The Role and Business Case for Existing and Emerging Fibres in Sustainable Clothing

Research Summary

Under the UK Defra led Sustainable Clothing Roadmap (SCR) industry initiative to improve the environmental and ethical impacts of clothing, Defra has commissioned a series of industry informed evidence projects in key areas, one of which is **"*The Role and Business Case for Existing and Emerging Fibres in Sustainable Clothing".*** The aim of the project was to evaluate the environmental and social impacts of existing and emerging clothing fibres and their market potential into the future in order to determine the business case for clothing fibres and fabrics from a sustainability perspective. The intent was to provide industry with clarity on the environmental and social impacts of fibres/fabrics to enable increased use of those with sound sustainability credentials and economic viability. The research found a large number of data gaps and inconsistencies in reporting of sustainability impacts, for both emerging and established fibres. This prevented a comprehensive assessment of impacts and determination of the business case for fibres in sustainable clothing. However, the research identifies important market data on fibre types (existing and emerging), collates the existing life cycle sustainability impacts information that is available by fibre, clarifies key gaps and required next steps. The project is an independent study funded by government, and has been peer reviewed. The research outputs are a **Summary** and a more detailed **Technical Report**. The results were designed to inform interested industry parties. The project was informed by an industry steering group as outlined in the report and encompassed two 1 day workshops.

Key findings

Table 1 outlines the market potential and indicative environmental impacts for the fibres included in the study.

Recommendations

A number of key data gaps and inconsistencies in reporting of the environmental and social impacts of fibres prevented an accurate comparison of different fibre types. Specific gaps requiring further research include:

- Market and production data of emerging fibres (e.g. jute, soybean), but also for certain established fibres (e.g. silk, viscose).
- Environmental impacts of different production techniques, such as organic cotton production versus conventional cotton.
- Embedded greenhouse gas (GHG) emissions from energy used in pesticide production and irrigation of natural fibres.
- Inclusion of a broader range of environmental impacts in lifecycle assessments beyond energy and water usage, particularly with regard to chemical pollution, effluent and waste.
- Consideration of the effect of by-products on the overall sustainability impact of certain fibre types (e.g. wool is a by-product of lamb production).
- Further market information on the composition of blended clothing fabrics, beyond the primary fibre.
- Inclusion of social impacts, using standardised metrics for measurement.

Table 1: Summary of market potential and environmental impacts of textile fibre production

Fibre	Current Volume (raw fibre)	Growth prospects in textiles	Fibre Cost $/kg (typical and recent highs in brackets)	Relative impacts between fibres (+ = relatively low impacts, ++++ = relatively high impact)					
				Energy use	Water use	GHG emissions	Waste water production	Chemical use in finishing	Land requirement
Acrylic	2.5m t	declining	2.7	**+++**	**++**	**(+++)**	**+++**	**(++ - +++)**	N/A
Bamboo	9000t	limited	ID	**(++)**	**(+++)**	**(+)**	**(++)**	**(++ - +++)**	**(++)**
Cotton	27.5m t	increasing	1.2-1.5 (c. 3.3 organic)	**++**	**++++**	**++**	**++**	**+++**	**+++**
Flax	0.45m t	limited	2.0-3.0 (up to 3.5)	**+**	**+**	**(++)**	**(++)**	**(+++)**	**+++**
Hemp	0.08m t	declining	0.5-1.5 (up to 2.0)	**+**	**++**	**(++)**	**(++)**	**(+++)**	**++ - +++**
Jute	3.3m t	limited	<0.5	ID	ID	**(++)**	**(++)**	**(+++)**	**++**
Lyocell	0.25m t	increasing	ID	**++**	**++**	**+**	**(++)**	**(++ - +++)**	**+**
Modal	Part of viscose share	increasing	ID	**++**	**+++**	**(+)**	**(++)**	**(++ - +++)**	**++**
Nettle	negligible	v.limited	(estimate - high)	**(+)**	**+**	**(++)**	**(++)**	**(+++)**	**+++**
Nylon	4.1m t of which 1.5 m t textiles	increase	2.84	**+++**	**+++**	**++++**	**+**	**(+ - ++)**	N/A
PLA	c. 0.01m t	increasing	1.5-2.4	**++**	**(+)**	**++**	ID	**(+ - ++)**	**+**
Polyester	30.7m t (17.1m t textile yarn)	increasing	1.1-1.65	**++**	**+**	**+++**	**+**	**+ - ++**	N/A
PTT	ID	ID	ID	**++**	**+**	**+++**	**(+)**	**(+ - ++)**	**(+)**
Ramie	0.29m t	limited	3.0-3.5	ID	ID	**(++)**	**(++)**	**(+++)**	**++++**
Silk	0.1m t	limited	15-26	ID	**+++**	ID	**(++)**	ID	ID
Soybean	3000t	limited	ID	ID	ID	ID	**(+++)**	**(++ - +++)**	ID
Spanish b.	negligible	v.limited	ID	ID	**+**	**(++)**	**(++)**	**(+++)**	ID
Viscose	2.92m t	increasing	2.95	**++**	**+++**	**+**	**(++)**	**(++ - +++)**	**++**
Wool	1.2m t	declining	2.8-6.6	**+**	**+**	ID	**++++**	**++ - +++**	**++++**

ID = insufficient data, NA = not applicable, Figures in brackets based on use of information from similar fibre types

Methodology

The main environmental impact data available was for the "cradle to gate" life cycle stages (fibre raw material production to fabric finishing), for energy and water use impact categories and for the dominant fibres cotton and polyester. Outside of this, data was more limited on impact categories, for other fibres, in particular emerging and for blends. The results from parallel SCR projects Reducing the Environmental Impacts of Clothes Cleaning and Maximizing Reuse and Recycling of UK Clothing and Textiles provided a limited evaluation of the impacts of the laundering and end of life stages as relevant to the fibre/fabric sustainability impacts. Existing evidence using a variety of product impact assessment methods were used to include Life Cycle Assessment(LCA) in the main, but also Ecological Footprinting (e.g. for land use impacts). Social impact data at the fibre level was very limited.

Limitations and Robustness

Due to the evidence data gaps and method inconsistencies, the indicative ranking of fibres by environmental impact presented in the study must be treated with caution. They are an oversimplification and at best only represent a high level indication. The summary table 1 is more representative of the actual findings. Data for environmental impacts other than energy and water use were much less readily available (including greenhouse gas emissions and toxicity impacts from pesticide inputs and fertiliser application).

Further information:

Project Lead & Further Contact:
Dr. Dorothy Maxwell, Lead Sustainable Clothing Roadmap for Defra/Technical Director: Global View Sustainability Services Ltd.
Email: Dorothy.maxwell@defra.gsi.gov.uk

Research Manager:
Charlotte Lee-Woolf, Research Manager, Sustainable Consumption and Production Programme
Email: charlotte.lee-woolf@defra.gsi.gov.uk, Tel: 0207 2382068

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