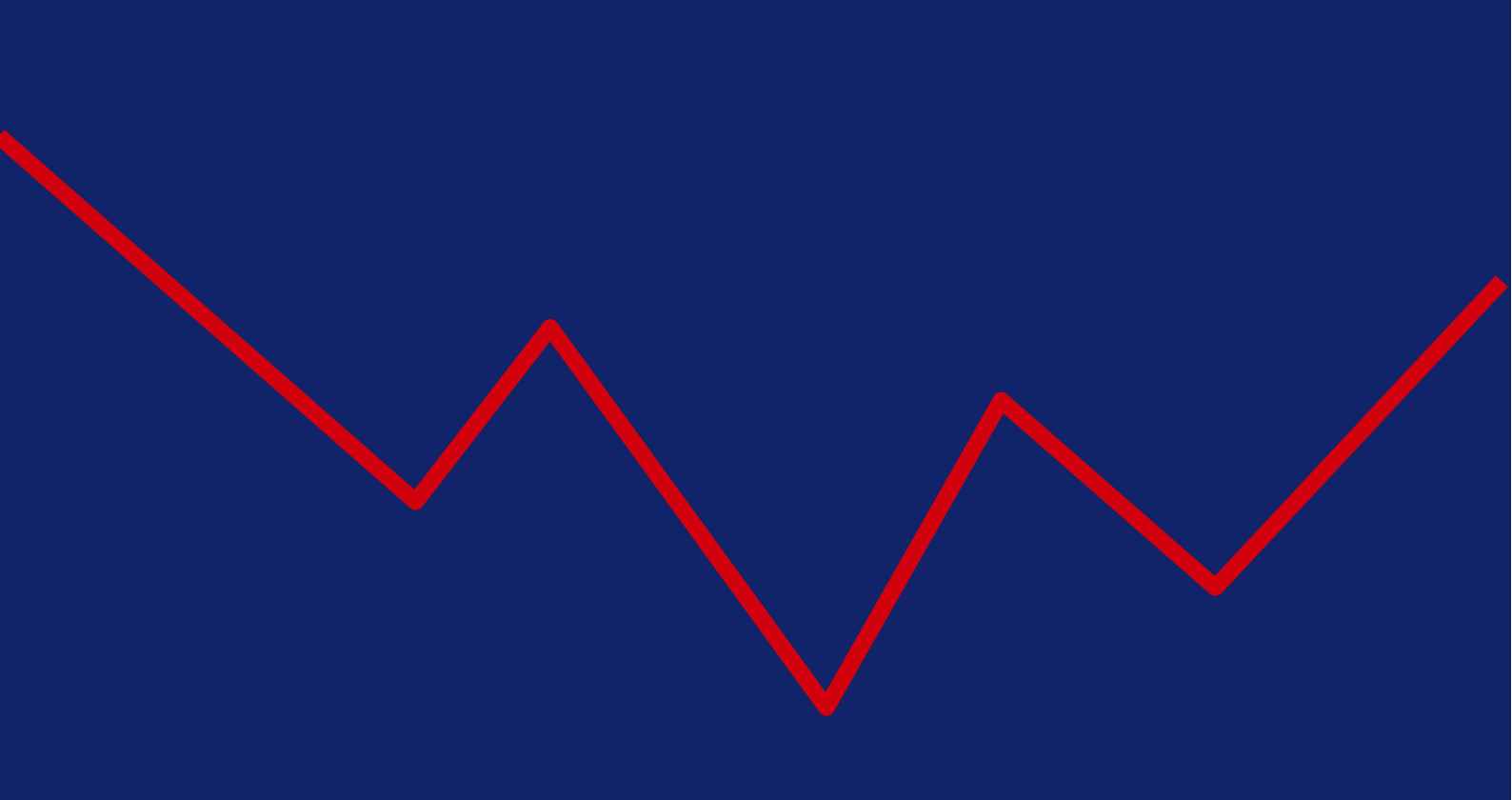


# DAERA Farm Business and Other Supported Businesses / Organisations Innovation Survey Report



*Sustainability at the heart of a living, working, active landscape valued by everyone*



Department of  
**Agriculture, Environment  
and Rural Affairs**

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## **KEY FINDINGS**

### **Farm innovation**

- 15% of Northern Ireland farm businesses carried out major changes to their farm business over the survey period.
- Larger farms were more likely to make changes and show adoption of innovative techniques.
- Horticulture growers, pig and dairy farmers were most likely to make major changes to their businesses.
- 10% of farmers invested in new equipment and/or computer software. Investment in new, more technologically advanced machinery was highest on large farms.
- Uptake of Big Data, Artificial Intelligence and Transformative Bioeconomy technologies remains very low.
- 4% of farmers produced new or improved products or services and 6% of farmers introduced new or significantly improved ways of producing and/or selling what they produce.
- 40% of large farmers took advantage of obtaining advice or training to increase their knowledge and ability to improve what they produce or how they produce it compared to 27% of medium farmers and 17% of small farmers.
- The most important factors in farmers deciding to innovate were more efficient production, improving health and safety and reducing environmental impacts.
- The greatest barriers to innovation on farm were financial costs/risks and availability and cost of finance.

### **Innovation in Other Businesses / Organisations supported by DAERA**

- 42% of non-farm businesses introduced major new business practices but many businesses were constrained by the COVID-19 pandemic.
- Investments in innovation were in more technologically advanced machinery, equipment or computer hardware or software (48%) and internal R&D (36%).
- Big Data technology (IoT) was adopted by 18% of other businesses / organisations supported by DAERA. Adoption of all other Big Data, AI and Transformative Bioeconomy technologies was very low and details could not be reported.
- High cost of finance was considered the most important factor in constraining innovation in food and rural businesses.

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## 1. INTRODUCTION

Little information is available as to the extent of innovation undertaken by businesses within DAERA's remit. In an attempt to assess levels of innovation and create a baseline to inform the DAERA Innovation Strategy, an online survey was issued to over 5,000 farms, food, drink and other rural businesses and environmental organisations in 2021. The survey achieved close to a 10% response rate from farm businesses and almost 9% from the other businesses surveyed. This response rate is in line with that of other DAERA surveys.

## 2. BACKGROUND

**Farming:** In 2020 there were approximately 26,000 farms in NI supporting an agricultural labour force of over 51,000 on 1.03 million hectares (ha) of land or 76% of the NI land area. Total sales generated were £2.2bn, and the value added to the economy was £673m. NI has a greater reliance on its agricultural industry than the rest of the UK, agriculture makes up 1.6% of NI's Gross Value Added (GVA) compared to 0.5% across the UK as a whole. NI is characterised by the predominance of small farms. Approximately 20,500 NI farms (79%) are classified as 'very small'. Dairying is the largest sector in terms of output accounting for 30% of gross agricultural output. Sheep and cattle account for a further 23% of the total, poultry and eggs 19%, pigs 10% and horticulture and crops 7%.

**Food and Drinks Processing:** The Northern Ireland food and drinks processing sector has over 300 businesses with a turnover in excess of £250,000. In 2019, these businesses are estimated to have turned over nearly £5.4 billion in total sales, employed nearly 25,000 FTEs and contributed to 30% of NI's total manufacturing employment. GB is the sector's largest market accounting for 48% of sales.

**Rural Businesses:** In 2020 around 58% of businesses registered for VAT and/or PAYE schemes operating in NI were in rural areas. Approximately 94% of these rural businesses were sole traders, businesses with no employees or micro businesses. In total, there are close to 44,000 businesses in NI rural areas with 41% of these businesses involved in agriculture, forestry or fishing. Other predominant rural sectors include construction (16%), production (7%) and retail (5%). There are smaller numbers of rural businesses involved in wholesale, transport and storage, accommodation and food services.

### 3. METHODOLOGY

Letters inviting recipients to complete the survey online were sent to approximately 5,000 farmers, 294 food and drinks businesses, 20 aquaculture businesses, 99 rural businesses and 36 environmental organisations of relevance to DAERA. The sample breakdown is shown in Table 1. Each recipient was provided with a Unique Identifier Code.

#### Sampling

**Table 1 – NI Innovation Survey Sample Breakdown**

Sector	Details	Sampling frame/source
Farming	Sample of 4,971 farm businesses	Farm Census 2019 database, ensuring no overlap with other survey samples
Food and drinks processing	294 firms (those with turnover of at least £250k)	Food and drinks processing sector database
Aquaculture	20 businesses	Business details available on DAERA website. All businesses to be sampled
Rural businesses	99 rural businesses	Rural Innovation Scheme
Environmental organisations	36 organisations of relevance to DAERA	Northern Ireland Environment Link

#### *Farm Survey Sample*

Some 20% of the farm businesses that completed the 2019 Agricultural Census were selected proportionately across all farm types and sizes (Table 2).

**Table 2 - Farm Business Sample Selection**

Sector	Farm Size <sup>1</sup>				TOTAL
	Very Small	Small	Medium	Large	
Cereals and cropping	160	14	5	9	188
Horticulture	16	8	5	20	49
Pigs	14	4	5	13	36
Poultry	34	47	25	23	129
Dairy	53	139	122	203	517
Cattle and sheep LFA	2,630	220	43	30	2,923

<sup>1</sup> Farm size: Very small requires less than 1 Standard Labour Unit (SLU); Small requires at least 1 SLU but less than 2 SLUs; Medium requires at least 2 SLUs but less than 3 SLUs; Large requires more than 3 SLUs. (1SLU= 1900 hours)

Cattle and sheep					
Lowland	862	92	26	15	995
Mixed	51	20	10	20	101
Other	22	5	3	3	33
<b>TOTAL</b>	<b>3,842</b>	<b>549</b>	<b>244</b>	<b>336</b>	<b>4,971</b>

Statistically weighted results were then produced using DAERA Farm Census data.

#### *Food, Drinks and Rural Businesses Survey Sample*

Due to the smaller number of food and drink businesses, all businesses who reported annual turnover in excess of £250,000 in the 2020 NI Food and Drinks Report were selected to participate in the survey.

This sample also included 91 micro rural businesses (i.e. those with expressions of interest in the Micro Rural Business Support Scheme), and eight timber processing firms.

Aquaculture businesses (fish farms) were also included. There are about 20 businesses on the Public Register of Authorised Production Businesses on the DAERA website. All of these businesses were asked to participate in the survey.

#### *Environmental Organisations Survey Sample*

Thirty-six environmental organisations of relevance to DAERA were selected to participate in the Innovation Survey. Names of environmental organisation officials and contact details were obtained from the Northern Ireland Environmental Link (NIEL) website.

### **Survey Questions**

Due to the diversity of the business sectors, small variations in Innovation Survey question wording and answer options between questionnaires were necessary. Separate survey forms were created for farm businesses, food and drinks and rural businesses and environmental organisations.

Survey forms are provided in Annex (vi).

### **Survey Issue**

Letters were sent to organisations representing the survey samples in advance, to ask them to encourage any of their members who were invited to participate in the Innovation Survey to complete the survey online within the required timescale. The organisations included the Ulster Farmers Union (UFU), Northern Ireland Agricultural Producers Association (NIAPA), NIEL and Northern Ireland Food and Drink (NIFDA).

The letters were then issued to the participants selected in the survey samples, asking them to complete the relevant survey online using Citizen Space.

### Farm Survey Responses

Five hundred Farm Innovation Survey forms were completed and received by DAERA electronically, giving a rate of response of around 10%. When the responses were validated against the farm census population from which the sample was drawn, the number of valid responses dropped slightly to 488 but the response rate remained the same. The 488 valid responses were combined with Farm Census data and responses weighted by farm type and size from the 2019 Agricultural Census (Table 3) to provide results and analysis for all the farm businesses in Northern Ireland.

The sample did not capture information for farms with certain characteristics, for example the only returns received for cereal and other farms were from those in the very small category. The coverage for these farms is therefore reduced and the weighting should be interpreted with **caution**.

Overall the categories not captured represent just over 2% of all farms in NI (see Table 3 and Table 4).

**Table 3 Farms captured in the Innovation Survey sample (weighted)**

<b>Farm Type</b>	<b>Very small</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>All</b>
Cereals	198	0	0	0	198
General cropping	589	0	15	0	604
Horticulture	80	0	26	102	208
Pigs	49	0	27	65	141
Poultry	169	236	0	115	520
Dairy	265	695	609	1,017	2,586
Cattle and sheep LFA	13,152	1,100	216	0	14,468
Cattle and sheep lowland	4310	458	129	74	4,971
Mixed	256	97	0	97	450
Other	109	0	16	0	125
<b>Total</b>	<b>19,177</b>	<b>2,586</b>	<b>1,038</b>	<b>1,470</b>	<b>24,271</b>

**Table 4 All farms included in DAERA Farm Census June 2019**

<b>Farm Type</b>	<b>Very small</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>All</b>
Cereals	198	38	10	7	253
General cropping	589	35	15	40	679
Horticulture	80	41	26	102	249
Pigs	49	20	27	65	161
Poultry	169	236	127	115	647
Dairy	265	695	609	1,017	2,586
Cattle and sheep LFA	13,152	1,100	216	148	14,616
Cattle and sheep lowland	4,310	458	129	74	4971
Mixed	256	97	49	97	499
Other	109	26	16	15	166
<b>Total</b>	<b>19,177</b>	<b>2,746</b>	<b>1,224</b>	<b>1,680</b>	<b>24,827</b>

For dissemination and reporting purposes, only the weighted results for the farm survey are provided to avoid statistical disclosure issues and increase the size of coverage for analysis. The weighted results are also disseminated separately by farm size and type to increase the coverage of the results and analysis further.

Table 5 and Table 6 illustrate that when the survey responses are compared separately by farm size and farm type characteristics they are slightly over-representative of very small and cattle and sheep farms. Therefore, **caution** needs to be taken when interpreting the results for all farm businesses as there **may be** a slight bias towards innovation activities taking place in very small cattle and sheep farms.

Dissemination of the weighted survey results by the number of full-time farmers working on farms (Annex iii) and the presence of other farm workers (Annex iv) is also provided. These farm population characteristics provide enhanced dissemination of the results by farm size.

**Table 5 Farm population 2019 by size compared to survey responses**

<b>Farm Size</b>	<b>No. Farms</b>	<b>%</b>	<b>No. Survey Responses</b>	<b>%</b>
Very Small	19177	77%	399	82%
Small	2746	11%	39	8%
Medium	1224	5%	22	5%
Large	1680	7%	28	6%
<b>Total</b>	<b>24827</b>	<b>100%</b>	<b>488</b>	<b>100%</b>



**Table 6 Farm population 2019 by type compared to survey responses**

<b>Farm Type</b>	<b>No. Farms</b>	<b>%</b>	<b>No. Survey Responses</b>	<b>%</b>
Cereals, general crops & horticulture*	1181	5%	19	3%
Pigs & Poultry*	808	3%	17	4%
Dairy	2,586	10%	40	8%
Cattle and sheep LFA	14,616	59%	292	60%
Cattle and sheep lowland	4971	20%	110	23%
Mixed / Other*	665	3%	10	2%
<b>Total</b>	<b>24827</b>	<b>100%</b>	<b>488</b>	<b>100%</b>

\*Categories merged to prevent statistical disclosure due to low number of responses

### **Other Businesses / Organisations Supported by DAERA Responses**

There were only 33 responses combined for the Food, Drinks and Rural Business Survey and the Environmental Business Survey. As a result, these surveys have been amalgamated for dissemination and reporting purposes into one category Food and Other Businesses.

Due to the low numbers of responses, it is not possible to provide analysis by size and sector. However, there were responses from 22 food firms and 11 other businesses. The 22 food firms were a variety of sizes with 7 firms having a turnover of £10 million or over and 15 firms employing 20 employees or more.

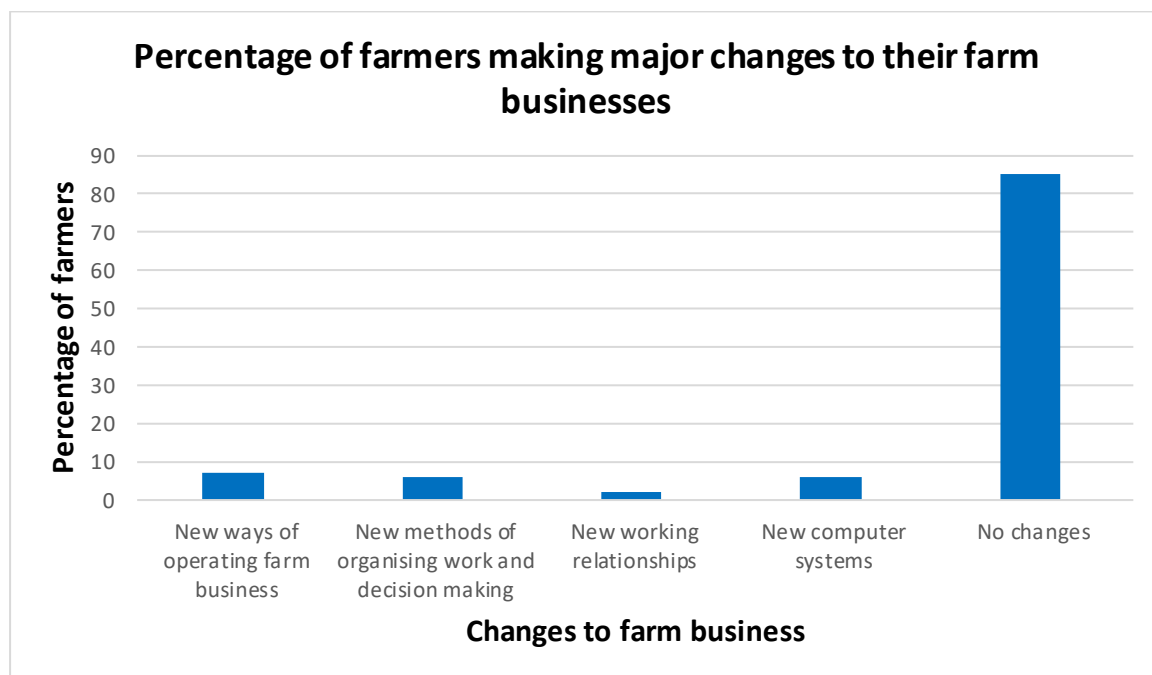
Due to the low number of responses, the results from Food and Other Businesses supported by DAERA should be treated with **caution**.

## 4. FARM INNOVATION SURVEY RESULTS

Within this report the term ‘*innovation*’ is defined as ‘*the successful generation and exploitation of new ideas. It is about transforming creative thinking into new products, new and improved processes and technologies to support new ways of doing things*’. This is the definition used within Innovate NI, the Innovation Strategy for Northern Ireland 2014 – 2025 and adopted within the DAERA Innovation Strategy 2021 – 2025.

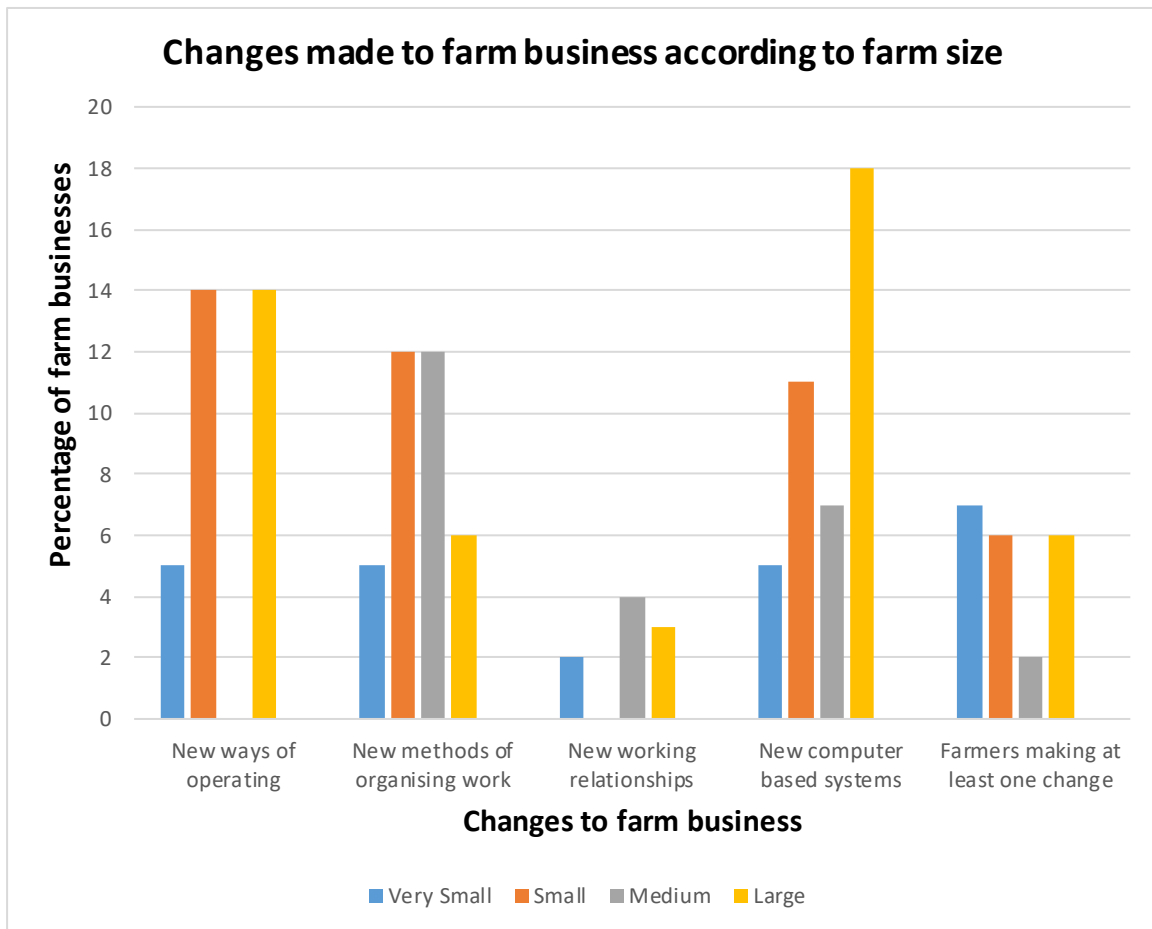
**Major changes to the farm business:** Between 1 January 2019 and 31 December 2020 15% of farmers carried out what they considered to be major changes to their business including new ways of operating, changes to organising work and decision making, developing new working relationships and use of new computer systems.

**Figure 1**



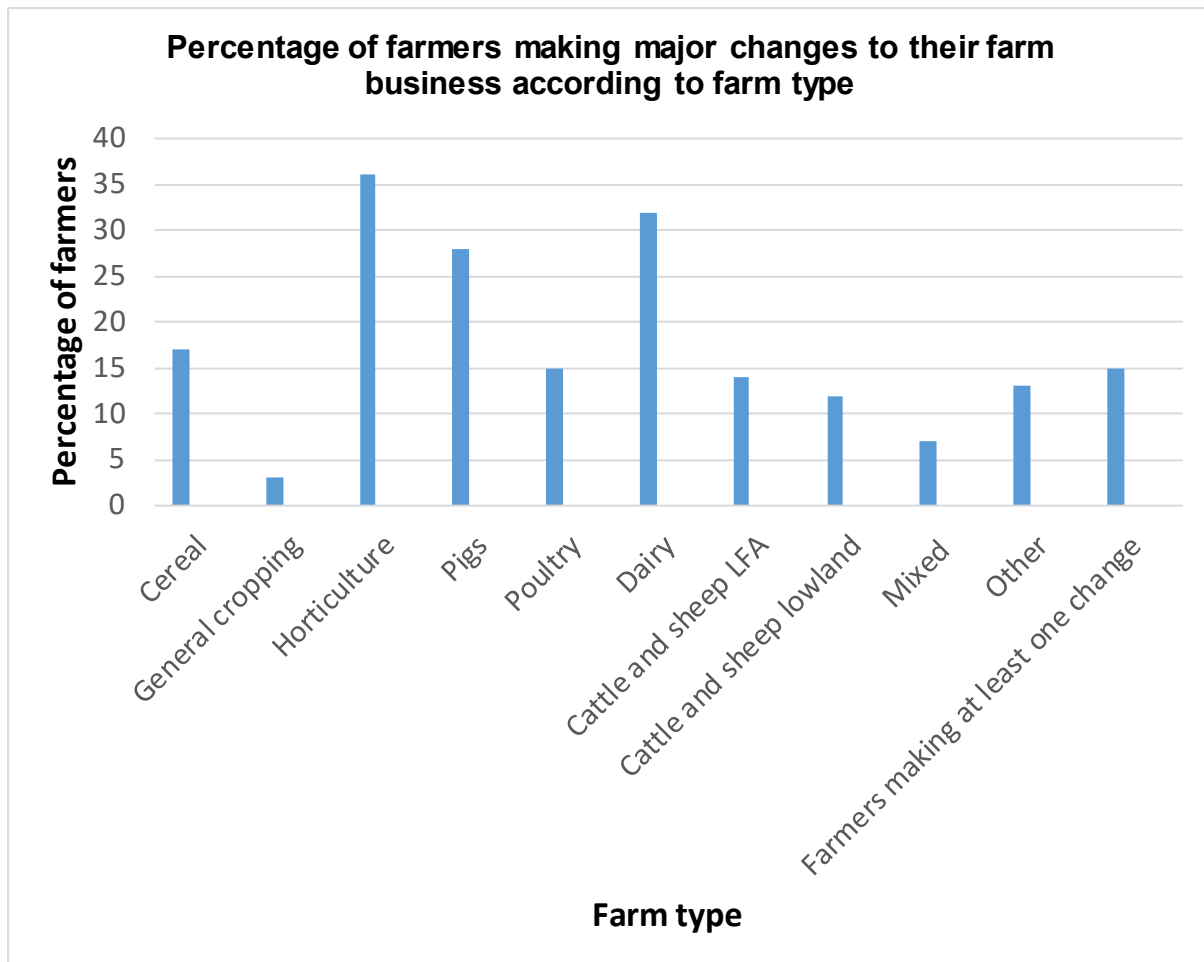
New ways of operating the farm business recorded on the survey returns included changes to enterprises, obtaining Farm Quality Assurance and training in basic agricultural skills. New ways of organising work responsibilities and decision making was mainly the creation of father/son partnerships and succession planning. The use of new computer-based systems shows a move to the use of apps for herd recording and management.

**Figure 2**



Results (Figure 2) indicate that small and large farms were more likely to have made changes with 30% of small and 30% of large farms reporting major changes. These changes were new ways of operating the farm business (14% of small and large farms) while 11% of small and 18% of large farms reported the introduction of new computer-based systems. Also, of note are the 12% of small farms and 12% of medium farms who introduced new methods of organising work.

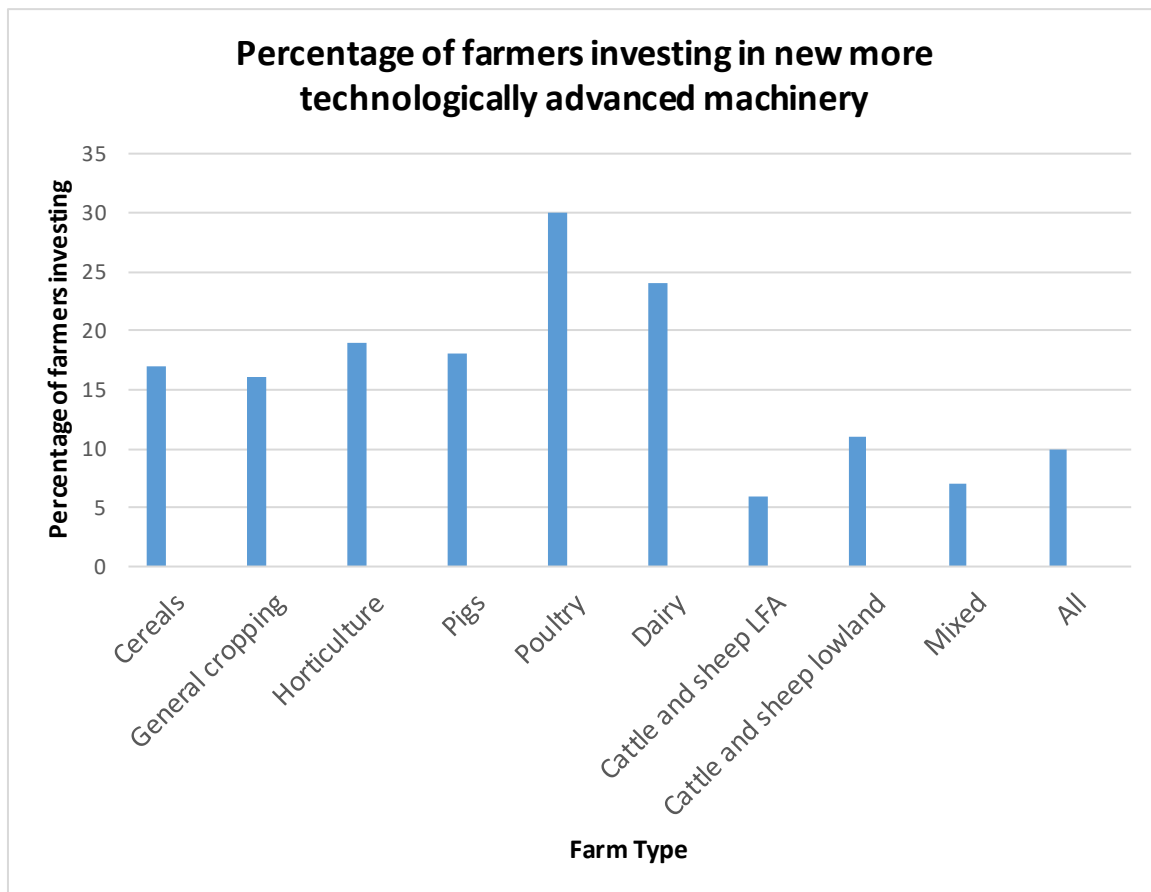
Figure 3



Major changes were mostly likely on horticulture units, pig and dairy farms. The reasons for this are unclear from the survey.

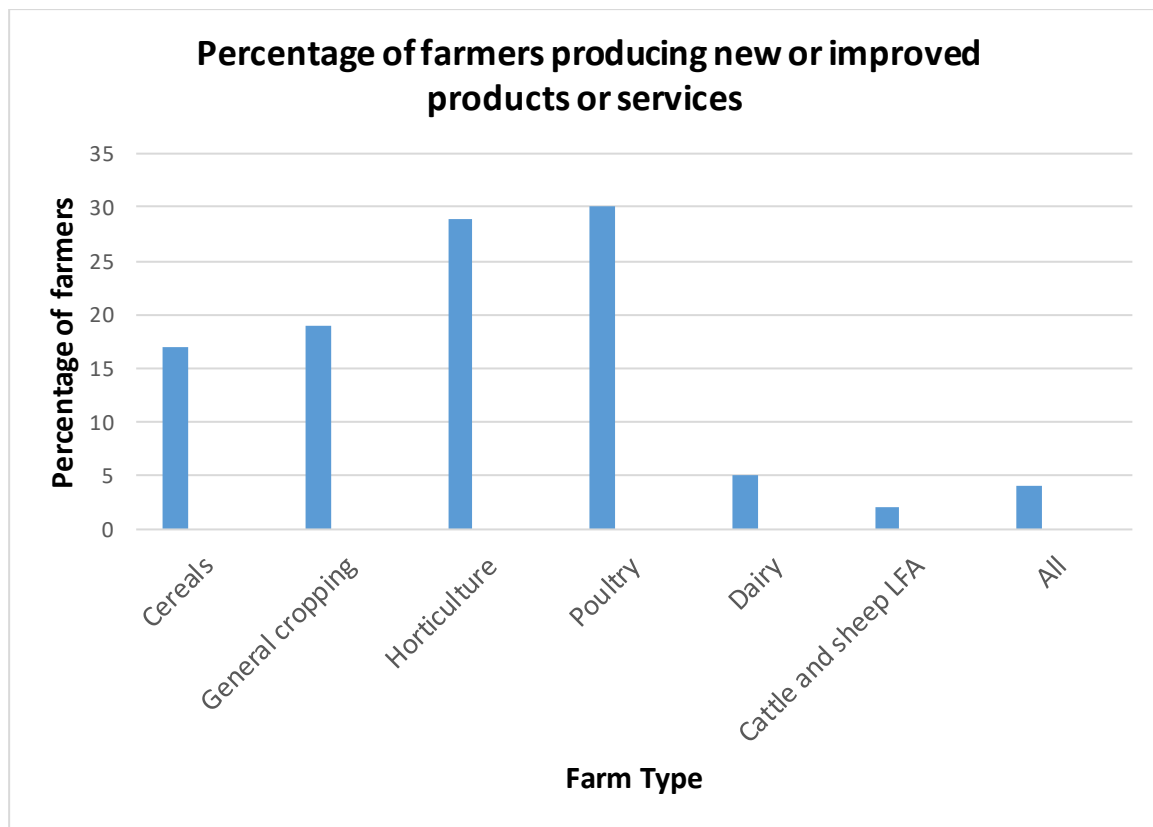
**Investment in new, more technologically advanced machinery:** 10% of farmers invested in new, more technologically advanced machinery, equipment and/or computer hardware or software for use on the farm. However, responses included equipment that could not be considered as innovative, for example new tractors, telehandlers and slurry spreading equipment. Investment in new, more technologically advanced machinery was highest on large farms at 32% compared to 6% on very small farms, 22% on small farms and 18% on medium farms. 30% of poultry farms invested in new more technologically advanced machinery. Other sectors were lower, dairy 24%, horticulture 19%, pigs 18% and cereals 17%. Cattle and sheep were 11% for lowland and 6% for LFA (Figure 4).

**Figure 4**



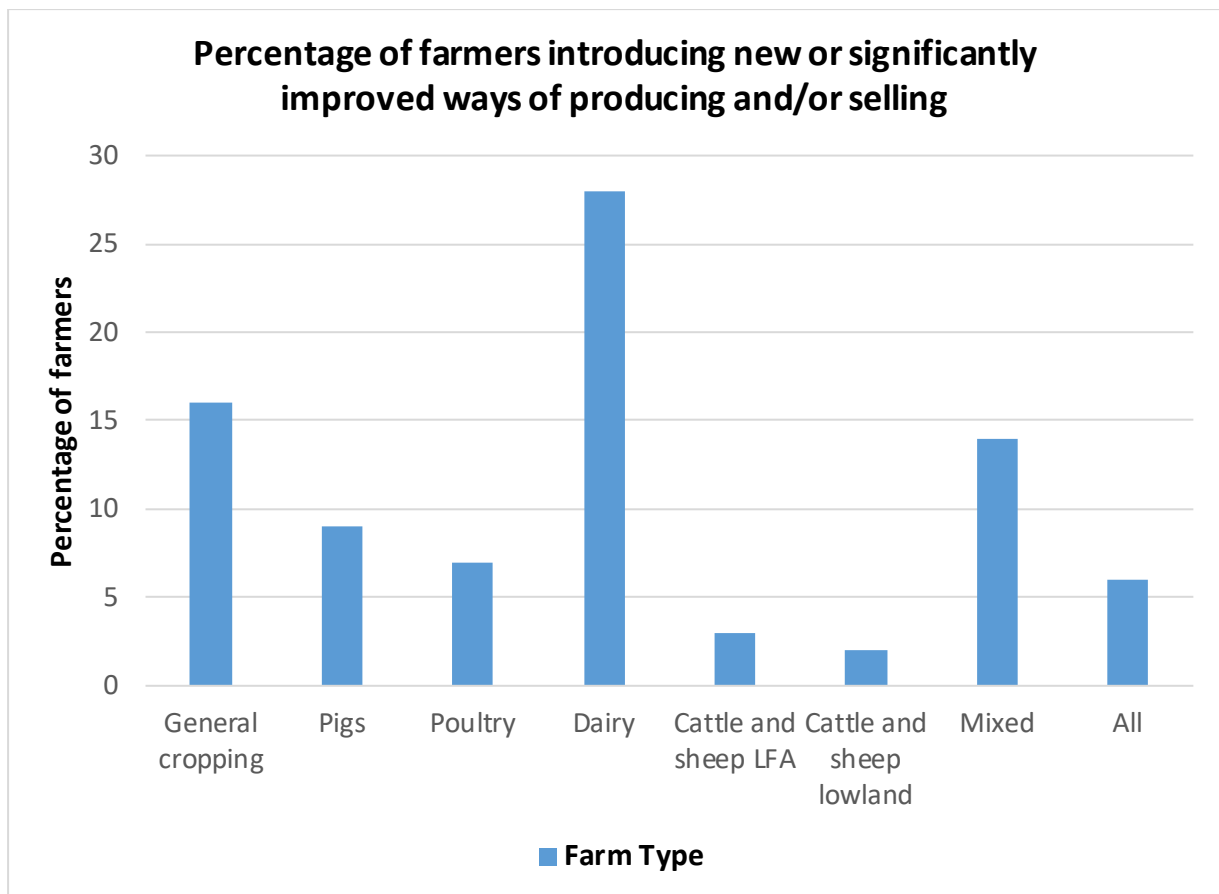
**New products or services:** 4% of farmers produced new or improved products or services. Examples of some of the more innovative products or services produced/offered included providing workspaces, producing ready meals, making charcoal and introducing new mental welfare programmes. 10% of small and 10% of large farms produced new or improved products or services compared to 2% of very small and 7% of medium farms. Poultry (30%) and horticulture (29%) units were most likely to produce new or improved products or start to offer new services (Figure 5).

**Figure 5**



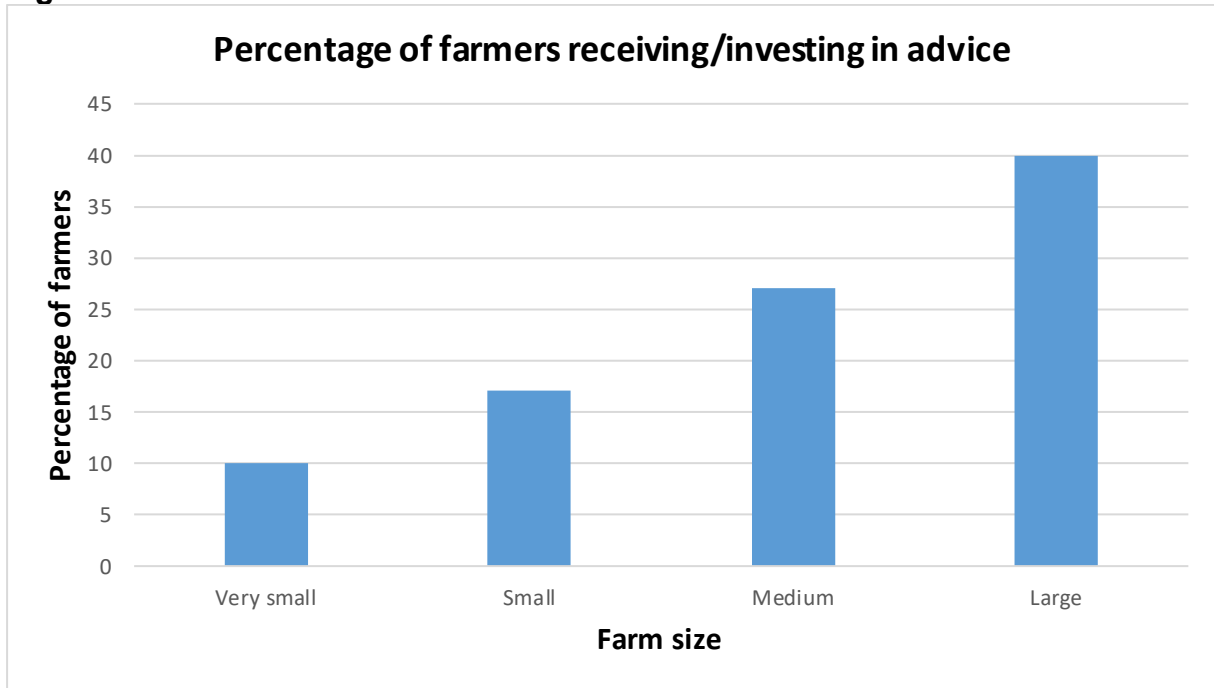
**New ways of producing and/or selling:** Figure 6 illustrates that 6% of farmers introduced new or significantly improved ways of producing and/or selling what they produce. Examples provided by respondents include using sexed semen, online livestock sales (due to COVID 19) and making better use of forage. Dairy farms were most likely to introduce new or significantly improved ways of producing and/or selling.

Figure 6



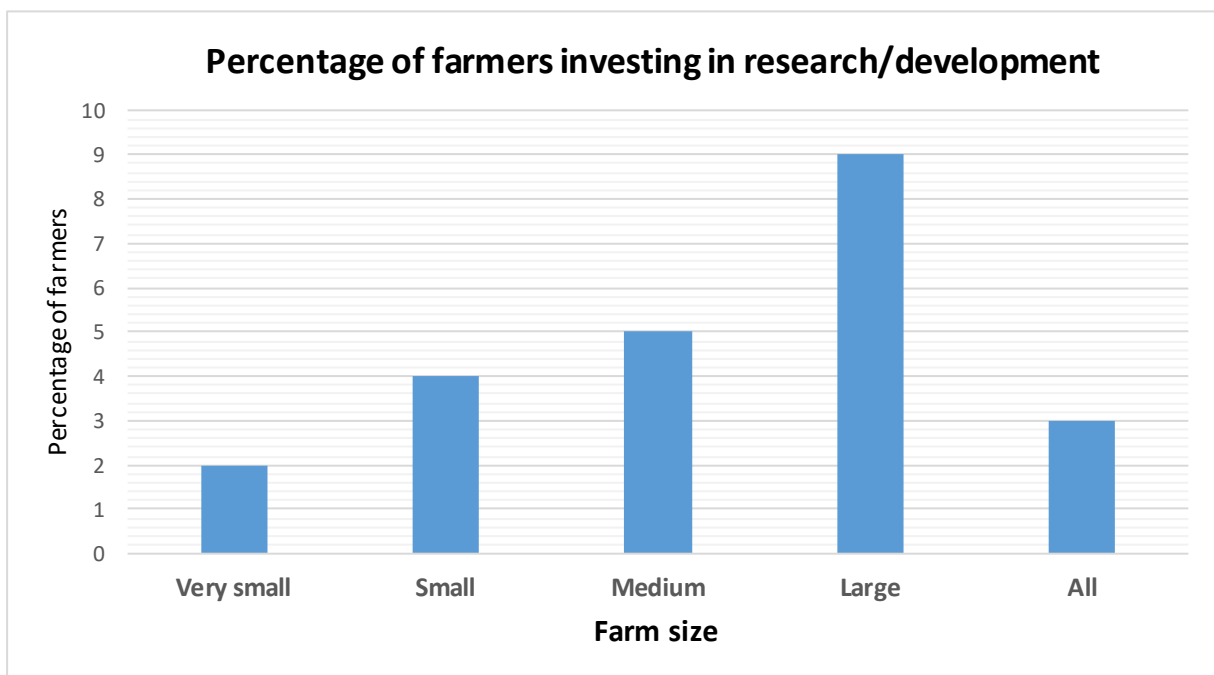
**Advice and training:** Thirteen percent of farmers took advantage of obtaining advice (from advisors, consultants, expertise) or training to increase their knowledge and ability to improve what they produce or how they produce it. This varied according to farm size with 10% of very small, 17% of small, 27% of medium and 40% of large obtaining advice (Figure 7). Mixed farmers were most likely to seek advice (55%) compared to pig producers (37%), cereal growers (33%), dairy farmers (28%), poultry (23%) and horticulture (16%). From the comments received advice was mainly from DAERA Development Advisers and Business Development Groups and vets. Only one percent of farmers reported that they had undertaken training to support on farm innovation.

**Figure 7**



**Research/development:** Three percent of all farms received/ invested in research and development. This was impacted by farm size with 9% of large, 5% of medium, 4% of small and 2% of very small investing (Figure 8). Pig (18%) and cereal (17%) were the most likely farm types to invest.

**Figure 8**



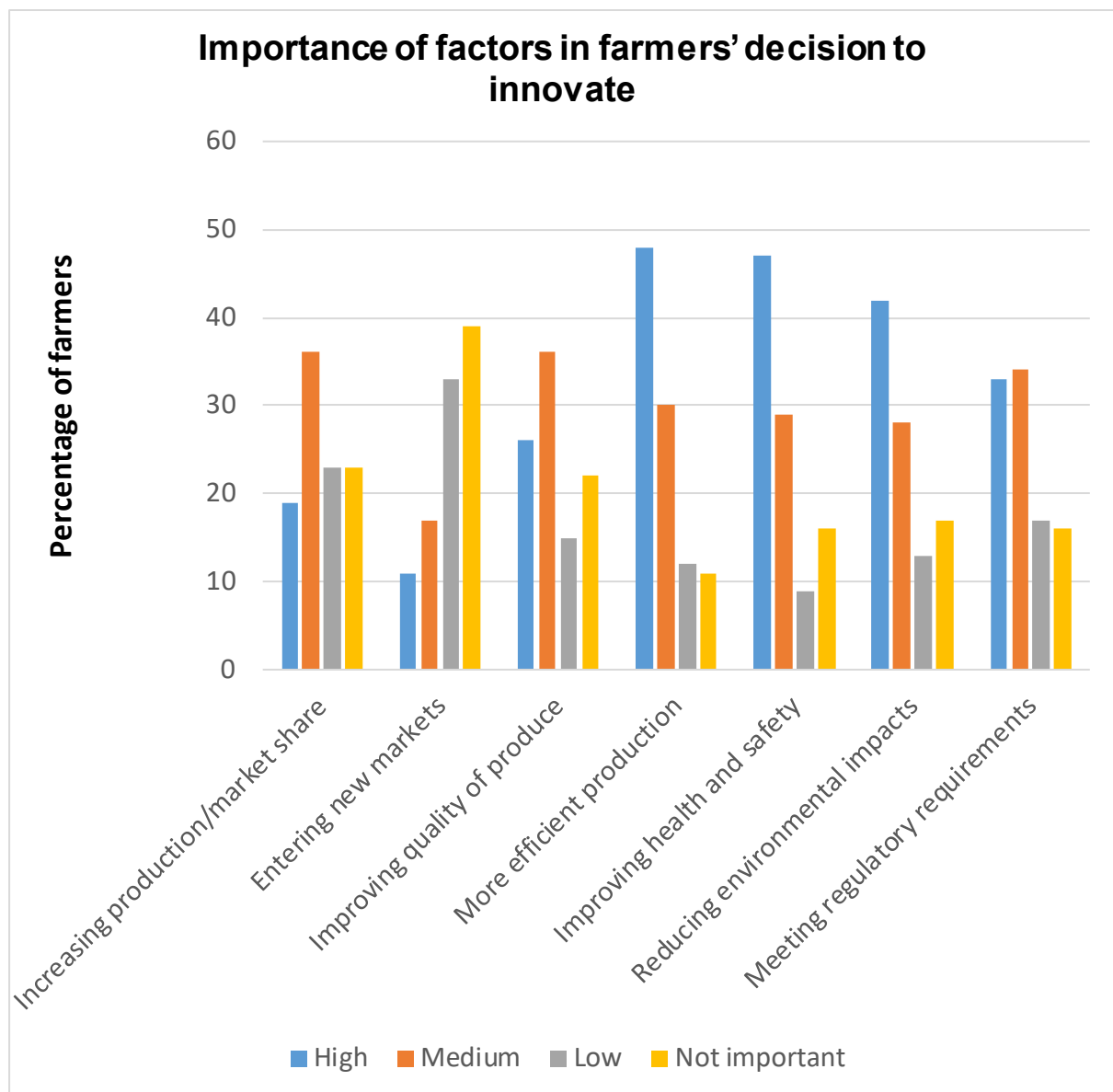


**New inventions/Design services/Market research:** Two percent of farms invested in new inventions and 1% invested in design services and market research.

**Why farmers are deciding to innovate?**

The most important factors in farmers’ decisions to innovate were more efficient production (78% of high or medium concern), improving health and safety (76% of high or medium concern), reducing environmental impacts (70% of high or medium concern), meeting regulatory requirements (67% high or medium concern) and improving quality of produce or replacing outdated products (62% of high or medium concern) (Figure 9). Entering new markets was not considered important or of low importance by 72% of farmers.

**Figure 9**

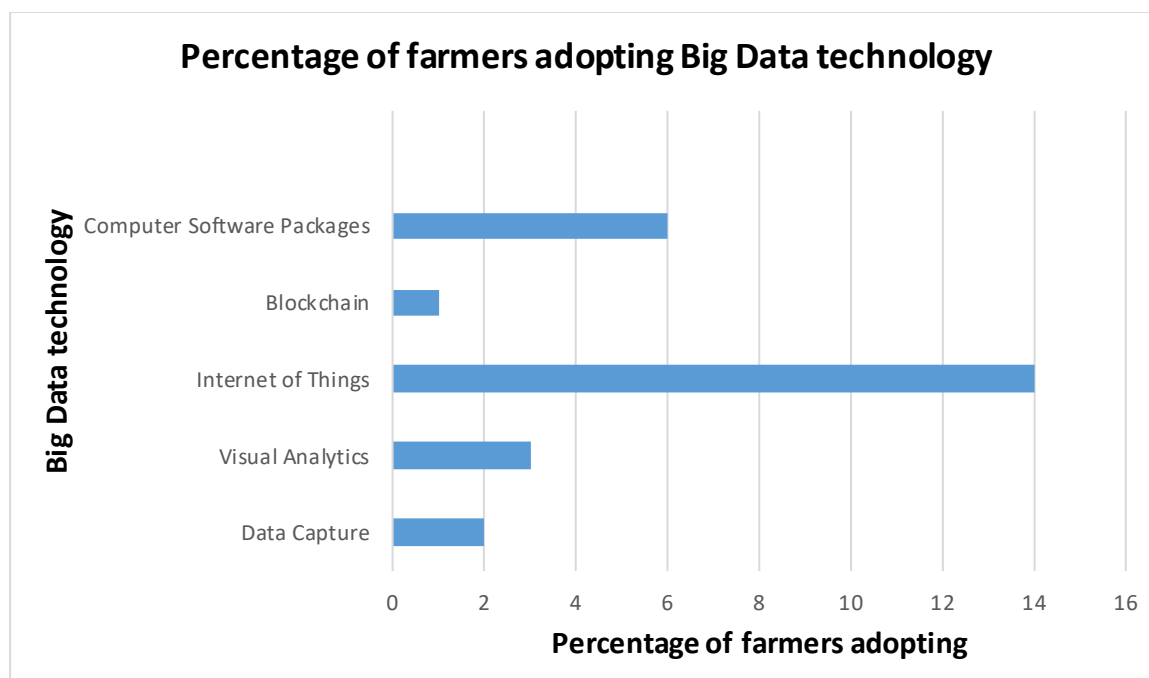


## Big Data, Artificial Intelligence and Transformative Bioeconomy

Uptake of Big Data, AI and Transformative Bioeconomy technologies was small.

### Big Data technologies

Figure 10



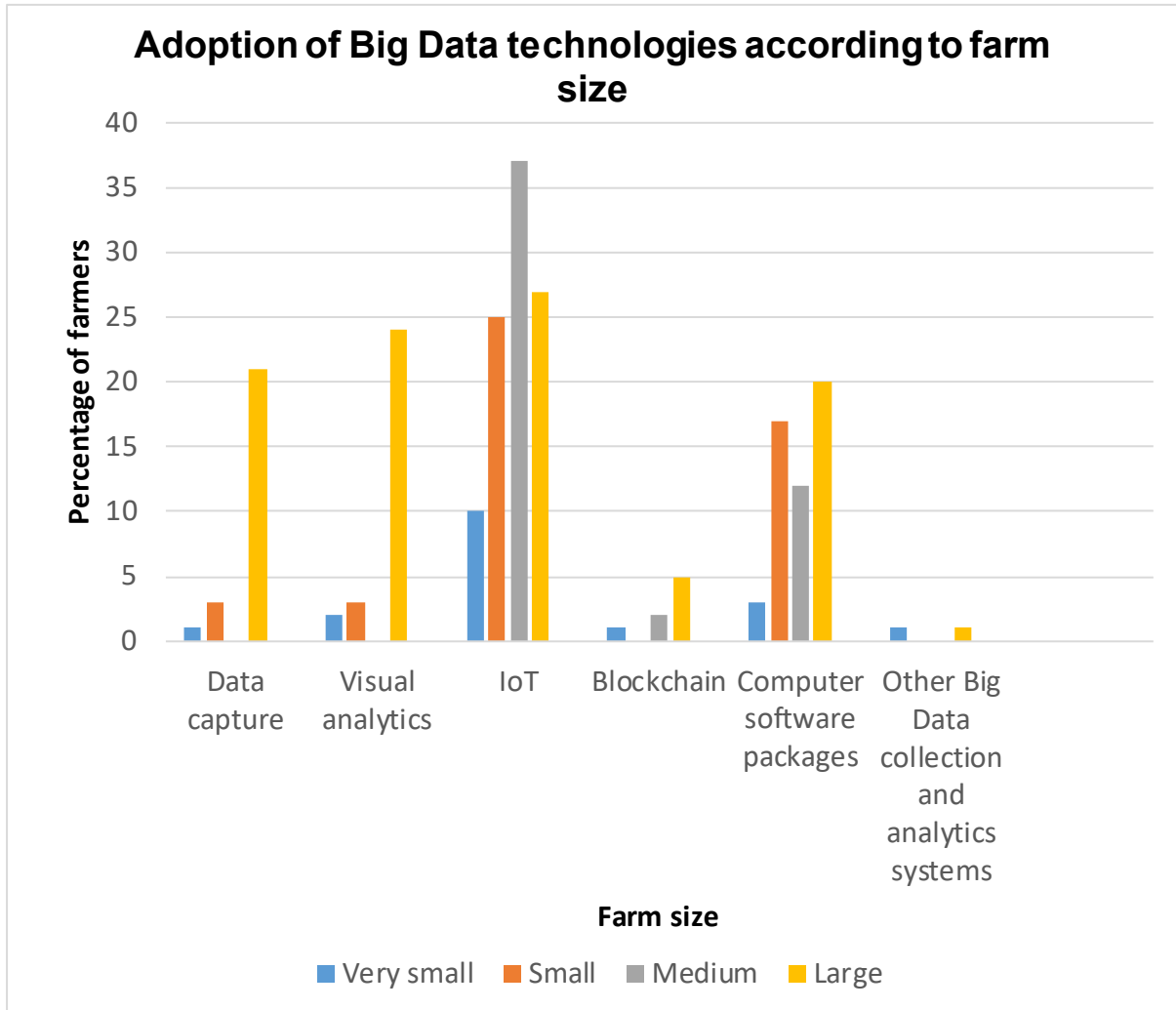
Between 1 January 2019 and 31 December 2020, 19% of farms indicated they carried out some form of Big Data innovation on their farm - 14% of farmers utilised the Internet of Things (IoT), 6% availed of new computer software packages and 3% adopted visual analytics (Figure 10).

Big Data technology adoption was reported on 39% of medium and 38% of large farms. Figure 11 illustrates that 21% of large farms adopted data capture techniques, 24% visual analytics, 27% IoT and 20% had computer software packages. 37% of medium farms adopted IoT technologies, while 12% had computer software packages. Pig (46%) and dairy farms (35%) were most likely to adopt some form of Big Data technology. IOT technologies were mainly adopted on mixed (29%), dairy (25%) and poultry (23%) farms. Computer software technology innovations were mainly taken up on poultry (30%), pig (28%) and dairy (20%) farms (See Annex (ii) Table 48).

On closer inspection, the number of farmers who indicated they had adopted the various Big Data technologies listed was not reflected in the comments received. A large number of respondents stated that they had installed cameras for calving/lambing/security reasons, others had purchased drones to check cows. The

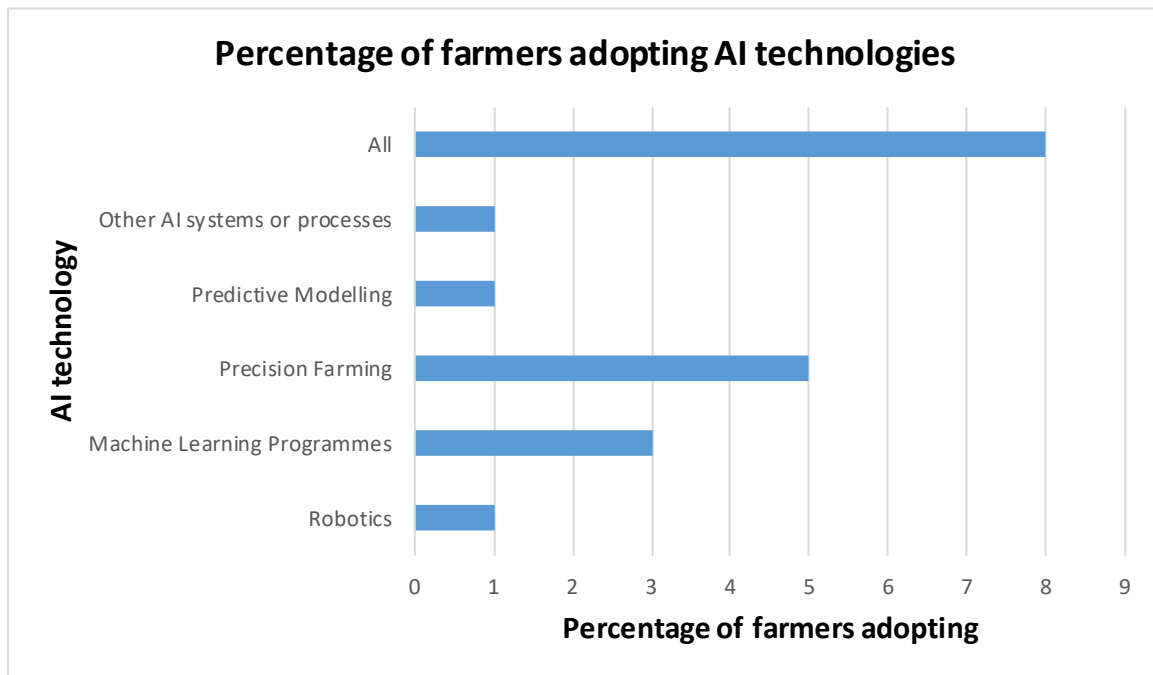
comments indicate that the cameras and drones were used solely for monitoring purposes and not for data capture. Computer analysis of herd performance and farm accounts packages were also included as examples.

**Figure 11**



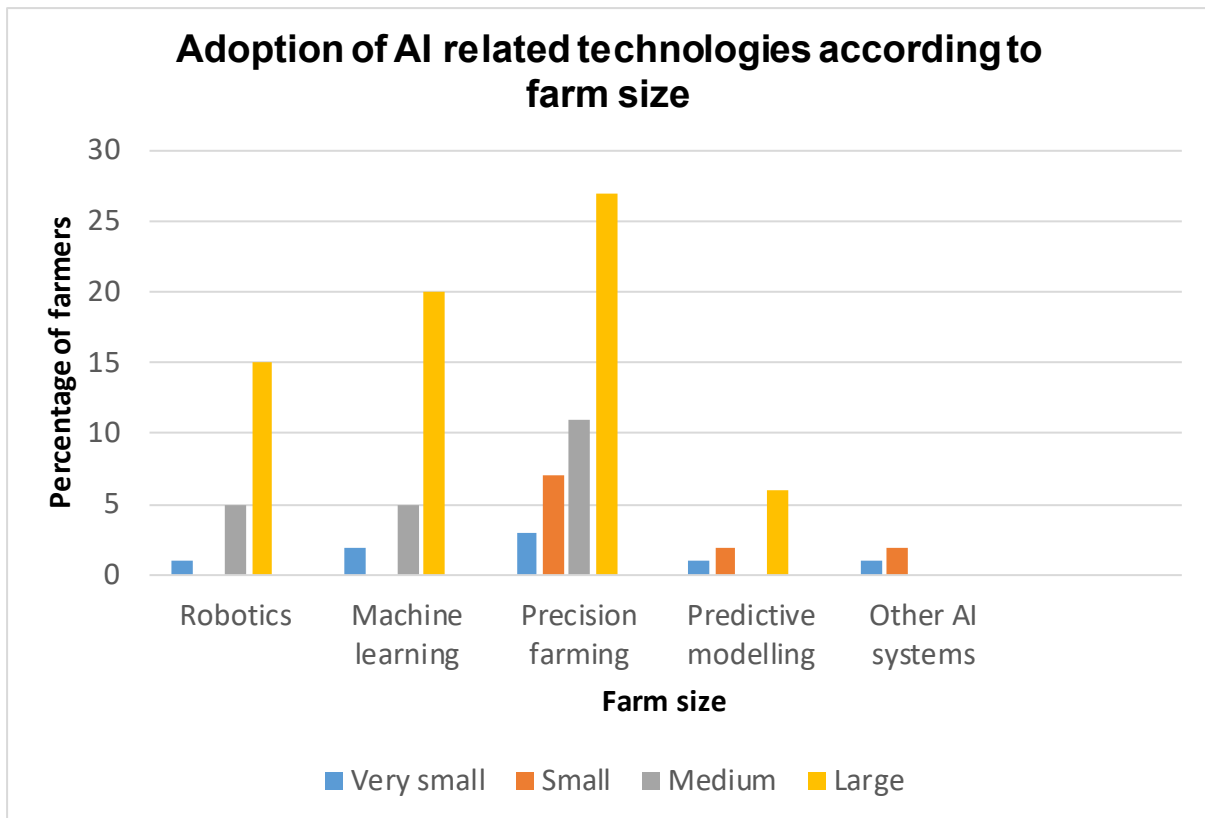
## Artificial Intelligence (AI) technologies

Figure 12



8% of farmers indicated they adopted some form of AI techniques (Figure 12). These were mainly precision farming (5%) and machine learning programmes (3%). AI uses were mainly reported as adoption of GPS for precision fertiliser and spray application and improved computer skills/computer systems.

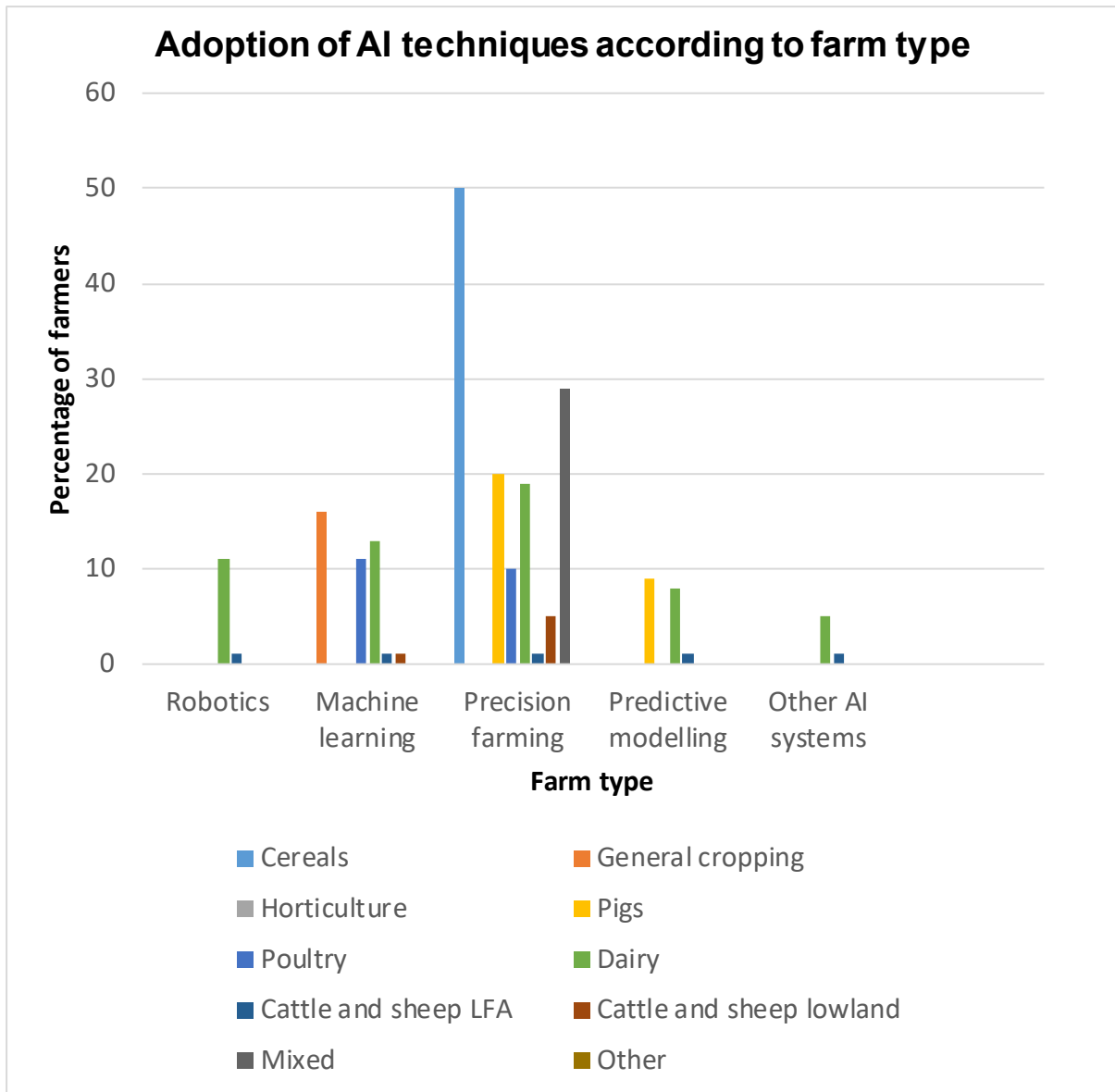
**Figure 13**



Uptake of AI technologies was greatest on large farms with 36% adopting some form of AI technology, mainly precision farming (27%), machine learning programmes (20%) and robotics (15%) (Figure 13). Around 21% of medium farms adopted AI technology, which was mostly precision farming (11%). Comparatively, uptake was low across all of these technologies on very small and small farms.

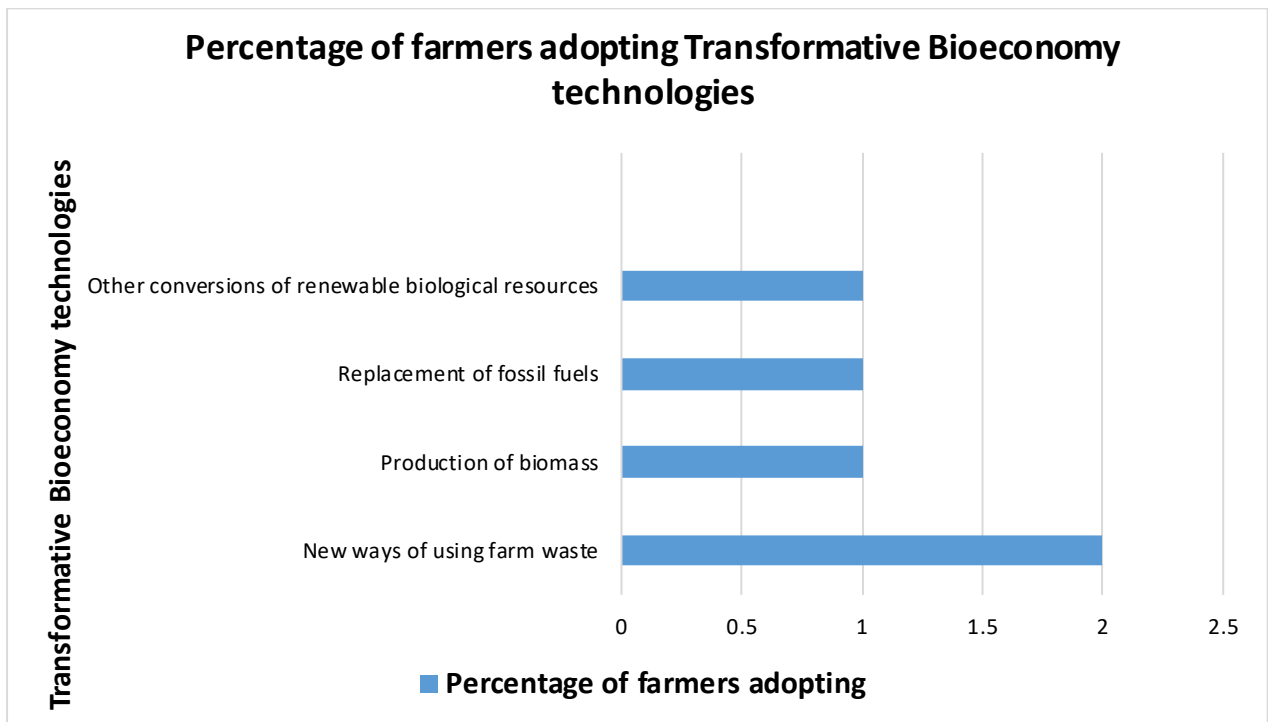
Uptake of AI technologies appears to be greatest on cereal farms with 50% responding that they have exclusively adopted precision farming techniques (Figure 14). 29% of mixed farms, 19% of dairy and 20% of pig farms also reported adoption of precision farming. Machine learning programmes were reported to have been adopted by 16% of general cropping farms, 13% of dairy farms and 11% of poultry units. Dairy farms had a 42% uptake of some form of AI technology across the full range of AI technologies presented. This included an 11% uptake in robotics.

Figure 14



## Transformative Bioeconomy

Figure 15

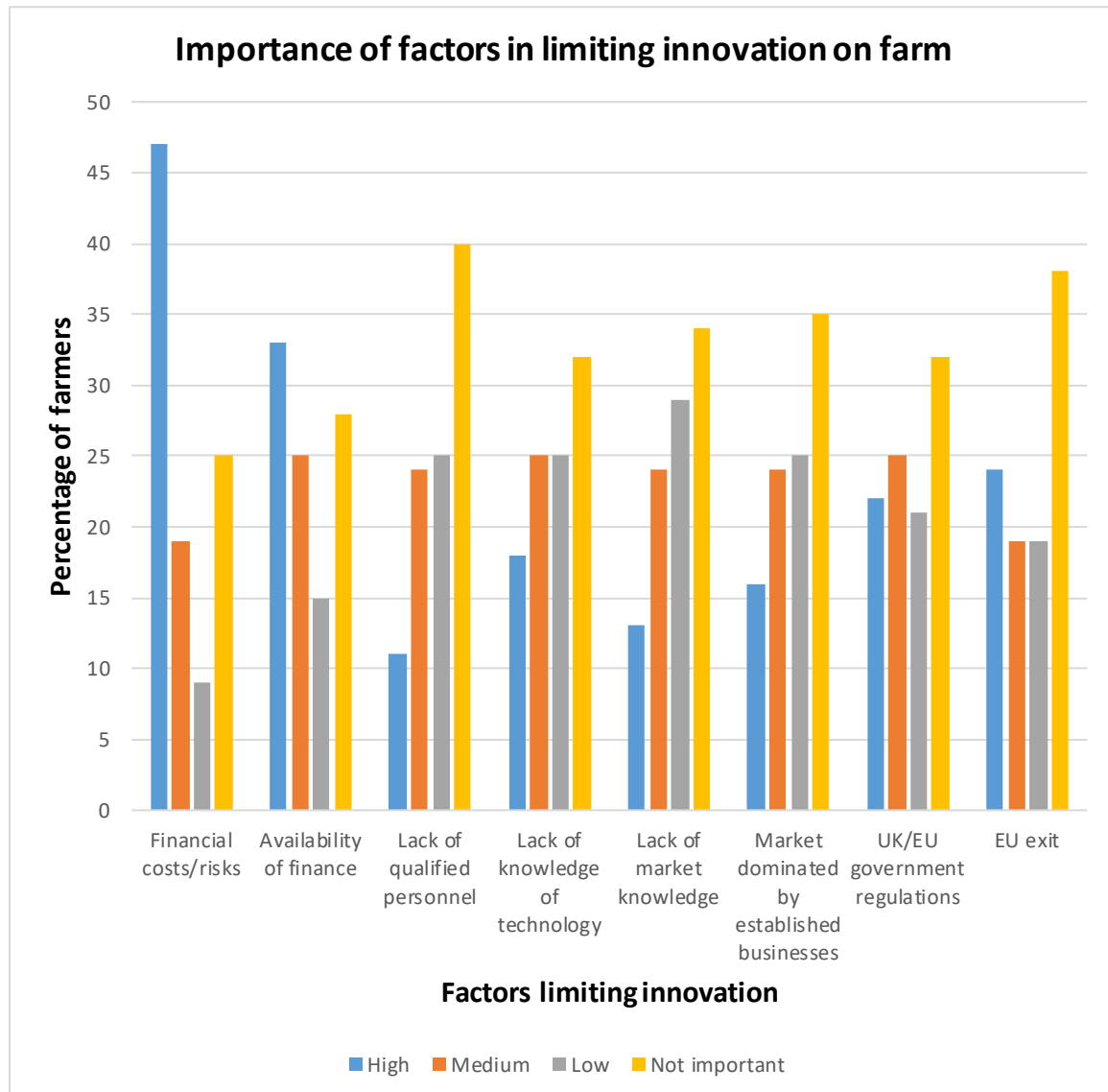


Uptake of Transformative Bioeconomy technologies was small with 4% of farmers indicating they had adopted some form of these technologies over the period surveyed. The highest uptake was new ways of using farm wastes (2%), while 1% indicated they adopted production of biomass, replacement of fossil fuels, nutrient valorisation and other conversions of renewable biological resources. Comments received relating to Bioeconomy include establishment of an anaerobic digester, use of prunings to make charcoal, recycling of plastic waste and biomass boilers (no longer used for biomass due to changes in RHI scheme).

## Barriers to innovation

Financial costs/risks and availability/cost of finance were the biggest barriers to innovation on farm with 66% of farmers rating financial costs/risks as of high or medium importance in limiting innovation and 58% rating availability/cost of finance as of high or medium importance (Figure 16).

Figure 16



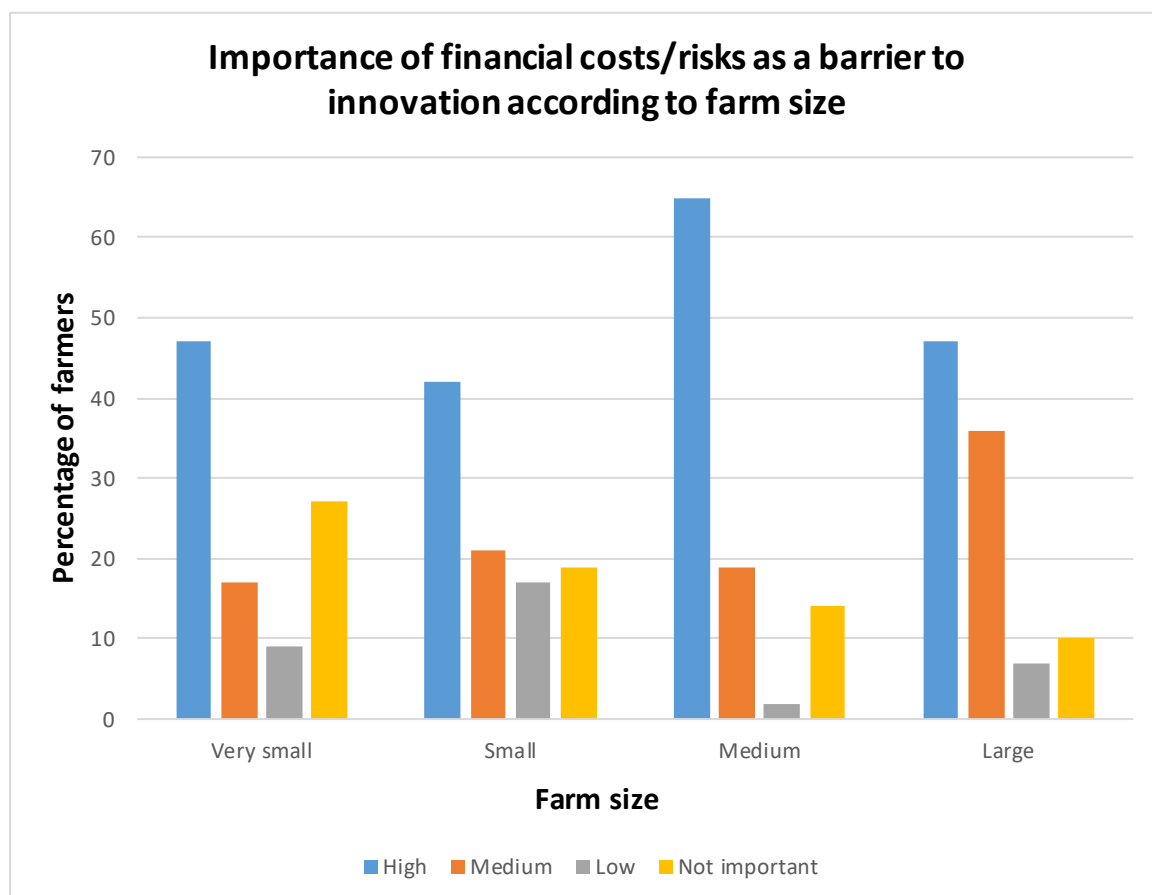
All other potential limiting factors were seen as of low importance or not important by more than half of respondents. The highest scoring low or no importance barriers to innovation were lack of market knowledge (63%), lack of qualified personnel (65%) and market dominated by established businesses (60%).



The other factors limiting on farm innovation given by farmers included age or ill health, small farm size, part time farmer, uncertainty in the market, planning difficulties, lack of funding, inability to keep up with technology and red tape.

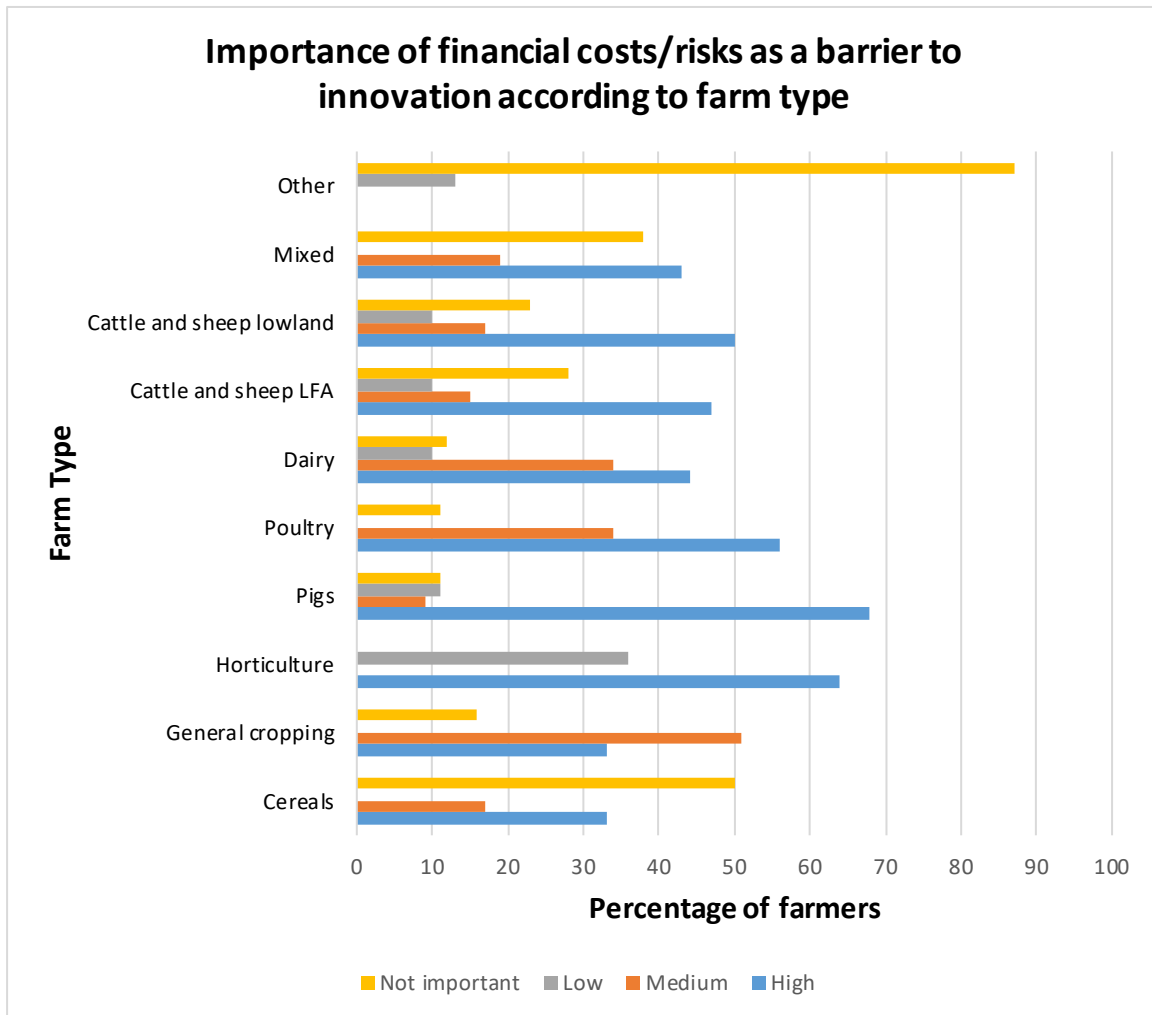
**Importance of financial costs/risks:** This was an important factor in limiting innovation across all farm sizes. It was considered a factor of high or medium importance by 64% of very small, 63% of small, 84% of medium and 83% of large farms (Figure 17).

**Figure17**



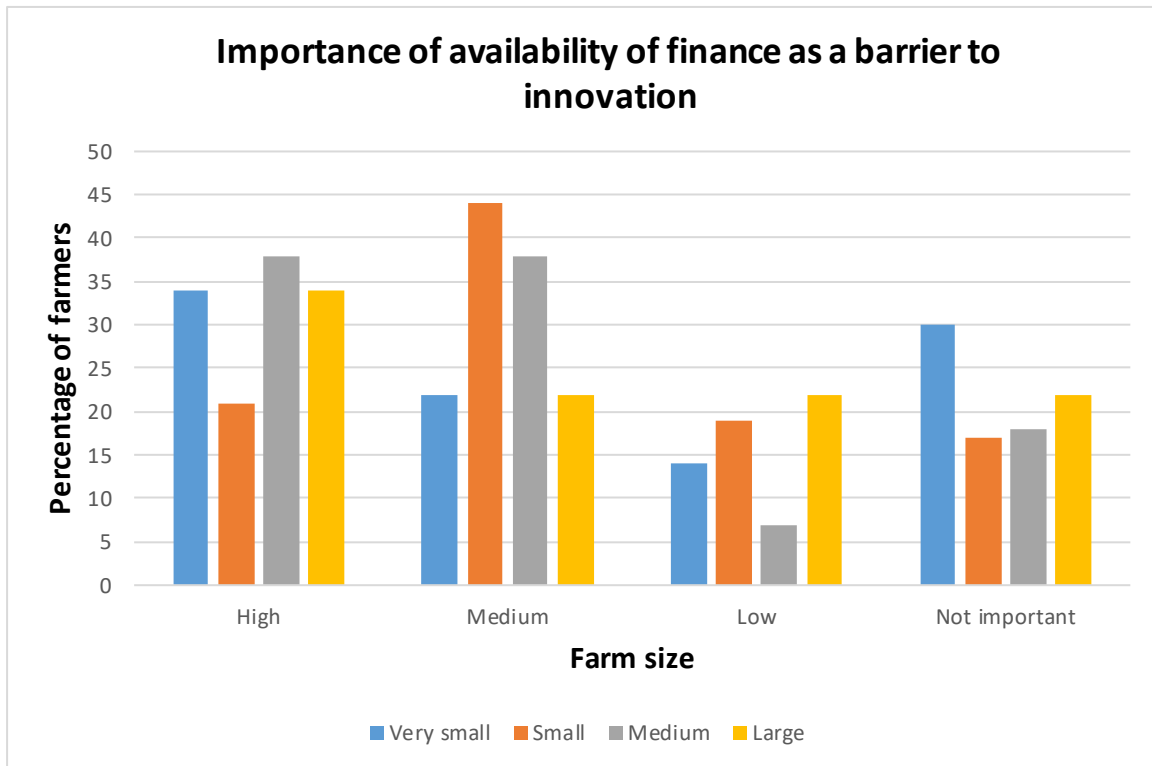
Financial costs/risks were considered a factor of high or medium importance in limiting innovation activities for the majority of all farm types except other (0%) and cereals (50%) (Figure 18). It was of particular importance to poultry farms where 90% viewed it of high or medium importance and general cropping where 84% viewed it as having high or medium importance.

**Figure 18**



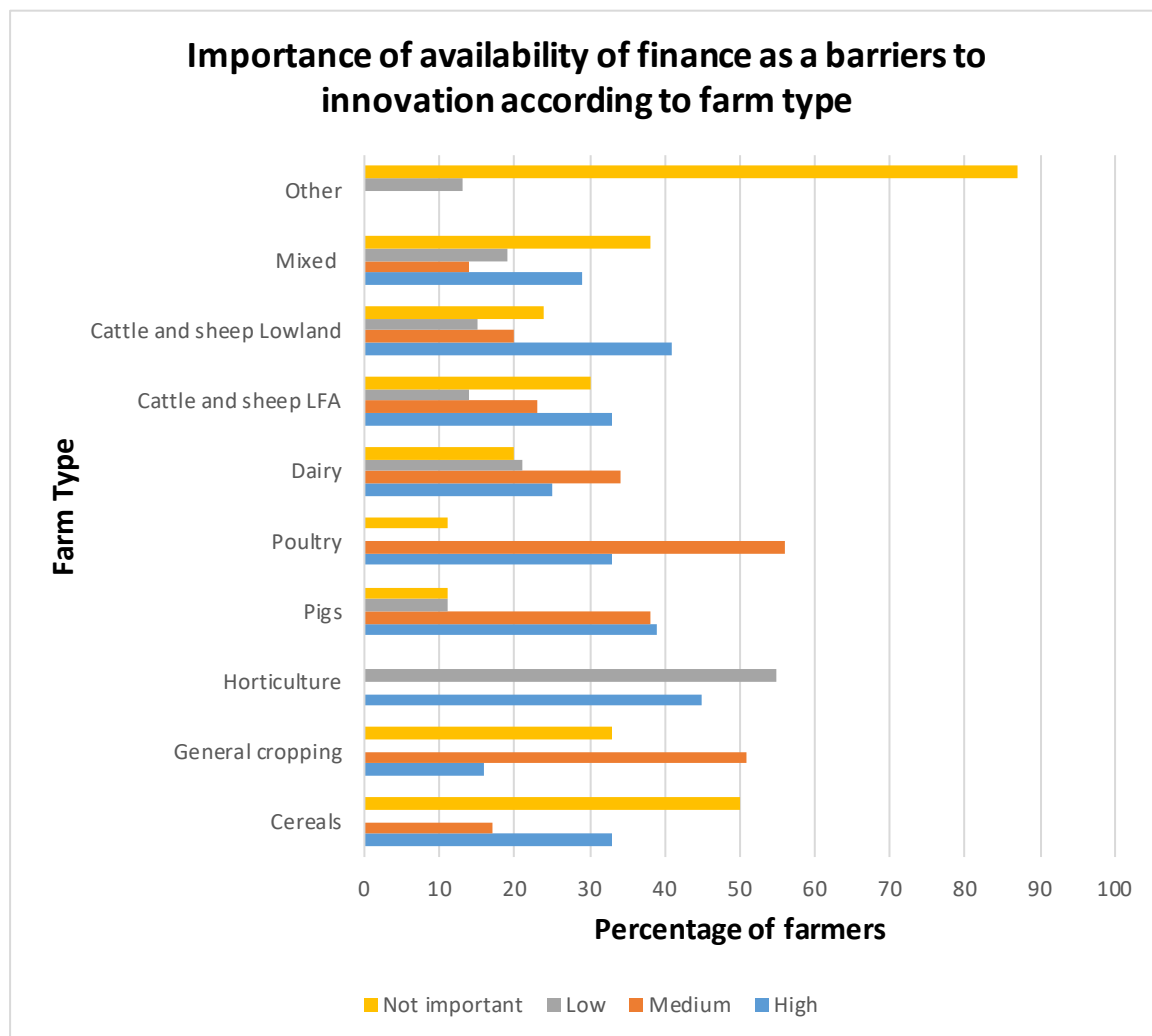
**Availability of finance:** The availability of finance was considered to be a factor of high and medium importance as a barrier to innovation by 56% of very small, 65% of small, 76% of medium and 56% of large farms (Figure 19).

**Figure 19**



The majority of farmers in six out of the ten farm types thought availability of finance was a high or medium barrier to innovation. The exceptions were cereals (50%), horticulture (45%), mixed (43%) and other (0%). Availability of finance as a barrier to innovation was of particular importance on poultry and pig units with 89% of poultry farmers and 77% of pig farmers indicating that it was of high or medium importance (Figure 20).

**Figure 20**

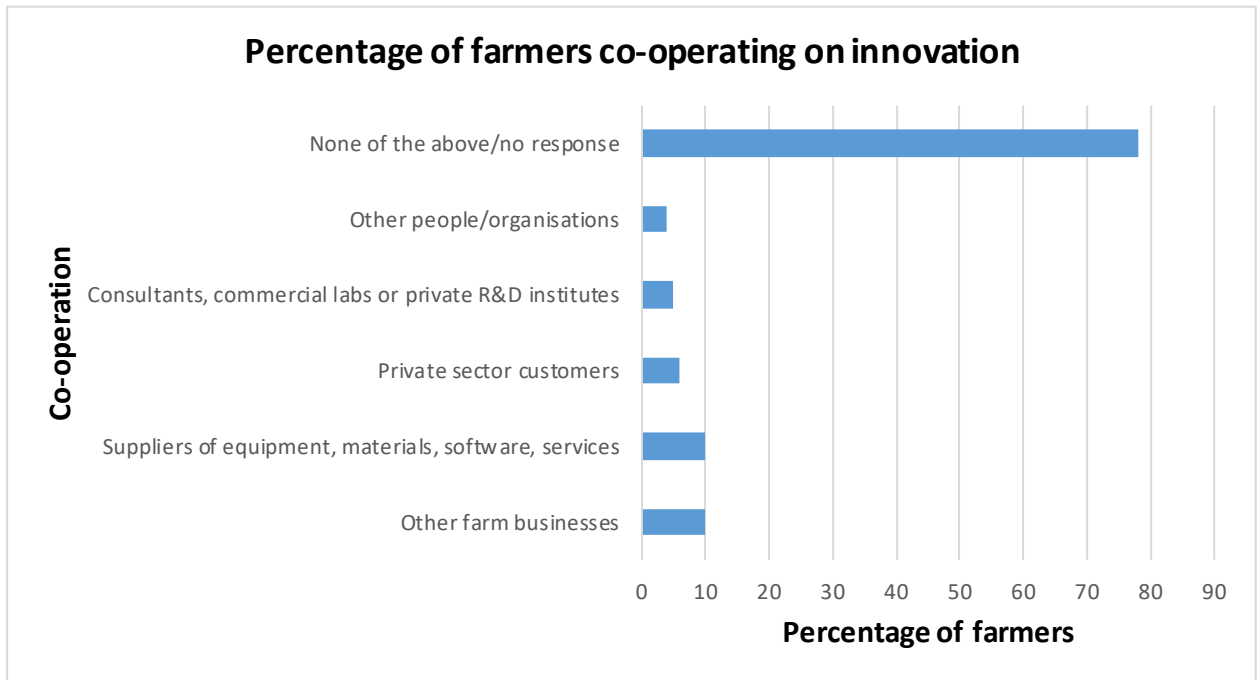


### Co-operation in innovation

78% of farmers did not co-operate with others on innovation. Where farmers had engaged in innovation 11% of them co-operated with other farm businesses and 11% co-operated on the innovation activity with suppliers of equipment, materials, services or software (Figure 21). Farmers recorded that they had co-operated with others such as veterinary labs, within Business Development Groups and Loughry College. The comments gave little/no indication of specific innovative projects completed on farm.

Large and medium sized farms were most likely to co-operate with 38% of medium and 28% of large farms indicating they had co-operated with others on innovation activities.

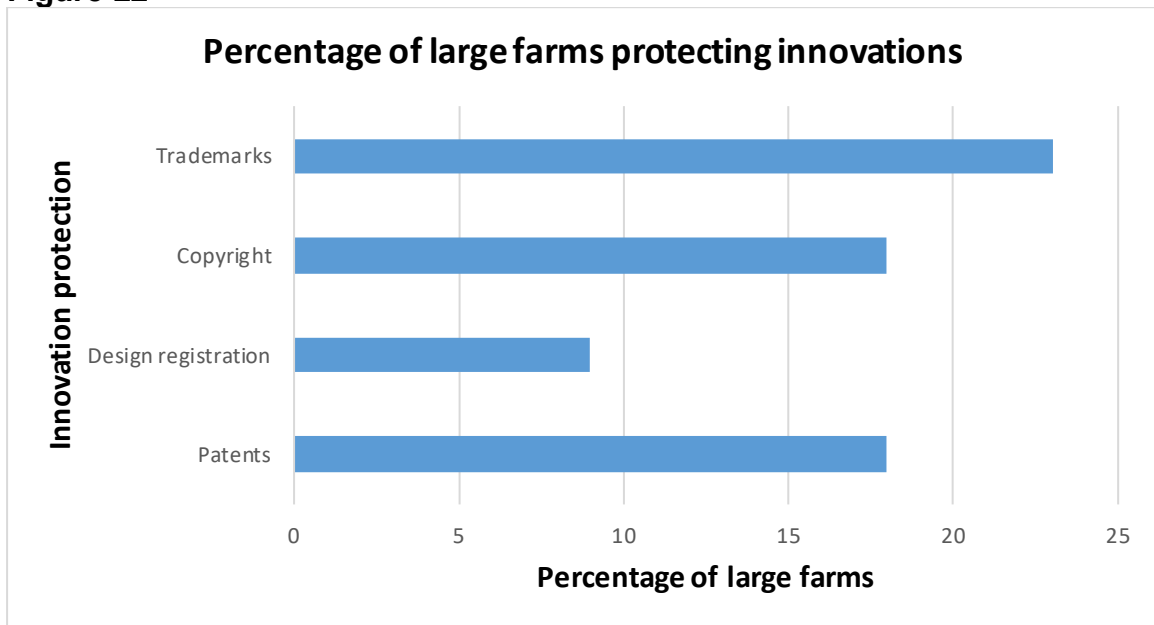
**Figure 21**



### **Protection of innovations**

Only 5% of farmers that engaged in innovation reported that they had protected innovations on their farms. The vast majority of protections were on large farms where 18% reported they had taken out patents, 9% design registration, 18% copyright and 23% trademarks (Figure 22). There were no innovation protections on small or medium farms and only 2% (complexity of goods or services) recorded on very small farms. There was no indication provided as to what the protected innovations were.

**Figure 22**

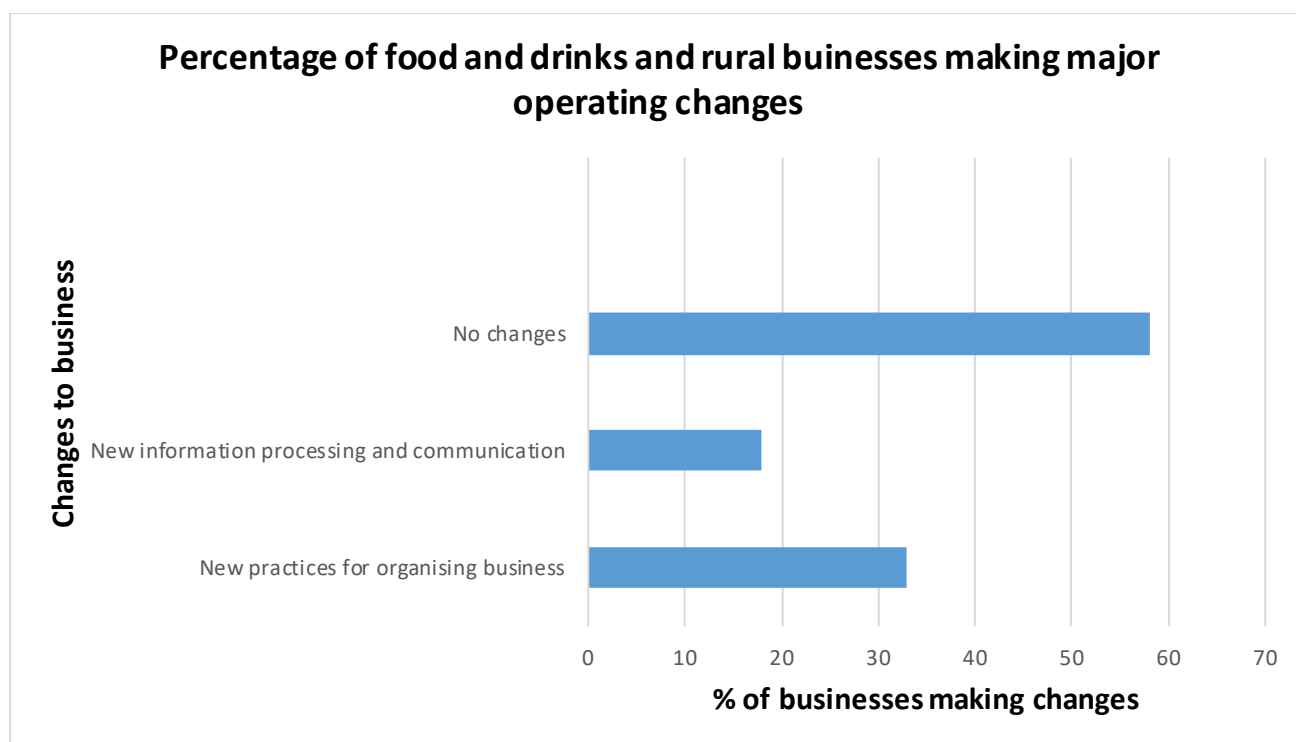


## 5. FOOD AND OTHER BUSINESSES SUPPORTED BY DAERA INNOVATION SURVEY RESULTS

**Major Changes:** 42% of NI's **Other Businesses supported by DAERA** made major changes during 2019 and 2020. However, for some businesses the amount of change is likely to have been curtailed due to the COVID 19 pandemic. Some businesses reported being forced to make operational changes to allow them to continue to trade during the pandemic.

33% of food and rural businesses introduced new practices for organising their businesses and 18% introduced new methods for information processing and communication (Figure 23). Results for other categories are too low to report. Details are provided in Annex (v) Table 132.

**Figure 23**

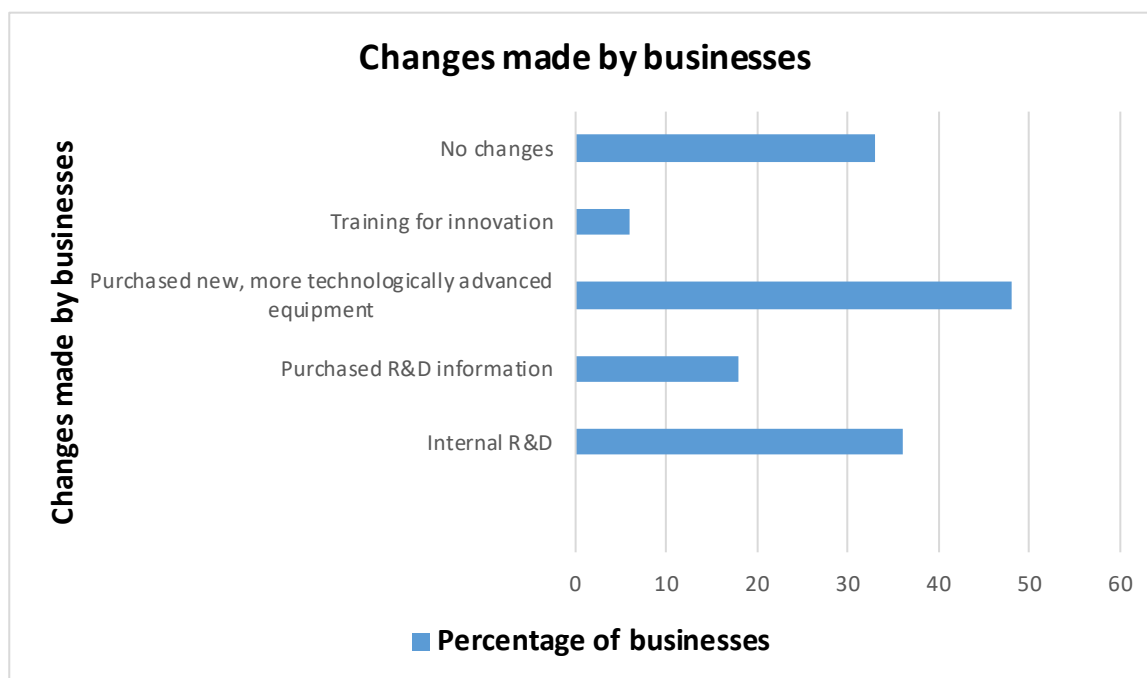


**Research and development:** 36% of food and rural businesses carried out internal research and development and 18% purchased research and development information for use in their business (Annex (v) Table 133).

**New technology:** 48% of food and rural businesses invested in new, more technologically advanced machinery, equipment and/or computer hardware or software (Figure 24). The numbers of businesses that invested in design services,

changes to products or design and licensing or patents is too low to report. See Annex (v) Table 133 for details. A brief description of investments is also provided.

**Figure 24**



**New or significantly improved products or services:** 33% of food and rural businesses produced new or significantly improved products or services with 73% of these new or improved products or services developed within the business. The new or significantly improved products or services were largely only new to the business and none were new to the market or a new innovation to benefit the environment. See Annex (v) Tables 135, 136 and 137 for details.

**Big Data:** 24% of businesses undertook Big Data innovation activity. Innovation in Internet of Things technology is the only reportable investment at 18%. Innovations in data capture, visual analytics, blockchain or data analysis software are too low to report due to possible data disclosure. Annex (v) Table 141 relates.

**Artificial Intelligence:** 18% of businesses undertook innovation relating to Artificial Intelligence but breakdowns cannot be provided due to low responses and possible data disclosure. Annex (v) Table 142 relates.

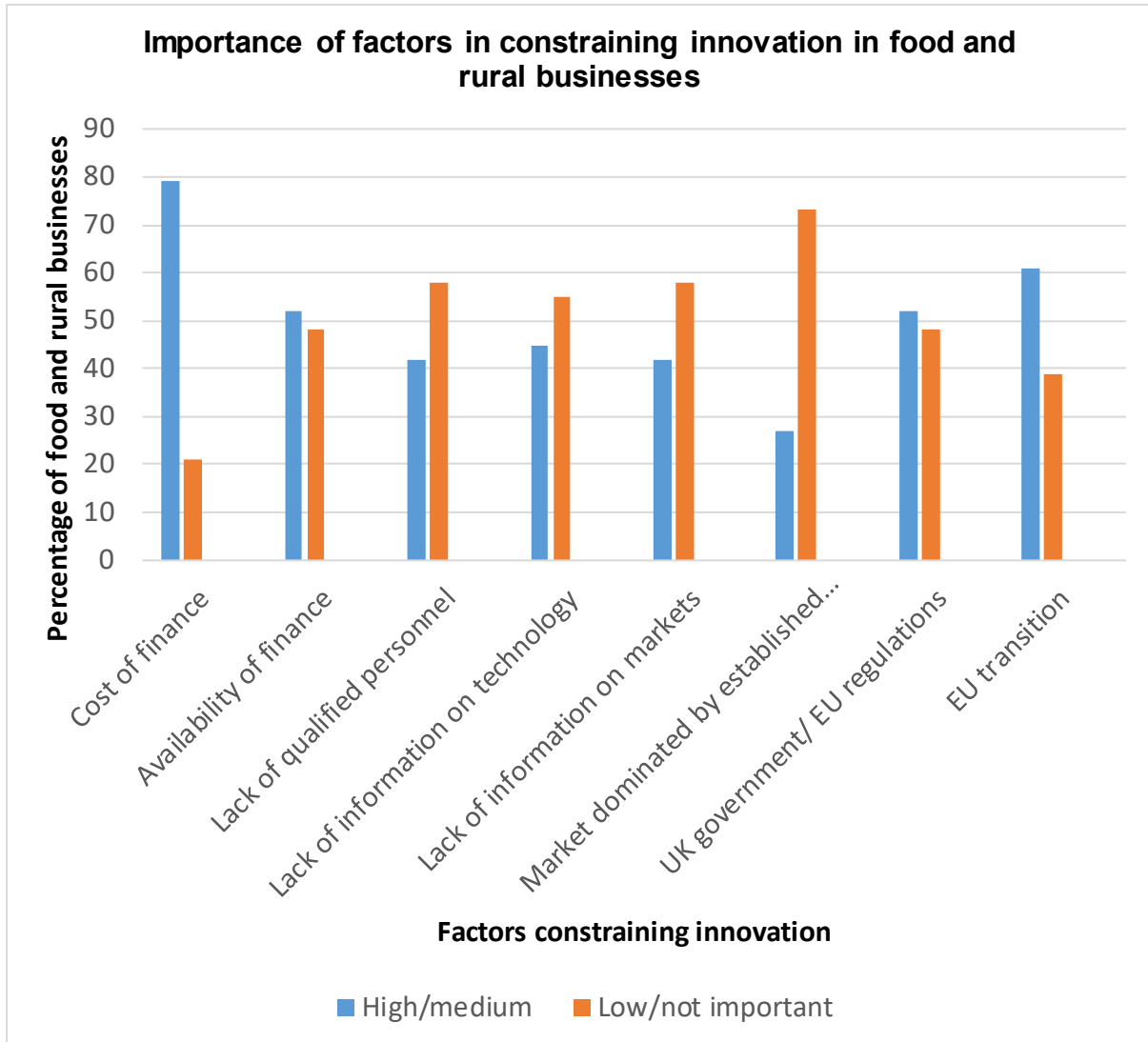
**Transformative Bioeconomy:** Although some businesses undertook innovation relating to Transformative Bioeconomy, numbers are too low to report.

**Barriers to innovation:** The high cost of finance was the major factor in preventing innovation with 79% of businesses rating it as of high or medium importance in preventing innovation. 61% of businesses rated EU transition as a high or medium



barrier to innovation with EU Transition and the NI Protocol having a major impact on the ability to plan for the future. 52% rated availability of finance as of high or medium importance. Markets dominated by established businesses were considered to be of least importance with 73% of businesses indicating that it was of low importance or not important. Annex (v) Table 144 relates.

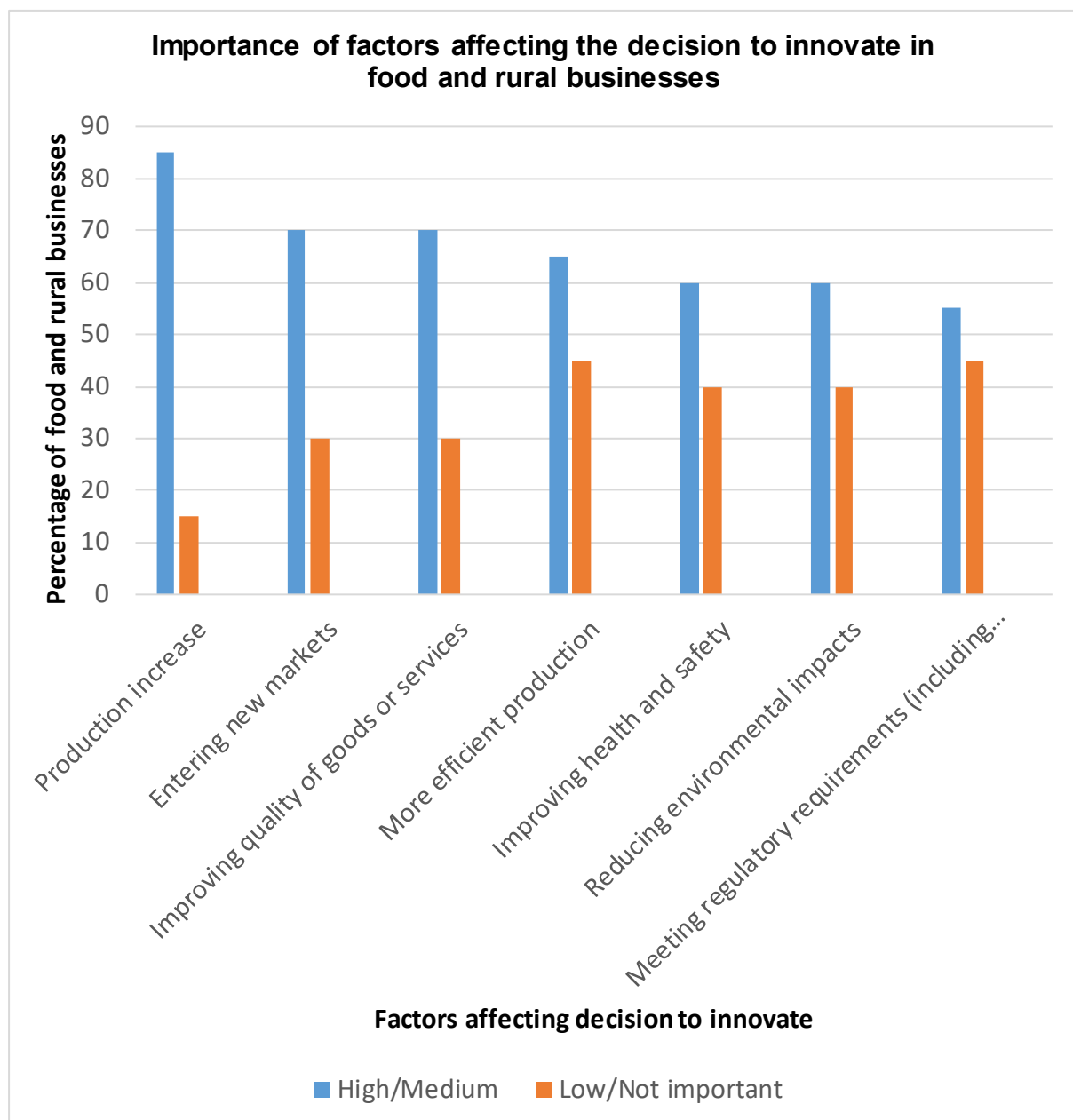
**Figure 25**



## Why do food and rural businesses innovate?

The most important factors (factors indicated as high or medium importance) in the decision to innovate were production increase (85%), entering new markets (70%), improving quality of goods or services (70%), improving health and safety (60%) and reducing environmental impacts (60%) (Figure 25). 55% of respondents indicated that more efficient production was of high or medium importance in their decision to innovate. See Annex (v) Table 146 for more details.

Figure 26



**Co-operation in innovation**

25% of businesses that engaged in innovation indicated they had co-operated with other businesses in innovation activities and 25% had co-operated with suppliers of equipment, materials, services or software. A small number of these businesses provided examples of international collaboration on innovation. In total 45% of respondents that co-operated did so with an external partner to develop their innovation. See Annex (v) Table 147 for more details.

**Protections**

15% of business that engaged in innovation placed some sort of legal protection on their innovation activities.

## 6. DISCUSSION

The DAERA Innovation Strategy, launched in April 2021, focuses on the establishment of an enabling environment within DAERA to support innovation and the implementation of innovation actions within the Department. It also focuses on the development of an enabling, external environment to encourage and support the implementation of innovation actions across the sectors it serves. The strategy's Mission is to *'Create an innovation ecosystem delivering for the environment, societal wellbeing and the rural economy, through creating an enabling environment for innovation to flourish, enhancing the impact of knowledge generation and science investments, and collaboration and exploitation, ensuring positive, measurable outcomes for the Northern Ireland environment and economy.'*

There are many innovative opportunities available, particularly involving rapid advances in technology. The Innovation Strategy identified the exploitation of Big Data, Artificial Intelligence and Transformative Bioeconomy as being at the forefront of innovation change.

The sectors within DAERA's remit include agri-food, environment, fisheries, forestry, rural development and cross-sector issues including sustainability, climate change and Green Growth. Agriculture, food and drink and rural businesses are vital sectors of the Northern Ireland economy. Agriculture had nearly 26,000 farms<sup>2</sup>, supported over 52,000 jobs and had a gross output of £2.43bn, with a value added of £716 million in 2021.

The food and drinks processing sector in NI has over 300 businesses<sup>3</sup> with a turnover in excess of £250,000 with total sales of nearly £5.4bn in 2019 and a value added of £998 million. It accounts for 37% of total manufacturing goods sales, 39% of manufacturing external sales and 24% of export sales. The sector's contribution to total manufacturing employment was 30% in 2019. Around 58% of businesses operating in NI in 2019 were in rural areas with close to 43,800 businesses. Some 41% of these rural businesses are involved in agriculture, forestry or fishing.

A drive to continuously innovate is crucial to these economically and environmentally important sectors. However little information is available as to the extent of innovation in these businesses across NI. The Innovation Survey was carried out to help provide this information. The response rate to surveys can be difficult to predict however the Innovation Survey obtained a 10% response rate from farmers and a combined response rate of about 9% from food, rural businesses and environmental organisations. However, it is disappointing that no surveys were completed by drinks businesses and only three were received from environmental organisations despite letters and reminders being sent to sectoral organisations asking them to encourage

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<sup>2</sup> DAERA (2021) Statistical Review of Northern Ireland Agriculture 2021

<sup>3</sup> DAERA (2020) Northern Ireland Food and Drinks Processing report 2020

members to complete the survey if invited to do so. Results have therefore been merged into one category called food and rural businesses.

The term 'innovation' is not new, it has been used for many years and it is a very broad concept. Within the Innovation Strategy it is defined as '*the successful generation and exploitation of new ideas. It is about transforming creative thinking into new products, new and improved processes and technologies to support new ways of doing business.*' However, the understanding of what 'innovation' is has been diluted and as such risks minimising its importance and undermining its value in generating and exploiting new ideas and transforming how we do business at a time when the sectors in DAERA's remit are facing many challenges.

This 'dilution' was apparent within the comments received by respondents to the Farm Innovation Survey. For example, only 15% of farmers indicated they had carried out what they considered to be major changes to their business including new ways of operating, changes to organising work and decision making, developing new working relationships and use of new computer systems. Small and large farms were more likely to have made changes with 30% of small and 30% of large farms reporting major changes.

Changes were most likely on horticulture units, pig and dairy farms.

Examples of what the respondents included as 'new or significantly improved' were:

- Increased feeding of meal to calves;
- Making better use of forage;
- Round bale silage to offer more flexibility;
- Moved from outside lambing to inside lambing;
- Using sexed semen.

While these 'new and significantly improved ways' may be new to the farm they cannot be considered as 'innovation' as these practices are now routine on many farms across NI.

10% of farmers responded that they invested in new, more technologically advanced machinery. Examples provided include slurry spreading equipment, new front-end loaders, new tractors. While the tractors may be more technologically advanced than older models they could not be described as on farm innovation. Only 2% of farms invested in new inventions.

Advice from advisors, consultants, expertise or training for use within the farm business scored 13%. The comments received indicate that this is mainly advice from DAERA Development Advisers, BDG meetings and vets. It is interesting to note that advice obtained increased with farm size with 10% of very small farmers seeking advice compared to 17% of small, 27% of medium and 40% of large.

New ways of organising work responsibilities and decision making was mainly the creation of father/son partnerships and succession planning. The use of new

computer-based systems showed a move to the use of apps for herd recording and management.

77% of respondents did not participate in any DAERA programme or scheme. Only 3% indicated participation in Farm Innovation Visits and 2% in Technology Demonstration Farms, however this was largely due to the suspension of these programmes as a result of the COVID-19 pandemic. Work will be required to engage more farmers if DAERA is to increase on farm innovation/adoption of innovative techniques on NI farms.

Survey questions relating to adoptions of new technologies did not refer directly to Big Data, Artificial Intelligence or Transformative Bioeconomy to avoid complicating the survey questions as they are not terms that would be regularly used within the agriculture industry. In terms of uptake of Big Data technologies, Internet of Things (IoT) was adopted by 14% of farmers, while 6% had availed of new computer packages during the time period of the survey, and 3% had adopted visual analytics. However, the number of farmers who indicated they had adopted the Big Data technology was not reflected in the comments received. A large number of respondents stated they had installed cameras for calving/lambing/security reasons, others had purchased drones to check cows. The comments indicate that the cameras and drones are used solely for monitoring purposes and not for data capture. Computer analysis of herd performance and farm accounts packages were also included. Big Data technologies are most likely to be utilised on large farms.

AI was reported to be used mainly on large farms with 15% adopting robotics, 20% machine learning programmes, 27% precision farming and 6% predictive modelling and algorithms. Also 50% of arable farms have indicated they have adopted precision farming techniques.

Uptake of Transformative Bioeconomy technologies was very limited with only 2% of farmers stating they had employed new ways of using farm wastes including recycling waste plastic and using spent mushroom compost on grass. 1% of respondents indicated production of biomass using prunings to make charcoal and another 1% replaced fossil fuels by using solar panels and sending slurry to an anaerobic digester.

The Innovation Strategy contains a commitment to complete an in-depth review and report on the barriers to innovation across the sectors in DAERA's remit. From the survey, the main factors reported to be limiting innovation on farms are financial cost/risk and availability/cost of finance. The examples cited as limiting to innovation included age or ill health, insufficient profit from farming, small farm size, part time farming, uncertainty in the market and red tape.

Deciding to innovate was mainly driven by the aim of more efficient production and also improving health and safety.

Food and rural businesses reported only negligible participation in the programmes or schemes listed indicating their level of engagement with DAERA may be lower than for farmers. It could be assumed that it will be more difficult to get DAERA's innovation message out to these businesses.

Much of the time period over which the survey was based was during the COVID 19 pandemic. This had an impact on how some of the food and rural businesses operated. Many had to 'innovate' at pace to overcome the challenges the pandemic posed to their businesses.

Despite this:

- 42% of food and rural businesses made major changes during 2019 and 2020;
- 36% carried out internal research and development;
- 18% purchased research and development information for use in their business;
- 48% invested in new, more technologically advanced machinery, equipment and/or computer hardware or software;
- 33% produced new or significantly improved products or services.

New or significantly improved products or services included production of new vegan lines, incised timber services and new surveying equipment.

As for agriculture, one of the main barriers to innovation was the cost of finance.

Food and rural businesses also cited EU exit as a major barrier to innovation.

Decisions to innovate by food and rural businesses were production increase driven (85%) and entering new markets and improving quality of goods and services (70%).

Protection of innovations in food and rural businesses was found to be negligible.

## 7. ANNEXES

### (i) Farm Survey responses weighted by farm size

Q1. What is your unique survey code?

Q2. Have you taken part in any of the following DAERA programmes or schemes during the period 1 January 2019 to 31 December 2020? (Please select all that apply.)

**Table 7**

DAERA Programmes / Schemes	Farm size				
	Very small	Small	Medium	Large	All
Business Development Groups	10%	21%	45%	42%	14%
Farm Innovation Visits	3%	0%	4%	12%	3%
Agri-food Cooperation Scheme	1%	0%	0%	0%	1%
Technology Demonstration Farms	2%	0%	0%	3%	2%
European Innovation Partnerships	0%	0%	0%	0%	0%
Rural Micro Business Growth Scheme	0%	0%	0%	0%	0%
None of the above/no response	89%	79%	51%	53%	84%
Base (Number of farms)	19177	2586	1038	1470	24271

Q3. Between 1 January 2019 and 31 December 2020 did you make any major changes to your farm business in the following areas? (Please select all that apply.)

**Table 8**

Type of major business change	Farm size				
	Very small	Small	Medium	Large	All
New ways of operating your farm business	5%	14%	0%	14%	7%
New methods of organising work	5%	12%	12%	6%	6%
New working relationships	2%	0%	4%	3%	2%
New computer based systems	5%	11%	7%	18%	6%
None of the above/no response	88%	70%	78%	70%	85%
Base (Number of farms)	19177	2586	1038	1470	24271

#### *Brief description of business changes*

Additional enterprise added, meat processing and wholesale
After 40 years I stopped farming to focus on Agricultural Consultancy and other off farm interests
APHIS online
Auto weighing platforms in poultry house



Calf to beef system implemented instead of calf to store, FQA qualified, supplying beef to .. ( <i>Food processor</i> )
Change from dairy enterprise to beef finishing enterprise
Change of farm business and planting of protein crops
Change of ownership and management
Changed from partnership to sole trader
Cleared site for retailing milk
Computer system on Sage to complete VAT returns
Continue to work with other farms developing food chain supply
Designing new software for recording pesticide records
Digital Cameras installed to observe livestock and yard
New computer software and packages
Succession planning
Farm Quality Assurance
Using Gatekeeper recording program for crop records
Herdwatch app for herd organisation
Farm Family Key Skills Anti-Microbial Resistance training
Got a Government Gateway number and keep all my herd lists etc online. Uploaded the Herdwatch app on the phone
Involved family members in feeding regimes and paperwork eg, farm accounts and SFP
Keeping more records so can make informed decisions, training team members in more tasks to share workload, considering various other potential income streams on and off farm, considering environment within all decisions
Made improvements to cattle handling facilities for health and safety reasons
Marts on line
New cattle accommodation
New laptop and printer; DAERA online services
New website
Paddock grazing system
Participated in DAERA Business Development Group
Reduction of herd and flock numbers
Started rearing calves for cow replacements and consulted with the source dairy farmer on breeding.
Took the Level 3 - Business in Agriculture course.
Training in sheep shearing. Recording and processing information kept from sheep and cattle (ie weighing)
Training on foot trimming, computer software package to record/manage fertility and lameness
Upgraded Smart Camera system for herd management; GPS installed in tractor

Q4. Between 1 January 2019 and 31 December 2020 did you receive / invest in any of the following? (Please select all that apply.)

**Table 9**

Type of investment	Farm size				
	Very small	Small	Medium	Large	All
Advice	10%	17%	27%	40%	13%
Research/development	2%	4%	5%	9%	3%
New more tech advanced machinery	6%	22%	18%	32%	10%
New inventions	2%	6%	4%	1%	2%
Training to support innovation	1%	0%	5%	5%	1%
Design services	1%	0%	0%	0%	1%
Market research	1%	0%	0%	3%	1%
None /no response	83%	65%	68%	54%	78%
Base (Number of farms)	19177	2586	1038	1470	24271

*Brief description of investments*

Acquired improved handling facilities
Advice from DAERA advisors, guest speakers and other participants in BDG groups. Invested in automatic scraper with smart switch to operate from mobile phone and camera system for cattle houses
Advice from my vet
Antimicrobial course for antibiotic use, GPS for efficient use of fertiliser
Automatic scrapers; New telehandler
Availed of advisors through CAFRE and sourced other independent advice through the likes of agronomists.
Body scoring sheep to maintain a desired condition for tugging
Bought a cattle weighbridge, changed feed company, spoke with other farmers in a similar system
Bought dribble bar and tanker; Put up slurry store; Member of BDG Dairy and now joined Environmental BDG; Planted trees and erected fencing under wider environmental scheme
Bought new sprayer
Diet feeder
GPS navigation system for tractor to precisely apply fertiliser
Use of a consultant for spray advice

Make continuous use of the latest advice and developments to make my farming, in this case cereal growing, as efficient as possible using the newest varieties and materials. By joining the land that I farm with that of my farming partner we have been able to use more modern and efficient machinery and develop a better relationship with our customer.
I paid for assistance and expertise and through Agri-Food Co-operation Scheme, utilised a design and marketing team to design packaging and website and marketing materials.
In 2020, one of the partners our farm business completed a Level 2 qualification in agriculture.
In BDG, in touch with mentor and discuss farm business issues and benchmarking
Indirect export of breeding sheep.
Loughry College food technology; Computerised weighbridge; Invest NI support
Meeting with other farmers and sharing ideas, some of which we can adapt for use on our own farm
New computers; software
New front-end loader for tractor
A number of respondents reported investing in machinery including McHale baler; new tractor and sower; new tractor with electronics; battery powered shears for clipping sheep; new telehandler; slurry tanker and dribble bar
Soil samples
Sale of milk direct from farm

Q5. Between 1 January 2019 and 31 December 2020 did you produce any new or improved products or start to offer any other new services from your farm?

**Table 10**

	Farm Size				
	Very small	Small	Medium	Large	All
Yes	2%	10%	7%	10%	4%
No	98%	90%	93%	90%	96%
Base (Number of farms)	19177	2586	1038	1470	24271

Q6. Were these products or services developed mainly by:

**Table 11**

	Farm size				
	Very small	Small	Medium	Large	All
Other businesses or organisations?	13%	44%	47%	0%	23%
Your farm business with a group of businesses or organisations?	13%	0%	0%	0%	6%
Your farm business?	74%	56%	53%	100%	71%
Base (Number of farms)	372	266	77	145	860

Q7. Between 1 January 2019 and 31 December 2020 were any of your products and services innovations: (Please select all that apply.)

**Table 12**

	Farm Size				
	Very small	Small	Medium	Large	All
New to your market	26%	0%	0%	26%	16%
Only new to your business	48%	32%	100%	50%	48%
Base (Number of farms)	372	266	77	145	860

*Brief description of improved products or services*

Started breeding novel breed of sheep
Introduced different breed of pedigree sheep
Lamb prime cuts and ready meals
Making charcoal, apple juice and cider
New mental welfare programmes. Increased scope of tourism provision
Using new vitamin and minerals for cows to help improve calf health at birth
Protein crop - beans
Providing work spaces
Pure bred Aberdeen Angus bulls

Q8. Between 1 January 2019 and 31 December 2020 did you introduce any new or significantly improved ways of producing and/or selling what you produce? (This includes major changes in how you produce and any new equipment or software.)

**Table 13**

	Farm size				
	Very small	Small	Medium	Large	All
Yes	4%	12%	18%	18%	6%
No	96%	88%	82%	82%	94%
Base (Number of farms)	19177	2586	1038	1470	24271

Q9. Were these new or improved ways of producing or selling developed mainly by:

**Table 14**

	Farm size				
	Very small	Small	Medium	Large	All*
Your farm business?	93%	100%	30%	73%	83%
Your farm business with a group of businesses or organisations?	0%	0%	20%	0%	2%
Other businesses or organisations?	7%	0%	50%	27%	14%

Base (Number of farms)	705	317	183	269	1474
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\*Does not add to 100% due to rounding

Q10. Were any of the new or significantly improved ways of producing or selling on your farm also new to the Northern Ireland agricultural industry?

**Table 15**

	Farm size				
	Very small	Small	Medium	Large	All
Yes	20%	0%	30%	5%	14%
No	80%	100%	70%	95%	86%
Base (Number of farms)	705	317	183	269	1474

*Brief details of improvements in producing or selling*

Colostrum protocol using sexed semen for dairy replacements
Better use of forage; Using more round bale silage
Investment in lambing sheds and pens to allow indoor lambing
On line livestock sales
Producing high quality wool to enhance returns from flock
Selling through Facebook and an online shop
Using social media
Sell on line through Done Deal etc

Q11. Between 1 January 2019 and 31 December 2020 did you have new farm business innovation activities that were: (Please select all that apply.)

**Table 16**

	Farm size				
	Very small	Small	Medium	Large	All
Abandoned	1%	5%	0%	0%	2%
To be further developed	3%	6%	4%	17%	4%
Scaled back	1%	0%	5%	8%	2%
Still ongoing unchanged at the end of 2020	5%	7%	7%	6%	5%
None of the above/no response	90%	85%	84%	76%	89%
Base (Number of farms)	19177	2586	1038	1470	24271

*Brief description of innovations*

Additional free-range poultry unit
New production facility for our yoghurt
Biodigester project scaled back to reflect changed circumstances on farm
Discussed forestry option on part of farm
Due to my age I have reduced stock numbers
Experimented with Min-till autumn 2020 to be furthered in spring 2021 in order to also try spring crops under same system. Results to be monitored harvest 2021
Fencing grant application but I ran out of time
Fencing waterways and planting of hedgerows
Further orchard planting
Grass measuring
Modernise some livestock buildings and equipment
Off-setting farm carbon footprint by growing native trees and planting
Paddock grazing; Tight calving and lambing periods; Blood sampling; Soil sampling
Glamping pods; Marketing freezer vacuum pack poultry and lamb
Solar panels 20 KVA with roc and export payments in now nearly 8 years
Work is ongoing into the alternatives to zinc oxide in piglet diets; Lactating diets for young sows

Q12. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following technologies?

**Table 17**

	Farm size				
	Very small	Small	Medium	Large	All
Data capture	1%	3%	0%	21%	2%
Visual analytics	2%	3%	0%	24%	3%
Internet of things	10%	25%	37%	27%	14%
Blockchain	1%	0	2%	5%	1%
Computer software packages	3%	17%	12%	20%	6%
Other big data collection and analysis systems	1%	0%	0%	1%	1%
None of the above	86%	68%	61%	62%	81%
Base (Number of farms)	19177	2586	1038	1470	24271

The majority of brief descriptions of Big Data innovation adopted by respondents related to installation of cameras to check on cows at calving and in lambing sheds. A small number of other respondents mentioned use of drones to check cows, out of parlour cow feeders, robotic milking, heat detection sensors and new computers and software.

Q13. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following areas?

**Table 18**

	Farm size				
	Very small	Small	Medium	Large	All
Robotics	1%	0%	5%	15%	1%
Machine learning programmes	2%	0%	5%	20%	3%
Precision farming	3%	7%	11%	27%	5%
Predictive modelling and algorithms	1%	2%	0%	6%	1%
Other AI systems or processes	1%	2%	0%	0%	1%
None of the above	95%	91%	79%	64%	92%
Base (Number of farms)	19177	2586	1038	1470	24271

The majority of brief descriptions of AI systems or processes reported by respondents referred to the use of GPS systems for fertiliser spreading. Comments also included use of automatic slurry scrapers, machine prediction of heat in cows, flow meters on dribble bars to apply slurry more accurately and soil sampling.

Q14. Between 1 January 2019 and 31 December 2020 did any innovations on your farm include any of the following areas?

**Table 19**

	Farm size				
	Very small	Small	Medium	Large	All
New ways of using farm wastes	1%	5%	0%	2%	2%
Production of biomass	1%	0%	0%	5%	1%
Replacement of fossil fuels with alternative	1%	0%	0%	0%	1%
Biorefineries	0%	0%	0%	0%	0%
Nutrient valorisation	1%	0%	0%	5%	1%
Other conversion of renewal biological resources	1%	0%	0%	0%	1%
None of the above	97%	95%	100%	88%	96%
Base (Number of farms)	19177	2586	1038	1470	24271

*Brief description of bioeconomy adoptions*

Use spent mushroom compost to grow grass for poultry and sheep production. Harvest rain water to supply drinking water for livestock.
Anaerobic digester plant making use of slurry, farmyard manure and silage to produce electricity.
All plastic waste collected by a recycling firm.
Make charcoal
Biomass boilers
Silage covers and plastic containers sent for recycling.
Slurry bugs
Solar panels and fire wood
Supply silage to digester
Waste timber for heating
Willow filters for yard run off was harvested and used to heat the dwelling

Q15. Between 1 January 2019 and 31 December 2020 how important were the following factors in limiting innovation activities on your farm?

**Table 20**

Importance of financial costs/risks:	Farm size				
	Very small	Small*	Medium	Large	All
High	47%	42%	65%	47%	47%
Medium	17%	21%	19%	36%	19%
Low	9%	17%	2%	7%	9%
Not important	27%	19%	14%	10%	25%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

**Table 21**

Importance of availability of finance:	Farm size				
	Very small	Small*	Medium*	Large	All*
High	34%	21%	38%	34%	33%
Medium	22%	44%	38%	22%	25%
Low	14%	19%	7%	22%	15%
Not important	30%	17%	18%	22%	28%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding



**Table 22**

Importance of lack of qualified personnel:	Farm size				
	Very small	Small	Medium	Large	All
High	13%	4%	10%	11%	11%
Medium	22%	23%	45%	28%	24%
Low	22%	43%	25%	30%	25%
Not important	43%	30%	20%	31%	40%
Base (Number of farms)	19177	2586	1038	1470	24271

**Table 23**

Importance of lack of knowledge of technology:	Farm size				
	Very small	Small*	Medium*	Large*	All
High	18%	17%	18%	16%	18%
Medium	24%	23%	42%	35%	25%
Low	24%	39%	24%	25%	25%
Not important	34%	22%	17%	25%	32%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

**Table 24**

Importance of lack of market knowledge:	Farm size				
	Very small	Small	Medium*	Large*	All
High	14%	14%	7%	7%	13%
Medium	24%	15%	41%	29%	24%
Low	26%	45%	36%	36%	29%
Not important	36%	26%	17%	29%	34%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

**Table 25**

Importance of market dominated by established businesses:	Farm size				
	Very small	Small	Medium	Large	All
High	18%	11%	12%	3%	16%
Medium	22%	31%	46%	31%	24%
Low	22%	38%	28%	35%	25%
Not important	38%	20%	14%	31%	35%
Base (Number of farms)	19177	2586	1038	1470	24271

**Table 26**

Importance of UK/EU government regulations:	Farm size				
	Very small*	Small*	Medium	Large*	All
High	24%	18%	13%	17%	22%
Medium	22%	38%	43%	32%	25%
Low	21%	23%	19%	24%	21%
Not important	34%	22%	25%	28%	32%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

**Table 27**

Importance of EU exit:	Farm size				
	Very small	Small*	Medium*	Large*	All
High	26%	20%	17%	8%	24%
Medium	17%	18%	34%	28%	19%
Low	18%	26%	26%	20%	19%
Not important	39%	36%	24%	43%	38%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

*Brief description of barriers to innovation*

Difficulties with RHI scheme
Small size of farm limiting return of investment
Cash flow combined with uncertainty in the market place
Climate/weather conditions
Constantly evolving technology
Costs and veterinary fees, all necessary expenses increasing and price of livestock stays the same
Debt bureaucracy; Infrastructure cost
Disability ..... farm investment schemes are not constructed in a way that is helpful for the disabled
Difficulties importing livestock from GB due to EU exit.
Farm is too small and older farmer not available to get grants and get innovations
Farm size; age; ill health
Financial and time constraints. Working off farm, using off farm earnings to make basic improvements to farm. Most 'Innovations' are only viable for large farms, and not traditional family farms which are being taken over by larger enterprises.
Financial impact of materials and also red tape and restrictions and cost on supplying water to an area
Financial profit margins on the farm increasingly tighter
Price increases since leaving the EU
My farm is too small

Innovation activities must produce a tangible benefit and be cost effective, and not just be the latest trend
Lack of funding; time; Personnel; Red tape; Market uncertainty
Lack of profit to reinvest

Q16. Between 1 January 2019 and 31 December 2020 did you implement any other innovations in your farm business that you have not already told us about in this survey?

**Table 28**

	Farm size				
	Very small	Small	Medium	Large*	All
I did not implement any innovations in my business between the above dates	80%	49%	48%	46%	73%
Yes, or just those already stated	20%	51%	52%	55%	27%
Base (Number of farms)	19177	2586	1038	1470	24271

\*Does not add to 100% due to rounding

*Brief description of other innovations*

Air b'n'b
Calf headlock system
Developing extension of farm business by offering facilities/self-catering accommodation
Embryo transfer and flushing of ewes
Environmental Farming Scheme (Wider)
Farm diversification projects; Glamping pods

Q17. Between 1 January 2019 and 31 December 2020 how important were each of the following factors in your decision to innovate on your farm?

**Table 29**

Importance of increasing production/market share:	Farm size				
	Very small*	Small	Medium	Large	All*
High	16%	23%	35%	18%	19%
Medium	39%	26%	38%	37%	36%
Low	20%	30%	10%	32%	23%
Not important	26%	21%	17%	13%	23%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 30**

Importance of entering new markets:	Farm size				
	Very small*	Small*	Medium	Large*	All
High	11%	10%	7%	18%	11%
Medium	16%	17%	45%	2%	17%
Low	32%	34%	31%	38%	33%
Not important	42%	40%	17%	43%	39%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 31**

Importance of improving quality of produce or replacing outdated products:	Farm size				
	Very small	Small*	Medium*	Large	All*
High	19%	31%	45%	41%	26%
Medium	36%	38%	34%	37%	36%
Low	17%	14%	10%	9%	15%
Not important	28%	18%	10%	13%	22%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 32**

Importance of more efficient production:	Farm size				
	Very small*	Small	Medium	Large	All*
High	36%	48%	80%	82%	48%
Medium	37%	28%	13%	9%	30%
Low	13%	18%	7%	0%	12%
Not important	15%	6%	0%	9%	11%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 33**

Importance of improving health and safety:	Farm size				
	Very small	Small	Medium	Large	All*
High	45%	37%	70%	55%	47%
Medium	32%	34%	13%	20%	29%
Low	6%	18%	0%	12%	9%
Not important	17%	11%	17%	13%	16%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 34**

Importance of reducing environmental impacts:	Farm size				
	Very small*	Small	Medium	Large	All
High	40%	26%	49%	78%	42%
Medium	32%	32%	24%	9%	28%
Low	10%	31%	10%	0%	13%
Not important	19%	11%	17%	13%	17%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

**Table 35**

Importance of meeting regulatory requirements (including standards):	Farm size				
	Very small*	Small	Medium *	Large*	All
High	27%	46%	38%	39%	33%
Medium	39%	30%	34%	17%	34%
Low	15%	18%	10%	30%	17%
Not important	20%	6%	17%	13%	16%
Base (Number of farms)	3845	1320	529	801	6495

\*Does not add to 100% due to rounding

Q18. Between 1 January 2019 and 31 December 2020 did you co-operate on any innovation activities with any of the following: (Please select all that apply)

**Table 36**

	Farm size				
	Very small	Small	Medium	Large	All
Other farm businesses	9%	10%	17%	17%	11%
Suppliers of equipment, materials, services or software	6%	12%	28%	23%	11%
Private sector customers	4%	0%	28%	14%	6%
Public sector customers	2%	5%	7%	5%	3%
Consultants, commercial labs or private R&D institutes	3%	2%	0%	6%	3%
Universities or higher education institutions	3%	0%	10%	0%	3%
Other people/organisations	5%	0%	0%	0%	3%
None of the above/no response	81%	81%	62%	72%	78%
Base (Number of farms)	3845	1320	529	801	6495

*Other cooperation description*

BDG
Farmers; Loughry College Food Technology and a food processing firm
Gave a private individual access to premises and machinery to trial new technology
I help other farm businesses with any regulatory issues they have
Mental welfare and Tourism groups
U-tube channels with same objectives - very useful to bounce ideas internationally and gain feedback good and bad.
Veterinary labs
We talked to other cattle breeders

Q19. Between 1 January 2019 and 31 December 2020 were any of the innovations on your farm protected by any of the following methods? (Please select all that apply.)

**Table 37**

	Farm size				
	Very small	Small	Medium	Large	All
Patents	0%	0%	0%	18%	2%
Design registration	0%	0%	0%	9%	1%
Copyright	0%	0%	0%	18%	2%
Trademarks	0%	0%	0%	23%	3%
Lead time advantages	0%	0%	0%	0%	0%
Complexity of goods or services	2%	0%	0%	0%	1%
Secrecy (including NDAs)	0%	0%	0%	0%	0%
None of the above/no response	98%	100%	100%	77%	95%
Base (Number of farms)	3845	1320	529	801	6495

## (ii) Farm Survey responses weighted by farm type

Q2. Have you taken part in any of the following DAERA programmes or schemes during the period 1 January 2019 to 31 December 2020? (Please select all that apply.)

**Table 38**

DAERA Programmes / Schemes	Farm Type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Business Development Groups	17%	0%	16%	56%	7%	30%	11%	13%	55%	0%	14%
Farm Innovation Visits	0%	0%	0%	0%	0%	8%	3%	2%	0%	0%	3%
Agri-food cooperation scheme	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	1%
Technology Demonstration Farms	0%	0%	0%	0%	0%	0%	2%	1%	0%	0%	2%
European Innovation Partnerships	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rural Micro Business Growth Scheme	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
None of the above/no response	83%	100%	84%	44%	93%	65%	88%	86%	45%	100%	84%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q3. Between 1 January 2019 and 31 December 2020 did you make any major changes to your farm business in the following areas? (Please select all that apply.)

**Table 39**

Type of major business change	Farm Type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
New ways of operating your farm business	17%	0%	0%	18%	0%	11%	6%	8%	7%	0%	7%
New methods of organising work	0%	0%	0%	9%	0%	15%	6%	4%	0%	13%	6%
New working relationships	0%	0%	0%	0%	7%	0%	3%	0%	0%	0%	2%
New computer based systems	17%	3%	36%	9%	7%	15%	5%	4%	0%	0%	6%
None of the above/no response	83%	97%	64%	72%	85%	68%	86%	88%	93%	87%	85%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271



Q4. Between 1 January 2019 and 31 December 2020 did you receive / invest in any of the following? (Please select all that apply.)

**Table 40**

Type of investment	Farm Type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Advice	33%	0%	16%	37%	23%	28%	10%	12%	55%	0%	13%
Research / development	17%	0%	0%	18%	7%	7%	2%	1%	7%	0%	3%
New more tech advanced machinery	17%	16%	19%	18%	30%	24%	6%	11%	7%	0%	10%
New inventions	0%	0%	0%	9%	0%	2%	3%	2%	0%	0%	2%
Training to support innovation	0%	0%	0%	0%	0%	5%	1%	1%	0%	0%	1%
Design services	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%
Market research	0%	0%	0%	0%	7%	0%	1%	0%	0%	0%	1%
None / no response	67%	84%	64%	54%	70%	65%	83%	78%	38%	100%	78%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q5. Between 1 January 2019 and 31 December 2020 did you produce any new or improved products or start to offer any other new services from your farm?

**Table 41**

	Farm type										All
	Cereals	General cropping	Horticulture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	
Yes	17%	19%	29%	0%	30%	5%	2%	0%	0%	0%	4%
No	83%	81%	71%	100%	70%	95%	98%	100%	100%	100%	96%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q6. Were these products or services developed mainly by:

**Table 42**

	Farm Type							All*
	Cereals	General cropping	Horti culture	Poultry	Dairy	Cattle and sheep LFA*		
Other businesses or organisations?	0%	0%	0%	76%	0%	23%	24%	
Your farm business with a group of businesses or organisations?	0%	0%	0%	0%	0%	13%	6%	
Your farm business?	100%	100%	100%	24%	100%	63%	71%	
Base (Number of farms)	33	113	60	156	136	361	859	

\*Does not add to 100% due to rounding

Q7. Between 1 January 2019 and 31 December 2020 were any of your products and services innovations: (Please select all that apply.)

**Table 43**

	Farm Type						
	Cereals	General cropping	Horti culture	Poultry	Dairy	Cattle and sheep LFA	All
New to your market	0%	0%	0%	24%	0%	27%	16%
Only new to your business	100%	13%	43%	0%	54%	73%	48%
Base (Number of farms)	33	113	60	156	136	361	859

Q8. Between 1 January 2019 and 31 December 2020 did you introduce any new or significantly improved ways of producing and/or selling what you produce? (This includes major changes in how you produce and any new equipment or software.)

**Table 44**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Yes	0%	16%	0%	9%	7%	28%	3%	2%	14%	0%	6%
No	100%	84%	100%	91%	93%	72%	97%	98%	86%	100%	94%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q9. Were these new or improved ways of producing or selling developed mainly by:

**Table 45**

	Farm type							
	General cropping	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	All*
Your farm business?	100%	100%	100%	82%	74%	100%	100%	83%
Your farm business with a group of businesses or organisations?	0%	0%	0%	0%	8%	0%	0%	2%
Other businesses or organisations?	0%	0%	0%	18%	18%	0%	0%	14%
Base (Number of farms)	98	13	38	714	457	89	65	1474

\*Does not add to 100% due to rounding

Q10. Were any of the new or significantly improved ways of producing or selling on your farm also new to the Northern Ireland agricultural industry?

**Table 46**

	Farm type							
	General cropping	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	All
Yes	0%	100%	0%	8%	21%	50%	0%	14%
No	100%	0%	100%	92%	79%	50%	100%	86%
Base (Number of farms)	98	13	38	714	457	89	65	1474

Q11. Between 1 January 2019 and 31 December 2020 did you have new farm business innovation activities that were: (Please select all that apply.)

**Table 47**

	<b>Cereals</b>	<b>General cropping</b>	<b>Horti culture</b>	<b>Pigs</b>	<b>Poultry</b>	<b>Dairy</b>	<b>Cattle and sheep LFA</b>	<b>Cattle and sheep lowland</b>	<b>Mixed</b>	<b>Other</b>	<b>All</b>
Abandoned	0%	0%	0%	0%	23%	0%	1%	1%	0%	0%	2%
To be further developed	0%	0%	16%	9%	7%	8%	4%	3%	22%	0%	4%
Scaled back	0%	0%	0%	0%	8%	5%	1%	1%	0%	0%	2%
Still ongoing/ unchanged at end 2020	17%	0%	33%	9%	0%	10%	5%	5%	0%	13%	5%
None of the above/ other/no response	83%	100%	51%	82%	63%	83%	90%	91%	78%	87%	89%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q12. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following technologies?

**Table 48**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Data capture	0%	0%	0%	9%	0%	14%	1%	0%	7%	0%	2%
Visual analytics	0%	0%	0%	18%	7%	14%	1%	3%	0%	0%	3%
Internet of things	0%	16%	0%	9%	23%	25%	13%	10%	29%	0%	14%
Blockchain	0%	16%	0%	0%	0%	3%	1%	1%	0%	13%	1%
Computer software packages	17%	0%	19%	28%	30%	20%	3%	4%	0%	13%	6%
Other big data collection and analysis systems	0%	0%	0%	9%	0%	0%	1%	0%	0%	0%	1%
None of the above	83%	84%	21%	54%	70%	65%	85%	84%	71%	87%	81%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q13. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following areas?

**Table 49**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Robotics	0%	0%	0%	0%	0%	11%	1%	0%	0%	0%	1%
Machine learning programmes	0%	16%	0%	0%	11%	13%	1%	1%	0%	0%	3%
Precision farming	50%	0%	0%	20%	10%	19%	1%	5%	29%	0%	5%
Predictive modelling and algorithms	0%	0%	0%	9%	0%	8%	1%	0%	0%	0%	1%
Other AI systems or processes	0%	0%	0%	0%	0%	5%	1%	0%	0%	0%	1%
None of the above	50%	84%	100%	82%	82%	68%	97%	95%	71%	100%	92%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q14. Between 1 January 2019 and 31 December 2020 did any innovations on your farm include any of the following areas?

**Table 50**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
New ways of using farm wastes	0%	16%	16%	0%	0%	3%	1%	2%	0%	0%	2%
Production of biomass	0%	16%	0%	0%	0%	3%	1%	0%	0%	0%	1%
Replacement of fossil fuels with alternative	17%	0%	0%	0%	0%	0%	1%	1%	0%	0%	1%
Biorefineries	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nutrient valorisation	0%	0%	0%	0%	0%	3%	1%	1%	0%	0%	1%
Other conversion of renewal biological resources	0%	0%	0%	0%	0%	3%	1%	1%	0%	0%	1%
None of the above	83%	84%	84%	100%	100%	89%	98%	96%	100%	100%	96%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271



Q15. Between 1 January 2019 and 31 December 2020 how important were the following factors in limiting innovation activities on your farm?

**Table 51**

Importance of financial costs/risks:	Farm type										
	Cereals	General cropping	Horti culture	Pigs*	Poultry*	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
High	33%	33%	64%	68%	56%	44%	47%	50%	43%	0%	47%
Medium	17%	51%	0%	9%	34%	34%	15%	17%	19%	0%	19%
Low	0%	0%	36%	11%	0%	10%	10%	10%	0%	13%	9%
Not important	50%	16%	0%	11%	11%	12%	28%	23%	38%	87%	25%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 52**

Importance of availability of finance:	Farm type										
	Cereals	General cropping	Horti culture	Pigs*	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All*
High	33%	16%	45%	39%	33%	25%	33%	41%	29%	0%	33%
Medium	17%	51%	0%	38%	56%	34%	23%	20%	14%	0%	25%
Low	0%	0%	55%	11%	0%	21%	14%	15%	19%	13%	15%
Not important	50%	33%	0%	11%	11%	20%	30%	24%	38%	87%	28%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 53**

Importance of lack of qualified personnel:	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy*	Cattle and sheep LFA	Cattle and sheep lowland*	Mixed	Other	All
High	0%	16%	16%	9%	7%	5%	12%	14%	0%	13%	11%
Medium	17%	16%	19%	56%	22%	31%	24%	21%	7%	0%	24%
Low	33%	19%	36%	11%	53%	33%	22%	26%	33%	0%	25%
Not important	50%	49%	29%	23%	18%	30%	42%	40%	60%	87%	40%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 54**

Importance of lack of knowledge of technology:	Farm type										
	Cereals	General cropping*	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA*	Cattle and sheep lowland	Mixed	Other*	All
High	0%	33%	16%	30%	7%	7%	19%	19%	36%	0%	18%
Medium	33%	16%	19%	28%	11%	35%	24%	28%	0%	13%	25%
Low	17%	3%	36%	31%	64%	35%	25%	22%	26%	0%	25%
Not important	50%	49%	29%	11%	18%	23%	33%	31%	38%	88%	32%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 55**

Importance of lack of market knowledge:	Farm type										
	Cereals*	General cropping	Horti culture	Pigs*	Poultry	Dairy*	Cattle and sheep LFA	Cattle and sheep lowland*	Mixed*	Other	All
High	0%	33%	16%	18%	7%	2%	15%	14%	14%	0%	13%
Medium	33%	16%	19%	18%	11%	37%	24%	20%	0%	13%	24%
Low	33%	19%	36%	40%	71%	30%	27%	32%	26%	0%	29%
Not important	33%	33%	29%	23%	11%	31%	34%	33%	59%	87%	34%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 56**

Importance of market dominated by established businesses:	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs*	Poultry	Dairy*	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All
High	0%	33%	36%	9%	23%	2%	18%	14%	0%	0%	16%
Medium	0%	16%	13%	28%	41%	39%	25%	16%	14%	13%	24%
Low	50%	51%	36%	39%	7%	33%	21%	29%	26%	0%	25%
Not important	50%	0%	16%	23%	29%	25%	36%	40%	59%	87%	35%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

**Table 57**

Importance of UK/EU government regulations:	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
High	0%	16%	16%	49%	7%	10%	27%	20%	0%	0%	22%
Medium	0%	49%	32%	19%	71%	39%	22%	19%	33%	13%	25%
Low	50%	35%	36%	11%	11%	16%	21%	23%	29%	0%	21%
Not important	50%	0%	16%	21%	11%	35%	30%	38%	38%	87%	32%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

**Table 58**

Importance of EU exit:	Farm type										
	Cereals	General cropping*	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
High	0%	33%	0%	40%	0%	13%	28%	24%	0%	0%	24%
Medium	0%	33%	19%	9%	26%	34%	17%	14%	26%	0%	19%
Low	33%	19%	52%	9%	56%	18%	18%	20%	0%	13%	19%
Not important	67%	16%	29%	42%	18%	35%	37%	42%	74%	87%	38%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

\*Does not add to 100% due to rounding

Q16. Between 1 January 2019 and 31 December 2020 did you implement any other innovations in your farm business that you have not already told us about in this survey?

**Table 59**

	Farm type										
	Cereals	General cropping	Horticulture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
I did not implement any innovations in my business between the above dates	67%	97%	48%	63%	48%	45%	77%	78%	57%	100%	73%
Yes or just those already stated	33%	3%	52%	37%	52%	55%	23%	22%	43%	0%	27%
Base (Number of farms)	198	604	208	141	520	2586	14468	4971	450	125	24271

Q17. Between 1 January 2019 and 31 December 2020 how important were each of the following factors in your decision to innovate on your farm?

**Table 60**

Importance of increasing production /market share:	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs	Poultry	Dairy*	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All*
High	0%	0%	32%	75%	21%	31%	18%	4%	17%	0%	19%
Medium	50%	100%	0%	25%	44%	19%	34%	60%	67%	0%	36%
Low	0%	0%	0%	0%	35%	33%	21%	16%	17%	0%	23%
Not important	50%	0%	69%	0%	0%	18%	27%	20%	0%	0%	23%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

**Table 61**

Importance of entering new markets	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All
High	0%	0%	63%	0%	35%	5%	11%	12%	0%	0%	11%
Medium	50%	100%	0%	25%	0%	17%	16%	24%	17%	0%	33%
Low	0%	0%	0%	25%	65%	41%	29%	32%	17%	0%	17%
Not important	50%	0%	37%	50%	0%	37%	44%	32%	67%	0%	39%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

**Table 62**

Importance of improving quality of produce or replacing outdated products:	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All*
High	0%	0%	32%	75%	21%	41%	22%	20%	34%	0%	26%
Medium	50%	100%	37%	25%	58%	28%	32%	52%	50%	0%	36%
Low	0%	0%	0%	0%	0%	13%	17%	16%	17%	0%	15%
Not important	50%	0%	32%	0%	21%	18%	29%	12%	0%	0%	22%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

**Table 63**

Importance of more efficient production:	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All*
High	100%	0%	63%	100%	79%	64%	31%	56%	84%	0%	48%
Medium	0%	100%	0%	0%	0%	27%	32%	40%	17%	0%	30%
Low	0%	0%	37%	0%	21%	4%	18%	0%	0%	0%	12%
Not important	0%	0%	0%	0%	0%	5%	19%	4%	0%	0%	11%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

**Table 64**

Importance of improving health and safety:	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs	Poultry	Dairy*	Cattle and sheep LFA*	Cattle and sheep lowland*	Mixed*	Other	All*
High	50%	0%	32%	75%	79%	50%	40%	56%	34%	0%	47%
Medium	50%	100%	0%	25%	21%	32%	27%	37%	17%	0%	29%
Low	0%	0%	37%	0%	0%	4%	11%	0%	50%	0%	9%
Not important	0%	0%	32%	0%	0%	13%	21%	8%	0%	0%	16%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

**Table 65**

Importance of reducing environmental impacts:	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs	Poultry	Dairy*	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All*
High	50%	0%	32%	100%	35%	47%	32%	60%	84%	0%	42%
Medium	50%	100%	0%	0%	65%	26%	28%	28%	17%	0%	28%
Low	0%	0%	37%	0%	0%	8%	19%	4%	0%	0%	13%
Not important	0%	0%	32%	0%	0%	18%	21%	8%	0%	0%	17%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding



**Table 66**

Importance of meeting regulatory requirements (including standards):	Farm type										
	Cereals	General cropping	Horti Culture*	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed*	Other	All
High	0%	0%	32%	50%	65%	54%	18%	44%	34%	0%	33%
Medium	100%	100%	37%	50%	35%	18%	39%	36%	17%	0%	34%
Low	0%	0%	0%	0%	0%	19%	19%	12%	50%	0%	17%
Not important	0%	0%	32%	0%	0%	9%	24%	8%	0%	0%	16%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

\*Does not add to 100% due to rounding

Q18. Between 1 January 2019 and 31 December 2020 did you co-operate on any innovation activities with any of the following:  
(Please select all that apply)

**Table 67**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Other farm businesses	50%	0%	0%	0%	14%	17%	7%	4%	50%	0%	11%
Suppliers of equipment, materials, services or software	0%	0%	0%	25%	21%	26%	4%	0%	67%	0%	11%
Private sector customers	0%	0%	0%	0%	14%	17%	3%	4%	0%	0%	6%
Public sector customers	0%	0%	0%	0%	14%	9%	1%	0%	0%	0%	3%
Consultants, commercial labs or private R&D institutes	50%	0%	0%	25%	14%	0%	3%	0%	17%	0%	3%
Universities or higher education institutions	0%	0%	0%	0%	0%	9%	2%	1%	0%	0%	3%
Other people/organisations	0%	0%	0%	0%	0%	0%	4%	4%	0%	0%	3%
None of the above/no response	50%	100%	100%	75%	65%	65%	86%	88%	17%	100%	78%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

Q19. Between 1 January 2019 and 31 December 2020 were any of the innovations on your farm protected by any of the following methods? (Please select all that apply.)

**Table 68**

	Farm type										
	Cereals	General cropping	Horti culture	Pigs	Poultry	Dairy	Cattle and sheep LFA	Cattle and sheep lowland	Mixed	Other	All
Patents	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	2%
Design registration	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	1%
Copyright	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	2%
Trademarks	0%	0%	0%	0%	14%	10%	0%	0%	0%	0%	3%
Lead time advantages	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Complexity of goods or services	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	1%
Secrecy (including NDAs)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
None of the above/no response	100%	100%	100%	100%	86%	85%	100%	100%	100%	100%	96%
Base (Number of farms)	66	15	108	52	269	1423	3265	1102	194	0	6494

### (iii) Farm Survey responses weighted by number of full-time farmers

Q2. Have you taken part in any of the following DAERA programmes or schemes during the period 1 January 2019 to 31 December 2020? (Please select all that apply.)

**Table 69**

DAERA Programmes / Schemes	Number of full-time farmers					
	None	One	Two	Three	Four	All
Business Development Groups	11%	15%	14%	38%	47%	14%
Farm Innovation Visits	3%	3%	3%	5%	32%	3%
Agri-food cooperation scheme	1%	0%	0%	0%	0%	1%
Technology Demonstration Farms	2%	1%	0%	5%	0%	2%
European Innovation Partnerships	0%	0%	0%	0%	0%	0%
Rural Micro Business Growth Scheme	0%	0%	0%	0%	0%	0%
None of the above/no response	87%	85%	85%	63%	21%	84%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q3. Between 1 January 2019 and 31 December 2020 did you make any major changes to your farm business in the following areas? (Please select all that apply.)

**Table 70**

Type of major business change	Number of full time farmers					
	None	One	Two	Three	Four	All
New ways of operating your farm business	5%	7%	8%	10%	0%	7%
New methods of organising work	6%	5%	7%	10%	21%	6%
New working relationships	2%	2%	1%	0%	0%	2%
New computer based systems	5%	5%	8%	20%	36%	6%
None of the above/no response	85%	86%	84%	70%	64%	85%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q4. Between 1 January 2019 and 31 December 2020 did you receive / invest in any of the following? (Please select all that apply.)

**Table 71**

Type of investment	Number of full time farmers					
	None	One	Two	Three	Four	All
Advice	10%	14%	12%	36%	47%	13%
Research/development	3%	2%	1%	10%	0%	3%
New more tech advanced machinery	7%	10%	14%	29%	53%	10%
New inventions	3%	2%	1%	12%	0%	2%
Training to support innovation	1%	1%	4%	0%	0%	1%
Design services	1%	0%	0%	0%	0%	1%
Market research	2%	1%	0%	0%	0%	1%
None /no response	82%	77%	83%	52%	32%	78%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q5. Between 1 January 2019 and 31 December 2020 did you produce any new or improved products or start to offer any other new services from your farm?

**Table 72**

	None	One	Two	Three	Four	All
Yes	4%	3%	4%	12%	0%	4%
No	96%	97%	96%	88%	100%	96%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q6. Were these products or services developed mainly by:

**Table 73**

	Number of full time farmers					
	None	One	Two	Three	Four	All*
Other businesses or organisations?	0%	15%	100%	0%	0%	24%
Your farm business with a group of businesses or organisations?	16%	0%	0%	0%	0%	6%
Your farm business?	84%	85%	0%	100%	0%	71%
Base (Number of farms)	307	314	154	85	0	860

\*Does not add to 100% due to rounding

Q7. Between 1 January 2019 and 31 December 2020 were any of your products and services innovations: (Please select all that apply.)

**Table 74**

	Number of full time farmers					
	None	One	Two	Three	Four	All
New to your market	28%	15%	0%	0%	0%	16%
Only new to your business	40%	54%	23%	100%	0%	48%
Base (Number of farms)	307	314	154	85	0	860

Q8. Between 1 January 2019 and 31 December 2020 did you introduce any new or significantly improved ways of producing and/or selling what you produce? (This includes major changes in how you produce and any new equipment or software.)

**Table 75**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Yes	5%	6%	10%	10%	0%	6%
No	95%	94%	90%	90%	100%	94%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q9. Were these new or improved ways of producing or selling developed mainly by:

**Table 76**

	Number of full time farmers				
	None	One	Two	Three	All*
Your farm business?	89%	100%	44%	100%	83%
Your farm business with a group of businesses or organisations?	0%	0%	10%	0%	2%
Other businesses or organisations?	11%	0%	46%	0%	14%
Base (Number of farms)	444	603	355	73	1475

\*Does not add to 100% due to rounding

Q10. Were any of the new or significantly improved ways of producing or selling on your farm also new to the Northern Ireland agricultural industry?

**Table 77**

	Number of full time farmers				
	None	One	Two	Three	All*
Yes	22%	2%	28%	0%	14%
No	78%	98%	72%	100%	86%
Base (Number of farms)	444	603	355	73	1475

Q11. Between 1 January 2019 and 31 December 2020 did you have new farm business innovation activities that were: (Please select all that apply.)

**Table 78**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Abandoned	1%	3%	0%	0%	0%	2%
To be further developed	3%	5%	4%	12%	0%	4%
Scaled back	1%	2%	3%	0%	0%	2%
Still ongoing / unchanged at end 2020	5%	7%	1%	0%	15%	5%
None of the above / no response	91%	85%	94%	88%	85%	89%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q12. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following technologies?

**Table 79**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Data capture	1%	2%	6%	0%	32%	2%
Visual analytics	4%	1%	6%	2%	32%	3%
Internet of things	12%	14%	16%	32%	0%	14%
Blockchain	2%	1%	1%	0%	0%	1%
Computer software packages	5%	6%	9%	0%	21%	6%
Other big data collection and analysis systems	2%	1%	0%	0%	0%	1%
None of the above	83%	82%	81%	66%	47%	82%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q13. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following areas?

**Table 80**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Robotics	1%	2%	0%	10%	0%	1%
Machine learning programmes	2%	4%	4%	0%	0%	3%
Precision farming	2%	6%	8%	12%	0%	5%
Predictive modelling and algorithms	1%	1%	4%	0%	0%	1%
Other AI systems or processes	1%	1%	2%	0%	0%	1%
None of the above	95%	90%	89%	88%	100%	92%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q14. Between 1 January 2019 and 31 December 2020 did any innovations on your farm include any of the following areas?

**Table 81**

	Number of full time farmers					
	None	One	Two	Three	Four	All
New ways of using farm wastes	3%	1%	3%	0%	0%	2%
Production of biomas	2%	1%	2%	0%	0%	1%
Replacement of fossil fuels with alternative	1%	2%	0%	0%	0%	1%
Biorefineries	0%	0%	0%	0%	0%	0%
Nutrient valorisation	1%	0%	3%	0%	0%	1%
Other conversion of renewal biological resources	1%	0%	3%	0%	0%	1%
None of the above	96%	98%	90%	100%	100%	96%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q15. Between 1 January 2019 and 31 December 2020 how important were the following factors in limiting innovation activities on your farm?

**Table 82**

Importance of financial costs/risks:	Number of full-time farmers					
	None	One	Two*	Three	Four	All
High	51%	44%	41%	77%	21%	47%
Medium	16%	20%	21%	11%	64%	19%
Low	10%	9%	8%	12%	15%	9%
Not important	23%	27%	29%	0%	0%	25%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

**Table 83**

Importance of availability of finance:	Number of full-time farmers					
	None	One	Two	Three	Four	All*
High	37%	30%	30%	55%	0%	33%
Medium	23%	26%	22%	24%	53%	25%
Low	14%	16%	13%	12%	47%	15%
Not important	26%	28%	35%	9%	0%	28%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding



**Table 84**

Importance of lack of qualified personnel:	Number of full-time farmers					
	None	One	Two	Three	Four	All
High	13%	12%	6%	12%	0%	11%
Medium	21%	25%	20%	31%	53%	24%
Low	26%	22%	29%	31%	47%	25%
Not important	40%	41%	45%	26%	0%	40%
Base (Number of farms)	8760	11051	3532	701	227	24271

**Table 85**

Importance of lack of knowledge of technology:	Number of full-time farmers					
	None	One*	Two*	Three	Four	All
High	19%	23%	4%	19%	0%	18%
Medium	22%	26%	26%	31%	53%	25%
Low	28%	22%	29%	24%	47%	25%
Not important	31%	30%	41%	26%	0%	32%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

**Table 86**

Importance of lack of market knowledge:	Number of full-time farmers					
	None	One*	Two*	Three	Four	All
High	15%	14%	8%	14%	0%	13%
Medium	24%	25%	17%	19%	85%	24%
Low	29%	28%	35%	48%	15%	29%
Not important	32%	34%	41%	19%	0%	34%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

**Table 87**

Importance of market dominated by established businesses:	Number of full-time farmers					
	None*	One	Two	Three	Four	All
High	20%	15%	9%	8%	0%	16%
Medium	22%	26%	22%	30%	85%	24%
Low	24%	23%	31%	43%	15%	25%
Not important	35%	36%	38%	19%	0%	35%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

**Table 88**

Importance of UK/EU government regulations:	Number of full-time farmers					
	None	One*	Two*	Three*	Four	All
High	24%	21%	18%	38%	21%	22%
Medium	24%	26%	24%	24%	64%	25%
Low	24%	19%	22%	18%	15%	21%
Not important	28%	35%	37%	19%	0%	32%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

**Table 89**

Importance of EU exit:	Number of full-time farmers					
	None*	One	Two	Three*	Four	All*
High	27%	24%	14%	26%	53%	24%
Medium	17%	18%	27%	23%	0%	19%
Low	22%	13%	28%	31%	47%	19%
Not important	33%	45%	31%	21%	0%	38%
Base (Number of farms)	8760	11051	3532	701	227	24271

\*Does not add to 100% due to rounding

Q16. Between 1 January 2019 and 31 December 2020 did you implement any other innovations in your farm business that you have not already told us about in this survey?

**Table 90**

	Number of full-time farmers					
	None	One	Two	Three	Four	All
I did not implement any innovations in my business between the above dates	79%	72%	72%	41%	32%	73%
Yes or just those already stated	21%	28%	28%	59%	68%	27%
Base (Number of farms)	8760	11051	3532	701	227	24271

Q17. Between 1 January 2019 and 31 December 2020 how important were each of the following factors in your decision to innovate on your farm?

**Table 91**

Importance of increasing production/market share:	Number of full-time farmers					
	None	One	Two	Three	Four	All*
High	11%	19%	25%	36%	22%	19%
Medium	33%	41%	22%	31%	78%	36%
Low	28%	17%	28%	33%	0%	23%
Not important	28%	23%	25%	0%	0%	23%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 92**

Importance of entering new markets:	Number of full-time farmers					
	None*	One	Two	Three	Four	All
High	16%	7%	8%	21%	22%	11%
Medium	8%	22%	13%	31%	0%	17%
Low	39%	34%	31%	0%	47%	33%
Not important	38%	37%	48%	48%	31%	39%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 93**

Importance of improving quality of produce or replacing outdated products:	Number of full-time farmers					
	None	One*	Two	Three	Four	All*
High	21%	25%	35%	53%	0%	26%
Medium	30%	39%	30%	47%	78%	36%
Low	20%	15%	12%	0%	0%	15%
Not important	29%	22%	23%	0%	22%	22%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 94**

Importance of more efficient production:	Number of full-time farmers					
	None*	One	Two	Three	Four	All*
High	36%	44%	63%	85%	69%	48%
Medium	41%	25%	28%	15%	31%	30%
Low	11%	17%	4%	0%	0%	12%
Not important	13%	14%	5%	0%	0%	11%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 95**

Importance of improving health and safety:	Number of full-time farmers					
	None*	One*	Two*	Three	Four	All*
High	36%	45%	60%	67%	78%	47%
Medium	39%	29%	17%	33%	0%	29%
Low	3%	14%	9%	0%	0%	9%
Not important	23%	13%	15%	0%	22%	16%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 96**

Importance of reducing environmental impacts:	Number of full-time farmers					
	None	One	Two	Three	Four	All
High	41%	40%	42%	52%	78%	42%
Medium	31%	29%	18%	48%	0%	28%
Low	8%	18%	14%	0%	0%	13%
Not important	20%	13%	27%	0%	22%	17%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

**Table 97**

Importance of meeting regulatory requirements (including standards):	Number of full-time farmers					
	None	One	Two*	Three	Four	All
Importance						
High	18%	35%	53%	24%	78%	33%
Medium	41%	30%	29%	58%	0%	34%
Low	18%	22%	0%	18%	0%	17%
Not important	23%	13%	19%	0%	22%	16%
Base (Number of farms)	1850	3104	974	411	155	6494

\*Does not add to 100% due to rounding

Q18. Between 1 January 2019 and 31 December 2020 did you co-operate on any innovation activities with any of the following: (Please select all that apply)

**Table 98**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Other farm businesses	11%	15%	4%	0%	0%	11%
Suppliers of equipment, materials, services or software	4%	14%	22%	0%	0%	11%
Private sector customers	8%	2%	21%	0%	0%	6%
Public sector customers	6%	2%	4%	0%	0%	3%
Consultants, commercial labs or private R&D institutes	5%	3%	5%	0%	0%	3%
Universities or higher education institutions	6%	2%	0%	0%	0%	3%
Other people/organisations	5%	2%	5%	0%	0%	3%
None of the above/no response	79%	76%	74%	100%	100%	78%
Base (Number of farms)	1850	3104	974	411	155	6494

Q19. Between 1 January 2019 and 31 December 2020 were any of the innovations on your farm protected by any of the following methods? (Please select all that apply.)

**Table 99**

	Number of full time farmers					
	None	One	Two	Three	Four	All
Patents	0%	0%	8%	18%	0%	2%
Design registration	0%	0%	0%	18%	0%	1%
Copyright	0%	0%	8%	18%	0%	2%
Trademarks	2%	0%	8%	18%	0%	3%
Lead time advantages	0%	0%	0%	0%	0%	0%
Complexity of goods or services	4%	0%	0%	0%	0%	1%
Secrecy (including NDAs)	0%	0%	0%	0%	0%	0%
None of the above/no response	94%	100%	92%	82%	100%	96%
Base (Number of farms)	1850	3104	974	411	155	6494

#### (iv) Farm Survey responses weighted by presence of farm workers

Q2. Have you taken part in any of the following DAERA programmes or schemes during the period 1 January 2019 to 31 December 2020? (Please select all that apply.)

**Table 100**

DAERA Programmes / Schemes	Other workers		
	Yes	No	All
Business Development Groups	19%	13%	14%
Farm Innovation Visits	5%	2%	3%
Agri-food cooperation scheme	0%	1%	1%
Technology Demonstration Farms	3%	1%	2%
European Innovation Partnerships	0%	0%	0%
Rural Micro Business Growth Scheme	0%	0%	0%
None of the above/no response	78%	87%	84%
Base (Number of farms)	6566	17706	24272

Q3. Between 1 January 2019 and 31 December 2020 did you make any major changes to your farm business in the following areas? (Please select all that apply.)

**Table 101**

Type of major business change	Other workers		
	Yes	No	All
New ways of operating your farm business	12%	4%	7%
New methods of organising work	9%	5%	6%
New working relationships	4%	1%	2%
New computer based systems	11%	5%	6%
None of the above/no response	74%	88%	85%
Base (Number of farms)	6566	17706	24272

Q4. Between 1 January 2019 and 31 December 2020 did you receive / invest in any of the following? (Please select all that apply.)

**Table 102**

Type of investment	Other workers		
	Yes	No	All
Advice	15%	13%	13%
Research/development	5%	2%	3%
New more tech advanced machinery	14%	9%	10%
New inventions	2%	3%	2%
Training to support innovation	2%	1%	1%
Design services	0%	1%	1%
Market research	3%	1%	1%
None /no response	74%	80%	78%
Base (Number of farms)	6566	17706	24272

Q5. Between 1 January 2019 and 31 December 2020 did you produce any new or improved products or start to offer any other new services from your farm?

**Table 103**

	Other workers		
	Yes	No	All
Yes, I did	6%	3%	4%
No, I didn't	94%	97%	96%
Base (Number of farms)	6566	17706	24272

Q6. Were these products or services developed mainly by:

**Table 104**

	Other workers		
	Yes	No	All
Other businesses or organisations?	44%	7%	10%
Your farm business with a group of businesses or organisations?	0%	10%	6%
Your farm business?	56%	83%	71%
Base (Number of farms)	374	485	859

Q7. Between 1 January 2019 and 31 December 2020 were any of your products and services innovations: (Please select all that apply.)

**Table 105**

	Other workers		
	Yes	No	All
New to your market	23%	10%	16%
Only new to your business	36%	57%	48%
Base (Number of farms)	374	485	859

Q8. Between 1 January 2019 and 31 December 2020 did you introduce any new or significantly improved ways of producing and/or selling what you produce? (This includes major changes in how you produce and any new equipment or software.)

**Table 106**

	Other workers		
	Yes	No	All
Yes	10%	4%	6%
No	90%	96%	94%
Base (Number of farms)	6566	17706	24272

Q9. Were these new or improved ways of producing or selling developed mainly by:

**Table 107**

	Other workers		
	Yes	No*	All*
Your farm business?	81%	85%	83%
Your farm business with a group of businesses or organisations?	0%	5%	2%
Other businesses or organisations?	19%	11%	14%
Base (Number of farms)	689	785	1474

\*Does not add to 100% due to rounding

Q10. Were any of the new or significantly improved ways of producing or selling on your farm also new to the Northern Ireland agricultural industry?

**Table 108**

	Other workers		
	Yes	No	All
Yes	17%	12%	14%
No	83%	88%	86%
Base (Number of farms)	689	785	1474

Q11. Between 1 January 2019 and 31 December 2020 did you have new farm business innovation activities that were: (Please select all that apply.)

**Table 109**

	Other workers		
	Yes	No	All
Abandoned	0%	2%	2%
To be further developed	4%	4%	4%
Scaled back	1%	2%	2%
Still ongoing / unchanged at end 2020	5%	6%	5%
None of the above / no response	89%	88%	89%
Base (Number of farms)	6566	17706	24272



Q12. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following technologies?

**Table 110**

	Other workers		
	Yes	No	All
Data capture	5%	1%	2%
Visual analytics	5%	2%	3%
Internet of things	19%	12%	14%
Blockchain	2%	1%	1%
Computer software packages	10%	5%	6%
Other big data collection and analysis systems	1%	1%	1%
None of the above	74%	84%	82%
Base (Number of farms)	6566	17706	24272

Q13. Between 1 January 2019 and 31 December 2020 did any innovations on your farm involve the following areas?

**Table 111**

	Other workers		
	Yes	No	All
Robotics	3%	1%	1%
Machine learning programmes	4%	3%	3%
Precision farming	9%	3%	5%
Predictive modelling and algorithms	1%	1%	1%
Other AI systems or processes	2%	1%	1%
None of the above	88%	93%	92%
Base (Number of farms)	6566	17706	24272

Q14. Between 1 January 2019 and 31 December 2020 did any innovations on your farm include any of the following areas?

**Table 112**

	Other workers		
	Yes	No	All
New ways of using farm wastes	3%	2%	2%
Production of biomass	3%	1%	1%
Replacement of fossil fuels with alternative	2%	1%	1%
Biorefineries	0%	0%	0%
Nutrient valorisation	1%	1%	1%
Other conversion of renewal biological resources	3%	1%	1%
None of the above	94%	97%	96%
Base (Number of farms)	6566	17706	24272

Q15. Between 1 January 2019 and 31 December 2020 how important were the following factors in limiting innovation activities on your farm?

**Table 113**

Importance of financial costs/risks:	Other workers		
	Yes	No	All
High	49%	46%	47%
Medium	22%	18%	19%
Low	11%	9%	9%
Not important	18%	27%	25%
Base (Number of farms)	6566	17706	24272

**Table 114**

Importance of availability of finance:	Other workers		
	Yes	No*	All*
High	38%	31%	33%
Medium	27%	24%	25%
Low	16%	15%	15%
Not important	19%	31%	28%
Base (Number of farms)	6566	17706	24272

\*Does not add to 100% due to rounding

**Table 115**

Importance of lack of qualified personnel:	Other workers		
	Yes	No	All
High	12%	11%	11%
Medium	29%	21%	24%
Low	28%	24%	25%
Not important	31%	44%	40%
Base (Number of farms)	6566	17706	24272

**Table 116**

Importance of lack of knowledge of technology:	Other workers		
	Yes	No	All
High	21%	17%	18%
Medium	30%	23%	25%
Low	27%	25%	25%
Not important	22%	35%	32%
Base (Number of farms)	6566	17706	24272

**Table 117**

<b>Importance of Lack of market knowledge:</b>	<b>Other workers</b>		
	<b>Yes</b>	<b>No</b>	<b>All</b>
High	16%	12%	13%
Medium	29%	22%	24%
Low	30%	29%	29%
Not important	25%	37%	34%
Base (Number of farms)	6566	17706	24272

**Table 118**

<b>Importance of Market dominated by established businesses:</b>	<b>Other workers</b>		
	<b>Yes</b>	<b>No</b>	<b>All</b>
High	16%	16%	16%
Medium	36%	20%	24%
Low	27%	24%	25%
Not important	21%	40%	35%
Base (Number of farms)	6566	17706	24272

**Table 119**

<b>Importance of UK/EU government regulations:</b>	<b>Other workers</b>		
	<b>Yes*</b>	<b>No</b>	<b>All</b>
High	24%	22%	22%
Medium	35%	21%	25%
Low	19%	22%	21%
Not important	23%	35%	32%
Base (Number of farms)	6566	17706	24272

\*Does not add to 100% due to rounding

**Table 120**

<b>Importance of EU exit:</b>	<b>Other workers</b>		
	<b>Yes</b>	<b>No</b>	<b>All</b>
High	28%	23%	24%
Medium	20%	18%	19%
Low	17%	20%	19%
Not important	35%	39%	38%
Base (Number of farms)	6566	17706	24272

Q16. Between 1 January 2019 and 31 December 2020 did you implement any other innovations in your farm business that you have not already told us about in this survey?

**Table 121**

	Other workers		
	Yes	No	All
I did not implement any innovations in my business between the above dates	66%	76%	73%
Yes or just those already stated	34%	24%	27%
Base (Number of farms)	6566	17706	24272

Q17. Between 1 January 2019 and 31 December 2020 how important were each of the following factors in your decision to innovate on your farm?

**Table 122**

Importance of increasing production/market share:	Other workers		
	Yes*	No*	All*
High	20%	19%	19%
Medium	29%	40%	36%
Low	30%	19%	23%
Not important	22%	23%	23%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 123**

Importance of entering new markets:	Other workers		
	Yes	No*	All
High	16%	9%	11%
Medium	9%	21%	17%
Low	44%	27%	33%
Not important	31%	44%	39%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 124**

Importance of improving quality of produce or replacing outdated products:	Other workers		
	Yes	No*	All*
High	29%	25%	26%
Medium	29%	41%	36%
Low	23%	11%	15%
Not important	19%	24%	22%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 125**

<b>Importance of more efficient production:</b>	<b>Other workers</b>		
	<b>Yes*</b>	<b>No</b>	<b>All*</b>
High	49%	47%	48%
Medium	31%	29%	30%
Low	12%	11%	12%
Not important	9%	13%	11%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 126**

<b>Importance of improving health and safety:</b>	<b>Other workers</b>		
	<b>Yes*</b>	<b>No</b>	<b>All*</b>
High	49%	46%	47%
Medium	35%	26%	29%
Low	4%	11%	9%
Not important	13%	17%	16%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 127**

<b>Importance of reducing environmental impacts:</b>	<b>Other workers</b>		
	<b>Yes*</b>	<b>No</b>	<b>All</b>
High	48%	39%	42%
Medium	21%	33%	28%
Low	16%	11%	13%
Not important	16%	17%	17%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

**Table 128**

<b>Importance of meeting regulatory requirements (including standards):</b>	<b>Other workers</b>		
	<b>Yes</b>	<b>No*</b>	<b>All</b>
High	36%	32%	33%
Medium	31%	36%	34%
Low	18%	16%	17%
Not important	15%	17%	16%
Base (Number of farms)	2248	4247	6495

\*Does not add to 100% due to rounding

Q18. Between 1 January 2019 and 31 December 2020 did you co-operate on any innovation activities with any of the following: (Please select all that apply)

**Table 129**

	<b>Other workers</b>		
	<b>Yes</b>	<b>No</b>	<b>All</b>
Other farm businesses	11%	10%	11%
Suppliers of equipment, materials, services or software	17%	8%	11%
Private sector customers	15%	2%	6%
Public sector customers	5%	2%	3%
Consultants, commercial labs or private R&D institutes	6%	2%	3%
Universities or higher education institutions	5%	1%	3%
Other people/organisations	7%	1%	3%
None of the above/no response	69%	83%	78%
Base (Number of farms)	2248	4247	6495

Q19. Between 1 January 2019 and 31 December 2020 were any of the innovations on your farm protected by any of the following methods? (Please select all that apply.)

**Table 130**

	<b>Other workers</b>		
	<b>Yes</b>	<b>No</b>	<b>All</b>
Patents	3%	2%	2%
Design registration	3%	0%	1%
Copyright	3%	2%	2%
Trademarks	5%	2%	3%
Lead time advantages	0%	0%	0%
Complexity of goods or services	3%	0%	1%
Secrecy (including NDAs)	0%	0%	0%
None of the above/no response	92%	98%	96%
Base (Number of farms)	2248	4247	6495

## (v) Other Businesses / Organisations supported by DAERA survey findings

Q2. Has your business taken part in any of the following programmes or schemes during the period 1 January 2019 to 31 December 2020? (Please select all that apply.)

**Table 131**

	Number	Percent
DAERA Rural Business Investment Scheme	0	0%
DAERA Rural Micro Business Growth Scheme	**	**
DAERA Rural Business Development Grant Scheme	**	**
Invest NI Innovation Voucher Programme	0	0%
Invest NI R&D Scheme	**	**
Department for the Economy Innovate Us	0	0%
Department for the Economy Innovation Accreditation Programme	0	0%
InterTradeIreland FUSION programme	0	0%
InterTradeIreland Challenge programme	0	0%
None of the above/no response	23	70%
Other scheme or programme relating to innovation (Please specify)	0	0%

Note: This question was not asked of environmental organisations

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

Q3. Between 1 January 2019 and 31 December 2020 did your business make any major changes in the following areas? (Please select all that apply.)

**Table 132**

	Number	Percent
New business practices for organising procedures	11	33%
New methods of organising work responsibilities and decision making.	**	**
New methods of organising external relationships with other firms/public institutions	**	**
Implementation of changes to marketing concepts or strategies	**	**
New methods for information processing and communication	6	18%
None of the above/no response	19	58%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of changes*

Added capacity to improve production flow
The COVID 19 pandemic halted all face-to-face training and we had to redevelop all the training material and delivery format to work over Zoom remotely. This meant new content development processes, totally new marketing concepts, strategies, and execution. As we are mainly an export-oriented business our recent innovations are likely to become permanent changes post pandemic.
We have been working on improving processes and systems in primary production, logistics and haulage, procurement, sales, finance, training, and development. This has involved changing work and production practices; the introduction of new software systems and devices and the creation of in-house applications. Employees have received training to support the changes and where needed support has been brought in via consultancy or sub-contracting.
Better integration of information from milking robots for local decision making
Brexit
Impact of COVID-19 determined change in sales methods. Customers telephoned order and paid over the telephone. Then given time to collect their order.
Lean Management Programme; Clear Steps
Muddy boots; In house changes to quality control procedures
Had to restructure due to COVID 19 guidelines
We have moved more towards doing our advertising using our own Facebook page as well as setting up a new website. We were previously advertising mainly through external websites but only use one now as well as outsourcing our advertising to a marketing agent.



Q4 Between 1 January 2019 and 31 December 2020 did your business invest in any of the following innovations? (Please select all that apply.)

**Table 133**

	<b>Number</b>	<b>Percent</b>
Internal research and development undertaken within your business	12	36%
Research and development information purchased for use in your business	6	18%
New, more technologically advanced machinery, equipment and/or computer hardware or software for use on your farm.	16	48%
Purchase or licensing of patents and non-patented inventions, know-how and other types of knowledge	**	**
Training for the purposes of innovation (this could be training in the use of new technologically advanced equipment or systems).	**	**
Design services for the development or implementation of new or improved goods, services or processes	**	**
Changes to product or design services, market research, changes to how you sell products, services, advertising	**	**
None of the above/no response	11	33%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of investments*

Investments in R&D, computer systems, training, website and rebranding
Internal R&D was carried out into sprouted grain
Multi head weighing system to reduce giveaway on packs
New accounting and stock software; new computer
New equipment installed and moving over of office premises due to COVID 19
New robots installed
Purchase of the licence to manufacture and sell new products.
Research was carried out on how to improve efficiency and new machinery was purchased to speed production process
Trials on plant populations; QA recording; New machinery
Upgrade to Robot PC; Installation of Farm Wifi network
We are always looking for new raw material to make our products better and new recipes.
New computer system
Purchased surveying equipment for the business
We have used an external company to help with the design of new products and have changed how we advertise, now using an external agent and our own website and Facebook page.
Invested in international expansion by establishing new companies abroad

Q5. Between 1 January 2019 and 31 December 2020 did your business produce any new or significantly improved products or services?

**Table 134**

	<b>Number</b>	<b>Percent</b>
Yes	11	33%
No	22	67%
Total	33	100%

Q6. Were these products or services developed mainly by:

**Table 135**

	<b>Number</b>	<b>Percent</b>
Your business?	8	73%
Your business with other businesses or organisations?	**	**
Other businesses or organisations?	**	**
Total	11	100%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

Q7. Between 1 January 2019 and 31 December 2020 were any of your products and services innovations: (Please select all that apply.)

**Table 136**

	<b>Number</b>	<b>Percent</b>
New to your market /new innovation to benefit the environment?	**	**
Only new to your business/organisation i.e. you introduced a new product or service that was essentially the same as a product or service already available?	7	21%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of improved products or services*

Developed, launched, and generated new business sales for Training Course abroad
Made some of our products vegan
New bakery lines introduced
Introduced facility for consumers to buy treated timber products online with delivery to their door.
- Data Analytics
- CRM & Marketing
- Office 365 implemented.
- Microsoft Power Platform (Apps, PBI and Automate)
Use of UV radiation to sanitise products

We bought the new surveying equipment to expand the level of services we can offer to our existing clients
We designed new products that were similar to what is already available on the market but with the core workings and functionality being different.
Developed new systems for weed control

Q8. Between 1 January 2019 and 31 December 2020 did your business introduce any new or significantly improved processes for producing or supplying goods or services/benefiting the natural environment?

**Table 137**

	Number	Percent
Yes	10	30%
No	23	70%
Total	33	100%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

Q9. Were these processes developed mainly by:

**Table 138**

	Number	Percent
Your business?	**	**
Your business with other businesses or organisations?	**	**
Other businesses or organisations?	**	**
Total	10	100%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

Q10. Did your business introduce any new or significantly improved processes for producing or supplying goods or services which were new to your industry/benefit the natural environment?

**Table 139**

	Number	Percent
Yes	**	**
No	**	**
Total	10	100%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief details of these new processes*

Bespoke plant populations for vegetables to optimise sizing for Northern Ireland market
---

Moved purchasing of packaging to the one local company  
 Removal of graffiti using a steam only system (no chemicals), and the introduction of a weed killing/control system which uses only hot water.

Q11. Between 1 January 2019 and 31 December 2020 did your business undertake any innovation activities that were: (Please select all that apply.)

**Table 140**

	Number	Percent
Abandoned	**	**
To be further developed	7	21%
Scaled back	5	15%
Still ongoing unchanged at the end of 2020	8	24%
None of the above	16	48%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of incomplete innovation*

Firewood project still ongoing unchanged at the end of 2020
COVID and lack of funds meant we progressed slower than we had hoped
In-house packing of 3 in line onions
Looking at upgrading the milk processing equipment to improve productivity and cut down wastage/use of energy
Multi-head weighing system; GPS system to reduce labour and increase accuracy of our vegetable planting operation; New 7 row sower purchased with the plan to introduce a camera guided interrow cultivator
New technology activity scaled back/abandoned as application to Rural Micro Business Growth Scheme rejected.
Need assistance with development of training programmes abroad
Reviewing products to make them clean deck
Grain project put on hold
Trials on topping weeds
We were developing a new product, but due to the pandemic we stopped development and are only restarting now.
We were in collaboration with a spirit producer to develop gin but this had to be put on the back burner when COVID 19 hit.
Our recording work on the natural environment will continue indefinitely as this is one of our core purposes. COVID-19 has only temporarily affected it.
Projects that have been planned like additional walking trails have been put on hold.

Q12. Between 1 January 2019 and 31 December 2020 was there any innovation in your business relating to the following Big Data areas? (Please select all that apply.)

**Table 141**

	Number	Percent
Data capture	0	0%
Visual analytics	**	**
Internet of things	6	18%
Blockchain	0	0%
Data analysis software	**	**
Other (specify)	**	**
None of the above	25	76%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of Big Data innovation*

All non-production employees able to work off-site/remotely - Continued work on Microsoft office Power Platforms developing collation and analytic tools to improve efficiency in various areas of manufacturing, sales, and finance. e.g. Issues Apps, CHP & Secondary processing production apps. - Data Analytics in place
Digital GPS Surveying Equipment to survey levels on site
Muddy boots machinery apps
New hand-held ordering system introduced for drivers
New VOIP telephone system.
Using PowerBI more to make MI more accessible
We rolled out tablets to our farmers for the recording of farm production data.

Q13. Between 1 January 2019 and 31 December 2020 was there any innovation in your business relating to the following Artificial Intelligence areas?

**Table 142**

	Number	Percent
Robotics	**	**
Machine learning	**	**
Predictive modelling and algorithms	**	**
Other AI systems or processes (specify)	0	0%
None of the above	27	82%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of AI systems or processes*

Purchase and use of main supplier software applications.
Brexit
Marketing analytics for US and International markets.

Muddy Boots
We installed a robot to load eggs on to grader.
We trialled a machine that was semi-automated robotic picking of mushrooms

Q14. Between 1 January 2019 and 31 December 2020 was there any innovation in your business relating to the following Transformative Bio economy areas?

**Table 143**

	Number	Percent
New ways of using wastes for energy production or as raw material for another value added product	0	0%
Production of bio mass and/or conversion of biological resources into value added products	0	0%
Replacement of fossil fuels with biological resources in production methods	**	**
Bio refineries	0	0%
Nutrient valorisation	0	0%
Other conversion of renewal biological resources	**	**
None of the above	**	**

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Brief description of bio economy*

Energy from biomass generation business, renewable fuel, research on bio-refining
We await investment to implement Hydro-electricity scheme and RAS plant.

Q15. Between 1 January 2019 and 31 December 2020 how important were the following factors in constraining innovation activities in your business?

**Table 144**

	Importance				Total	
	High / Medium*		Low / Not important*			
Cost of finance	26	79%	7	21%	33	100%
Availability of finance	17	52%	16	48%	33	100%
Lack of qualified personnel	14	42%	19	58%	33	100%
Lack of information on technology	15	45%	18	55%	33	100%
Lack of information on markets	14	42%	19	58%	33	100%
Market dominated by established businesses	9	27%	24	73%	33	100%
UK government/ EU regulations	17	52%	16	48%	33	100%
EU transition	20	61%	13	39%	33	100%

\*Categories merged to avoid statistical suppression

*Brief description of barriers to innovation*

Brexit and uncertainty around NI Protocol has had a major impact on the ability to plan going forward. The pandemic then came in on the back of this removing normal market trends and conditions.
Brexit has meant we do not have the full range of agricultural chemicals available as NI is left out of new extension of use certificates as they can only be used in GB and we have to meet EU directives but our customers are in GB
COVID / Hospitality sector/ Brexit price increase
Investors put off by Brexit and COVID
Too many innovations are driven by grants, which sometimes make no sense eg grass going to feed biomass, this drives up conacre rent
Misconceptions about, and generally low level of awareness and understanding of, environmental issues. The very low level of public accessibility of the natural environment as compared with other UK and European nations.

Q16. Between 1 January 2019 and 31 December 2020 did your business implement any other innovations that you have not already told us about in this survey?

**Table 145**

	<b>Number</b>	<b>Percent</b>
I did not implement any innovations in my business between the above dates	13	39%
Yes or just those already stated	20	61%
Total	33	100%

*Description of other innovations*

Access to more funding for small conservation organisations needed.
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Q17. Between 1 January 2019 and 31 December 2020 how important were each of the following factors in the decision your business made to innovate

**Table 146**

	<b>Importance</b>
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	High / Medium*		Low / Not important*		Total	
Production increase	17	85%	3	15%	20	100%
Entering new markets	14	70%	6	30%	20	100%
Improving quality of goods or services	14	70%	6	30%	20	100%
More efficient production	13	65%	7	45%	20	100%
Improving health and safety	12	60%	8	40%	20	100%
Reducing environmental impacts	12	60%	8	40%	20	100%
Meeting regulatory requirements (including standards)	11	55%	9	45%	20	100%

\*Categories merged to avoid statistical suppression

Q18 Between 1 January 2019 and 31 December 2020 did your business co-operate on any innovation activities with any of the following: (Please select all that apply)

**Table 147**

	Number	Percent
Other businesses/organisations	5	25%
Suppliers of equipment, materials, services or software	5	25%
Private sector clients or customers	**	**
Public sector customers	**	**
Consultants, commercial labs or private R&D institutes	**	**
Universities or higher education institutions	**	**
Other people/organisations	**	**
None of the above	11	55%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents

*Other cooperation description*

Consultants abroad
Developed and modified training programs for US and Australian-based businesses.

Q19 Between 1 January 2019 and 31 December 2020 were any of the innovations in your business protected by any of the following methods? (Please select all that apply.)

**Table 148**

	Number	Percent
Patents	0	0%
Design registration	0	0%
Copyright	**	**
Trademarks	**	**



Lead time advantages	0	0%
Complexity of goods or services	**	**
Secrecy (including NDAs)	**	**
None of the above	17	85%

\*\*Cells suppressed to prevent data disclosure of categories with less than 5 respondents