Peat free growing media

A Supplier's Perspective

RHS Workshop 6th March 2024

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Agenda

01

Klasmann-Deilmann
Expertise in substrates since 1913

02

Current and future Raw Materials

03

Raw Materials in Detail

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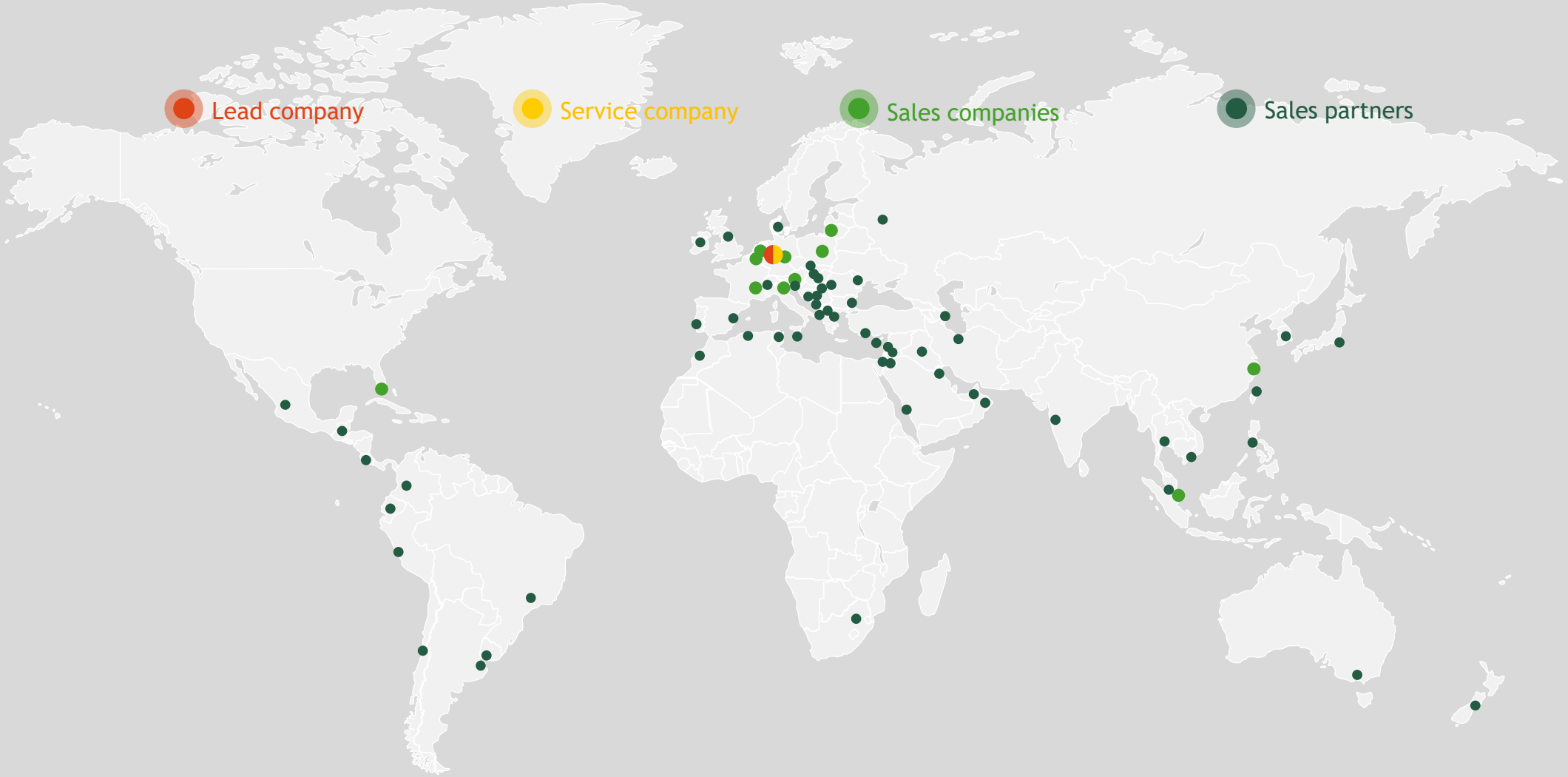
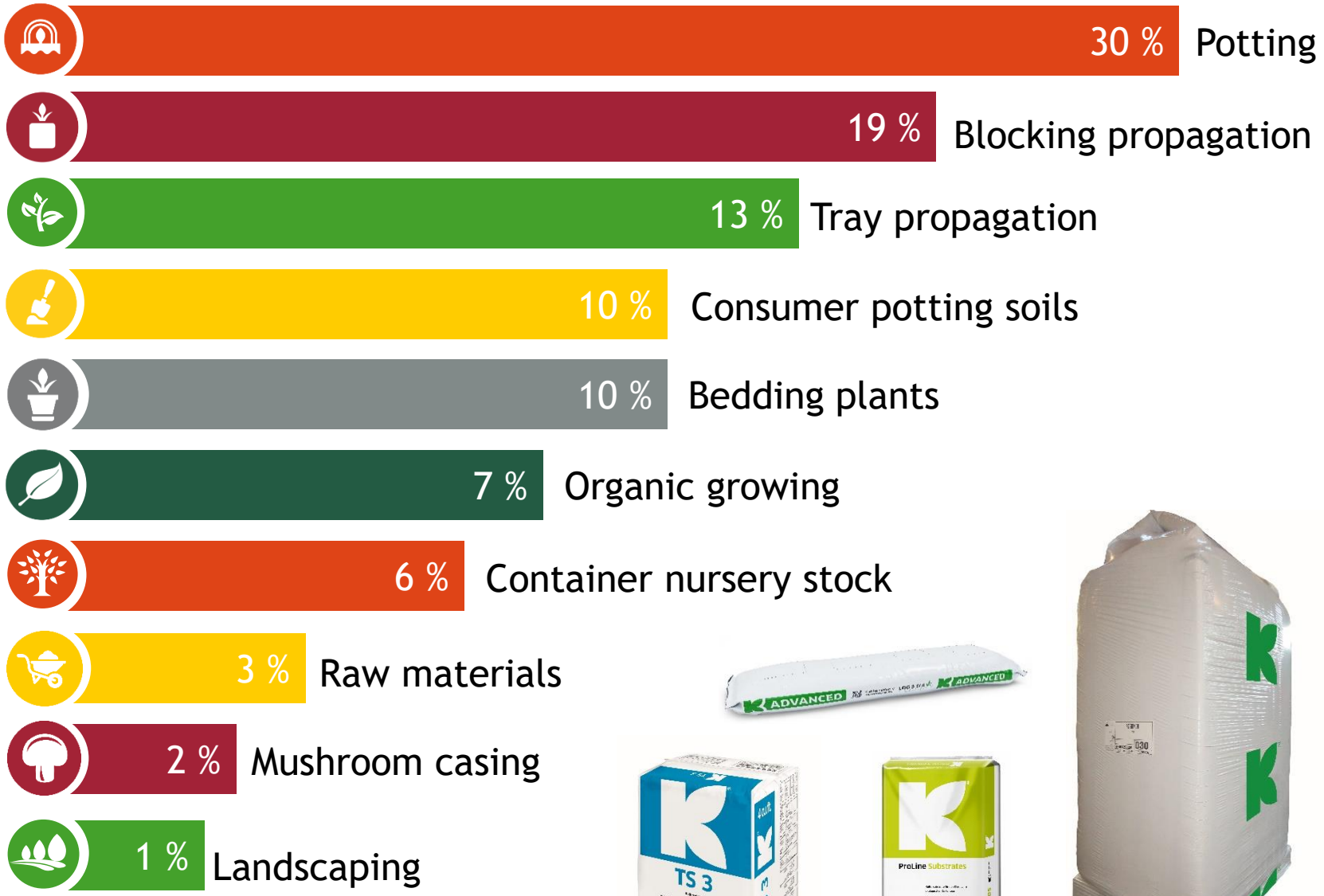
The Optimum Growing Media

Klasmann-Deilmann: corporate structure



Klasmann-Deilmann: Substrate Supply 2023



Substrate production 2021:
= 3.95 mio. cbm substrate

(of which 0.96 mio. cbm alternatives = 24.3%)

Substrate requirements: Commercial availability

SUBSTRATES Advanced

Global growth of substrate demand until 2050

7.3 Bill. — **global population** — **9.3 Bill.**

	2017	2050	Increase
	Mio. m^3/yr	Mio. m^3/yr	%
Peat	40	80 ??	200 %
Coir	5	35 ??	700 %
Wood fibre	2	25	1250 %
Bark	1	10	1000 %
Green compost	1	5 ?	500 %
Perlite	1.5	10	667 %
Stone wool	0.9	4	433 %
Soils / clay	8	33 ?	413 %
New alternatives		42	
Total:	**59** (32.2% alternatives)	**244** (67.2% alternatives)	**415 %**

Source: Prof. Chris Blok, „Reflections on circular horticulture in the period 2020-2050", Wageningen University, The Netherlands, 2019

+ 415 % increase of substrate demand by 2050

How can we find enough raw materials ?

Competition for raw materials with other sectors (energy) !!

02

Current and future raw materials and assessment

Suitable constituents for peat free / peat reduced mixes

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Organic materials	Mineral materials
Coir, washed / buffered (SA8000 certif.)	Perlite
Coir (Eco) (SA8000 certif.)	Clay granules / milled clay
Coco fibers (SA8000 certif.)	Vermiculite
Coco chips / crush (SA8000 certif.)	Pumicestone
Wood fibre	Expanded clay, crushed
Green compost	Sand, washed
Potting bark	
Composted bark	

New constituents - what's on the radar?

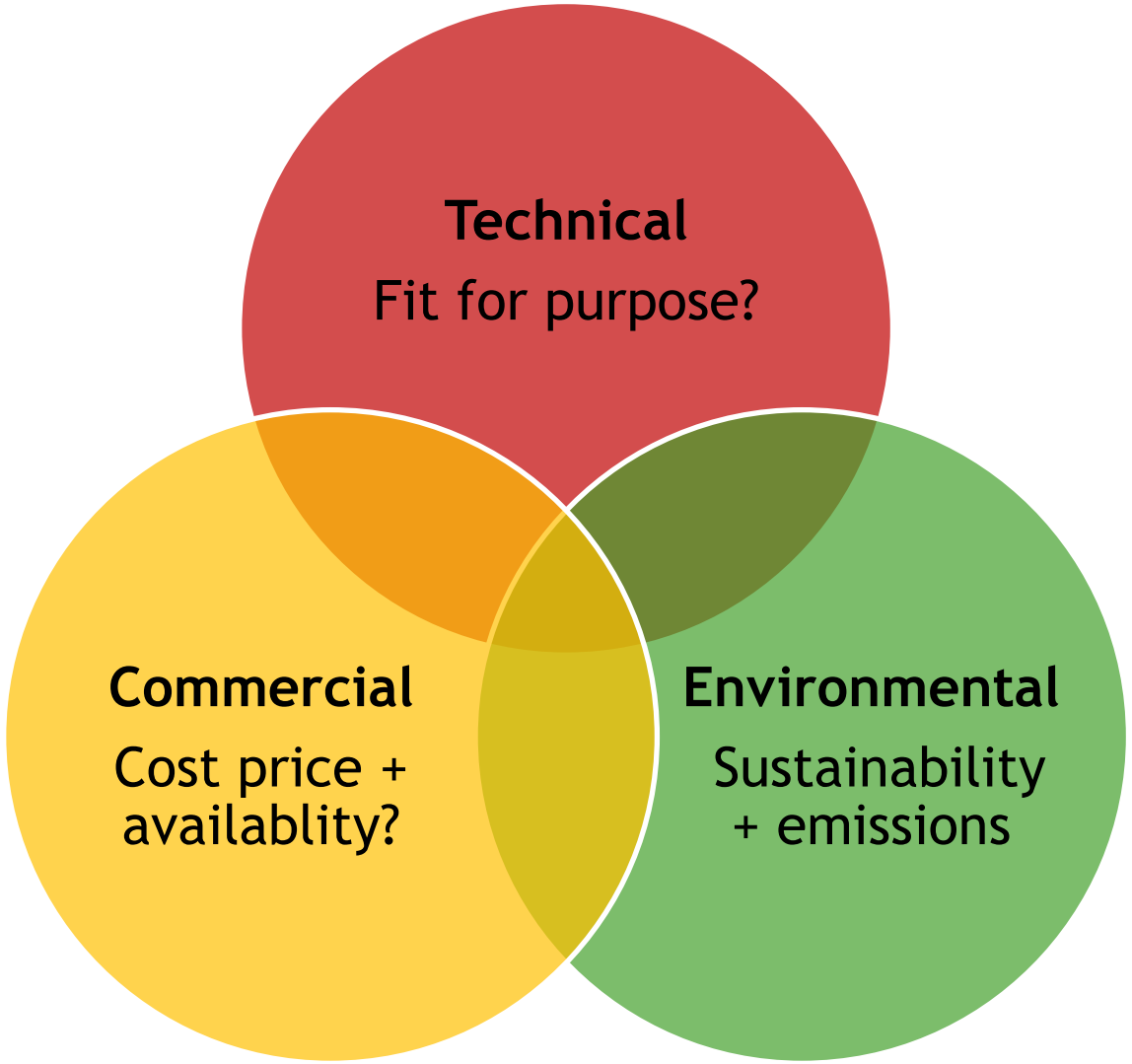
Tested constituent	Limitation
Rice husks	Availability, price, weed issues, transport (LCA), growth issues due to phenols (e.g. Saintpaulia, Begonia)
Flax rasps	N-fixation issues, weed issues,
Rockwool	Price, energy intense (LCA)
Digestates	Inhomogeneity, human pathogen issues, local availability, herbicide residues, mould
Biochar	Limited availability, price, weight, energy intense (LCA)
Plant fibres (e.g. flax, reed, Silver grass, hemp bred)	Still limited availability, N-fixation issues, weed issues, shrinkage
Sphagnum moss	Harvesting technique, weeds, limited availability, price
Xylit (young brown coal)	Limited availability, weight
Cork granules	Limited availability, price
Native / biobased polymers	Price, technology

New constituents - what's on the Distant Horizon?

⇒ Ongoing research in various countries and companies
⇒ KD itself has 60+ materials in test in its own Incubator
⇒ Still: no direct alternative to peat has been found for various reasons

Requirements of growing media

Today 3 areas for substrate performance:



Evaluation matrix for constituents

[Technical dimension]

Characteristics

pH value

Nutrient content

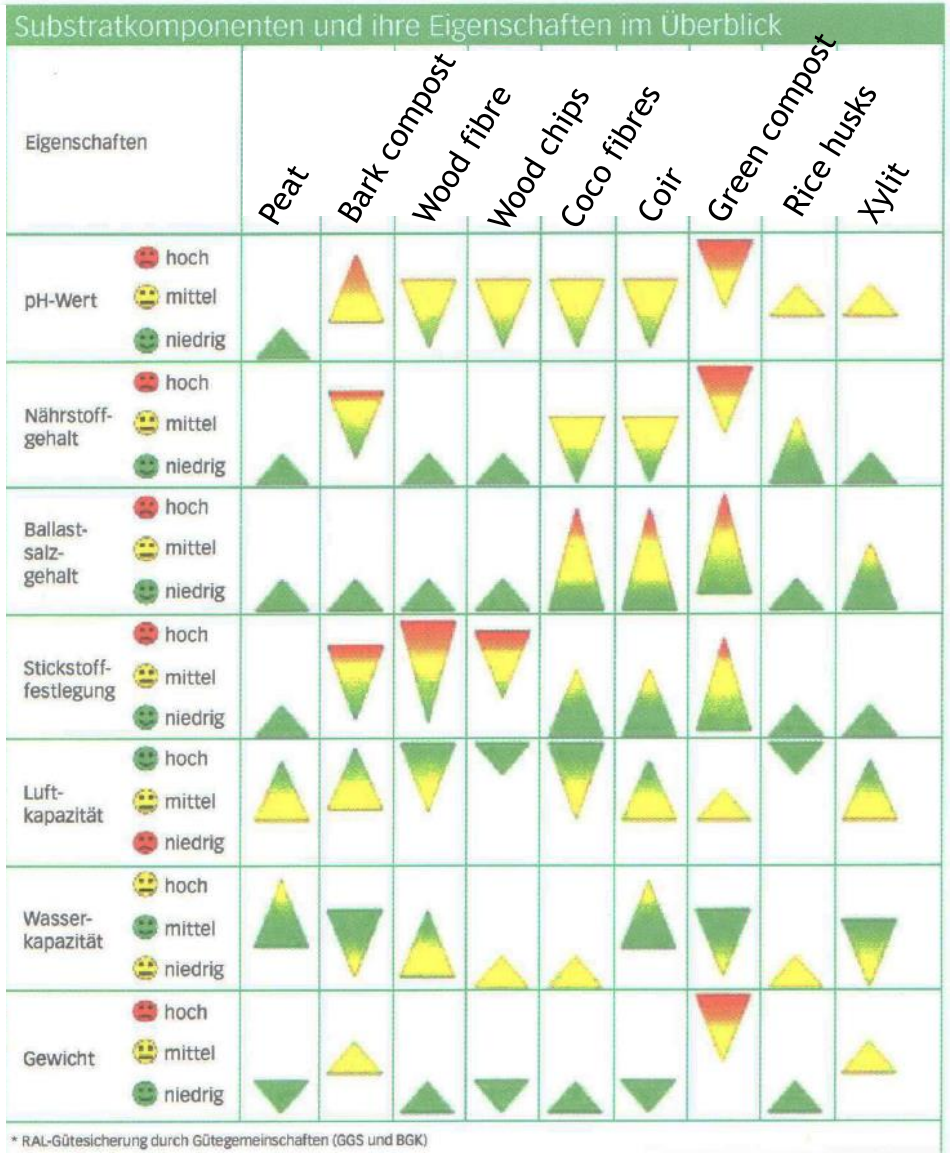
Total Salt content

N immobilisation

Air capacity

Water capacity

Bulk density



Chemical influences

Physical Influences

Source:
Emmel, M., Substrat ist nicht gleich Substrat, DEGA magazine, vol. 02/2015

Evaluation matrix for constituents

[Risk factors]

- Critical salts
- Heavy metals
- Human pathogens
- Unspecific toxic effects
- Chemical residues, e.g. herbicides
- Microbiological activity/shelf life
- Increased attractiveness for saprophytic fungi (wood digester), Sciarid flies
- Weeds
- Image/aversion to green compost

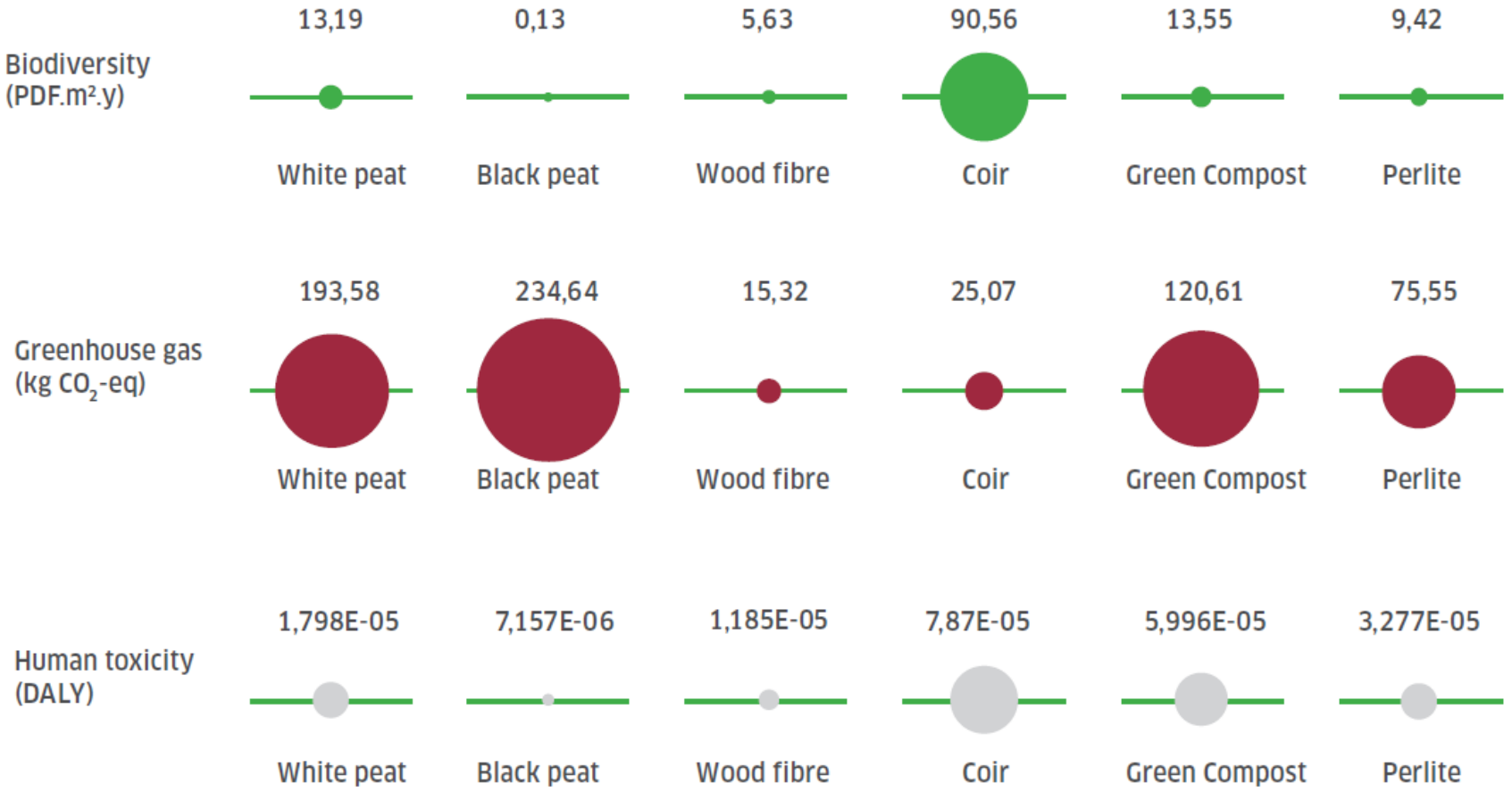
Substrate requirements: Environmentally

LCA for different constituents

= Influence on ecosystems: **P**otentially **D**isappear **F**raction of species, hazard potential to oust certain forms of life from their ecosystems

= Climate affecting emissions given as kg **CO_2-eq**uivalents: From product / production process itself (cradle to grave-approach, CO_2, methane, etc.)

= Influence on human health: **D**isability-**A**djusted **L**ife **Y**ears. Influence on health / life expectancy of people within their surroundings



* all data are based on the ‚cradle to grave'-approach including final use

Sources: LCA 2011 per Quantis Suite 2.0; Klasmann-Deilmann Sustainability Report 2012
GHG Balance 2016; Klasmann-Deilmann Sustainability Report 2016

Raw Materials in Detail

Raw materials and judgement

Coir pith

ADVANTAGES

- Known raw material in horticulture
- Best water retention of all non-peat-materials
- Suitable air capacity
- Reliable drainage
- Easy rewetting
- Easy handling in substrates

To be considered:

- Salinity
- Potassium
- pH levels from 5.5 – 6.0
- Water consumption for processing (washing / buffering)
- Transport overseas
- High price (today 70 € +)
- Ethical concerns

Possible share in growing media

100%

Raw materials and judgement

Coco fibre and chips

ADVANTAGES

- Known raw material in horticulture
- Air capacity
- Drainage
- Good re-wetting
- Structural stability

To be considered:

- Salinity, Chips accumulate salts
- High / varying pH levels
- Low water retention
- High price (today 70 € +)

Possible share in growing media

100%

Raw materials and judgement

Woodfibre

ADVANTAGES

- High air capacity
- Excellent drainage
- Easy rewetting
- Good structural stability
- pH 5.0
- EC very low
- NKP, micro elements very low
- Phytosanitary safe
- Low weight
- Approval for organic cultivation

Possible share in growing media

10-40%

To be considered:

- Only fresh wood shavings
- Only soft wood species (conifers)
- Low buffer (pH, nutrients)
- N-immobilisation
- Wood chip prices are depending on the engergy sector

Raw materials and judgement

Perlite

ADVANTAGES

- Known raw material in horticulture
- High air capacity
- Excellent drainage
- Easy rewetting
- High structural stability
- pH neutral
- EC low
- Phytosanitary safe
- Low weight

To be considered:

- Price
- No water buffer
- no nutrient buffer
- No microbial life

Possible share in growing media

10-30%

Raw materials and judgement

Clay

ADVANTAGES

- Nutrient buffer
- Improves water distibution and thus water availability
- Can support substrate structure
- Binder in press pots and plugs

To be considered:

- Only additive, not constituent
- Different applications need different clay types
- Extra costs
- Weight
- Requires heat treatment
- Must be low in Carbonates
- Salinity
- Heavy metals

Proportion in growing media

10 - 40 kg/cbm

Raw materials and judgement

Composted bark

ADVANTAGES

- P and K supply
- pH 5.5
- Low salinity
- Trace element supply
- Chemical buffer (pH, nutrients)
- Suppressive effect on plant pathogens
- Microbial life
- Structural stability

To be considered:

- Choose the right input
- Composting process is crucial
- Extensive test program
- Heavy
- Lower air capacity
- N-Immobilisation
- Herbicide residues
- In demand by the energy industry

Possible share in growing media

10-40 %

Raw materials and judgement

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Green compost

ADVANTAGES

- Suppressive effect on plant pathogens
- P and K supply
- Trace element supply
- Good chemical buffer (pH, nutrients)
- Microbial life
- Organic cultivation

Possible share in growing media

5-30 %

To be considered:

- Choose the right input (only selected green residues)
- Composting process is crucial
- Extensive test program
- High pH 7.5 – 8.5
- Salinity (Na, Cl)
- N-Immobilisation
- Heavy
- Low air capacity
- Herbicide residues
- RAL - WRAP Quality accredition

Raw materials and judgement

Digestates

ADVANTAGES

- Low Price
- Supplies P & K
- Structure material
- Moderate water capacity
- Low weight
- Currently large volume (but: for soil improvement in agriculture)
- With composting processes can be made more homogenous

DISADVANTAGES

- Inconsistent batches
- Requires composting
- Issues with growth hormone herbicide residues
- Strong N-fixation
- Fungal growth during storage
- Strong smell possible
- RHP approval not possible
- No reliable delivery infrastruture
- Local material

Possible share in growing media

Raw materials and judgement

Sheep wool

ADVANTAGES

- Circular economy
- Organic “waste” material
- Light weight
- Low price
- Slow-release nutrient release (N)
- Good availability in UK

DISADVANTAGES

- Local availability
- “Organic fertiliser” (N)
- Requires heat treatment
- Mix homogeneity
- No RHP quality management
- Sciara attractivity
- Risks for mould
- Human pathogen risks
- Water repellent (natural oils)

Possible share in growing media

10%

Raw materials and judgement

Rice husks

ADVANTAGES

- High air capacity
- Drainage
- Low weight
- Good structural stability

DISADVANTAGES

- Availability
- Price
- No water buffer
- Nitrogen consumption
- Very viable rice seeds / quality management

Possible share in growing media

5-30 %

04

The optimum growing media

Raw materials and judgement (Overview)

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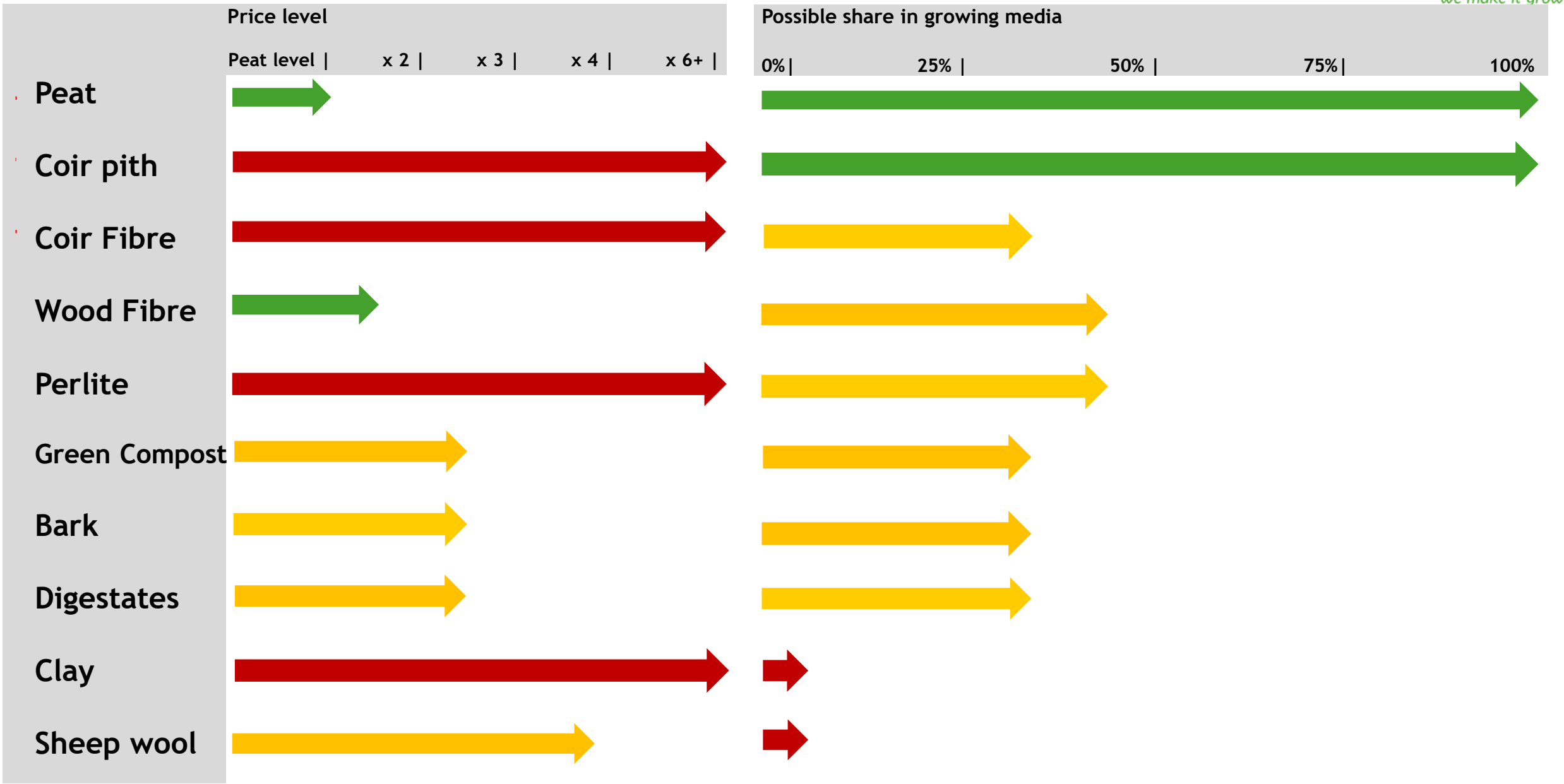

Raw material Structure - Grades

Physical Characteristics (DIN EN 13041)		Chemical Characteristics	
Density, dry	70 – 80 g/l	pH-level (H_2O)	5.0
Pore volume	95 Vol.-%	Salt content	< 150 mg/l
Air capacity (pF 1,0)	60 – 65 Vol.-%	Nitrogen	< 15 mg/l
Water capacity (pF 1,0)	25 – 30 Vol.-%	Phosphate	< 30 mg/l
Shrinkage	< 5 %	Potassium	50 – 80 mg/l
		Magnesium	< 25 mg/l

Raw Material Chemical Attributes

- N P K and Micro Nutrients - consider that supplied in the raw materials
- pH high starting point 6-6.5
- Leaching – maintain an optimum watering regime
- Avoid polluting

Thank you for your attention.

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