

Perspectives, Trends and Sustainability Initiatives in the Soilless Growing Media Industry

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Summary

Growing media is fundamental to greenhouse and nursery production. Sustainability issues as well as competition for sub-

strate from a growing controlled environment food production sector is making it important to reevaluate existing media resources and examine viable alternatives.

INTRODUCTION

The growing media industry today is being altered on a continual basis due to a number of factors that have a worldwide impact and what was once a local phenomenon no longer has a geographic center. Factors such as projected global demand are influenced by a variety of driving forces behind this demand. Potting media is no longer potting soil, along those lines the original

one gallon nursery pot is no longer a discarded food can and it is no longer a true one gallon. Factors such as this change the focus of what it means to project the coming needs of the nursery industry. But it does not stop there. The industry has sprouted branches into many different aspects of horticulture which often requires tailor made media substrates for specific

crops and that in turn affects component availability and supply. How do we keep abreast of these changes and what does it mean for our future endeavors?

By 2050 the projected future demand for soilless substrates in all aspects of

horticultural production is expected to quadruple. Currently, supply and availability issues of many substate products will extend well into 2023 and perhaps beyond. The immediate take home lesson is to act now and do not get cut short.

Table 1. Total estimated substrate market in 2050 based on the expected market increase and a more realistic estimate of the potentially available materials.

	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		65	
Total	67	283	

The future demand for growing media materials can be clearly seen in the trend towards 2050 as a massive increase in the use of materials (**Table 1**). Notice that while peat moss is still being used the increase in need for peat moss is 200% while that of wood fiber is 1000% followed by significant increases in other materials. This is important to know because there is a worldwide effort to limit peat moss production, it is not a matter of availability so much as it is a response of many countries looking at the actual and hypothetical environmental damage that the peat moss industry is causing. Issues such as water quality, land degradation and potential release of greenhouse gases is causing concern. The increase in peat moss usage from 2017 to 2050 is 2x but the total increase for all materials is closer to 4.5X. Most notably coir, wood fiber, bark, and compost. This increase in demand for alternative substrates as compared to peat moss will inevitably lead to both shortages and higher prices as time goes by.

While the trend has been increasing for years the amount of materials being allocated to alternative crops on a worldwide basis has become substantially significant. One of the biggest “new crops” is the tremendous increase in growing herbs, vegetables and fruits in greenhouse environments.

The amount of acreage of such systems is increasing steadily and is being driven in part due to the high costs of shipping and a greater understanding of the use of fossil fuels. Systems that can produce edible crops more locally are gaining great favor over those that are produced via conventional means. Less environmental damage, cleaner environment of the production facilities, less over the road fuel usage all contribute to a rise in this type of production. This results in an accelerated need for significant amounts of substrate that used to be destined for the ornamental plant industry, but quite frankly not anymore.



Figure 1. New crops in soilless substrates under greenhouse conditions.

Typical vegetable production in closed greenhouse systems include cucumber, peppers and tomato (**Fig. 2**). Production of vegetables and fruits on a local scale eliminates costly shipping and promises better product quality and availability. “Organic”

suddenly becomes a prominent reality. The downside of course to the ornamental plant industry is that there is increased competition not for sales but for starting materials such as substrates.



Figure 2. Closed greenhouse systems for vegetables and fruits.

Production of vegetables and fruits on a local scale eliminates costly shipping and promises better product quality and availability. “Organic” suddenly becomes a prominent reality. The downside of course to the ornamental plant industry is that there is increased competition not for sales but for starting materials such as substrates. The prominence of the marijuana and hemp production activities presents a relatively

new venue for the usage of substrate materials as well as talented horticultural professionals. That trend is not likely to decrease anytime soon.

In the future there could well be other “medicinal” crops other than Cannabis that will also occupy significant greenhouse space and materials. The growing field of “nutraceuticals” is on a steady march as is a trend towards more natural

products for food flavoring and dyes instead of the artificial coloring agents so commonly used presently.

There simply no end to the possibilities of new crops coming on line in the future. In Holland efforts are underway to

produce vanilla from greenhouse grown orchids to offset the problems facing the natural vanilla production from Madagascar.

Soft fruits meaning berries of all sorts including specialty product lines such as petite grapes or Zante currents (a type of grape) are coming into prominence and will increase as time progresses (**Fig. 3**).



Figure 3. Soft fruit (berry) crops being grown under controlled environment systems. A. Strawberry. B. Blueberry. C. Raspberry.

Not only are soilless media used they are necessary to produce both the propagules as well as the finished production plants. Soilless media are fundamental in production due to the greater control over nutrient applications, water usage and in maintaining a high degree of sanitation and disease prevention.

In **Table 1**, it was detailed that wood fiber would increase 1000% from 2017 to 2050. Such an increase obviously means an increase in raw wood production either by seed, cuttings or tissue culture. Efforts are underway to produce woody plants tailored to provide an optimum wood product for the revolution of greater use of wood fiber as opposed to peat-based substrates. These “new” targeted woody trees will in turn require new production facilities to meet the increasing demand (**Fig. 4**).

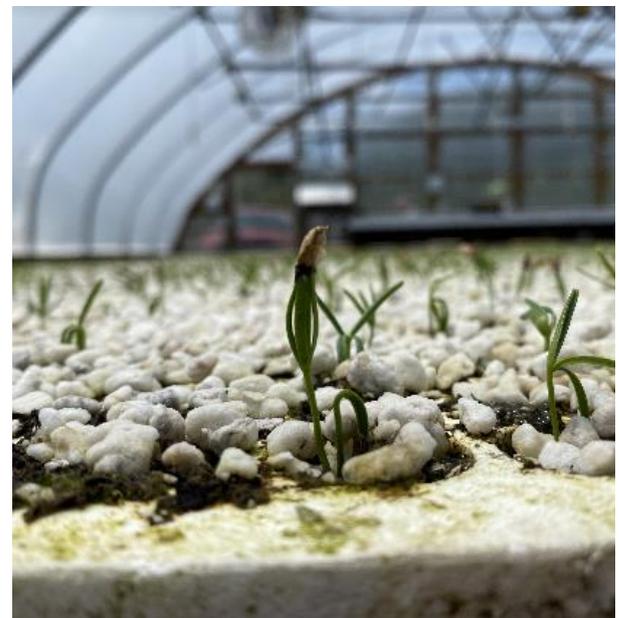


Figure 4. Woody conifer seedlings destined for the production of wood fiber.

These seedlings are not just for Christmas trees anymore. Wood fiber for substrates is an absolute necessity for the soilless media industry. Efforts have been

underway for a couple of decades to produce softer hardwoods such as clonal *Liquidambar* to meet such demands. It should be noted that wood fiber also has a significant application in the alternative fuel industry which could potentially affect substrate raw material availability.

Challenges facing the Growing Media Industry

One of the most significant concerns to the growing media industry is the

availability of peat and peat products. While it is true that the overall supply of sphagnum peat is not in jeopardy this does not mean that availability is guaranteed. **Figure 5** highlights some of the current situation on concern to the world supply of peat. We in North America cannot arbitrarily consider the peat issue a local issue, much like petroleum resources and due to the one world concept of international trade what happens in country A thousands of miles from country B still has an effect.

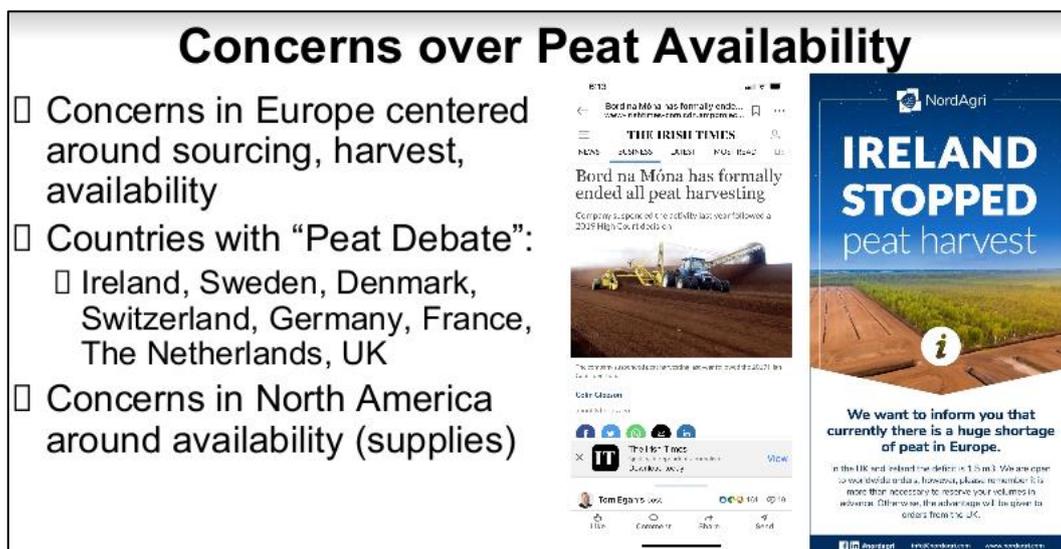


Figure 5. Peat availability concerns in Europe and North America.

The headline “Ireland Stopped Peat Harvest” pretty well sums it up (**Fig. 5**). It should be said this is not an isolated case.

Regulatory threats to the peat industry are alive and well and not just in the Northern Hemisphere. Worldwide there is greater and greater emphasis on doing the “right” thing when it comes to environmental issues. Chile and other South American countries are struggling with an increasing awareness of the population on environmental issues and how the voting public is making their concerns known even if it means dumping an entire industry. The horticulture industry needs to be fully

aware of and not take for granted that the future will be business as usual. **Table 1** illustrates the point with respect to alternatives to peat entering the field of soilless media and it should be seriously considered that more alternatives will be needed in the future. The industry as a whole needs to embrace this and endorse more research into new technologies for soilless media and techniques for growing in those media.

Coconut coir is one such alternative substrate constituent with the center of world production being in India and Sri Lanka. Granted production is a reality but with the increased awareness of the people

of the world to the many facets of commercial activities what we have traditionally

taken for granted may or may not be the same as it has always been.

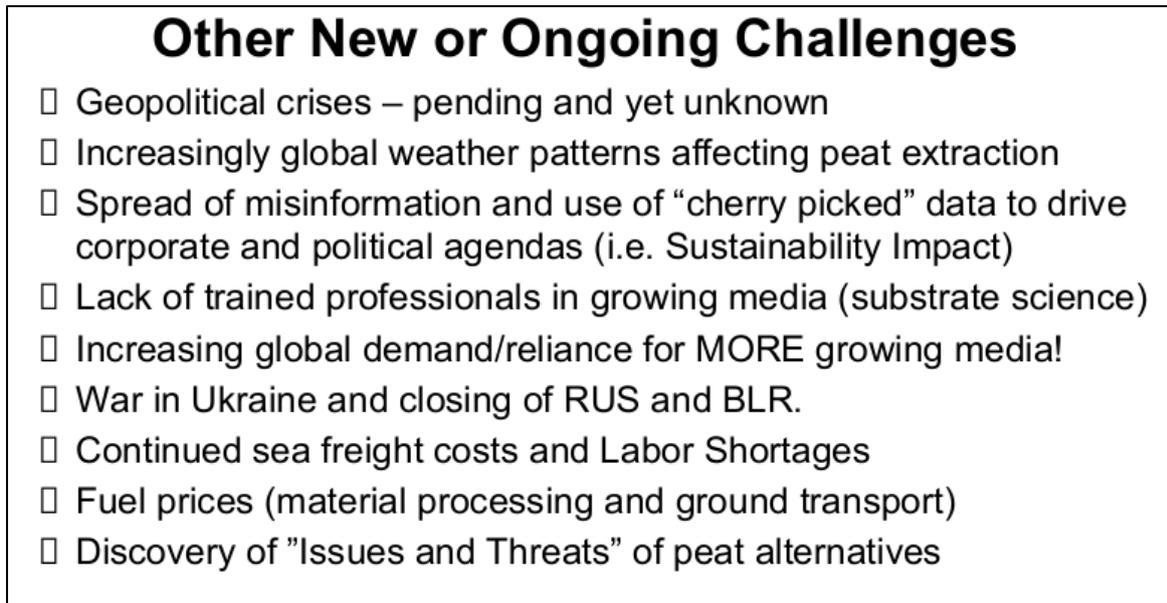


Figure 6. Other new and /or ongoing challenges facing substrate and soilless media availability.

In the headlines of late, hardly a day goes by that the war between Russian and the Ukraine does not enter the picture. Such geopolitical crises both actual and potential (even the threat of a conflict has massive ramifications on the world market). Picture a conflict between India and Sri Lanka, how that might affect the coir industry and in turn affect the production of strawberries in Holland or Society Garlic in Florida.

One subject that is prominent and yet seems innocuous is the high cost of shipping, alas, it is rising to the top of major concerns. But there is another equally innocuous and perhaps more deleterious element in the mix and that is labor shortages, not just in North America but in Europe, China of all places and a whole mix of countries throughout the world. This is especially exacerbated by the lack of trained

and knowledgeable workers. Coupled with the need for more directed research to solve some of the substrate issues as presented here could lead to a decrease again in substrate availability.

While there are some who discount the effects of global warming the reality is that the impact of climate change on substrate materials can and will be significant. To address this consequently demands more talented workers and researchers to find new methods to produce the vast array of horticultural crops.

As given in the **Table 1**, peat presently is the #1 component of all soilless substrates worldwide. This will change. Unprecedented demand is taxing the system so that in short order it will no longer be sustainable to use peat and peat products.

Current & Future Status: Peat

- Remains most used/critical growing media component globally
- Supplies affected by harvest (weather), facility capacity, transport, unprecedented demand
- Many suppliers booked through the year (no new customers)

	2017	2050	Potential
	Mm ³ /yr		Mm ³ /yr
Peat	40		??
Coir	5		60
Wood fibre	2		1139
Bark	1		140
Compost	1		157
Perlite	1.5		16
Stone wool	0.9		120
Soils / tuffs	8		100?
Total	59		2025



Figure 7. Just how sustainable is peat for soilless substrates.

Table 1 also indicates that wood and bark products and compost (often made from wood by products such as sawdust will take a greater center stage in the soilless media industry. Engineered wood fiber and other forest products are thought to have the greatest overall potential for sourcing, development and utilization in soilless media. Many peat companies are proactive in substituting 20-30% peat with wood materials (sawdust or pulverized wood fiber). In the past 3 years over a dozen wood processing facilities have been built and are operating to supply this type of materials.

Perlite can be considered to be a “filler” in the soilless substrates. It allows for porosity, some water retention, and provides consistent avenues for air into the

substrate . It is sterile, and generally non-reactive although for certain tropical plants it presents problems with excess fluoride. It should be noted that while useful in a soilless media it has limitations and too much perlite in a given mix often results in a poor root system for the intended crop.

On a global scale most of the world’s production is from Greece. Production does occur in the United States limited quantities due to industry consolidation with resources being stretched thin. It is an expensive production due to the extraction methods and the high costs of fossil fuels or electricity. It unusual for perlite production to be near adequate energy supplies thereby requiring expensive transportation of fuels or ores to the production facilities.

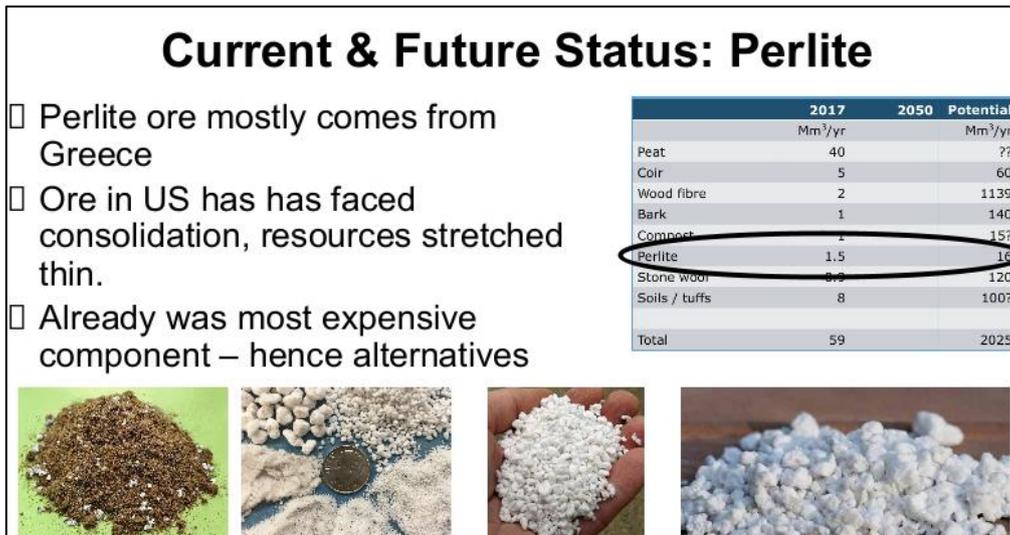


Figure 8. Status of perlite.

The nursery/greenhouse and allied industries are now being confronted with having to make noteworthy changes in their production methods. It is important to note that while Canadian peat is still widely available that might change in the future due to some of the factors mentioned in this thesis.

Can new growing techniques be implemented in a strategic manner that allows for a weaning from peat products to more renewable resources. Perhaps a thorough study of what is happening in Europe is a good starting point. In Germany, the use of

peat is not allowed. Decades ago in the United States, some growers were using what is known as sedge peat, not a sphagnum peat at all but decayed organic matter dredged from ponds and lakes perhaps there could be a resurgence of this activity. New suppliers and alternative products seem to be some of the possible solutions to the coming shortage of sphagnum peat supplies. Euro peat, Coconut products (coir, fiber, chunks, etc) and of course wood products derived from a variety of sources, not just tree trunks. With the advent of other new industries such as hemp the number of new possibilities is increasing (**Fig. 9**).



Figure 9. New and developing substrate products.

A Lot Goes into Alternative Substrate Evaluation

There are many factors in evaluating a new product for commercial availability. Specific areas of interest are:

- Business Performance (will this thing fly?)
- Social Performance, (what are the societal consequences good or bad)
- Environmental Performance (water use, carbon footprint, ecosystems)

From a research endeavor to bring a new product into the market these questions have to be asked and acceptable answers provided. It is not merely an operation involving just horticulture. Granted that is a big component of the process but the consequences of the social and environmental aspects also have an important presence in the process.

Raw Material Assessment

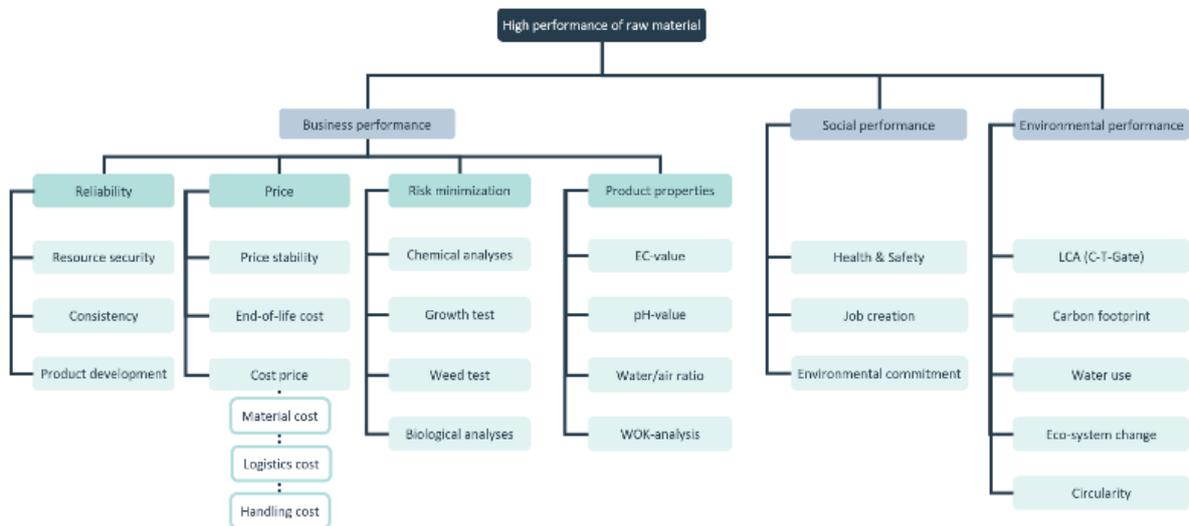


Figure 10. Raw Material Assessment.

In today's world, growers have a myriad of resources available to them. Educational webinars, substrate supplier online tutorials (many questions can be answered by these tutorials), publications, advice services by many companies. They are there to help if it means that the activity helps create a market. One thing to know is that when searching add "PDF or PPT" to the verbiage as that makes the search more concentrated to the subject matter.

There is lots of materials available for information. One caveat - don't necessarily stick with what you already know. Branch out to other possibilities. For instance, the *Cannabis* growers are perhaps some of the most innovative horticulturists going. New techniques, new ideas are often on the front burner. Just because you grow pine seedlings or eucalyptus does not mean you might not learn something from a hemp grower. The internet is a vast resource, take advantage of it.

Looking Ahead to the Future

It is important to remember that our industry is on the forefront of global change and that “substrate security” is a food, health, and National security issue. To meet these challenges there is a need for creative, collaborative, and innovative solutions. Global trends based on perceptions, social media, political platforms, etc. are helping to steer the future of our industry. We will need to stay proactive and reactive.

For the immediate future, order your substrate components early – very early. Potentially expect limited volumes even if once “guaranteed”. Soon, 100% peat will be almost impossible to get.