Cotton Catchment Communities CRC

FINAL REPORT

(due within 3 months on completion of project)

Part 1 - Summary Details

Cotton CRC Project Number: 4.5.01

Project Title: Measuring Contamination in Australian Cotton

Project Commencement Date: 01/07/2005 **Project Completion Date:** 31/06/2008

Cotton CRC Program: **The Product**

Part 2 – Contact Details

Administrator: Heather Dixon
Organisation: CMSE
Postal Address: P.O. Box 21,Belmont,Vic,3216
Ph: 03 5246 4000 **Fax:** 03 52464057 **E-mail:** heather.dixon@csiro.au

Principal Researcher: Rene van der Sluijs
Organisation: CMSE
Postal Address: P.O. Box 21,Belmont,Vic,3216
Ph: 03 5246 4000 **Fax:** 03 5246 4057 **E-mail:** rene.vandersluijs@csiro.au

Supervisor: Stuart Gordon
Organisation: CSME
Postal Address: P.O. Box 21,Vic,3216
Ph: 03 5246 4000 **Fax:** 03 5246 4057 **E-mail:** stuart.gordon@csiro.au

Signature of Research Provider Representative: _____

Part 3 – Final Report Guide (due within 3 months on completion of project)

(The points below are to be used as a guideline when completing your final report.)

Background

1. Outline the background to the project.

Contamination, **even if it is a single foreign fibre,** can lead to the downgrading of yarn, fabric or garments or even the total rejection of an entire batch. Most contamination arises from impurities being incorporated into the bale as a result of human interaction during harvesting, ginning and baling. An International Textile Manufacturers Federation (ITMF) study in 2001[1] reported that claims due to contamination amounted to between 1.4 – 3.2% of total sales of cotton and blended yarns. Most contamination arises from impurities being incorporated into the bale as a result of human interaction during harvesting, ginning and baling. Contamination represents a significant cost to spinning mills and this has led them to implement a range of methods to cope with contamination. These include:

- Avoiding or minimising use of cotton from origins that are known to be contaminated. International Textile Manufacturers Federation contamination survey results, direct experience with contaminated growths and industry hearsay are taken into consideration when purchasing cotton.
- Spinning mills situated in countries where labour costs are comparatively low employ large numbers of people to patrol the bale laydown and remove contamination from bales before cotton is fed into the blowroom line by the bale opener.
    - A small number of spinning mills are able to manually check and remove contamination from every bale of cotton before it is released for processing in the mill.
- Equipping blowrooms with contaminant detection and removal systems. These systems are typically installed at the beginning of the blowroom line before the final cleaning stage, although some spinning mills also install a second machine at the end of the blowroom line. The installation of contaminant detectors has imposed a cost to the spinning industry in excess of $US150 million over the past 10 to 12 years. It has been estimated that these detectors inspect approximately 30 - 35% of the global cotton consumption[2] amounting to approximately 3500 to 4000 systems installed worldwide[3]. However, according to one mill these systems only remove 60 – 65% of contaminants[4]. The inclusion of metal detectors in blowrooms has been a standard feature for many years.

[1] Strolz, H. M., 'ITMF Cotton Contamination Survey 2001', *proceedings* International Cotton Conference Bremen, pg. 35, 2002

[2] Strolz, H. M., 'A fresh look at cotton contamination', *Asian Textile Journal*, pg. 29, May 2004

[3] Personal communication at Asia ITMA, Shanghai, August 2008

[4] Vijayshankar, M., 'Processing Your Product – Using Australian Cotton', 13th Australian Cotton Conference, Broadbeach Queensland, August 8-10, 2006

- Equipping winding and spinning machines with yarn clearers that detect and remove foreign matter from the yarn before it is wound onto packages and delivered to the knitter or weaver. The types of contamination and the efficiency of removal depend on the sensors employed in these systems. However, in general these systems only remove 80 to 85% of contaminants[5]. Approximately 40% of yarn spun in China is cleared in this way versus 70% of yarn in the rest of the world[6].
- Installing fluorescent lights in the packing and inspection areas to detect contamination that fluoresces such as chemical/oil-based hydrocarbons and foreign man-made fibres such as polyester.
- Removal of contaminants manually from the fabric before it is dyed, finished and/or delivered to the next customer. This is however very time consuming and expensive and is applicable only to companies that are vertically integrated through to fabric manufacture.
- Applying chemical treatments such as bleaching/scouring in preparation for dyeing reduces the sightliness problem of some plant matter contaminants such as seed-coat fragments incorporated into fabric but adds further cost in processing and is not always acceptable to all customers.

All the methods and approaches discussed above reduce the risk of claims due to contamination but do not guarantee that the yarn or fabric produced will be totally free of foreign matter. There are no international standards written for acceptable levels and size of contaminants in fabrics, although the argument for zero contamination as a 'standard' is perhaps more compelling.

Australian cotton is generally viewed worldwide as a quality fibre with low or no contamination and is usually purchased (at a premium) with the intention of producing high quality fine count ring spun yarn. Figure 1 shows the average response of over 30 international spinners surveyed in 2002 and 2003 to their perceptions of fibre quality characteristics in Australian cotton[7]. Spinner's responses indicated that contamination was one of the most favourable properties of Australian cotton. However, despite this favourable response individual spinning mills at the time had concerns incidences of contaminants such as blue polypropylene and jute string (from jute/hessian bags) were increasing.

[5] Vijayshankar, M., 'Processing Your Product – Using Australian Cotton', 13th Australian Cotton Conference, Broadbeach Queensland, August 8-10, 2006

[6] Personal communication at Asia ITMA, Shanghai, August 2008

[7] Gordon, S., van der Sluijs, M. and Prins, M., 'Quality Issues for Australian Cotton from a Mill Perspective', *pub* Australian Cotton CRC, June 2004

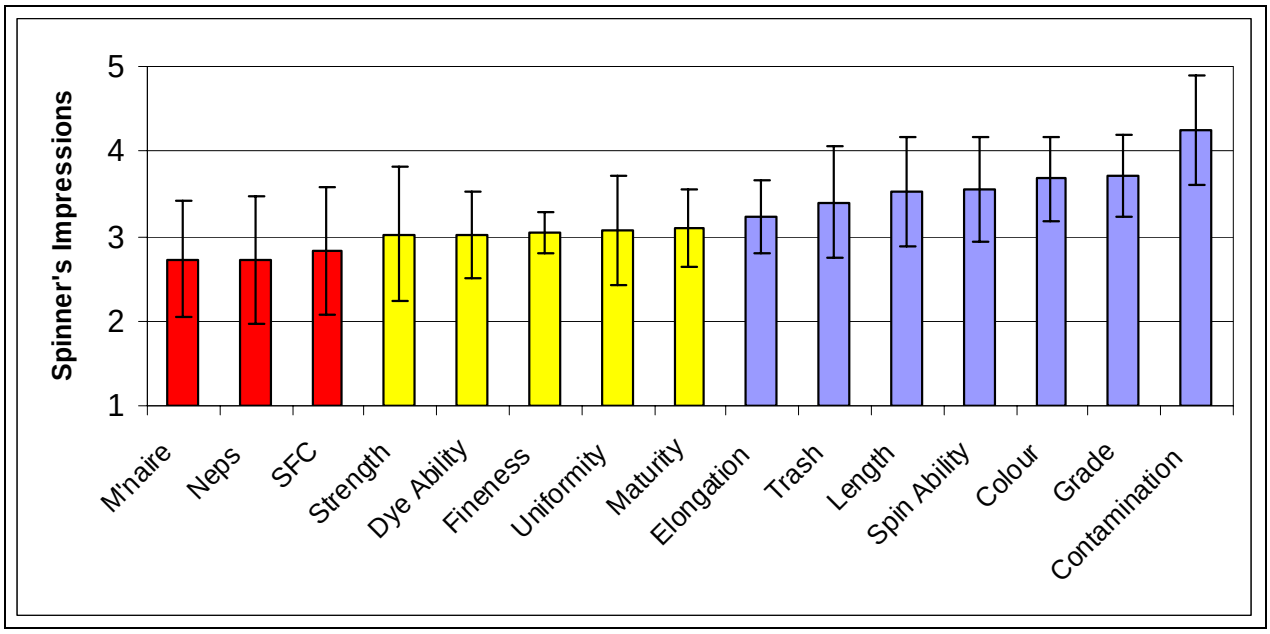

Figure 1 Average spinner's impressions of Australian Fibre Quality[7] (5 = good rating, 3 = average rating and 1 = poor rating). Error bars indicate one standard deviation in spinner's responses.

The results from the above survey support in part results of ITMF Contamination Surveys from 1989 through to 2005[8], which have showed increasing contamination in world and Australian cotton. The ITMF surveys are conducted on a biannual basis using the same protocol. Spinners are asked to rate the degree of contamination in cotton lint according to 16 categories of foreign materials listed in Table I according to whether they were non-existent or insignificant, moderate or serious.

Table I – ITMF Contamination Sources[8]

1	**Fabrics made of**	Woven plastic
2		Plastic film
3		Jute/hessian
4		Cotton
5	**Strings made of**	Woven plastic
6		Plastic film
7		Jute/hessian
8		Cotton
9	**Organic matter**	Leaves, feathers, paper, leather, etc.
10	**Inorganic matter**	Sand, dust
11		Rust
12		Wire, metal
13	**Oily substances/chemicals**	Grease/oil
14		Rubber
15		Stamp colour
16		Tar

[8] International Textile Manufacturers Federation, Cotton Contamination Surveys 1989 to 2007

As one would expect the degree of contamination varies widely from region to region. The most contaminated cotton continues to originate from India, Turkey and Central Asia. In contrast the least contaminated cotton continues to originate from Zimbabwe, the USA, Israel, Australia and some countries from West Africa. No growths are contaminant free. Analyzing results of the surveys from 1989 it is notable the degree of contamination or percent of cotton deliveries to spinning mills that were contaminated, steadily increased from 14% in 1989 to 26% in 2003, although a decrease to 22% was recorded in 2005 which was maintained in 2007 (see Figure 2).

A further breakdown reveals that the major source of contamination continues to be organic matter such as leaves, feathers, paper, leather, etc., which has steadily increased from 30% in 1989 to 50% in 2003, although it decreased to 40% in 2005 and 2007. The next most prevalent contaminant is fabrics and string made from cotton, woven plastic, plastic film and jute/hessian. There has been a general reduction in the incidence of oily substances/chemicals and inorganic matter since 1989.

Australia is still considered to be one of the countries least affected by contamination, although its ranking amongst cotton growing countries (for contamination free cotton) slipped from five to nine between 1999 and 2003 and to six in 2005 and third in 2007. The ITMF data shows that the incidences of contaminated Australian cotton increased from 5% in 1989 to 8% in 1999 and to 13% in 2003 and 2005 and 7% in 2007 (see Figure 2).

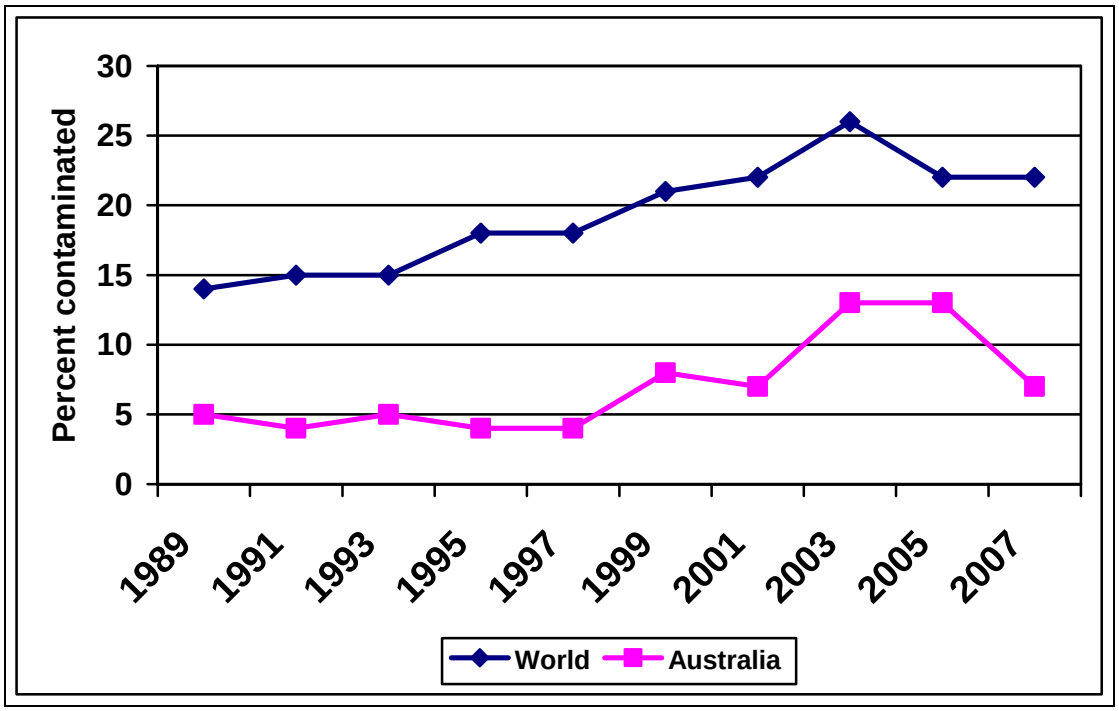

Figure 2 – ITMF Contamination survey results from 1989 to 2007[8]

In parallel with the world data, the major single source of contamination is organic matter which has steadily increased from 10% in 1989 to 36% in 2003 and decreased to 21% in 2007. The next most damaging source of contamination in Australian cotton is string and fabric made from jute/Hessian (probably from bale covering),

steadily increasing from 18% in 1989 to 44 % in 2003 and reducing to 16% in 2007, followed by plastic film fabric and string, cotton string and fabric, woven plastic (probably from module covers), inorganic matter and oily substances/chemicals.

It is important to note some limitations associated with the ITMF Contamination Surveys, which are as follows:

- Surveyed mills make a largely subjective assessment of the contamination found in a growth and moreover whether the occurrence in a particular growth has been insignificant, moderate or serious. On this basis the survey does not quantitatively measure the number or proportion of bales actually affected by contamination.
- Low overall numbers of contamination conceal 'higher levels' of particular contaminants as each category is given equal weighting in determining the average contamination number.
- With regard to Australian cotton, only a small number of spinning mills in our traditional markets such as China, Indonesia, Thailand, South Korea and Japan participate in these surveys.

With increased information demanded by retail customers, particularly with regard to environmental issues, and the way in which this information can be distorted it is prudent for the Australian cotton industry to investigate the existence of pesticide residue on cotton lint. This study is currently being undertaken with the University of Sydney and the results for this study will be reported separately once the analysis has been completed.

Objectives

2. List the project objectives and the extent to which these have been achieved.

The objectives of this project were to:

- Identify the major sources of contamination currently found in Australian cotton and the industry segments in which it is introduced, e.g. on farm, during harvest and module building, in the module yard or during ginning;
- Quantify the degree and type of contaminants found in Australian cotton bales.
- Brief on an annual basis growers and gin companies on survey outcomes and together identify and prioritise actions to minimise or eradicate contamination.
- Include descriptions of contamination minimization actions in the 'Ginning Best Management Practice (BMP)' and 'Harvesting BMP' handbooks.

The study has identified that contaminants found in Australian cotton originate from the harvest and module building segments of the cotton supply chain. The degree and type of contaminants found have been quantified using data and contaminant samples collected from a large spinning mill in Indonesia. Gins in Australia also collected and logged the incidents of contaminants in seed-cotton (modules) delivered to the module feeding area of gins during the 2006.2007 &2008 ginning season. Presentations on the level and type of contaminants found in

Australian cotton have been presented to the Australian Cotton Ginners Association at their Annual General Meetings and at the Australian Cotton Conference in 2006 and 2008. The Ginning BMP handbook has a section on contamination management which highlights the role that the ginners play in preventing contamination and the procedure to follow if contaminants are found.

Methods

3. Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related research.

In order to quantify the degree of contamination in Australian cotton and implement methods to eradicate contamination, it was necessary to obtain more accurate information on the level of contamination than can be gained from the ITMF Contamination Surveys, which although are very informative are subjective and measure only the contamination perceived to be found at the spinning mill. Thus this project comprised:

- Surveys of local ginners during the 2006, 2007 and 2008 ginning seasons to determine the degree and type of contamination found in cotton delivered in modules to the gin yards. A survey of this kind has never been conducted before and was needed to get a complete understanding of the magnitude and source of contaminants found in Australian cotton.
- Collecting all the contaminant material removed from Australian cotton bales exported to a large Indonesian spinning mill by a range of Australian and International merchant companies over a three year period from December 2005.
- Briefing growers and ginning companies progressively on survey outcomes and together identifying and prioritising actions to minimise or eradicate contamination.
- Formulating a BMP plan to reduce contamination for the industry at large.
- A preliminary investigation of chemical residues found on Australian cotton fibre and the development of test protocols to measure these on a routine basis.

Results

4. Detail and discuss the results for each objective including the statistical analysis of results.

Contaminants in Modules

During the past three seasons all operating gins in Australia have participated in the survey, collecting and recording all contaminants found in modules delivered to the module feeding area of the gin. Gins also recorded the costs of repair and replacement of parts due to damage caused by contaminants (see Table II). The costs quoted in Table II refer to the cost of repairing or replacing parts damaged due to foreign objects, but do not include the cost of labour or loss of production. A photo library was also compiled of the various contaminants found during this part of the study. Over 600 incidents of contamination were recorded from a total of 157,316 modules processed between 2006 and 2008 (see Table II). Figure 3 shows a

breakdown of contaminant type found in modules during the 2006, 2007 and 2008 seasons.

Table II – Details of contaminants recorded during past three seasons

STATISTIC	2006	2007	2008#
No. of gins	23	27	16
No. of Modules	81,121	53,042	23,153
No. of contaminant incidents	350	127	125
Probability of contamination incident in %	*0.43*	*0.27*	*0.54*
Cost to all gins in $AUD	46,420	45,313	-

Waiting further information from 2008

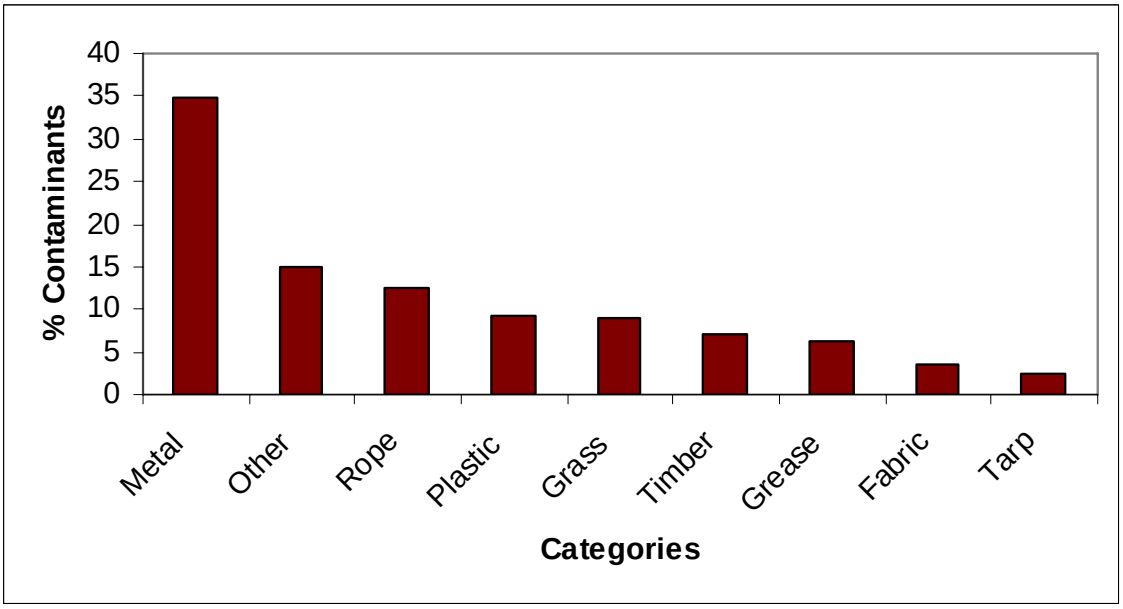

Figure 3 – Breakdown of contaminants (by number) found in modules.

The survey showed that the majority of contaminants found in modules were metallic pieces from harvesters, module builders and from transportation of modules to the gins. However as will be seen in the contaminants found in bales metallic objects are usually not a big issue for spinners as they are generally large and are easily removed during the ginning process either manually or by magnets, although they can cause considerable damage to the gin. This was followed by a category 'other', which included items such as mobile phones, shotgun shells, beer cans, oil cans, two-way radios, hats and rubber mats. This was followed by module ropes and plastic which included plastic bags, moisture pads from harvesters, strapping, rakes and a siphon. This was followed by grass and timber, which is followed by grease and oil which is mainly due to hydraulic oil. The fabric category includes all rags and cloth of any description and tarp refers to module covers.

Although the gins recorded a large number of rocks during the survey they were not considered in this survey as they are easily removed during the initial stages of the ginning operation.

Examples of the contaminants removed from modules at the gin are illustrated in Figure 4.

Figure 4 – Examples of contaminants collected from modules

Contaminants in Bales

P. T. Apac Inti Corpora (herein Apac Inti) is a large cotton spinning mill situated in Indonesia that performs a unique process at their mill; every bale of cotton is manually inspected before processing and contaminants, even single human hairs, are removed and collated. This allows for a direct measurement by weight and by type of contaminants exported with Australian cotton. Since 2000 Apac Inti has cleaned over 200 million kilograms of cotton sourced from around the world and have generated a large and accurate database on the levels of contaminants found in a wide range of growths.

Apac Inti's data[9] (see Table III) reveals that in 2004/05 some 20% of Australian cotton bales delivered to the mill had some contamination, up from 14% in 1999/2000. Under the Apac Inti system a single foreign fibre defines a contaminated bale. For the same period Apac Inti found that 23% of Chinese, 27% of Brazilian, up to 31% of US, depending on growing region, and 66% of West African cotton bales were contaminated.

[9] Vijayshankar, M, 'Extraneous Contamination in Raw Cotton Bales – A Nightmare to Spinners', *proceedings* International Cotton Conference Bremen, pg. 61, 2005

Table III – Percentage of bales contaminated received by Apac Inti

Country	1999/2000 (% bales)	2004/2005 (% bales)	2006/2007 (% bales)
Australia	14	20	12
China	20	23	-
Brazil	35	27	15
US	26	31	15
Uzbekistan	84	86	78
West Africa	58	66	63

The data for 2006/07 reveals that at 12% Australian cotton has once again decreased and is the lowest of all growths imported by Apac Inti. The data also however reveals that contaminants found in Australian cotton's major competitors such as Brazil and cotton from Memphis, San Joachim Valley (SJV) and Fiber Max in the US, have decreased over the same period.

In order to accurately quantify the degree and type of contaminants found in Australian cotton bales Apac Inti has been sending data and the actual contaminants removed from shipments of Australian cotton, amounting to over 4,825 tons or 21,256 bales, to CSIRO since December 2005 (see Table IV). Apac Inti reports contaminants as fibrous and non fibrous. During this study further analysis was conducted at CSIRO on the contaminants to identify the exact chemical composition of the contaminants with a view to accurately identifying their source. This was done by identifying fibres on the basis of their melting point using the Reichert–Jung Hot Bench with electronic stabilization.

Table IV – Australian consignments received by Apac Inti

Consignments	Tons	Bales
December 2005	976	4,301
April 2006	200	881
December 2006	1486	6,546
July 2007	818	3,604
December 2007	1035	4,560
March 2008	310	1,364

Table V and Figure 5 shows the proportion by number of fragments found of particular contaminants in Australian bales. The major contaminant found in bales delivered were pieces of cloth from either woven or knitted rags or clothing in various colours made from either cotton or polyester or blends thereof, followed by yarn made from either cotton or polyester or blends thereof. This was followed by polypropylene yarn in various colours, followed by followed by bird feathers jute/hessian yarn, human hair, plastics including shopping bags, lolly papers and garbage bag fragments, paper from newsprint and notepads and metallic pieces such as nuts, bolts and wire.

Table V – Contaminants found in Australian consignments received by Apac Inti

Contaminants	Total	Dec. 2005	April 2006	Dec. 2006	July 2007	Dec. 2007	March 2008
Total	5,140	482	96	254	583	1,600	2,125
Cloth	2,100	46	0	12	9	33	2,000
Yarn	1893	164	19	76	401	1,186	47
Polypropylene	425	98	16	116	52	124	19
Feather	277	93	7	23	30	112	12
Jute	159	54	28	13	24	21	19
Hair	147	15	24	7	27	70	4
Plastic	113	0	1	5	35	48	24
Paper	13	7	0	0	0	6	0
Metal	13	5	1	2	5	0	0
Bales	21,256	4,301	881	6,546	3,604	4,560	1,364

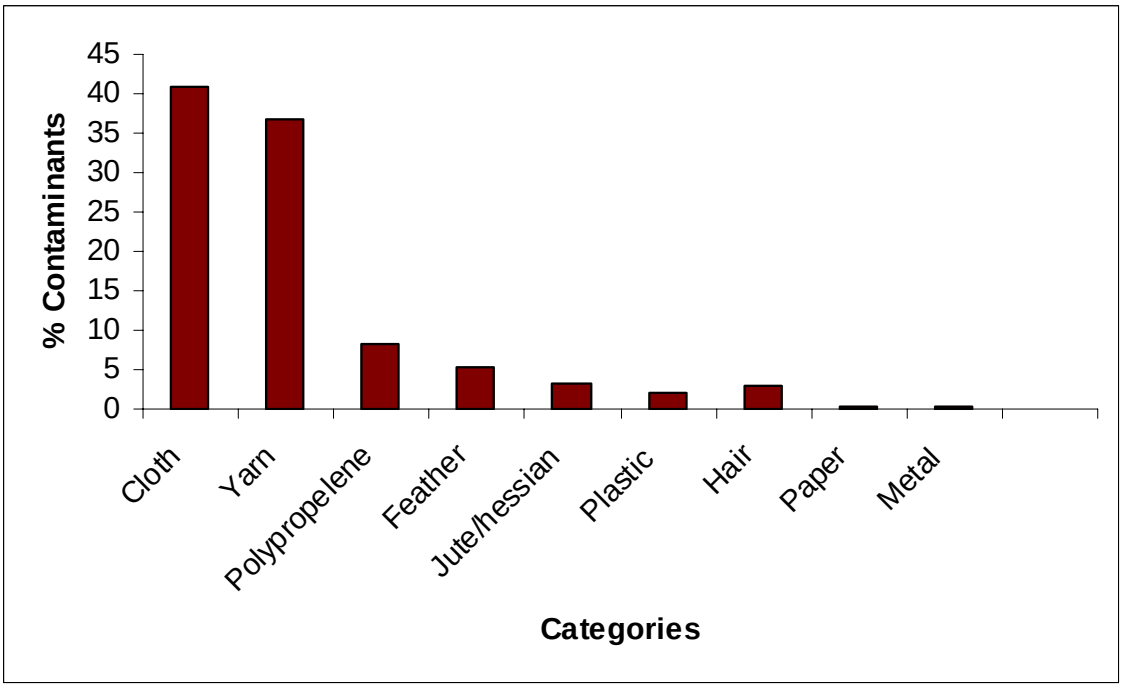

Figure 5 – Breakdown of contaminants (by number) found in Australian cotton shipments

Figure 6 shows contaminants removed from Australian cotton shipments. Contamination due to jute/hessian only amounted to 3.1% of the total contaminants found which indicates that if care is taken with storing/transporting and removal of the bale covers that there should be no problems with contamination.

Figure 6 – Examples of contaminants collected from Australian lint bales

It is surprising considering the fact the majority of Australian cotton is processed through two lint cleaners that a large amount of vegetable plant material (total of 645.8 grams from the six consignments), mainly from stems and branches was still present in bales delivered to Apac Inti .This vegetable matter was not included in the study as this will be easily removed during opening and cleaning process in the cotton spinning blowroom. There is also a large amount of stained cotton (mostly brown/orange in colour) present in the bales most likely due to hydraulic oil and grease.

In comparison with historical data from Apac Inti the data further reveals, there was an increase in the rate of contamination from 1.4 grams/ton in 1999/2000 to 1.9 grams/ton in 2004/2005, whilst contaminants found in Australian cotton's major competitors such as Brazil and some growths from the US decreased over the same period (see Table VI). However, data for 2006/07 reveals contamination found in Australian cotton decreased to 0.6 grams/ton, the lowest of all growths imported by Apac Inti. Reasons for this decrease are that there is an increased awareness of the issue of contamination in Australia and that the Australian crop has been decreasing over the past few years due to drought. The data also however reveals that contaminants found in Australian cotton's major competitors such as Brazil, West Africa and and cotton from Memphis, San Joachim Valley (SJV) and Fiber Max in the US, have decreased over the same period. Reasons for this decrease are that spinners are willing to pay a premium for contaminant free cotton and avoid growths that have a reputation for high contamination which has resulted growers becoming more aware of contamination.

Table VI – Contaminants by country of origin in grams/ton found in bales shipped to Apac Inti

Country	1999/2000 (grams/ton)	2004/2005 (grams/ton)	2006/2007 (grams/ton)
Australia	1.4	1.9	0.6
China	2.2	3.0	-
Brazil	3.2	2.7	2.4
US	2.8	2.0	1.4
Uzbekistan	-	9.1	2.4
West Africa	3.7	7.0	2.5

Results from this survey reflect the ITMF Contamination Survey results for 2007, which show that the level of contamination in Australian cotton reduced from 13% in 2005 to 7% in 2007 (back to the levels recorded in 1999 and 2001, but still higher than levels recorded in 1989 to 1997), whilst the degree of contamination in all growths remained steady at 22%. This improvement also resulted in an improvement in Australia's ranking from sixth to third in terms of contaminant free cotton.

Sixteen percent was contaminated with jute/hessian. This is a major reduction from the 34% recorded in 2005 and is due to the fact that in 2007 at least 50% of the Australian crop was covered with cotton bale covering up from 31% in 2005[10].

Comparison of contaminants in Modules and Bales

The data for the contaminants found in modules and bales as presented in Table V and Figure 3 and 5 shows that the major contaminant found in bales at 77.7% is cloth and yarn followed by polypropylene at 8.3%, feathers at 5.4%, jute/hessian at 3.1% plastic at 2.2% and paper and metal at 0.25%. In contrast the major contaminant found in modules at 34.8% is metal followed by other at 15%, rope at 12.5%, plastic at 9.2%, grass at 9.0%, timber at 7.2%, grease/oil at 6.2%, fabric at 3.5% and tarps at 2,5%.

The difference between the findings can be explained by the fact that the metal and timber will be removed during the ginning process as they are generally large and in the case of metal will be caught by the magnets installed in the system. Grass will also be removed during the ginning process. Any fabric, plastic, rope and feathers that are not detected and removed prior to the ginning process will be disintegrated as the lint goes through a large number of machines during the ginning process which could potentially cause problems for the spinner.

[10] Gordon, S. and van der Sluijs R., 'The Use of Bale Coverings in the Australian Cotton Industry', report for CRDC, August 2006

A preliminary investigation to determine if there are any chemical (pesticide) residues on Australian cotton fibre is still being conducted in conjunction with Dr. Angus Crossan from The University of Sydney, NSW. The investigation will describe the analysis of cotton lint, seed cotton and seed collected from various modules with known pesticide treatment history and determine the levels if any of pesticide residues in the seed and lint. The results of this analysis will be reported separately.

Outcomes

5. Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

Results of this survey provide a true and objective indication of the degree of contamination found in Australian cotton in the previous three ginning seasons (2005/06, 2006/07 & 2007/08). Growers and ginning companies will be briefed of the results at forums over the next six to 12 months. The main outcome from these forums will be to identify and prioritise actions to minimise or eradicate contamination in Australian cotton. The prescribed actions for growers, ginners and harvesters will be communicated via BMP practices.

6. Please describe any:-
   a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);
   b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and
   c) required changes to the Intellectual Property register.

N/A

Conclusion

7. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

There is no doubt that Australian cotton is under pressure to regain market share after a number of years of drought. Coupled with the current oversupply of cotton world wide and the emergence of other high quality growths on the export market, the only way to make this happen is by offering consistently high quality fibre. The industry will thus need to continue to control contamination, a property which is seen as being one of the most attractive aspects of Australian cotton. Although the amount of foreign matter found in Australian cotton bales is small relative to other growths it must be borne in mind that during yarn formation cotton is processed through a large number of machines which can lead to further disintegration of the contaminants which will subsequently lead to quality and production issues. The

study found that the harvesting/module building operations are the major contributors to contaminants found in modules and the challenge for the industry is to raise awareness and BMP's should be developed for harvesting and warehousing/transportation and contamination should be included in grower BMP to complement BMP's already in place for ginning and classing.

Extension Opportunities

8. Detail a plan for the activities or other steps that may be taken:
   (a) to further develop or to exploit the project technology.
   (b) for the future presentation and dissemination of the project outcomes.
   (c) for future research.

Findings from the contamination surveys have been conveyed to members of the Australian Cotton Ginners Association at their Annual General Meetings in 2006, 2007 & 2008. Contamination also forms an integral part of the BMP for ginning. Contamination as a topic has also been incorporated into the 'Cotton Field to Fabric' Training Course. A number of papers describing the survey and contamination levels in Australian in general have been published in the local and overseas press; see details listed below.

It is proposed that a report on this work be published (similar to the Mill Survey) for circulation amongst the industry and to current and potential customers of Australian cotton.

Publications

9. A. List the publications arising from the research project and/or a publication plan.
   (NB: Where possible, please provide a copy of any publication/s)

- M. H. J. van der Sluijs, Contamination in Australian Cotton, *Australian Cotton Grower*, **Vol 27 (1)**, pg 26-30, Feb-Mar 2007
- M. H. J. van der Sluijs, Contamination in Australian Cotton *Textile Asia*, **Vol 38**, pg 63-66, July 2007
- M. H. J. van der Sluijs, The Issue of Contamination, *CRDC Spotlight*, pg 22-24, Winter 2008
- M. H. J. van der Sluijs, Vigilance will ensure cotton remains contaminant free, Farming Ahead, **No. 199**, August 2008

B. Have you developed any online resources and what is the website address?

N/A

Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

Contamination, even if it is a single foreign fibre, can lead to the downgrading of yarn, fabric or garments to second quality or even the total rejection of an entire consignment and is thus a very important fibre parameter.

The Australian Cotton CRC Mill Survey rated contamination as one of the most favourable fibre properties of Australian cotton. However, there has been concern that incidences of some contaminants are increasing. This was supported by ITMF Contamination Survey findings from 1999 to 2005, which showed an increase in the number of contaminated Australian cotton bales delivered to overseas spinning mills. The major source of contamination identified in these surveys is organic matter such as leaves, feathers, paper and leather followed by string and fabric made from plastic film and from jute and hessian.

The objective of this project was to accurately quantify the degree and sources of contaminants found in Australian cotton. CSIRO conducted a survey of ginning companies and gathered samples to determine the type and amount of contamination present in modules. The survey found that the majority of contaminants found in modules were metallic pieces from harvesters, module builders and from transportation of modules to the gins. This was followed by 'other', which included items such as mobile phones, shotgun shells, beer cans, oil cans, two-way radios, etc., followed by module ropes, plastic which included plastic bags, grass and timber, grease and oil which is mainly due to hydraulic oil, followed by fabric which includes rags and cloth followed by tarp which refers to module covers.

With the assistance of a large international spinning mill CSIRO was also able to quantify the degree and type of contaminants found in Australian cotton. The major contaminant found in bales delivered were pieces of cloth from either woven or knitted rags or clothing in various colours made from either cotton or polyester or blends thereof, followed by yarn made from either cotton or polyester or blends thereof. This was followed by polypropylene yarn in various colours, followed by followed by bird feathers jute/hessian yarn, human hair, plastics including shopping bags, lolly papers and garbage bag fragments, paper from newsprint and notepads and metallic pieces such as nuts, bolts and wire.

The survey showed that in 2006/07 Australian cotton contained the lowest levels of contamination of all growths imported by the spinning mill. The data also reveals

that contaminants found in Australian cotton's major competitors such as Brazil, West Africa and some regions in the US are also decreasing.

There is no doubt that the continued and increasing presence of foreign matter in raw cotton is a serious issue for textile processors and it is pleasing to note that the amount of foreign matter found in Australian cotton bales continues to be small relative to other growths. One must not lose sight of the fact that during yarn formation cotton is processed through a large number of machines which can lead to further disintegration of the contaminants which will subsequently lead to quality and production issues. The challenge for the Australian cotton industry is to provide cotton with zero contamination. In response to this challenge, the Australian ginning sector is implementing Best Management Practices (BMP) and the industry is currently investigating the possibility of integrating decontamination systems into the gin .These measures will reduce and possibly eliminate the occurrence of foreign matter in modules delivered to the gin yard and subsequently the bales delivered to the spinner.