



Coleg
Glynllifon

Growing fruit and vegetables using hydroponics



Arloesi Bwyd
Cymru
Food Innovation
Wales



HELIX

Overview

Growing fruit and vegetables using the latest agri-technology through hydroponics represents a viable method for crop production. The controlled environment agriculture of hydroponics overcomes geographical factors such as altitude and weather conditions, enabling a year round, more efficient production system for a range of valuable fruit and vegetable crops.

A Menter Môn – Tech Tyfu hydroponics project, funded by the Welsh Government's Rural Development Fund (RDF 2014-2020), was implemented with the following partners – Menter Môn as the project lead and Grŵp Llandrillo Menai Glynllifon Agriculture College's Independent Living Skills Department.

The objective of the project was to trial a vertical farming VF 5207 hydroponic unit to demonstrate an agri-technological controlled environment system as a potential diversification opportunity for farmers, and the educational value of this technology for student learning and knowledge transfer.

What is hydroponics?

Hydroponics is the science of growing plants without using soil, by feeding them on mineral nutrient salts dissolved in water. This can be done horizontally on table tops or if space is limited vertically through stacked shelving using a variety of growing techniques and equipment.

Any plant can be grown hydroponically but the method is most widely used to produce greenhouse crops such as lettuce, microgreens, herbs, tomatoes, cucumbers, spinach, peppers, including a range of different flowers.

The advantages of hydroponics is that plants can be grown anywhere, in a polytunnel, greenhouse, or in redundant farm buildings, and crops can be grown all year round, enabling improved control over growing conditions. Other benefits include no weeding, a more efficient use of water and nutrients, no need for crop rotation, ease of harvesting, that all leads to an overall increased efficiency in crop production.

Unfortunately, disadvantages can include higher start-up costs compared to soil growing systems. To establish a basic hydroponic unit can cost anything up to £10,000 and a vertical hydroponics system would also need artificial lighting and possibly heating and ventilation equipment.

Glynllifon trials

For the past three years (2020 to 2022) students and staff at the Independent Living Skills Department (ILS) have been trialling a VF 5207 hydroponic unit, a stacked shelving system. During the trial period they have successfully grown 11 different crops - lettuce, water cress, coriander, parsley, nasturtiums (edible flowers), strawberries, pak choi, rocket, spinach, kale and Ethiopian kale. The growing time to harvest varied from as little as 10 days for coriander, and up to 30 days for spinach, kale and strawberries.

The results

At the beginning of the trial there were challenges in stabilising the pH of the water-soluble nutrient mixture for optimal plant growth. In addition, different growing mediums were tried for supporting roots, with clean wool found to be the most successful, particularly for the larger plants grown such as spinach, kale and strawberries. Wool has been found to be more sustainable, available locally, and therefore a great alternative to clay balls or coco coir.

Due to dirt in the water the main challenge encountered was occasional blockages in the water-soluble nutrient mixture feed pipes and flow regulators. The nutrient flow technique has been used to grow all 11 crops, with artificial light provided to plants within the stacked shelving unit for up to 16 hours a day.

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As demonstrated by Glynllifon's strawberry crop grown at the college, plants have grown all year round indoors at three different locations at Glynllifon without the need for heating or ventilation.

Overall, labour requirements have been found to be minimal at about three hours a week, regardless of the crop type grown. Tasks included daily checks of the pH level and nutrients being made available within water-soluble nutrient mixture to the plants, checking for any pipe blockages and plant growth and health.

Harvesting was easy, with most labour time required to clean the trays and system thoroughly after each crop has been harvested, with a half a day needed for cleaning and sterilisation of the hydroponics unit.

The VF 5207 hydroponic unit trialled retails for £8,000, and is capable of growing 140 lettuce plugs every three to four weeks, equating to about £1.60 per plant, or £3,000 sales per year.

"The hydroponics unit here is already giving good results. As it has a controlled environment there are many benefits, including improved production times and increased yield."
Martin Jardine, Director of Agri Food at Grŵp Llandrillo Menai

What does the future hold?

For established agricultural-food businesses hydroponics can offer another source of income for the farming business, and an opportunity to diversify the farm business with a new enterprise. Alternatively, hydroponics is suitable as a start-up business for those with limited land resources, and as experienced through the trial at Glynllifon by ILS learners can provide new technical skills.

The start-up cost of any hydroponic enterprise is expensive when compared to soil farming. However, monthly output sales against the enterprise's operational costs, in particular energy costs, are key aspects to take into account whether your hydroponic enterprise will run at a loss or profit. Energy costs can be offset through the use of renewable energy sources, or via a lower operational cost polytunnel or greenhouse table-top horizontal hydroponic growing system.

Identifying and establishing selling channels and local markets for the enterprise's produce in the supply chain, be it shops, restaurants, or hotels, is a critical aspect to consider before undertaking a hydroponics venture. The market crop demand, product quality and price, and what you can grow as produce will need to be identified, planned and costed, to establish financial viability along with technical feasibility to supply and meet the needs of the selling channels. If the enterprise is to be successful, the business needs to be willing and ready to invest time and money in establishing and building business relationships with partners in the supply chain.

For further information please contact Wyn Davies
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About Grŵp Llandrillo Menai Glynllifon Campus

Coleg Glynllifon is a land-based college with residential facilities, situated on the Glynllifon Estate near Caernarfon.

The Glynllifon farm, including the woodland, extends to 300 hectares and is a great environment for studying countryside management and agricultural studies.

www.gllm.ac.uk/locations/glynllifon