Growing Media Market by 2050:

A framework for projecting Raw material Demand and Availability and preliminary results

Van Nguyen, Tommaso Barbagli, Chris Blok
Wageningen University & Research

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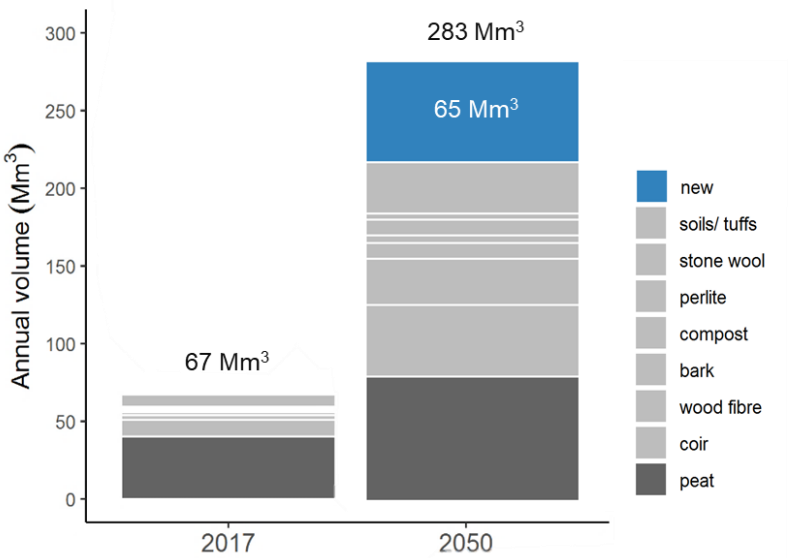
IPS International Peatland Society

Increasing global horticultural produce in soilless systems leads to increased demand for growing media

Prognosis to 2050, conducted in 2017

Annual volume of world growing media [1]



[1] Blok et al., 2021, doi:10.17660/ActaHortic.2021.1305.46

Drivers for GM demand

- **Population** growth
- Global per capita **income** growth
- **Health arguments** in favour of vegetables
- Quality of **life arguments** in favour of public and private ornamentals.

Continent use

A shift from **Europe** and **North America** to **Asia**

Demand for new renewable growing media

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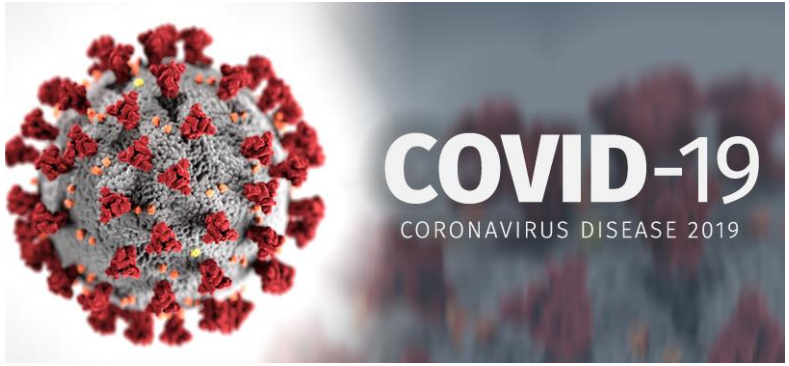


Nursery MANAGEMENT

Horticulture hearing: Peat moss shortage catches Congress' attention

On Sept. 30, 2022, Brian Jackson, a professor at North Carolina State University, participated in a briefing with members of the House Agricultural Committee regarding the peat moss shortage.

Press release

Sale of horticultural peat to be banned in move to protect England's precious peatlands

The sale of peat for use in the amateur gardening sector will be banned by 2024 to protect peatlands and the natural environment.

IPS request 2024

- What is the expected geographical consumption for growing media in 2050?

- What raw materials (growing media) in what quantities will be available in 2050?

Content of this presentation

Framework for projecting growth of the Growing Media Market by 2050 (methodology)

- Demand for Growing Media in 2050, per continent & market segment
- Availability of GM constituents in 2050, per continent & market segment

Preliminary results on:

- Present growing media volume traded (2022)
- List of potential available growing media (performance)

N.B. These preliminary results are not final and are subject to change.

Methodology

Market segments

- Food crops
- Ornamentals
- Tree nursery
- Casing mushrooms
- Hobby market

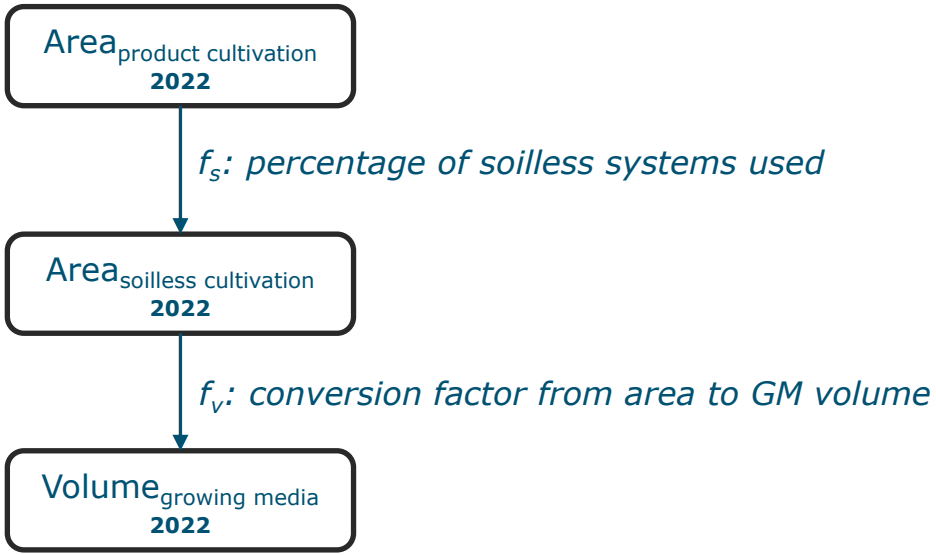
Geographical regions

- America
- Europe
- Africa
- Middle East
- Asia, excl. China
- China

1. Demand for Growing Media in 2050, per region & market segment

Present growing media volume traded (2022)

Food crops, ornamental, tree nursery



Assumptions:

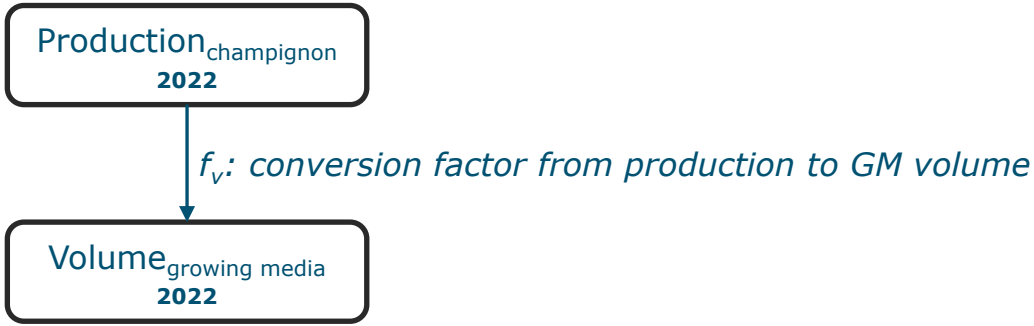
- glass greenhouse: 100% SC
- plastic greenhouse: 1-15% SC
- open field: 1-15% SC

SC: soilless culture

- Food crops: 20 L m^{-2}
- Ornamentals: 30 L m^{-2}
- Tree nursery: 40 L m^{-2}

Present growing media volume traded (2022)

Casing mushrooms: 1 m^3 casing substrate → 1000 kg champignon mushrooms



Present growing media volume traded (2022)

Hobby market

- IPS survey for Europe in 2013 (Schmilewski et al, 2017)
- Growing media market in UK in 2022 (Growing Media Monitor Report)

Assumption: growth rate +30%

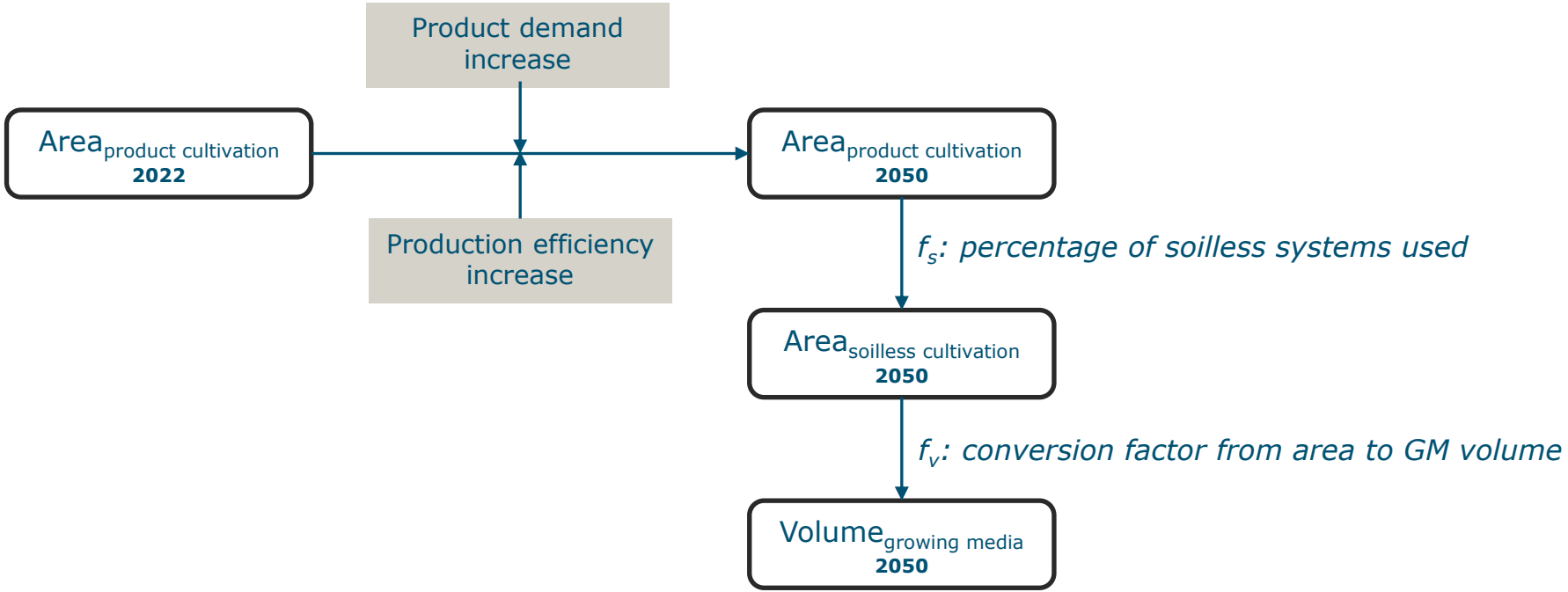
Preliminary result: growing media volume 2022

Region	Soilless culture area (Kha)			Champignon production (Mkg)	GM volume (Mm^3)				
	food crops	ornamentals	tree nursery	casing mushrooms	food crops	ornamentals	tree nursery	casing mushrooms	hobby market
North America	10.0	6.0	28	440	2.0	1.8	11.2	0.4	13.7
South America	2.6	3.2	3	:	0.5	0.9	1.1	:	:
Europe	37.0	12.4	20	1162	7.4	3.7	8	1.2	19.6
Africa	4.8	1.2	0	:	1.0	0.4	0.00	:	:
Middle East	5.6	1.9	0	:	1.1	0.6	0.03	:	:
China	19.7	1.9	13	13629	3.9	0.6	5	13.6	:
Asia, excl. China	18.2	4.6	4	74	3.6	1.4	2	0.1	:
TOTAL	98	31	68	15306	20	9	27	15	33
	197			15306	105				

Note:

1. Data on hobby market are *not completed*.
2. These preliminary results are *not final* and are *subject to change.*

Predicted growing media demand in 2050



Drivers influencing product demand increase

Lists of drivers affecting product demand increase as below, but not limited to

	Food crops	Ornamentals	Tree nursery	Casing mushrooms	Hobby market
Drivers	• Population growth • Per capita income • Urbanization • Lifestyle-health arguments				
Factors	• Population • Diet • Food waste	• Rich population • Per capita ornamental expenditure	*(average of demand increase for food crops and ornamentals)*	• Population subgroup (age, gender) • Per capita mushroom expenditure	• Middle & rich population • Per capita substrate expenditure

2. Availability of GM constituents in 2050, per region & market segment

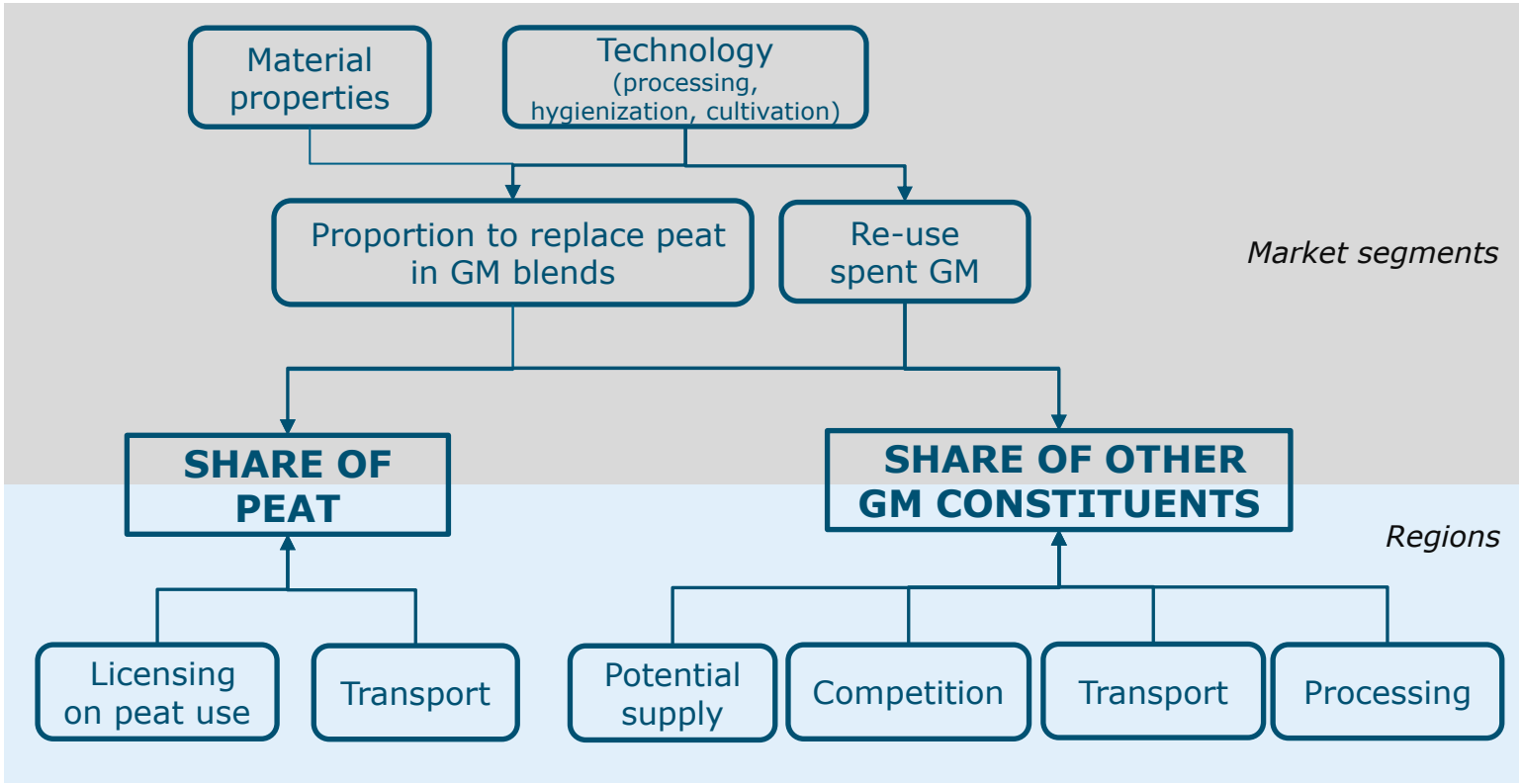
Requirements for raw materials as growing media

- Performance: reliable, predictable
- Economic costs: availability

(>100,000 m^{-3} a^{-1}), cost (<€50 m^{-3})

- Environmental impacts: low

Drivers for shares of GM constituents in 2050



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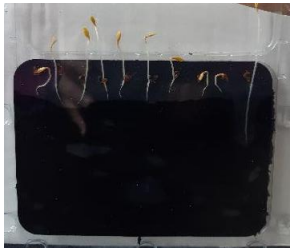
Potential renewable growing media

Commercial GM

- Peat
- Coir
- Wood fiber (pine)
- Bark (pine)
- Compost
- Mineral GM

Feedstock supply

Aspect	Approach
Consistent quality	Source management (harvest, storage)
Phytosanitary (weeds, herbicides, pathogens)	Hygienization techniques
Phytotoxicity biochar (volatile contamination), bark extruded , new wood types (deciduous tree)	Pre-treatments remove volatiles during pyrolysis (biochar), aging (bark & wood)
Volume loss at mixing	Calculation tool Mechanical processing
Feedstock competition	Communication



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Hydrological properties

	Container capacity (%, v)	Air content (%, v)	(*)
White peat 0-10mm	78	15	
Coir fiber mix	60	30	
Acrotelm	90	4	++
Wood fibers	35-60	60-30	-/=
Miscanthus chips	40	50	-
Miscanthus extruded	76	16	=
Biochar (wood chips)	46	47	-

(*) Container capacity comparison to peat/coir:
- lower CC, = similar CC, + higher CC
EN13041

- Design textures via **material processing** (chips, fibers)
- Compensate by **mixing recipes** (acrotelm + wood fiber)
- Adjust **irrigation strategy** (number of cycle, cycle length, start time and stop time)
- **Stratified** growing media

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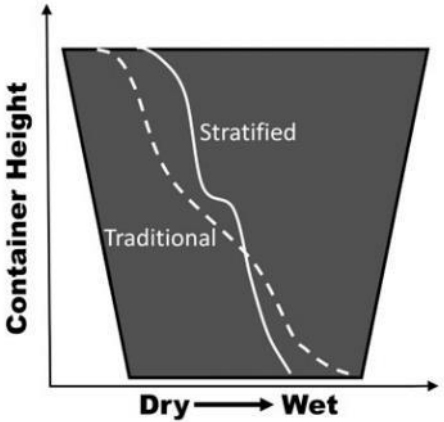
Stratified (layered) growing media

Moisture profile of growing media (GM) in pot



(Fields et al.)

Fine GM

Coarse GM

Stratified growing media in potted spathiphyllum

Normal fertigation

70peat | 35peat | 25coir/ 25acrotelm | 5coir/ 15acrotelm

Modified fertigation

70peat | 35peat | 25coir/ 25acrotelm | 5coir/ 15acrotelm

Biostability – N immobilization

	OUR (mmol O_2/ kg DOM/h)	(*)
White peat 0-10mm	2-3	
Coir	2-3	
Acrotelm	3.7	+
Wood fibers	7-14	++
Bark fiber	12	++
Miscanthus chips	8.8	++
Miscanthus extruded	10.4	++
Biochar (wood chips)	1.7	-

(*) Oxygen uptake rate (OUR) comparison to peat/coir:
- lower, = similar, + higher
EN16087

- Add **base fertilizers** to mixtures $Ca(NO_3)_2$, slow-released N fertilizers
- Adjust **fertigation strategy** (increased irrigation frequency, increased nutrient strength)
- **Stratified** growing media

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Biostability – fungal growth

- Water repellence
- Attract fruit flies/flying insects
- Customer acceptance

- Topic still need attention/ further research

pH & nutrients availability

pH increase during cultivation
Risk of **less micronutrient availability** (Fe, Zn, Mn)

	pH at start	pH during cultivation
Stone wool	6.5-7	5-4
Coir	6.5-7	5-4
Acrotelm	4	
Acrotelm (limed)	6	7
Wood fiber	6.4	7-7.5
Miscanthus chips	6	7.5
Biochar (wood chips)	9.7	

1:1.5 water extraction

- Adjust **NH_4/NO_3 ratio** in nutrient solution
- Use **EDDHA-chelate**
- Adjust **mixture ratio**

30Miscanthus:70peat/coir: pH 5.8-6.1
30BC:70peat/coir: pH 5.7-6.0

- Measure **pH buffering capacity**

4 important aspects to be considered when using renewable growing media

Source of raw material

Processing of raw material

Mixing calculation base fertilizers

Adapted cultivation management Fertigation strategy

Summarise

The market for growing media is growing quickly,

as is research on new renewable growing media.

Thank you!

van.nguyen@wur.nl