CottonInfo **Information** *when you need it*

20th September 2020

Hi All,
I know we are now all thinking about the coming season and I had planned to get this summary out in July, however there were a few delays with data. Please find below a summary of the last cotton season. Every season is different and there is always something to learn from past season. I have included the season snapshots for the CSD Gwydir Ambassador sites. This provides a good range of results experienced across the Gwydir. I have also included the key results from the Industry Disease Surveys and the Insecticide Resistance Monitoring Program, with links to presentations prepared by our Cotton Pathologists and Entomologists for the CSD Cotton Management Tour.

Physiological view of the 2019/20 Cotton Season at MOREE

2019/20 was another challenging cotton season, with a hot dry start, no allocation from Copeton Dam and no opportunity for any dryland planting. The Gwydir had only 2600 ha irrigated cotton, all irrigated with bore water. Let's take a look from the plants point of view!
The majority of cotton in the valley was planted around 1st November 2019. Nights were cool to start (Figure 1) and this slowed emergence in some fields. The crop experienced 9 cold shock days (<12°C) during November to early December (Figure 2). If we look at the day degrees (DD's) for a crop planted on 1 November in Moree (Figure 3) we can see that the DD were similar to the last few years early in the season, with a cool start.

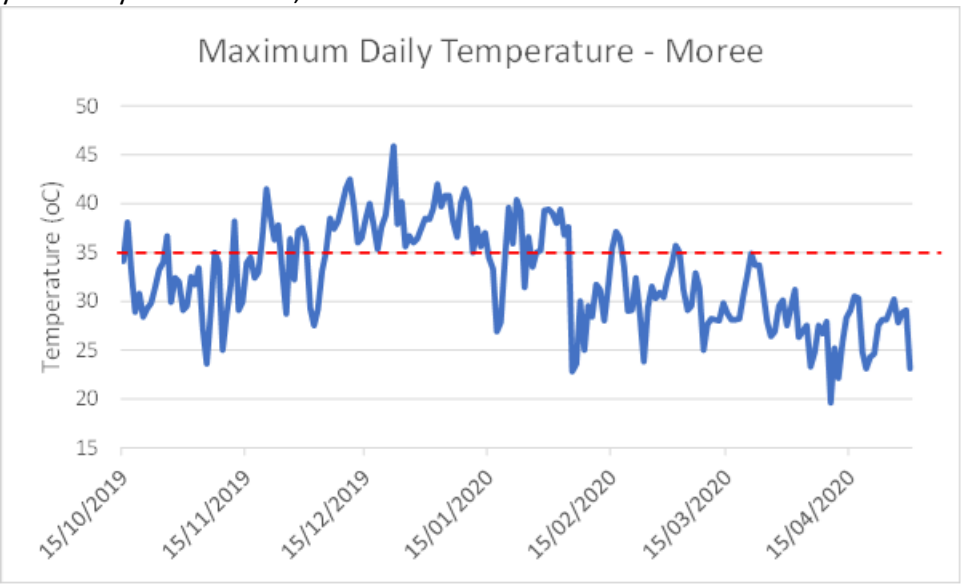

Figure 1: Maximum day time temperatures experienced at Moree 2019/20 season

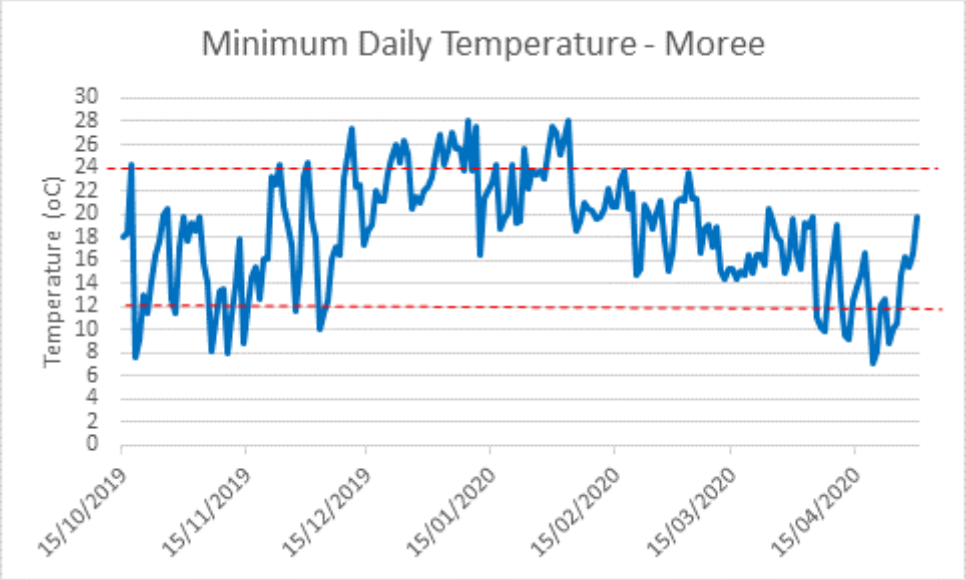

Figure 2: Night time temperatures experienced at Moree 2019/20 season

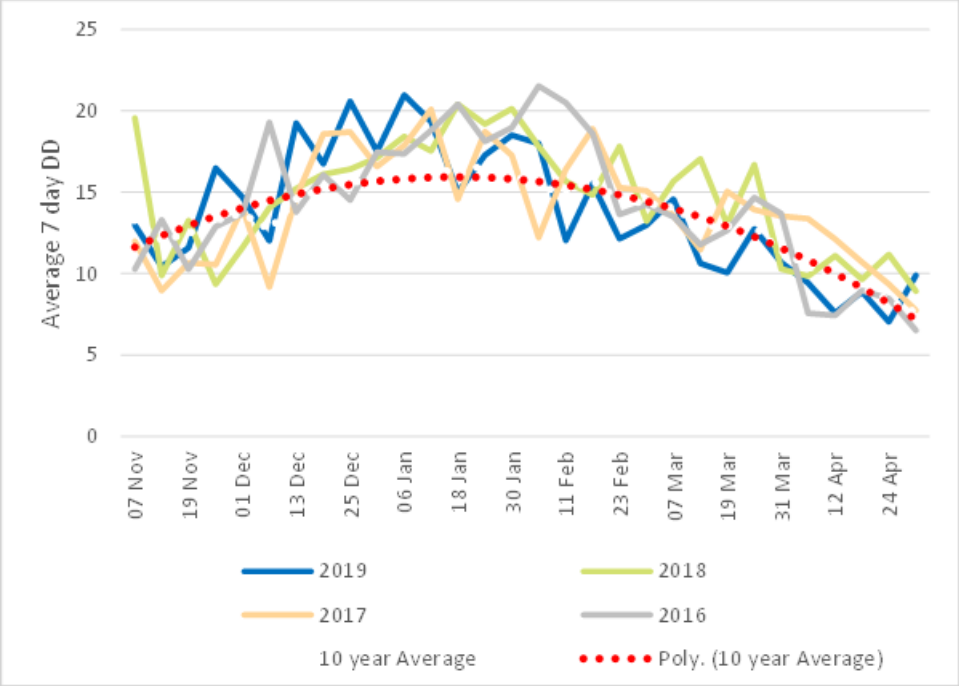

Figure 3: Comparison of 7 day average Day Degrees – Moree Crop planted 1st November

Cold temperatures will slow down expansion of roots and leaves. It can impact good crop structure both below and above the ground, remembering the importance of setting up the crop at the start to support the fruit.

Cooler temperatures are also conducive to early season disease. While seedling diseases such as black root rot and rhizoctonia were present, severity was low. Brown flea beetle caused some early

damage to cotyledons on some crops, but as the days warmed up, the cotton grew through these issues and were off and running.
The CSD Ambassador Planting and Establishment Snapshot for the Gwydir is presented in Table 1. The establishment counts are lower than the previous season (2018/19) and also the 5 year average with the cool start impacting germination and establishment.

Table1: Gwydir Ambassador Network – Planting and Establishment Snapshot (Solid plant, irrigated)

Planting and establishment	2019-20 (range)	2018-19	5 Year Average
Planting Date	24/10/2019	20/10/2018	17-Oct
Seed wet date	27/10/2019	21/10/2018	21-Oct
Establishment method	Watered up	Watered up	Watered up
Planting speed (km/Hr)	9.75 (8-11)	8.86	9.02
Planting depth (cm)	2.75 (2-3.5)	2.43	2.89
Traffic light	Green	Green	Green
Planter uniformity index (%)	40.75 (11 – 69)	22.86%	31.13%
Monitor rate	13.38 (12-15)	13.06	13.38
Planting rate (kg/ha)	11.93	Missing data	Missing data
Final established plants	8.93 (7.6 – 9.9)	11.9	10.85
Final establishment (%)	67.57% (50.7 – 81.7)	90.37%	81.09%

From 6th Dec till the 10th January the weather was hot (Figure 1), dry and often windy, with the crop experiencing 34 almost continuous hot shock days. This is also illustrated in Figure 3, showing DD to be higher during this time compared to previous seasons. Water use was higher than expected and irrigators were concerned they could run short if this kept up. Despite this, the crop was doing well, insect pressure had been very low and retentions high. Nodes above white flower at first flower (around New Year) were generally around 9 or 10.
Nodes to first fruiting branch were higher, in some cases up to 11 or 12 nodes. Some crops started fruiting, then threw in a couple of vegetative branches before setting more fruit branches. Physiology can play a role in explaining this to some degree as cold temperatures can to some point delay fruiting and cause the first fruiting branch to be higher on the plant. (This has a large impact, particularly with dryland crops, where the plant continues to use valuable soil moisture, but not putting on any fruit, ideally dryland needs to square at node 7 or 8).
The CSD Ambassador First Flower Snapshot for the Gwydir is presented in Table 2. The slow start also pushed back the First Flower Date, 8 days later than the 5 year average. However, during this period 1st retention position remained high with an average retention of 85.50%.
NOTE: The CSD STEFF (Simulated time to estimate first flow) Tool will help estimate the date of first flower (1 flower per meter). CSD E&D used it on their trial and Ambassador sites last season. It requires you to select a location and the imbibition date for that field. If we use the average date of imbibition for the Gwydir Ambassador fields in 2019/20, presented in Table 1, STEFF estimates first flower date as 29th December, which is 5 days from the actual date, 3rd January (Table 2). Last season STEFF generally predicted within 3 days of the actual date for an individual field across all

cotton growing areas from the date of seed imbibing moisture, however here the prediction is based on the average imbibition date and average date of first flower for all the Gwydir Ambassador fields.

Table 2: Gwydir Ambassador Network – First Flower Snapshot

First flower snapshot	2019-20 (range)	2018-19	5 Year Average
First flower date	3/01/2020 (31/12-5/01)	31/12/2018	28-Dec
First flower day degrees	1046.75 (995 – 1131)	1067.43	987.73
Days after planting	68.75 (66-72)	70.57	71.85
Total nodes	17.73 (16.5 – 18.4)	16.21	16.90
Squaring nodes	9.80 (8.8 – 10.8)	9.74	9.92
Plant height (cm)	49.00 (38.5 – 61.7)	48.13	52.46
NAWF	9.35 (9-9.8)	8.41	8.71
1st position retention (%)	85.50 (80-90.9)	88.23	83.42
Vegetative growth rate	5.65 (3-8.8)	6.19	4.99

DD was higher during December and early January (Figure 3) compared to previous seasons and generally crop growth was vigorous and pix starting to be applied.

Extreme heat during the day, often extended into the night. Figure 2 shows the minimum daily temperature for Moree over the season. At night temps greater than 24°C, a cotton plant will need to use more of the energy that it stored during the day time to maintain cellular function during the night, so the plant has to make up these energy reserves in the first few hours the next day, rather than driving new growth.

Here is a link to a CottonInfo video that explains why night temps can impact our yields, the CSIRO team have done a lot of work on what happens to cotton at night and how temperature plays a big part in these processes. http://bit.ly/2qAlCnV.

Extreme heat can also have an effect on cotton seed. Pollination in the extreme heat is reduced and thus smaller lighter bolls with less seeds. These fewer seed could be larger and heavier due to the bolls having less seeds in total. This also contributes to lower turn out percentages.

The season broke on 17th January and by the end of the month around 100mm had fallen. Then another 100mm in February (only 11 dry days in the month) (Figure 4). This did cause some irrigation scheduling issues and possible times of water logging in some fields.

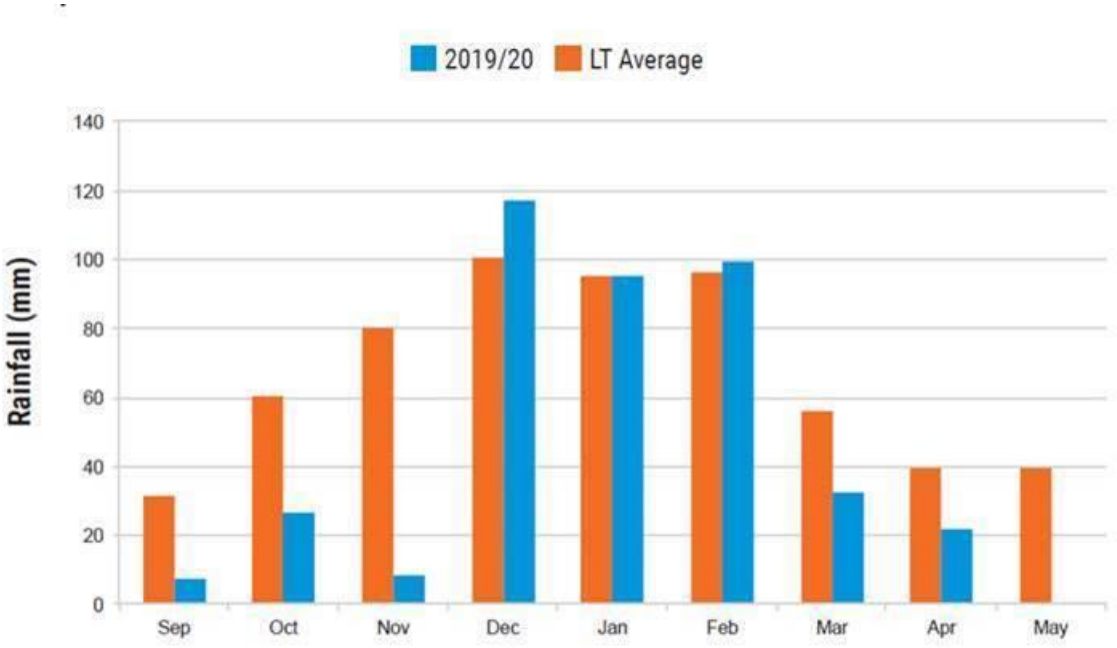

Figure 4: Monthly rainfall during the 2019/20 season in the Gwydir Valley (Source CSD Moree 2019/20 Weather Summary)

The continued wet weather resulted in fruit shedding with the cooler cloudy days, delaying cut-out. The accumulated DD dropped as illustrated in Figure 3. The average 7 day DD was lower than previous seasons and lower than the 10 year average from the 1st February right through to picking. The other telling factor was the solar radiation, which was significantly reduced come late January due to the cloud cover and rainy days (Figure 5). This would have affected the photosynthesis and carbohydrate production in crops impacting boll weights.

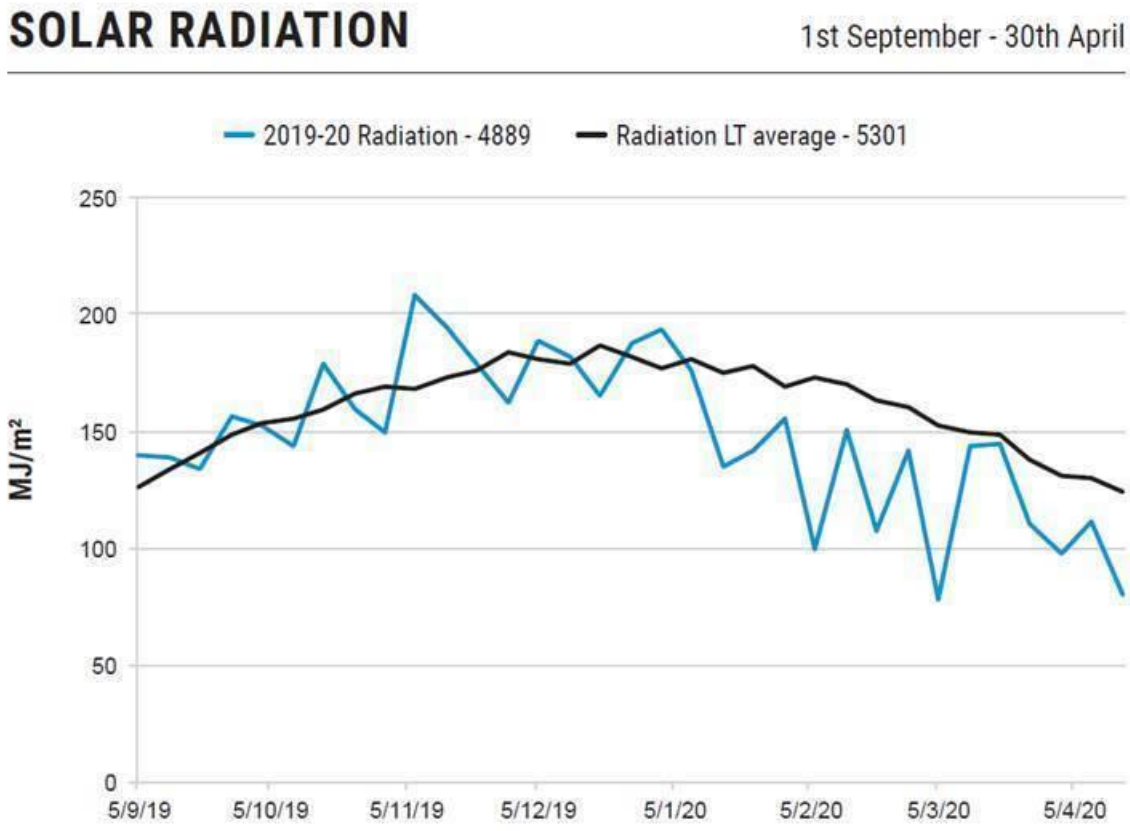

Figure 5: Solar Radiation experienced during the 2019/20 season in the Gwydir Valley (Source CSD Moree 2019/20 Weather Summary)

Reduced boll loads did however result in continued vegetative growth and crops holding at 5-6 NAWF for a number of weeks. Higher rates of pix were used in an effort to pull the crops up. The cooler wet conditions also brought with it more disease, in particularly Verticillium Wilt and Fusarium. Alternaria leaf spot was also present in higher incidence than other seasons.

Insect pressures remained low, and while SLW was about, cooler weather kept numbers low and the parasitic wasp was found from early February with parasitism levels greater than 50% and increasing to almost 90% in some fields by March.

For most crops in the Gwydir many first positions were lost lower in the plant and there was really not a great deal of fruit on vegetative branches. The crop compensated quite well on top, with boll counts ranging from around 130 up to 170 plus bolls per metre.

The CSD Ambassador Cut Out Snapshot for the Gwydir is presented in Table 3. The ambassador sites cut out around 4th February, 115 days after planting, taking an extra week to reach cutout. Similarly, the number of days the crops flowered was longer than average, 46.5 days, compared to the 5 year average of 41.04. Plant height and total nodes also higher than average at cutout which was expected due to the vigorous growth and need for higher rates of pix.

Table 3: Gwydir Ambassador Network – Cut out snapshot

Cut out snapshot	2019-20 (range)	2018-19	5 Year Average
Cut out date	4/02/2020	12/02/2019	7-Feb
Cut out day degrees	1813.0 (1601-1915)	1755.9	1605.1
Length of flowering- day degrees	766.3 (606-849)	637.9	656.4
Days after planting	115.3 (100-123)	109.43	109.4
Length of flowering- days	46.5 (33-54)	38.9	41.0
Total nodes	26.5 (24.5-27.7)	22.1	23.3
Squaring nodes	18.6 (17.1-19.4)	15.6	16.7
Plant height (cm)	94.0 (84.1-102.9)	88.4	91.3
Green bolls/m	159.7 (147.7-176)	166.5	156.6
Open bolls/m	0.0	0.9	0.3
Total bolls/m	159.7 (147.7-176)	167.3	156.8

The CSD Ambassador End of Season Snapshot for the Gwydir is presented in Table 4. Despite final plant height being shorter than the 5 year average at 93.0cm, total nodes was higher at 28.77, ranging between 35.4 and 31.2 nodes. Cloud and cooler weather reduced retention and final boll counts. Of the cotton that managed to hang on down low, boll rot was widespread, as was tight locking.

Table 4: Gwydir Ambassador Network – End of Season snapshot

End of season snapshot	2019-20 (range)	2018-19	5 Year Average
Final plant height (cm)	93.0 (65-112.1)	90.1	99.6
Total nodes	28.8 (25.4-31.2)	26.0	26.9
Squaring nodes	21.0 (17.7-22.9)	19.5	19.3
Retention 1-12	62.6 (60.93-64.9)	63.4	60.4
Final boll count	147.3 (113-165.3)	155.1	151.5
Boll/plant	15.2 (14.5-16.5)	14.5	14.4
Fruiting factor	0.6% (0.5-0.6)	0.6%	0.7%
Main stem fruit (%)	65.3 (56.0-71.0)	67.3	64.6
Outer fruit (%)	16.3 (12.7-21.2)	19.3	21.1
Vegetative fruit (%)	18.2 (16.2-22.1)	13.4	13.6

Defoliation started in the last week of March and continued through till the end of May. Defoliation had mixed results, with patchy rainfall and the unfortunate drift of herbicides onto some crops. Worst cases resulted in leaf freeze. All fields had 3 defoliation passes with many needing a fourth pass. For a successful defoliation the plant has to be healthy and we need a shift in the internal hormonal balance within the plant. For a good overview of the process check out the physiology of defoliation a paper from Arizona http://bit.ly/2qxYzdp.

Nitrogen levels in the leaves can affect defoliation. Anyone gearing up to harvest a 15 bale crop would have fertilised for this. The impact of a cold start to the season and extreme heat that was experienced could have resulted in smaller boll loads and smaller individual bolls, therefore not taking up the nitrogen. This means much of the unwanted N could have remained in the leaves. The stronger healthy leaves due to high nutrient level require higher rates of defoliants as they tend to resist defoliation by reducing the impact of defoliating hormones and enzymes that are trying to get the leaf off.

Underutilisation of nitrogen also means that any crop that received rainfall at the end of the season was able to support new growth. This regrowth means a change in balance of the hormone levels and a lot of normal growth hormones tend to offset the application of defoliants.

Disease, such as Verticillium Wilt can also affect defoliation.

Reasons for poor defoliation can be many and varied; crop development stage, age of leaves, boll load, nitrogen levels are just some of the factors that affect defoliation.

Picking commenced in early May. Rainfall did interrupt picking; however, the majority of the Gwydir cotton crop was picked by the end June. Just a few late semi-irrigated crops chasing top bolls not picked until July.

The average Yield and Quality data for the Gwydir CSD Ambassador fields are presented in Table 5. Average yield was lower than average at 13.0 b/ha, ranging between 11.15 and 14.63b/ha. Similarly, the yields reported across the valley averaged around 12.5b/ha, ranging between 11 and 13b/ha. The highest field yield we have heard for the Gwydir valley in 2019/20 was 15.63 (Sicot 748B3F).

Table 5: Gwydir Ambassador Network – Yield and Quality

Yield and Quality	2019-20 (range)	2018-19	5 Year Average
Yield (b/Ha)	13 (11.2-13.7)	13.91	13.28
Boll weight (g)	Missing data	Missing data	Missing data
Bolls/bale	Missing data	Missing data	Missing data
Defoliation date	15/04/2020 (09/4-22/04)	5/04/2019	29-Mar
Defoliation day degrees	2460.8 (2429-2496)	2492.86	2405.51
Length of season (days)	172.3 (168-177)	163.29	165.69
Pre plant N (kg)	165 (100-240)	162.57	172.21
Post plant N (kg)	102.5 (60-160)	143.14	147.79
Total N applied (kg)	267.5 (200-330)	305.71	320.00
NFUE (of applied N)	20.4 (18-24)	18.91	13.25
Phosphorus (kg)	35.5 (22-50)	23.14	31.98
Potassium (kg)	46.3 (30-55)	17.86	29.03
Zinc (kg)	1.6 (0-3)	1.64	2.09
Flowering Pix (L)	0.9 (0-1.2)	0.28	0.40
Cut out Pix (L)	0.5 (0-1.0)	0.87	0.79
Total Pix (L)	1.4 (1.0 – 1.8)	0.58	1.07
Insecticides	3 (0-3)	1.43	0.89
Heliothis targeted	0.8 (0-2)	0.14	0.53
No. of irrigations	7.8 (6-10)	9.29	8.64
Est. water use (ML/ha)	8 (7-10)	6.21	7.34
Crop Etc (mm)	763.3 (700-819)	846.29	880.32
WUE ML applied (b/ML)	1.7 (1.3-2.2)	1.21	1.69
Kg lint/mm	3.9 (3.6-4.1)	3.16	3.36
Staple length (inch)	1.2 (1.2-1.3)	1.26	1.22

Micronaire	4.4 (4.3-4.6)	4.21	4.41
Fibre strength (g/tex)	322.3 (31-54)	34.20	90.75
Turn out (%)	41.3 (39-43)	41.97	41.45
Manual class colour	31 (21-31)	21	21
Manual class trash	3 (2-3)	3.00	3.00

Ginning Update:
Around 44,000 bales have been ginned in the district. Field yields have ranged from 10 to 15.6 b/ha, with the majority between 11-13b/ha. Despite a fair bit of leaf in some modules, boll rots and tight locking the quality has been good – ie 21-2, 21-3, 31-2, 31-3. The 1, 2, 3 being the leaf content which given the difficult defoliation and picking season was well managed by growers and gins to clean the sample up to avoid 4 leaf which starts accumulating a discount from merchants.
Mic was base and better as well, 3.5 – 4.9 so no discounts. There was a handful of bales with mic 5.0 – 5.2. This cotton was picked late in June so A$40/bale discount. Mic is impacted by heat stress, short of water, lack of top crop, location etc. All the other classing parameters were fine ie no discounts on strength and length
What the Ginners are saying:
"All cotton we have ginned has been base or better in the classing room, with mic within the parameters but on the high side".
"Yields have been good 11-13b/ha, quality has been good, no discounts on any parameters".
"Colour is a little flat/dull so some 31's, probably the majority are 21-3".
"All in all a pretty good season considering the season".
"Quality holding up even with modules reasonably leafy, all been base grade or better".
Thanks to Brighann Cotton, North West Ginning, AFF and LDC for the 2019/20 ginning update.
This article was prepared by Stuart McFadyen, E&D Agronomist, CSD and Janelle Montgomery, CottonInfo REO, Gwydir and Mungindi.
Thanks to Mike Bange and James Quinn for their input to this article.
A complete weather summary for the Moree (Gwydir Valley) is available on the CSD website for the Gwydir CSD Cotton Management Tour https://www.csd.net.au/cmt/gwydir.

Resistance surveillance in major insect pests of cotton, Lisa Bird, NSW DPI

Summary of key points for insect pest management

- TSM - Moderate to high resistance to abamectin in the Namoi and Gwydir
- Mirids - No evidence of resistance to fipronil and sulfoxaflor in all regions
- Aphids - Very low resistance to neonicotinoids and no resistance to sulfoxaflor in all regions
- Helicoverpa - Resistance levels still of concern in northern regions, however the situation has improved in the past season (possibly drought related)

REDUCE RESISTANCE RISK!

- Comply with Industry Best Practice and consult the Insecticide Resistance Management Plan (IRMS) on all pest management decisions

Principles of Resistance Management

- Use product windows to limit exposure to any one MoA group
- Rotate insecticides with different MoA within and between windows
- Comply with label instructions (use only the recommended number of sprays)

- Use recommended thresholds (avoid prophylactic sprays)
- Do not respray a field failure with products from the same MoA group
- Use the most IPM compatible options where possible
- The label is the law

For more detail please refer to Lisa Bird's CSD CMT Tour presentation:

Update on SLW Insecticide Resistance, Jamie Hopkinson, QDAF

Summary of key points for SLW Insecticide resistance

- 30 day spray window has reduced selection pressure, fewer sites with resistance to pyriproxyfen this season
- Application window for pyriproxyfen is working
- Silverleaf whitefly can quickly develop resistance
- Avoid double applications of the same insecticide
- Pyriproxyfen is a slow acting IGR
- Conservation of natural enemies
- Widespread resistance to Bifenthrin

For more detail please refer to Jamie Hopkinson's CSD CMT Tour presentation:

Industry Disease Survey, Duy Le NSW DPI

Key findings early season

Over all 45 fields from 31 farms across NSW were visited during the early season disease survey in Nov 2019. Of these, 16 new fields from 14 new farms were for the first time included in this year survey. Black root rot (BRR) and Rhizoctonia-like rot were still major seedling diseases across NSW. Alternaria leaf spot (ALS) remained prevalent and the disease damage caused minor concerns in most of the surveyed fields. Seedling death caused by wireworm was also detected in many fields.

Gwydir

About 2/3 of the surveyed fields were brand new to the disease survey program. Average seedling stand per meter was from 8.7 to 13.9. BRR incidence was between 7.4 to 88.4% (mean 56.5%); severity was from 4.8 to 19.3% (mean 13%) (Figure 1).

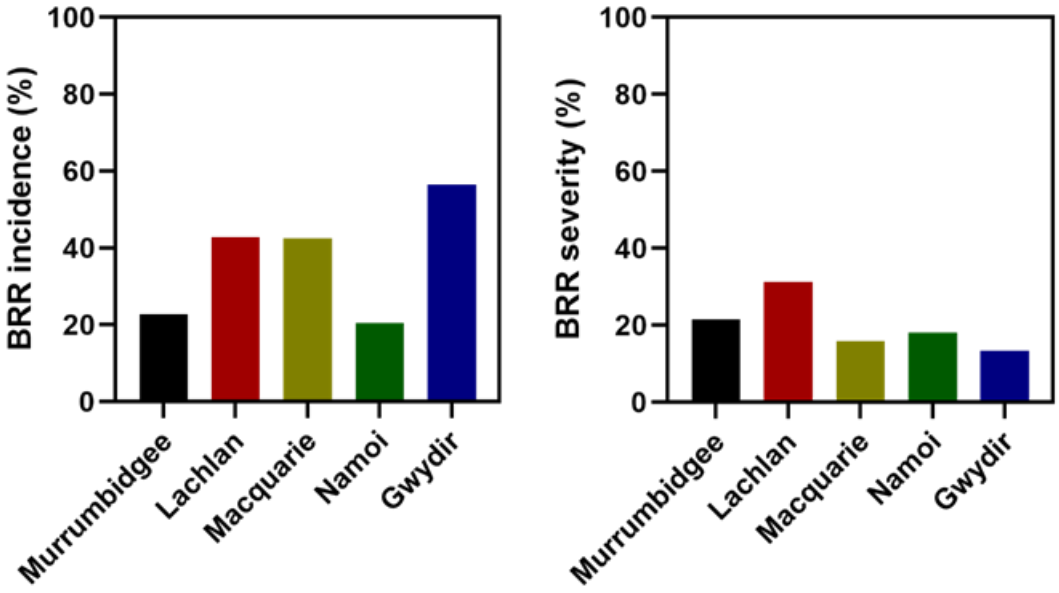

Figure 1: Mean BRR incidence (%) and severity (%) recorded during the early season disease survey across main growing valleys in NSW in 2019/20 season. The BRR severity (%) indicating the percentage of black necrosis covering below ground hypocotyls and tap roots was calculated only for diseased seedlings.

Rhizoctonia-like rot incidence was from 14.7 to 99.6% (mean 74%); severity was from 3.7 to 16.5% (mean 10.3%) (Figure 2).

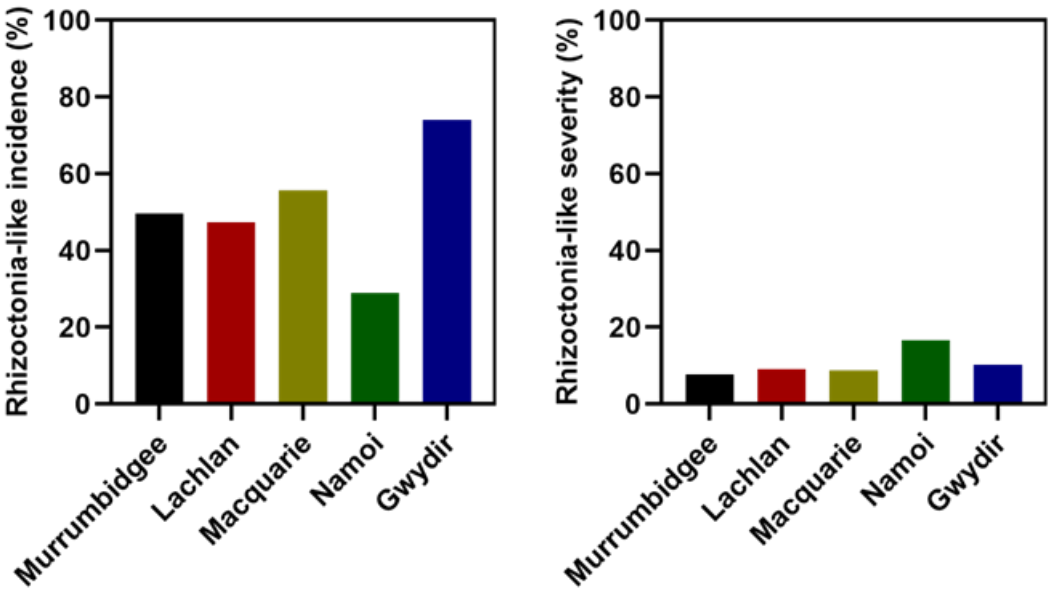

Figure 2: Mean Rhizoctonia-like rot incidence (%) and severity (%) recorded during the early season disease survey across main growing valleys in NSW in 2019/20 season. The Rhizoctonia-like rot severity (%) indicating the percentage of reddish brown necrosis covering below ground hypocotyls and tap roots was calculated only for diseased seedlings.

Figure 3: Rhizoctonia-like diseased cotton seedlings exhibiting irregular reddish brown lesions which frequently girdled the collars (red arrows).

Note: Rhizoctonia-like rot (collar rot) was to refer to cotton seedlings exhibited superficial, irregular reddish brown lesions commonly around the collar regions (**Figure 3**). These symptoms resemble those induced by *Rhizoctonia solani*; however, we recovered a greater number of Fusarium species, including *F. oxysporum*, *F. equiseti*, *F. falciforme*, etc. than that of *R. solani*. Of the *Fusaria*, *F. oxysporum* was predominant and lacked a specific pathogenicity marker that is unique to Australian *F. oxysporum* f. sp. *vasinfectum*. However, due to biosecurity restriction on site at ACRI we have not been able to confirm the pathogenicity of these *Fusaria* on cotton seedlings, so the name Rhizoctonia-like rot will carry on.

Only half of the surveyed fields were detected with ALS. There was a couple of fields with obvious incidence over 62%. As a whole, the leaf spot incidence was from 0.4 to 89% (mean 17%) and the severity was from 0.1 to 3%. (Figure 4).

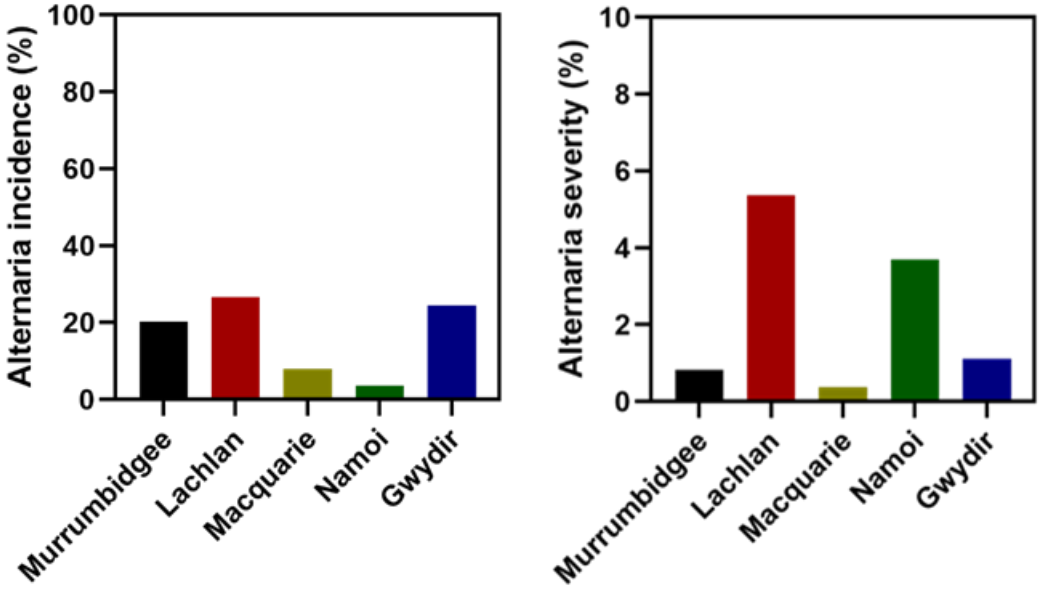

Figure 4: Mean ALS incidence (%) and severity (%) recorded during the early season disease survey across main growing valleys in NSW in 2019/20 season. The ALS severity (%) was assessed based on the percentage of cotyledon necrosis.

Figure 5: ASL on seedlings

Key findings late season

Common diseases such as Fusarium and Verticillium wilts, Alternaria leaf spot and sporadic boll rot were detected across the state and regionally important. Boll rot and wilt diseases were more prevalent in central north, while ALS were more prevalent in southern valleys.

Gwydir

Boll rot was detected in all surveyed fields with the min incidence of 7.8% and max of 26.5%, mean of 15.8%, the highest incidence across the five valleys. Gwydir was also a hot spot of Fusarium wilt. Eight of the 10 surveyed fields were detected with Fusarium wilt. The incidence was up to 39% in one field, but most fields had a low level of the disease. Similarly, Verticillium wilt was detected in eight fields,

and the incidence was up to 36%, mean 8.6%. Seven fields were detected with both wilt diseases, which might bring a real challenge for disease management in these fields. ALS severity remained below 2% on average. Tight lock and seed rot were also commonly observed in the valley.

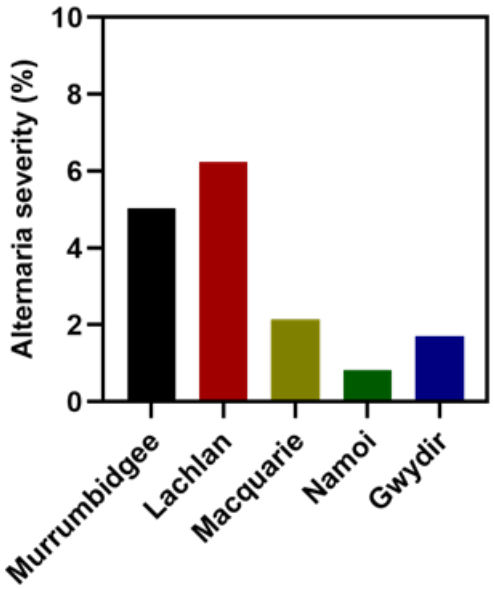

Figure 6: Mean ALS severity (%) recorded during the late season disease survey across main growing valleys in NSW in 2019/20 season.

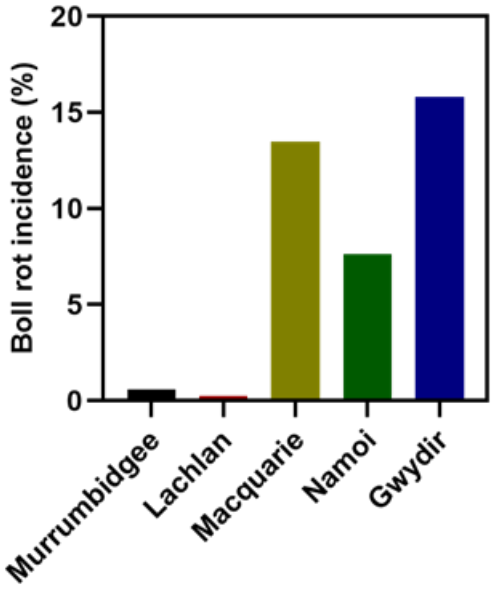

Figure 7: Mean boll rot incidence (%) recorded during the late season disease survey across main growing valleys in NSW in 2019/20 season.

Figure 8: Boll rot was more severe on lower bolls close to ground and prevalent across Macquarie, Namoi and Gwydir during the late season disease survey across main growing valleys in NSW in 2019/20 season.

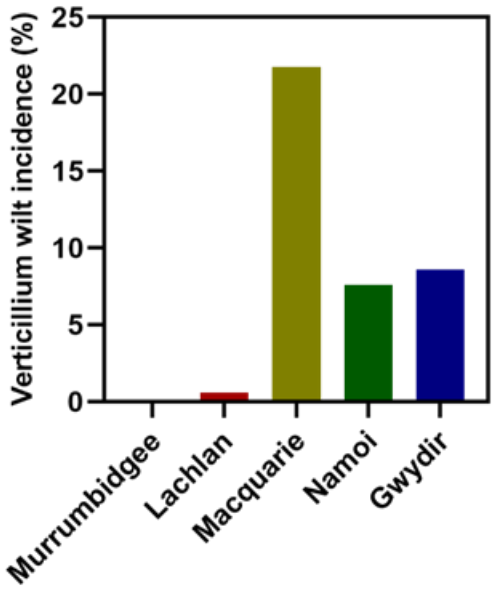

Figure 9: Mean Verticillium wilt incidence (%) recorded during the late season disease survey across main growing valleys in NSW in 2019/20 season.

For more detail on the NSW Disease Survey please refer to Duy Le's CSD CMT Tour presentation:

For more detail on the Qld Disease Survey please refer to Linda Smith's CSD CMT Tour presentation:

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