Issues for Ultra Narrow Row Cotton in Australia: Agronomy, Machinery and Ginning

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The 1997-98 season saw the re-investigation of ultra narrow row cotton ("UNR" cotton) as an alternative production system. Since that time, growers have responded to the system's development in a cautious but extremely enthusiastic manner. Four experimental sites were established in 1997-98, which totalled an area of 52.6 ha (130ac). The majority of these sites returned an almost unbelievable result; three weeks earliness and comparable yields, tc conventional planting's. The 1998-99 season resulted in the establishment of 17 sites and 1821 ha (4500ac) planted to UNR. The following season, 1999-2000 saw the production area increase to 3642 ha (9000 ac). The bulk of this production increase has been centred in the southern production areas of the Lachlan, Hillston and Murrumbidgee.

Initially, much of the research, which forms the basis of the current system, was coordinated during the late 1960's, and early 1970's. Historical results were not favourable, with UNR cotton being abandoned, as technology was not available to solve the challenges it faced. An example of the type of technology unavailable was growth regulators. Technology has advanced presenting more options for developing viable UNR systems. However, it is important to remember that no system is without faults and UNR cotton is no exception. The aim of this paper is to outline these positive and negative issues associated with UNR production.

Growers are experimenting with UNR cotton because they see this system as a way of maximising their gross margins and / or allowing them to produce cotton in regions previously not viable. Potential savings growers for see are less stage 3 insecticides, no in-crop cultivation, better water use efficiency, reduced pesticide application costs through groundrigs, more time between rotation crops for land preparation, and potentially cheaper harvesting costs. These advantages are calculated against the negatives such as increased seed cost, higher use of growth regulators, only broad-acre application of pesticides, restricted availability of contracting equipment, specialised equipment is expensive to purchase and a negative perception from marketer's in relation to the lint quality. Only the rigour of commercial production will determine if UNR cotton is a viable option.

Definition of UNR cotton

A theoretical UNR crop should consist of harvestable plants with 16 - 18 nodes. Plants should be no more than 60 - 70cm high. Each plant should have between 4 - 6 matured bolls, with row spacings ranging from 18 up to 38cm (7-15 inches). The system can be planted either on furrow irrigated beds or in flat fields which are irrigated by bay or pivot systems. Plant populations should be a very uniform, evenly established population which fall between 250,000 - 350,000 plants/hectare,(25 - 35 plants/square metre). The most common system has approximately 300,000 plants per hectare. Further research is required to determine the ideal plant population. A common configuration is to plant into a 2m bed with a very wide flat top and narrow furrows. Six rows of cotton are planted per bed resulting in an average spacing of 33cm.

The Concept Of The System

The concept is to develop plants with 10-11 fruiting branches. Of these fruiting branches, only 6 - 7 will develop mature harvestable bolls. This assumes the top 3-4 fruit branches, result in aborted squares or small fruit. Thus, the system relies on an increased plant population per square metre to compensate for the reduced number of total fruit on individual plants. The concentration of this harvestable fruit will be at positions 1 and 2. To obtain yields, which are comparable, if not higher than traditional production systems require considerably more fruit per unit area. However, the number of fruit per plant declines as mentioned. Research indicates that simply increasing the plants per square metre does not automatically result in higher yields, since individual boll size decreases as the plant population per square metre increases, refer to figure 1.

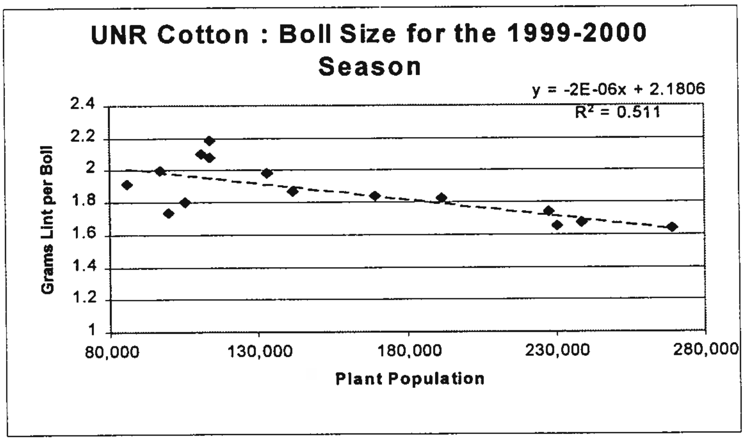

Figure 1: Relationship between Boll Size and Plant Population

The earliness of UNR cotton relies on a reduced number of fruiting branches as outlined above. It is this reduced number of fruiting branches and bolls that allows the total development time to be condensed by 2-3 weeks. This condensed period allows complete boll development to occur in most years in more optimal environmental conditions. Both researchers and growers agree that with UNR cotton, there is a 1-3 weeks advantage compared to conventional row.

Agronomic Issues

Plant Uniformity and Population

Uniform plant population is important for maximising yields with UNR. Measurements conducted at the Liverpool Plains Research Station, Breeza in 1998-99, indicated a 19% reduction in UNR cotton yield due to plant uniformity. This calculation was based on modelling data generated for variable plant stands in conventional cotton. In this trial the UNR crop yielded 5.55 bales/ha compared to the conventional cotton yielding 5.78 bales/ha.

Results from a CRDC funded research project between NSW Agriculture and Deltapine Australia Pty Ltd indicates that plant populations above 200,000 plants/ha are still achieving increasing lint yield. Growers' experience indicates that plant population in fields with an evenly established plant stand need to be approximately 240 000 plants/ha. This value is based on 33 cm row spacing; 8 plants per linear metre. While fields with a high spatial variation across the bed require more plants to compensate for the gaps. Growers claim the population is more like 300,000 + plants/ha. Plants within a highly variable plant stands have a tendency to require more growth regulation to ensure the earliness target is met.

Simply increasing the population can also be negative, since a reduction in the weight of seed cotton produced per individual boll occurs when plant populations increase. Refer to the relationship in figure 1. Note: boll sizes under the lower populations are very variable because these plants can vary greatly in their pacing along a row. Therefore if the sampling area consisted of plants in clumps, then the boll size was smaller than a population uniformly spaced that has even access to assimilates. Spatial distribution of plants between neighbouring rows can be an issue for individual boll size. Excessive populations may also lead to an increased proportion of barren plants within the field.

Weed Issues

Chipping UNR Cotton

UNR cotton uses no in season cultivation. Land preparation and pupae destruction are the only form of cultivation used. This is positive in one sense, as no cultivation means no cultural stimulation of the weed seed banks, reducing weed germination. A negative aspect is the reliance on chipping and limited "over the top" herbicides for the control of the weeds that do germinate. There was at least one UNR crop in the 1999-00 season that became completely non-harvestable due to an excessive weed population. The key is to select relatively clean fields and use a good pre and post-emergent herbicide program, followed by a chipping program to remove the weeds that survive.

UNR growers have recorded limited chipping in fields with uniform plant populations. One such case was in the Narromine region, where the chipping bill was $12-14/ha. However, at the Liverpool Plains Research Station, UNR cotton was planted into a field with an unknown yellow vine problem, and this combined with a warm, wet start to the season resulted in a chipping bill of $800/ha.

The Impact of Herbicide Tolerant Varieties

Transgenic cotton such as Roundup Ready ® (pending registration) will provide a sound insurance measure for early season weed control. Roundup® as an over the top herbicide up to the 4^{th} true leaf is a good management strategy for UNR cotton. Richards (1999) reported that the earlier development of the canopy in UNR cotton resulted in it intercepting 25 % of available light 15 days earlier. This translated into UNR cotton achieving canopy closure 34 days earlier. The use of herbicide tolerant cotton and this knowledge would then allow growers to control weeds directly after emergence and to then allow canopy closure to provide a shading effect to retard weeds. Chipping would only be needed to remove late weed germination and / or missed weeds. All growers are waiting for the commercial release of Roundup Ready ® cotton as they believe it will become an integrated tool in combating weeds in UNR.

Weeds and Harvesting Fronts

Weeds present at harvest (especially vine type weeds) present a serious issue for the current harvesting fronts. These fronts consist of fingers that are blocked by weeds tangling in the feeding mechanism. While the production system does use a desiccant for harvest preparation which can be helpful in killing the weeds, weeds alive or dead add extra trash to the lint sample delivered to the gin complex. This means that the seed cotton requires extra processing to remove the trash. Large weeds such as noogoora burrs or castar oil plants can also cause major problems at harvest. Their large stem makes it difficult for the weeds to pass through the fingers on the front. Causing reductions in harvesting speed and increased trash in the sample.

Insects

Economic Thresholds

Scouting thresholds, mostly used to manage UNR cotton, were developed from thresholds researched in conventional cotton systems. The current recommendation is to adopt the conventional thresholds, but adjust them for your row spacing calculated on a per hectare basis. For example, the current system of 2 larvae/metre at preflowering is really 2 larvae/square metre, given the spacing of rows is 1 metre. Therefore, a crop of 33cm row spacing (6 rows on a 2 metre bed) then converts to 0.66 larvae/checked linear metre. That is, 2 x 0.33 = 0.66 larvae/linear metre. These thresholds have not been tested in the field.

Plant Compensation

Before economic thresholds can be established for UNR cotton, the level of plant compensation to insect damage has to be determined. The likely level of plant compensation in UNR cotton under Australian conditions has not been researched to date. Theoretically, there is reduced compensatory growth with a UNR plant simply because, plants development is capped at a reduced number of fruit per plant and total fruiting branches. Therefore, as a percentage, each established fruiting position has a higher contribution to the overall yield than conventional sites. This does not mean that there is no compensation available with the system, just a reduced amount.

Plants that experience multiply terminal damage can cause problems for the current harvesting fronts. However, research needs to establish what is acceptable terminal damage. For this reason Ingard ® cotton has a vital role in early season insect control of UNR, although much of the UNR grown to date has been with conventional varieties

Mites and UNR Cotton

In the 1998-99 season two spotted mite caused severe problems. The mites did not specifically target UNR cotton over conventional cotton. Rather, the UNR crops that were infected experienced increased control problems. From personal experience at the Liverpool Plains Research Station at Breeza, I witnessed a dramatic reduction in yield potential and earliness in both the conventional and UNR cotton plots due to mite populations. UNR has two specific characteristics which pre-dispose the crop to mite damage. Firstly, Neil Forrester (Deltapine, 1999), in Deltapine Australia's UNR Conference Proceedings suggested that there be may be a reduced airflow in a dense canopy associated with UNR which may provide a more attractive micro-environment for mites. Secondly, earlier mite infestations could occur faster if natural predators were removed or not present during the early season stages. Experience indicated mite colonies when established on lower leaves, had control problems, due to significantly reduced contact by insecticides. Be extremely vigilant in scouting for mites and use the research by Lewis Wilson for establishing when to spray.

Growth Regulator

The registered label for growth regulators such as Pix ® allows a maximum applied total of 1.5L/ha per season. This is a problem for UNR cotton, which relies heavily on the use of these products to achieve a harvestable and early maturing crop. To address this issue Aventis, Deltapine Australia, NSW Agriculture and various growers have collected residue samples to establish if there are concerns for total volumes above this label recommendation. Data was not available at the time of compiling this paper to comment further.

The use of growth regulators in UNR cotton is based on the recommendation for 3 applications. Commencing at 7-8 nodes, then repeated at nodes 10-12 and the final cutout rate at nodes 16-18. However, these timings are only a guide. Decisions to apply growth regulators in UNR cotton should be based on the level of plant uniformity within the field, and environmental conditions and growth rates of the plant. A very important component is the plant population and uniformity of the stand. Deltapine Australia is currently developing growth response curves to Pix® for UNR production. These curves are expected to be available for the 2001-2002 season. In combination with this work, Deltapine Australia is investigating other additives and growth controlling options besides Pix®. NSW Agriculture is also investigating strategies for Pix usage.

Water Use Efficiency of UNR

This is an area that requires more scientific work. There is some anedotal evidence from some growers that indicates an improvement in water use efficiency. While other growers remarked that the water use was the same as conventional cotton. All growers agreed the timing of irrigation in UNR cotton was earlier than for conventional cotton.

Dr Sunil Tennakoon (CSIRO Plant Industry) analysed probe data from NSW Agriculture's Liverpool Plains Research Station, which indicated that UNR cotton had a slightly higher total water use (evapotranspiration) than the conventional cotton. Comparing daily water use of both systems at the same leaf area showed the UNR and conventional systems to be the same. This indicates that the greater water use early season, was due to UNR cotton having a greater leaf area (Richards, 1999).

Yield Comparison

Comparisons between conventional cotton and UNR cotton has shown UNR cotton to yield as good if not better than cotton grown conventionally. Table 1 outlines the yield advantages for the last three seasons. Growers have recorded yield increases from different varieties in different production valleys. For example, the southern production areas indicated that UNR cotton yielded up to a bale more per hectare than conventional cotton this season. As a general comment, the maturity benefit and yields experienced to date by UNR growers is certainly encouraging the adoption of this alternative system.

Table 1: Yields from replicated experiments comparing UNR cotton to conventional cotton.

Cotton System	1997-98 Season Yields Bales /ha	1998-99 Season Yields Bales /ha	1998-99 Season Yields Bales /ha	1999-00 Season Yields Bales /ha
Conventional	7.25	5.78	5.76	7.09
UNR	7.65	5.55	4.96	7.96
	Upper Namoi	Upper Namoi	Macquarie	Upper Namoi

Sources: Hickman (1999) & Cooper , Hickman unpublished. (2000)

Machinery Issues

Planters

Precision and accuracy are the keys. Select a machine that gives the desired row spacing is accurate, consistent in plant establishment and, financially affordable to the grower. Options that have been tried include conservation tillage systems with individual parallelograms, combine style planters, to precision planters such as a Monosem. A few growers combined the technology of a Beeline Navigation System ® and double sowed their field with traditional planters like John Deere or Kinze .

Results to date indicate that crops can be established with the conservation tillage equipment, however the uniformity in the plant stand is not present. This is a critical component to ensure the success of UNR cotton. In comparison growers who use the precision planter with narrow spacings establish good uniform plant populations. However there is a large cost involved. A 24 unit, 8 metre Monosem planter is approximately $100,000 to $120,000 in Australia. A grower in the Macquarie valley has purchased a machine and planted 3,500 acres in the 1999 - 2000 season and established an excellent plant stand at 33cm row spacing. Alternatively, a grower at Hillston has employed an engineering firm to build a vacuum plate disc planter that can plant on 25cm row spacing. The planter also has bulk delivery system for the seed allowing him to plant over a large area quickly and with accuracy, especially in fields developed for bay irrigation.

Manufacturers need to develop bulk handling systems for the precision planters. One suggestion is a form of bulk seed box with delivery by air to a traditional cotton planter unit. Currently Monosem, are investigating this seed distribution system. Tandou cotton engineered a planter consisting of Cyclo-seed boxes as the bulk seed bin, with air delivery to the planter units. This planter is mounted on a tool bar. The challenge with this type of arrangement is to ensure the planter will sow enough area per pass and still be able to be lifted on the hydraulics of the tractor. Bulk handling systems need to be developed if extensive areas are to be sown in a short time frame.

Harvesting

From a growers' perspective, this is the number one issue that needs addressing for the advancement of UNR cotton production. The current technology used in harvesting fronts, is the same as it was back in the late 60's early 70's and needs further development.

Currently a UNR harvesting front consists of a finger style comb attached to a dryland stripper (John Deere 7445 - 7455). Visually it appears similar to the front of a wheat header attached to a cotton picker. In Australia there are two brands, one produced by Osprey Manufacturing in Toowoomba and the other from a United States company called Cencorp. Both work on the same harvesting principle, but differ in modifications in beater/baton ratios and structural design. The Osprey machine has a beater style system to strip the bolls from the bush and fingers, while the Cencorp front has nylon baton reel that sweeps the bolls off the bush and fingers.

Initially, harvest problems consisted of whole plants being removed from the soil and blocking up the fingers. Grower experience since then has shown that with a well-grown, defoliated and desiccated crop there is no problem. However, heavily weathered cotton can still experience this problem. Contractors commented that blockages in the front appear when the moisture level in the cotton is too high or fruiting branches were too green. An average rate of stripping is 8-10 hectares / day. To achieve this rate or better, contractors commented that each stripper machine needed a designated boll buggy for unloading to minimise the down time. This also removes the difficulty of unloading into module builders with the comb front.

One design limitation with the current harvesting system is the inability of the stripper's precleaner equipment to adequately process seed cotton above 7.5 bales/ha yields. This is because these machines were designed for dryland cotton with 3-bales/ha production. One problem is the large volume of seed cotton that is fed to the gin saw in an uneven pattern. The current 60-inch saw has most of the cotton concentrated in the centre of the saw and this does not allow for even removal of trash. These problems are exacerbated, when the cotton has been weathered and / or the volume of sticks in the sample is increased.

Modifications and Options

Several manufacturing companies are addressing the limitation of not being able to handle high lint volumes. Cencorp is attempting to address this issue by developing a bi-sided throat delivery system prototype, with each throat connected to its own precleaning gin. The front may be mounted on a bi-directional tractor, with the two gins on a boll buggy that is towed. This system is similar to the single mounted gin on the current Cencorp Boll Buster® system. There is an option for the precleaned cotton to be formed into mini modules through the stacking builder rather than blown into a boll buggy. The advantage of the system is that it can be a one man harvesting operation. Other manufacturers are experimenting with the concept of a larger single gin, however more research is required.

One grower/contractor in the Macquarie Valley has purchased Osprey fronts and then modified them, in an attempt to improve harvesting efficiency. Modifications include adding air ducts into the throat of the machine to assist in blowing the augured seed cotton into the gin. The John Deere 74 45 precleaners now have extra doffer brushes. The contractor has also increased the gin speed by 10% and reduced the chute opening to the precleaner to compress the air flow in an attempt to improve lint flow onto the gin saw. In comparison the Cencorp front has a shortened throat between the front and precleaner to increase the lint flow. The Cencorp front also has the ability to tilt front and back, as well as side to side, allowing more adjustment in crops of varying height.

Murray Schoenfisch of the National Centre for Engineering in Agriculture (USQ, Toowoomba) and some Hillston growers are investigating a novel concept for a new UNR picker. The concept is based on the Helicasaw design used in Russian pickers. This machine has no spindles rather each row has a main concentric cylinder which rotates with the forward motion of the machine. The concept is to wrap the cotton onto smaller saw cylinders on the outside of the large cylinder. These smaller saw cylinders rotate in one direction while in contact with the bush and reverse direction to unwrap the cotton on the other half of the rotation cycle. The action is similar to a roller gin.

Murray's vision is to have this Helicasaw design mounted in a horizontal position possibly on an oval type rotating motion rather than the current vertical position found in Russian pickers. These rotating drums would be lowered onto the UNR bush for picking. The front would consist of a wide tray combine, which helps collect the lint, and each row would have a slot in the tray. There is strong grower interest in the design especially if the picker reduces the initial trash component in the sample. However, much more investigation is required.

Ginning

High trash contents can be found in UNR cotton especially if cotton is picked after weather damage or it is not properly prepared for picking initially. This extreme trash level results in extra abrasion on the system's pipe work, conveyor systems and gin saws. Hence, there is a cost to the gin in extra wear and tear, as well as reduced total volume of modules ginned. This highlights the importance of ensuring that the gin processing UNR cotton has the capacity to handle large trash volumes if the situation arises. This then raises the issue of extra ginning charges, which is starting to occur in the USA.

UNR cotton that was picked late and extremely weathered in the 1998-99 season opposed significant ginning problems at the Trangie gin. The problem was that the gin had difficulty processing cotton with this high level of trash. It is important to note, UNR cotton that was picked early and not weathered was not an issue. Table 2 indicates the difference in ginning from an early picked, non-weathered crop (grower 1) to the other end of the spectrum (grower 2). The key differences in table 2 are the weathering statistics, the module moisture, which reduced number of burners required and the overall efficiency of the gin run (hourly rate). The burners are important because the more heat used on seed cotton, the greater the potential for a reduction in fibre strength. In grower one's gin run there were modules that required no extra cleaning. When UNR grades especially from the southern areas of Australia are being quoted from the 1998-99 season, people should note that picking was still occurring in August and the grades can be related to the figures in Table 2. In dialog with the ginner, it was revealed, grower 2's grade reduction was not confined to UNR cotton. As conventional cotton, when exposed to similar weather damage gave him similar grading to the UNR, except there was much less bark discounts.

At Hillston where UNR Cotton is expanding, Namoi Cotton has invested in Australia's first stacked stick machine in an attempt to improve the trash handling system. A vertical flow drier has also been installed. This drier consists of a series of shelves and seven spiked rollers that rotate slowly. The idea is to hold the seed cotton up in the heated air to fluff up the cotton. This preparation loosens large pieces of trash and untangles trash before the first stage of cleaning. However, the trash remains in the air flow until it reaches the first cleaning stage. If the cotton is extremely trashy, then this gin has the ability through the stick cleaners and piping to segregate out and process cottons with different trash levels.

Table 2: 1998 - 1999 UNR ginning Comparison at Namoi Cotton's Trangie Gin

	Grower 1	Grower 2
Rain on Open Cotton	None	3 inches
Frosts	None	5 approx
Module Moisture	7 - 8%	9 - 12%
Ginning Moisture	5 - 6%	5 - 6%
Hourly Bale Rate	81%	50%
Average Turnout 2	33%	28%
Line Cleaners Used	3	6
Grades	20-31	40-41 Bark +++
Burners Temp	75/50/50/50°C	110/90/90°C

Source: Deltapine (1999)

Alternative Ginning System

Keith Hood is a UNR grower / ginner from the USA, and he has installed a Vandergriff American gin design (Vandergriff and Freeman, 1999). The two main components of this system which improve the trash removal is the use of a Jet Drier and Tube Density Separator. The jet drier consists of a main cylindrical cone chamber that tapers to the base. The seed cotton enters at the base and rides a vertical steam of air upwards. Then it hits the top and is directed back to the base, along the outer wall. This action loosens the cotton <u>without</u> using moving parts. This significantly reduces the likelihood of nep formation at this stage of processing. The second noteworthy component is the tube density separator. Its function is to remove foreign matter using materials density and varying air speeds. The seed cotton is directed vertically once it enters the centre of the tube. As the cotton rises, the velocity slows and the higher density particles (foreign matter) drop out and fall to the tubes base. The lighter cotton continues upwards to the next stage. Seed cotton that falls with the trash is then reprocessed through an alternative system called the re-claimer. Overall this complete system is an alternative ginning system being developed specifically for UNR cotton in the USA, and should be assessed for potential in Australia.

Quality of the Lint

Table 2 provides a good illustration of what can happen to UNR cotton if stripped after cotton is badly affected by weather. It must be noted that this downgrading could also occur to conventional row spaced cotton, if it was exposed to similar weather. The key component is to ensure the agronomy and harvest is completed in a timely manner to reduce the stick/ trash component.

At the time of writing this paper, some growers in the Upper Namoi had some gin runs of early harvested UNR cotton completed. The grades were excellent at base grade or better and no discounts. With one run averaging turnouts of 39%. At the time of processing, the gin manager commented on how this sample was the cleanest cotton he had seen for a long time. A Darling Downs site which picked early, resulted in base grades but some slight penalty for bark did occur. It is important to note, bark penalties are not solely restricted to UNR cotton as numerous conventional modules in the 1999-2000 season were discounted for bark. If the extra processing at the gin is not performed or the initial trash content is extremely high, then there are penalty issues with bark. Bark develops in the system when the level of sticks and trash exceed the cleaning system, which allows stalks to get trapped in the ribs of the saws and continually be shredded. Very fine pieces of bark intertangle with the lint fibre and is impossible to remove or dye.

Neps

Neps in UNR cotton are currently an unknown. While there are no penalties for neps now, it will become an issue in the future, in both conventional and UNR cotton systems. Neps consist of small fibre knots or imperfections. These can cause fibre dye problems or weakness. Neps can be classed as mechanical or biological. The mechanical neps occur in the harvesting and ginning process, especially if the cotton is weathered. If seed cotton requires more processing to remove trash, then the extra mechanical handling potentially causes a higher likelihood of fibre damage. Biological neps are caused by trash remaining in the cotton lint when formed into a fabric or immature fibres that are harvested.

Initial concerns were UNR cotton caused more neps in the lint. However, Tandou in 1998-99 were able to test a few early modules for neps and recorded no abnormal levels. This season has seen extensive testing of lint cotton from UNR fields for Neps by Deltapine Australia and NSW Agriculture, with the results yet to be analysed. There are many thoughts on this topic, but very little work done in Australia. Work from the USA by Dr M Buschermobile and Dr W Mayfield did record a higher Nep count with UNR due to the ginning process. The results are in Table 3. The analysis tested lint from 10 UNR stripper sites and 10 conventional spindle picked fields. Foreign matter was segregated and lint quality tested. As seen in table 3, the nep counts were higher than the conventional cotton but this level was still regarded as acceptable. To ensure both systems were fairly tested, the cotton from the UNR fields was processed considerable more for the trash than the conventional cotton. This ensured, that the sample tested for lint quality and neps was a true representation. Of the tested 10 sites, only one UNR field recorded a "barky " level.

Table 3:

Average Foreign Matter and HVI Classification for Conventional and UNR Cotton from 10 Experiments and Field Demonstrations across the Mid-South and Southeast United States of America : 1998

Foreign Matter	Conventional	UNR
Initial %	7.8	20.9
Feeder %	3.4	4.8
Lint %	2.1	1.8
Turnout %	34.9	29.8
Classification	**Conventional**	**UNR**
Leaf Score	2.9	2.8
Micronaire	4.5	4.4
Length (inches)	1.08	1.07
Strength (gram/tex)	28.9	29.0
Short fibre (%)	8.6	9.4
Neps (No/gram)	277	397

Source: Milan Field day (1999)

Gross Margins of UNR Cotton

Due to a late start to the ginning season, there is little information available for the 1999-2000 season to allow a proper comparison. Pre-season, growers felt the system should return savings due to reductions in late season sprays, reduction in application costs due to groundrigs, no inter crop cultivations, the possibility of one less irrigation, and cheaper harvesting costs. Off setting these possible benefits are the negatives of extra seed cost, all pesticides are applied broadacre, possible extra charge for ginning, extra defoliation costs, and the risk of grade reductions if growers are unable to grow and harvest the crop in a timely manner. Growers wishing to trial the system need to understand the system completely to avoid these penalties.

Just prior to ginning growers were commenting that they felt the UNR gross margins would be similar or slightly behind the conventional when all production costs and ginning charges were considered.

Conclusion

As outlined, there are numerous issues UNR cotton needs to address before it reaches it's full potential in Australia. Agronomic issues, which have been addressed in this paper, could be classed as minor. Grower experience in Australia reinforces the need to establish a uniformly spaced plant population as the solid foundation for a successful UNR crop. While financially this involves a major capital investment, it means the issue of plant stand variability is solvable.

Machinery issues focus around the harvesting of UNR cotton, with the long term solution focused toward better engineering of equipment. However, much can be achieved through good agronomics and preparation of the current stripper system. As a grower, your aim is to remove as much trash as possible at the field level before it is placed in a module. In relation to weather, if UNR and conventional cotton are exposed to excessive adverse weather conditions then both systems will receive down grading. However, the UNR cotton will be more likely to experience the extra bark discounts due to the type of harvesting mechanism used. Consider this when assessing the availability of contractors.

Finally, ginning and quality issues are issues that need special attention. If growers deliver seed cotton containing large volumes of sticks and the gin does not have the trash handling capabilities then the outcome is a "bark" classing. Subsequently, the textile industries may not purchase the end product. At the same time, through science, this perceived automatic down grading associated with UNR cotton needs addressing, since there is now much evidence to the contrary. I encourage growers who are thinking of trying UNR cotton to be fully aware of how the system operates and give this system the attention it deserves. I believe there are many challenges to be faced by the UNR production system, but overall I see the development of a strong and viable industry.

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