



NC STATE UNIVERSITY 9 February 2023
Plumosa County Wood Fiber Project Meeting

Wood Fiber Growing Media: Status and Potential

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Overview of Today's Topics

- Global Demand of Growing Media
- Drivers of Current & Future Demand
- Challenges facing Growing Media Industry
- Commercial Products
- Summary



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Horticultural Substrate Science Lab

Research & Service



Teaching & Mentoring





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HSL: Substrate Analysis

- Physical Properties
- Hydrological Properties
- Chemical Properties
- Biological Properties



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HSL: Material Engineering

- Bark Products
- Wood Products
- Agricultural Feedstocks
- Biomass Feedstocks





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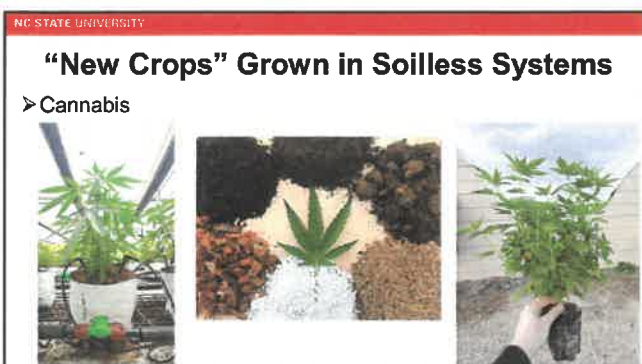
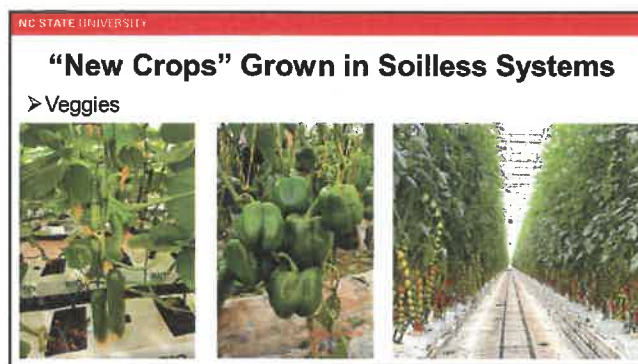
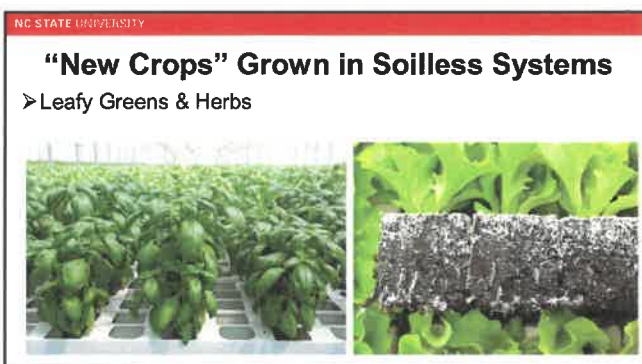
Growing Media Demand

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Future Demand for Growing Media

Table 4. Total estimated market in 2050 based on the expected market increase (Table 2) and a more realistic estimate of the potentially available materials (Table 3).

	2017 (Mm ³ year ⁻¹)	2050 (Mm ³ year ⁻¹)	Increase (%)
Peat	40	80	200
Coir	11	46	418
Wood fiber	3	30	1000
Bark	2	10	500
Compost	1	5	500
Perlite	1.5	10	667
Stone wool	0.9	4	433
Soils/tuffs	8	33	413
New		85	
Total	67	283	



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"New Crops" Grown in Soilless Systems

➤ Soft Fruit - Blueberries

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Controlled Environment & Vertical Farms

- Investment-backed Farming Systems have seen unprecedented acceptance & growth
- Engaged and educated the public on food production and security

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Challenges Facing the Growing Media Industry

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Challenges Facing the Growing Media Industry

➤ Due to on-going and future **imposed, proposed, or perceived** restrictions on peat extraction and use in horticulture, a global campaign to extend peat supplies and identify extenders and alternatives is underway.

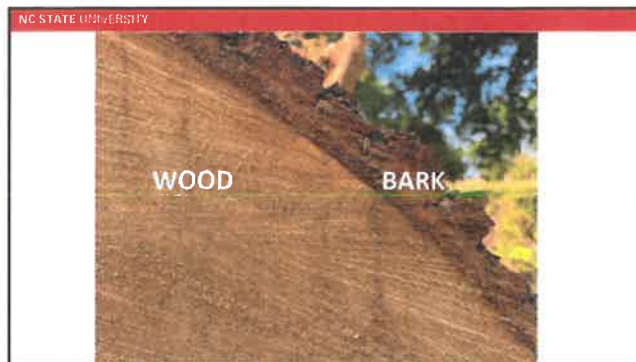
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Global Concerns of Peat Supply

- Mostly centered around European Peat extraction (separate from current demand)
- Some countries with "Peat Debate"
 - Ireland, Sweden, Denmark, Switzerland, Germany, France, The Netherlands, UK
- Justified or not, concerns spreading to North American market
- Current Demand **AND** Supply Chain is fueling the fire (debate and concern)

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Wood Substrates



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History of Wood Substrates

- Alain Courtabessis "invents" Hortifibre (circa 1979-1980)
- Original product was disc refined but switched to extruder
- Patented the process in 1981 (sold it; now expired)
- Since 1980.....A LOT HAS HAPPENED!

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Wood Species Tested

- Literature suggests 32 species tested
- Conifers proven to be best
- Hardwoods breakdown too quickly
- North America: *Pinus taeda* most used
- Europe: *Pinus*, *Larix*, *Picea*

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Why Wood? Why Now?

- Renewed interest within last 5-8 years:
 - Increasing governmental mandates of Peat Reduced/Free
 - One viable solution to demand of growing media in future
 - Occasional poor peat harvests (wet summers)
 - Wood products often cheaper
 - Particularly compared to perlite (now for peat too!)

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Wood Substrate Manufacturing Methods

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Making Wood: 1) Extrusion

- Extruder/Retruder (Single or Twin screw types)
- Chips may or may not be pre-washed/soaked
- Process utilizes friction to de-fiberize wood chips (110-165C)
- Fiber thickness adjusted with screw spacing and chip size

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Daltons, NZ (PineGro)

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Variations in Extruded Products

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Making Wood: 2) Disc Refiners

- Twin disc refiners utilize high pressure and heat (~150° C) to "precondition" wood chips before being de-fiberized.
- Fiber thickness adjusted with disc spacing and wood chip size

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Making Wood: 3) Hammer Mills

- Traditional machinery used for processing materials
- Variables influencing end-product type and consistency:
 - Moisture, wood chip size, screen size, rpm's,
- No heat generated in this process**
- Cannot make true "fiber" but can make many sizes



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Wood Feedstock Sizes and Types

➤ Regardless of machine type, wood feedstocks and their properties/size and uniformity matters!

A blue tray containing nine different samples of wood feedstock, showing various species, sizes, and textures.

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Chipping vs. Shredding Trees

Two photographs side-by-side. The left photo shows a yellow chipping machine with a log being processed. The right photo shows a red shredding machine with a log being processed.


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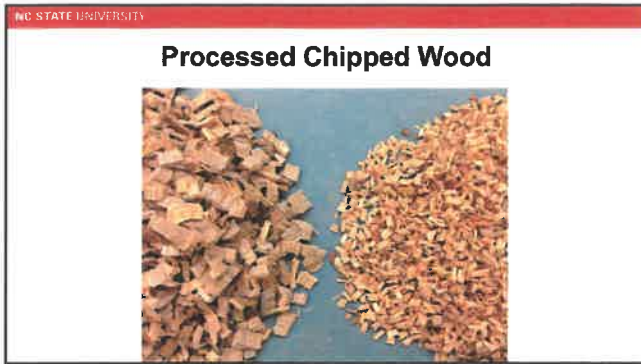
Chipping vs. Shredding Trees

Two photographs side-by-side. The left photo shows a pile of wood chips, which are larger and more uniform in size. The right photo shows a pile of wood shavings, which are much smaller and more irregular in shape.

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Processed Shredded Wood

A blue tray containing two distinct piles of processed shredded wood. The left pile consists of long, thin wood shavings, while the right pile is a darker, more fibrous material.



Profile – Hydrafiber, EZ Blend

This is a product profile page for HydraFiber. It features a central image of a plant in a pot with the text "Take the Guesswork Out of Your Media Program". To the right, there is a table with columns for "Media", "Volume", and "Weight". Below the table, there are several small images of different media products and their packaging.



Pindstrup & BullRush – Forest Gold

Combined production capacity is 500,000 m³/annually

This is a product profile page for Forest Gold. It features a large image of the product and the text "Forest Gold - wood fibre mixed with Pindstrup peat". Below this, there is a table with columns for "Media", "Volume", and "Weight". At the bottom, it says "Started using wood in 1992".



Klasmann – GreenFibre

Marketing materials for Klasmann GreenFibre peat moss. On the left, a man in an orange jacket stands in a field with the text 'The green benchmark: GreenFibre from Klasmann Deilmann'. On the right, a man in a green shirt works in a field with the text 'GreenFibre - the summit of high grade peat moss'. A large green 'K' logo is at the bottom left.



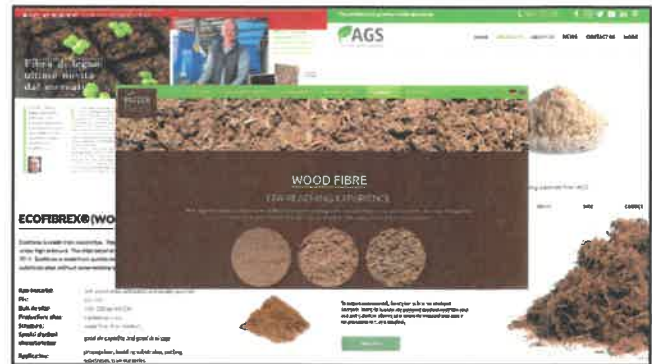
Lambert Peat – ECOPEAT

Marketing materials for Lambert Peat ECOPEAT peat moss. On the left, the word 'ECOPEAT' is written vertically in large letters. In the center, there are four small images showing peat moss being used in various applications. On the right, there is a document titled 'PEAT - ECOPEAT' with detailed text and a logo at the bottom right.



Florentaise & Aquiland – HortiFibre

Marketing materials for Florentaise & Aquiland HortiFibre peat moss. On the left, there is a document titled 'HORTIFIBRE' with detailed text and a logo at the bottom. On the right, there is a large image of a round, fibrous peat moss sample on a blue surface with a ruler for scale.



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Some Known Advantages (Pros) of Wood Substrates

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Storage

- Compact or Loose/Bulk Storage Options
 - Can save space or require space at grower/supplier facility

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Other Advantages

- Easily processed in many ways/particles
- Compressible (depends on type)
- Can be “Sterile” after heating/processing
- Low EC
- Good Stability

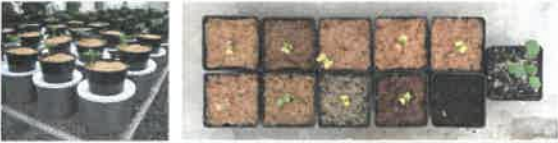
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Some Known Challenges (Cons) of Wood Substrates

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Green Wood Toxicity

- Natural chemicals in wood can be phytotoxic to young plants
- Oils, Tannins, Phenolic's, VOC's, etc.
- More of an issue with greenhouse crops than nursery crops.
- Degree and severity of toxicity in wood materials depends much on how wood was processed (machine process).



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Mitigating Wood Toxicity

- Various "Preconditioning" treatments to hammer-milled wood being investigated to reduce or eliminate toxins.
 - Aging, steaming, drying, charcoal binders, etc.



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Summary of Potentials/Advantages


- Wood is a blank canvas.....
- Abundant, Local/Regional (depends on location)
- Physically stable
- Excellent rooting
- Excellent storage properties (when dry)
- Good wettability, drainage, water relations
- Offered in various forms to fit specific needs
- Can be economical
- Production not reliant on weather



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Summary of Concerns/Issues

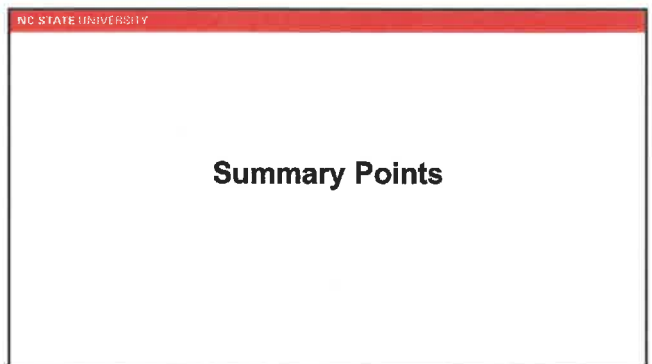
- Competition for wood resources in future
- Science can't keep up with demand
- Some use of bad wood sources
- Green wood toxicity
- Nutrient tie-up and fertility
- Changes to pH Management
- Changes to irrigation management
- Many unknowns remain



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Growers as Wood Substrate Producers





A Few Takeaways....

- Substantial body of evidence that engineered/processed forest products can be viable and economical substrate components
- West coast conifers have not be thoroughly vetted for their potential but protocol's of R&D exist to quickly assess their potential
- The demand for higher volumes of growing media will continue to increase and forest products are believed to hold the greatest potential (globally) to fill the void
- Emerging wood fiber processing technologies are enabling this movement