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Alternative marketing systems for the apparel wool textile supply chain: filling the communication vacuum

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Abstract

Analysis of secondary data and information gathered from interviews with downstream wool supply chain members suggests that problems exist with the sourcing of raw wool for the apparel textile industry. Specific problems relate to 'hard' attributes, such as contaminated fibres and fibre diameter, as well as 'soft' attributes, such as origin of the wool and the nature of wool production systems. These problems may arise due to inadequate communication of quality attributes between chain members. The authors argue that more effective communication in the apparel wool supply chain requires the removal of 'functional silos', where supply chain members fail to look outside (upstream and/or downstream) their specific sectoral interests, and the continued dominance of the auction as the primary marketing system. The authors conclude that the apparel wool industry needs to co-operate to compete in dynamic, global markets increasingly dominated by synthetic fibres, in which vertically co-ordinated supply chains are the norm, auctions non-existent and communication is seen as a strength, rather than a weakness.

1. Introduction

During the 1990s the various sectors of the world's wool production and processing supply chain have faced a period of static demand and correspondingly poor prices, a declining share of the world textile market and changing consumer tastes. The industry also suffers from a number of points of disadvantage with respect to competing fibres. For example, the time from wool harvesting (shearing) to availability at retail may be up to

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2 years (Seaman, 1998a; Wool Industry Future Directions Task Force, 1999) and compared to cotton and synthetic fibres, wool is expensive and difficult to process, and as a result typically maintains a 3.5:1 price premium against these 'benchmark' fibres (Seaman, 1998a). Wool is also small with respect to market share. By comparison, cotton represents approximately 45% of the world textile trade and polyester, 35% (Wool Industry Future Directions Task Force, 1999).

Production systems also differ. While wool and cotton are both natural fibres, the production environment for cotton is more controlled, typically involving intensive cropping with irrigation, whereas wool is produced from extensive grazing or rangelend enterprises (Wool Industry Future Directions Task Force, 1999). Polyester and other synthetic fibres have no environmental variability impacting on their production and hence quality. Wool production is dispersed with respect to its production units and the links between producers and processors. This is certainly true compared to both cotton and polyester and has significant cost implications (Wool Industry Future Directions Task Force, 1999). These cost differences were underlined clearly in a review of the New Zealand wool industry by McKinsey and Company (2000) who found a NZ$8/kg cost disadvantage for a carpet manufacturer to produce a wool carpet, compared to making a carpet of similar style from nylon (see Table 1).

The combined impact of these factors has been acutely felt by the world's largest wool exporters, Australia and New Zealand, which together account for 92% of world wool exports (IWS, 1998). In response to these conditions, major wool industry reviews were commissioned in Australia (Wool Industry Future Directions Taskforce, 1999) and New Zealand (McKinsey and Company, 2000). Both reviews provided recommendations relating to the need for woolgrowers to communicate more closely with their downstream customers, in order to better understand their requirements for raw wool. In this sense, at least in outlook, the wool industry is beginning to move from production to market orientation and will mirror changes in other agri-food industries (Meulenberg & Viaene, 1998). However, there are few concrete ideas on how to achieve this transition quickly, efficiently and effectively and recent history has seen a number of failed attempts on behalf of various growers and grower groups, to add value to their wool in various ways (Seaman, 1998a).

This paper presents the initial findings of on-going research to assess the level of communication between the various links in the apparel wool supply chain, with particular emphasis on the link between woolgrowers and their downstream customers. The paper is in four parts. First, the characteristics of traditional wool marketing systems are discussed; the research method for the collection of primary data is then described; evidence drawn from

Table 1
Comparative processing costs (NZ$/kg) for carpet made from competing fibres

Fibre	Spinning/dyeing cost	Tufting cost	Total
Wool (scoured)	8	15	23
Nylon staple	7	8	15
Polypropylene	0	8	8

Source: (McKinsey and Company, 2000).

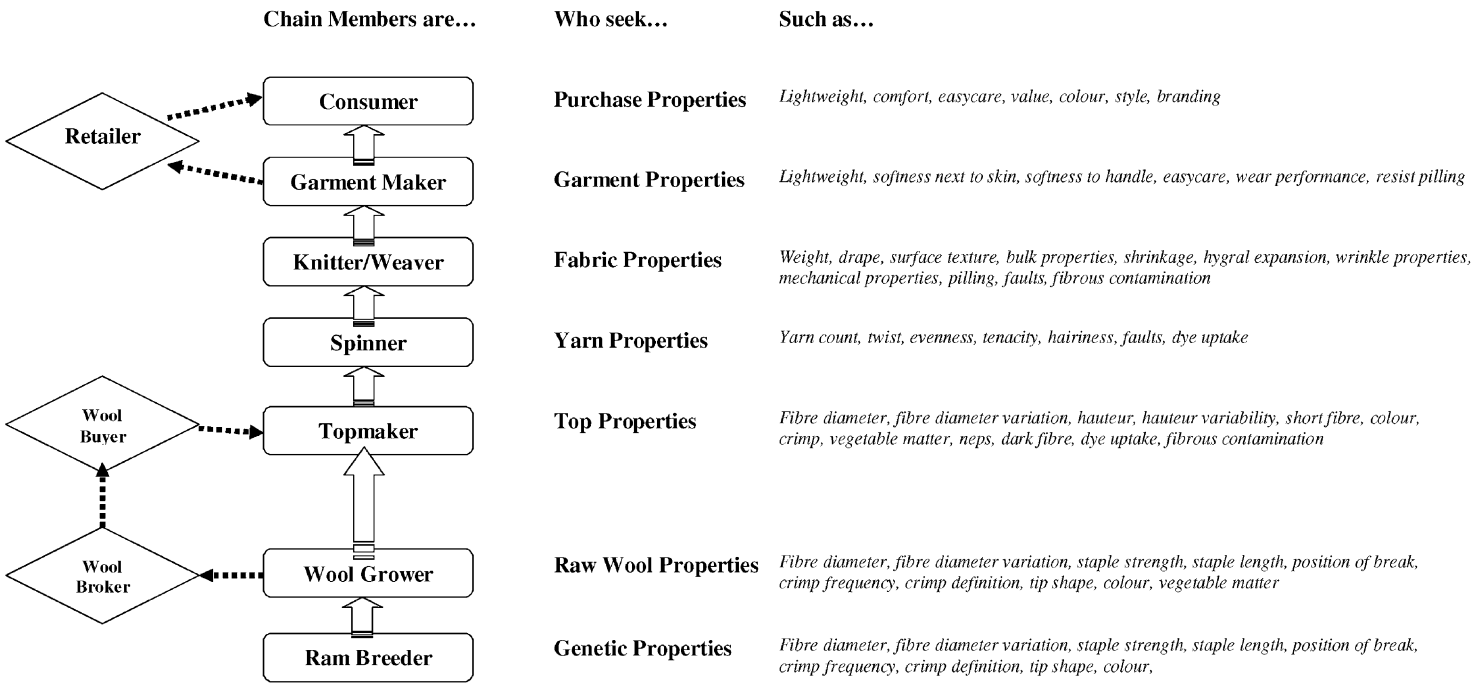

Fig. 1. The apparel wool supply chain (adapted from Seaman, 1998b).

published wool industry studies and interviews with downstream participants in the European apparel wool supply chain, is discussed; and the final section highlights the key areas for further research.

2. Characteristics of wool production

2.1. The structure of the apparel wool supply chain

The apparel wool supply chain is, arguably, one of the more complicated and elongated (in terms of transformation stages, lead times and geographical location) of the different players within the food and fibre industries (see Fig. 1). This increases the likelihood of marketing system mismatch and makes it more difficult for commodity marketing systems, such as auction markets, to adequately serve the needs of the many and disparate players.

2.2. Characteristics of the production base and traditional wool marketing systems

In 1996–1997, exports of raw and processed wools accounted for 16% of Australia's total rural exports by value (AU$3.74 billion). Exports are highly concentrated with the top six markets of China, Italy, France, Taiwan, Japan and Germany, taking 68% of these (Ward, 1998). In 1996–1997, 46,300 farms ran sheep in Australia, although only 12,700 (27%) received the majority of their income from sheep and wool and hence are often referred to as 'specialist' wool producers. Approximately 75% of Australia's wool production comes from the 37% of farms producing more than 11,000 kg per annum. (Martin, 1998).

The difficulties experienced by the industry are also evident in the data relating to farm financial performance. Between 1994–1995 and 1997–1998 only 50% of wool producing farms returned profits. Top-performing farms, earned rates of return typically three times the average of all wool-producing farms and were characterised by their receipt of higher prices per kilogram wool sold and their operation by younger farmers. These farmers were also typically members of the Landcare movement, had approved farm plans and had attended training activities in the past 5 years (Martin, 1998).

Average annual farm production ranges from 7 to 22 tonnes of clean wool per annum, whereas early stage processing mills will process 10,000–20,000 tonnes per annum and a late stage processor between 1,000 and 4,000 tonnes per annum (Dolling, 1999). This size imbalance between mill and farm production batch means that interdependence is difficult to achieve (O'Keeffe, 1998) and this in turn limits the likelihood of improved communication flow as information generated from the processing of a mill batch is irrelevant to a farm lot (Dolling, 1999).

In terms of current practice with respect to wool selling and marketing systems, auctions dominate with approximately 84% of wool being sold in this way (Ward, 1998). Wool brokers act on behalf of the woolgrowers, and while there are forty registered brokers in Australia, the largest two handle 60% of production (the 'clip'), and the largest ten account for more than 90% (Ward, 1998). Brokers facilitate the sale of growers' wool through the auction system and more specifically, they (McKinsey and Company, 2000):

1. Receive wool from the grower.
2. Provide technical and financial services to the grower.
3. Arrange the auction.
4. Store wool until sold.
5. Assemble bales into lots, each lot averaging from six to seven bales and typically ranging between three and ninteen bales.
6. Arrange for raw wool testing.
7. Appraise the wool subjectively.
8. Sell wool on behalf of the grower and invoice the buyer.
9. Provide feedback to the grower on the quality of the wool and a market appraisal.
10. May store wool after sale at cost to the buyer.
11. Deliver wool to the dump or the local processor.
12. Guarantee payment.

On the other side of the transaction, wool buyers act on behalf of the processing sector. Again, while there are 50 buying firms active in the auction sector, 10 account for 55% of all Australian sales (Ward, 1998). The top 15 or 20 largest buying firms are processors, either owning early stage processing equipment in Australia or overseas or else processing on commission (Quirk, 1997). The buyers' role is to purchase wool from the broker under sale contract with the processor. The processor may source wool through an in-house buyer, through a third-party buyer or a mixture of both. Buyers receive orders for wools of particular specification from a processor and agree to supply the wool for a certain price. The buyer then buys the wool, mostly at auction. The buyer will try to obtain the wool at the lowest price, including lots of differing quality so that the physical parameter averages meet the specification required (McCrea, Dickinson, & Hawley, 1998). In addition, the buyer will undertake the following functions (Dolling, 1999):

1. Accumulation of wools to fill a processing consignment.
2. Combination of wools to meet specification.
3. Guarantee of the quality of the wool top, with the carriage of risk.
4. Arrangement of transport and handling.
5. Organisation or provision of financial facilities such as credit, part- and extended-payment.
6. Arrangement of international trading contracts.
7. Hedging of interest rates and currency associated with international transactions.

In common with most commodities, wool prices at auction can be volatile as raw wool quality is variable and wool is costly to store (Lubulwa, Beare, Bui-Lan, & Foster, 1997). On Australian wool producing farms, production risk contributes about 20% of the volatility in annual farm income while price volatility contributes the other 80% (Woods & Honey, 1998). For approximately 20 years from the early 1970s, a reserve price scheme removed this volatility and saw the auction system dominate as the main means for selling wool, with 80% to 90% of the clip being sold through the auction system. The majority of the remainder was sold through private treaty merchants and a very small proportion sold through forward contract (Lubulwa et al., 1997).

For woolgrowers, this dominance of the auction system means that diversity is lost, as wool is channeled through a small number of brokers, exporters and topmakers, before diversity reappears amongst the larger number of spinners, knitters and weavers (Wool Industry Future Directions Task Force, 1999). Additionally, auctions add extra costs through wool delivery via the broker rather than directly to the mill, and because of the costs associated with the broker's storage of the wool and running of the auction. Also, growers prepare wool for auction without knowing the identity of their customers and so cannot seek to meet specific market or customer specifications (McKinsey and Company, 2000).

However, the auction meets some important needs through its activity as an aggregator. This ensures competition and sets a public market price, and provides a simple and open method for buyers and sellers to transact. For the buyer, the auction gives confidence in the quality of wool purchased, a guarantee of the integrity of the contract and the timing of delivery. As a result, the auction should not be abolished (McKinsey and Company, 2000). It deals with the principal problem associated with forward sale of wool, that is that the quality of wool produced is likely to be different from that specified in the contract, due to factors beyond management control, principally environment/season (Lubulwa et al., 1997). That is, poor 'programmability' is an inherent characteristic of the wool production system.

2.3. Is wool a product or a commodity?

A fundamental question for wool as a textile fibre is whether it is a commodity or a product. While the question may seem 'academic', the implications are significant as they should guide management decisions by all members of the wool processing chain.

A *commodity* can be defined as ''materials in their natural state which are often termed primary commodities'' (Barker, 1992). In contrast, Kohls and Uhl (1990) define a *product* as ''a bundle of physical, service and symbolic attributes that satisfies consumers' wants and needs''. The first key point to note is that commodities are in their ''natural state'' and are materials, that is they do not consist of intangible attributes such as service or other characteristics which may be of value to the consumer. The second is that a product is directed towards an end user rather than being sold 'blind' onto a market. While these definitional differences may seem simple their operationalisation in the marketing system can be difficult and the change required to move from a commodity culture to a product culture is fundamental.

The interaction between 'unit type' (i.e., commodity or product) and the market is detailed by Boehlje, Schrader, and Akridge (1998), who identify currently a distinct move away from commodity markets, with minimal interaction between actors, to a more interactive, co-ordinated form in which differentiated products are traded:

> ''... in traditional commodity markets where specific attributes are not demanded, supplies are fully adequate and can be obtained from various sources, and information flow between the stages are minimal, traditional spot commodity markets can function quite effectively and efficiently. As one deviates from these conditions—which is increasingly the case with more specificity in raw materials and information flows, and with fewer potential sources of acceptable supplies—various forms of negotiated

co-ordination systems become more effective and necessary for efficient functioning of the production and distribution system.''

The importance of the determination of 'unit type' is that it guides marketing system choice. When a product is treated as a commodity or vice versa, a mismatch and resultant inefficiency occurs. In most agricultural systems it is more likely that the first of these cases will be typical, i.e., that loss of value will occur through the inability to exploit or develop non-material or 'intangible' aspects of the product such as service, brand etc. as the commodity marketing system used does not allow efficient communication of these attributes.

In Kohls and Uhl's definition of 'product', the consumer is central to product construction. Altmann (1997) further asserts that the product must primarily solve the problems of the consumer, then those of the middleman and finally those of the producer. As the requirements of the three markets do not go hand-in-hand, then a compromise must be reached, but the consumer must remain the driver of the system. Any potential mismatch is important as it impacts on the consumer through the delivery of goods of poorer 'value'.

With respect to these issues, wool's position is unique. It is a vast range of products which combine physical and potentially strong 'intangible' attributes. Yet it is treated largely as a commodity, without recognition of this product diversity, the result being weak connections between the actors in the marketing system. The result of this mismatch of product with commodity system, is lost value. To this end, it is useful to consider the Wool Industry Future Directions Taskforce's (1999) comments:

> ''There is a tendency in general discussion to refer to the wool industry as though it were a single commercial entity. It is not ... It is merely the statistical aggregation of independent businesses. Those businesses are characterised by diversity not homogeneity ... The same is true of other businesses along the textile chain.''

This view is further supported by McKinsey and Company's (2000) recent inquiry into the New Zealand wool industry. They found:

> ''Different types of New Zealand wool have very different markets and end uses. Understanding the major markets and the competition that wool faces is the first step in assessing the potential for demand growth or the opportunities to service more attractive market segments.''

Additionally there is increasing importance placed on product differentiation at the retail level, as consumers increasingly look for intangible attributes conveyed via quality labels (e.g., The Woolmark), brands (e.g., New Zealand Merino) which may serve a range of purposes, and fashion labels. As Rowe (1995) states:

> ''Label recognition is comfort zone shopping for the customer who is time poor and requires track record of reliability ... It is vital to position wool in association with leading brands at all market levels to more easily access the customer.''

However, auction systems do not represent complete communication vacuums. While almost all commodities are regarded as homogeneous, they typically display significant variability in product characteristics which are of importance to buyers. As a result, even in auction systems, sellers use grading systems in an effort to improve price and to communicate this variability to buyers. Grades and standards fill a number of roles. As Carman (1997) points out, they convey information about a commodity that facilitates communication between buyers and sellers and provide a framework for improving the flow of information, they reduce transaction risk, they increase the physical boundaries of markets and they increase economic and productive efficiency.

In the wool industry, the impact of grades is seen in the diversity of description of wool lots offered at auction. This diversity translates into various premiums and discounts based on type and level of defect (e.g., vegetable matter and colour contamination, and poor fibre strength) and on the most important quality attribute, fibre diameter, as illustrated in Table 2.

Grades make possible 'sale by description' systems and generate more accurate market information. They act to lower buyer and seller search and transaction costs and foster a more efficient price discovery mechanism (Kohls & Uhl, 1990). However, very few grades are carried through to the retail level, with consumers relying more on brands as indicators of quality (Carman, 1997). The fundamental question is whether these systems add or convey information relating to consumer perceptions of value. If they do not, then system efficiency is lost and consumer value will suffer. So in summary, the key differences between the commodity and product approach to wool marketing are as detailed in Table 3.

As mentioned previously, the need for improved communication between buyers and sellers is identified by Boehlje et al. (1998) as a driver of the move away from commodity markets to more interactive, co-ordinated market forms. The question is whether communication in the apparel wool supply chain meets the needs of growers, intermediate processors and end users. In a spot market, such as an auction, relationship and therefore the level of communication between the actors, is weak, whereas in a more co-ordinated or integrated marketing system it is (potentially) strong. As a result, any analysis of the fibre marketing system must analyse the relationship between the actors in the system and as part of this, their level of communication and interaction.

Table 2
Discounts (%) in the first quarter of the 2000–2001 season for various wool faults in different fibre diameter categories

Fibre diameter descriptor	Fibre diameter (μm)	Vegetable matter (3 vs. 1%)[a]	Fibre strength (25 N/ktex vs. 38 N/ktex)[b]	Point at which discounts are applied for strength (N/ktex)	Colour (medium)
Superfine	16.6–18.5	11	19	40	–
Fine	18.6–20.5	8	7	35	10
Medium	20.6–22.5	5	4	29	6
Strong	22.5–24.5	5	2	28	4

Source: (Woolmark, 2000a, 2000b).

[a] Australian mean vegetable matter level for first half of 2000–2001 season = 2.0% (AWTA, 2001).

[b] Australian mean staple strength for first half of 2000–2001 season = 35.4 N/ktex (AWTA, 2001).

Table 3
Commodity and product/marketing approaches to marketing wool

Commodity approach (traditional)	Marketing/product approach (SCM)
No known customer	Wool viewed as part of the textile industry
No agreed price at point of production	Exploration and development of an understanding of the customers needs
No agreed product specification	Production of wool which is fit for purpose to satisfy customers needs
No agreed delivery date	Differentiation of product through branding
Speculation on receipt of profitable price at auction	Promotion of product on the basis of delivery to an agreed price, specification and date. An active marketing strategy and plan

Source: Dolling (1999).

3. Methodology

This study sought to collect preliminary data relating to communication in the apparel wool supply chain. To assess the effectiveness of this communication, data was collected relating to the improvement of raw wool quality, especially contamination, a highly publicised issue of importance to the processing sector. The data was collected from mostly downstream or 'late stage' wool processors; the spinners and weavers. This arose due to the interests of, and interaction with, a Tasmanian woolgrower group with whom the lead author had previously worked. They saw potential opportunities through collaboration with these late stage processors, leveraging off grower involvement in on-farm quality assurance and through their perception that late stage processors were best placed to reap the benefits of the improved wool quality this delivered.

The target markets of Germany and Italy were the focus of data collection, due to Western Europe being the dominant purchaser (>50%) of Tasmania's wool in the past (DPIWE, 1999), and due to the continued high quality, high value focus of these markets. A comparison of Western Europe's buying patterns in Tasmania compared to Australian wool production as a whole are shown in Table 4. For Australia as a whole, China is the largest purchaser, but only ranks third for Tasmanian wool. It is important to note that Tasmania produces only ~2.75% of Australia's wool, however it remains an important industry within the state, with a farm-gate value of up to AU$100 million.

Table 4
Western European wool purchases (% of production) for the Tasmanian and entire Australian wool clip

Country	Tasmania	Australia
Germany	18.6	6.2
Italy	16.9	14.9
France	11.8	8.7
United Kingdom	6.5	2.8

Source: DPIWE (1999).

Table 5
Description of informant organisations by country and chain element/position and the status of the countries as destinations for Australian raw wool exports

Chain position	Chain element (sector)	Germany	Estimated sectoral market share in Germany[a] (%)	Italy	Estimated sectoral market share in Italy[a] (%)	Total informants
Upstream	Topmaker	1[b]	35.7	N/A	–	1
	Spinner	1	26.9	1	15.6	3
Downstream	Weaver	2	26.1[c]	3	7.5	4
	Total	4		4		8
	Aust. destination rank[d,e]	9		2		
	Tas. destination rank[f,g]	1		2		

[a] Estimated market shares of interviewed firms based on production figures provided in the interviews and national statistical data for 1996 (IWS, 1998). Data assumes majority of raw wool production and an average fabric weight of 250 g/m. Value is a total for all firms interviewed within a sector.
[b] Informant operates topmaking capacity in both Germany and Italy.
[c] Data available for one firm only.
[d] Source: Woolmark (2000c).
[e] Where 1 is the largest export destination for the entire Australian wool clip.
[f] Source: DPIWE (1999).
[g] Where 1 is the largest export destination for Tasmanian wool.

Italian and German spinners, weavers and a topmaker (see Table 5) were approached to provide comment and insights on aspects of raw wool quality, raw wool contamination and communication with woolgrowers during January 1999. With the assistance of staff of The Woolmark Company's Dusseldorf, Germany and Biella, Italy offices, middle-senior management representatives of appropriate spinners and weavers were identified as being key informants and were interviewed. These informants were single individuals in some organisations and small groups (up to four persons) in others.

Semi-structured interviews, were conducted with a representative from each organisation. This interview method was chosen due to the small sample space and the desire to generate rich qualitative data enabling the exploration of the underlying issues the authors were seeking to examine. Permission to record the interviews was provided by all informants and the tape recordings were later transcribed. It should be noted that staff of The Woolmark Company acted as interpreters in meetings where interviewees did not speak English, or on occasions where interpretations/translations of technical information were needed.

4. Key findings

Data from the interviews is summarised in Tables 6 and 7 and the sample verbatims presented below are taken direct from the transcripts and represent unaltered processor comments. It should be noted that not all informants were able to answer all questions.

Table 6
Structure of the interviewed organisations and responses to questions relating to wool quality and contamination

Questions	Organisation number							
	1	2	3	4	5	6	7	8
Structure of the organisation								
Chain element	Weaver	Weaver	Spinner	Knitwear spinner	Worsted and woollen weaver	Spinner	Weaver	Topmaker and trader
Fibre diameters processed (μm)	18.5–19.0	18.0–21.5	15.0–20	19.5–20.5	19.0–21.0	18.5–26.5	19.0–23	<18.0–21.5
Volume processed	300,000 kg	1,000,000 kg	1,500,000 kg	10,000,000 kg	15,000,000 lm	~11,000,000 kg	N/A[a]	11,500,000 kg
Australian wool as a proportion (%) of total wool consumption (%)	90	100	100	90	~100	85	~90	70
Buying arrangements	70–80% purchased as yarn, the remainder as top spun on commission.	Mainly top, but recently started purchasing greasy wool in an effort to improve wool quality.	Source both greasy wool and top.	Purchase at auction and by forward contract through in-house buying office.	Purchase of raw and dyed yarn	Purchase top only	Purchase yarn only.	All buying systems used.
Wool quality and contamination								
Has wool quality improved over the last 10 years?	Yes, but buying patterns have changed and as a result, higher quality wools have been purchased.	There has been improvement but not sure whether this is significant.	Yes, in general.	No, but differences have been noted between suppliers.	Not sure	Yes	Not sure, probably not.	Has improved, but not significantly.
Do you have problems with contamination?	No	Yes	Yes	Yes, with polypropylene and dark fibre. Sometimes in-house test results differ from that certified by the supplier.	Yes, but they are sporadic.	Very rare, one case in last 3–4 years. Some problems with dark fibres and meeting weavers requirements in this area. Difficult to source wools with low dark fibre levels for the whole season.	Not really. Occurs only when piece dyed.	Yes, mainly polypropylene. Dark fibre levels depend on type of wool purchased
Has the level of contamination decreased over the last ten years?	N/A	Mostly the same through the last decade, however some improvement over the last year.	It has never been resolved and is a significant problem, mainly due to polypropylene. They would be prepared to pay more for uncontaminated wool. Contamination is sporadic but is costly when it happens.	No improvement in polypropylene. Impact of dark fibre depends on the product.	Not sure.	Yes. Dark fibre limits have got tighter also.	Not sure.	N/A

[a] N/A: no answer.

Table 7
Responses to woolgrower focus and along-chain communication

Questions	Organisation number							
	1	2	3	4	5	6	7	8
Where should the focus be for woolgrowers?								
On deceased diameter?	N/A[a]	Shouldn't be the only focus.	Not necessary. Better to improve the other characteristics.	Yes, as long as price doesn't increase.	N/A	Yes	Not a relevant question. These are problems for spinners.	No. Decrease in diameter is driven by desire for increased income.
On higher staple strength?	N/A	N/A	Yes, needs to be increased.	Yes, but more important for woven wear than for knitwear.	N/A	Not normally a problem, but depends on the season.	N/A	Important
On longer staples?	N/A	No	No	No	N/A	No, fibre lengths are adequate now.	N/A	No. Some mills have problems at longer lengths.
On decreased fibre diameter variability?	Yes, but variability (CV%) not always measured and therefore low CV% wools can be hard to source.	No	N/A	Yes, especially in coarser product and due to felting in knitwear following washing.	N/A	Yes	N/A	Yes, but not yet ac tively seeking lots measured for low variability.
Communication with woolgrowers								
Do you currently have any level of communication with growers or grower groups?	Parent company does. This is very important.	No experience so far but see two-way communication as important.	Informal links only through visits to Australia and mill visits in Italy by woolgrowers. Company is a member of grower organisation.	No formal program but chairman frequently visits Australia.	No, but do have discussions with spinners and makers-up. Some contact with the topmaker but always through the spinner.	Have visited growers in Australia on-farm. Feel there is a growing separation between 'good' and 'bad' growers. Would like to see them concentrate on their business.	Parent company has been approached.	Member of grower organisation and have input from growers through topmaking activities.
If not, do you see any benefit in doing this in the future?	N/A	Important in the future to have more transparency. Would like to start now in order to support a move to greasy wool purchases. Would like to have precise information as to wool quality.	Difficult to get quality fibre, so there is a role for going direct to growers but difficult to communicate and there is variability from year to year so growers supplying may not be the same. There is a role for the provision of early warning information due to seasonal conditions.	N/A	N/A	Yes, but it will remain a small part of the business.	N/A	Not really. Difficult due to mismatch between farm lot and processing batch.
What other means can growers and processors use to move closer together to improve their level of understanding?	N/A	N/A	N/A	N/A	N/A	N/A	Need to get all sections of the chain together; growers and processors with the marketers.	Use existing channels such as IWTO and grower associations.

[a] N/A: no answer.

4.1. Size and sourcing arrangements of the interviewed wool processing organisations

Wool processed by the interviewed organisations had fibre diameters in the range 15.0–26.5 μm, and the volume of wool processed ranged from 300,000 to 11,500,000 kg per annum (see Table 6). As indicated in Table 5, both Germany and Italy rank amongst the ten most significant export destinations for Australian raw wool, but in Tasmania they rank as one and two, respectively. The higher concentration of processing capacity in Germany is evident from the larger market shares and processing volumes of the German firms. In comparison, the Italian wool processing sector is fragmented, with firms specialising in particular product niches. Most of the organisations interviewed purchased their inputs from the previous chain member, although one of the weavers had recently commenced sourcing greasy wool direct from growers.

4.2. Wool quality and contamination

When asked whether wool quality had improved over the last decade (Table 6), five organisations felt it had, although two of these questioned whether this improvement had been 'significant'. One commented that improvement, in their case, had come about more through changes in buying strategy and another that a change in supplier of semi-processed product had significantly changed the quality of the inputs into their business. One weaver emphasised that contamination continued to be a significant problem and that they were prepared to pay increased prices should they be able to source uncontaminated wool. This latter comment seems to verify the cost of contamination to the processing sector.

Six organisations identified that they still experienced problems with contamination (Table 6) although two of these commented that the incidence of contamination was rare, but unpredictable. One stated:

> Contamination has never been resolved ... you may go 3–4 months without anything and then ... it's a real problem. It costs a lot.

The data highlights the problems associated with managing for contamination where occurrence is rare, but impact, due to tight tolerances, is significant. Within the organisations surveyed, the success of on-farm anti-contamination campaigns appears questionable and continued adoption of in-shed quality assurance programmes seems warranted. However, as one spinner noted, the limits on the amount of contamination (number of dark or urine stained fibres) acceptable in their product has got tighter over time, often with little reference to how easily achieved these new tolerances were. This comment seems to suggest poor communication between adjacent sectors as to reasonable limitations with respect to product quality. The comments below also underline the seasonal variability inherent in wool and the problems this may present.

> But from time to time we have problems with the weavers because if these people don't accept four [number of contaminated fibres/100 g product], they want to

have between zero and two and that's very difficult to get for the whole season. It is possible to get two coloured fibres per 100 g, but from time to time it's difficult to get the right wool.

4.3. Raw wool quality attributes

Four organisations felt it was not important to further decrease fibre diameter (Table 6) and a fifth stressed further reductions in fibre diameter were acceptable as long as price did not increase. As one spinner commented:

It is better to improve the other characteristics; tenacity, crimps . . .There are so many ways without changing the diameter.

These reflections are interesting given the dominance of fibre diameter as a raw wool price determinant and the strong messages from industry service providers as to the need to decrease fibre diameter in order to remain profitable. While reductions in fibre diameter will undoubtedly increase return in the short to medium-term, an industry-wide shift may not see sustainable price increases in the longer term due to the altered supply of finer wools. Clearly, growers should not neglect productivity factors such as fleece weight in their breeding programmes, and possibly other quality measures, given the comments above. Improved communication with the processing sector as to long-term trends would seem warranted, guiding the on-farm management and breeding processes that determine the nature of the raw materials entering the supply chain. More thought as to the implications of these trends, especially as they relate to customer requirements, is needed.

Only four organisations commented on staple strength (Table 7), three commenting that improved strength was important, the fourth that the characteristics varied with season and therefore so did the need for improvement. All five organisations commenting on staple length felt further increases were not important. With respect to the variability of fibre diameter (Table 7), five organisations responded, four seeing improvement as important, one not. One organisation commented that wools of low fibre diameter variability can often be hard to source as the characteristic, at the time of this data being collected, was not always objectively measured. However, fibre diameter distribution data is now captured along with mean fibre diameter, through the introduction of new testing technology in June 2000.

The diversity of these responses is interesting in that it appears to show that the processing sector is not united with respect to their reflections on wool quality and those areas that require improvement. This lack of unity may have implications for feedback arising from price signals at auction and also for grower groups undertaking general data gathering/feedback exercises amongst a range of processors. It also suggests that clear direction arises through a strong relationship developed along a chain, rather than with a horizontal sectoral cluster, e.g., a number of spinners and weavers. The diversity of response may also indicate that more work is required to inform the processing sector of the implications of raw wool quality for processing efficiency.

4.4. Communication with woolgrowers

The extent of communication between the processing organisations interviewed and woolgrowers was considerable. When asked if they communicated with woolgrowers or grower groups, six of the eight processors responded positively (Table 7), the contact occurring either directly with their own business unit or through a parent company. While most of these links were informal, two of the organisations held membership of a woolgrower representative body. Given the significant level of past communication, the question then becomes not whether communication is occurring, but whether this communication is effective.

Some processors viewed their communication with growers positively. One spinner commented on the usefulness of shared understanding with respect to wool quality, and on the critical role of the spinner as a communication agent, due to their interaction with both upstream and downstream chain elements. They said:

> ... we show these people our production and explain our problems ... I think it is necessary to keep in contact with growers because I think the spinners and weavers can explain their problems much better than the combing mills [topmakers], because we have the contact with the weaver and the weaver with the retailer ...

It is clear that communication can deliver benefits. One spinner commented on a specific case where a quality problem was identified as being under the control of the grower and was rectified simply, following communication between the spinner and the grower. However, not all comments about communication with woolgrowers were positive. Some saw problems associated with the size mismatch between farm production and mill batch or with the geographic separation between growers and processors. Some processors clearly exhibited a strong desire to limit interaction with respect to sectoral activity. As one spinner commented:

> ... I think the growers are making a good job but they should concentrate on their business and that means I think it's a problem if growers want to produce tops and all these things ... and he hasn't so much time for the farming, which is very important.

Also, communication was not always seen as a core business skill or capability, but rather it seemed to be viewed as an 'add-on'. As one interviewee commented:

> It depends on the communication. If it isn't every week it is no problem but if you have to discuss these things all the time you will have a problem because this is only one part of our business. Our main part is to buy the wool, to produce the product and to sell the yarn.

In relation to grower–processor communication in the future, there were few comments, although one organisation felt there was a need to get all parts of the wool supply chain

together, including the marketers, while another felt that existing structures such as the International Wool Textile Organisation (IWTO) were sufficient for communication between chain members.

Given the presence of a sectoral view or 'silo' amongst some processors, it was interesting to note comments that highlighted the interdependency of the chain members and the need to think from the market back to the production base. It demonstrates that amongst some organisations there is a recognised need to identify customer needs and communicate these back to the production base. With respect to interdependency, one weaver commented:

> Most of the questions are more or less . . . interesting . . . but our part as weavers . . . we can only give you indirectly because we react on our part from what we get.

In relation to communication and the drivers of product specification:

> When you, as I say, see the sheep and you think from the sheep to the market then you have already made the mistake. You have to go from the market to the sheep.

Another interesting comment, given the interest amongst woolgrower groups with respect to direct communication with processors, related to the potential fragmentation of the grower base along the lines of region, genetic type or other point of coalescence. This was highlighted as a potential problem by one spinner with respect to the problems and confusion it may create for the intermediate chain customers. The centrality of price as a point of negotiation is also underlined.

> Now we have a group from New Zealand, now it's from Tasmania. And everybody wants to make their own product. Our difficulty is to explain it to the weaver . . . Perhaps it's an advantage in the production, but not for the retailer and in the end product. There's no advantage for these people and if they see no advantage I think nothing will happen. Perhaps you can sell a lot of fabric from Tasmanian wool but you don't get more money. And at the end we always talk about money.

5. Discussion and conclusions

The data collected in this study in relation to processor perspectives, confirms anecdotal industry reports and discussion in the technical literature (IWS, 1997), that there appears to be considerable interest in the development of closer links between woolgrowers and wool processors, i.e., to adopt marketing systems that deal with wool as a product rather than a commodity. This arises in part from the realisation that a fundamental problem associated with commodity markets is that all commodities decline in price over time as an increasing proportion of consumer income is spent on services and intangibles (McKinsey and Company, 2000) (see Table 8).

Table 8
Average annual decline in real commodity prices 1980–2000

Commodity	Annual price decline (%, US$)
Lamb	2
Beef	2
Milk solids	2
Fertiliser	2
Wheat/corn/soy	3
Metals and minerals	3
Cocoa/coffee	3
Fine wool	3.5
Cotton	4
Mid-micron/strong wool	6

Source: (McKinsey and Company, 2000).

With respect to the woolgrower side of the 'farm-gate', Dolling (1999) lists motivations to become involved in supply chain management (SCM) arrangements with wool processors as including useful feedback and the use of this to improve raw wool production, the receipt of price premiums in return for superior product and the reduction of price volatility and achievement of long-term surety of supply. From the same relationship, processors are seeking better communication, tighter specification and early advice of clip characteristics, improved clip preparation and consistency of raw wool received and hence of the processing performance gained, and a more efficient and cost-effective supply route with reduced price volatility (Read, 1995; IWS, 1997; Dolling, 1999).

However, challenges for grower groups wanting to link to processors include small average clip sizes and seasonality of supply, the high costs involved in establishing marketing relationships and the changing patterns of demand and difficulty of establishing repeat business (Wool Industry Future Directions Task Force, 1999). There are also concerns that direct links with mills may give rise to the development of a ''cottage industry supply'' system, leading to an inability to meet critical mass, difficulties with respect to supply reliability and frequency, poor commitment given the possibility of favourable spot markets at some stage through the life of the contract and poorly-defined claim or dispute settlement procedures.

However, the downstream stages of the wool value chain (spinners and weavers) have an important role to play in innovation centred on new yarns and fabrics which can target specific niches of an increasingly selective consumer market and hence deliver improved consumer value (Ward, 1998). Interaction with woolgrowers will ensure a supply of raw wool that can meet the specifications, both tangible and intangible, required in these products and hence allow this value to be captured, thus alleviating some of the competitive disadvantage of the wool fibre.

The information provided by the downstream stakeholders interviewed in this preliminary study provides a number of interesting insights. Interviewees appeared divided as to whether contamination and general 'wool quality' had improved over the last decade. This would

suggest that there is further room for improvement and given the difficulties the sporadic contamination outbreaks cause, a preventative approach through on-farm quality assurance appears warranted. However, responsibility for contamination prevention rests with all chain elements, not just the on-farm sector, thus illustrating the interconnectedness of the value chain. The impact of quality variability was also mentioned in relation to other quality attributes. This lack of programmability is a potential problem for woolgrowers within a supply chain arrangement where meeting contract specification is central to chain performance. Clearly further work in quality management through improved farm management, or in quality prediction is needed.

The inability of some informants to comment on aspects of raw wool quality illustrates a disconnection from the supply base, despite other indicators of some level of communication. The nature and quality of communication would appear to be the issue, rather than whether it is occurring or not. Comments indicating a desire to retain activity within defined sectors would seem to be a causative factor. Despite these problems however, the various sectors are not foreign to one another and there are some interesting reflections on the need for change in raw wool quality that should be investigated further with respect to their implications for on-farm breeding and management. Interdependency and the role of the retailer as a chain driver were also identified. However, structural change in the chain, in response to the realisations, appears to be limited.

As a result and given the quality problems still present, a more co-ordinated approach to marketing, based on a definition of the customer's needs, appears warranted, although the concerns of potential fragmentation of the supply base, and the resulting downstream confusion need to be considered. It could be argued that in a vertically co-ordinated supply chain this fragmentation is essential and inherent and that rather than causing confusion, it should become a driver to building relationships within the chain. The aspects of improved communication and the defining of the drivers of customer value inherent in supply chain management, could be used effectively in the wool supply chain, although the sectoral barriers and focus on price as the sole point of negotiation, must be overcome.

In conclusion, while there appears to be an emerging recognition by the various members of the apparel wool textile chain of the need for, and power of, improved communication, significant barriers including the presence of 'functional silos' continue to exist. Given the increasingly fragmented nature of the apparel consumer base and its desire for innovative products with reduced product life-cycles, these structural problems limit wool's ability to improve it's competitive position against competing synthetic fibres and other destinations for disposable consumer income. Conversely, addressing the barriers, both cultural and structural, which limit chain communication, will see the creation of product value, through better matching consumer needs and increased chain efficiency.

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