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AFIC
Arable Food Industry Council

Economic impact 2021

Arable Food Industry Council

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Arable industry economic impact summary

As a nation heavily reliant on primary industries, arable production is important to the New Zealand economy. The arable sector grows crops to supply industries that process these crops for use in other industries. This includes preparation of foods for human consumption, as well as livestock feed. Arable production is made up of wheat, barley and maize crops, including maize grown for silage, as well as seeds for sowing.

As in the wider economy, in 2021 the arable sector was impacted by COVID-19 restrictions on labour. However, as an essential industry the arable sector continued growing and producing.

Total arable production 2021

Grains & Pulses¹



2,216,423 tonnes

Seeds for sowing



81,470 tonnes

Total



2,297,893 tonnes

Total production from the arable sector in 2021 was 2.3 million tonnes. This was a 31 percent increase from 2018, when total arable production was 1.8 million tonnes. Total grain and pulse production of 2.2 million tonnes was a 30 percent increase from 2018. Meanwhile seeds for sowing production grew by 40 percent from 58,268 tonnes in 2018 to 81,470 tonnes in 2021.

Arable industry total economic impact 2021

Economic impacts

Sales



GDP



Employment



Grains & Pulses	\$1,604 million	\$684 million	5,647 FTEs
Seeds	\$580 million	\$247 million	2,041 FTEs
Total	\$2,184 million	\$932 million	7,687 FTEs

In 2021 the arable sector directly produced crops worth \$1 billion. These sales went upstream of the arable sector and created total sales of all goods and services of \$2.2 billion. These total sales were equivalent to a contribution of \$932 million to New Zealand's gross domestic product (GDP). This has seen the arable sector increase its contribution to GDP from 0.3 percent of national GDP to 0.34 percent.

The contribution to GDP is sufficient to support 7,687 full time equivalent employees (FTEs).

¹ Includes B. Napus or rapeseed for oil production

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1 Structure and scope

This report has been prepared for the Arable Food Industry Council (AFIC), a Council which combines the interests of a number of groups serving the arable industry. It provides a comprehensive overview of the diverse arable production activities in New Zealand in 2021 and the associated direct and ‘upstream’ impact to the New Zealand economy.

This report is an update of the ‘*Economic Impact Assessment of Arable Production*’ report Business and Economic Research Limited (BERL) completed for AFIC in 2019 for the 2018 year. This is the fifth update BERL has completed since 2011.

1.1.1 Objective

The objective of this study is to define the core of the arable industry in terms of the arable producers, through to the mills and export. The analysis of this consistent production data set can then be used estimate the upstream impact of arable production on the economy, through the suppliers of goods and services to the arable producers.

1.2 Who is AFIC

AFIC was formed in the late ‘90s in response to a growing need for a “peak industry body”.

AFIC focuses on New Zealand industries using grains, seeds, and the products of grains and seeds, in innovative ways to satisfy global lifestyle needs. The AFIC membership is composed of 11 leading industry organisations connected with the research into, and production of, arable food. The member list includes:

- AgCarm Limited
- AgResearch Limited
- AsureQuality Limited
- Foundation for Arable Research
- Federated Farmers of New Zealand – Arable Industry Group
- New Zealand Feed Manufacturers Association Inc.
- New Zealand Flour Millers Association Inc.
- New Zealand Grain & Seed Trade Association
- New Zealand Plant Breeding & Research Association Inc.
- The New Zealand Institute of Plant & Food Research Limited
- United Wheat Growers New Zealand Limited.

AFIC’S Vision for New Zealand’s arable industry is for it to be strong and forward thinking, competitive and respected globally. For more information see <https://www.afic.co.nz/>

1.3 Scope of the report

In this report the arable production industry is defined as the industry that grows crops under cultivation to supply to those who process these crops for use in other industries, for example livestock production and human food preparation. There is a range of information, available from a

number of sources, on different parts of the industry. The data generated by these sources are not always consistent with each other.

Using the definition of arable production, existing data sources are used to estimate the direct and upstream impact of this production. Upstream impacts captured are those that occur through the supply of goods and services to arable producers. As was the case in the economic analyses that BERL provided AFIC of 2011, 2013, 2015 and 2018 arable production, the economic impact of the downstream users of arable products are not included. Downstream industries that rely on arable production are varied and range from beer production (barley), to the fast food industry that uses wheat for pork and poultry feed.

1.3.1 Common terms and their meaning

This report summarises the results of a complex economic research project. Appendix A explains our methodology in detail but it is useful to dedicate a small section to some of the common terms used throughout the report.

Direct and total impacts

The methodology we use for this analysis is such that it takes as inputs the sales of grains and seeds that happen immediately after harvest. This figure is called the *direct* sales. This revenue flows to farmers.

Economic activity occurs in a roundabout way. For example a farmer might sell some maize to another farmer, who uses it to feed livestock. This requires additional inputs, and so the whole process is repeated. The roundabout nature of economic activity is accounted for in our methodology and so it is this final, or *total*, effect that is calculated.

Sales

When talking about *direct* sales in this report we are referring to the first transaction when a crop is harvested and sold, and the revenue is gained by the farmer.

Total sales is a measure of all the gains in sales, of all products and services, to producers from industries across the economy, from the sale of grains and seeds.

Gross Domestic Product (GDP)

GDP, sometimes called value add, is a standard measure in economics. It measures the total value of final goods sold to consumers. Final goods are items, for example food or televisions, that are bought and used by the consumer and that is the end of it. In contrast, intermediate goods are items, for example raw coffee beans or fertiliser, which are purchased by producers for further processing. GDP is concerned only with the value of final goods.

Direct GDP is a measure of the value created by a grain or seed farmer at the farm gate when the grain or seed is sold. *Total* GDP accounts for the roundabout nature of economic activity and allows us to describe the total value created throughout the economy because of the activities of the farmer.

Employment

Employment is measured in Full Time Equivalents (FTEs). This is a complex estimate of how many 30 hours a week jobs it would require to produce a given level of economic output. Each 30 hours a week job can be divided into an arbitrary number of part-time jobs.

When we refer to employment in this report it is important to keep in mind we are referring to a level of economic activity sufficient to sustain the employment. We are not referring to actual numbers of people employed.

The *direct* employment effect refers to the level of economic activity generated by the sale of grains and seeds at the farm gate. The *total* employment effect refers to the end result of the roundabout nature of economic activity, and measures all of the impact generated by the sales at the farm gate.

1.3.2 Downstream economic impact

There are large economic impacts resulting from the downstream industries that rely on arable products, such as brewing, baking, and livestock farming. However, quantifying these impacts is beyond the scope of this report.

Arable production puts food on the table, both in terms of employment and also in terms of the variety of products it is used to produce. Downstream from the employment supported by arable production discussed above, there are people employed in producing food for livestock, as well as food for humans. This employment sustains communities across New Zealand.

The grains produced by the arable sector are used to produce beer, bread, cakes and biscuits along with many other goods we enjoy.

Maize silage produced by the arable sector, and grains sold to livestock farmers, contribute to the production of milk, eggs and pork.

We continue to see an increase in the production of niche and specialty products, for example ancient grain cereals and specialty bread products.

1.4 Sources of information used

Key information on various aspects of arable production in New Zealand used in this report is sourced from the following organisations:

- **Statistics New Zealand (Stats NZ)** collects information on a range of aspects of arable production in New Zealand through various surveys and Censuses of agricultural production. Stats NZ also estimates area and tonnages harvested for main crops. Stats NZ also provides the detailed export information on quantities and values of exports from New Zealand. Certified and noncertified seed types are recorded separately. This information enables estimates of average export prices per kilogram at FOB for a detailed range of grains and seeds.
- The **Foundation for Arable Research (FAR)** is a levy-funded research organisation. As part of its levy-collection function FAR collects detailed information on the volume of sales, and value of all grains and seeds sold. The levy on these values is collected at first point of sale, whether to industry, or to another grower. This information, on volume and value, also enables an estimate of average prices per kilogram or tonne at each point of sale.
- **AsureQuality** is responsible for operating the Seed Certification scheme in New Zealand. They therefore have information, for each cultivar of each species, on the number of sites entered for seed certification, the total area in hectares, and the weight of certified seed dressed, from the sites entered in the scheme. Taken with the total production information from the FAR levy data, this enables separation into certified and noncertified production.

- **Arable Industry Marketing Initiative (AIMI)** collects a range of information on the main grains. This includes, for feed grains and milling grains, the areas, production, stocks on hand, and marketing channels.
- The **New Zealand Feed Manufacturing Association (NZFMA)** collects detailed information on the use of local product and imports, for compound animal feed manufacture in both the North and South Islands. The NZFMA includes most of the major players in the industry, and so provides an accurate estimate of the volumes of grains going into compound feed manufacture.

Following feedback from the industry and AFIC, we have based our analyses on the levy information from FAR for the 2021 year, and used other sources to estimate volumes and value going to the different uses that are shown in later sections

1.5 Report structure

This report has two sections:

- Arable production in New Zealand
- Economic impact of arable production

For aesthetic purposes we have simplified the tables in this report. We provide with this report an accompanying Excel file which contains tables with greater detail.

2 Arable production in New Zealand

Arable production, by definition, is anything that is grown and harvested as a crop. This includes all grains, all seeds, and certain other plants which are grown as crops. This includes fodder crops and high value leafy greens or other vegetables for human consumption. It also includes the production of seeds for sale.

Historically grain was the main crop in New Zealand. This was used both as sustenance for the people living and working in New Zealand, and as a source of export revenue to fund the importation of goods unable to be produced in New Zealand. More recently arable production has been used to supplement livestock feed.

In 2021 prices were higher for grains of all types. This is partially explained by the supply chain disruptions caused by the international response to COVID-19. These disruptions, along with geopolitical posturing, have caused rapid adjustments in the prices of all commodities, including grain prices.

As in all industries, the arable industry felt the impacts of COVID-19. The arable sector was impacted by COVID-19 restrictions on labour. However, as an essential industry, the arable sector was able to continue growing and producing. This meant that although it was impacted by COVID-19, the impact was not as great as it could have been, or was, for other industries.

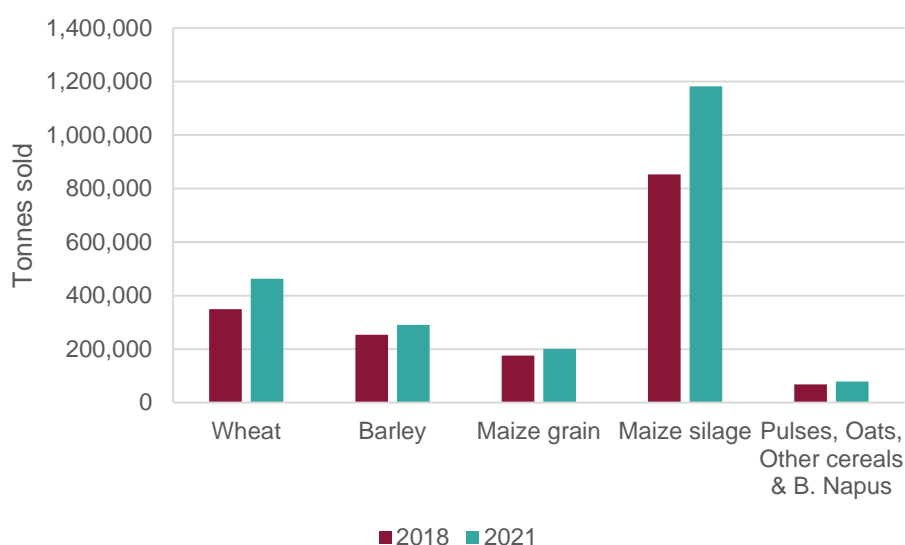
These increased prices flow through into our estimates of the economic impact of arable production. In some sense the impact is artificially great, but it reflects the reality that grain prices have been higher than historical norms.

2.1 Grain crops

Tonnes sold

In 2021 there were 2,216,423 tonnes of grain and pulses sold.² This was a 30 percent increase from the 1,701,142 tonnes sold in 2018. Maize silage tonnes increased 39 percent from 853,600 tonnes in 2018, to 1.18 million tonnes in 2021. This is a strong recovery following a 25 percent decline between 2015 and 2018. Together, the production of oats, pulses and other cereals in 2021 was 69,537 tonnes, this represents a 12 percent increase on 2018.

Figure 2.1 Tonnes sold, grain crops

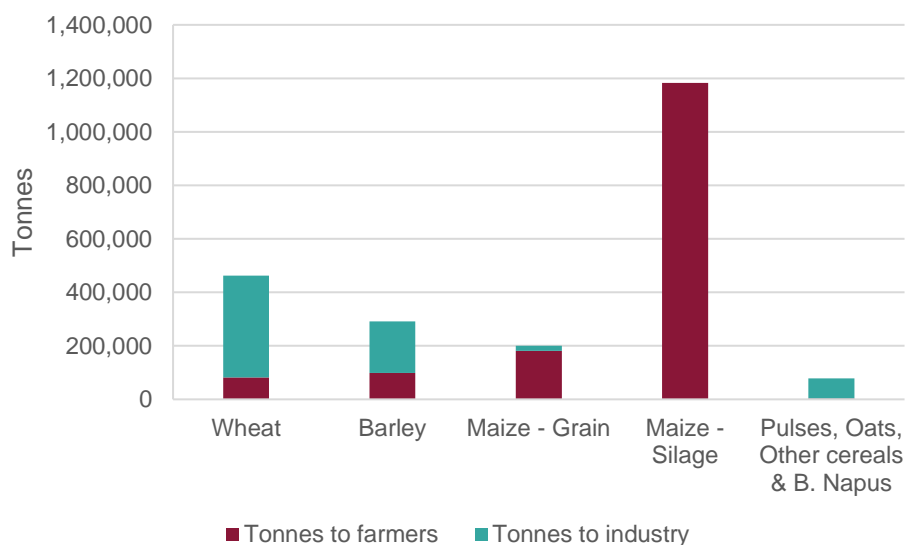


Grain and maize sold to industry and farmers

Of the 2,216,423 tonnes of grain and pulses sold in 2021 70 percent (1,548,750) was sold to other farmers. This is an upward shift from 2018 when 62 percent was sold to farmers. The largest flow of arable production to farmers is maize for silage. In 2021 1.18 million tonnes of maize silage was sold to farmers, this represents a 39 percent increase from 2018 when 853,620 tonnes of maize silage was sold.

² This includes B. Napus, commonly known as rapeseed which is used in the production of oil for human consumption.

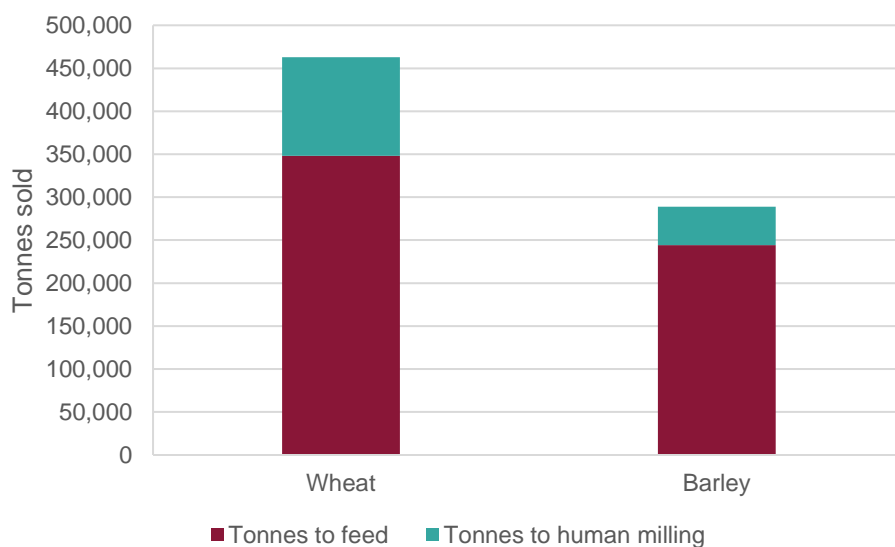
Figure 2.2 Arable flows to farmers and industry



Grain and maize silage flows

In 2021 754,190 tonnes of wheat and barley was sold. 348,014 tonnes of wheat and 244,114 tonnes of barley went to feed. Flour and malt mills purchased 114,836 tonnes of wheat and 44,612 tonnes of barley that would eventually be used in the production of goods such as bread and beer for human consumption.

Figure 2.3 Production grain flows 2021



We have combined data from FAR andASUREQuality to build an account of grain production in New Zealand in 2018 and 2021. This is summarised in Table 2.1

Table 2.1 shows that of the 2,216,423 production tonnes of grain and pulses produced in 2021, 1,548,750 (70 percent) went to farmers and the remaining 667,673 (30 percent) went to feed mills, flour and malt mills, and other uses.

Table 2.1 Grain and pulses tonnes sold, tonnes to farmers and tonnes to industry

	Tonnes sold 2021	Tonnes to farmers 2021	Tonnes to industry 2021
Wheat	463,124	82,539	380,585
Barley	291,066	98,918	192,148
Oats	24,216	1,316	22,900
Maize	1,382,861	1,363,642	19,219
Other cereal grains	12,609	2,080	10,529
Pulses	32,712	255	32,457
B. Napus*	9,835	0	9,835
Total grains & silage	2,216,423	1,548,750	667,673

*B. Napus is also known as rapeseed and is used to produce oil for human consumption.

Above, we have a calculation to summarise flows of grain to farmers. We also present a calculation of the tonnage of grains and pulses used for feed and human consumption. To do so we used the fact that wheat and barley levies are different depending if the crop was destined for feed or milling/malting. We summarise the breakdown in Table 2.2

Our data shows that of the 463,124 tonnes of wheat sold 348,014 (75 percent) was used for feed.³ While the balance, 114,836 was used for human milling.

In 2021 New Zealand farmers produced 291,066 tonnes of barley, after farmers transferred 96,578 barley between each other we calculate that 147,536 of the remainder (77 percent) was used for animal feed. This makes a total of 244,114 tonnes of barley used for feed and 44,612 (23 percent) used for human consumption, mostly malting.

In New Zealand maize is used entirely for animal consumption. Sweetcorn is a related plant, and is grown for humans but is not included in our analysis.

Table 2.2 Grain tonnes to milling and livestock

	Tonnes to feed	Tonnes to human consumption
Wheat	348,014	114,836
Barley	244,114	44,612
Maize (silage and grain)	1,382,861	0
Total	1,974,990	159,447

2.1.1 Sales of grains and pulses

Having estimated the general flow of grains and maize silage from New Zealand farms we can estimate their value at first point of sale; that is at sale to other farmers or to industry. Price data comes from FAR levy information.

Table 2.4 shows that sales of grain and maize silage totalled \$740 million in 2021. This is composed of \$453 million to farmers, and \$287 million to industry. This is 42 percent up on 2018.

³ There is a discrepancy of 274 tonnes of milling wheat which went to farmers.

Table 2.3 Value of grains and maize silage

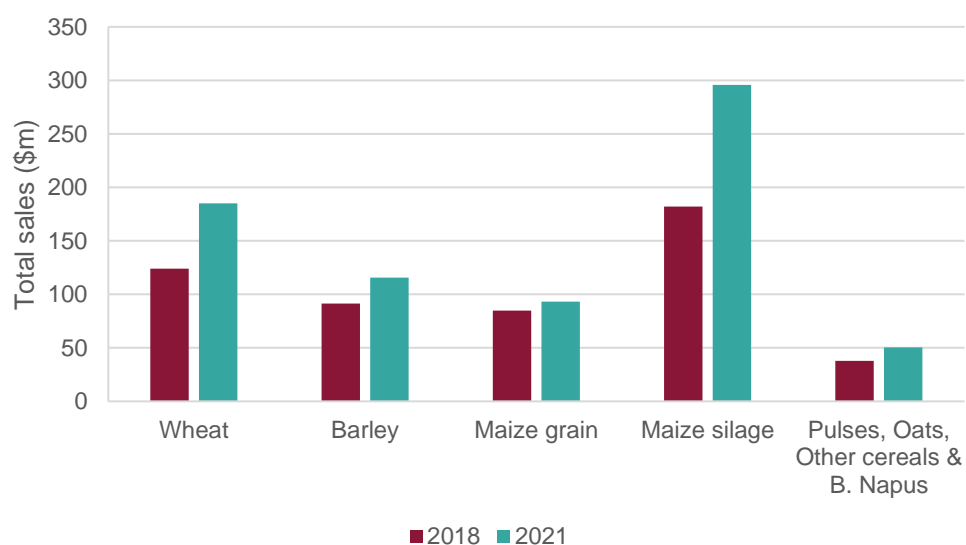
	Price (\$/tonne)	2021		Total Sales (\$Million)	2018 Total Sales (\$Million)
		To farmers	To industry		
Wheat		32	153	185	124
Milling	422	0	48	49	37
Feed	392	32	104	137	87
Barley		39	77	116	92
Malting	430	1	19	20	18
Feed	391	38	58	95	74
Maize		380	9	389	267
Grain	465	84	9	93	85
Silage	250	296	0	296	182
Oats	474	1	11	11	10
Other cereal grains	408	1	4	5	7
Pulses	805	0	26	26	17
B. Napus*	747	0	7	7	5
Total grains and silage		453	287	740	520

*B. Napus is also known as rapeseed and is used to produce oil for human consumption.

Value of sales of grain and pulses

The total value of grain and pulses sales in 2021 was \$740 million. The largest portion of this was made up of sales of maize silage, which increased from \$182 million in 2018 to \$296 million in 2021. This increase can be attributed to increased maize silage production, a more accurate data source for the price, and higher and more volatile maize prices during 2021. Wheat sales grew by 49 percent from \$124 million in 2018, to \$185 million in 2021. Barley sales grew from \$92 million in 2018 to \$116 million in 2021, which was a 26 percent increase. Maize grain sales increased slightly over the period, from \$85 million to \$93 million.

Figure 2.4 Total sales, grain and pulse crops



Direct and upstream impact of grain and maize silage

The \$740 million value of grains and pulses sold in 2021 multiplies up to \$1,604 million when the indirect impacts on upstream suppliers, and associated impacts on household expenditure, are taken into account. This is 42 percent higher than in 2018, when the total gross value multiplied up to \$1.13 billion.

The \$740 million of direct sales generated \$293 million value added in 2021. When we factor in upstream impacts we find that the GDP generated was \$684 million.

This level of direct value add (\$293 million) is sufficient to support around 2,606 FTEs. When we factor in the upstream impacts we find that employment of 5,647 FTEs across the economy could be sustained as a result of grain production in 2021.

Table 2.4 Economic impact of grains

	2021		2018
	Direct impact	Total impacts	Total impacts
Total sales (\$M)	740	1,604	1,128
GDP (\$M)	293	684	481
Employment (FTEs)	2,606	5,647	3,971

2.2 Seed for sowing crops

Alongside grains and pulses the second broad activity the arable sector is engaged with is the production of seeds for sowing. This serves two markets. The first is certified seeds, which are 'certified'. With certified seeds purchasers can have confidence in what they are buying when purchasing certified seed. Certified seed is generally of a higher quality, so would be expected to yield more than noncertified seed. The second type is noncertified seed. Noncertified seed is sold generally as the seed of a single species or cultivar, but may have seeds of another type in it. This is suitable for general use in production.

The variety of seed grown commercially in New Zealand is surprising, with 44 different species in official data. These include traditional species, for example grasses and legumes that are mostly used as fodder, as well as higher value vegetable seeds, for example radish and carrot.

We define certified and production seed as follows for the remainder of the report:

- **Certified seed:** seed is grown so that it is certified to be only of the species and cultivar designated. The process of certification is administered and operated byASUREQuality, a 100 percent government-owned commercial entity, related to the Ministry of Primary Industries.
- **Noncertified seed:** Seed of species or cultivars that do not require certification through the schemes managed by ASUREQuality.

2.2.1 Scope of seed certification in New Zealand

ASUREQuality is a commercial entity owned and operated by the New Zealand government. It operates the seed certification service and handles at least 44 species of seed. We summarise the data on hectares of certified seed entered into certification in 2018 and 2021 in Table 2.5. In 2021, a total of 43,668 hectares were entered for certification. This is a 35 percent increase on the 32,864 hectares entered in 2018. The largest growth of hectares was in grasses, which grew by almost 10,000 hectares (53 percent). Brassicas had the greatest proportional increase, growing by 137 percent, from almost 1,700 hectares in 2018 to over 4,013 in 2021.

Certified seed for sowing

In 2021 43,668 hectares of seed crops for sowing were entered for certification. 27,560 hectares (63 percent) were herbage and amenity grasses. This was a 53 percent increase from 18,349 hectares in 2018. Legumes were the second largest seed type, with 7,963 hectares planted. However legumes were the only seed to have a decline (by 1,200 hectares) in planting since 2018. Brassicas had the greatest proportional growth in hectares planted between 2018 and 2021. The 2,320 additional hectares in 2021 was a 137 percent increase from 2018.

Figure 2.5 Hectares of certified seed entered

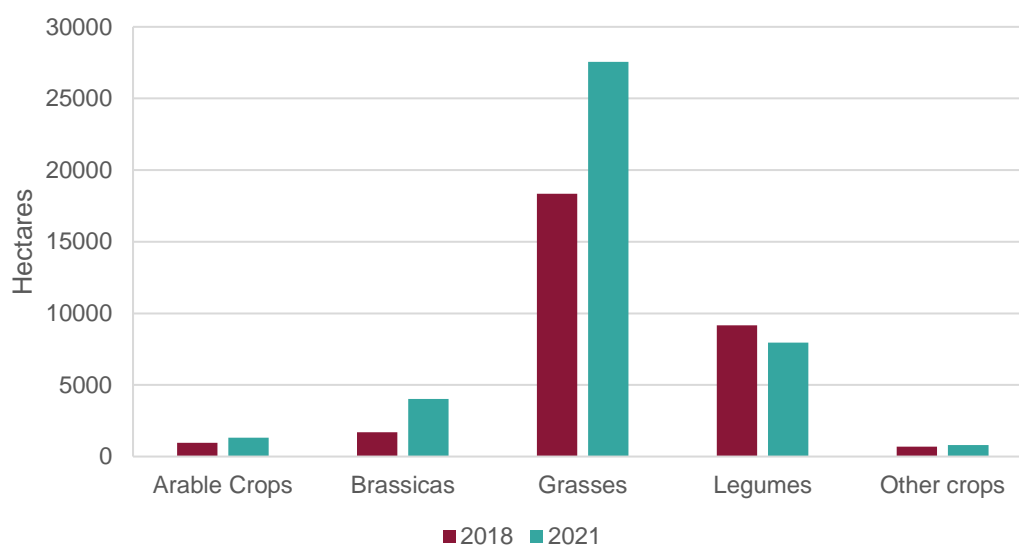


Table 2.5 Certified seed hectares entered

	Hectares	
	2018	2021
Arable Crops	949	1,308
Brassicas	1,693	4,013
Grasses	18,349	27,560
Legumes	9,163	7,963
Other crops	692	803
Total	32,864	43,668

2.2.2 Certified and production seed produced

By combining the data from FAR andASUREQuality, we can calculate the tonnes of certified seed and noncertified seed produced. Table 2.6 summarises tonnes of seed, ex the farm, sourced from FAR levy data and Statistics New Zealand export data. The quantity of certified seed is sourced from ASUREQuality, to provide an estimate of the total volume of certified seed.

Certified seed production reached 64,424 tonnes in 2021, up from 46,479 in 2018, 80 percent (52,139 tonnes) of which was grasses. In 2021 17,046 tonnes of noncertified seed was produced. This was a 44 percent increase from 2018 when 11,789 tonnes were produced.

In 2021 81,470 tonnes of seed for sowing were produced, a 40 percent increase from 2018. Certified seed production grew 40 percent from 2018, and remained the largest (79 percent) category of seeds produced. Most (52,139 tonnes) of the certified seeds produced were grasses. This represented a 49 percent increase from 2018.

Noncertified seed grew by 45 percent, to reach 21 percent of all seed produced by the arable industry. The greatest production of noncertified seed type was Brassicas at 6,146 tonnes in 2021.

Figure 2.6 Seeds produced, certified and noncertified

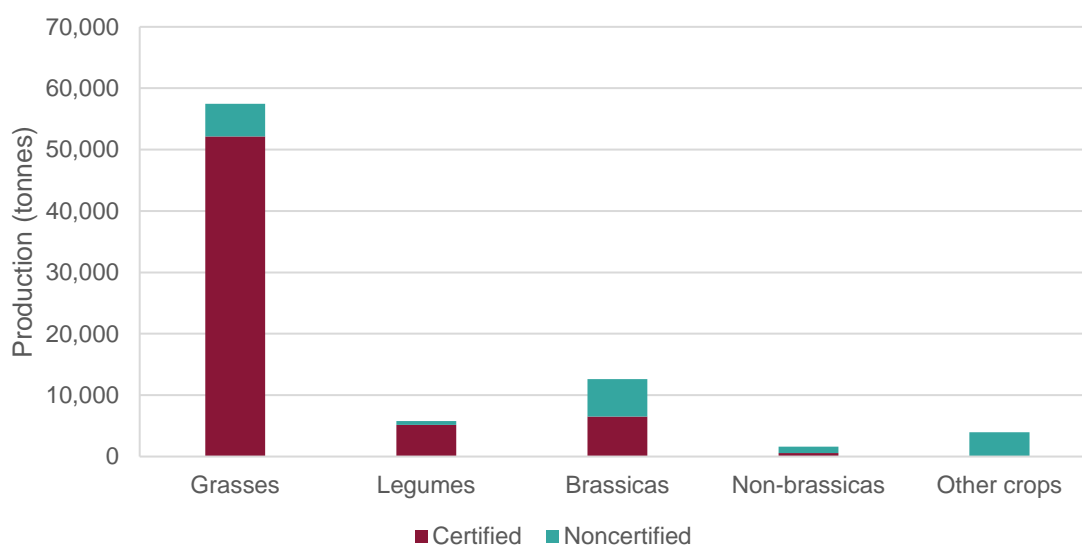


Table 2.6 Seed production, certified and noncertified (tonnes)

	2021	
	Certified	Uncertified
Grasses	52,139	5,342
Legumes	5,177	614
Brassicas	6,495	6,146
Non-brassicas	589	1,027
Other crops	23	3,918
Total	64,424	17,046

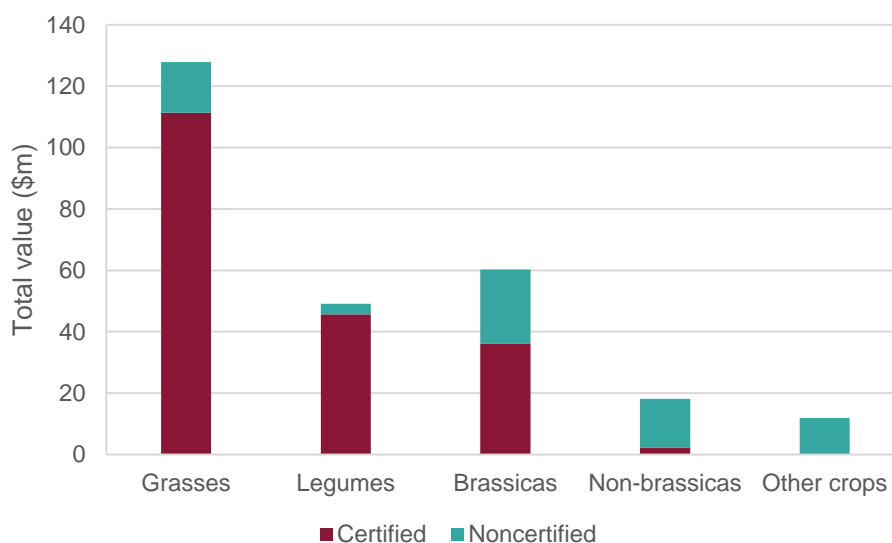
2.2.3 Value of seed

In 2021 the total value of seeds sold was \$267 million. We suggest caution in making comparisons with data in the 2019 report (values from 2018). Since publication of that report we have revised our methodology for collecting, processing, and calculating the value of certified seeds. In particular, every seed variety reported byASUREQuality is included in our calculations. Additionally, we have put considerable effort into obtaining an accurate price estimate for **every** seed variety from either export data, or consultation with agriculture professionals. In previous updates to this work we relied more heavily on assumptions.

We expect future updates to this work will follow our new methodology, and comparability across years will be valuable as time goes by. This methodology implies fewer assumptions and is more robust.

In total the value of seeds produced for sowing in 2021 was \$267 million. This is a three percent decrease in the total value of seeds produced. Grasses were the largest certified seed type by value of sales. Of the \$127 million of grasses seeds sold 87 percent (\$111 million) were certified.

Figure 2.7 Value of seed sales 2021



As Table 2.7 shows, the total value of seed sales in 2021 was split with 73 percent (\$196 million) from certified seeds and 27 percent (\$73 million) from noncertified seeds. Certified seeds were dominated by grasses, which made up 56 percent (\$111 million). Other significant certified seed sales were legumes, valued at \$46 million (23 percent), and brassicas, valued at \$36 million (18 percent).

The largest species in noncertified seed sales was brassicas which had sales of 24 million, around a third of all sales of noncertified seed.

Table 2.7 New Zealand seed for sowing sales

	2021	
	Certified \$m	Uncertified \$m
Grasses	111	16
Legumes	46	3
Brassicas	36	24
Non-brassicas	2	16
Other crops	0	11
Total	196	71

Direct and upstream impact of seeds for sowing

The direct output value of seeds produced in 2021 (\$267 million) multiplies up to \$580 million when we take into account the upstream effects, and increased household expenditure.

The \$267 million of direct output generated \$106 million in direct value added. When the indirect and induced impact are included the total GDP impact of seed for sowing multiplies up to \$247 million.

Despite the challenges presented by health measures, put in place to restrict the spread of COVID-19, in 2021 the production of seeds was sufficient to employ 942 people. When the roundaboutness

of economic activity is accounted for, the total contribution to national employment from the production of seeds for sowing is 2,041 FTEs.

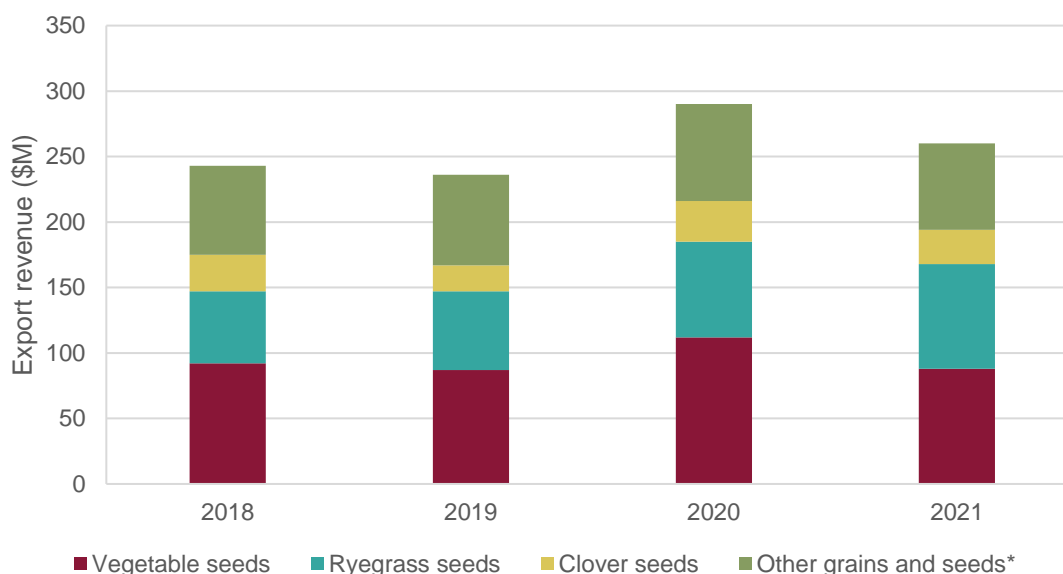
Table 2.8 Economic impact of seeds for sowing

	2021		2018
	Direct impact	Total impacts	Total impacts
Total sales (\$M)	267	580	646
GDP (\$M)	106	247	276
Employment (FTEs)	942	2,041	2,275

3 Arable exports

The total value of New Zealand's arable exports in 2021 was \$260 million. Exports have grown by \$17 million since 2018 (the period of our last update). The largest contributor to exports is vegetable seeds, followed by ryegrass. Vegetable seed exports had a considerable spike in 2020 but have since returned to what appears to be a more average value of \$88 million.

Figure 3.1 Export revenue of arable exports from New Zealand



*Includes maize, other grains and oil seeds.

We summarise the same data in tabular form in Table 3.1

Table 3.1 Export revenue of arable exports from New Zealand

Crop	Export revenue (\$M)			
	2018	2019	2020	2021
Vegetable seeds	92	87	112	88
Ryegrass seeds	55	60	73	80
Clover seeds	28	20	31	26
Other grains and seeds*	68	69	74	66
Total	243	236	290	260

*Includes maize, other grains and oil seeds.

4 Economic impact of arable production

This section estimates the economic impact of arable production in New Zealand. To estimate the economic impact of arable production, the impact of the industry's gross output, the value added or GDP component, and employment, is calculated using multiplier analysis.

The multipliers capture the impact upstream through the economy, of the output produced by the arable sector, accounting for the roundaboutness of economic activity. As discussed earlier, this multiplier analysis does not capture the impact of downstream arable production on the downstream impact of arable production to the New Zealand economy.

4.1 Economic impact of grain and pulse production

In 2021 New Zealand farmers produced and sold 2,216,423 tonnes of grains and pulses. We break down grain and pulse production in Table 4.1

Table 4.1 Tonnage of grains and pulses produced and sold, 2021

	Tonnes
Wheat	463,124
Barley	291,066
Oats	24,216
Maize	1,382,861
Other cereal grains	12,609
Pulses	32,712
B. Napus	9,835
Total	2,216,423

To estimate the economic impact of the production of grains and pulses, we take the value of sales, as estimated in Section 2, and use multiplier analysis to find the indirect and total impacts, from the suppliers to the arable production industry. A component of this gross output is the value added. Value added from each industry goes to make up New Zealand's GDP. At a high level our results are presented in Table 4.2 with detailed breakdowns of gross output, gross domestic product (GDP) and employment, measured as full time equivalent employees (FTEs)

Table 4.2 Economic impact of grain and maize silage production

	2021		2018
	Direct impact	Total impacts	Total impacts
Total sales (\$M)	740	1,604	1,128
GDP (\$M)	293	684	481
Employment (FTEs)	2,606	5,647	3,971

We detail each of these numbers below, and provide a breakdown by product included in each.

4.1.1 Total sales

The total sales of grain and pulse production was \$740 million in 2021. This \$740 million in direct sales represents \$1.6 billion in total sales across the upstream economy. This is an increase of 42 percent on 2018's total sales impact which was \$1.12 billion.

Table 4.3 Sales of grain and maize silage production

	2021		2018
	Direct impact	Total impacts	Total impacts
Sales (\$M)			
Wheat	185	402	269
Barley	116	251	199
Oats	11	25	21
Maize	389	843	579
Other cereal grains	5	11	14
Pulses	26	57	36
B. Napus	7	16	11
Total (\$M)	740	1,604	1,128

4.1.2 Gross Domestic Product (GDP)

GDP is the total of value added to a product in the New Zealand economy. In the case of grains, this is obtained as the proportion of value added for each \$1 of sales, obtained from industry analyses.

Table 4.4 shows that in 2021 the \$740 million in direct sales of grains, resulted in \$293 million direct GDP. After accounting for all of the flow on effects upstream of this process, our analysis reveals that there was economic activity of \$684 million generated in total. As at June 2021 New Zealand's GDP was \$273,049 million, this implies that grain and pulse production contributed around 0.25 percent of the June 2021 year's GDP.

Table 4.4 Grain and maize silage production gross domestic product

	2021		2018
	Direct impact	Total impacts	Total impacts
GDP (\$M)			
Wheat	73	171	115
Barley	46	107	85
Oats	5	11	9
Maize	154	360	247
Other cereal grains	2	5	6
Pulses	10	24	15
B.Napus	3	7	5
Total GDP (\$M)	293	684	481

4.1.3 Employment

Employment is the third economic impact that is generated by the arable industry. Employment is measured in full time equivalent employees (FTEs). This is different to a count of employees in the sector. To interpret the result we suggest framing it in terms of economic activity sufficient to support the number of FTEs reported. We have not completed a survey of employment across the diverse arable production industry. As a result we have used the national coefficients from the relevant section of the overall agricultural sector to estimate the employment in the arable industry.

Table 4.5 describes that the total sales of grains of \$740 million was equivalent to economic activity sufficient to employ 2,606 FTEs. When we account for all the effects of this economic activity we calculate that total employment able to be supported across the economy was 5,647 FTEs. This is an increase of 42 percent on 2018, where we calculated that sales of grains was sufficient to support 3,971 FTEs across the economy in total.

Table 4.5 Grain and maize silage production employment

	2021		2018
	Direct impact	Total impacts	Total impacts
Employment (FTEs)			
Wheat	652	1,413	946
Barley	407	882	699
Oats	40	88	73
Maize	1,369	2,967	2,038
Other cereal grains	18	39	50
Pulses	93	201	127
B. Napus	26	56	39
Total employment (FTEs)	2,606	5,647	3,971

4.2 Economic impact of seeds for sowing

As with grain and maize silage, to estimate the economic impact of seeds, we took the value of sales as estimated in Section 2, and used multiplier analysis to find the upstream indirect and total impacts from the suppliers to the arable production industry.

In 2021 New Zealand farmers produced and sold around 81,470 tonnes of the seed crops included in our analysis. We break down the production of seeds in Table 4.6

Table 4.6 Tonnage of seeds for sowing produced and sold, 2021

	Tonnes
Grasses	57,481
Legumes	5,791
Brassicas	12,641
Non-brassicas	1,617
Total other crops	3,941
Total	81,470

At the highest level our results are summarised in Table 4.7 which shows that the direct impact of seeds for sowing directly produced \$267 million sales, this is sufficient to support 942 FTEs, and directly contributed \$106 million to national GDP. When the indirect and induced impacts are included, the total impact of seeds for sowing is a \$247 million contribution to GDP, and 2,041 FTEs supported.

Table 4.7 Economic impact of seeds for sowing

	2021		2018
	Direct impact	Total impacts	Total impacts
Total sales (\$M)	267	580	646
GDP (\$M)	106	247	276
Employment (FTEs)	942	2,041	2,275

We do not include a detailed comparison with 2018 for seeds as we have significantly changed our approach to calculating the economic impact of the arable industry between 2018 and 2021. Most of this change has been in improving our treatment of seed variety data, and prices received for seed products.

4.2.1 Total sales

We summarise in Table 4.8 the sales effect of seed production in 2021. Our data shows that the total value of seeds sold was \$267 million, a large proportion (48 percent) being accounted for by grasses.

As described previously, we utilise the multiplier method in this analysis to calculate the total impact of sales of seeds. This allows us to account for the roundaboutness of economic activity. When we take into account the roundabout nature of economic activity this \$267 million in direct sales in seed production creates \$580 million in sales across the entire New Zealand economy.

Table 4.8 Total sales of seeds for sowing

	2021	
	Direct impact	Total impacts
Sales (\$M)		
Grasses	128	277
Legumes	49	107
Brassicas	60	131
Non-brassicas	18	39
Total other crops	12	26
Total (\$M)	267	580

4.2.2 Gross domestic product (GDP)

We calculate that the direct sales of \$267 million resulted in GDP of \$106 million directly for the seed industry. This is summarised in Table 4.9

After accounting for all the economic effects, we calculate that the total impact of this \$267 million sales is around \$247 million total GDP. As at June 2021 New Zealand's GDP was \$273,049 million. This implies that the total effects of seed production are worth approximately 0.09 percent of New Zealand's GDP.

Table 4.9 Gross domestic product impact of seeds for sowing

	2021	
	Direct impact	Total impacts
GDP (\$M)		
Grasses	51	118
Legumes	19	45
Brassicas	24	56
Non-brassicas	7	17
Total other crops	5	11
Total GDP (\$M)	106	247

4.2.3 Employment

As mentioned previously, we suggest caution in interpreting the employment numbers reported. This measure is a measure of economic activity that is sufficient to support a number of full time equivalent jobs, it is not the number of people actually employed. We summarise our calculations on the employment effects of seed production in Table 4.10

Our calculations show that the \$267 million sales of seeds generated economic activity sufficient to employ 942 FTEs directly in 2021. Once we account for all of the economic effects, we calculate that the \$267 million in direct sales generated \$247 million in GDP, which is sufficient to support 2,041 FTEs in the New Zealand economy.

Most of this impact is attributable to production of grasses. This underscores our messaging that we measure the economic activity, not actual jobs. It is unlikely that 450 people are employed to produce the seeds of grasses in New Zealand, compared to 173 for legumes. Our data shows legume production was around ten times lower than grass seed production.

Table 4.10 Employment impact of seeds for sowing

	2021	
	Direct impact	Total impacts
Employment (FTEs)		
Grasses	450	976
Legumes	173	375
Brassicas	213	460
Non-brassicas	64	139
Total other crops	42	90
Total employment (FTEs)	942	2,041

4.3 Summary economic impact of the arable industry

Combining the information from the grains and the seed production, to show the full impact of the arable industry, we estimate that the annual value of sales of the arable industry in 2021 was \$1 billion. This generated a total level of sales in the economy of just about \$2.2 billion.

As Table 4.11 shows, this \$1 billion in sales generated \$399 million in GDP directly, and \$932 million GDP in total. This represents economic activity sufficient to support the direct employment of 3,548 FTEs in arable industries, and 7,687 FTEs across the economy.

Table 4.11 Economic impact of the arable industry

	Tonnes	2021 Direct impact	Total impacts	2018 Total impacts
Sales (\$M)				
Grain and pulse production*	2,216,423	740	1,604	1,128
Seeds	81,470	267	580	646
Total	2,297,893	1,007	2,184	1,775
GDP (\$M)				
Grain and pulse production*		293	684	481
Seeds		106	247	276
Total		399	932	757
Employment (FTEs)				
Grain and pulse production*		2,606	5,647	3,971
Seeds		942	2,041	2,275
Total		3,548	7,687	6,246

*Includes B. Napus or rapeseed

4.3.1 Downstream economic impact

Downstream industries that rely on arable production are varied and range from the fast food industry, that uses pork and poultry fed on feed formulations including grains like maize, to brewing which makes use of barley. BERL believes the economic impact of arable production on these downstream industries, while not quantified in this report, to be large.

The grain millers and processors are producing specialised value added products including health and exercise bars, muesli bars, and baking products.

Downstream industries also rely heavily on seeds produced in New Zealand. These include those using the outputs of pastoral livestock production, where the sheep and cows are fed on grasses and forage brassicas grown from New Zealand seeds.

Other downstream seed users are the horticulture/market gardening industries. Downstream benefits therefore also accrue to retailers, exporters and restaurants/fast food outlets. The greatest winner at the end is the consumer, who gains the produce of all these activities in the form of meat, milk, beer, bread, and cakes, among many other products. These downstream benefits are not included in our estimates of the impacts of arable seed production.

Appendix A Multiplier analysis

The analysis in this report uses multipliers derived from inter-industry input-output tables for New Zealand. Input-output tables have been derived and updated from the national input-output tables produced by Statistics New Zealand.

Multipliers allow us to identify the direct, indirect and induced effects in terms of expenditure, Gross Domestic Product, and Full-Time Equivalent (FTE) employment.

Measures of economic activity

The three measures used are:

Sales: the value of production, which is built up through the national accounts as a measure of gross sales or turnover. This is expressed in \$million at constant prices (i.e. removing the effect of inflation), and includes GST.

GDP: the increase in output generated along the production chain, which when aggregated, totals Gross Domestic Product, or GDP. This is the sum of:

- Compensation of employees (i.e. salaries and wages)
- Income from self-employment
- Depreciation
- Profits
- Indirect taxes less subsidies.

Note that expenditure is made up of the above (value added) plus:

- Intermediate purchases of goods (other than stock in trade)
- Intermediate purchases of services.

Employment: the volume of employment is usually expressed as Full-Time Equivalents (FTEs). These are estimated as the number of full-time employees and working proprietors and one-third of the number of part-time employees, converted to an annual basis.

FTEs provide a measure of total labour demand associated with expenditure - e.g. four full-time jobs running for three months or three part time jobs running for a year would be shown as a single FTE.