 2021 - Forestry Representation on Irish Farms

System	Farm Population	Farms with forest	% with forest	Average forest area per farm (ha)
Dairy	15,319	1,050	7.0	7.9
Cattle Rearing	17.903	1,889	11.0	8.2
Cattle Other	30,324	3,064	10.0	11.8
Sheep	13,979	1,207	9.0	10.7
Tillage	6,246	666	11.0	8.4
Mixed Livestock	1,158	302	26.0	14.2
ALL	**85,633**	**8,178**	**9.5**	**10.1**

Source: Dillon *et al*. 2022

The latest Teagasc NFS data indicate that the largest populations of farms who previously chose the forestry option are those with cattle systems (cattle rearing and in particular, cattle other). Farms showing the highest average forest area per farm include those with cattle other, sheep and mixed livestock enterprises albeit the latter has the lowest overall representation of farms with forests in the

survey. The data indicate that 7 percent of dairy farms contain a forest enterprise, with an average forest area of 7.9ha. (Table 1).

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 and the timescales involved are also a significant drivers of the afforestation decision.

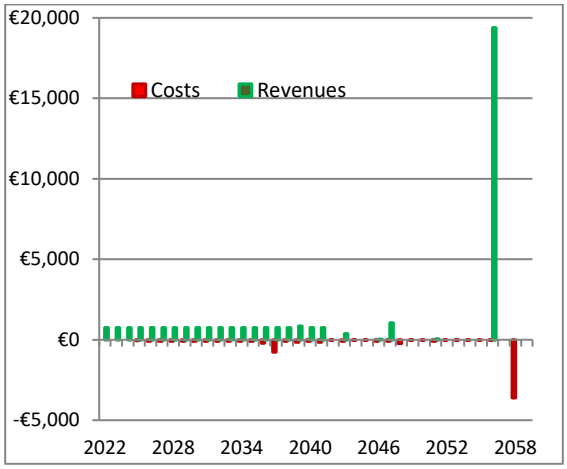
The draft Implementation Plan for the New Forestry Strategy (DAFM, 2022f) identified barriers to achieving the 8,000ha annual forestry target. These include competing land uses that offer higher economic reward in the short term, the permanent land use change, difficulties in the administration of forestry licences in recent years and negative perceptions of forestry. The draft Plan also identifies the need to raise awareness of forestry as a profitable and recognised land use and the need for incentives to plant appropriate species to ensure forest resilience.

4. Financial Returns - draft New Forestry Programme

The Teagasc Forest Investment Valuation Estimator (FIVE) informs decision making in relation to potential land use and forestry options. FIVE uses discounted cash flow (DCF) analysis to model indicative financial returns for forestry land use options (forest creation) and management options (e.g. forest thinning). It provides financial output for decision support, particularly in relation to reviewing pre-planting options and comparing criteria such as tree species, yield classes and forest rotation lengths according to landowners' preferences and objectives.

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 by FIVE and are discounted to present day values and presented as net present values (NPVs).

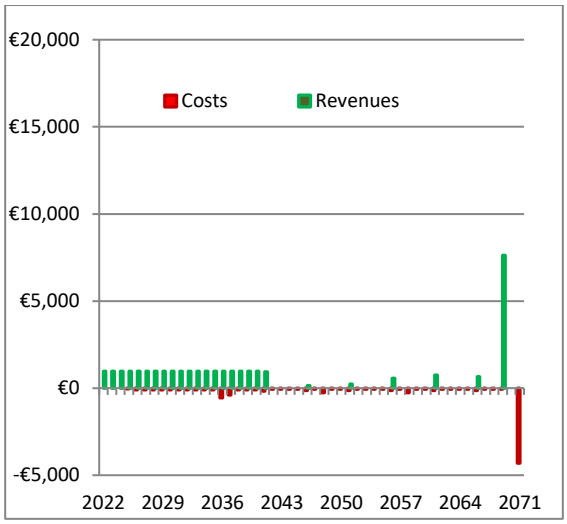
Figure 3: Indicative Forest Returns, One hectare of Forest Type 12 (FT12)



Source: Teagasc, FIVE (2022)

Assumptions: Forest Type 12, Mixed High Forest with mainly spruce, 20% broadleaf species, 15% retain area for biodiversity enhancement, forest cycle of 35 years, discount rate 4.5%, 10-year average timber prices used.

Figure 4: Indicative Forest Returns for One hectare of Broadleaf Forest (FT7)



Source: Teagasc, FIVE (2022)

Assumptions: Grant and Premium Category 5 (85% sycamore (yield class 8), 15% retain area for biodiversity enhancement), forest cycle of 50 years, discount rate 4.5%, 10-year average timber prices used.

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 Forest Type 12, comprising mixed high forest (mainly spruce, 20 percent broadleaves (FT12) and Forest Type 7 (other broadleaf forest (FT7) respectively, based on FIVE analysis. "FT" refers to the relevant forest type under the proposed new DAFM Forestry Programme, Intervention 1, Forest Creation. A summary of the comparative financial outputs for these two afforestation categories is presented in Table 2. The respective AEVs are €692 /ha/year for FT12 and €589 /ha/year for FT7.

Table 2: Comparative per Hectare Financial Outputs for Forest Types 12 and 7

Proposed Forest Type / Financial output	Forest Type 12	Forest Type 7
Total revenues (€)	35,904	30,168
Total costs (€)	6,980	9,180
Net Present Value (€/ha)	12,048	11,643
Annual Equivalent Value* (AEV) €/ha/year	692	589

Source: Teagasc 2022

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 hectare and family farm income can be considered conceptually equivalent.

It should 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. In this regard, forestry returns based on proposed new premia levels in the Forestry Programme 2023-2027, can be very competitive when compared to many agricultural enterprises.

FIVE analysis does not take into account the capacity for eligible forestry parcels to draw down the new Basic Income Support Scheme (BISS) payment as well as the forestry premia. It also does not factor in the potential income-tax free returns and relative efficiencies in terms of labour inputs when compared to other 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.

5. Licensing of Forest Operations

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

Project Woodland's Interim Report No. 4 (DAFM, 2022g) conveyed significant progress in reducing the licensing backlog. From the start of 2022, there was reportedly 3,770 applications on hand (greater than 120 days) which was reduced to 1,875 by September 2, 2022. The report describes further work underway to address identified blockages in afforestation licensing. As of October 25, 2022, a total of 1,639 applications awaited approval. DAFM also reported the issuing of more licenses than applications received, resulting in the backlog continuing to drop (Oireachtas.ie, 2022).

Other reported areas of progress in the Project Woodland Interim Report No 4 and subsequently include the following:

- Sanctioning of an Environment Report Grant by DPER with payments at Form 2 stage from July 12, 2022.
- Finalising Standard Operating Procedures for a nationwide rollout of Pre-Application Discussion to improve accuracy and efficiency of processing applications.
- Conclusion of the Independent Regulatory Review for Afforestation, Road and Felling and consideration by the Project Board in discussion with the various Working Groups.
- A Business Systems and Process review, working closely with the Agile Implementation Group to implement new process and system improvements.
- Publication of a Shared National Vision for Trees, Woods and Forestry in Ireland 2050 (DAFM, 2022a) following wide public consultation.
- Publication of and consultation on Ireland's Forest Strategy 2022-2030 (DAFM, 2022k) to deliver the vision.

- Publication of and public consultation on the draft Implementation Plan for the Forest Strategy, SEA Environmental Report and AA Natura Impact Report.
- Plans to implementation of a Communication Plan to enable strong communications and promotion initiatives with cross-industry stakeholders.
- Work on a Customer Charter including taking inputs from WG4 in developing the appropriate response times for license applications.
- Training Needs Analysis undertaken by Auxilia consultants which is currently being finalised.

Feedback from stakeholders across the forest sector highlights the importance of a continuous flow of approvals through the licensing system to support measures within the new Forestry Programme 2023-2027. 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 (DAFM, 2022f).

6. Timber Harvest and Supply

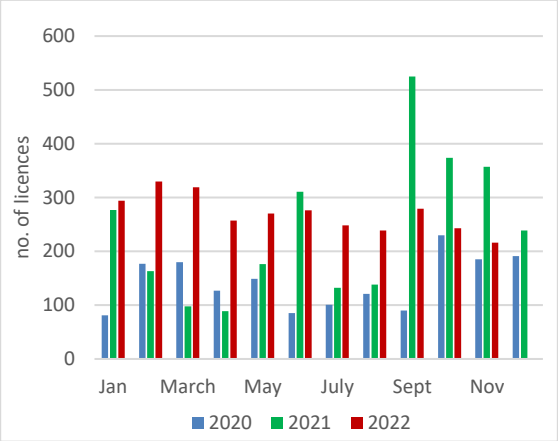
6.1 Felling Licence Approvals

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. The Forestry Felling Site Notice was amended in September, 2022 to remove the requirement for the name of the applicant to appear on the notice (DAFM 2022g)

The number of felling licences issued annually is reported as a monthly sectoral figure, combining licence numbers issued for Coillte and private forest owners (DAFM, 2022i). The total number of felling licences issued up to Week 4 November, 2022 (Figure 5) was 3,107 (Coillte 1,571, private 1,536). In comparison, the total number of felling licences issued for 2021 and 2020 was 2,879 and 1,717 respectively.

The 2022 felling licence approvals issued (to November inclusive) represent a reported thinning area of 24,286ha and clearfell area of 20,604ha. This compares to an approved thinning area of 12,494ha and clearfell area of 20,709 ha for the full year of 2021 (DAFM, 2022h). 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. Further information on the breakdown of private and Coillte licensing is contained within the DAFM weekly Forest Licensing Dashboard.

Figure 5: Monthly Felling Licences Issued 2020 - 2022



Source: DAFM, Forestry Section Monthly Reports (2020/21/22) and Forestry Dashboard

Similar to the sectoral requirement regarding afforestation licences, feedback also highlights the need to sustain progress in increasing the flow of approvals for both forest road construction and harvesting operations in 2023. These are essential elements required to maintain a well-functioning timber supply chain.

6.2 Wood Removals from Forests and Purchases by Industry

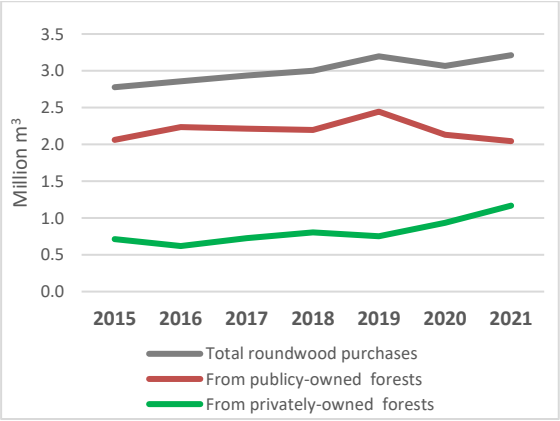
Since 2019, the Central Statistics Office (CSO) compiles annual returns for forestry data in Ireland. These includes statistics on forest wood removals and wood input purchases by industry.

Roundwood removals from forests reached a reported 4.3 million cubic metres (m^3), with a total value of €227 million in 2021. This represented an 11 percent increase in volume (from 3.89 million m^3) from 2020 levels and a corresponding 36 percent increase in value. Wood removals from private forests in 2021 comprised 48 percent of total removals, compared with 40 percent in 2020 (CSO, 2022). This reflects a continued upward trend in private timber supply.

The total volume of roundwood input purchases by industry was 3.2 million m^3 in 2021, a 4.8 percent increase from 2020 levels. Almost 1.17 million m^3, or 36 percent of overall timber purchases was from privately-owned forests, representing a 63 percent

increase in purchased volumes since 2015 (CSO, 2022, Figure 6).

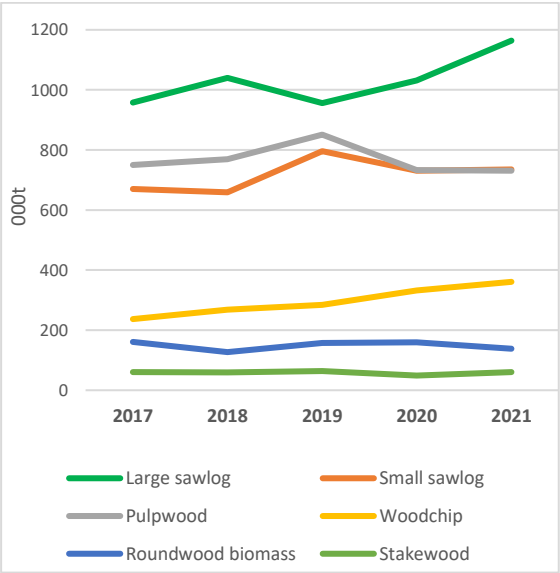
Figure 6: Roundwood Purchases by Industry 2015-2021



Source: CSO 2022

Overall, large sawlog represented the highest proportion of roundwood purchase volume at approximately 42 percent in 2021. Small sawlog accounted for 26 percent with pulpwood at 25 percent of purchase volumes respectively (Figure 7). Purchases of non-roundwood products such as brash, tree stumps, woodchip and sawdust totalled 487,000 tonnes in 2021.

Figure 7: Coniferous Roundwood Purchases by Product 2017-2021



Source: CSO 2022

6.3 Global Timber Supply/Demand Trends

Global trade of softwood timber fell by an estimated 10 percent in the first half of 2022, when compared to the same period the previous year. This was reported as mainly driven by lower timber demand in the US, China and Germany. At the same time, as a result of a boycott of Russian forest products by European Countries, North America and Asia, Russian timber exports fell by over 30 per cent year-on-year during the first six months of 2022. These exports are expected to fall further in the second half of the year (Global Wood Markets Info, 2022a).

Weakening wood demand and sharp falls in timber prices which reduced production rates were reported through North America in the spring and summer of 2022. In Europe, the boycotting of Russian forest products created significant uncertainty in the timber market. Buyers were reported to have responded by growing timber inventories in the expectation that supply would tighten in the second half of 2022 (Global Wood Markets Info, 2022a). However, this short-term demand upswing promptly faded with timber prices softening in early summer, 2022.

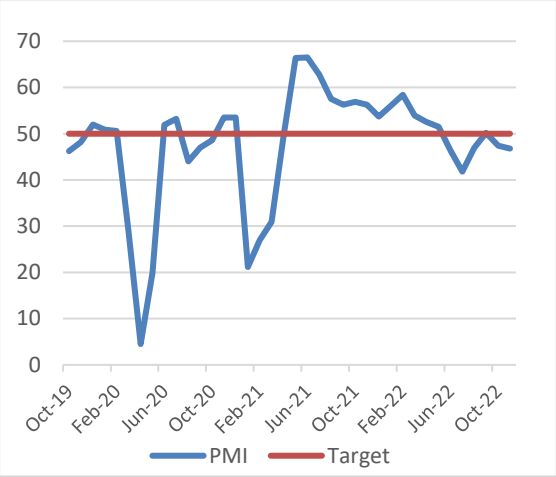
Timber exports from Nordic countries were reported to have fallen by approximately 5 percent year-on-year between January and May 2022. Shipments of wood to China reduced considerably, with a fall of 30 percent between Quarter 1 (Q1) and Quarter 2 (Q2), 2022. This resulted in timber volume exports for Q2 being close to being the lowest in seven years (Global Wood Markets Info, 2022a).

7. Timber Demand Drivers

7.1 Domestic Timber Demand

The BNP Paribas Real Estate Ireland Construction Index (PMI) is a seasonally adjusted index which tracks changes in construction activity over time. Index readings above 50 signal increased growth (Figure 8). The index posted a reading of 46.84 in November 2022, down from 47.4 the previous month. This was reported as the lowest reading since July 2022. The pace of decline in housing activity accelerated sharply with civil engineering falling for the ninth straight month while commercial activity contracted at a softer rate. New orders were reported as subdued, due to caution among clients, price pressures and supply issues. Also firms reportedly reduced their input buying sharply, to the greatest extent in three months (Markit Economics, 2022).

Figure 8: BNP Paribas Real Estate Construction PMI Oct 2019 to Nov 2022



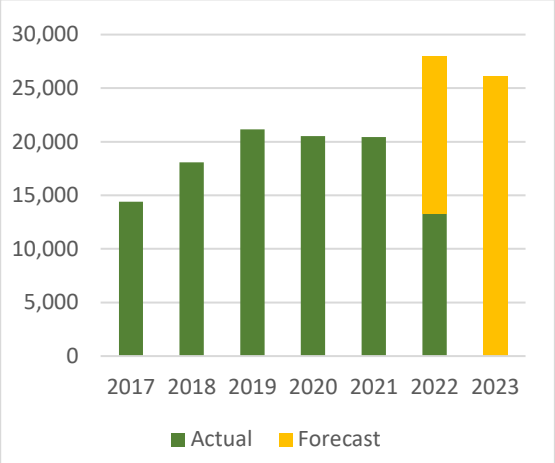
Source: Tradingeconomics.com

BNP Paribas Real Estate Ireland Construction PMI Report (December 2022) commentary suggested that sentiment was optimistic that activity will increase over the coming year, with some expecting housing demand to support growth. (Market Economics, 2022).

The Economic and Social Research Institute outlined how, while delivering housing supply has been a long term challenge for the Irish economy and Irish society, the current inflationary pressures in the construction sector post a further risk to delivery (McQuinn *et al*., 2022). In addition, the reported general moderation in the broader economy and rising interest rates are identified as factors presenting challenges on the demand side of the housing market as households struggle with affordability challenges. The combination of such factors can result in a lower level of housing completions if such risks materialise or if the underlying downside factors weaken (McQuinn *et al*, 2022).

Figure 8 shows the number of dwelling completions in the State since 2017, with forecasts for 2023. A total of 20,433 dwelling completions were reported in 2021, which was just 0.5 percent less than the 2020 level (CSO, 2022). Given the multitude of economic factors resulting in downside risks for the housing sector (lower household demand, rising input cost pressures and uncertainty, McQuinn *et al* (2022) have revised their forecasts for housing supply). Housing completions are forecast to be 28,000 units for 2022 and 26,000 for 2023 (Figure 9).

Figure 9: Dwelling Completions RoI (actual and forecast) 2017-2023



Source: CSO and ESRI 2022

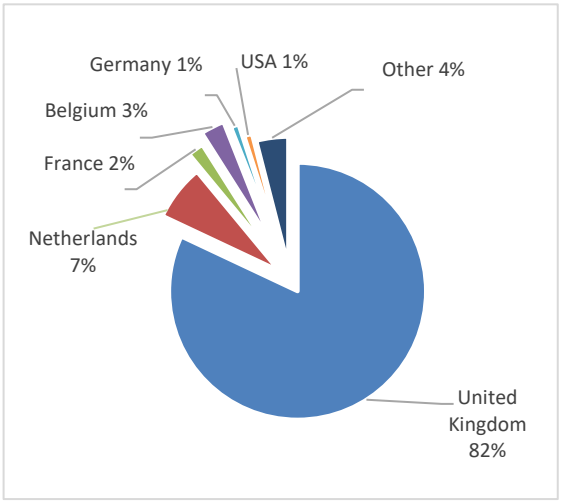
7.2 UK and Other Markets

The United Kingdom (UK) is the largest single importer of timber in Europe. Wood imports to the UK in 2021 included an estimated 8.2 million m^3 of sawnwood (a 3 percent increase from 2020) 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 53.1 million m^3 of wood raw material equivalent (underbark) in 2021, representing a 3 percent decrease from 2020 figures (Forestry Commission, 2022).

Overall timber import volumes into the UK in the first eight months of 2022 stood at 6.8 million m^3. This represents the lowest January to August total since 2016. Softwood import reductions were reported as mainly responsible, with volumes 25 percent lower than in 2021 and 16 percent lower that pre-pandemic volumes in August 2019 (Global Wood Market Info, 2022).

The United Kingdom is by far Ireland's largest export market, accounting for 82 percent of forestry and wood-based product exports by value (Figure 10) and 88 percent by volume. Although the volume of forestry and wood-based products exported to the UK dropped by 2 percent in 2021 compared to the previous year, the value of exports to the UK increased by 60 percent from €349 million to €558 million. Apart from the United Kingdom, the Netherlands, Belgium, France, Germany and United States were destinations for Irish Forestry and wood-based products (DAFM 2022c and Figure 10).

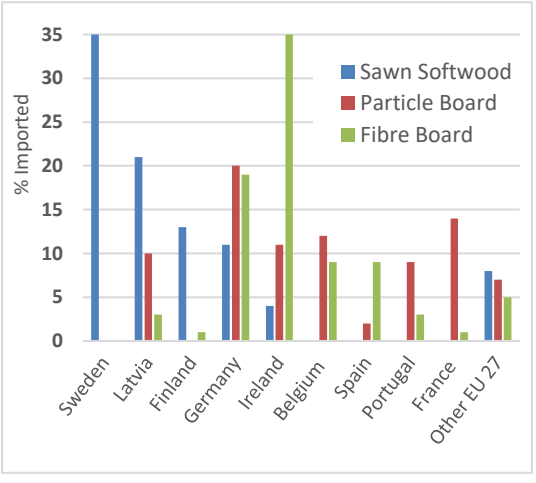
Figure 10: Top destination countries for forest and wood-based exports in 2021 by value



Source DAFM 2022c

Medium density fibreboard (MDF) accounted for 78 percent in value of forestry and wood-based product exports in 2021 and was worth €236 million, accounting for close to 300,000 tonnes. Sixty nine percent of Irish MDF exported went to the United Kingdom. Wood of coniferous species, thicker than 6 mm, was the second largest export product. It accounted for 45 percent of forestry and wood-based products exports and was worth €183 million, also accounting for close to 300,000 tonnes. Almost all of this product went to the United Kingdom.

Figure 11: Country of origin of wood imports (per cent) to the UK 2021

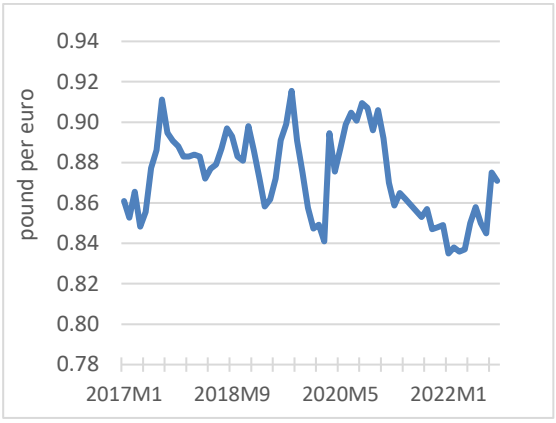


Source: Forestry Commission, 2022

The Forestry Commission trade statistics for 2021 reported that Ireland supplied 4 percent of the UK sawn timber products market, down from 5 percent in 2020. Sweden, with 35 percent, Latvia, with 21 percent, Finland with 13 percent Germany with 11 percent provided the majority of sawn softwood imports (Figure 11). Ireland supplied a reported 11 percent of the fibreboard and 35 percent of the particleboard imports to the UK in 2021.

The UK timber products market is subject to cyclical price fluctuations, reflecting trends in the UK economy. 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 12 presents the Euro-Sterling (€/UK£) relationship between January 2017 and October 2022.

Figure 12: Euro - Sterling Exchange Rate Jan 2017 to October 2022



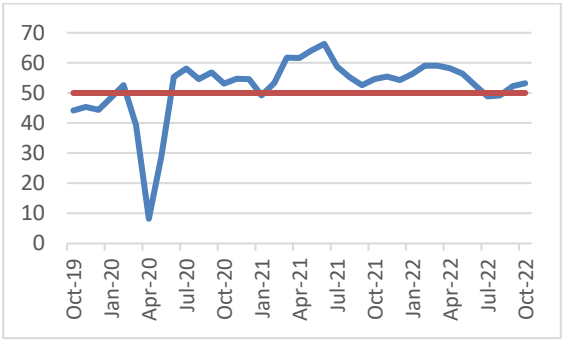
Source: European Central Bank, 2022

Sterling has generally maintained a course of depreciation against the Euro in 2022, having declined by 4.3 percent up to October. A weaker Sterling negatively impacts the competitiveness of Irish timber exports to the UK.

7.3 UK Economy

Figure 13 presents the S&P Global/CIPS Construction PMI between October 2019 and October 2022. Readings over 50 indicate growth.

Figure 13: S&P Global/CIPS UK Construction PMI Oct 2019 to Oct 2022



Source: www.cips.org

The index recorded an increase to 53.2 in October, from 52.3 the previous month. Despite this increase in growth, there was a reported drop in optimism reflecting falling volumes of new work and concerns over the UK's longer term economic outlook. (ww.cips.org, 2022).

Timber Development UK (TDUK) reported slower demand, particularly from repair maintenance and improvement (RM&I), but also lower import volumes could be attributed to healthy UK stock levels. The supply situation was reported as "steadier" in 2022 with timber stocks at more stable levels compared to 2021. In terms of timber demand, the cost-of-living crisis reportedly began to impact on the construction sector with high energy prices impacting consumer confidence and reducing demand for home improvements. TDUK also express some room for confidence in the sector with need for low-carbon construction materials being more important than ever, a fact highlighted at the COP27 summit (Global Wood Market Info, 2022).

The UK Construction Products Association (CPA) forecasts construction output to fall by 3.9 percent in 2023 following a rise of 2.0 percent in 2022. The fall for 2023 is a sharp downward revision from -0.4 percent in the lower scenario of the CPA's Summer Forecast. It is reported as mainly due to the impact of a wider economic recession, exacerbated by the effect of the 'Mini Budget' and the consequent fallout from recent political uncertainty (CPA, 2022).

8. Timber prices

Published timber price information for both Coillte and private sales has not been available during 2022. Magner (2022) outlines how Coillte prices are no longer available because of market sensitivity, while the UCD Wood Price Quarterly for standing private timber sales has been impacted by a lack of available price data.

Despite the overall lack of published timber price data, industry sources reported reductions in timber prices during 2022 from record prices achieved during 2021. This reduction is linked to factors affecting the prevailing market situation, including economic uncertainty, a fall in construction activity since July (see section 7) and UK timber market variability.

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 also vary significantly based on factors such as forest age, timber quality, the extent and quality of previous management interventions, including forest thinning and decisions on timber assortments made at time of harvesting.

Table 3 presents indicative timber assortment (mill gate) prices for the period July to September 2022. 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 €22 to €27 per tonne for thinning and €12 to €15 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		41-43
Stake	1.6+	>8 <15	
Pallet	3.4	14+	66 - 77
Pallet	3.7	14+	72 - 85
Sawlog	3.7+	18 - 20+	
Sawlog	4.9	18 - 20+	104-115

Source: Industry sources during 2022
Note: Prices are indicative **mill gate** (delivered in), expressed as € per tonne, and can vary according to a range of factors

The Irish Farmer's Association (IFA) Farm Forestry Timber Price survey comparing the periods January-March and July-September 2022 is shown in Table 4.

A comparison of surveyed roadside prices for Q4, 2021 and Q3, 2022 indicated a timber prices for timber and sawlog in particular decreased by a reported 20 percent.
It should also be noted that the price ranges provided are indicative rather than absolute. Prices are expressed as roadside sales (where the timber is sold to the buyer on the forest road and the harvesting contractor is paid by the forest owner) and in € per tonne.

Table 4: IFA Farm Forestry Timber Price Surveys, Comparing Jan- March and July-September 2022

Product	Length (m)	Diameter (cm)	Roadside Price Nov/Dec 2021 (€/tonne) (ex VAT	Roadside Price July-Sept 2022 (€/tonne) (ex VAT)
Pulp	3	< 7	26-44	28-40
Stake	1.6	>8 <15	42-75	35-44
Pallet	2.5	14+	40-63	37-48
	3.1	14+	60-79	53-60
	3.4	14+	74-80	58-65
	3.7	14+	70-82	60-72
Sawlog	4.9	20+	95-117	80-105
	5.5		114-127	95-110

Source: IFA Farm Forest Timber Price Surveys 2022, Note: Prices are roadside and expressed as € per tonne

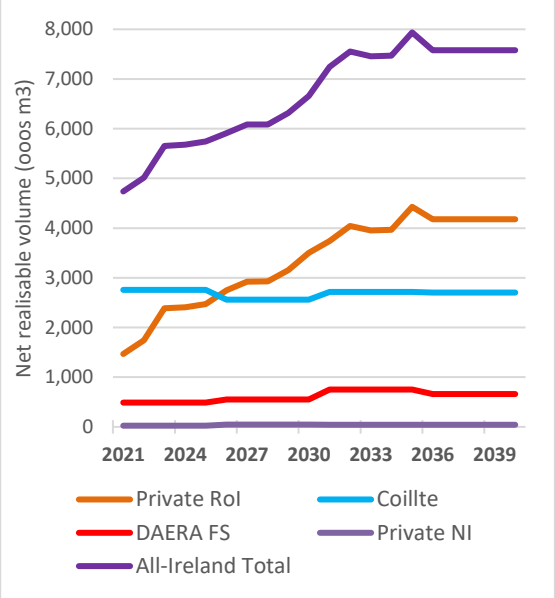
9. Realisable Future Timber Volumes

The COFORD All Ireland Roundwood Production Forecast 2021-2040 (Phillips *et al.,* 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 14).

Figure 14 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 from this sector 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.

Figure 14: 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)

10. Forest Certification

The increasing timber supply forecast from Irish forests brings the urgent requirement for certification into sharp focus. 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). Forest Certification incorporates two processes:

- Assessing forests to determine if they are being managed according to agreed standards, known as Forest Management Certification
- Labelling wood that has been harvested from a well-managed forest, known as Chain of Custody Certification

A COFORD-commission study on private forest certification in Ireland (Forestry Services *et. al.,* 2022) established that only 5.7 percent of private forests in Ireland, representing an area of 15,680 ha, are certified. In terms of market access, a survey questionnaire was completed by entities in the processing and wood panel sectors. Lack of forest management certification was identified by 40 percent of survey respondents as an issue for them purchasing timber from the private sector within the past year. Ninety percent of respondents indicated that lack of forest management

certification will be an issue regarding purchasing timber from private forests in the future.

The certification study describe how 55.4 percent of total roundwood production will be available from the private sector over the next 20 years. A 70 percent rule for certification claims applies, which involves a concession to certificate holders allowing limited mixing of certified and uncertified material). Assuming this 70 percent threshold remains in place, then approximately 24.6 million m^3 will require certification in the long term (Forestry Services *et al*, 2022).

However, an estimated 2.9 million m^3 of timber from private forests will need to be certified over the next 5–year period. This is estimated in the study to represent approximately 2,000 forest owners. In the absence of increased certification, there is a predicted significant impact as timber processors will either have to import additional certified timber to meet this 70 percent threshold and/or develop markets for non-certified material (Forestry Services et al, 2022). The study suggests that this could result in a decrease in timber price for uncertified timber and the scenario of withholding of timber by the private sector in anticipation of developing markets.

As harvesting levels in the private sector are projected to surpass Coillte levels by 2026 (Figure 13), this study highlights the urgency of increasing the area of certified private forestry in order to help ensure future access to timber markets. It also provides a series of recommendations to help facilitate certification uptake by private forest owners.

Voluntary forest certification schemes are run by international non-governmental organisations to promote good forest practice. There are currently two certification 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 COFORD-commissioned study indicated that dual certification is required by the forest processing sector. The study concluded that a national group certification scheme is the only sustainable approach that can adequately address identified barriers. It also suggested the need for the establishment of a new legal entity, supported by a representative steering group with representation and collaboration across the forestry sector (Forestry Services *et al*, 2022).

Meeting certification standards involves a chain of custody traceability and evidence of 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.

11. 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.

As part of the European Green Deal, the European Commission has committed to achieving a series of actions under the Fit for 55 Package. (European Council, 2022). It is a highly significant, cross-sectoral package detailing the binding actions, by which it is proposed the EU will reduce greenhouse gas emissions by at least 55 percent by 2030 as compared to 1990 levels. The Fit for 55 package consists of proposals to amend existing legislation as well as new initiatives in climate, energy & fuels, transport, buildings, land use and forestry.

The increased ambition under the Renewable Energy Directive to set a target of 40 percent of gross final consumption of energy being met from renewable sources by 2030 is of particular interest to Ireland (DAFM, 2022c). While energy policy is a matter for the Department of the Environment, Climate and Communications (DECC), DAFM works closely on related matters promoting energy efficiency. These include increasing on-farm generation of renewable energy and regulating agricultural feedstocks to produce indigenous biomethane as the renewable alternative to natural gas. There will be increased opportunities for the agricultural sector to turn renewable biological

resources and agriculture by-products into value-added bio-based products and bio-energy. Realising the potential of such opportunities will require sustained attention over the period ahead.

In addition, DAFM continues to support farmers, foresters and landowners to participate in this energy transition through achieving energy use efficiencies, the deployment of renewable energy technology sources for self-consumption and in the provision of biomass feedstocks (DAFM, 2022c).

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 1980s.

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).

Increasing uptake levels of the SSRH can stimulate demand for small logs and wood chip. 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).

12. Brexit

The impact of Brexit continues to be felt through new requirements for both import controls and for export certification. In 2021, operational responsibility for import controls at Dublin Port, Dublin Airport and Rosslare Europort were transferred to the Department's new Import Controls Operations Division. Forestry imports from Great Britain (GB) have largely been via 'roll-on roll-off' transport through Dublin Port, but there is also trade of coniferous roundwood into a number of regional ports (DAFM, pers. comm.).

The GB market is of enormous importance for the Irish forest sector. Upon leaving the EU, new phytosanitary requirements applied including the requirement for an exporter of a controlled commodity to obtain a Phytosanitary Certificate from DAFM which involves inspection and the issue of an official document by the Department to the exporter. In order to meet this new demand from the exporting sector a new IT system Export Certification System (ECS) was developed and made available to the sector through an on-line portal. Exporters were briefed throughout on the new requirements and the mechanism for application for Phytosanitary Certificates backed up by training. New staff were recruited by the Department to deal with this new requirement (DAFM, pers. comm.).

ISPM No. 15, is the FAO IPPC, International Standard for Phytosanitary Measures, Regulation of Wood Packaging Material in International Trade. ISPM 15 describes phytosanitary measures to reduce the risk of introduction and/or spread of quarantine pests associated with wood packaging material made of raw wood, in use in international trade. In practice, wood packaging material made from unprocessed raw wood and used in supporting, protecting or carrying a commodity, must be subject to a specific phytosanitary treatment (e.g. heat treatment). In addition each individual unit of the wood packaging material must be marked on at least two sides with the officially approved ISPM No. 15 mark verifying the treatment and incorporating the country code and the registration number of the producer of the packaging.

Wood packaging material, associated with exports of goods of all kinds from Ireland to most non-EU countries around the world, is required to comply with ISPM No. 15. Since January 1st 2021, this requirement also applies to wood packaging going from Ireland to Great Britain. ISPM No. 15 thereby facilitates exports by Irish companies, which are being transported using wooden pallets, crates, loose wood dunnage etc. In Ireland there are currently 52 companies authorised to treat WPM to ISPM 15 Standard. The Forestry Inspectorate is responsible for the national implementation of ISPM No. 15.

13. 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 has the potential to transform the industry, boost the rural economy and deliver a green vision for new technologies in Ireland, but requires significant R&D.

The NXTGENWOOD is a multisectoral research programme, funded by DAFM is addressing innovation in structural timbers, green adhesives and resins for bonded wood products (e.g. plywood and MDF) , extraction and synthesis of biomaterials and the development of wood-based composites and biopolymers (nextgenwood.ie, 2022). Its research programme has the following broad 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;
- Sponsor development of science to help fulfil Ireland's sustainability targets.

NXTGENWOOD's is a collaboration between BiOrbic, AMBER and others. Biorbic is a national collaboration of researchers working on separating and extracting valuable compounds from renewable materials and converting these resources into novella bio-based products and processes, delivering market and industry-scalable sustainable resources (Biorbic.com, 2022). 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 hosted by Trinity College Dublin, in partnership with CRANN (Centre for Research on Adaptive Nanostructures and Nanodevices) and a range of key collaborators.

14. 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 (2021) 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.

14.1 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 8,000ha and 16,000ha 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 (COFORD, 2021).

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 (COFORD 2021).

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 suggested 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).

14.2 Climate Change Adaption

COFORD (2021) 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.

14.3 Use of Wood Products

The increased use of wood products provides a pathway and opportunity to significantly reduce the embodied emissions of buildings. COFORD (2021) 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 internationally in high-rise construction up to 24 storeys. 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, 2021).

The COFORD adaptation 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.

15. Forest Health

Ireland's Plant Health and Biosecurity Strategy 2020-2025 (DAFM, 2019) 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. It 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.

The Plant Health Regulation EU 2016/2031 and Official Controls Regulation EU 2017/625 came into effect in December, 2019. This Plant Health Regulation replaced 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, 2022f). These include appropriate import controls, requirements for the implementation of Plant Passport systems, health surveys and contingency planning and requirements in relation to regulation of wood packaging materials in international trade.

The Plant Health Regulation sets out a list of priority pests (those pests whose potential economic, environmental or social impact is the most severe for the Union territory) for which the Department is required to conduct mandatory annual surveys. For

example, the main priority pests from the forestry perspective include *Agrilus planipennis* (emerald ash borer), *Agrilus anxius* (bronze birch borer), *Anoplophora chinensis* (citrus long-horn beetle*), Anoplophora glabripennis* (Asian long-horn beetle), *Dendrolimus sibiricus* (the Siberian moth) and *Bursaphelenchus xylophilus* (pine wood nematode).

The Regulation also requires that by August 2023 Member States prepare and publish on the internet contingency plans for all those priority pests that could establish on their territory. DAFM is currently working on these plans, and the process will involve consultation with relevant stakeholders.

Ireland has Protected Zone status for 14 harmful organisms that are present in other EU member states but not present here. To justify Irelands Protected Zone status, the Forestry Inspectorate conducts national forest surveys and reports annually to the European Commission. For example a network of observation points, pheromone traps, bait logs and sampling points distributed around the country is used to monitor for the presence of regulated organisms and for general forest health monitoring purposes. No detection of any of these organisms was reported from surveys conducted in 2019, 2020 and 2021 (DAFM 2022e).

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. DAFM surveys conducted in 2021 included a systematic survey in a selection of 10x10km grid squares where there had not previously been a confirmed positive. By the end of 2021, there had been disease findings in ash in all 26 counties in over 675 locations in various settings – forests, nurseries and garden centres, on farm planting, roadside and motorway planting, hedgerows and private gardens (DAFM 2022e). Evidence of significant further disease spread during 2021 is also clear in all of the above contexts.

A proactive approach is essential to minimise the economic, ecological and social impact of the disease. In order for this to happen, forest owners also require clear guidance and appropriate supports to facilitate positive management interventions.

Teagasc continues to actively support this essential effort and facilitates the transfer of knowledge on best practices for the management of woodlands affected by Ash Dieback, informed by ongoing research. Teagasc's Forestry Development Department produced a series of videos during 2022 to provide objective advice to forest owners whose ash plantations have been affected by ash dieback (*Hymenoscyphus fraxineus*) and to highlight the important factors that need to be considered when removing the infected ash trees and replacing them with alternative tree species.

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 disease-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 2021, the disease had been confirmed present in Japanese larch at 61 forest locations affecting over 337 ha of forestry (DAFM 2022e). DAFM forestry inspectorate continued to conduct surveys of larch for the presence *of Phytophthora ramorum* in 2021 and 2022 with increased detection and reporting of the disease.

At an EU level, the review of the regulatory status of *P. ramorum* has resulted in the reclassification of *Phytophthora ramorum* the effect of which is that non-EU isolates of *P. ramorum* will be treated as Union quarantine pests while EU-isolates will be regarded as a Regulated Non-Quarantine Pest (RNQPs). The impact of this is that there is no longer a statutory requirement to act on finding the disease (EU-isolates) in a forest location.

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 2018e). 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 Ips typographus / Ips cembrae

The eight-toothed European spruce bark beetle (*Ips typographus*) is considered a serious pest and threat on spruce in Europe. In July 2022, UK Forestry Commission officials found the presence of *Ips typographus* on spruce in Kent, Surrey, East and West Sussex. An existing demarcated area, covering those counties, was extended to parts of Hampshire in a bid to combat the spread of the insect (Forestry Journal.co.uk, 2022).

While this insect is considered mainly a secondary pest, preferring stressed or weakened *Picea sitchensis*, *Pinus* spp. and *Abies* spp., under the right conditions, beetle numbers can increase enough to result in attacks on living trees. If left uncontrolled, the beetle, in association with pathogenic fungi, has the potential to cause significant damage to spruce-based forestry and timber industries (Gov.uk, 2022).

The Scottish forestry authorities informed DAFM that the large larch bark beetle, *Ips cembrae*, had been detected in traps at three locations within the Pest Free Area (PFA) of Scotland during 2022 surveillance. This species is one of the six bark beetles for which Ireland has a Protected Zone and is the first recording of the beetle inside the Scottish Pest Free Area (PFA). Scottish Forestry has conducted inspections in surrounding areas and no evidence of beetle activity or the presence of a breeding population have been found. As a result of this finding, the Department, in association with authorities of Northern Ireland, has agreed that exports of larch roundwood and bark from the PFA to the Island of Ireland are suspended. Scottish Authorities have stated that they will not be issuing Phytosanitary Certificates for roundwood of larch from the PFA while wider surveillance is completed.

15.5 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.

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. Tuffin (2020) 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.

In 2020, the DAFM Pest Risk Analysis Unit (PRAU) was created through the appointment of two new Pest Risk Analysts. These staff carry out and coordinate a number of activities across DAFMs plant health teams. The PRAU's primary duties are to undertake:

- Horizon scanning for emerging plant health threats
- Risk evaluation
- Risk communication

16. Knowledge Transfer Group (KTG) Scheme

Senator Pippa Hackett, Minister of State for Biodiversity and Land Use, re-opened the current Forestry Knowledge Transfer Group (KTG) scheme in March 2022. A total of 35 groups were proposed, incorporating over 670 forest owner participants. The aim of the scheme is to facilitate additional knowledge among forest owners and increase the level of management activities in private forests. Since its inception in 2018, the KTG Scheme, DAFM has invested in excess of €1.3

million in knowledge transfer for Irish forest owners, funding over 1500 participants (DAFM 2022l)

17. Outlook for 2022 and beyond

17.1 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 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.

17.2 New CAP 2023-2027

The new 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 enhancement of provisions and measures 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) highlighted 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.

17.3 Food Vision 2030

The Food Vision 2030 Report (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 being finalised 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 Report 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.

17.4 Afforestation

There is a clear urgency to sustainably increase afforestation rates and make progress towards stated planting targets in 2023 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 recently-announced proposed investment by the Government of over €1.3 billion in Irish forestry will support the national Forestry Programme 2023-2027. Strong positivity around the proposed new Forestry Programme 2023-2027 measures will need to be combined with provision of strong support to farmers and landowners in re-engaging with forestry and building confidence regarding its many benefits.

The measures proposed in Ireland's draft Forest Strategy Implementation Plan (DAFM 2022f) aim to

re-engage landowners including the farming community in afforestation through a range of approaches:

- Introduce new sources of income for qualifying applicants to bridge the gap between the last premium payment and revenue from timber;
- Make the planting of small forests more attractive to farmers;
- Offer higher payments for forests that deliver more environmental benefits;
- Improve awareness amongst the general public regarding the benefits of forestry and make forests more accessible for recreation and amenity;
- Achieve enhanced biodiversity;
- Adopt measures to address species diversity;
- Increase the resilience of the national forest estate to the effects of climate change (climate adaptation).

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.

17.5 Sustainable Forest Management

The draft Forest Strategy 2023-2030 (DAFM, 2022k) also outlines how all forest types can deliver benefits to the economy, environment and society. The choice of management approach will result in trade-offs between the forest types and the range of benefits they can provide. Each will have its advantages and disadvantages depending on the objectives and purpose of the forest. This will mean applying the most appropraite forest management approach for the objectives set for a forest, whether it be even-aged forests with a commercial focus, closer-to-nature forests, semi-natural forests or agroforestry but within the overall framework of Sustainable Forest Management (DAFM, 2022k).

The measures proposed in Ireland's draft Forest Strategy Implementation Plan (DAFM 2022f) also aim to support sustainable management through a range of approaches, including the following:

- Intervention 4 has the primary objective of offering forest owners a range of schemes to manage their forests sustainably to increase the delivery of ecosystem services, biodiversity, regeneration capacity and vitality. These include the following measures:
  - Measure 1: Woodland Improvement Scheme (WIS) covering thinning, tending and agroforestry maintenance,
  - Measure 2: WIS covering the conversion of existing forests to Continuous Cover Forestry (CCF),
  - Measure 3: WIS comprising the adoption of coppice and coppice with standards
  - Measure 4: WIS involving seed stand management
  - Measure 5: Deer Tree Shelter, Hare and Deer Fencing Scheme
  - Measure 6: Forest Management Plans
  - Measure 7: Native Woodland Conservation
  - Measure 8: Pilot Scheme for Environmental Enhancement, encouraging forest owners to manage their forest with an approach that enhances archaeology, water quality, habitats and species.
- Intervention 5 is has a focus on developing skills and empowering the sector for Sustainable Forest Management:
  - Measure 1: Forest Knowledge Transfer Groups
  - Measure 2: Training calls for Proposals
  - Measure 3: Forest promotion
  - Measure 4: Continuous Professional Development
- Intervention 6 provides support, via 5 proposed measures, for management practices delivering increasing accessibility and amenity features in existing social, cultural and heritage forests.
  - Measure 1: The Forest Classroom (pilot)
  - Measure 2: Neighbourwood
  - Measure 3: Neighbourwood - the active forest
  - Measure4: Neighbourwood –Heartwoods
  - Measure 5: Heritage Forests (pilot)

The draft Forest Strategy Implementation Plan also contains a proposed Payment for Ecosystem Services (PES) Pilot Premium Structure. This proposed pilot promotes the longer-term sustainable management of forests. It proposes that applicants, out of premium, or who never

received a grant payment, would be considered for approval to select a PES option in accordance with the management practice selected for native woodland conservation, CCF, seed stand management, environmental enhancement, creation of public access or planting for water protection.

17.6 Timber Mobilisation

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. Intervention 3 of the draft Forest Strategy Implementation Plan, proposes 9 measures supporting infrastructure and technology investments. These include a Forest Road Scheme and additional support elements, investment aid for the development of the forest tree nursery sector and support for innovation and development of technology tools via a Forest Technology Challenge Grant.

Net realisable timber production from private 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). An urgent focus on the rapid expansion of forest certification in the private forest sector has been identified as necessary to ensure the sector is well positioned to meet future timber market requirements (Forestry Services *et. al.*, 2022).

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 continues to be facilitated in private forests that are suitable for this important silvicultural practice.

Teagasc, in co-operation will the wider forestry sector, 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.

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 2023. 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. Sustained progress in the licencing of forest roading and felling activities is also deemed essential to enable sustainable wood mobilisation and supply to domestic and export timber markets.

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 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.

17.7 Carbon Farming

The Food Vision 2030 Report (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.

Ireland reports and accounts the carbon emissions and removals associated with all sectors, including forestry. On November 30, 2022, the European

Commission adopted a proposal for a first EU wide voluntary framework to reliably certify high-quality carbon removals. It aims to boost innovative carbon removal technologies and sustainable carbon farming solutions. It sets out rules for the independent verification of carbon removals as well as rules to recognise certification schemes that can be used to demonstrate compliance of carbon removals. The proposed regulation establishes four QUALITY criteria (European Commission, 2022). There is recognition that in agriculture and forestry, carbon farming practices can sustainably enhance the storage of carbon in soils and forests or reduce the release of carbon from soils, and create a new business model for farmers and foresters. Long-lasting products and materials, such as wood-based construction products, can also keep carbon bound over several decades or longer.

The Commission proposal will now be discussed by the European Parliament and the Council, in line with ordinary legislative procedure. Based on the QUALITY criteria, the Commission will develop tailored certification methodologies for the different types of carbon removal activities, supported by an expert group.

All member states will subsequently consider systems to facilitate the voluntary trading of carbon and the EU will set the rulebooks on how that might happen with the intention that farmers should be rewarded for the sequestration of carbon.

17.8 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 8.2 million m^3 of sawnwood and 3.8 million m^3 of wood based panels in 2021 (Forestry Commission, 2022). 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 appropriate levels of timber mobilisation are achieved.

17.9 Forest Investment Scenarions

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 relatively new development in the private forest sector 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 developing insights into the merits of this expanding forest investment sector. It is also critical in terms of ensuring that the considerable value underpinning productive forests can be fully realised by owners. In appropriate 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.

References

Barrett, P. (2020). Creating and shaping the development of Ireland's bioeconomy. The Teagasc ConnectEd Signpost Series; pointing the way to low impact agriculture. Available at: https://www.youtube.com/watch?v=7U0yiLQ7hTI

Biorbic.com, (2022). Bioeconomy SFI Research Centre. Accessed on 04/12/2022. Available at: https://biorbic.com/about/

Climate Change Advisory Council (2021). Carbon Budget Technical Report, October 2021. Available at: https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/Technical%20report%20on%20carbon%20budgets%2025.10.2021.pdf

COFORD, (2018). COFORD Forest Land Availability Implementation Group. Department of Agriculture, Food and the Marine, Dublin. Available at: http://www.coford.ie/media/coford/content/publications/2018/2COFORDForestLandAvailabilityImplementationGroupReport121218.pdf

COFORD (2021). Forests, wood products and their importance in climate change mitigation- A Series of COFORD Statements. COFORD, Kildare St. Dublin2. Available at: http://www.coford.ie/news/forestsandwoodproductsandtheirimportanceinclimatechangemitigationaseriesofcofordstatements.html

Coillte (2022). A Greener Future for All. Coillte Annual Report 2020. Available at: https://www.coillte.ie/media/ 2021/04/Coillte-Annual-Report-2020.pdf

Coillte (2020). *Forests for Our Future.* Annual Report 2019. Available at: https://www.coillte.ie/ media/2020/05/Coillte-Annual-Report-2019.pdf

Construction Products Association (2022). *Construction output expected to fall significantly in 2023 amid looming economic recession*. Press Release Friday 4th November Available at: https://www.constructionproducts.org.uk/news-media-events/news/2022/november/cpa-autumn-forecast-2022/

Construction Products Association (2021a). *Construction Industry Forecasts - Autumn 2021.* 25 October 2021. Available at: https://www.constructionproducts.org.uk/publications/economics/construction-industry-forecasts/construction-industry-forecasts-autumn-2021/

CSO (2021). Forestry. Available at: https://www.cso.ie/en/statistics/forestry/

DAFM (2015). *Phytophthora ramorum* Factsheet-Understanding *Phytophthora ramorum* in Irish larch forests. Available at: www.agriculture.gov.ie/media/migration/forestry/forestservicegeneralinformation/foresthealthandseeds/PHYTOFORPramorumfactsheet220915

DAFM (2018), *Ireland's National Forest Inventory 2017 – Main Findings*. Department of Agriculture, Food and the Marine, Dublin. Available at: https://www.agriculture.gov.ie/nfi/nfithirdcycle2017/nationalforestinventorypublications2017/

DAFM (2018a). *Tree diseases- ash dieback Chalara*. Available at: https://www.agriculture.gov.ie/forestservice/treediseases/ashdiebackchalara/

DAFM (2018b). Dothistroma Needle Blight (DNB) Available at: https://www.agriculture.gov.ie/forestservice/treediseases/dothistromaneedleblight/

DAFM (2019). Plant Health and Biosecurity Strategy 2020-2025. *Department of Agriculture Food and the Marine, Dublin. Available at: https://www .gov.ie/en/publication/b737e-dont-risk-it/#plant-health-bio-security-strategy-2020-2025*

DAFM (2020a). Oak Processionary Moth (Thaumeetopoea processionea). Department of Agriculture Food and the Marine, Circular 10/2020. Available at: https://www.agriculture.gov.ie/dontriskit/pestsdiseases/currentissues/hereseverythingyouneedtoknowabouttheoakprocessionarymothtreepest/

DAFM (2022). Forestry and wood sectors worth more than €2 billion annually to the economy according to new COFORD study. Government Press Release. Available at: https://www.gov.ie/en/press-release/9385e-forestry-and-wood-sectors-worth-more-than-2-billion-annually-to-economy-according-to-new-coford-study/#:~:text=The%20study%2C%20%E2%80%9CEconomic%20activity%20and,wood%20and%20wood%20products%20sector.

DAFM (2022a). Shared Vision for Forestry Published. Government Press Release. Available at: https://www.gov.ie/en/press-release/15d15-shared-national-vision-for-forestry-2050-published-visionary-document-based-on-project-woodlands-extensive-public-consultation/#:~:text=The%20Minister%20of%20State%20with,Forests%20in%20Ireland%20until%202050.

DAFM (2022b). €1.3 billion announced for new Forestry Supports. Government Press Release 03 November, 2022. Available at: https://www.gov.ie/en/press-release/2e80d-13-billion-announced-for-new-forestry-supports/

DAFM (2022c). Annual Review and Outlook for Agriculture, Food and the Marine 2022. Available at: https://www.gov.ie/en/press-release/c32cb-department-of-agriculture-food-and-the-marine-annual-review-and-outlook-published-for-2022/

DAFM (2022d). Minister McConologue announces 13% Budget increase. Government Press Release September 29 202. Available at: https://www.gov.ie/en/press-release/95bf9-minister-mcconalogue-announces-13-budget-increase/#:~:text=Up%20to%20%E2%82%AC500m%20to,the%20beef%20and%20sheep%20sectors

DAFM (2022e) Forest Statistics Ireland 2022. Prepared by the Department of Agriculture Food and the Marine. Available at: https://www.teagasc.ie/media/website/crops/forestry/advice/Forest-Statistics-Ireland-2022.pdf

DAFM (2022f). Ireland's Forestry Strategy Implementation Plan. Draft for public consultation. Department of Agriculture, Food and the Marine. Available at: https://www.gov.ie/en/consultation/b4288-consultation-on-the-draft-implementation-plan-for-the-forest-strategy-and-associated-

sea-environmental-report-and-aa-natura-impact-report/#documents

DAFM (2022g) Revised Felling Site Notice. DAFM Circular 17/2022. Available at: https://www.gov.ie/en/collection/c04fb-forestry-grants-and-premium-schemes-2014-2020-circulars/

DAFM (2022h). Project Woodland Project Board Interim Report No. 4, August 2022. Available at: https://www.google.com/search?q=project+woodland+interim+reports&rlz=1C1GCEA_enIE946IE946&oq=project+w&aqs=chrome.0.69i59j69i57j69i59l2j69i60l3.3786j0j3&sourceid=chrome&ie=UTF-8

DAFM (2022i). Forestry Division, Dept. of Agriculture, Food and the Marine Monthly Report for October 2022. Available at: https://www.gov.ie/ga/bailiuchan/20d6c-forestry-division-monthly-reports/#2022

DAFM (2022j) Trade Factsheet, Full Year 2021. Available at: https://www.google.com/search?q=Trade+Factsheet%2C+Full+Year+2021.&rlz=1C1GCEA_enIE946IE946&oq=Trade+Factsheet%2C+Full+Year+2021.&aqs=chrome..69i57.1025j0j1&sourceid=chrome&ie=UTF-8

DAFM (2022k). Irelands Forest Strategy (2022 - 2030). Draft for Public Consultation. Department of Agriculture Food and the Marine. Available at: https://www.gov.ie/en/consultation/849a5-consultation-on-the-draft-forest-strategy/#:~:text=It%20is%20an%20ambitious%20vision,people%2C%20economy%20and%20rural%20development.

DAFM (2022l). Minister Hackett announces Opening of the Forestry Knowledge Transfer Group (KTG) Scheme 2022. Available at: https://www.gov.ie/ga/preasraitis/6af2e-minister-hackett-announces-opening-of-the-forestry-knowledge-transfer-group-ktg-scheme-2022/

DECC (2021). Climate Action Plan 2021, Securing Our Future. Government of Ireland. Available at: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

DHLGH, (2021). Housing for All - a New Housing Plan for Ireland. Government of Ireland. Available at: https://www.gov.ie/en/publication/ef5ec-housing-for-all-a-new-housing-plan-for-ireland/

Dillon, E., Donnellan, T., Moran, B., Lennon, J. (2022). Teagasc National Farm Survey 2021 Preliminary Results. Agricultural Economics and Farm Surveys Department, Rural Economy Development Programme. Available at: https://www.teagasc.ie/media/website/publications/2022/Teagasc-National-Farm-Survey-2021.pdf

European Commission (2021). Renewable energy directive. 2021 revision of the directive. Available at: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en#:~:text=In%20July%202021%2C%20the%20Commission,EU's%20energy%20consumption%20by%202030.

European Commission (2022). European Green Deal: Commission proposes certification of carbon removals to help reach net zero emissions. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7156

European Council (2022). Fit for 55. Available at: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

Forestry Commission (2022). Forestry Statistics 2022. Chapter 3: Trade. Available at: https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2022/3-trade/

Forestryjournal.co.uk (2022). Ips typographus: Further finds of spruce bark beetle in England, 13 July. Available at: https://www.forestryjournal.co.uk/news/20275977.ips-typographus-finds-spruce-bark-beetle-england/

Forestry Services Ltd., Phillips, H (2022). Economic activity and employment levels in the Irish forestry sector. COFORD, Dublin, Ireland. http://www.coford.ie/media/coford/content/publications/2022/Coford%202%20The%20Estimated%20Employment%20and%20Economic%20Activity%20Associated%20with%20the%20Forestry%20Sector%20011122.pdf

Forestry Services Ltd., Western Forestry Co-op, Euroforest Ltd. Phillips, H. (2022). A Study on Private Forest Certification in Ireland. COFORD, Dublin, Ireland. Available at: http://www.coford.ie/media/coford/content/publications/projectreports/StudyonPrivateForestCertificationinIreland011122.pdf

Global Wood Markets Info (2022). UK timber imports hit six year low. Wood industry news at GWMI, November 22, 2022. Available at: https://www.globalwoodmarketsinfo.com/uk-timber-imports-hit-six-year-low/

Global Wood Markets Info (2022a). Global trade of softwood down 10%. Wood industry news at GWMI, November 7, 2022. Available at: https://www.globalwoodmarketsinfo.com/global-trade-softwood-lumber-10/

Government of Ireland (2021). Food Vision 2030 – World leader in sustainable food systems. Available at: https://www.google.com/search?q=food+vision+2030&rlz=1C1GCEA_enIE946IE946&oq=food+vision+2030&aqs=chrome..69i57.9032j0j1&sourceid=chrome&ie=UTF-8

Government of Ireland (2021a). Housing for All – A new Housing Plan for Ireland. Prepared by the Department of Housing, Local Government and Heritage. Available at: https://www.gov.ie/en/publication/ef5ec-housing-for-all-a-new-housing-plan-for-ireland/

Gov.uk, (2022). Larger eight-toothed European spruce bark beetle (Ips typographus) guidance. Available at: https://www.gov.uk/guidance/eight-toothed-european-spruce-bark-beetle-ips-typographus

Markit Economics (2022). Irish Construction PMI falls to 3-Month Low. Available at: https://tradingeconomics.com/ireland/construction-pmi

Magner (2020). Protecting Our Trees and Forests. The importance of safeguarding Ireland's forests from pests, diseases and other damage. Report on National Forestry Conference, Zoom Webinar, 8 October, 2020, Dublin.

Magner, D. (2022). *Ambitious €1.3bn forestry programme launched*. Irish Farmers Journal, 9th November, 2022. Available at: https://www.farmersjournal.ie/ambitious-1-3bn-forestry-programme-launched-732772#:~:text=Ambitious%20%E2%82%AC1.3bn%20forestry%20programme%20launched%2009%20November%202022%20Free&text=Major%20effort%20to%20revitalise%20afforestation,20%20years%2C%20writes%20Donal%20Magner.

McQuinn, K., O'Toole, C., Coffey, C., Disch, W., Kenny, E. Shiel, E. (2022). Quarterly Economic Commentary, Macro Economic Forecasting October 2022. ESRI Available at: https://www.esri.ie/publications/quarterly-economic-commentary-autumn-2022

Nxtgenwood.ie, (2022). Next generation wood products. Accessed on 04/12/2022. Available at: https://nxtgenwood.ie/

Oireachtas.ie, (2022). Questions (737, 759, 784). Written answers by Minister for Agriculture< Food and the Marine to). Tuesday, 25 October 2022. Available at: https://www.oireachtas.ie/en/debates/question/2022-10-25/739/

Phillips, H., McDonagh, M., Fairgrieve, M., Malone, L., Redmond, J. (2021) All Ireland Roundwood Production Forecast 2021-2040. COFORD, Kildare St. Dublin 2. Available at: http://www.coford.ie/media/coford/content/CofordAllIrelandRoundwoodBookREVISED150721.pdf

Ryan. M., O'Donoghue and Kinsella, A (2016). Returns on afforestation of agricultural land. *TResearch*, Vol 11, No. 4, Winter 2016. Available at: https://www.teagasc.ie/media/website/publications/2016/TResearch-Winter-2016.pdf

Ryan, M. and O'Donoghue, C. (2016). Socio-economic drivers of farm afforestation decision making. Irish Forestry. Volume 73, Nos. 1&2. Available at: https://journal.societyofirishforesters.ie/index.php/forestry/article/view/10847

S&P Global (2022). BNP Paribas Real Estate Ireland Construction PMI, Press Release. Available at: https://www.pmi.spglobal.com/Public/Home/PressRelease/4276fb6f789a4da28f4352ccf0f59fa6#:~:text=The%20end%20of%20the%20third,times%20continued%20to%20lengthen%20markedly.

Teagasc (2020). 2027 Sectoral Roadmap: Forestry. Available at: https://www.teagasc.ie/media/website/publications/2020/2027-Sectoral-Road-Map---Forestry.pdf

Teagasc (2021). Forest Certification in Ireland. Farm Forest Series No. 25. Available at: https://www.teagasc.ie/media/website/crops/forestry/advice/Teagasc-Timber-Certification-in-Ireland-Booklet.pdf

Timber Trade Federation (2020). *Brexit and the Timber Supply Chain*. TTF webinar, Tuesday 24 November, 2020.

Trading Economics (2021). United Kingdom Construction PMI. Available at: https://tradingeconomics.com/united-kingdom/construction-pmi

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Farm level Sustainability
Environmental Dimension 2022 Outlook

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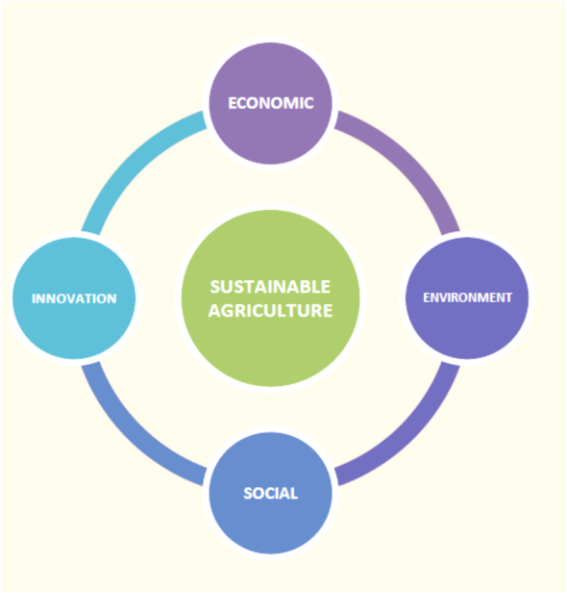
1. Introduction

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. 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 covers the greenhouse gas (GHG) and ammonia (NH3) emissions emitted at farm level.

Farm level emissions are estimated based on activity data multiplied by an emission factor. The 2021 Teagasc sustainability report (Buckley & Donnellan, 2022) sets this out in greater detail and reports results for 2021 and as well as a number of preceding years. This sustainability analysis uses activity data from the Teagasc National Farm Survey (Dillon et al., 2022) and emission factors from national inventory accounting methods for GHG (Duffy et al., 2022) and ammonia (Duffy et al., 2021). With the exception of some emission factors that relate to the dry matter intake of animals, generally speaking, emission factors tend to remain relatively static in the short to medium run until new scientific evidence emerges. Hence, GHG and NH_3 emission projections for 2022 in this chapter are based mainly on changes on farm activity levels. Farm based activity levels in 2022 are estimated with reference to the Teagasc National Farm Survey using 2021 as the base year.

The Teagasc National Farm Survey (NFS) which is part of the EU Farm Accountancy Data Network (FADN) contains a sample of 837 farms from across Ireland in 2021. The survey collects data on an annual basis on livestock numbers, cropping area, inputs and outputs, assets and liabilities, direct payments under the CAP and family farm income. 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 84,929 farms are represented in this study for 2021). 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 2022 are animal numbers, and type and quantity of chemical N fertiliser applied to land.

Animal Number Projections for 2022: The Central Statistics Office (CSO, 2022) publish bovine animal numbers held on farms each June. Results from the CSO June 2022 survey were compared with those from 2021 and this showed an increase in overall cattle numbers of 0.51% as seen by Table 1. However, this increase was not uniform across the different categories of bovines. Dairy cow numbers increased by 1.42%, this suggests that increases in livestock numbers are driven by the dairy sector as numbers of other cows declined by 2.88% between 2021 and 2022.

Table 1: Changes in cattle numbers 2021 vs 2022

Animal inventories	2021 vs 2022
Total cattle	0.51%
Dairy cows	1.42%
Other cows	-2.88%
Bulls	-4.17%
Cattle: 2 years and over	2.38%
Cattle: 1-2 years	2.01%
Cattle: under 1 year	-0.54%

Source: CSO (2022)

For the ovine numbers, overall numbers are shown to have increased by 1.4% between 2021 and 2022 with ewe numbers increasing by 3.27% over this period.

Table 2: Changes in sheep numbers 2021 vs 2022

Animal inventories	2021 vs 2022
Total sheep	6.39%
Ewes	3.27%
Rams	-1.76%
Other sheep	7.55%

Source: CSO (2022)

These national level changes in livestock inventories (by category) are applied proportionately across farms with dairy, cattle and sheep animals within the 2021 base year to yield a 2022 estimate of farm level livestock numbers. Land area farmed is assumed to remain static.

Chemical N Projections for 2021: The second major element that could likely impact farm level emissions is the volume and type of chemical fertiliser applied on farms. 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, 2022a) based on a September to October sales year. This indicates that total N (elemental) decreased by 14% year on year between 2021 & 2022. Straight CAN and NPK compounds were the most common fertilisers purchased in volume terms and the volume of each purchased decreased by 20-25% between 2021 & 2022. Sales of protected urea fertiliser increased significantly between 2021 and 2021, and now contributes 9% of total chemical N applied. Protected urea is associated with lower GHG emission (vs. CAN) and lower ammonia emission (vs. straight urea). While there has been a decline in aggregate volume of fertiliser applied between 2021 and 2022 on the back of increased prices, there has also been a substitution away from CAN based fertiliser to straight urea. This has implications for ammonia emissions, as the emission factor from straight urea is significantly higher than that of CAN or protected urea.

Changes in chemical N fertiliser applied at farm level are assumed to be reflective of the national level changes as outlined in Table 3.

Table 3: Total tonnes of Chemical N sold 2021-2022

	2021*	2022*	% change
Straight CAN	140,127	109,548	-21.8%
Straight Urea	40,687	52,823	29.8%
Protected Urea	20,540	31,282	52.3%
NK Compounds	2,947	2,632	-10.7%
NP Compounds	2,404	1,670	-30.5%
NPK Compounds	189,071	142,078	-24.9%
Other N Fertilisers	3,384	3,160	-6.6%
Total	399,160	343,193	-14%

*September to October sales year (Source: DAFM 2022a)

Technology Adoption for 2022: 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 2022 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 2021 sustainability report (Buckley & Donnellan, 2022) indicated a movement from 38% in 2020 to 48% in 2021 of aggregate slurry spread by LESS. It is assumed this transition continues in 2022 and that a similar proportional increase in aggregate slurry applied by LESS is realised in 2022. Additionally, there is preliminary data that suggests lime applied also increased by circa 18% between 2021 and 2022 (DAFM, 2022b). This has implication

for nutrient use efficiency but also GHG emissions as CO_2 is released when lime is applied.

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), others 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. Hence, drawing inference based on one year movements must be untaken with caution.

3.1 GHG Emissions

Agriculture is the largest contributor to Irish greenhouse gas emissions by sector, with 37.5% of the national emissions total in 2021 (Environmental Protection Agency, 2022). 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 down a greenhouse gas emissions reduction target of 51% by 2030 for the state and towards climate neutrality by 2050. Under the Climate Action Plan 2021, agriculture has a sectoral target of to reduce emissions by 25% by 2030 (Government of Ireland, 2022).

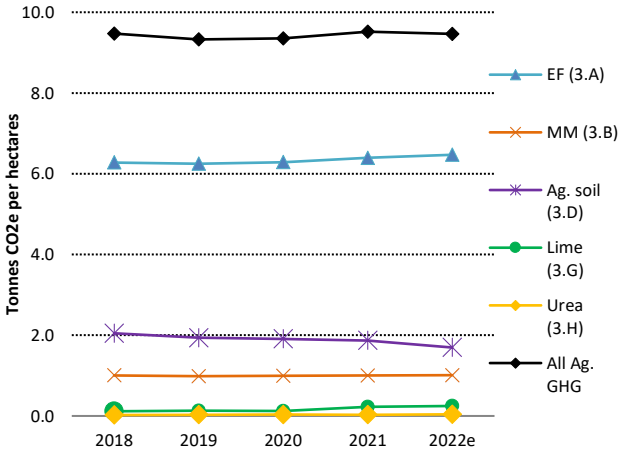
The GHG emissions indicators in this analysis are estimated following the IPCC methodology accounting conventions and Irish emission factors as employed in the 2020 National Inventory Report for Ireland (Duffy et al., 2022). The main sources of agricultural GHG emissions are methane (CH_4) emissions 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 CO_2 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 (CO_2) emissions are converted to CO_2 equivalents (CO_2e) using appropriate IPCC based global warming potentials (GWP100). The relevant co-efficients for CH_4 and N_2O are 28 and 265 respectively.

3.1.1 GHG on Dairy Farms

Figure 2 presents results by emission category between 2016 and 2022e. The 2022e result is an estimate for emissions in 2022 based on the projected changes in activity levels as set out in section 2 above.

Projections for 2022 indicated a slight decline in GHG emissions on dairy farms compared to 2021. This is driven by reduction in chemical N usage as reflected in the Agricultural soils category (3.D) in Figure 2. Reductions in this category of emissions were sufficient to override projected GHG increases in the Enteric Fermentation (3.A) and the Manure Management (3.B) categories (on the back of increased animal numbers) as well as from increased CO_2 emitted from higher liming rates (Category 3.G).

Figure 2: Dairy Farm Agricultural based GHG Emissions by emission category

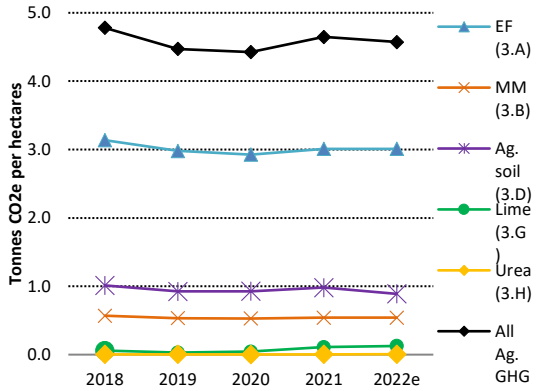


Source: Teagasc Sustainability Report and Author's estimate

3.1.2 GHG on Cattle Farms

Figure 3 presents GHG emissions per hectare results by category on cattle farms. Similar to dairying, results indicate that per hectare GHG emission have declined slightly in 2022 compared to 2021. Again this was driven by reduction in chemical fertiliser applications which were sufficient to override some increases associated with liming. Based on the composition of the average cattle herd by age category, animal numbers on cattle farms are projected to remain stable hence there is no increases in GHG emissions associated with Enteric Fermentation (3.A) or Manure Management (3.B).

Figure 3: Cattle Farm Agricultural based GHG Emissions by emission category

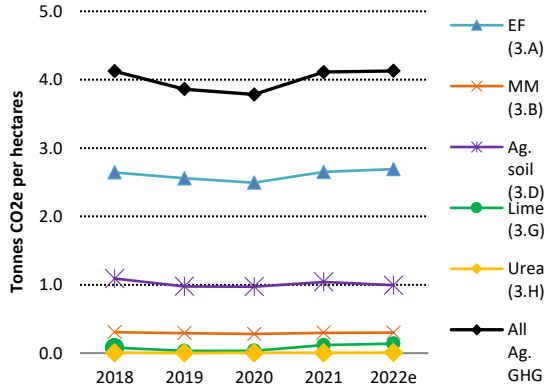


Source: Teagasc Sustainability Report and Author's estimate

3.1.1 GHG on Sheep Farms

Figure 4 reports GHG per hectare results by emissions category on sheep farms. GHG emissions on sheep farms are projected to remain stable in 2022 compared to 2021. Increased emissions associated with increased animal numbers (3.A Enteric Fermentation) and with increased liming rates (3.G) are offset by declining emissions associated with decreased chemical fertiliser use (3.D Agricultural Soils).

Figure 4: Sheep Farm GHG Emissions by emission category - Rolling 3 year average

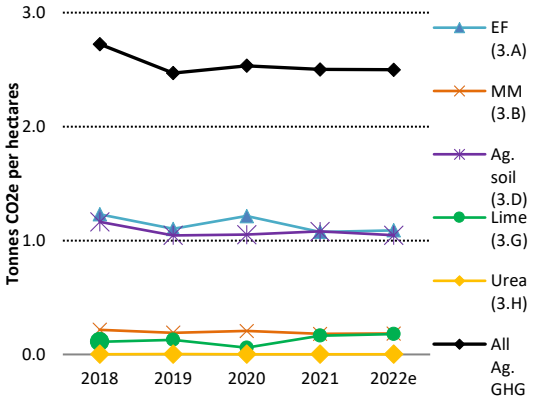


Source: Teagasc Sustainability Report and Author's estimate

3.1.2 GHG on Tillage Farms

GHG per hectare results by emission category on tillage farms are presented in Figure 5. Similar to sheep farms, emissions on tillage farms are expected to remain stable in 2022 compared to 2021. The drivers of this are also similar to what is projected for sheep with increased emissions associated with increased animal numbers (3.A Enteric Fermentation) and with increased liming rates (3.G) being offset by reduced emissions associated with decreased chemical fertiliser use (3.D Agricultural Soils).

Figure 5: Tillage Farm GHG Emissions by emission category - Rolling 3 year average

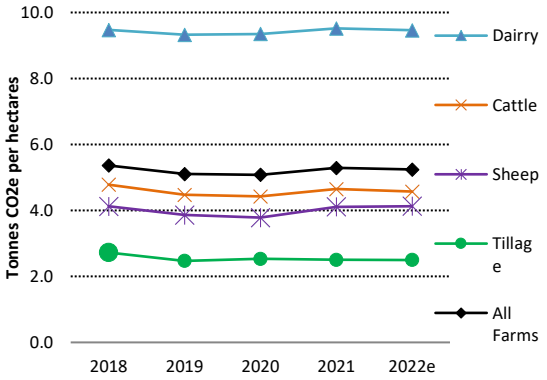


Source: Teagasc Sustainability Report and Author's estimate

3.1.3 GHG on All Farms

Figure 6 illustrates trends in average GHG emission per hectare across the different farm types. With stable GHG emissions projected for sheep and tillage farms, the decreased emissions on dairy and cattle farms is projected to lead to a slight decline of emissions on an all farms basis in 2022.

Figure 6: Total GHG Emissions (CO2e) per hectare by farm type - Rolling 3 Year average



Source: Teagasc Sustainability Report and Author's estimate

3.2 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 the 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,

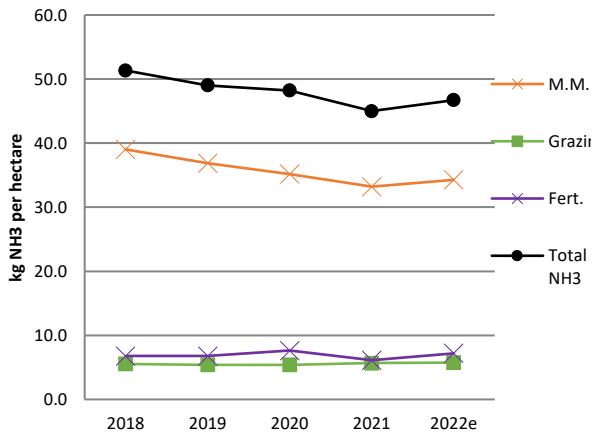
Commission 2016). Over 99.4% of Ireland's NH_3 emissions originate within agriculture, principally from animal waste and the application of synthetic fertilisers (EPA, 2022). The fact that ammonia emissions in Ireland come almost exclusively from agriculture means that any future national ammonia reduction target for Ireland *de facto* represent 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., 2022) in conjunction with the projected activity data for NFS farms in 2022 (as set out in section 2) is used for estimating NH_3 emission indicators across different farm types for 2022.

3.1.4 NH_3 on Dairy Farms

Figure 7 outlines 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 and is the major NH_3 emissions category on livestock orientated farms (accounting for over 70% of NH_3 emissions on dairy farms). With emissions associated with grazing livestock and with chemical fertiliser application making up the remaining emission categories (12-15% on dairy farms).

Figure 7: Dairy Farm NH3 emissions by category - Rolling 3 Year average



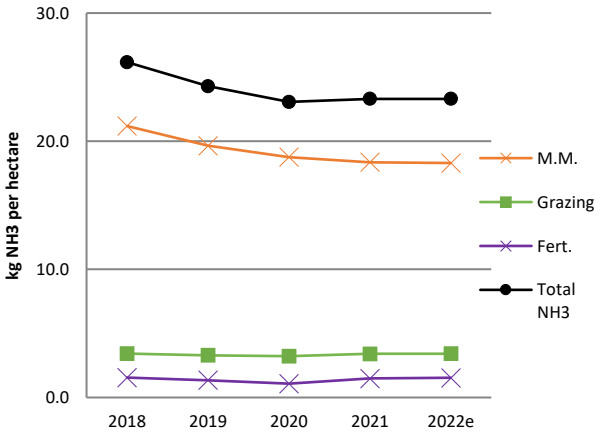
Source: Teagasc Sustainability Report and Author's estimate

In contrast to GHG emissions, ammonia emissions on dairy farms are projected to increase slightly in 2022 compared to 2021. This is driven by increased animal numbers (leading to increased N excretion) and by the mix of chemical fertilisers used in 2022 compared to 2021. Although there was an overall reduction in the use of chemical N there was a substitution towards straight urea in 2022 with volume applied up by circa 30% compared to 2021. The ammonia emission factor associated with straight urea is a multiple of that associated with CAN or protected urea. Hence, this was a significant factor behind the projected increase.

3.1.5 NH_3 on Cattle Farms

NH_3 emissions on cattle farms are outlined in Figure 8. The NH_3 emissions on cattle farms are projected to remain relatively stable in 2022 compared to 2021. Increased emissions associated with the move toward straight urea fertiliser use tends to be offset by a move towards LESS methods on cattle farms.

Figure 8: Cattle Farm NH3 emissions (kg NH3 ha^{-1}) by category - Rolling 3 Year average

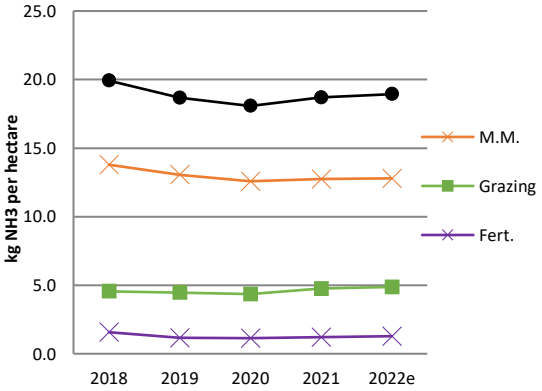


Source: Teagasc Sustainability Report and Author's estimate

3.1.6 NH_3 on Sheep Farms

Figure 9 reports kg of NH_3 emission per hectare on sheep farms.

Figure 9: Sheep Farm NH3 emissions by category - Rolling 3 Year average



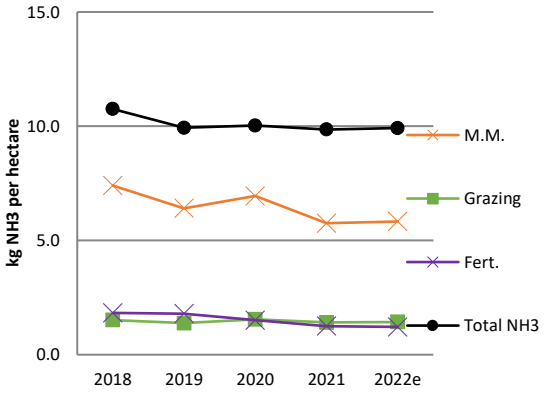
Source: Teagasc Sustainability Report and Author's estimate

Ammonia emissions per hectare on sheep farms are projected to increase slightly in 2022 compared to 2021 on the back of increased livestock numbers on sheep farms and the use of greater quantities of urea fertiliser.

3.1.7 NH_3 on Tillage Farms

NH_3 emissions on tillage farms are reported in Figure 10. 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 their emission profile in Figure 10. Ammonia emissions per hectare on tillage farms are projected to remain stable in 2022 compared to 2021.

Figure 10: Tillage Farm NH3 emissions by category average 2016-2022e

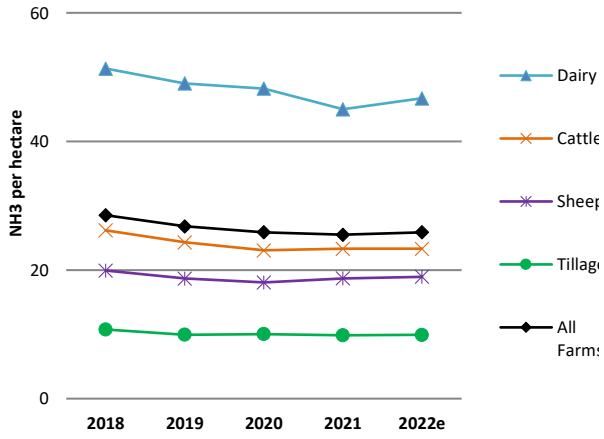


Source: Teagasc Sustainability Report and Author's estimate

3.1.8 NH_3 on All Farms

Figure 11 illustrates trends in total NH_3 per hectare across the different farm types.

Figure 11: Total NH3 Emissions (kg per hectare) by farm type - Rolling 3 Year average



Source: Teagasc Sustainability Report and Author's estimate

Dairy and sheep farms are projected to have a slight increase in emissions in 2022 compared to 2021 while cattle and tillage farm NH_3 emissions are projected to remain stable. The cumulative effect is a slight increase in emissions on a per hectare basis in 2022 compared to 2021.

4. Summary Conclusions

- Fertiliser use declined by 14% in 2022 which was the main factor in generally reducing projected GHG emissions from agriculture in 2022. This reduction was sufficient to override GHG emissions associated with increased livestock numbers and liming rates.
- However, increased use of straight urea fertiliser is associated with increased ammonia emissions on some farms.
- Per hectare GHG emissions on dairy and cattle farms are projected to decline in 2022 on the back of reduced chemical N application.
- Per hectare GHG emissions on sheep and tillage are projected to remain stable in 2022 on the back of reduced chemical N application.
- Per hectare NH_3 emissions on dairy and sheep farms are projected to increase in 2022 on the back of increased livestock numbers and increased use of straight urea fertiliser.
- Per hectare NH_3 emissions on cattle and tillage are projected to remain stable in 2022.

References

Buckley, C., Krol, D., Lanigan, G. J., Donnellan, T., Spink, J., Hanrahan, K., Boland, A., Forrestal, P., Humphreys, J., Murphy, P., NiFhlatharta, N., O'Brien, D., O'Dwyer, T., O'Mara, F., Richards, K., Shalloo, L., Wall, D., & Waters, S., 2020. An Analysis of the Cost of the Abatement of Ammonia Emissions in Irish Agriculture to 2030. https://www.teagasc.ie/media/website/publications/2020/NH3-Ammonia-MACC.pdf

Buckley, C and Donnellan, T., 2022. Teagasc National Farm Survey 2021 Sustainability Report. https://www.teagasc.ie/publications/2022/national-farm-survey---2021-sustainability-report.php

Central Statistics Office, 2022. Number of Livestock in June. https://data.cso.ie/#

Department of Agriculture, Food and the Marine, 2022. Fertiliser Sales from 1st October 2021 to 30th September 2022.

Department of Agriculture, Food and the Marine, 2022. Lime Sales.

Dillon, E., Donnellan, T., Moran, B. & Lennon, J., 2022. Teagasc National Farm Survey 2021 Preliminary Results.

https://www.teagasc.ie/media/website/publications/2022/Teagasc-National-Farm-Survey-2021.pdf

Duffy, P., Hyde, B., Ryan, A.M. Murphy, J., Quirke, B., Fahey, D., & Kehoe, A., 2021. Informative inventory report 2020 air pollutant emissions in ireland 1990–2019 reported to the secretariat of the unece convention on long-range transboundary air pollution and to the European Union.

https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland-IIRv3_2021.pdf

Duffy, P., Black, K., Fahey, D., Hyde, B., Kehoe, A., Murphy, J., Quirke, B., Ryan, A.M. & Ponzi, J. 2021. Ireland National inventory report 2020 greenhouse gas emissions 1990 - 2019 reported to the United Nations framework convention on climate change.

https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland-NIR-2022_Merge_v2..pdf

European Commission, 2016. Directive 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

https://eur-lex.europa.eu/legal-ontent/EN/TXT/PDF/?uri=CELEX:32016L2284&from=EN

Environmental Protection Agency, 2022. Ireland's Provisional Greenhouse Gas Emissions 1990-2021. https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Ireland's-Provisional-GHG-Emissions-1990-2021_July-2022v3.pdf

Government of Ireland, 2021. Climate Action and Low Carbon Development (Amendment) Act 2021. https://data.oireachtas.ie/ie/oireachtas/act/2021/32/eng/enacted/a3221.pdf

Government of Ireland, 2022, Pathway to 51% reduction in economy-wide emissions agreed - McConalogue confirms 25% reduction in agricultural emissions

https://www.gov.ie/en/press-release/40b39-pathway-to-51-reduction-in-economy-wide-emissions-agreed-mcconalogue-confirms-25-reduction-in-agricultural-emissions/

Lanigan, G., Donnellan, T., Hanrahan, K., Carsten, P., Shalloo, L., Krol, D., Forrestal, P. J., Farrelly, N., O'Brien, D., Ryan, M., Murphy, P., Caslin, B., Spink, J., Finnan, J., Boland, A., Upton, J., Richards, K., 2018. An analysis of abatement potential of Greenhouse Gas emissions in Irish agriculture 2021-2030. https://www.teagasc.ie/media/website/publications/2018/An-Analysis-of-Abatement-Potential-of-Greenhouse-Gas-Emissions-in-Irish-Agriculture-2021-2030.pdf

Sutton, M.A., Moncrieff, J.B. & Fowler, D., 1992. Deposition of atmospheric ammonia to moorlands. Environmental Pollution, 75, 15–24.

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