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Restricting factors inhibiting broader industrial use of fibre crops

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Restricting factors inhibiting broader industrial use of fibre crops

- Technological
- Ecological
- Social
- Economical
- Research gaps

Restricting factors inhibiting broader industrial use of fibre crops

Technological factors:

- Concentration of processing industry around cultivation zones
- Organization of cultivation (high fractionation, especially in new member states)
- Supplies strongly depend on weather conditions
- Quality of raw material depends on weather conditions, harvest date, method of fibre extraction and storage conditions
- High level of manual operations in extraction and handling
- Low efficiency of flax and hemp processing compared to chemical fibres – result of currently used technologies
- Without proper management, fibre extraction and processing can be a source of environment pollution (consumption of water, energy, waste products)

For the fibre to be utilized by industry, the quality and quantity must be consistent over time. This requires a reliable supply chain to be in place with both the quality and quantity of raw material to be consistent over time. There must also be sufficient profit available throughout the production pipeline.

Restricting factors inhibiting broader industrial use of fibre crops

Research gaps

Wastes can be utilised far better.

- The environmental impact of natural fibres also relies on how by-product management is organized. In principle renewable resources will be fully bio-convertible and may be reutilised as source for carbon in the form of carbohydrates (sugars), lignin or nitrogen (protein) and minerals.
- Often agricultural production utilises only a small part of the total fixed carbon in the biomass produced or harvested.
- Eco-effective design of products requires reuse of wastes to make new products. The suggestion is made that limitless economic growth can be obtained when the resources are properly reused (without quality loss).
- Since primary production is paid for quantity rather than quality, the breeding is often focussed on yield improvement and disease resistance. Concerns about the safety of genetically modified organisms or GMO-crops has resulted in fierce political discussions

Restricting factors inhibiting broader industrial use of fibre crops

Research gaps

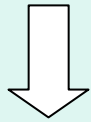
- Concentration of cultivation and processing (to improve homogeneity and quantity of raw material lots and will allow for control of sowing material and mechanization on high areas. It will also develop new harvest techniques e.g. using combines)
- New harvesting and processing technologies (more efficient and controllable e.g. using ultrasound, enzymes, osmosis, plasma and other unconventional methods)
- Improvement fo further processing steps (spinning)
- Searching for new applications (e.g. production of viscose fibres from shives)

Ecological aspects

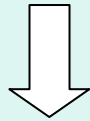
Ecological factors

Physicochemical

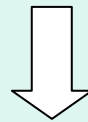
Quality of basic raw materials is subordinated from environmental conditions. Adverse conditions cause worse yield of fiber, dry mass and fiber quality. Problem with "fidelity of flax yielding" – it is hard to obtain large lots of good quality raw material



Fiber flax is very sensitive to high temperatures and low air humidity



Poor root system and short vegetation period (spring crop) cause strong sensitivity on drought



It's difficult to control (to manage) process of dew retting; (the most important is weather conditions) what has an effect on dew retted fiber quality. Problem with "fidelity of flax yielding" – it is hard to obtain large lots of good quality raw material

Biological



- Recommended regionalization of flax growing leads for excessive concentration of breeding. Narrow genetic pool is this result.
- Low heritability of functional traits and difficulties with correction of functional traits.

Research gaps and recommendation for broader industrial use of fibre crops

Ecological aspects:

- 1. Knowledge of genetic mechanism plants immunity on drought. Breeding of new cultivars more resistant to drought and high temperature.***
- 2. Widen of genetic pool (interspecific crosses).***
- 3. Research for improvement of dew retting process for different weather conditions.***
- 4. Limitation of environmental conditions influence on raw material quality (biotechnology).***
- 5. Conduct of research concerning biostimulators***





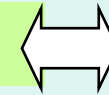
Social aspects I



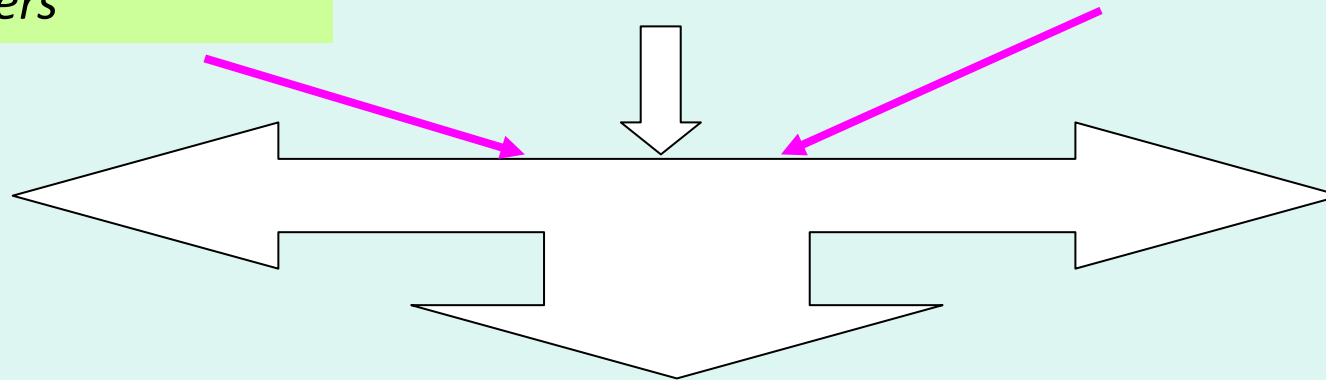
***Low level of consciousness
on the subject: advantages
of natural fibers***



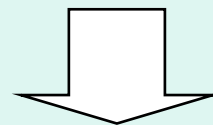
Synthetic fibers



***Import of cheap
fiber beyond UE***



Profitability decrease of fibre crops cultivation



Limitation (decay in some countries) of textile industry

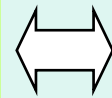


Social aspects II



Product price (not it's quality) is first factor (on many market segments) during **buying decision**

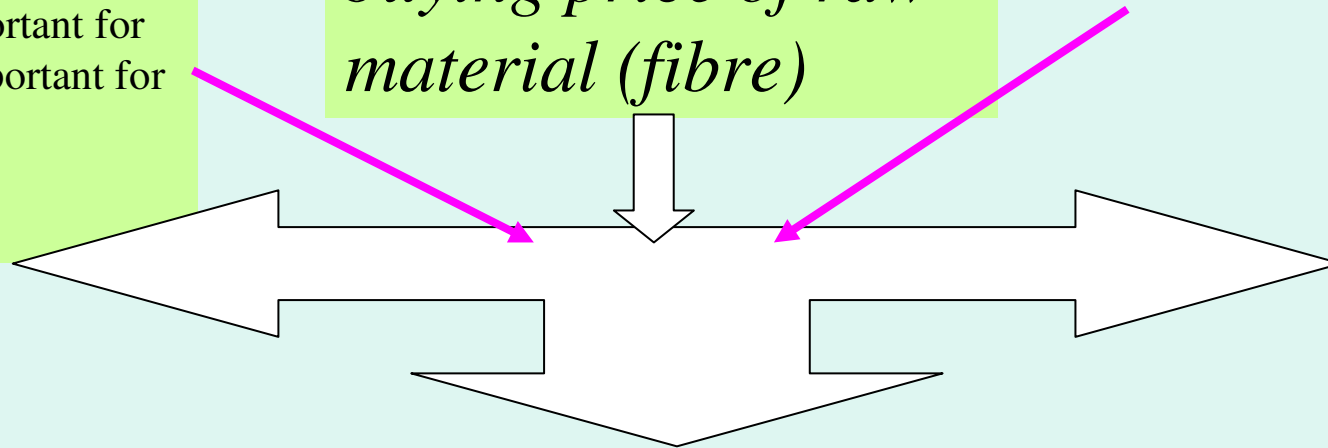
Price – not so important for clothing. More important for home.



Conflict between crop selling price (farmers income) # buying price of raw material (fibre)



Poor knowledge about industrial hemp # marihuana



Not satisfying demand on products from natural fibers

Research gaps and recommendation for broader industrial use of fibre crops

Social aspects:



- 1. Education and PR for increasing knowledge about advantages of natural fibers.***
- 2. Promotion of the own textile production in UE countries.***
- 3. Market research for estimate hiding market segments for bioproduct made from fibre crops.***
- 4. Conduct of research concerning possibilities of cost reduction in each period of processing and biological production (drop of price).***



Restricting factors inhibiting broader industrial use of fibre crops

Economical factors

Main flax producers in Europe. Cultivation area [ha]

Country	2003	2004	2005	2006	2007
F+Be+NI	98360	102621	99047	97103	91500
Germany	224	180			
Austria	142	109			
Latvia	-	1654	2072		3000
Lithuania	10000	5494	3599	1000	
Czech Republic	6003	5499	4318	4318	
Poland	6000	5745	6823	6823	
Russia	104000	112300		80000	50000
Belarus	60000	79146		65000	70000
Ukraine	32000	37000		12000	6000
Egypt	36000	36000	20000	8000	16000
China	133000	200000	130000	130000	80000

Restricting factors inhibiting broader industrial use

Economical factors of fibre crops

Cultivation area of hemp in EU – main producers [ha]

COUNTRY	2001	2002	2004	2005	2006	2007	2008
Czech Republic			150	159	156	1086	700
France	7700	7729	8800	9600	9315	8083	7500
Germany	2967	2035	1730	2005	1985	1233	800
Italy	151	300	885		157	500	250
Poland	111	83	910	216	129	1007	1200
Spain	6103	691	654	700	853	3	
Sweden	0	0	141	368		700	200
UK	2245	1413	1658	3000	1274	1671	1300
Total EU	20404	14584	14557	16462	14541	13974	12650
Ukraine		1910	1510	1940	1940	2490	910

Europe – ca 14000 ha

Canada – ca 15000 ha

China?

Kenaf – ca 500 ha

Total fibre production EU 2600 t (France 1800 t)

Nettle – ? research

Restricting factors inhibiting broader industrial use of fibre crops

Economical factors

- Competition from other cultures (wheat, maize - market fluctuations)
- Products diversity (fibres + shives; fibres + waste fibres)
- Low specialization of industry (often factories cover the whole production chain from fibre to final product) – low production volume (no textile industry in Europe), = big investments
- Quality maintenance (field-field; region-region; year-year)
- Complex and low efficiency processing technologies
- Competition from tropical natural fibres
- Competition from man-made fibres
- Political barriers (subsidies inequality)

Restricting factors inhibiting broader industrial use of fibre crops

Research gaps

- Yield improvement
- Breakthrough extraction and processing technologies (cost & volume efficient)
- Development of new/niche products
- Involving bast fibres and marketing specialists together in marketing activities

Restricting ecological-social factors inhibiting broader industrial production of biofuels

- The greenhouse effect - production of cellulosic bioalcohols,
- Recent developments on energetic balance and waste management in the technological process,
- Influence of not always right choice of plant parts and biomass distribution and unnecessary antagonization of food and fuel sectors,
- Influence of social-ethical aspects and ecological protection policy in biomass use.

Restricting ecological-social factors inhibiting broader industrial production of biofuels

Plants for biofuel

- SECOND GENERATION BIOETHANOL OR n- BUTHANOL PRODUCTION AND ALCOHOL-BIOCOMPONENTS FOR BIODIESEL MIXTURE
- [THERMAL ,CHEMICAL AND BIOCHEMICAL CONVERSION OF BIOMASS BY ENZYMES]

PLANTS FOR NATURAL POLYMERS

- OBTAINING NANOFILTERS FROM NATURAL POLYMERS BASED ON CELLULOSE FROM HEMP STRAW, KENAF, WOOD etc.
- PRODUCTION OF NEW TYPE OF THE CELLULOSIC FILTERS, THIN SURFACE MODIFIED BY VARIOUS ACTIVE SUBSTANCES, WHICH CLEAN THE PASSING AIR - WITH ANTIBACTERIAL PROPERTIES (ESPECIALLY FOR CAR DUST FILTERS AND AS HYGIENIC MASKS)
- RESEARCH ON SILK FIBROIN AS THE PHARMACEUTICAL CARRIER FOR MEDICAL APPLICATIONS

PLANTS FOR NATURAL POLYMERS

Research gaps:

- NANO-MATERIALS FROM POLY-LACTIC ACID [PLA], POLY-HYDROXY BUTYRATE [PHB] MODIFIED ENZYMATICALLY e.g.: LYSOZYME, α -CHYMOTRYPSIN
- COMPLEX RHEOLOGICAL ANALYSIS OF NATURAL POLYMERS AND RESINS SOLUTIONS; NANO-RHEOLOGY