MILLS' NEEDS

The current style of cotton grown in Brasil relates to two basic value usages. That of the traditional drills and denims (coarse count) which have formed the base for the long term industry survival and progress. This style of cotton is typically a 41-4 or 51-5 (6/0 or 6/7) where the colour is not as important to the final finish as it is either indigo dyed or bleached.

The plant matter remaining with the lint is also less important as this is covered by more fibres strengthening the weakness of the yarn caused by bark and leaf material.

The fibre characteristics are less important because the fineness of the yarn is less crucial as the strength of the yarn is based on multiples of fibres instead of inherent fibre strength.

This type of spinning accounts for most of the world’s raw cotton usage and we are now finding that due to many reasons, including better spinning machinery, lower margins, higher costs and of course higher raw cotton production, the balance of raw cotton produced needs to find a more sustainable home.

The other major usage for Upland style of cotton is for fine to medium count yarns that go into fine shirting/sheeting and knitted fabrics. This type of spinning is performed in Brasil by only the top spinners looking for niche markets and who have in the past relied heavily on imported raw cotton. The top end of this fine to medium count usage worldwide is currently supplied by mainly SJV and Australian with other growths (West African, Uzbekistan etc.) sometimes able to perform to these standards. The main grades purchased are 21 to 31 colour to allow dying into pastel shades without bleaching, 2 to 3 leaf to lessen the risk of fibre and yarn faults and to allow for better mill running efficiency, 29 g/tex to allow less fibres per cross section and still maintain suitable yarn strength; length of 1-1/8” (28.2 mm) and above to lessen twist and still ensure softness, 3.8 to 4.5 micronaire to ensure fineness for yarn thickness and to ensure even dye ability. This cotton must be free of contaminants like grass and bark!!

The importance of the fine to medium count market to the Brasilian industry is increasing to the extent that many producers are using a 30% production plan for the export market. The transition to this market entails many changes to the management of all concepts of the industry – growing, harvesting, shipping, which will inevitably lead to an established reputation.

It is not possible to just produce a high quality cotton and expect to be able to attract a price equal to that of long term growths in the global market without first proving over several seasons that mills can be comfortable with relying on the guaranteed delivery dates and long term quality suitability to their needs. These mills will carefully judge the percentage of bales in their mixes to the confidence they acquire in their shipments. At this stage of our export development, one late shipment that allows a mill to run out of stock or have to purchase a more expensive growth or a delivered quality that will not spin to their needs will severely damage the reputation of the modern Brasilian industry to that mill. You are on trial.

In addressing the quality aspect of raw cotton to this fine/medium export market, I would like to start at the ginning area and then give my opinion on both the inputs to ginning and the classing and delivery of cotton to the next customer in the chain – the spinner.

My history in cotton has always been related to ginning and marketing with a heavy bias towards the growing side, by working with producers to improve the reputation and quality of Australian cotton to the Global market.
Unlike Australia, Brasil has a long history in cotton and has inherited some ginning equipment that is probably mismatched within a plant. The fact that this equipment is old and small compared to newer, larger plants, need not present a problem, as long as these plants are well matched to speed and size within a plant. This will also apply to newer modern equipment.

In Australia we have been criticised for over-ginning in the past by using too many lint cleaners and ginning too fast. This practice has been revised but speed should not be confused with large equipment as demonstrated by a Queensland Cotton gin in Australia having 6 stands x 170 saws and 2 x 108 lint cleaners that is very well positioned to average 60 bales/hour equating to 1,440 bales per hour day. That horrifies most mill people but this figure is well below the full speed capability of this plant around 90 bales per day and we generally do not use all cleaning equipment which preserves the fibre as much as economically able. This could be compared to a 6 stand plant of various manufacturers with 90 saws each and one lint cleaner doing 9 bales/hour and 200 bales per day perceived to be a gentle gin. In fact the mismatch of feeders/pre-cleaning (if any) and gin could be causing unnecessary damage such as neps and Short Fibre Content far more than a well designed and matched gin.

It is well known and documented that gins do create damage to the fibre and there are only minimal avenues to address this issue in a well tuned and matched plant.

Without further pursuance of this issue, I would now like to address my favourite topics - producing good quality cotton to the spinning and finishing customer and management of the cotton plant for quality.

I will be very bold and state that all aspects of growing cotton are manageable; therefore the end product is a product of the decisions of each producer – they are in complete control.

Possibly the first decision taken, once cotton farming is decided, is the location to farm – this is taken with respect to economics – environment, raingrown/irrigated – social reasons – support – infrastructure. This decision sets the stage for all other quality aspects – if a location is chosen that has severe drought conditions to guarantee less weathering of the fibre then you must have irrigation water to feed the plant – if there is no water!! Is that a bad decision or just an economic decision to buy or find water?? Get the idea, everything is manageable!! The same goes for too much water/rain!! - cover your fields with a shed like a nursery!! – ONLY economics!!

There are also two types of management decisions – reactive – to an unexpected event and proactive – to a re-occurring or expected event. The proactive decisions are usually based on history and experience of yourself or others and would likely include seed varieties/planting dates/fertiliser rates/soil preparation/defoliation etc. The reactive decisions would be – insect control/crop inputs for plant health/irrigation timing (if used)/weed control/environmental damage (hail or flooding or drought) and defoliation.

The reactive decisions should be based on a very intimate knowledge of plant physiology that considers the crucial fibre development at any given time of growth, e.g. a drought event before first flower is less critical to the length than 20 days after first flower and so on.

Fibres are unicellular (one cell) hairs that develop in cells in the outer skin of the seed coat. There are two kinds of fibre, short fibre that remains attached to the seed (the fuzz or linters) and the longer fibres that form the lint for spinning.

The boll development period is divided into two parts as shown in the following diagram.
1. From flowering for a period of 15-25 days the boll develops to its maximum size and the fibres elongate to their maximum length.

2. From 15-25 days after flowering onwards, thickening of the fibres occurs as layers of cellulose are laid on the inside of the follicle. The thickening stops before the fibre is completely full, and the fibre collapses to form a flat ribbon as it dries out with maturity. As the fibre dries out it twists into convolutions. This feature makes the fibres spinnable.

Micronaire, being a measurement, indicates fibre fineness and/or maturity.

The fibre diameter is determined in the early 15/25 day stage and can be affected by plant stress eg. extreme heat will produce larger diameter (coarse-high mic). Fibre maturity is determined in the later stage where fibre thickening occurs. Any stress at this stage will halt this process and create immature fibres (3.0 mic).

Staple length is determined in the first 20 days of fibre development (after flowering).

Reasons most often cited for short staple are anything that inhibits carbohydrate supply during the lengthening process. This includes high temperatures, severe water stress and nutrient deficiency.

If a crop has good early vegetative growth and is stressed post flowering it will usually produce a fibre of slightly reduced length but of high micronaire. This is because stress during early flowering reduces fibre elongation and at the same time causes young boll shed.

It is also good to fully understand the way in which a spinner deals with the problems associated with variability of our natural fibre – cotton.

Our mill customer uses averages and blends to minimise the variation of cotton by mixing either qualities or growths to determine a managed, final result. This result can be for quality yarn and/or to a price. With experience and knowledge a mill can produce a mix or blend with qualities that make you question “why should we produce a quality product?” but this is the answer to all our actions.

**BLENDING**

If you look at a single plant and understand the fruiting positions and their determined quality values, it shows another avenue to producing this quality product. Look at this micronaire and fruiting positions for example to show how the plant itself starts the blending process.

Position 1 – fruit can have a micronaire of around 5.1
Position 2 – fruit around 4.2
Position 3 – fruit (possibly immature) around 2.7

The average micronaire of this blend is dependent on the percentage of fruit in each position. For example if the 1st position was 60%, 2nd -25% and 3rd -15% this could give an average micronaire of 4.5. Also if the 1st position was diluted to 20%, 2nd - 40% and 3rd - 40% this could equate to an average micronaire of 3.5 and so on.

The same principal applies to the other characteristics of length (and its associated SFI/Uniformity) and strength.

So, understanding the changes in these percentages and their blended average is very important when making reactive decisions to growing a cotton crop.
When we also add the blended averages to soil types – variations to land fall (slopes) – timing of plant – inputs – areas and rainfall variation you can see we all rely on blends of blends of blends to average out the natural variations of the cotton plant. This knowledge has proven in the past to assist in the economical blend of a mix and allowed the plant physiologist to find methods to economically produce of preferred product.

A modern method to track all of these ideas is with GPS. Queensland Cotton is firmly committed to our QC.SciAg, which utilises the differential Global Position System (GPS) to accurately pinpoint unique geographic locations, producing an exact map of a farm. By providing the producer with an extensive database of information about yields, soil test data, crop types and returns, QC.SciAg can assist with the planning and management of the farm to ensure the fullest utilisation resources and early diagnosis of problems.

With the use of QC.SciAg, it is possible to add multiple layers of information to each field within a 'map', such as:

- Nutritional history
- Crop rotations
- Pest dynamics
- Crop inputs
- Water management yields
- Quality information

Providing a complete picture of any designated field.

**IMPROVEMENTS**

With this preamble in mind, I would like to suggest that the three areas most needing attention are the control of bark, leaf content and the preserving of the colour.

I have been involved with issues like this in Australia and once again it is purely a management decision to rectify these contamination issues.

**BARK**

The probable reasons or related indicators for bark showing up in Brazilian cotton are as follows:

1. Bushes too high and being dragged horizontally through picker heads allowing the spindles to rotate along the stem and peeling the bark off.
2. Bark becoming dry/old and lifting off the stem, allowing the spindles to again easily strip this bark.
3. Picker pressure plates too tight and pushing the branches and stem too hard onto the spindles.

You can hear the excuses:

(1) Too hard to keep the plant small;
(2) Not enough pickers – too much country.
(3) Too much cotton left on the bush and being wasted

All of these excuses are solvable but the management decision is an economical one. When the coarse count domestic price is higher than the export fine to medium count price, it is hard to justify the effort and expense but this again is a long-term sustainable decision.

**LEAF**

Leaf content in cotton is also manageable and I don’t see the need to over-gin cotton to reduce the leaf when surely it is better to harvest just the lint and not the plant by the following methods.

1. Select less vegetative varieties and reduce plants size (as with bark).
2. Defoliate the crops to your preferred timing, allowing the leaf to fall off in a pliable form and not freeze on the plant and become brittle. Don’t use desiccants!! The timing and planning of defoliation is both reactive and proactive decision making because you have to manage your plant inputs to cut out by defoliation to make the plant want to finish or stop growing. It is a fact that defoliated crops here produce a better leaf grade without any special ginning.

3. The gin – although I feel this is the last hope and it is better to have a clean in–clean out philosophy, a well-matched set of pre-cleaners are far less damaging to cotton fibres than lint cleaners. We constantly see our quality trials showing zero leaf in the pre cleaned seed cotton before the saws and this always translates to less damage by only using lint cleaners to comb the cotton and not harshly clean it.

I have witnessed these two problems reduced to a very low incidence in Australia by addressing the points as described using variations of the controls available.

The tall bushes causing bark were an issue in our northern areas where the seasons were longer and the accepted growing technique was that the bush had to be tall to attract the yield, “the early bolls fell off and why worry, as there was plenty of season to grow replacement bolls”, and they could compensate this with the longer season. We showed how to protect the 1st and 2nd position fruit and pix the plant to obtain a good yield and a smaller plant. Bark solved!!

Another area that was colder at plant finishing was famous for its use of salt as a desiccant to drop the leaf. This resulted in the leaf freezing on the bush and being picked. The area average leaf grade was 4 to 5 (6/0 to 6/7) and attracted an average discount of US$30 per bale or Usc06/lb. With a lot of convincing to change to better defoliants and lately with Dropp Ultra that area leaf average is now a 2.3 (5/0) leaf grade and we are now selling more Dropp Ultra and no salt. The producers are also enjoying an average premium of US$6 per bale and fitting into Australia’s reputation of a reliable high quality producer. Wins all round.

I would also like to offer that all cotton is saleable but the price determines the profitability. Sometimes we have to be far sighted to see the changes and be prepared to experiment and trial different methods to obtain a way to be sustainable.

The methods to solve the same problems in Australia would not necessarily be the same to solve problems here, but to understand the reasons for these faults and have an open mind (and possibly chequebook) will produce a better, unique way to the future.

COLOUR

Colour is the best it will ever be the moment the boll opens and has it first look at the sun, from that time on it can only deteriorate. The natural oils and lustre are weathered to produce a dull, lacklustre finish. Classing to colour is a way to indicate that some damage has occurred to the fibre and relates the caution on to the spinner.

The colour issue may require a different tack as I feel the colour is being depredated by remaining open on the bush for an extended amount of time, allowing the cotton to be exposed to the various environmental conditions.

The colour is dulled off by too much exposure to harsh weather conditions, dust and direct sun. In some cases the 1st position fruit can be open as much as 25 days longer than the final bolls which will change the average colour by the percentage of these over exposed bolls. The relative average on a bush is the same as micronaire, length and strength.

The answer here may be in the planting date, to avoid late rain falls and then the careful attention to finishing and defoliation that should bring your fine/medium count crop in ready for a quick harvest to minimise the exposure of the open bolls to weathering.
In Australia we don't have a guaranteed dry harvest and all producers are fanatical about picking their fields as soon as the optimum amount of bolls are open to avoid any risk of colour loss and resultant discount through a rain event. They have even looked at the possibility of estimating the approximate colour degradation by knowing the percentage of open bolls at a particular rain event and how much the colour can return under good drying conditions. These are the type of things you will have to experiment with here to work towards your goals.

**CLASSING**

The move to using universal standards and descriptions in Brasil is an easier option to competing in the World Market and this was also re-endorsed for the Australian industry recently. The pressures of maintaining a Quality Standard outside of the local market is difficult and why duplicate costs and complicate the market with different standards when the world is shrinking and the wheel has already been invented. USDA Universal Standards are well known today, but I do believe they will be fazed out overtime when a fully mechanical instrument is developed and we have to be prepared for that time. U.S. cotton is classed to colour by HVI and only leaf at this stage is visually valued.

In Australia we still visually class our cotton for colour and leaf as we feel our naturally bright white colour is not valued correctly with the USDA colour grade that is applied to HVI. As mentioned previously I believe cotton is at its best when first opened and any change from this original colour only indicates that damage has occurred. The two parts of HVI colour RD (Reflectance) and +b (yellowness) are solid and useable measurements but in my opinion the colour grade devalues the bright white cottons of the world which just happens to be growths Queensland Cotton are mostly involved in - Australia - SJV and now Brasil.

I would hope the next stage of this change to USDA boxes in Brasil will be finalised next year and all classing rooms will have current USDA Standards available. We have noted that Classing rooms that have Standards this year have a very clear idea of the future and there is no uncertainty in the presentation of lots and their uniformity.

All cotton exported from Brasil requires HVI data and because of the delays caused by the sheer volume of samples to be tested I feel producers will have to rethink the selling and delivery terms currently in place. I think lots should be put together after the receipt of HVI data to achieve the absolute best and uniform cotton to be offered to the fine/medium count market. This would entail more time between the comitment of cotton to a buyer and it would also need more space to hold before sorting.

My current recommendation would be to visually class the cotton to eliminate the need to HVI test any lower grades not suitable for fine/medium sales, bulk stack bales into visual grades, e.g. 21-2 / 31-3 / 31-4, then wait for the HVI data and rework these stacks into the other characteristics.

<table>
<thead>
<tr>
<th>STACK</th>
<th>US COLOUR - LEAF</th>
<th>Approx BRASILIAN GRADE</th>
<th>HVI LENGTH</th>
<th>HVI MIC</th>
<th>HVI STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(mm)inches</td>
<td></td>
<td>(g/tex)</td>
</tr>
<tr>
<td>Export</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>11-2</td>
<td>T - 4/0</td>
<td>28.5 1-1/8</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
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<tr>
<td></td>
<td>21-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC+</td>
<td></td>
<td></td>
<td>29.4 plus 1-5/32+</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
<tr>
<td>EF</td>
<td>21-2</td>
<td>T - 4/5</td>
<td>28.5 1-1/8</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
<tr>
<td>EF+</td>
<td></td>
<td></td>
<td>29.4 plus 1-5/32+</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
<tr>
<td>EH</td>
<td>21-3</td>
<td>T - 5/0</td>
<td>28.5 1-1/8</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
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<tr>
<td></td>
<td>31-1</td>
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<tr>
<td></td>
<td>31-2</td>
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<tr>
<td></td>
<td>31-3</td>
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<td></td>
</tr>
<tr>
<td>EH+</td>
<td></td>
<td></td>
<td>29.4 plus 1-5/32+</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
<tr>
<td>EK</td>
<td>31-4</td>
<td>T - 5/6</td>
<td>28.5 plus 1-1/8+</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
<tr>
<td>EK+</td>
<td></td>
<td></td>
<td>29.4 plus 1-5/32+</td>
<td>3.8 - 4.5</td>
<td>27-29</td>
</tr>
</tbody>
</table>
1. Visually class all bales to either Brasilian type or US colour & leaf.
2. All grades below T-5/6 (31-4) would go to Domestic and stacked as normal.
3. All "Export" grades could be lotted (Truck loads) and await HVI data (to see if suitable for Export), OR
4. Have a holding area that is in running-bales. After HVI data is received then sort into lots in the proposed manner.
5. D (domestic) stacks are the balance of bales that don't fit into the E (export) stacks and have lower length, mic and strength. For example, a bale of colour-leaf 21 - 1 with lower length, mic and strength than needed for the EC (export) stack is placed in the (domestic) stack.

I do feel this would better present an even and eventual higher expectation of your cotton to this market to which I refer to today. This is once again an economic management decision but the long term benefits of rescheduling your cash flow to obtain a reputation as a constant even quality supplier, will pay off well into the future.
Shipping

For quite a few years spinners have practiced a "just in time" (J.I.T.) delivery ideology to their raw material needs as profits are squeezed and their cash flow is needed in other areas. Many mills I am familiar with have gone from a 3 to 6 months supply of cotton to as little as two weeks. As you can imagine, if a mill buyer can not have complete confidence in receiving a shipment J.I.T from a certain supplier then they have to buy from a more trusted source. You have to earn this trust, as with it comes a demanded premium. If an expected shipment does not arrive in time, then a mill has to either buy stock on the open market at any price or close the mill. The next time they will pay more for a reliable J.I.T. shipper.

Just as a matter of reference a “premium” can be just being able to sell your cotton on a regular basis.

The current shortage of containers is severely affecting the reputation of the Brasilian industry today and will slow the uptake of cotton to replace other growths in our fine/medium count area.

Future Ideals

For over thirty-five years I have been trying to place cotton, a naturally grown plant fibre, from a gin to the ever-increasing demands of the modern spinner. The modern spinning mill requires cotton with parameters that are tighter and characteristics that are, at the moment, difficult to control under traditional growing and ginning processes.

As the cotton industry is renowned for its adoption of technology and innovation, I can envisage a day when cotton is grown under the scrutiny of aerial digital photography and satellite imagery. This would ensure that cotton is grown in harmony with the environment by alerting a producer manager via electronic means so that needs like fertiliser, water, pest management and defoliation are attended to, in a timely manner.

After this “perfect” cotton is harvested and moved to a gin, we would go back to the future with technology to perform testing of seed cotton in modules. Similar quality modules would be stored at a gin to enable predictable quality to be processed in an even running gin run to suit upcoming sales. Confirmation testing would be performed at the bale press and bales loaded directly into containers. Electronic transfer of all baled information, including quality results, would complete this ideal situation.

Segmented technology is almost capable of fulfilling these ideas, all we need to do is pull it all together.

We are getting there with developing means to rapidly test fibre characteristics, including neps at the gins. Crop image analysis by air and space is being carried out, so all that has to be done is to apply the experience of producers, agronomists, ginners and classers to transform these ideas to reality.
Conclusion

I am a newcomer to the modern Brazilian industry, although my beginnings here were in the Northeast of this country in 1974, but I am an old hand at the supply of fine/medium count raw material to the world market. I do not come to you with any pre conceived ideas and have been very careful not to claim to have the answers but I have fully explored the reason for change and looked at all the ramifications of these changes.

To summarise, I feel there is a definite need to have producers make a committed decision to grow a percentage of their crop for each of the markets available in this industry. This choice is not available to all growths worldwide and, for example, course count raw cotton material in Australia is heavily discounted because the growers cannot be relied upon to produce this style every year and therefore it can only be sold on the spot market. The choice to produce some higher quality cotton here is a bonus as it also covers any mistakes or economical decisions to drop out of the fine/medium count production and market into the lower count at a small price penalty.

There should be a commitment to the higher quality market to be able to sustain the current industry and especially if there is to be any expansion in the cotton producing area. This will be a hedge against any more decline in the domestic drill and denim market and will allow the industry to be more flexible to take advantage of any future shifts between these two areas – the decline in the U.S.A. course count market could even signal a larger shift in that direction to cover that shortfall.

Queensland Cotton is very committed to the supply of fine to medium styles of cotton to the Global market as shown by our long history in Australia since 1921, our purchase of Anderson Clayton in California in 1997 and our recent venture into Brazil this year. We are following our successfully proven plan by testing ourselves with the forward marketing group entering into a new area and redeveloping into our full company profile, as opportunities arise.

The success of the Brazilian industry breaking into this fine, medium count market globally is very important to Queensland Cotton as we are also looking to use our diverse locations as a natural hedge for our business.

Queensland Cotton
Cotton Cycle

<table>
<thead>
<tr>
<th>Australia</th>
<th>Brasil</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planting</strong></td>
<td>October – November</td>
<td>December - January</td>
</tr>
<tr>
<td><strong>Picking</strong></td>
<td>March – May</td>
<td>June - August</td>
</tr>
<tr>
<td><strong>Ginning</strong></td>
<td>March – August</td>
<td>June - September</td>
</tr>
<tr>
<td><strong>Shipping</strong></td>
<td>April – October</td>
<td>July - December</td>
</tr>
</tbody>
</table>

I also feel the fear of over supply to the market can only be a bonus to our customers by challenging all suppliers to produce a product that truly challenges synthetic fibre. It should be all our goals to produce a preferred fibre to the spinners so they in turn can convince the end consumer to wear cool natural breathing cotton instead of the onslaught of plastics so commonly seen in the modern sporting garments.