

## Final Technical Report Template

# Final Technical Report

## Using long season wheats for increases in profits and grazing opportunities

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## Abstract

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Growers in the southern region of Western Australia aim to sow their cereal crops in mid-May to maximise yield potential whilst managing frost risk, however later sowing can lead to a reduced yield potential. Early sowing opportunities through summer rainfall events or early breaks in the season often present themselves and producers are not able to take advantage of this opportunity without facing a significant frost risk.

Long season wheats offer a cropping option that can be sown March – Mid April, without excessive frost risk reducing yields and are able to utilise the available early moisture and warmer temperatures.

The aim of the project is to assist growers in introducing long-season wheats into their farming systems to best utilise summer rainfall and early-sowing opportunities. The primary objective of this project is to demonstrate to growers the agronomic and enterprise fit and associated benefits of including a long season wheat into their rotation and to encourage the adoption through the farmer scale demonstrations and economic analysis.

Over the two years of the project three demonstration sites were established in the Albany Port Zone and four were established in the South-East Kwinana Port Zone. All demonstrations were replicated allowing the appropriate statistical analysis on each site to be conducted. All trial sites had 3 long season wheat varieties and a control spring wheat variety.

In the Albany port zone Illabo was the highest yielding variety in the 2020 Muradup trial followed by Accroc then Scepter and Nighthawk. Illabo a long season winter wheat was able to match the high yielding spring variety despite the late seeding date of 26<sup>th</sup> of May. In 2021 Accroc was the highest yielding variety across both demonstrations. Accroc yielded 8.40 tons/Ha at the Murradup site. Overall the demonstrations at Muradup/West Muradup shows there is a fit for these varieties in the rotation in the high rainfall zones of the Great Southern.

In 2020 at the Corrigin site Catapult was the highest yielding variety followed by Scepter then Denison. In 2020 at the Kurrenkutten site Denison yielded significantly higher than the other three varieties achieving a yield of 2.79 MT/Ha. 2021 was a much better growing season than 2020 with the yields reflecting the better growing season. Denison was the highest yielding variety at 3.32 ton/Ha. Mt Walker in low rainfall zone showed that long season wheats may not really suited to the low rainfall areas even in better seasons.

## Executive Summary

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Traditionally, many growers in the southern region of Western Australia have mixed farming enterprises and aim to sow their cereal crops in mid-May to maximise yield potential whilst managing frost risk. However, this later sowing can lead to a reduced yield potential. Farmers in southern WA are sometimes presented with early sowing opportunities through summer rainfall events or early breaks in the season and are not able to take advantage of this opportunity without facing a significant frost risk.

Long season wheats offer a cropping option that can be sown March – Mid April and utilise the available early moisture and warmer temperatures without excessive frost risk reducing yields.

The aim of the project is to assist growers in introducing long-season wheats into their farming systems to best utilise summer rainfall and early-sowing opportunities. Growers in south western WA are also interested in adding wheat back into their crop rotations and reducing their reliance on continual canola barley rotations to maximise profits.

The primary objective of this project is to demonstrate to growers the agronomic and enterprise fit and associated benefits of including a long season wheat into their rotation and to encourage the adoption through the farmer scale demonstrations and economic analysis

In 2020 one demonstration site was established in the Albany Port Zone and two were established in the South-East Kwinana Port Zone. In 2021 two demonstrations were established in both the Albany Port Zone and the South-East Kwinana Port Zone. All demonstrations were replicated allowing the appropriate statistical analysis on each site to be conducted. All trial sites had 3 long season wheat varieties and a control spring wheat variety.

In the Albany port zone Illabo was the highest yielding variety in the 2020 Muradup trial followed by Accroc then Scepter and Nighthawk. Illabo a long season winter wheat was able to match the high yielding spring variety despite the late seeding date of 26<sup>th</sup> of May.

In 2021 Accroc was the highest yielding variety across both demonstrations. Accroc yielded 8.40 tons/Ha at the Muradup site which was affected by frost impacting all the other varieties. The 2021 season was ideal for growing long season wheats with both demonstrations sown in late March and April. The long season wheats were the highest yielding varieties across both sites and Accroc demonstrated the yield potential of these varieties when the seasonal opportunities present. The long season wheats produced up to \$2,688/Ha (Accroc) well above the standard spring wheat variety which was frost effected and only able to generate \$678/Ha (Catapult). Overall the demonstration at Muradup/West Muradup shows there is a fit for these varieties in the rotation in the high rainfall zones of the Great Southern.

In 2020 at the Corrigin site Catapult was the highest yielding variety followed by Scepter then Denison with Longsword yielding significantly lower than the other three varieties. The trial was sown in the preferred window for long season wheat on the 15<sup>th</sup> of April. In 2020 at the Kurrenkutten site Denison yielded significantly higher than the other three varieties achieving a yield of 2.79 MT/Ha. Yitpi was the next highest yielding variety.

2021 was a much better growing season than 2020 with Kurrenkutten receiving 368 mm for the year and 299.5mm for the growing season (Apr – Oct). The yields reflected the better growing season at Kurrenkutten. Denison was the highest yielding variety at 3.32 ton/Ha followed by Vixon, Yitpi and finally Rockstar. Denison generated gross proceeds of \$1062/Ha compared to the standard spring wheat producing \$931/Ha (Vixon). Mt Walker lies east of Kurrenkutten receiving less rainfall which showed in the yields. Scepter was the highest yielding variety followed by Denison, Kinsei and finally Rockstar. This site demonstrates that long season wheats may not be suited to the low rainfall areas even in better seasons.

Similarly to the conclusions drawn from the Muradup site, three of the four demonstrations in the Corrigin region showed there is a fit for longer season wheats in the medium rainfall zones when the seasonal conditions present themselves. The highest yielding longer season wheat varieties suited to this region from this project were Denison and Catapult which are both longer season spring wheats. The longer season spring wheat appears to be the preferred longer season wheat for this area over the

true winter wheat. The economic results from the demonstration have shown that the longer season type of wheats have a place in the rotation for growers in areas with longer growing seasons and give producers the ability to increase total revenues and capture more of the production potential of longer growing seasons. This result was particularly evident in better seasons, like 2021, with an early break and softer finish.

Further work has been uncovered from the project primarily around better understanding the frost risk benefits, developing a detailed agronomic package and understanding the full yield potential of these types of wheat in higher rainfall growing seasons.

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## Background

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Traditionally, sowing wheat in Western Australia is not recommended before the 25th of April (Brenda Shackley et al., 2017). This is due to higher frost risk. Many growers in the southern region of Western Australia have mixed farming enterprises and aim to sow their cereal crops in mid-May to maximise yield potential whilst managing frost risk. However this later sowing can lead to a reduced yield potential. Farmers in southern WA are sometimes presented with early sowing opportunities through summer rainfall events or early breaks in the season.

Farmers are looking for a cropping option to utilize this early available moisture without excessive frost risk reducing yields. Long season wheats can be sown March – Mid April and utilise the available early moisture and warmer temperatures.

The aim of the project is to assist growers in introducing long-season wheats into their farming systems to best utilise summer rainfall and early-sowing opportunities. Growers in south western WA are also interested in adding wheat back into their crop rotations. Currently, many growers are relying on continual canola barley rotations to maximise profits. Growing more wheat will add diversity to their cropping rotations which will combat fungicide and herbicide resistance issues in all crops.

There is limited information, on which varieties to grow with a very early sowing opportunity in Southern WA. The key to successful early sown wheat is for growers to match their region's optimal flowering window with the correct varieties and sowing dates. There is a requirement to produce localised data to aide growers about which varieties to grow and when to sow them. Since 2000, there has been a general increase in summer rainfall and a corresponding decrease in winter rainfall (AEGIC data 2018). As a result, not only are traditional crop yields being affected, but there is an opportunity to take advantage of early available moisture and a longer growing season to achieve higher yields when these seasonal opportunities are presented.

Grazing winter crops can be the key to mixed farming profitability and is starting to gain traction through programs such as grain and graze, whereby oats, barley, wheat and canola have been sown early to capture the benefits of grazing. Therefore, an additional opportunity for sowing long season wheats is an enhanced ability to graze them with minimal yield penalty and greater management flexibility. Winter type wheats are easier to graze than spring wheats because they remain vegetative for much longer. This means they can be grazed for longer periods of time compared to spring type wheats, with less risk of yield loss. Having early sown established wheat crops will help address the autumn feed gap that growers face every year.

These varieties can provide value to the livestock component of an enterprise by providing high quality feed in June – July which replaces supplementary feeding. It also can allow the time for new pastures to establish, or to increase pasture dry matter for later in the season.

## Project objectives

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# OBJECTIVES

There is growing interest from growers in southern Western Australia around the opportunities that long season wheats can provide them in a mixed or 100% cropping farming enterprise. The primary objective of this project is to demonstrate to growers the agronomic and enterprise fit and associated benefits of including a long season wheat into their rotation and to encourage the adoption through the farmer scale demonstrations and economic analysis

The project will demonstrate time of sowing, best available varieties suited to the areas of the demonstration sites and season permitting, the opportunity for grazing without yield penalty. It is worth noting the 2020 season did not allow the opportunity to graze any of the demonstrations. The project will also provide practical guidelines or agronomic packages for production of long season wheat in the medium to high rainfall zones of South Western Australia. The key outcomes of this project are:

- Demonstrate the yield potential of different long season wheat varieties relative to spring wheat varieties with an early sowing window
- Develop economic analysis comparing long season and spring wheat varieties and time of sowing regarding yield to assist producers in making informed decisions
- Begin the development of an agronomic package on growing long season wheats, time of sowing, seeding rates and fertiliser application and timing will be examined within this project.
- Develop protocols around the importance of time of sowing for long season wheat varieties that are best suited to different areas within southern Western Australia
- Where seasonal conditions allow, demonstrate the ability of sowing long season wheats to manage the feed gap in Autumn and winter through crop grazing with having minimal yield penalty



## Methodology

In 2020 one demonstration site was established in the Albany Port Zone within the Southern Dirt Region and two were established in the South-East Kwinana Port Zone within the Corrigin Farm Improvement Group's region. In 2021 two demonstrations were established in both the Albany Port Zone and the South-East Kwinana Port Zone. All demonstrations were replicated allowing the appropriate statistical analysis on each site to be conducted.

All trial sites had 3 long season wheat varieties (or long spring wheats) and a control spring wheat variety. The chosen varieties, both long season and spring wheats were selected as the most agronomically appropriate varieties for the trial locations.

In-crop assessments were taken during the growing season which included NDVI readings, plant counts, tissue and soil tests, grain yield and grain quality sampling completed via a CBH analysis. All demonstration sites were managed as a commercial crop. All inputs were recorded plus operations to allow a gross margin and return calculation to be generated.

### Albany Port Zone

Year	Location	Plot Number									
		1	2	3	4	5	6	7	8	9	10
2020	Murradup	Nighthawk	Nighthawk 160 kg/Ha	Scepter	Accroc	Nighthawk	Nighthawk 160 kg/Ha	Illabo	Scepter	Accroc	Illabo

Figure 1 – 2020 Albany Port Zone trial design

Year	Location	Plot Number									
		1	2	3	4	5	6	7	8	9	10
2021	West Muradup	Scepter	Catapault	Denison	Illabo	Accroc	Illabo	Catapault	Scepter	Accroc	Denison
2021	Muradup	Illabo	Denison	Illabo	Catapault	Accrock	Accrock	Accrock	Denison	Zanzibar	Catapault

Figure 3 - 2021 Albany Port Zone trial design

#### Kwinana South East Port Zone

Year	Location	Plot Number											
		1	2	3	4	5	6	7	8	9	10	11	12
2020	Corrigin	Scepter	Longsword	Catapault	Denison	Scepter	Catapault	Longsword	Denison	Scepter	Catapault	Denison	Longsword
2020	Kurrenkutten	Yitpi	Longsword	Catapault	Denison	Yitpi	Catapault	Longsword	Denison	Yitpi	Catapault	Denison	Longsword

Figure 3 – 2020 Kwinana South East Port Zone trial design

Year	Location	Plot Number											
		1	2	3	4	5	6	7	8	9	10	11	12
2021	Kurrenkutten	Yitpi	Vixen	Rockstar	Denison	Yitpi	Rockstar	Vixen	Denison	Yitpi	Rockstar	Denison	Vixen
2021	Mt Walker	Kinsei	Scepter	Rockstar	Denison	Kinsei	Rockstar	Scepter	Denison	Kinsei	Rockstar	Denison	Scepter

Figure 4 – 2021 Kwinana South East Port Zone trial design

## Location

NOTE: Where field trials have been conducted please include location details: Latitude and Longitude, or nearest town, using the table below (please add additional rows as required):

	Latitude (decimal degrees)	Longitude (decimal degrees)
Trial Site #1	-33.843119	115.757783
Nearest Town	Muradup	
Trial Site #2	-32.33383	117.87181
Nearest Town	Corrigin	
Trial Site #3	-32.3131	118.0647
Nearest Town	Kurrenkutten	
Trial Site #4	-33.5344	116.5740
Nearest Town	Muradup	
Trial Site #5	-33.89865	116.80532
Nearest Town	Muradup (West Muradup site)	
Trial Site #6	-32.339197	118.079314
Nearest Town	Kurrenkutten	
Trial Site #7	-32.034167	118.765972

Nearest Town	Mount Walker
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If the research results are applicable to a specific GRDC region/s (e.g. North/South/West) or Agro - Ecological Zone/s please indicate which in the table below:

Research	Benefiting GRDC Region (can select up to three regions)	Benefiting GRDC Agro-Ecological Zone (see link: <a href="http://www.grdc.com.au/About-Us/GRDC-Agroecological-Zones">http://www.grdc.com.au/About-Us/GRDC-Agroecological-Zones</a> ) for guidance about AE-Zone locations	
Experiment Title	Choose an item. Choose an item. Choose an item.	<input type="checkbox"/> Qld Central <input type="checkbox"/> NSW NE/Qld SE <input type="checkbox"/> NSW Vic Slopes <input type="checkbox"/> Tas Grain <input type="checkbox"/> SA Midnorth-Lower Yorke Eyre <input type="checkbox"/> WA Northern <input type="checkbox"/> WA Eastern <input type="checkbox"/> WA Mallee	<input type="checkbox"/> NSW Central <input type="checkbox"/> NSW NW/Qld SW <input type="checkbox"/> Vic High Rainfall <input type="checkbox"/> SA Vic Mallee <input type="checkbox"/> SA Vic Bordertown-Wimmera <input type="checkbox"/> WA Central <input type="checkbox"/> WA Sandplain

## Results

### Grain Yield Results – Albany Port Zone 2020 & 2021

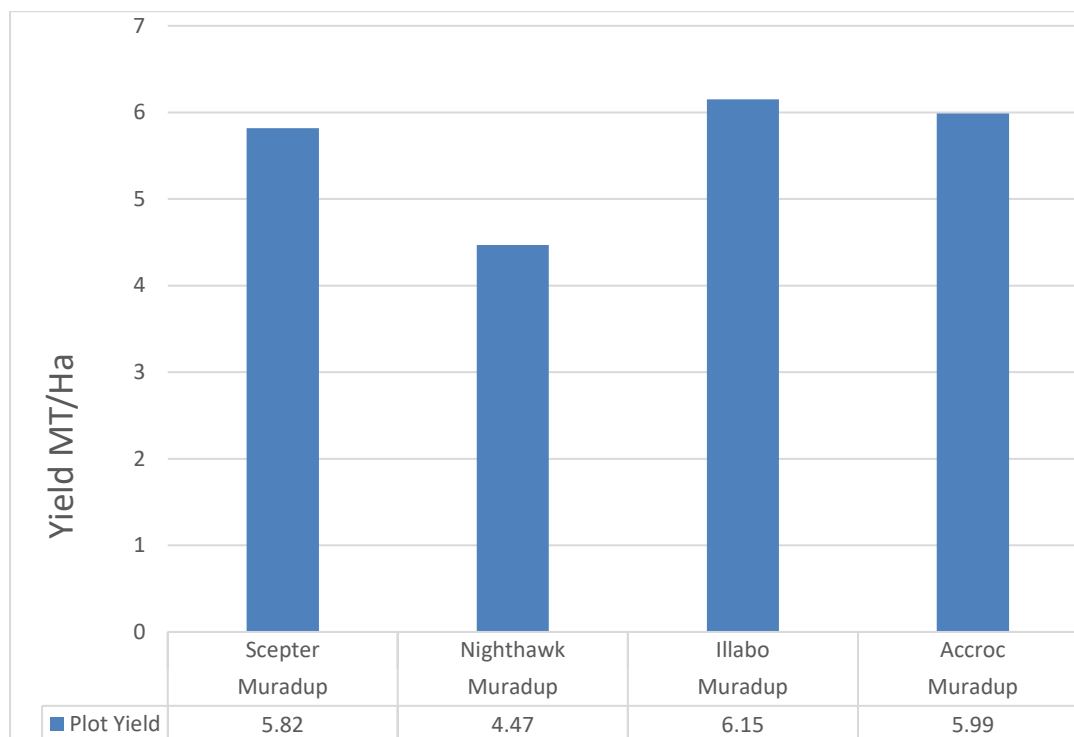


Chart 1: 2020 Wheat Yields Albany Port Zone

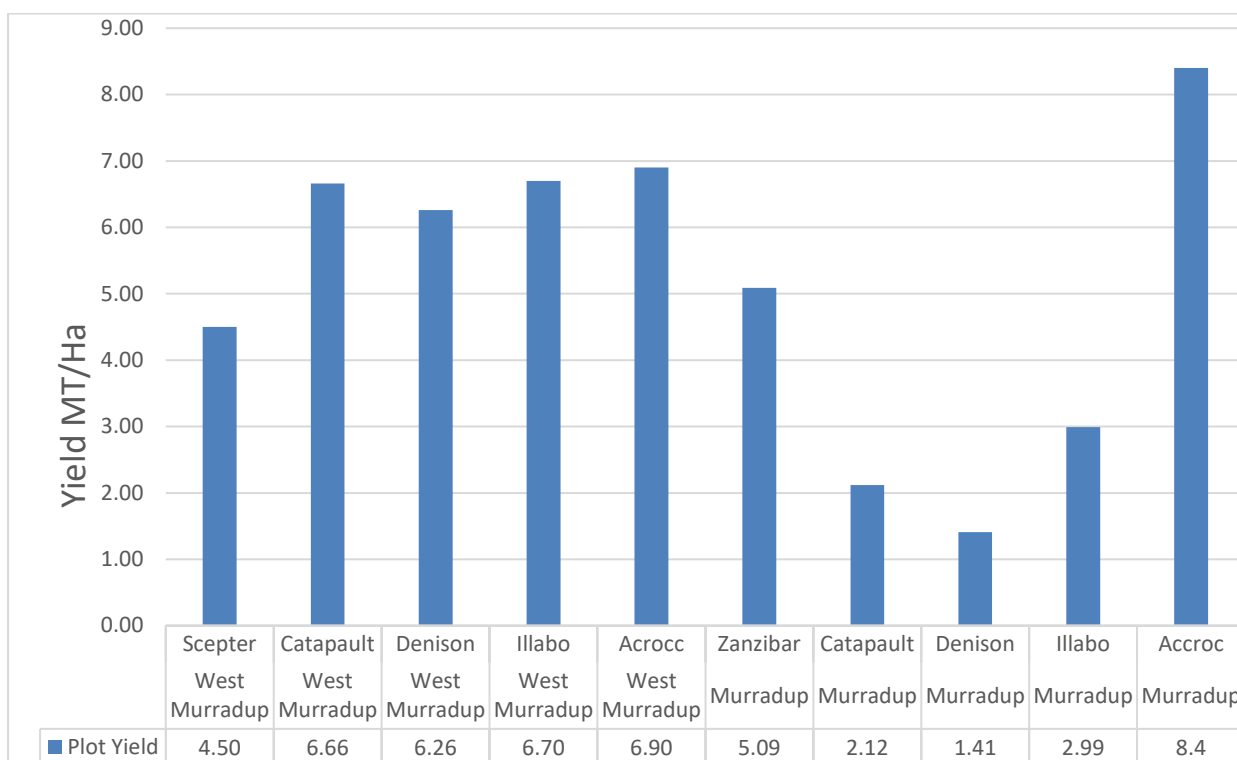


Chart 2: 2021 Wheat Yields Albany Port Zone

### Crop Grazing Results – Albany Port Zone 2021

The demonstration and surrounding paddock was grazed by 1,600 ewe hoggets when the wheat was between the Zaddock growth stage, GS22 – GS24. The total area of paddock was 80 Ha giving an average DSE rate of 20 DSE/Ha. The hoggets entered the paddock on the 14<sup>th</sup> June and exited on the 16<sup>th</sup> July. Grazing cages (1m x 1m) were erected within each of the demonstration plots to measure the impact of the grazing on the final yield. The caged control areas were hand harvested to measure yield. To calculate the results the average of the ungrazed area was compared to the average of the grazed areas. As can be seen in Chart 4 the grazed area yield 99.6% of the ungrazed area.

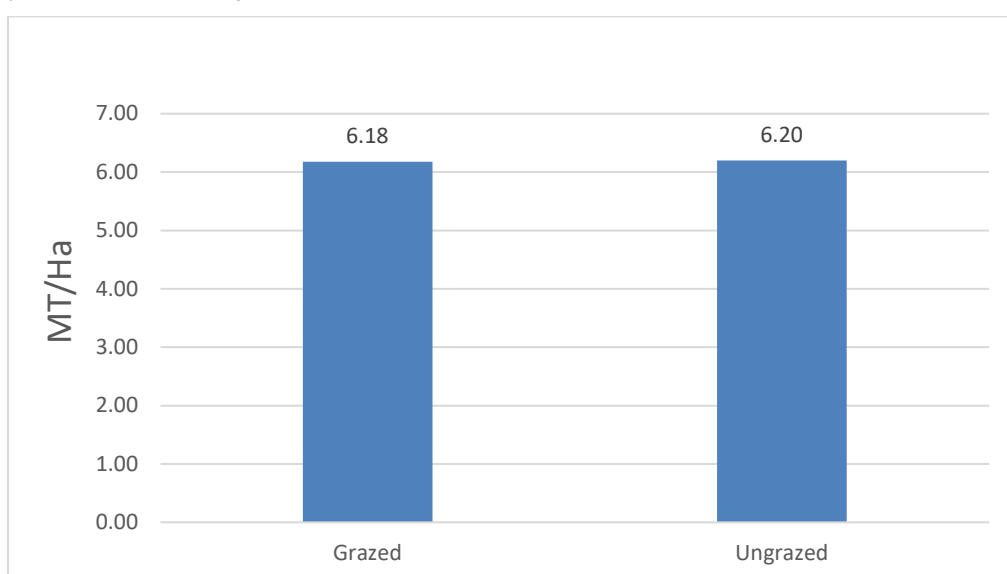


Chart 3: West Muradup 2021 Wheat Yields from Crop Grazing Trial

### Grain Yield Results – Kwinana Port Zone 2020 & 2021

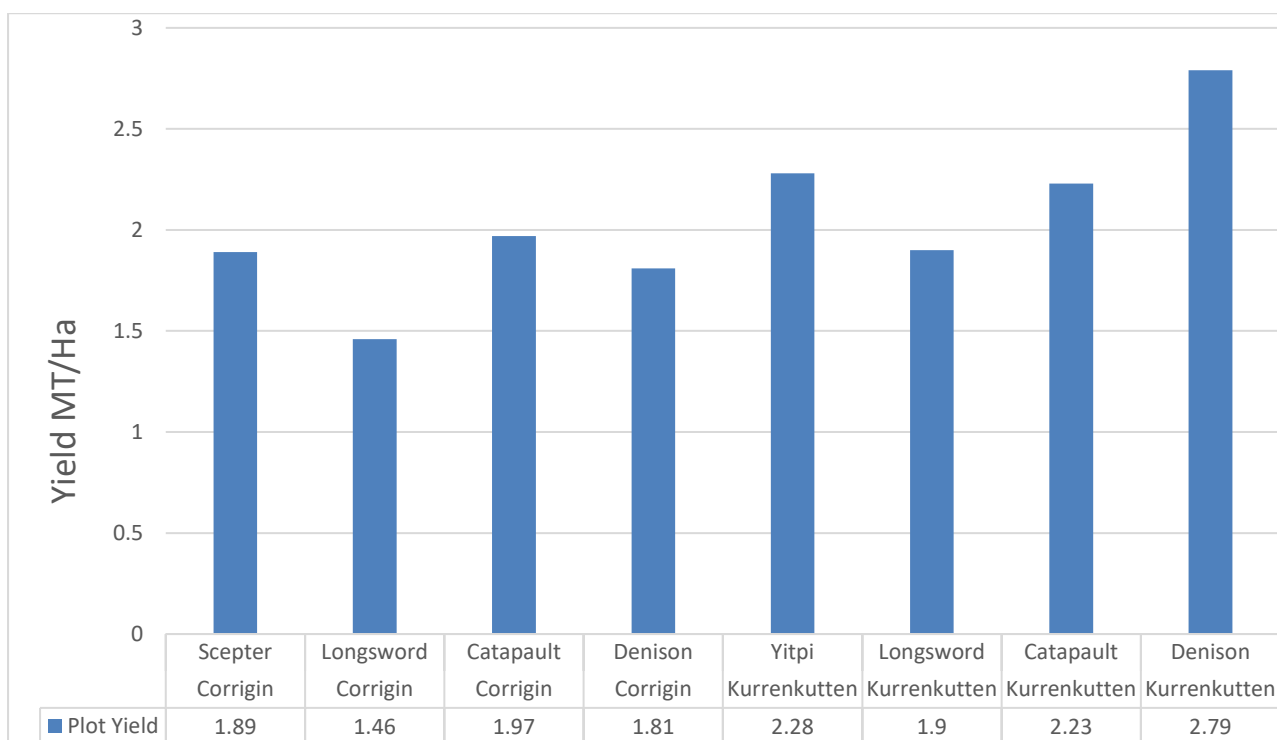


Chart 4: 2020 Wheat Yields Kwinana South East Port Zone

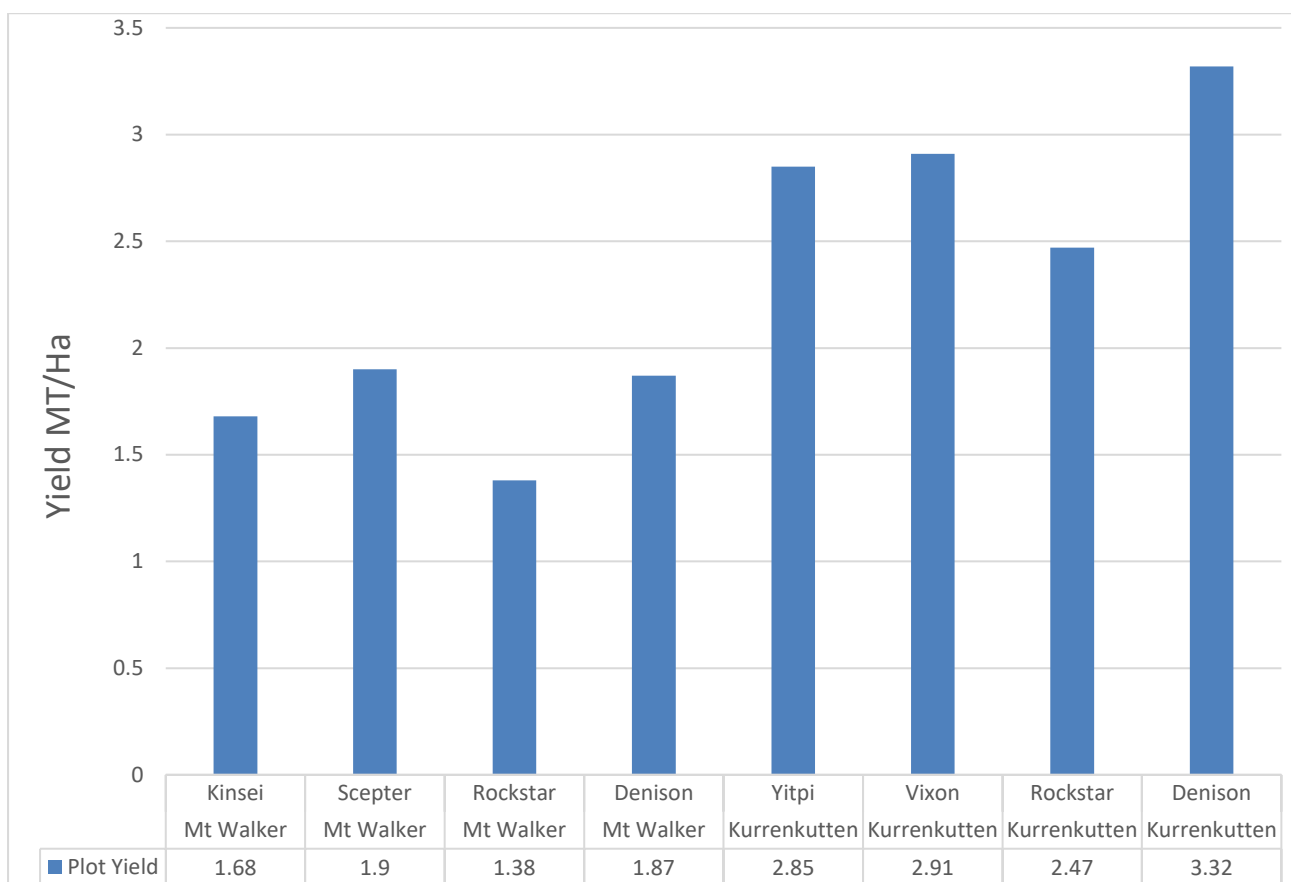


Chart 5: 2021 Kwinana Wheat Yields South East Port Zone

Results for other in-crop assessments such as NDVI readings, plant counts, tissue and soil tests, grain yield and grain quality sampling are available from Southern Dirt on request. The grain harvest results have been presented only as these are most impactful for growers.

### Economic Returns - Gross Proceeds

Economic returns have only been examined as a gross proceeds per hectare as each plot within each trial was treated equally therefore the input or production costs are the same within each trial. Grain qualities at the Albany sites were not measured. Grain quality for the Kwinana sites was measured. All the varieties averaged ASW1 except for Kinsei which was ANW2. An average harvest wheat price of \$320/ton FIS was used to generate the gross proceeds per varieties per hectare.

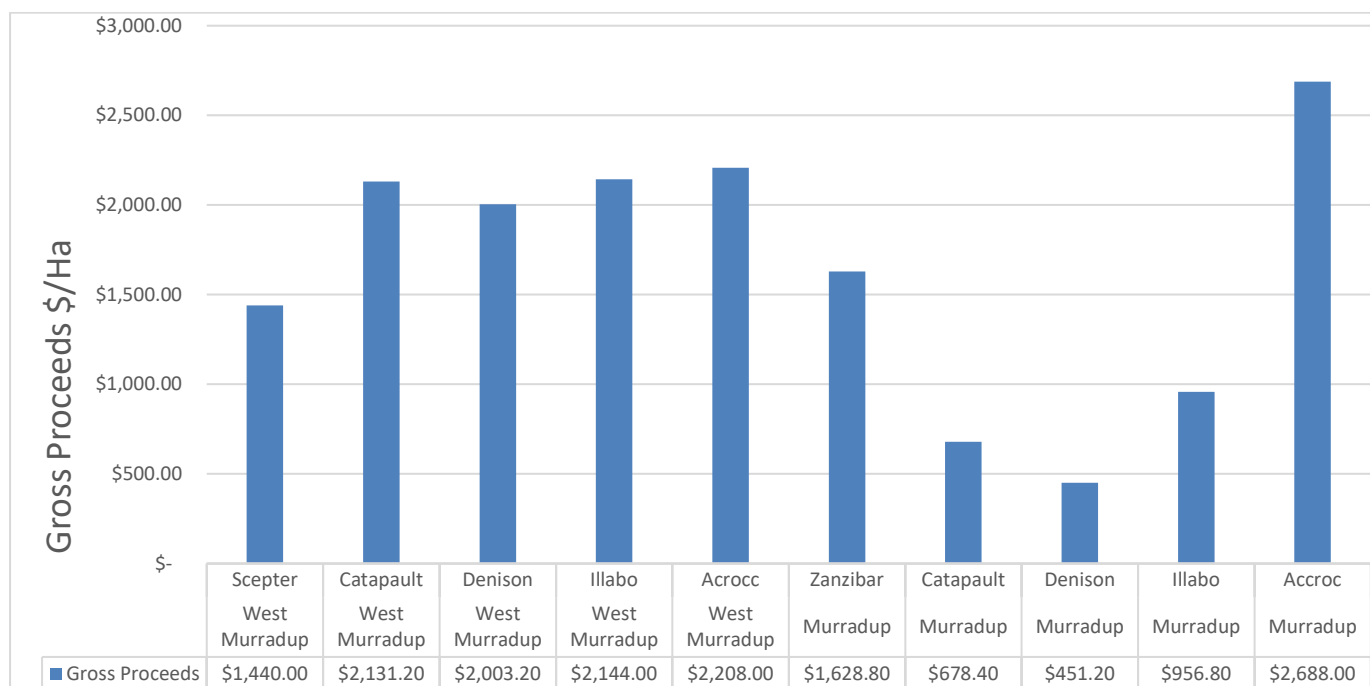


Chart 6: 2021 Gross Proceeds per hectare Albany Port Zone



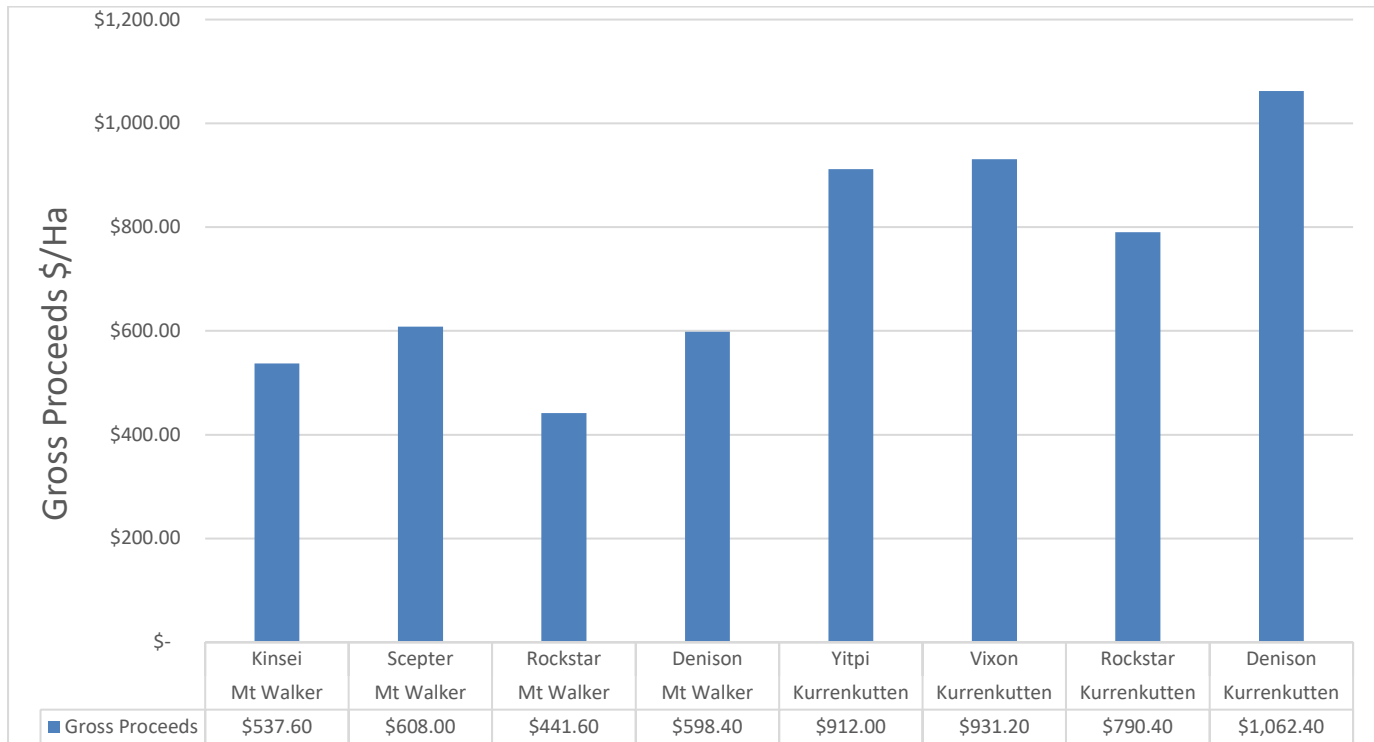


Chart 7: 2021 Kwinana Gross Proceeds per hectare South East Port Zone

## Discussion of Results

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The seven long season wheat demonstrations were conducted across two seasons over 2 different regions within WA. Muradup lies on the Western region of the high rainfall zone and the Great Southern and the Corrigin/Mt Walker trials lie in the middle of the medium rainfall regions in the wheatbelt of WA. Muradup's mean long term rainfall is 540mm and Corrigin's mean long term rainfall is 371.5mm.

Due to these environmental differences the data generated from each region will be analysed separately as the varieties that are suitable to Corrigin will generally not be the best variety for Muradup.

### Albany Port Zone

Illabo was the highest yielding variety in the 2020 Muradup trial followed by Accroc then Scepter and Nighthawk. While the yield differences between the first three varieties was not significant it is reassuring that the long season winter wheat were able to match the high yielding spring variety despite the late seeding date of 26<sup>th</sup> of May. Nighthawk (a very slow spring wheatt) yielded significantly lower than the other three varieties and does not appear to be an optimal variety for the Muradup region.

In 2021, Accroc was the highest yielding variety across both demonstrations. Accroc yielded 8.40 tons/Ha at the Muradup site which was affected by frost impacting all the other varieties. The 2021 season was ideal for growing long season wheats with both demonstrations sown in April and late March. The long season wheats were the highest yielding varieties across both sites and Accroc demonstrated the yield potential of these varieties when the seasonal opportunities present.

Overall, the demonstration at Muradup/West Muradup shows there is a fit for these varieties in the rotation in the high rainfall zones of the Great Southern. The long season wheats were the highest yielding varieties in all three trials with both an early and a late break to the season. The long season wheats appear to have the ability to yield similarly to the best spring wheats in a late break and can considerably outyield these types of wheat on an early break.

### Corrigin, Kurrenkutten and Mt Walker

The four sites in the Corrigin region had the same 3 long season varieties with the different spring wheat controls the only difference. Yitpi and Scepter are both popular wheat varieties in the area.

In 2020 at the Corrigin site Catapult was the highest yielding variety followed by Scepter then Denison with Longsword yielding significantly lower than the other three varieties. The trial was sown in the preferred window for long season wheat on the 15<sup>th</sup> of April. The average yield across the 4 varieties of 1.78 MT/Ha was also impacted by the heavy ryegrass and barley grass competition across the trial site. Despite the weed burden the yields are encouraging for the potential of these varieties and the fit for early sowing wheat when there are early sowing seasonal opportunities.

In 2020 at the Kurrenkutten site Denison yielded significantly higher than the other three varieties achieving a yield of 2.79 MT/Ha. Yitpi was the next highest yielding variety followed by Catapult and then Longsword, the lowest yielding variety at both sites. The time of sowing was inside the preferred sowing window for the long season varieties. Similarly, to the Corrigin site the varieties were sown at different seeding rates and at this site on different dates.

2021 was a much better season for growing wheat than 2020 with Kurrenkutten receiving 368 mm for the year and 299.5 mm for the growing season (Apr – Oct). The yields reflected the better growing season at Kurrenkutten. Denison was the highest yielding variety at 3.32 ton/Ha followed by Vixon, Yitpi and finally Rockstar. The varieties were sown into their preferred sowing window and the season allowed them to yield to their potential. Mt Walker lies east of Kurrenkutten receiving less rainfall which showed in the yields. Scepter was the highest yielding variety followed by Denison, Kinsei and finally Rockstar. This site demonstrates that long season wheats may not be suited to the low rainfall areas even in better seasons.

Similarly to the conclusions drawn from the Muradup site, three of the four demonstrations in the Corrigin region showed there is a fit for longer season wheats in the medium rainfall zones when the seasonal conditions present themselves. The best longer season wheat varieties suited to this region from this project are Denison and Catapult which are both longer season spring wheats. The longer season spring wheat appears to be the preferred type of longer season wheat for this area over true winter wheats. Early sown long season varieties can out yield the current best performing spring wheats and perform very well on limited growing season rainfall, particularly in cooler regions. Further work is still required on the overall agronomic package to extract the full yield potential from these types of wheat.

### **Economic Analysis**

The results from the project help to demonstrate the fit and ability of long season wheats to generate extra income for producers which is particular evident in better seasons. Long season wheats in the 2021 demonstration sites in the Albany Port zone produced up to \$2,688/Ha (Accroc) well above the standard spring wheat variety which was frost effected and only able to generate \$678/Ha (Catapult).

Determining the full economic benefit of grazing long season wheat crops to the overall farm operation is beyond the scope of this project, however it is worth noting the economic results from the grazing demonstration conducted at the West Muradup site. The yield cost of grazing the wheat crop in June/July was 20 kg/Ha or \$6.40/Ha. The sheep enterprise was able to graze the crop for 32 days at 20 DSE. The economic benefit of this grazing to the overall operations can be determined through either increased sheep numbers as the overall carrying capacity has improved or increased cropping area with the same sheep numbers. It is worth noting that the demonstration was carried out in a good season which allowed the crop to be early sown and established early enough in the season to start grazing on the 14<sup>th</sup> of June. Grazing the crops early in the growing season is important to minimise the impact on final yield.

Similar economic results were evident in the demonstrations in the south east Kwinana zone although not as pronounced. At the 2021 Kurrenkutten site Denison generated gross proceeds of \$1062/Ha compared to the standard spring wheat producing \$931/Ha (Vixon).

Overall the results from the demonstration have shown that the longer season type of wheats have a place in the rotation for growers in areas with longer growing seasons and give producers the ability to increase total revenues and capture more of the production potential of longer growing seasons. This result was particularly evident in better seasons, like 2021, with an early break and softer finish.

## Conclusion

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The primary objective of this project was to demonstrate to growers the agronomic and enterprise fit and associated benefits of including a long season wheat into their rotation and to encourage the adoption through the farmer scale demonstrations and economic analysis.

The outcomes from the demonstrations have met the primary objectives of the project demonstrating the fit for growing long season wheat in the current rotation in the medium to high rainfall zones. Long season wheat varieties have the ability to outperform the current spring wheat varieties in both early and late break scenarios (particularly in cooler climates). This gives growers the confidence to plant these types of wheat across a range of dates and dry sown if required, reducing the need to hold multiple varieties.

The fact that Accroc was not affected by frost at the Muradup site in 2021 should also give producers a level of confidence that long season wheats can avoid the impact of frost in some scenarios. Further work is required to better understand why Accroc was not impacted by frost as Illabo (the other true winter wheat in the trial) was.

While the project primarily focused on comparing the yields of long season and spring wheat varieties, the demonstrations did highlight areas that require further work (see section below).

There was some minor varietal inconsistency however in the high rainfall zone Accroc was the highest yielding variety closely followed by Illabo. In the medium rainfall zone Denison was the highest yielding variety with Catapult appearing to be the next best option however this variety wasn't in the 2021 demonstrations.

The economic results from the demonstration have shown that the longer season type of wheats have a place in the rotation for growers in areas with longer growing seasons and give producers the ability to increase total revenues and capture more of the production potential of longer growing seasons. This result was particularly evident in better seasons, like 2021, with an early break and softer finish.

Growers in the medium to high rainfall zones can take a great deal of confidence around bringing in long season wheats into their rotations. Long season wheats can be utilized in conjunction with spring wheats to add more flexibility to growers rotations and increase the seeding windows allowing more hectares to be covered by each machine. Additionally when seasonal conditions are suitable, early established long season wheats are well suited to grazing with minimal impact of final yield.

## Implications

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There are two main implications from the project:

- 1) Long season wheats have a fit in the cropping rotation of growers in the medium to high rainfall zones in the southern regions of Western Australia. Prior to this project many growers were starting to use these types of wheat and the uptake of these wheats can be expected to increase in the coming years.
  - a. The benefits to adding long season wheat to a rotation include:
    - i. Longer sowing window
    - ii. Reduced frost risk
    - iii. Higher yield potential in particular on early breaks
    - iv. Grazing opportunities on early established crops
- 2) The second implication is around the importance of better understanding the full yield potential of long season wheats in the high rainfall zone when the season breaks early and the crop can germinate in April. Accroc at Muradup in 2021 showed the potential of a long season wheat grown in a long season, yielding 8.40 ton/Ha. Is this type of yield achievable across a large area and is there further potential under a more developed agronomic package that matches this yield potential?

## Recommendations

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Like all projects while the demonstration certainly met the key objectives it did also unveil some further questions which should be further explored by industry over the coming seasons.

- 1) Reduced frost risk – How do long season wheats reduce frost risk and can this be quantified. Accroc yielded 8.40 ton/Ha at the demonstration at Muradup in 2021, Zanzibar 5.09 ton/Ha and the remaining three varieties all under 3.00 ton/Ha. The key driver for the poor yields was frost damage. There is a need to better understand the ability of long season wheat to withstand frost events which will enable growers to better plan their farm rotations.

Additionally future work is required to compare the ability of long season wheat to withstand frost in comparison to other cereal varieties such as oats and barley.

- 2) The project has helped give growers the confidence to bring long season wheats into the rotation, however there still remains further work to develop a specific agronomic package around long season wheats especially in the case of an early break to enable producers to really optimize the yield potential.
- 3) Demonstration plot sites are generally selected to be in the premium soil type within the paddock and yields are therefore higher than what can be achieved across the paddock or as general farm averages. Better understanding the yields of long season wheats across large areas will better determine the financial impact to growers who adopt the addition into their rotation and at what level it should be integrated.
- 4) Defining marketing and supply chain options should also be examined and extended to producers to ensure growers who produce a long season wheat understand their options at harvest.

## **Appendix A. Appendix Title**

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## Glossary and Acronyms

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Below is a sample Abbreviations and Acronyms list. Be sure to include on this page all abbreviations and acronyms that appear in the report

DAFWA	Department of Agriculture and Food, Western Australia
DAP	di ammonium phosphate
DArT	Diversity Arrays Technology
DAT	days after treatment
Db	bulk density
DAFWA	Department of Agriculture and Food, Western Australia



## References

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This section provides the information a reader would need to locate the articles, journals, and/or other publications referred to in the report.

## Social Media Posting

Refer to 'GRDC Long Season Wheat Communication and Extension Plan'.