



AgriFutures™
Pasture Seeds



Lucerne Variety Trial – Assess optimum plant stress levels for seed production



SEED PRODUCTION REPORT - YEAR 2

Lucerne Australia is pleased to release this report summary for the **Lucerne Variety Trial - Assess optimum plant stress levels for seed production.**

Funding was received from AgriFutures Australia through the Pasture Seeds Program funded by a \$15 per tonne levy on the sale of certified lucerne seed from Australian growers which is matched by Commonwealth Government funding.

The trial work is being conducted by Kalyx Australia on Simon Allen's Warrawee Park property south of Keith, SA.

Seed varieties have been supplied by:

Alforex Seeds, Barenbrug (formerly Heritage Seeds), Naracoorte Seeds, Pasture Genetics, PGG Wrightson Seeds, Seed Force, S&W Seed Co, Upper Murray Seeds.

This trial commenced with seeding on 22nd June 2018.

The seed harvest was carried out on 17th March 2020.



Disclaimer

While all due care has been taken in compiling the information within this summary report, Lucerne Australia Inc or the researchers involved take no responsibility for any persons relying on the information and disclaims all liability for any errors or omission in the publication.

SUMMARY

The trial was conducted at Keith, South Australia on a sandy loam soil to evaluate and compare the seed yield of 29 current and pre-commercial Lucerne (*Medicago sativa*) varieties under modified irrigation management strategies.

The trial was replicated over three flood irrigation bays to simulate a standard, moderate and high stress watering strategy. The standard watering strategy represented farmer practice. Details of the irrigation schedules used this season can be found in the Appendix.

Through the implementation of commercial soil probes and visual crop assessments, the crop condition and soil moisture were monitored throughout the duration of this trial, to assist and guide irrigation management regimes.

The varieties evaluated in this trial include SFR27-032, SFR27-033, SF 914QL, SFR27-030, L71, L92, GTL60, Magna 901, Magna 868, Silverland (D5), Silverosa GT (D7), Silverado (D9), Silversky (D11), Siriver MK II, Titan 9, AR245, AR323, SW18NPK90, SW18NPK91, SW18NPK92, SARDI 10 Series II, Heritage 10, Heritage ST, SARDI 7 Series II, SC01, SC02, SC03, SC04 and SC05. Siriver and Aurora were included in this trial as benchmark varieties.

Crop seed yield was determined at commercial harvest, both as a harvest sample and cleaned seed weight (t/ha)

Data for this year's yields were collected from a second year Lucerne stand with yield averages ranging from 0.448 - 0.817 t/ha (Table 1).

Table 1: Lucerne clean seed yield (t/ha)

Rating Date Rating Type Rating Unit Description Crop Stage Majority Crop Stage Minimum/Maximum Plant-Eval Interval	17-March-2020 YIELD t/ha		
	Standard Water	Moderate Stress Water	High Stress Water
	99		
	99 99 655 DP-1		
Trt Treatment No. Name			
1SFR27-032	0.582b-e	0.651b-h	0.736a-e
2SFR27-033	0.561b-g	0.691bc	0.736a-e
3SF 914QL	0.559b-h	0.657b-g	0.745a-d
4SFR27-030	0.497e-j	0.583h-m	0.616ghi
5L71	0.459hij	0.549lm	0.647e-i
6L92	0.571b-f	0.615d-l	0.688d-h
7GTL60	0.538c-j	0.692bc	0.728a-e
8Magna 901	0.475f-j	0.560j-m	0.624f-i
9Magna 868	0.448j	0.453n	0.593i
10Silverland (D 5)	0.620a-d	0.683bcd	0.746a-d
11Silverosa GT (D 7)	0.521d-j	0.615d-l	0.677d-i
12Silverado (D9)	0.552b-i	0.631c-j	0.747a-d
13Silversky (D11)	0.549b-i	0.632c-j	0.715b-e
14Siriver MK II	0.526d-j	0.554klm	0.599hi
15Titan 9	0.558b-h	0.601e-m	0.677d-i
16AR245	0.585b-e	0.580h-m	0.698c-g
17AR323	0.471g-j	0.584h-m	0.648e-i
18SW18NPK90	0.597a-e	0.684bcd	0.809a
19SW18NPK91	0.630abc	0.766a	0.817a
20SW18NPK92	0.648ab	0.636c-i	0.778abc
21SARDI 10 Series II	0.562b-g	0.666b-f	0.698c-g
22Heritage 10	0.693a	0.719ab	0.813a
23Heritage ST	0.581b-e	0.568i-m	0.666d-i
24SARDI 7 Series II	0.631abc	0.626c-k	0.804ab
25SC01	0.618a-d	0.671b-e	0.662d-i
26SC02	0.564b-g	0.593g-m	0.665d-i
27SC03	0.580b-e	0.597f-m	0.713c-f
28SC04	0.508e-j	0.534m	0.679d-i
29SC05	0.516e-j	0.636c-i	0.786abc
30Siriver	0.456ij	0.570i-m	0.620ghi
31Aurora	0.562b-g	0.584h-m	0.652e-i
LSD P=.05	0.1002	0.0721	0.0900
Standard Deviation	0.0713	0.0513	0.0640
CV	12.84	8.29	9.12
Levene's F	1.694	0.816	0.979
Levene's Prob(F)	0.029*	0.731	0.508
Skewness	0.1607	-0.1734	0.0714
Kurtosis	-0.1045	0.7166	-0.5979
Replicate F	1.110	4.345	6.222
Replicate Prob(F)	0.3491	0.0066	0.0007
Treatment F	2.775	5.977	4.124
Treatment Prob(F)	0.0001	0.0001	0.0001

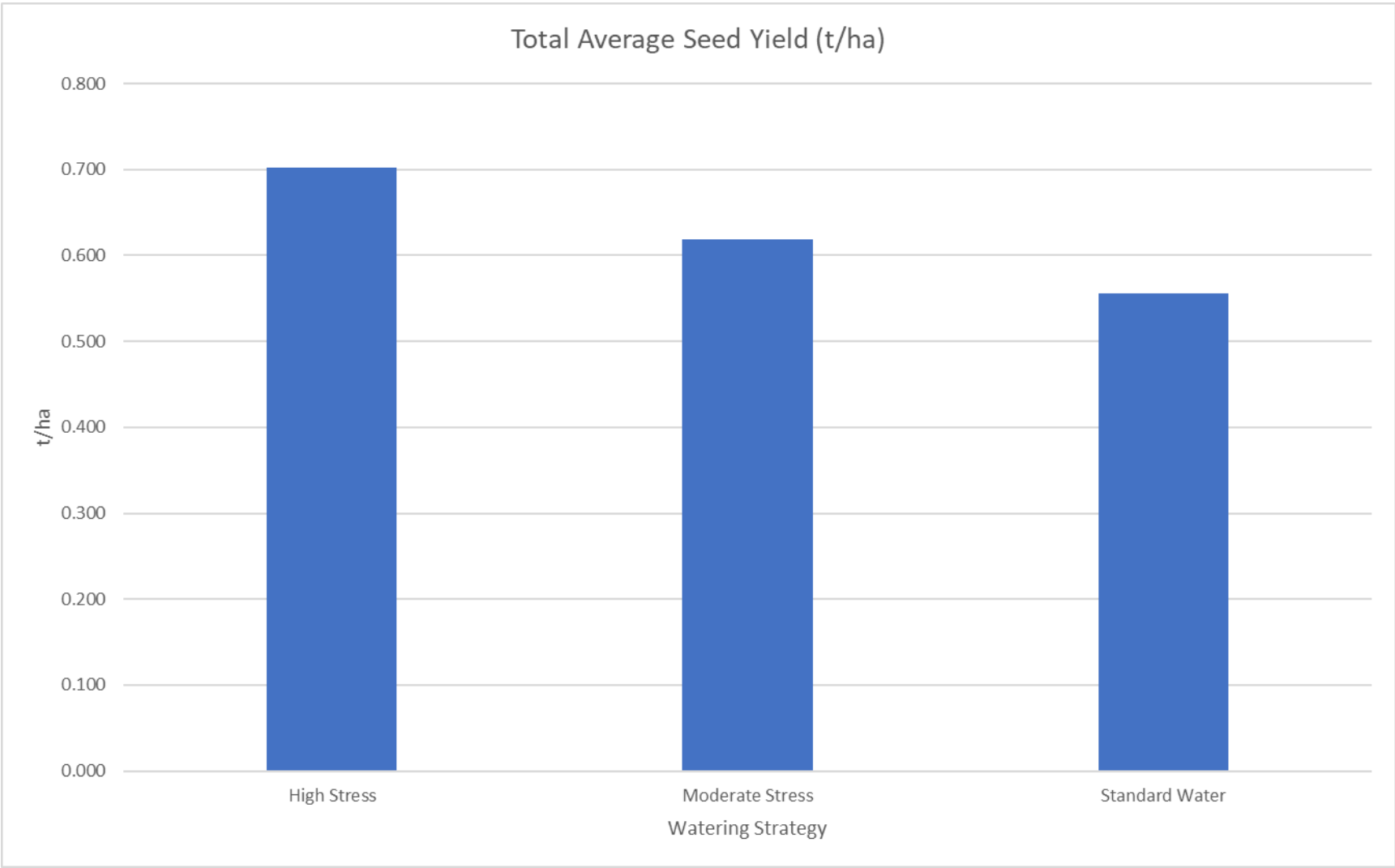
Means followed by same letter do not significantly differ (P=.05, LSD).

Table 2: Lucerne clean seed yield percentage relative to the standard watering

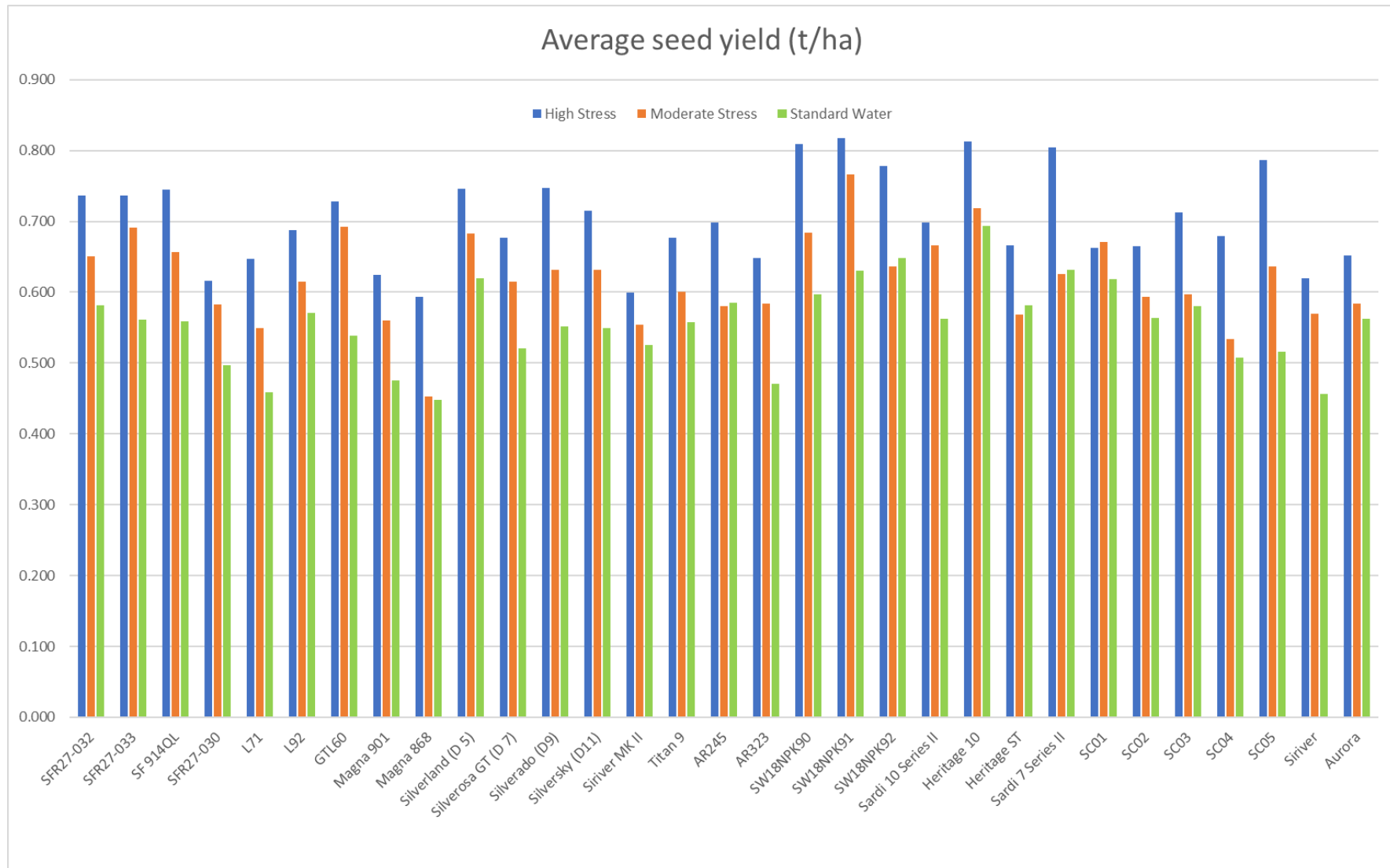
Assessment Date	17-March-2020		
Assessment Type	YIELD		
Assessment Unit	% Relative to Standard Water		
Description	Standard Water	Moderate Stress Water	High Stress Water
Crop Stage Majority	99		
Crop Stage Minimum/Maximum	99 99		
Plant-Eval Interval	655 DP-1		
Trt No.	Treatment Name		
1	SFR27-032	100	112
2	SFR27-033	100	123
3	SF 914QL	100	118
4	SFR27-030	100	117
5	L71	100	120
6	L92	100	108
7	GTL60	100	129
8	Magna 901	100	118
9	Magna 868	100	101
10	Silverland (D 5)	100	110
11	Silverosa GT (D 7)	100	118
12	Silverado (D9)	100	114
13	Silversky (D11)	100	115
14	Siriver MK II	100	105
15	Titan 9	100	108
16	AR245	100	99
17	AR323	100	124
18	SW18NPK90	100	115
19	SW18NPK91	100	122
20	SW18NPK92	100	98
21	SARDI 10 Series II	100	119
22	Heritage 10	100	104
23	Heritage ST	100	98
24	SARDI 7 Series II	100	99
25	SC01	100	109
26	SC02	100	105
27	SC03	100	103
28	SC04	100	105
29	SC05	100	123
30	Siriver	100	125
31	Aurora	100	104

*This table displays the yield percentage of each Lucerne variety relative the standard watering strategy but does not compare varieties. i.e. Siriver yielded 25% more in the moderate water stress bay when compared to the standard watering strategy. The table indicates how the individual varieties responded to water stress; however, it is important to note that the top performing varieties in the trial performed well regardless of watering strategy.

Graph 1 – The total average seed yield (t/ha) for each strategy



Graph 2 -Average seed yield (t/ha) per variety for each watering strategy



DISCUSSION

Delaying irrigation timings in a controlled manner increased clean seed yield in this second-year lucerne stand (Graph 1). Under the conditions of the trial, the moderate stress strategy increased yields in comparison to the standard watering strategy by 11.5%. The high stress strategy increased yields by 26.7% and 13.6% compared to the standard and moderate stress watering strategies, respectively.

Within individual varieties, the responses to the moderate and high stress strategies on yield were generally positive relative to the standard strategy (Table 2 and Graph 2).

Standard watering

Under the standard watering strategy, clean seed yield ranged between 0.693 and 0.448 t/ha with a median yield of 0.561 t/ha. The highest yielding varieties under this treatment were Heritage 10, SW18NPK92, SARDI 7 Series II, SW18NPK91, Silverland (D5), SC01 and SW18NPK90 (Table 1).

Heritage 10 provided 23.3% significantly higher yield compared to the benchmark variety Aurora at 0.562 t/ha. Aurora recorded significantly higher yields than L71, Siriver and Magna 868 by up to 25.4%. All other varieties recorded equal yields to Aurora.

SFR27-030, L71, GTL60, Magna 901, Magna 868, Silverosa GT (D 7), Silverado (D9), Silversky (D11), Siriver MK II, AR323, SCO4 and SC05 yielded statistically similar clean seed weights to Siriver at 0.456 t/ha.

Moderate stress watering

Under the moderate stress watering strategy, clean seed yield ranged between 0.766 and 0.453 t/ha (Table 1) with a median yield of 0.615 t/ha.

The highest yielding varieties under this treatment were SW18NPK91 and Heritage 10 with clean seed weights of 0.766 t/ha and 0.719 t/ha. SW18NPK91 and Heritage 10 provided up to 34.4% significantly greater yield in comparison to benchmark varieties Siriver and Aurora which had statistically similar yields of 0.570 and 0.584 t/ha, respectively.

SFR27-030, L71, L92, Magna 901, Silverosa GT (D 7), Silverado (D9), Silversky (D11), Siriver MK II, Titan 9, AR245, AR323, SW18NPK92, Heritage ST, SARDI 7 Series II, SC02, SC03, SC04 and SC05 had significantly similar yields when compared to both Siriver and Aurora.

SFR27-032 also produced similar yield to Aurora but provided 11.5% significantly higher yield than Siriver.

High stress watering

Under the high stress watering strategy, clean seed yield ranged between 0.817 and 0.593 t/ha (Table 1) with a median yield of 0.698 t/ha.

The highest performing varieties under this treatment were SW18NPK91, Heritage 10, SW18NPK90, SARDI 7 Series II, SC05, SW18NPK92, Silverado (D9), Silverland (D5), SF 914QL, SFR27-033, SFR27-032 and GTL60.

These varieties had significantly similar yields ranging from 0.817 t/ha to 0.728 t/ha and produced yield increases of up to 31.7% when compared to Siriver (0.620 t/ha) and up to a 25.3% increase when compared to Aurora (0.652 t/ha).

SFR27-030, L71, L92, Magna 901, Magna 868, Silverosa GT (D7), Siriver MK II, Titan 9, AR245, AR323, SARDI 10 Series II, Heritage ST, SC01, SC02 and SC04 yielded equally to both the benchmark varieties Siriver and Aurora.

SFR27-032, SFR27-033, GTL60, Silversky (D11) and SC03 also yielded equally to Aurora, however these varieties yielded significantly more than Siriver by 15 – 18%.

CONCLUSIONS

The data reported from this trial to date suggests a strong trend for seed yield to increase under controlled water deprivation. It is critical to note that ‘stress’ under the conditions of this trial is not associated with the need to have the plant dry back severely.

By delaying irrigation timing in a strategic manner there is strong evidence that seed yield can be increased across any variety. The degree of irrigation delay and the specific timing is likely to vary between soil types and irrigation method, but this data supports anecdotal evidence. Only subsequent seasons will highlight if any differences exist in performance and response to irrigation deprivation between varieties.



APPENDIX

INTERPRETATION OF STATISTICAL INFORMATION

1. The results of replicated trials are presented as the average (mean) for each of the replicates within a treatment/variety.
2. Coefficient of variation (**CV%**) gives an indication of the precision of the experiment; experiments with a high CV are less reliable.
3. The 5% least significant difference (**LSD P=0.05**), seen at the bottom of data tables gives an indication of the treatment difference that could occur by chance. The size of the LSD can be used to compare treatment results and values must differ by more than this value for the difference to be statistically significant. NS (not significant) indicates that there is no difference between the treatments.

i.e.

In a hypothetical example of wheat yield, statistically significant differences were found between varieties for grain yield (Table 1). The LSD for grain yield of 0.40 means there must be more than 0.40 t/ha difference between yields before that variety's performance is significantly different to another. In this example Trojan is significantly different to all other varieties as it is the only variety followed by a superscript (a). Scout, Mace and Cosmick are not significantly different from each other and are all followed by a superscript (b) as they all yielded within 0.4 t/ha of each other.

Table 1. Wheat variety grain yield (example only)

Variety	Yield (t/ha)
Arrow	3.5c
Cosmick	3.98b
Mace	3.75bc
Scout	4.05b
Trojan	4.77a
LSD (P = 0.05)	0.40

		Lucerne Australia Variety Trial Season 2019/20			
		Management Calendar of Events			
Date	Activity			Application Rate	
11/04/2019	Snail bait				
5/06/2019	Pasture King fertilizer	N-0 P-15.7 K-0 S-4.6 Ca14		80 kg/ha	
20/06/2019	Grazed				
26/06/2019	Winter clean				
14/08/2019	Snail bait on border and banks				
2/12/2019	Grazed				
4/12/2019	Single super application			100 kg/ha	
4/12/2019	Snail bait				
4/12/2019	Pre emergent spray				
4/12/2019	1st Irrigation for seed - all bays			1.5 ML/ha	
10/12/2019	Trace element - foliar application				
22/12/2019	2nd Irrigation for seed - all bays			1.5 ML/ha	
24/12/2019	Insecticide				
8/01/2020	Insecticide				
12/01/2020	3rd Irrigation for seed- Standard strategy bay			1.5 ML/ha	
14/01/2020	3rd Irrigation for seed- Moderate Stress strategy bay			1.5 ML/ha	
21/01/2020	3rd Irrigation for seed - High Stress strategy bay			1.5 ML/ha	
3/02/2020	Insecticide				
18/02/2020	4th Irrigation for seed- Standard strategy bay			1.5 ML/ha	
8/03/2020	Defoliation				
17/03/2020	Harvest				
26/03/2020	Irrigated for feed -	all bays		1.5 ML/ha	
1/05/2020	Grazed				
12/06/2020	Grazed				
17/06/2020	Pasture King fertilizer	N-0 P-15.7 K-0 S-4.6 Ca14		70 kg/ha	
21/06/2020	Winter Clean				

Soil moisture levels at the trial site can be accessed through the following link:

[https://www.outpostcentral.com/remote/\(S\(tjaii20hgw3mwdr5yg4dy0qs\)\)/WildeyeEDefault.aspx?uguid=d4b7a7bb-e8f6-e811-80c8-bc764e18087e](https://www.outpostcentral.com/remote/(S(tjaii20hgw3mwdr5yg4dy0qs))/WildeyeEDefault.aspx?uguid=d4b7a7bb-e8f6-e811-80c8-bc764e18087e)