Water scarcity

It is time for a radical change.

> *"The way forward: water has to be treated as a scarce resource"*
>
> - United Nations

This is a quote from the United Nations Water website.[1] As the world's population increases and intensive resource use for economic development continues, many countries' water resources and infrastructure cannot meet the increasing demand.

Currently, agriculture accounts on average for 70 percent of all freshwater withdrawals globally and an even higher share of 'consumptive water use' due to the evapotranspiration* of crops. It is estimated that agricultural production will need to expand rapidly by 2050.[2]

The outlook is dire, so we have to take action. Indoor farming can be essential to the solution, as traditional agriculture uses much water.

"Water scarcity. It is time for a radical change." is a White Paper about Plantlab's rationale, methods, and equations, where water is considered scarce.

** Evapotranspiration includes water evaporation into the atmosphere from the soil surface, evaporation from the capillary fringe of the groundwater table, and evaporation from water bodies on land. Evapotranspiration also includes transpiration, which is the water movement from the soil to the atmosphere via plants.*

Summary

In-depth knowledge and expertise since 2005, entrenched in one of Europe's largest R&D centers in 's-Hertogenbosch in the Netherlands, make Plantlab a global pioneer in indoor farming. It is here where we still explore further developments for (new) implementations.

We have more than 15 years of experience in designing, developing, and operating our indoor farming systems, known as Plant Production Units (PPU's). Requiring less input than traditional agriculture methods, we grow fresh produce (leafy greens and herbs) in these facilities under optimal conditions, allowing us to provide the freshest, nutritious produce.

For this purpose, Plantlab has developed crucial cultivation technologies and plant production criteria. This White Paper shows the optimal conditions that save much water compared to traditional agriculture.

The water usage per kilogram of leafy greens with indoor farming is 1 liters**. This method of growing uses remarkably less water compared to, for example, the 250 liters required for lettuce production in California (responsible for 71% of leafy green production in the USA). Alternatively, compared to the 20 liters usage required with greenhouse production.

In 2020, we asked the True Price Foundation (in collaboration with Wageningen University) to provide insight into our water usage compared to traditional, greenhouse, and organic agriculture. They have developed a measurement method for agricultural production. The Foundation investigated our indoor leafy green production with water usage as one aspect. It is important to us that they can confirm our story scientifically with their developed method.

*** With regard to the cultivation phase only*

Background information

Sustainability also depends on the efficient use of local resources such as water.

Integrated Water Resource Management (IWRM) provides governments with a broad framework to tailor water use patterns to the needs and requirements of different users. Including the needs of the environment. IWRM has described various water stress management measures, such as:

- Reducing water loss from distribution systems
- Safe reuse of wastewater
- Desalination
- Correct water distribution

How can Plantlab contribute to the most efficient use of water? Water consumption is an essential issue that the founders of Plantlab have considered. Indoor farms use resources like water and land far more efficiently than greenhouses and conventional farming methods.

Plantlab has worked with various major partners in recent years, which has further increased our expertise and know-how in indoor farming enormously. The leafy green varieties and herbs from the Plantlab portfolio have minimal water usage.

Approach within Plantlab

A study shows that the amount of water used to produce a kilogram of leafy greens in traditional agriculture is comparable to filling a large freezer.[3] Meanwhile, greenhouses use 92% less water to produce the same quantity, equivalent to a bucket's volume. Indoor farms, on the other hand, can reduce their water consumption to the volume of a medium-sized saucepan.

How is this possible? Under optimal conditions, the three primary processes being utilized, which result in less water being used in our indoor production system, are as follows:

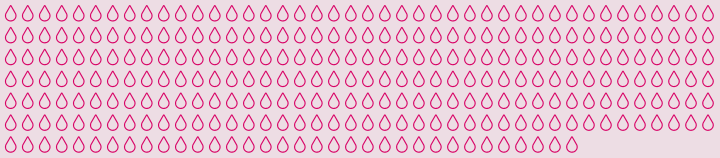
1. Collecting evaporated water for reuse,
2. Complete closed system of watering plants,
3. No washing of produce after harvest.

Point 1. Indoor farming is a method of growing fresh produce in controlled environments, where all the evaporised water is collected and reused over and over again.
Point 2. The water we put into the PPUs circulates in our system, because we filter and reuse the water.
Point 3. There is no need to wash our produce after harvesting. The produce grown in our indoor farms is already 100% clean and does not require washing.

This figure shows the differences in water usage between open-field production, greenhouse production, and indoor farming:

Open field production

250 L
Water usage[4]
per kg lettuce



Greenhouse production

20 L
Water usage[5]
per kg lettuce

Indoor Farm

1 L
Water usage[5]
per kg lettuce

Conclusion

"The traditional fragmented approach is no longer viable, and a more holistic approach to water management is essential," says the IWRM.[6]

And we agree. We want to make others aware of the fact that every bit will help. That is one of the reasons why Plantlab seeks cooperation with partners who also focus on reducing water usage in fresh food production.

A good example is our collaboration with Sysco, a company whose operations do not require significant water use. Nevertheless, the company focuses on partnering with suppliers to jointly reduce its water footprint through its sustainable agriculture initiatives.[7] For example, by 2022, Sysco has helped save 2.5 billion liters of water and can continuously improve its sustainability standards. Sysco's goal for 2030 is an additional reduction of 27.5%, which Plantlab is happy to contribute to.

Appendix

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3. European Institute of Innovation & Technology (EIT) Food, (2018, August). *"Is vertical farming really sustainable?"*. Retrieved from https://www.eitfood.eu/-blog/is-vertical-farming-really-sustainable
4. Graamans, L., Baeza, E., Van Den Dobbelsteen, A., Tsafaras, I., & Stanghellini, C. (2018). *"Plant factories versus greenhouses: Comparison of resource use efficiency. Agricultural Systems"*, 160, 31-43. 12.
5. Barbosa, G.L., Gadelha, F.D.A., Kublik, N., Proctor, A., Reichelm, L., Weissinger, E., Wohlleb, G.M., Halden, R.U. (2015). *"Comparison of land, water, and energy requirements of lettuce grown using hydroponic vs. conventional agricultural methods. International journal of environmental research and public health"*, 12(6), 6879-6891.
6. Integrated Water Resources Management (IWRM) , (2014, November). *"Water for Life Decade"*. Retrieved from https://www.un.org/waterforlifedecade/iwrm.shtml
7. Sysco (2022) *"Corporate Social Responsibility Report"*. Retrieved from https://www.sysco.com/dam/Sysco/About/Corporate-Social-Responsibility/2022-Sustainability-Report.pdf, (2022, October)