

Spinning a circular tale.

Dr Vikki Haffenden, University of Brighton, Brighton, United Kingdom.

V.M.Haffenden@brighton.ac.uk

Keywords: Slow textiles, slow fashion, cradle-to-cradle, heritage, legacy, longevity of use

Abstract

Between the 12th and 15th centuries wool created huge wealth in the British Isles. Knowledge and skills from early weaving clusters, combined with that of indigenous domestic textiles provided the core knowledge and skills that fuelled the British Industrial Revolution in the 1700s.

Wool was also important in the development of knitting in Britain. Because knitting has inherent stretch it was ideal for stockings; important fashion item for hundreds of years. Even after the invention of the knitting frame (1589) and subsequent industrialisation of knitting, hand knitting retained its place as a heritage craft skill using indigenous wool. Today, with a few notable (and high cost) exceptions, hand knitting is limited to hobby status, despite the skill involved. Yarn fashions are however common across hand and machine knitting, and current fashion requires perceived luxury for low prices. To meet this demand, machine and hand-knit yarns feature blends of merino wool, cashmere and alpaca with synthetic and 'eco' fibres; British wools do not figure significantly in these blends. Merino, cashmere, alpaca and bamboo; fibres that are prevalent in knitting yarns, do not originate in the British Isles and have a substantial carbon footprint.

Today many British farmers are finding it uneconomic to sell fleece from cross bred and less desirable breeds; some are burned, some used for insulation and others are abandoned. New purposes are being found but as the soil's ability to produce food and fibre declines, we should value every fleece.

This project focuses on British wool, in this instance from Shetland sheep, to work towards promoting longevity of use in knitwear through narratives, personal legacy and perceptions of heritage. It will record the time-cost of the practise of making from raw fleece to yarn; sorting, scouring, picking, carding and spinning, and of knitting a garment. Each fleece's individual character is being maintained throughout processing.

Introduction

This paper reports on the work-in-progress of research investigating the use of British grown wool, particularly that of Shetland sheep. The project discussed here is exploring the use of indigenous wool that accrues value through cultural heritage, and how this might contribute to ameliorating the ecological impact of fast fashion. It is acknowledged that the researcher is working within an interpretive axiology with a bias towards realism and that the researcher will be influenced by cultural experience and is part of what is being researched (the making process). Within this framework the aim is to work towards promoting longevity of use of items of knitwear through imbued narratives, personal legacy and perceptions of heritage.

The research emerged from a meeting with a shepherdess who is learning the skills of sheep husbandry through practise, by keeping a small flock of Shetland sheep. Her aim is to experience being a shepherdess and to explore relationships between humans, wool, sheepskin, sheep, heritage and soil. More about that project, SOS (Save our Soil) Shepherdess may be seen on Tumblr, (<https://sosshepherdess.tumblr.com/>).

My research is connected to, but not part of the SOS Shepherdess project. The ethos is however similar; working towards reducing consumption of raw materials. What style of garment will be designed and created from the yarn is still a bit of a mystery, because the yarn is leading the textile design, and the garment style is being informed by data about longevity of garments in people's wardrobes. Meanwhile I'm getting to know the fibre through spinning the yarn.

Historical background

Wool in Britian

Since the earliest times wool has been processed into fabric in the British Isles, but between the 12th and 15th centuries (the Middle Ages), Britain became the principle wool producing country and consequently wool played an important role in Britain's economic development and political history (Haigh 1952). Throughout this period European weaving mills imported enormous amounts of raw fleece from Britain, creating great wealth and making wool such a valuable commodity that, 'Wars have been fought because of wool, and financed by the production of it' (Haigh and Newton 1952: 2). A symbolic reminder of this wealth (and power) is the Woolsack on which the Lord Speaker in the parliamentary House of Lords sits. This large red cushion, originally introduced in the 14th century, is purported to have been stuffed with British wools but was refilled in 1938 with wools from around the British Commonwealth, (www.parliament.uk).

During the latter part of the 14th and early 15th century the depredations of The Hundred Years' War (1337-1453) and religious persecution in Europe had encouraged migration to Britain. Émigrés from Flanders, a stronghold of weaving, brought their skills with them and established new, craft weaving industries in the East, West and North of the British Isles.

These relocated weavers absorbed increasing quantities of indigenous wool production and

this domestic industry grew in economic importance. Heavy taxation and protective legislation such as that of the late 1500s requiring all male commoners to wear a woollen cap to Sunday worship (Black 2012), and the 16th century Act decreeing that all shrouds should be made of wool (Haigh and Newton 1952), compounded this economic success. Knowledge and skills from these clusters combined with that of indigenous fibre processing, yarn spinning, and domestic weaving underpinned the mechanisation of textile production (especially cotton), during the British Industrial Revolution in the mid-to-late 1700s (Zmolek 2013). By this time, wool was so valuable that landowners were displacing whole communities of small tenant farmers to make way for pasturing large flocks of sheep (Haigh and Newton 1952). A notorious example of this practise was the Highland clearances (1770-1850) which permanently de-populated the Highlands of Scotland (Devine 2018). Vestiges of these hugely productive post-industrial-revolution textile industries survive today, largely in the North of England and Scotland. These industries however focus mainly on traditional, high value cloth and garments using predominantly imported luxury fibres, and apart from a few exceptions such as the famous Harris Tweed, they seldom work with British wool.

Knitting with wool

Wool was also important to the development of knitting in Britain, but this industry developed along a slightly different path. Because knitting has inherent stretch it was, and still is, an ideal textile structure for stockings that need to stretch around the uneven, 3D leg-shape. Stockings, also known as 'hose', were important fashion items for hundreds of years for both men and women, rich and poor, and lent their name to the hosiery (knitting) industry (Brackenbury 1989). Early hose were cut on the bias from woven cloth, an expensive method, and the circular knit construction produced a superior fit (Brackenbury 1989). The 14th century saw the spinning wheel being introduced as a replacement for the traditional drop

spindle, a development that enabled finer and faster spun yarns (Black 2012). High quality stockings could then be hand-knitted in consistently fine wool and silk yarns on slender pins, a practise that continued even after the invention of the rudimentary stocking frame by William Lee in 1589 (Chapman 2002) (Brackenbury 1989). It was only following many iterations and additions that what is considered the knitting machine's industrial coming-of-age was achieved with Cotton's patent in 1863, somewhat later than that of other textile processes (Chapman and Millington 1989)(Nutting 1989)(Gulvin 1984). After the industrialisation of knitting, hand knitting retained its place as a heritage craft skill using indigenous wool; Shetland shawls, Fair Isle patterned knitwear and Aran sweaters being amongst these (Rutt 1987). All these hand knitted items have been translated into commercially machine-knitted versions, but these are rarely equivalent to the original article. This is particularly true of the yarn which will be machine spun, and due to wool processing methods is likely to be a blend of fibres originating from different flocks if not breeds of sheep and may be imported from other countries.

Current fashion – the problem we face

Since the 1980s fashion clothing has become cheaper and the fashion cycle has speeded up. In Europe clothing prices were significantly affected by the end of the Multifiber Arrangement (1974-2004), a protectionist international trade agreement which limited imports of textiles and clothing from 'developing' to 'developed' countries (Textiles Monitoring Body 2019). Nowadays, having become used to low prices and developing what is consider by many to be an unhealthy relationship with fast fashion and its consequences (Siegle 2011), consumers require perceived luxury with an expectation of low prices. In response to this, machine and hand-knit yarn spinners blend merino wool and cashmere with synthetic or 'eco' fibres, thus

diluting the cost of higher value wools whilst trying to capture the zeitgeist of sustainability

Figure?



This luxurious alpaca blend jumper will ensure you're feeling snug and looking stylish whenever it gets cold. Relaxed fit for supreme comfort and ease, enhanced by added stretch in the fabric. Batwing sleeves create a dramatic silhouette. Ribbed trim for added texture.

We've styled this with [trousers](#) and [boots](#).

DETAILS & CARE ^

Details Relaxed fit, Ribbed trim, Added stretch

Composition 56% acrylic, 23% polyamide, 12% wool, 5% alpaca and 4% elastane, (exclusive of trimmings)

Wash Care

-  Wash at 40°C delicate
-  Do not bleach
-  Tumble dry medium temperature
-  Iron at low temperature
-  Professional dry clean

Figure 1: Women's Alpaca blend jumper. An example of 'luxury' fibre (Alpaca) used to describe what is 83% synthetic fibre yarn. December 2019. <https://www.marksandspencer.com/ribbed-alpaca-blend-dolman-jumper/p/clp60282011>

British wools do not figure significantly in commercial knitwear seen on the UK high street for several reasons, predominantly because the items are not knitted in the UK. Those that are knitted in the UK may not use British wool for several reasons: as already state, consumers perceive indulgence in the form of luxury fibres such as cashmere, alpaca, and merino wool even if they are blended with synthetic fibres; secondly wool spun in the UK is likely to cost more than that spun in the Far East, and thirdly British wools tend towards a more robust yarn, which may not be suitable for all garment types. Notable commercial spinners of British yarns include Jamieson and Smith of Lerwick, who purchase and process the clip from the majority of sheep in the Shetland islands (www.shetlandwoolbrokers.co.uk).

British wool is however becoming increasingly better represented in hand-knitting yarns, for example Blacker Yarns range of classic British yarns, West Yorkshire Woollen Spinners collection, and Daughter of a Shepherd's offer of British wool with 100% traceability. Surprisingly, despite this resurgence of interest in using British wool, many British farmers are finding it uneconomic to sell fleece from cross bred, dark fleeced and less desirable breeds. Some fleeces are burned, some used for insulation and others are abandoned. New purposes are being found for these 'waste' fleece, but these bring low economic returns.

The layer of productive topsoil that humans rely on to grow food crops and provide animal fodder is diminishing at an alarming rate. It can take up to a thousand years for one inch of topsoil to develop from other organic materials, and yet in the UK since 2002 we have been losing over two million Tonnes of topsoil per year (Parliamentary Office of Science and technology 2002). As the soil's ability to produce crops and fodder declines, we should value every fleece, and SOS Shepherdess and this project are exploring how to maximise the useful product from every fleece, not just those deemed 'first class'.

The raw materials

This project concentrations on using wool from Britain's indigenous Shetland sheep that have been farmed on the Shetland and Orkney islands off the North coast of Scotland since the 8th century (British Sheep and Wool 2010). Modern sheep breeds are a product of historical invasion and trade; a melding of primitive sheep such as the Mouflon and Soay from over 4,000 years ago, and breeds introduced to the islands by the Romans and Vikings, but some, like the Shetland, retain features of their primitive ancestors (Haigh and Newton 1952, Robson and Ekarius 2011). Shetland sheep have a breed standard, established in 1985, which maintains the breed's phenotype (Shetland-sheep.org 2015), and wool for this project is being

sourced from a small flock of these heritage sheep. Although the flock from which the fleece comes is based on the English mainland, the sheep are registered in the Shetland Sheep Society flock book as part of the true-to-breed Wadley flock (Shetland Sheep Society online flock book 2018).

Shetland wool has a traditional place in hand-wrought textiles (Pearson 1985) therefore its use is apposite to the aims of this research's. Through practise, the researcher is recording the time-cost of making from raw fleece to yarn: sorting, scouring, picking, carding, spinning, and knitting a final garment. Each fleece's individual character is being maintained throughout processing. For example, the sun-bleached tips seen in Figure 2, which would be discarded in commercial processing, are instead being actively incorporated into the yarn design to create a tweed effect.



Figure 2: Sunbleached tips on the scoured Moorit fleece.

Fibre too short to be commercially processed is being hand-spun in a semi-worsted method that incorporates more air than worsted spinning and produces soft, lightweight but warm yarn that has good wearing properties. Analysing the fleece and yarn qualities in this manner

will lead the garment design process; the opposite to designing a garment using ready-made, standardised yarn with predictable behaviours.

Shetland sheep can have different types of fleece, some have fleece that develop a natural break between winter and new spring wool growth, and this weakness means that the inner and outer fleece can be separated along this line and peeled off (*rooed*). It was the original intention of the SOS Shepherdess project to hand *rooe* the sheep, but this proved impractical and the fleece spun so far has been clipped with hand shears. Commercial application of hand *rooeing* would be tricky because each sheep is different and can only be *rooed* when their individual fleece is assessed as ready.

Shetland fleece is generally soft and highly crimped with a thickness between 30-31.5 microns, and comes in range of natural colours from creamy white to black. These colours have fascinating names including: Shaela (dark grey), Emsket (blue/grey), Moorit (tan/brown), Mioget (yellow/brown) and Musket (grey/brown). The fleece that has been processed to date is that of Mango, a Moorit Shetland ewe (Figure 3).



Figure 3- Mango, the Moorit Shetland ewe whose fleece is being spun for the project. Photograph by Sarah Moorhead.

Mango, like many Shetland sheep is quite small and her fleece is typical, yielding only 428g after sorting and scouring (washing). The fibres are crimped, fine and super soft, with a handle almost equivalent cashmere. The locks (individual clumps of fibre) are rather short and triangular with some sun bleaching at the thinner tips as can be seen in Figure 4.



Figure 4- Short, soft, fine and crimped fibres in triangular locks.

There are a considerable number of nepps (flecks of felted wool) and noils (tiny lumps of short fibre) in the fleece as well as some insect carapaces. After wastage through combing and carding plus extra picking during spinning a further 2% wastage was anticipated, so I worked on the probability of getting just over 420g of spun yarn. It takes around 500g to make a long sleeved, medium sized jumper, which was another reason to spin the whole clean fleece rather than sort or pick it further and incur more wastage.

Picking proved difficult by mechanical methods due to the short, extremely soft fibres, so this was done by hand before carding the fleece on a drum carder. It would be reasonable to question why the fibre was not sent to a fibre processor, as it could still have been hand spun from commercially processed roving. Indeed, this was explored, but the local processor, Diamond Fibres of Horam require at least a kilogram of raw fleece and reckon on a loss of 50-70% weight during processing (Diamond Fibres 2019). Based on this estimate, Mango's fleece would have yielded less than 400g after processing. To work with commercial processors, it

would have been necessary to mix the fibre from two or more sheep, which was not desirable at this stage of the project but will be considered in future research.

Spinning the yarn

The fibre/yarn is being documented so that the garment will carry the story of the sheep from which it originates and that of its design process and any cultural/heritage influences. Even the pedigree of the individual sheep can be traced via the Shetland Sheep Society flock book, and Mango's can be seen in Figure 5.



Figure 5- Mango's pedigree page from the Shetland Sheep Society's online Flock Book. 2018.

This approach parallels the now discontinued 'Baa-code' initiative of New Zealand outdoor wear company Icebreaker, which was an early attempt to provide the consumer with some ethical transparency in the supply chain (Gregory 2008). Icebreaker used merino wool from New Zealand, and merino fibre from the antipodes has become synonymous with high quality knitwear and comfortable wearing qualities. However, there is a considerable carbon footprint attached to its use in Europe, which is why this project is investigating the use of

'local' raw materials.

Merino fibre is commercially spun in a semi-worsted/worsted process which makes the most of the fine, long staple fibres of this fleece and produces a smooth, sleek yarn. Shetland however is more commonly spun using the woollen process, which results in a loftier yarn with a more matt appearance. Nowadays, Shetland wool is often commercially overlooked as a high value fibre as it lacks the drape and sheen of the Merino wool we have come to associate with higher end sweaters. My first experience in the knitwear industry was designing sweaters with Shetland yarn, and the shrinking quality of the fibres was important to the finish of the final garments that were hard wearing and comfortable to wear. If harsh fibres are removed from the blend, both Shetland and Merino wool can be soft and comfortable next to the skin, with lambswool being the softest of both breeds.

This project aimed to give some indication of the time involved in hand processing compared to commercial fibre and yarn processing. In either process a 'singles' yarn is spun, and then two of these threads are 'plied' together to produce a 2ply, balanced yarn suitable for knitting. Hand plying adds roughly a third more to the time needed to spin the singles.



Figure 6: Mango's fleece at the singles stage of spinning

Mango's fleece is being spun into a yarn that results in 14 WPI (wraps per inch) shown in Figure 6, and will knit on hand knitting needles of 4.5mm-5mm, or on a mid-gauge 6.5 mm pitch (4 gauge) knitting machine of such as a Knitmaster HK160. Spinning a finer yarn would require longer. By hand it has taken approximately seventy-five hours to spin 500g of Shetland fibre into 2 ply yarn, and I estimate that even the most practised spinner would not manage it in less than seventy hours. If costed at minimum wage for those over twenty-five in the UK of £9.50, 500g of yarn would cost £675-£700! This is obviously not a calculation that can be used to price the yarn, but it does give some indication of the true time-cost of hand production. Industrially 500g of yarn would be spun in a fraction of the time; this amount could even be considered waste, which brings a different perspective to the two methods of

production. How this gathered information will inform the outcome of the project is not yet decided.

Garment design

As already discussed, the design of the garment that will be knitted from the finished yarn is still undecided. Results of a survey that asked how long people have kept woollen and non-woollen clothing in their wardrobes is are being used to inform the design.

Findings from this survey show that 88% of respondents own clothing made from 100% wool. The most commonly owned item is a jumper (30%), and a quarter of all respondents own a cardigan made from wool. Coats and jackets were the next most popular woollen items of clothing (Figure 7).



Figure 7: Type of 100% woollen garment owned for the longest time.

Respondents were first asked how many years they have owned the woollen item that has been in their wardrobe the longest. Over a quarter replied that they had purchased this item

in the last couple of years, and 13% have owned the item of woollen clothing for over ten years (Figure 8).

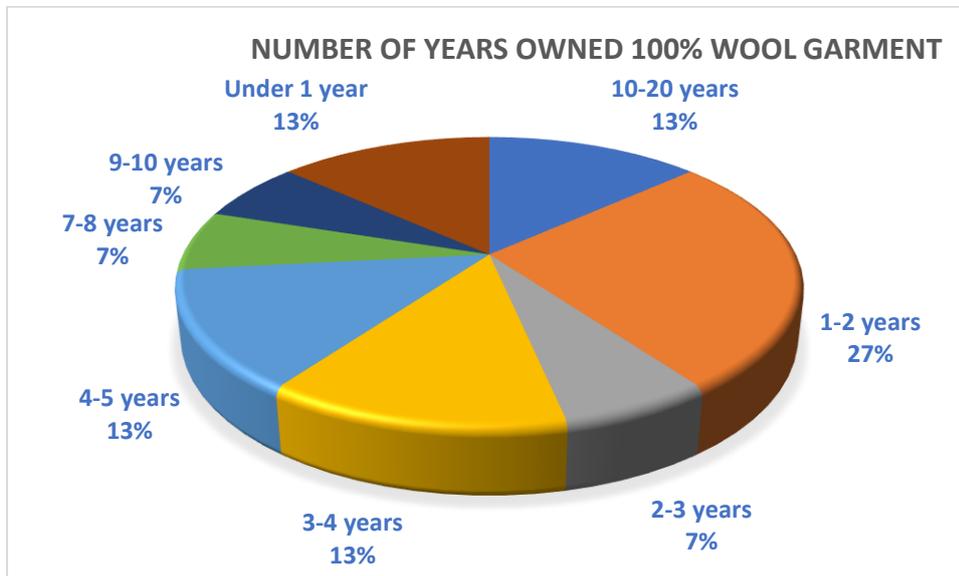


Figure 8: Length of time a woollen garment had been in their possession.

When asked which type of clothing they have owned for the longest time (but not necessarily made of wool), coats were the majority item, followed by jumpers, jackets and trousers (Figure 9). Surprisingly, considering the significant number of cardigans reported in the 100% wool garments, only 6% were reported in this category. Unlike their woollen clothing, over a quarter of respondents have owned these non-woollen items for over 10 years.

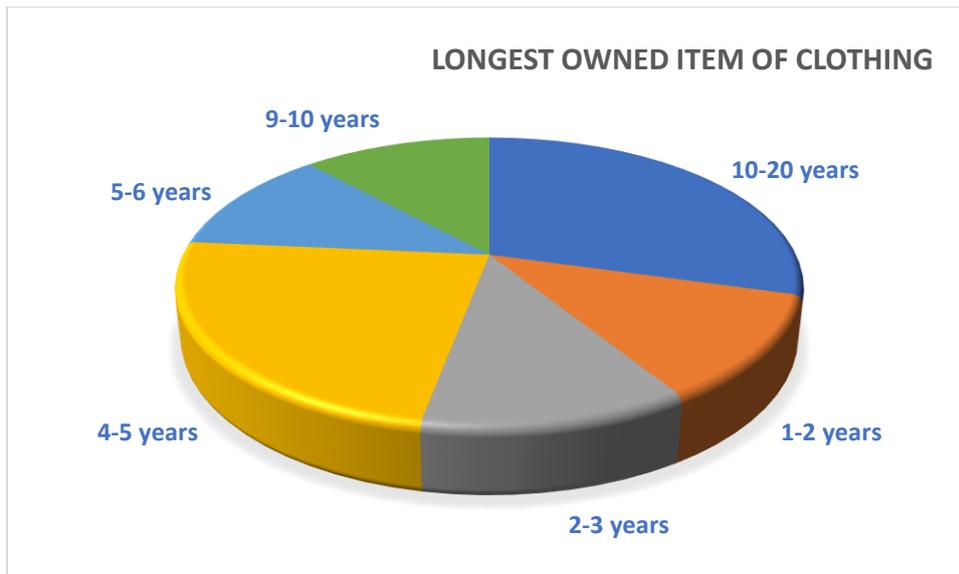


Figure 9: Length of time a non-woollen item has been in their possession.

From these findings it seems that wool has been a popular fibre for recent purchases of clothing, but that wool does not feature heavily as a fibre that remains for long periods of time in people's wardrobes. It is mooted that modern, low temperature wash cycles, 'superwash' treated wool and encouragement to reduce washing frequency may influence this in a positive manner by (Dombek-Keith and Loker in (Gwilt and Rissanen 2011)). Possibly moth damage might also have something to do with this?

Fit was also investigated, and almost a half described the garment they had owned the longest as a classic fit, with casual and oversized being equally split amongst the remainder and only a few people preferring tight fitting garments. When asked what their ideal fit would be, classic and oversized were the most popular at 41%, with casual as the remainder; no-one chose tight-fitting.

From these findings it is possible to speculate about garment design shapes for cardigan/jacket styles in a casually comfortable, (but not shapeless) fit. This early garment shape framework will be underpinned by sampling the yarn in knit swatches, informing future developments through the behaviour of the yarn in different knit stitch constructions (Figure 10).



Figure 10: hand knitted, hand spun 2ply Shetland yarn sample swatch.

Narratives of the yarn

This project will create its own narrative of myth and legend in addition to any that may be imbued by the wearer (such as being a gift or made especially for them). It is mooted that this approach, in combination with a garment design based on data gathered about knitwear

preferences and longevity of use of existing garments will lead to a prototype knitted garment that wearers will retain in their wardrobes for longer. Contributing to the legend will be the story of the wool from which the garment is made; in this case Mango, her heritage and that of the Shetland breed. This information will be attached to the garment at point of sale to involve the consumer in the narrative of the garment's genesis. It is anticipated that along with an attractive, user-friendly textile design and garment shape this will encourage users to wear the garment more frequently because it is functional, they truly enjoy wearing it and have connection with its making, thus reducing use of new fibres and unnecessary recycling or disposal of clothing. Other existing models for prolonging longevity, (return to base, yarn attached to the garment for darning etc.), will be evaluated and may also be applied to the garment (Fletcher 2014) (Van Deijnen 2019).

End of life – cradle to cradle

Wool is a truly magical fibre. It will grow without intervention and is fuelled by grass, so providing there is soil in which to grass can grow, it will renew itself every year. Of course, massive global production requires considerably more complex and sophisticated husbandry, but wool in its natural state has a self-sustaining growth cycle. Wool is a perfect fibre for working towards longevity of use in a garment, it is water resistant and has wonderful insulation properties so that it will keep the wearer cool in hot weather and warm in cold weather. It is resilient, (fibres bounce back after compression) and yarn can be spun to be extremely wear resistant. Wool fibre can absorb up to a third of its weight in moisture, but does not feel damp, making it comfortable in situations where other natural fibres such as cotton would be uncomfortable to wear. Woollen yarn can be re-used; I have unravelled whole or part sweaters to re-use the yarn and remake or adapt the original sweater, and other designers work in similar ways (Twigger Holyroyd 2017). Providing it has not been blended

with synthetics wool can be recycled and re-used. At final end of life, because wool is fully compostable and biodegrades in soil in a few months, the 100% wool garment can complete a truly circular, cradle-to cradle (C2C) cycle. Some designers would dispute that there is ever an end-of-life for a woollen garment. Tom Van Deijnen's Visible Mending project features examples of a thirty-eight-year old woollen garment repaired and remade, and another that has been mended over a period of six years (Van Deijnen 2018).

All wool fibre can be used productively, what is not suitable for spinning into yarn can safely be composted; heat in a compost heap kills bacteria in raw fleece. As compost wool returns nitrogen to the soil and as top dressing it will leach nutrients back into the soil.

Sustainability is not about being able to continue consuming at the current rate whilst simply substituting raw materials that have less environmental impact. It is also not about recycling; this also uses up resources; transportation (with its associated calls on resources), water and power are all necessary to recycling, and some materials may require a percentage of virgin raw materials in order to fulfil a second life.

An often overlooked aspect of sustainability is the necessity to reduce consumption on a global scale (Gwilt and Rissanen 2011). This may be uncomfortable to hear in today's world where growth is the key word. The concept of reduced consumption attracts arguments about 'have and have-not' countries, and whether developed countries are 'shutting the door behind them' when trying to restrain the development of newly emerging economies. This paper can only make passing reference to the wider sustainability discussion but is cognisant of the fact that encouraging a reduction in consumption must play a role in creating a sustainable textile and clothing industry for the future. In this paper I suggest that working

with materials that do not travel half-way around the world and exploring the results of wool processing in a manner that uses more of the raw material and reduces waste are both valuable areas of research.

References

- Black, S. (2012). Knitting, Fashion, Industry, Craft, V&A publishing.
- Brackenbury, T. (1989). A Fashion History of Knitting. Four Centuries of Machine Knitting. S. Chapman and J. Millington. Leicester, Knitting International: 26-27.
- British Sheep and Wool (2010). The British Wool Marketing Board.
- Chapman, S. and J. Millington, Eds. (1989). Four Centuries of Machine Knitting. Leicester, Knitting International.
- Classic British Yarns, [online] <https://www.blackeryarns.co.uk/yarn-ranges/classic-british-yarns>
- Daughter of a Shepherd yarns (2019) [online], <https://daughterofashepherd.com/>
- Devine, T. M. (2018). The Scottish clearances : a history of the dispossessed, 1500-1900, Allen Lane.
- Fletcher, K. (2014). Sustainable Fashion and Textiles: Design Journeys, Routledge.
- Gregory, A. (2008) [online] 'Baa Code' demonstrates ethical edge. New Zealand Herald. https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10516472
- Gulvin, C. (1984). The Scottish Hosiery & Knitwear Industry 1680-1980. Edinburgh, John Donald Publishers Ltd.
- Gwilt, A. and T. Rissanen (2011). Shaping sustainable fashion : changing the way we make and use clothes. London, Earthscan.
- Haigh, H. and B. A. Newton, B.A. (1952) The Wools of Britain, Pitman, London.
- History of the Breed, The Shetland Sheep Society (2015) [online], <http://shetland-sheep.org.uk/page.php?Plv=2&P1=6&P2=1&P3=>
<https://tomofholland.com/2018/09/14/the-six-year-darn/>
- McDonough, W. and Braungart, M (2009). Cradle to Cradle: Remaking the Way we Make Things, Vintage, London.
- New Yarn Wool Local, (2019) [online] <http://www.erikaknight.co.uk/wool-local/>
- Nutting, T. (1989). Salient Features of Knitting Technology. Four Centuries of Machine Knitting. J. Millington and S. Chapman. Leicester, Knitting International: 58-63.
- Parliamentary Office of Science and technology, (2002) [online] Postnote <https://www.parliament.uk/documents/post/postpn265.pdf>
- Pearson, M. (1985). Traditional Knitting. London, Collins.
- Pricing, Diamond Fibres (2019) [online], http://diamondfibres.co.uk/?page_id=128
- Robson, D. Ekarius, C. The Fleece & Fiber Sourcebook, Storey, North Adams.
- Rutt, R. (1987). A History of Hand Knitting, Interweave.
- Siegle, L. (2011) To Die For: Is Fashion Wearing out the World?, Fourth Estate, London.
- The Shetland Sheep Society online Flock Book (2019) [online], <http://ofb.ppdb.org.uk/sheep/pedigree/073258>

Twigger Holroyd, A. (2017) [online], Reknit Revolution, <https://amytwiggerholroyd.com/Reknit-Revolution>

Van Deijnen, T. (2018) [online], Repairing a Gansey, <https://tomofholland.com/2018/10/23/repairing-a-gansey/>

Woolsack, Parliament collections, catalogue [online], [https://www.parliament.uk/about/living-heritage/building/cultural-collections/historic-furniture/the-collection/chairs-chairs-chairs/woolsack-/](https://www.parliament.uk/about/living-heritage/building/cultural-collections/historic-furniture/the-collection/chairs-chairs-chairs/woolsack/)

Van Deijnen, T. (2018) [online], The Six-Year Darn

Van Deijnen, T. (2019) [online], The Visible Mending Programme: making and re-making, <https://tomofholland.com/portfolio>

World Trade Organisation, (2019) [online] Textiles Monitoring Body The Agreement on Textiles and Clothing https://www.wto.org/english/tratop_e/texti_e/textintro_e.htm#MFA

Zmolek, M. A. (2013). Rethinking the Industrial Revolution : five centruied of transition from agrarian to industrial capitalism in England. Boston, Leiden.