

New crop opportunities

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Alternative Crops for the Wairarapa

Project code X17-05

Duration Year 3 of 3

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Location: Wairarapa

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Key points

- Second year pre-commercial scale demonstration durum wheat plots were sown on irrigated and non-irrigated paddocks in the Wairarapa.
- The quality of wheat from both plots continued to be of good commercial quality, with the irrigated plot (7,100 kg/ha) having double the yield of the dry land plot (3,890 kg/ha).
- Samples of durum wheat semolina processed from the 2019 harvest were supplied to pasta makers, bakers and chefs in the region. Feedback was extremely positive with further work on granule size to be carried out at the mill.

Background

The unwanted organism pea weevil (*Bruchus pisorum*) was discovered in the Wairarapa region in 2016. The response to the incursion resulted in a ban on growing peas in the region for four seasons prompting the need to assess the viability of alternative crops. This project aims to identify potential new crop opportunities for the region.

Methods

Based on previous years' developments (McDougall and Lawrie 2019), the project team decided to proceed in the third year with establishing two one-hectare pre-commercial durum wheat plots, one with irrigation and one dryland, to get an indication of the feasibility of this crop for the region.

Results and Discussion

Following dry summer conditions for the region, and with both demonstration plots receiving almost identical inputs, the dryland plot yielded 3,890 kg/ha whereas the irrigated plot yielded 7,100 kg/ha (both adjusted to moisture of 14%).

Figures 1 and 2 show the detailed ProductionWise reports on the inputs and operations for the blocks at Ahiaruhe (irrigated) and Carters Line (dryland). Both treatments used cv. Farina, bred by the New Zealand Institute for Plant & Food Research and commercialised by Kiwi Seeds, Marlborough. For the purpose of this analysis, freight costs to Christchurch for milling were excluded as it would need to be scaled up to get market rates.

Gross Margin Analysis for Wheat 2019 Paddock Irrigated durum								
Crop	Durum Wheat	Start Date	1/11/2019					
Sowing Area	1.00 ha	End Date	8/03/2020					
Income	Date Occurred	Yield	Yield Source	Price	Per ha	Area (ha)	Total	
Grain Harvest	8/03/2020	7.10 t/ha	Diary	\$500.00 /t	\$3,550.00	1	\$3,550.00	
Forage Harvest		0.00 t/ha		\$0.00 /t	\$0.00	1	\$0.00	
Grazing		0.00 lwt kg/ha		\$0.00 /lwt k	\$0.00	1	\$0.00	
Operation	Date Occurred			Performed	Cost Per h	Area (ha)	Total Cost	
Sowing	1/11/2019			Contractor	\$145.00	1	\$145.00	
Fertiliser Application	1/11/2019			Contractor	\$22.00	1	\$22.00	
Spraying	25/11/2019			Contractor	\$32.00	1	\$32.00	
Fertiliser Application	25/11/2019			Contractor	\$22.00	1	\$22.00	
Irrigation	1/12/2019			Farm Emplo	\$0.00	1	\$0.00	
Spraying	16/12/2019			Contractor	\$32.00	1	\$32.00	
Irrigation	1/01/2020			Farm Emplo	\$0.00	1	\$0.00	
Grain Harvest	8/03/2020			Contractor	\$250.00	1	\$250.00	
Input	Date Occurred	Product	Rate/ha	Unit	Cost Per Un	Cost Per h	Area (ha)	Total Cost
Seed	1/11/2019	Other	339	kg/ha	\$1.36	\$461.04	1	\$461.04
Fertiliser	1/11/2019	Cropmast	250	kg/ha	\$0.87	\$217.50	1	\$217.50
Molluscicide	1/11/2019	Slug Out	4	kg/ha	\$8.90	\$35.60	1	\$35.60
Adjuvant	25/11/2019	Actiwett	37.5	mL/ha	\$0.02	\$0.64	1	\$0.64
Insecticide	25/11/2019	Transform	50	mL/ha	\$0.36	\$17.83	1	\$17.83
Fertiliser	25/11/2019	N-Protect	180	kg/ha	\$0.56	\$100.26	1	\$100.26
Irrigation	1/12/2019	Water	35	mm	\$2.15	\$75.25	1	\$75.25
Adjuvant	16/12/2019	Partner	1	L/ha	\$10.00	\$10.00	1	\$10.00
Fungicide	16/12/2019	Kestrel	1	L/ha	\$61.97	\$61.97	1	\$61.97
Fungicide	16/12/2019	Inspire	750	mL/ha	\$0.05	\$40.50	1	\$40.50
Herbicide	16/12/2019	Hussar	150	g/ha	\$0.40	\$60.00	1	\$60.00
Irrigation	1/01/2020	Water	35	mm	\$2.15	\$75.25	1	\$75.25
Total Income						\$3,550.00	1	\$3,550.00
Cost of Production						\$1,658.83	1	\$1,658.83
Gross Margin						\$1,891.17	1	\$1,891.17

Figure 1. ProductionWise data on the inputs and outputs associated with the irrigated, one-hectare pre-commercial durum wheat plot at Ahiaruhe in the 2019-20 season.

Gross Margin Analysis for Wheat 2019 Paddock Unirrigated durum								
Crop	Durum Wheat	Start Date	3/11/2019					
Sowing Area	1.00 ha	End Date	29/06/2020					
Income	Date Occurred	Yield	Yield Source	Price	Per ha	Area (ha)	Total	
Grain Harvest	29/06/2020	4.00 t/ha	Diary	\$500.00 /t	\$2,000.00	1	\$2,000.00	
Forage Harvest		0.00 t/ha		\$0.00 /t	\$0.00	1	\$0.00	
Grazing		0.00 lwt kg/ha		\$0.00 /lwt	\$0.00	1	\$0.00	
Operation	Date Occurred			Performed	Cost Per h	Area (ha)	Total Cost	
Sowing	3/11/2019			Contracto	\$145.00	1	\$145.00	
Fertiliser Applic	3/11/2019			Contracto	\$20.00	1	\$20.00	
Spraying	10/12/2019			Contracto	\$32.00	1	\$32.00	
Spraying	16/12/2019			Contracto	\$32.00	1	\$32.00	
Fertiliser Applic	17/12/2019			Contracto	\$22.00	1	\$22.00	
Grain Harvest	29/06/2020			Contracto	\$250.00	1	\$250.00	
Input	Date Occurred	Product	Rate/ha	Unit	Cost Per U	Cost Per h	Area (ha)	Total Cost
Seed	3/11/2019	Other	300	kg/ha	\$1.36	\$408.00	1	\$408.00
Fertiliser	3/11/2019	Yara Mila	200	kg/ha	\$1.02	\$204.00	1	\$204.00
Fertiliser	3/11/2019	YaraVera	140	kg/ha	\$0.66	\$92.40	1	\$92.40
Molluscicide	3/11/2019	Slug Out	5	kg/ha	\$8.90	\$44.50	1	\$44.50
Insecticide	10/12/2019	Sparta	20	mL/ha	\$0.22	\$4.44	1	\$4.44
Fungicide	16/12/2019	Phoenix	1	L/ha	\$24.48	\$24.48	1	\$24.48
Fungicide	16/12/2019	Proline	500	mL/ha	\$0.10	\$48.95	1	\$48.95
Fungicide	16/12/2019	Acanto	300	mL/ha	\$0.09	\$28.23	1	\$28.23
Herbicide	16/12/2019	Bromotril	750	mL/ha	\$0.04	\$26.55	1	\$26.55
Herbicide	16/12/2019	Glean	20	g/ha	\$0.60	\$12.08	1	\$12.08
Fertiliser	17/12/2019	YaraVera	100	kg/ha	\$0.66	\$66.00	1	\$66.00
Total Income						\$2,000.00	1	\$2,000.00
Cost of Production						\$1,460.63	1	\$1,460.63
Gross Margin						\$539.37	1	\$539.37

Figure 2. ProductionWise data on the inputs and outputs associated with the dryland, one-hectare pre-commercial durum wheat plot at Carters Line in the 2019-20 season.

A total of 11 tonnes of grain were sent to storage in Christchurch to be processed at Champion Mills in July 2020. Quality tests (Table 1) for both the irrigated and unirrigated block were of acceptable standards, on a par with 2019 results.

Table 1. Quality test results for durum wheat cv. Farina produced under irrigation or as a dryland crop in the Wairarapa in the 2019-2020 season.

		Screen (% 2.0mm)	TGW (g)	Test Weight (kg/hl)	Protein (%)	Falling No. (s)
Durum	Irrigated	3.8	40.4	71.9	12.5	398
Durum	Dryland	1.85	41.8	75	14	438

Summary

As the push to grow more domestic milling wheat in New Zealand grows, so do the opportunities for specialty grains and products from the regions. Durum wheat semolina has a wide range of uses from pasta making to pizza and specialty breads. Internationally, durum meeting the appropriate quality specifications will attract a 15-20 % premium over high grade milling wheat. For the purpose of this project, the estimated price for durum (as the market does not currently exist) was set at \$500 per tonne, against a current contract price for premium 1 milling wheat of \$450. This was a conservative estimate as currently in Canada (the world's largest producer of durum wheat) the price was USD 308.60/tonne in May, 2020, compared to USD 238.00/tonne for bread milling wheat.

In order to meet the profitability expectations of local growers (comparable to peas) gross margins of at least \$1800 per hectare need to be obtained consistently. Two consecutive years of field-scale plots indicate that it would be unlikely for this crop to be viable without irrigation in the Wairarapa region.

The demonstration plots have provided a platform for growers to think more broadly about which crops can be successfully grown in the area and how to engage with the milling and baking sectors on developing new products with a known local origin.

References

McDougall, S, and Lawrie, L (2019). Wairarapa alternative crops. *FAR Annual Research Report 2018-19* pp 137-139. <https://www.far.org.nz/files/display/8152/annual-research-results-18-19.pdf> NZX

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Food Products for the Future

Project code	X18-38
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Authors	Ivan Lawrie, Sam McDougall, Matilda Gunnarsson (FAR), Keith Gundry (Pure Oil NZ)
Location	Canterbury and Manawatu
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Acknowledgements	Roger Lasham (Pure Oil NZ), Paul Mackintosh (trial host)

Key points

- Three new imported high oleic sunflower hybrids have comparable yields to 'Idillic' in demonstration trials.
- Bird damage continues to be the most significant challenge for commercial sunflower crops.
- The commercial area in high oleic sunflower continues to increase, but yields need to be consistently above 2.8 tonnes/ha to make it sustainable.

Background

The aim of this MPI Sustainable Farming Fund project was to explore new crop options for added value food products, starting with a wide range of crops and narrowing the options to those with realistic commercial applications.

FAR and Pure Oil NZ identified an opportunity to diversify oilseed production with high oleic sunflower hybrids as there is increasing consumer demand domestically for a high-quality product with health benefits.

Internationally, sunflower grows well in temperate regions where wheat, barley and maize are grown. Hybrids suitable for New Zealand conditions were selected and imported from France by Pure Oil NZ.

Methods

Following the results from the 2019-20 season, demonstration plots were established to assess new high oleic sunflower hybrids to compare with the standard currently in use (Idillic). Both demonstrations were established on farmers' properties, one in the Manawatu and one in Canterbury. Cereal grain options were limited to small scale demonstration plots at FAR's Chertsey Arable Site in Canterbury with the primary purpose of display at FAR's ARIA event on Wednesday 4th December, 2019.

High Oleic Sunflower Hybrid Evaluation – Chertsey (South Island)

Location:	Chertsey (Turley's)
Sowing date:	12 December, 2019
Previous crop:	Process Peas (August Planted, Harvested first week December)
Sowing rate:	69,500 seeds/ha
Fertiliser:	None
Herbicides:	Interrow sprayed - 15 January, 2020
Desiccation:	Aerial Application 2L/ha Reglone® – 10 April 2020
Harvested:	26-27 April, 2020

High Oleic Sunflower Hybrid evaluation - Whanganui (North Island)

Three numbered pre-commercial sunflower hybrids were established in demonstration plots, 12 km West of Whanganui in December, 2019. Seed was drilled into a cultivated seed bed. The first planting was damaged by birds and/or rabbits, and a second planting was made in 12 December, 2019. Plots were weeded and netted to exclude birds on 24 January, 2020.

Harvest was undertaken on 5 June after being delayed due to Covid-19. Birds (12-15 sparrows) had managed to get through the net and remove some of the seed. A 5 m length from the centre row of each plot was harvested and returned to the lab for moisture assessment. Measurements of bird damage were made for each head. These data were used to correct yields for bird damage.

Results and Discussion

High Oleic Sunflower Hybrid Evaluation - Chertsey (South Island)

Table 1 shows the adjusted-seed yield and seed quality results for the high oleic sunflower hybrids grown at Chertsey in 2019-20, which on average was 2.9 t/ha. All hybrids met the international standards required for fat, while both Idillic and SF 78 002 meet the quality standards required for oleic acid (Table 2).

Table 1. Plant population, adjusted-seed yield and other plant measurements for high oleic sunflower hybrids grown at Chertsey in 2019-20.

Hybrid	Plant Population (plants/ha)	Average Yield (t/ha)	Average bird damage (%)	No. plants harvested (total) (4 plots x 3m ²)	Average diameter of head (cm)	No. plants harvested (total) (4 plots x 3m ²)	Weight per head (g)
78-001	71667	2.8	3.2	86	138	86	39.07
78-002	70000	3.1	0.5	84	137	84	44.29
78-003	72500	3	1.9	87	141	87	41.38
Idillic	61667	2.7	8	74	141	74	43.78
Average		2.9					

Table 2. Oil quality results (summarised fromASUREQuality analysis results) for high oleic sunflower hybrids grown at Chertsey in 2019-20.

Hybrid	Fat (%)*	Oleic acid (%)*	Linoleic acid (%)
Idillic	42.00	80.76	10.47
SF 78 001	45.30	75.97	14.98
SF 78 002	45.40	84.50	7.12
SF 78 003	44.70	76.60	14.71

*Total fat content required to meet international standards is above 42 %, minimum oleic acid required is 80 %. Yellow indicates hybrids that met the oleic acid standards.

Figure 1 shows sunflower heads of different hybrids produced in the demonstration trial at Chertsey.

High Oleic Sunflower Hybrid evaluation - Whanganui (MacIntosh)

Table 2 shows the adjusted-seed yield for the high oleic sunflower hybrids grown at Whanganui, Manawatu in 2019-20, which on average was also 2.9 t/ha.

Table 3. Plant populations and seed yields for a sunflower, hybrid Idillic, crop grown in Whanganui, Manawatu in 2019-20.

Hybrids	Population (plants/ha)	*Seed yield (t/ha)	*Estimated seed yield corrected for bird damage* (t/ha)
78-001	64,000	2.78	3.7
78-002	31,000	2.57	2.57
78-003	52,000	1.71	2.37

*adjusted to 9% moisture



Figure 1. Sunflower heads of different hybrids produced in the demonstration trial at Chertsey, Canterbury in 2019-20.

Summary

All work in these trials was conducted as demonstration plots and, as such, the work lacks the replication to reach statistically validated results. Nevertheless, having adjusted for bird damage, the demonstration trials showed that yields in the Southern North Island are comparable to those in Canterbury and both are potentially viable for arable farmers. The lack of processing capacity in the Manawatu region, however, would mean freight to Canterbury, with an impact of \$70-100 per tonne extra cost. The only installed capacity for processing currently exists at Rolleston. In Canterbury, grower interest and demand for high oleic sunflower contracts is steady with 17 growers and 259 ha in 2019-20, up from 9 growers and 112 ha the previous season.

Bird damage continues to be the most significant risk to the commercial success of this crop. The project team has indicated that a major focus on bird control on sunflower is a priority for next year. Activities are planned on a 7-ha commercial sunflower plot on the FAR Kowhai Research Farm in Lincoln for the 2020-2021 season, evaluating a range of bird scaring devices.