PROCESS TECHNOLOGY AND MARKETS OF ECO-LABELLED COTTON PRODUCTS

Dr. sc. nat. Marion Tobler
Institute of Textile Machinery and Industry
Federal Institute of Technology
Zürich, Switzerland

Abstract

European Markets show an enhanced awareness and preference for eco-products both in the food and textile sector. A large variety of labels and trademarks for the product and the cotton used make it difficult for the consumer to choose since the added value is not communicated appropriate. New regulations for specific marks like "bio" and "oekologisch" (organic) in many European countries force companies to study legislation in eco-labeling before using a trade mark for their products. Environment performance including process technology applied and limits for harmful substances varies in the individual labels and therefore promote unfair competition. Actually there are two attempts for international standardization indicating different levels of environment performance. Such standardization could help consumers and entrepreneurs as orientation. On the other hand some eco-textiles with traditional brand names are very successful. Increasing growth rates in European import of organic cotton indicate a possible coming out of the niche production. This seams feasible if the markets reach further milieus than the alternative with their eco-products. However, the products have to show additional values than environmental friendliness.

Introduction

Compared to worldwide consumption European Markets show a significantly higher preference for ecological products. While in the late eighties and the early nineties the first certified organic food products were sold on the market, organic textiles followed with a delay of some years, both markets growing rapidly. European consumers increasingly care for their health, safety and their environment, the latter representing a new social obligation. In policy, the environmental movement is gaining power and the former political opposition has risen to a government party in many nations.

Although the two production cycles, food and textiles, share some process technology in the agricultural stage, their marketing appears completely different. This is due to the structure of the value added chain, cost structure and the influence of design, a fact that was mainly neglected by organic textile producers. Unlike eco-food, which generally tastes better, eco-textiles can not so easily show their additional value. Investigations on the food market (Sinus in Hess 1998) showed that consumers are not mainly found in the alternative scene but above all in the technocratic-liberal milieu (fig.1 and fig.2). If product development in the eco-textile sector aims to reach similar markets as the ecological food market, there might be a coming-out of this niche. Today, textile process technology as well as marketing learn from experiences made in the food sector and combine these guidelines with new attempts on processing and marketing. One of the great challenges is the communication with the consumer, nowadays mainly basing on labeling. The market has to provide appropriate information on added values of eco-textiles, based on improved process technologies towards environmental solutions. However, the attempts made are not yet sufficiently successful (Hasselman 1996).

Eco-Labeling

The variety of labels indicating environmentally friendly products can be structured into three areas. In the European market, the early labels were merely trade marks ("ecollection", "wonderful world", "Patagonia", "Hess natur", "future collection", "Britta Steilmann" etc.) used by an individual company, highly promoted by a fashion trend in 1992 till 1994 (fig.3, light colored). These trade marks were not only given to cotton products, and an accounted body did not certify them as it is now requested for eco-labels (fig. 3 dark colored). Meanwhile, some of these trade marks became "individual eco-labels", still used by individual companies (e.g. natura line by Coop, Patagonia etc.). Products with individual eco-labels are manufactured according specified standards and undergo regular certification by accounted bodies like IMO, Tüv, Skal or Krav etc. National legislation protect certain marks in agriculture like "bio" (Bio-Verordnung in Switzerland) or "oekologisch" (EG Richtlinie 2092/91) as a warranty for ecological production technology (fig.4). The individual eco-labels like natura line, AKN, Krav and Skal etc. follow strict but not equal environmental regulations as well as equal protected marks.

Common eco-labels are registered trade marks, promoted by an institution (third party) and used for products of several companies like "green cotton", "AKN Markenzeichen", "kbA" (organic), "ecotex 100" etc. The certification follows the same procedure as individual eco-labels. Consumers are irritated since eco-tex 100 also includes other fibers than cotton (natural and man made), other labels are given only to cotton ("kbA" and "organic") while some ("green cotton", "AKN, "eco-tex 100") are given to the consumer good itself. Nevertheless, common eco-labels, used by several companies, may be still of some value if they are well communicated and obtain a certain range in the textile sector. Together with eco-labeling programs, they allow comparisons of environmental improvement.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:232-236 (1999)
National Cotton Council, Memphis TN

A somewhat different attempt is made by national or international eco labeling programs like the EC-Standards for T-shirts (cotton and polyester) and bed linens. Unlike the previous mentioned individual and common eco-labels that are regulated by registration, the labeling programs are regulated by national legislation. In the case of the EU-label for T-shirts (EC 1996), these standards must be met in all nations, while restrictions are on a low level.

Actually there are two mainstream tendencies in the field of eco-labeled products. For cotton, an environmental grading system[1] is discussed in a group around a Swiss spinning and weaving company (Boller Winkler 1997). Some attempts are made by different companies and certification offices in Europe to create international standards for a common eco-label with two or three different levels, whereby eco-tex 100 is considered as general standard to be reached within the next ten years (AKN 1998). This indicates that international standards will have to fulfill stronger requirements on both levels. All these trends stand for a better information of consumers in making their choice for an environmentally friendly product. Both attempts are promising, even if the image of the individual company and the properties of the products are mainly responsible for their performance on the market. However, in order to compare environmental improvement, process technology has to be considered.

Process Technology

As shown in fig.4, some of the mentioned labels differ widely in the range of processes included in the lifecycle and the required minimum of environmental standards, especially in cotton growing and cultivating as well as in finishing processes.

The first weak point in environmental performance is the cotton cultivation. In 1994, a 2,8 billion $ was used for pest control in areas of cotton growth, representing 2,4 % of the world's agricultural area (Reller and Gerstenberg 1996). Impacts on human and environmental health like in the area of Lake Aral are enormous (Semenza 1997). Long term investigations on wheat (Gaillard 1998) showed that the environmental balance of the ground's ecosystem is achieved only after 25 years (integrated production), respectively 15 years (organic production). Even with "integrated production"; the environmental impacts vary widely (Spaar 1997). Most of the world's cotton production outside of the USA is handpicked. The differences between handpicked and "organic production" are fluent. The European market has its areas of growth spread all over the world: Egypt, Turkey, Peru, India and Africa. Imports to Europe are mainly certified according EC 2091/92 while there are four different classification systems for organic cotton in the US (fig.5). Cultivation for the European market takes place in developing countries and is carried out by many farmers cultivating only a small amount of acres. Economic factors and technological support differ widely in these countries. In some areas most of the cotton is grown under organic conditions, but only a small percentage, mainly the export part, is certified as organic (Vreeland 1998). The need of a stable supply chain requires a social and economic investment on the level of the growers. Here, some labels are benchmarked by anthroposophic or similar standards while others do not require any social investments like for instance human rights (see fig.5).

As will be shown later, cotton cultivation is one of the driving forces for product and market development. Wherever the product requires limits of pest control, at least an indirect environmental control of cotton cultivation takes place.

In a historical view, the main attention in lifecycle assessment was given to finishing processes, for two reasons: because of strong environmental impacts on rivers, European governments introduced strong regulations by limiting the load of effluents from finishing processes years ago. This promoted different end of pipe solutions regardless of the individual product. Secondly, an increasing number of people suffering of allergies and skin diseases prefer labels like eco-tex 100 for human (not environmental) health reasons. In label standards we find this stated by a given percentage of recycling. However, eco-efficient technology is strongly related to economic benefits. If the focus is set on cancerogenic substances or allergenic dyes, heavy metals and AOX-carriers have to be substituted, sizing and tensids to be minimized. Such changes are strongly related to process technology and product quality.

By analyzing selected parameters (IMO 1997Skal 1994, EC 1996), enormous differences in label standards (fig.6) are found. There are no regulations for desizing in the EU-label and in eco-tex 100, while AKN and KRAV require 80% respectively 75% recycling of the size or easily respectively 90% biodegradable. Limits for toxicity of dyes vary by a factor 10 (LD 50 < 200mg/kg or LD 50 < 2000mg/kg).

The great challenge for a company lies in technology and product development, since product quality must remain one of the essential aims to achieve (Andraschko 1998). In practice, we used a more specific tool for a company's internal environmental evaluation (fig.7), whereby changes in formulas could be simulated (Stockar 1996 and Zwicker 1997). Changes in process technology, the development of formulas or even individual substances cause additional costs in product development that should be weighed against their respective environmental improvements.

One of the great difficulties is the lack of communication between the areas of process technology development and machinery development. Great innovations can only be achieved in co-operation of these two areas.

The more a label requires certain technologies, the less it enables competitiveness. However, it is reasonable to carry

a set of minimal standards into the market in order to give the individual label an approved value, allowing competitiveness on the topside and based on additional factors.

Markets

Organic cotton was first grown in 1990, resulting in a total amount of 335 tons of fiber. In 1995/96 about 15 000 tons were harvested (Ton 1996). Compared to worldwide cotton production, this is less than half a percent, but growth rates are considerable. During the rapidly increasing demand for organic cotton from 1992 to 1994, organic cotton supply was strongly influenced by a fashion trend, which favored natural colors. The development after that time can be defined as the real trend of eco-textiles. The European market showed a significantly higher growth rate compared to the worldwide growth (fig.8). This is remarkable, since the textile market in Europe generally declined by 2% in the same period.

Except for some 75 tons, all of the organic cotton for the European market was grown outside of the USA, mainly in developing countries. In order to build up stable supply chains the cultivation of organic cotton in co-operations was promoted by trade companies (Hess 1998, Remei 1998, Coop 1998) as well as by certification offices and related NGOs (Skal 1994, KRAV 1998,). Due to generally used standards, they are likely to attain greater preference and acceptance on the market.

In Egypt (Sekem 1998), organic cotton was first grown in 1991. When in 1994 more than 20% of the cultivated cotton was grown organically, the government decided to subsidize organic cotton. This action strongly increased the organic cultivation up to 500 000 ha in 1997, part of it being exported and part of it used for the national market where stable supply chains were built up. Similar reports are stated for organic cotton in Peru (Vreeland 1998), although growing conditions vary extremely and only a small percentage of the organically grown cotton is certified and can therefore be used for export.

Economic conditions are very different in the developing countries growing cotton (Cotton International 1997), including credits, taxes, access to markets, agricultural consulting as well as availability or restrictions of pest control. Four main companies representing the demand of the European market (fig.9) perform European import of cotton. But as long as the eco-market is a niche, higher productivity will not be easily to achieve, as calculations show. In agriculture the number of acres is essential for additional costs mainly in consulting and controlling (fig.10). Many of the companies in the supply chain suffer from small-scale orders. Additional costs rise where additional work or equipment for separating organic from conventional supply is necessary in order to fulfill strong regulations. An open question is the niche-margin in retail for eco-textiles based on the costs in the supply chain (fig.11), as discussed in Hummel 1996.

Nevertheless, companies (Remei 1998, Coop 1998, Hess 1998). show increased turnovers with eco-textiles (fig. 12), whereby different raw material is used[2]. Only a few are operating on an economically considerable scale[3]. Different strategies are applied and different consumers addressed. Most companies offering eco-textiles exclusively (Hess natur) or alternatively (Otto-Versand) work with mail order. Some companies have additional small shops (WWF, Greenpeace,). Consumers addressed belong to the alternative or traditional milieu (see fig.1). Newcomers like H&M or C&A addressing young consumer with a big market potential could not yet communicate sufficiently the standards of their eco-textiles. A new trend is the strategy of continual replacement of articles by eco-textiles (Natura line, BioRe) from a wholesaler (Coop 1998) and a retailer (Remei 1998). The decision of the wholesaler for this strategy bases on the success of the same company in the food sector (EcoPlan), where demand is increasing and still higher than the supply of organic food. Both companies Remei and Coop believe that eco-products are not specifically bought because of their environmental friendliness, but because of superior quality (for instance in hand and fall).

Niche markets open ways for diversification in both strategies and consumer groups. There is an open field for addressing different consumers, whereby decisions are made in improved product development. Enlarged markets lead to better conditions in the supply chain (from niche and small scale to large scale) and the critical mass in the European market is not yet reached.

Conclusion

Values in European societies promote markets for ecological products if they are of superior value. Moreover, eco-labeling has to provide a clear message to the consumer, which enables him to know the added value of eco-textiles. There is a need for co-operation between certification offices and independent expert knowledge in process technology as clarifying instance in controlling environmental performance of process technology and for the promotion of innovative processes. General standards on different levels will help the consumer to make their choice. On the other hand, standards must not interfere with free trade and the competitiveness of companies. The success of eco-textiles bases strongly on product development and the image of the individual companies, as well as on a stable supply chain. Increasing demand due to adequate communication, refined product development and improved process technology in the supply chains could promote the European niche market of eco-textiles to a segment of the worldwide textile market.

Notes

[1] See standards for cotton in the next chapter.
[2] There are no statistics for articles made of different raw materials because it makes no sense to compare e.g. apparel made of wool with apparel made of cotton.
[3] Limits are stated at 100 Mio. SFr. But there are many small retailers with 20 000 to 30 000 SFr. of sales.

References

AKN 1998 personal information.

Andraschko D., Qualitätsvergleich verschiedener Garnstrukturen im fertig ausgeruesteten Gestrick, Diplomarbei Fachhochschule Albstadt und ETH Zürich 1998.

Boller Winkler, Zukunft Baumwolle, Tagung Stein am Rhein, Okt. 1997.

Cotton international 1997.

Coop 1998 documentation and personal information.

EC, Label Ecologique communautaire, procédures d'attribution applicables aux tee shirts et au linge de lit, journal officiel des Caumunautés européennes 1996.

Gaillard G., Oekobilanzen des Weizenanbaus: Vergleich der intensiven, integrierten und biologischen Produktion, Referat Forum Oekobilanzen ETH Zuerich, 6. Okt. 1998

Hasselmann S., Marktorientiertes Umweltmanagement in der deutschen Textil- und Bekleidungsindustrie, Koeln, Eul 1996.

Hess 1998 personal information.

Hummel J., Oeko-Textilien: Von der Nische zum Massenmarkt, IWOe-Diskussionsbeitrag Nr. 30 1996.

IMO, Oeko-Textil-Labels, Vergleichende Studie, Sulgen, Schweiz 1997.

KRAV, Gro Link 1998

Reller A. and Gerstenberg J., Wienies Gold, wohin? Stand und Aussichten der Baumwollnutzung in GAIA (6) 1997.

Remei 1998 personal information.

Sekem 1998 documentaion and personal information.

Semenza J, et al., Water Distribution System and Diarrheal Disease Transmission: a case study in Uzbekistan, draft 1997.

Skal, Skal-Standards for Sustainable Textile Production, Standards for Processing of Natural Fibres, Zwolle, Netherlands, Sept. 1994.

Spaar T., Environmental Balance of Cotton Production in the High Plains Texas and the San Joaquin Valley California, Diplomarbeit ETH 1997.

Stockar R., Oekologische Bilanzierung in einem Textilveredlungsbetrieb, Diplomarbeit ETH 1996.

Ton P., The European Market for Organic Cotton and Eco-Textiles. A Market Survey, Foundation Ecooperation, Netherlands 1996.

Vreeland J., Organic and Naturally Pigmented Cotton Cultivation in Peru, draft for 12th IFOAM Scientific Conference Mar del Plata, Argentina 1998.

Zwicker K., Prozessoekobilanzen für Textilveredlungsverfahren, Diplomarbeit 1997.

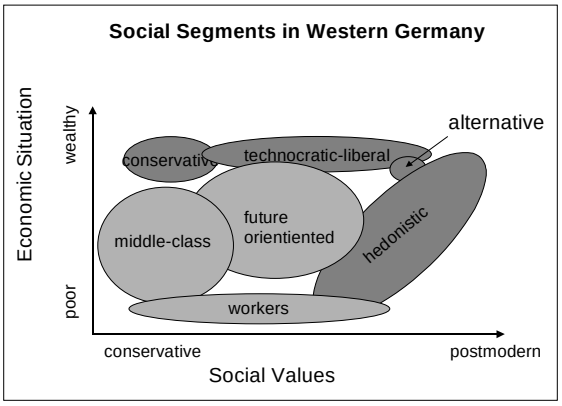

Figure 1. Social Segments in Western Germany

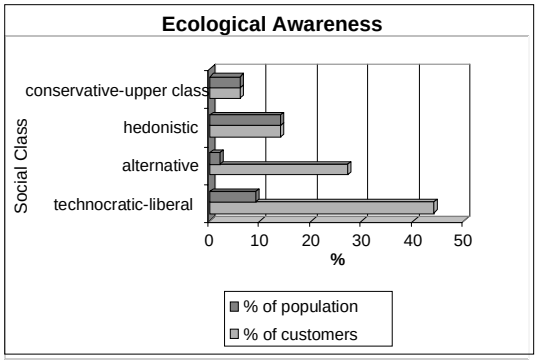

Figure 2. Ecological Awareness of Consumer Types

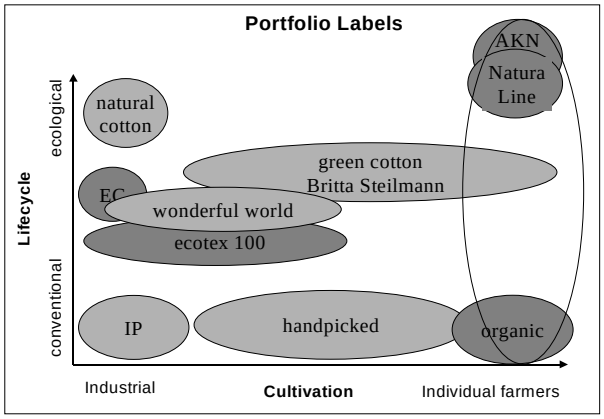

Figure 3. Labels (light grey: brand names, dark grey: eco-labels)

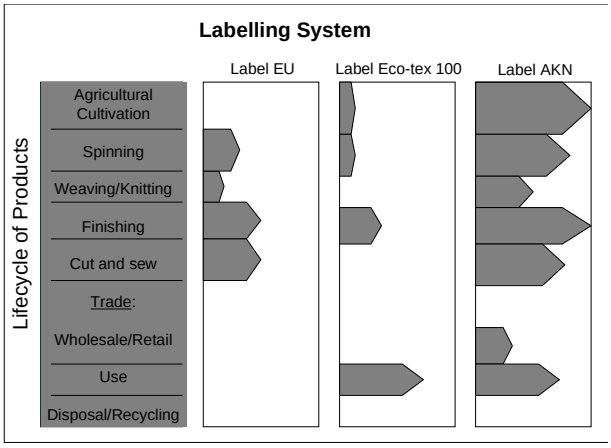

Figure 4. Labeling system regarding life cycle

Standards in Cultivation

	Cultivation	Declaration of Raw Material	Social Aspects
EU-Label	no restriction	polyester permitted cotton > 50 %	
Skal	EU standard 2092/91 (kbA)	organic	social declaration
KRAV	EU standard 2092/91	A > 95% organic B > 75% organic	social declaration decertification possible
AKN members	also mechanically pestizides < 0.1 mg/kg	100% cotton	national + international human rights
Ecotex 100	pestizides < 1mg/kg	no toxic agents	
Coop Natura Line	EU standard 2092/91	kbA	social standards
Migros/M-Sano	no restriction	declaration of fiber origin	
Hess Natur	2092/91 and handpicked (IP)	kbA and handpicked	proprietary choice of fiber antroposophical guidelines

Figure 5. Standards in cultivation

Selected Parameters in Finishing

	Desizing	Bleaching	Dyeing
EU-Label		if chlorine: AOX < 40mg/kg	no cancerogenes
Skal	LAS, Polyglykolether fatty alkohols	no chlorine oxidation/reduction	vegetabile or mineral no heavy metals
KRAV	easily degradeable or 75% Recycling	no perborate or hypochlorite	no heavy metals no urea
AKN Mitglieder	90% degradeable 80% recycling	no bleaching	LD 50 < 2000mg/kg eco-toxicity < 10
Ecotex 100		no bleaching with chlorine	limits for heavy metals
Coop Natura Line	bio-degradeable soaps and tensides	no chlorine, chlordioxid na-hypochlorid	no heavy metals no AOX
Migros/M-Sano	control of desizing	bleaching without chlorid	min. heavy metals LD 50 = 200mg/kg
Hess Natur	bio-degradeable soaps and tensides	reductive - or peroxide-bleaching	no heavy metals, non toxic

Figure 6. Selected finishing parameters

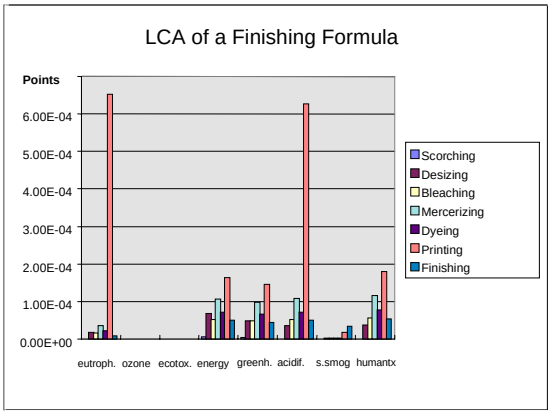

Figure 7. Life cycle assessment (CML) of a finishing formula

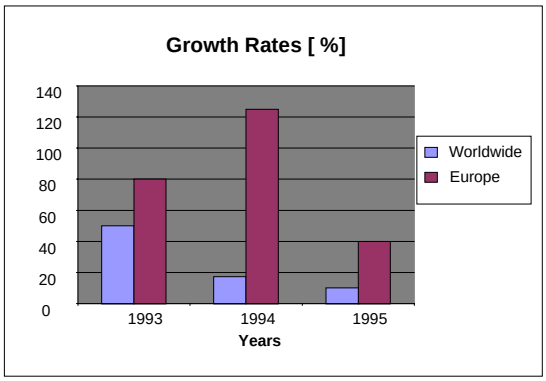

Figure 8. Growth rates of eco-textiles in Europe and worldwide

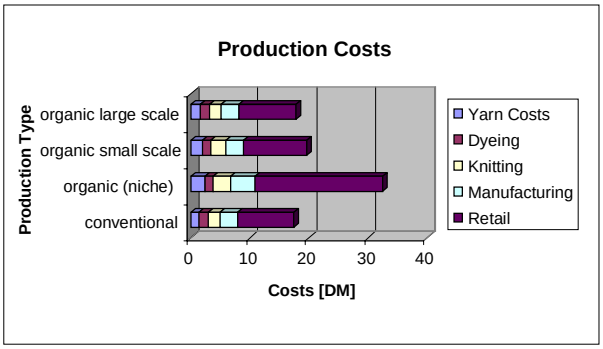

Figure 11. Production costs of conventional and organic cotton of different scales.

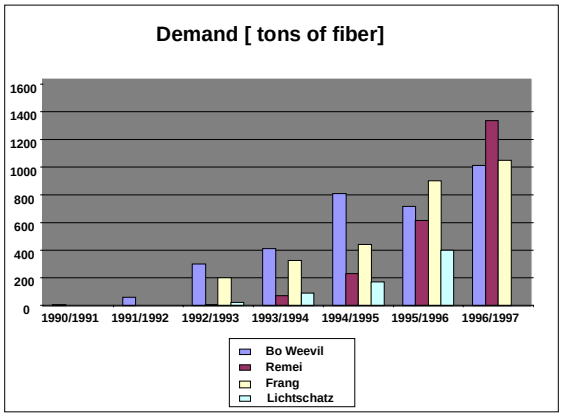

Figure 9. Organic cotton imports (Europe)

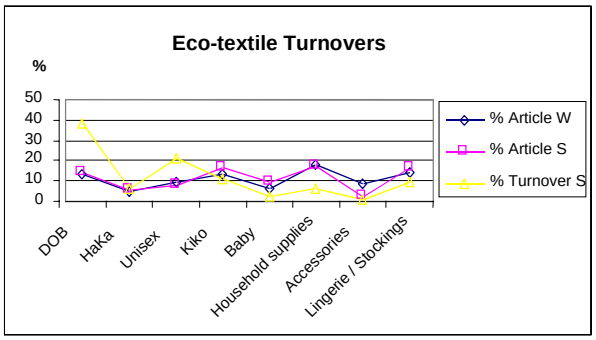

Figure 12. Turnovers of two seasons 1998 with different textile sections

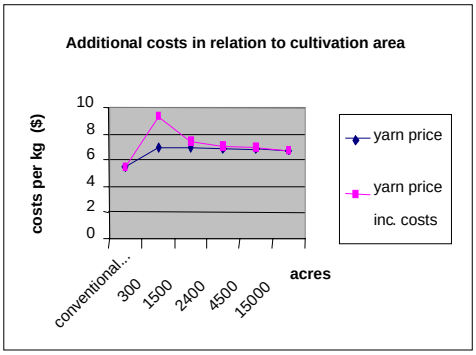

Figure 10. Economy of organic depending on production area