GREENHOUSES HARNOIS | BRIGHTER BY DESIGN

Hydroponic (Leafy Greens) and Greenhouse Solutions: A Perfect Match!

Introduction

Lately, hydroponic leafy greens growers are seeing their businesses expand. In fact, the current situation with COVID-19 is catalyzing this trend. The notion of food self-sufficiency is at the centre of the discussions; the vegetable-production industry is in the spotlight, and public authorities are supporting the financing of new projects.

More square footage allows greenhouse growers to not only increase production but also expand their local distribution network, and the local economy is benefiting from a variety of fresh and tasty products year-round. It's a great advantage for producers to be closer to their customers. Indeed, consumers are looking for more transparency, traceability and locally produced vegetables.

Hydroponic production methods, like the deep flow technique and the nutrient film technique (NFT), are gaining popularity around the world. These techniques allow producers to achieve rapid, consistent production with high-density cultivation.

Labour is an important issue for greenhouse growers, and hydroponic systems require fewer staff. Hydroponics is a sustainable alternative that maximizes the efficiency of water and fertilizer (while minimizing its use), controls water loss and increases land-use efficiency.

A mobile gully system (MGS) in a gutter-connected greenhouse

1. Targeted crops

A wide variety of lettuces and herbs can be grown in greenhouses using various hydroponic systems. Here are some of the most common varieties generally found in North America:

Butterhead

Red coral

SALAD :

_ T°F max day : 80-86
_ T°F max night : 65
_ Crop cycle : 6-7 weeks (average)

Green Oak

Red Batavia

BASIL AND HERBS :

_ T°F max day : 89
_ T°F max night : N/A
_ Crop cycle : 5-8 weeks (average)

Green Romaine

Frillice Iceberg

Red Oak

Many different herbs in the aromatic-plant family, such as basil, ginger, mint, cilantro, parsley, rosemary and chives, can be cultivated in individual and gutter-connected greenhouses using hydroponic techniques.

Note: Some varieties are more heat tolerant than others.

2. The main types of hydroponics

Growing leafy greens, like lettuces or herbs, using the nutrient film technique (NFT) is becoming increasingly popular. This consists of continuously recirculating a nutrient solution film over the bare roots of a row of plants inside a closed gully. The fixed gully system is most often used for small to medium operations as it is simpler and quicker to implement and requires a lower initial investment compared to the mobile gully system.

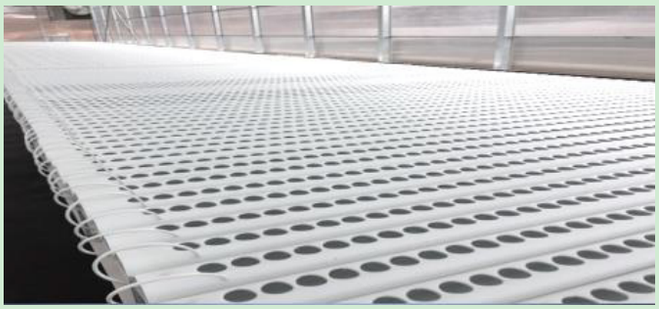
The mobile gully system (MGS) is a type of NFT that employs a mechanical system that automatically optimizes the spacing between the gullies as the plants mature to maximize the use of the greenhouse growing area and reduce the operational workload. The mobile tray system (MTS), usually used for the propagation stage, follows the same principle, but the mobile trays are irrigated with an automated aerial irrigation boom. Automated conveyors and transplant systems are often used to transfer the plugs from the MTS to the MGS. For high-tech greenhouse projects, harvesting, packaging and washing stations can be integrated into the process, creating a space-efficient and almost entirely automated

A fixed gully nutrient film technique installation under a Luminosa greenhouse

system.

The deep flow technique (DFT), or deep water culture (DWC), is a method of hydroponic plant production in which the roots of plants are suspended in a liquid solution rich in nutrients that is continuously circulated. Culture trays float, and the solution is oxygenated in order to allow a better assimilation of nutrients as well as limit the growth of undesirable microorganisms.

In an ebb and flow system, the root zone of the plants is periodically flooded with a nutrient solution for a short time using subirrigation. The drained nutrient solution is often treated and then recirculated for the next flooding event. This can be done with flooding tables (benches), gullies and specially designed sloped concrete floors.



3. The advantages of using hydroponics to cultivate leafy greens

A well-designed hydroponic system has many advantages:

- It's labour-friendly: Plants are easier to harvest because they are typically grown at waist height.
- The closed-circuit system results in water and nutrient efficiency.
- The greenhouse growing area is maximized.
- There is little or no need for pesticides.
- Good ventilation around the plant reduces the risk of leaf diseases (specific to NFT).
- There is reduced evaporation from the root zone, which creates a high-humidity microclimate in the lower section of the plants (specific to NFT).
- The risk of soil-borne diseases like Rhizoctonia, nematodes and Sclerotinia is greatly reduced.
- It provides a high yield and consistent quality year-round.
- Food safety: There is no risk of worms, sand or manure in the product.
- The costs are lower for quality control and washing.
- It's easy to integrate with post-harvest automation systems (conveyors, cleaning stations, cutting machine, packaging).
- There is a lower use of substrate media, resulting in less waste.
- It provides a more reactive and better control of nutrient concentrations and pH in the root zone.

On the other hand, these systems are more sensitive to equipment failure, like pumps and water treatment systems. They require significant fertigation-system vigilance in case of pump failure, for example.

Moreover, the thermal inertia is low. Quick temperature variation of the liquid solution temperature is expected more particularly in small- and medium-sized NFT units. Sudden changes in the nutrient solution temperature can be devastating.