

# Summary Report

## **Workshop: Opportunities and Challenges of co-location for vertical farming in Wales**

**Principality Stadium, Cardiff - 13<sup>th</sup> June 2017**

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### **Introduction**

Vertical farming (VF) is a globally relevant innovation in agriculture. In so called 'vertical farms' agricultural crops are produced under controlled environment conditions. VF can require a high initial capital cost and may need to overcome negative perception barriers amongst growers, which has slowed its adoption across the globe, despite significant operations in Japan, USA and UK. Co-location with producers of waste heat, CO<sub>2</sub> and nutrients offers significant opportunities to reduce costs, making VF more commercially viable. Wales has a traditionally rural economy, but growing urban centres. In order to diversify its portfolio of food producers and capture more value in local food chains, the Welsh Government is investigating the potential for vertical farming in Wales. As food prices rise and the cost of conventional agriculture becomes less sustainable, Wales needs to look to diversify its food production portfolio, particularly to service areas of high population density which are experiencing rapid growth. Vertical farms use low energy consumption LED lighting, and circulate water and nutrients for the crops resulting in substantially greater energy and water efficiency compared to conventional land-based agriculture. Controlled environments also reduce the need for pesticides and herbicides. Furthermore, crops can be grown at higher density and in multiple layers indoors, reducing the space required for cultivation, potentially releasing land for other carbon offsetting activities. Vertical farming represents a new innovation for the Welsh bio-economy, potentially providing new investment, jobs and skills. It represents a truly multi-disciplinary topic providing opportunities to combine the expertise of engineers, architects, growers, plant scientists and social/health scientists.

### **The Workshop Format**

The workshop was organised into two sessions (following a speakers' dinner the previous evening). In the morning session, the speakers (listed below) gave 10 – 15 minute presentations with 5 minutes for questions to introduce the areas of vertical farming that were relevant to the discussion and to prepare the participants to discuss research and development opportunities.

In the afternoon, the attendees participated in a series of 'gamestorming' exercises designed to develop understanding of the topic, but also to think more about the problems of co-location and the solutions that could be discovered through collaboration and innovation. Participants were divided into groups containing a mixture of expertise and background (6 tables of 10). Participants developed their ideas through a combination of discussion and group presentations.

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### **The Programme of Speakers**

**Dr Peter Wootton – Beard, Research Fellow at Aberystwyth University** - Peter explained the motivation for convening this meeting, together with the skills and expertise contained in the P&A cluster. He also gave an introduction to the topic.

**Tobias Peggs, CEO of Square Roots Urban Farming** - Square Roots is an urban farming accelerator based in the United States. It was co-founded by Kimbal Musk and aims to promote vertical farming as a future method of food production.

**Dr Will Stiles, Research Fellow at Farming Connect with Lynfa Davies at Menter a Busnes** - Will and Lynfa gave a combined presentation to discuss the circular economy agenda within the farming community and from the perspective of on-farm innovation.

**Mark Horler, Operations Manager of The Association for Vertical Farming** - The Association for Vertical Farming is a membership organisation that promotes VF across the world, particularly in the UK and Europe. Mark spoke about the trends in VF and the opportunity for Wales.

**David Morris – Deputy Head of Food, Agriculture, Fisheries and Rural Strategy at Welsh Government** - Welsh Government have ambitious and innovative aims to grow the food and drink industry in Wales. David spoke about the funding, policy and contextual landscape in Wales.

**Beca Beeby – Glasshouse Manager at Humble by Nature** - Humble by Nature is an aquaponics farm in South Wales and are trailing experimental crops and close loop systems. Beca spoke about the skills required for vertical farming, the training opportunities at HbN and novel crops.

**Tom Webster, Co-founder of Grow Up Farms** - Grow Up Farms is a successful indoor aquaponics farm in East London. Tom spoke talking about the challenges he has faced in setting up his business and the opportunities he sees for the future of vertical farming, specifically relating to co-location.

**Dr Jack James, MD of Pontus Aqua** - Pontus Aqua is a fast growing aquaculture research company based in Hirwaun, South Wales. He spoke about the needs of the aquaculture industry and the opportunity, as he sees it, for co-location.

**Andy Bull – Severn Wye Energy Agency** - Andy explained the perspective of the energy industry about the options for co-location and the challenges it can present. He also gave an insight into the work of the SWEA and why they are interested in circular economy initiatives.

**Dr Tim Patterson – Senior Lecturer and Research Scientist at The University of South Wales** - Tim's research is focussed on anaerobic digestion, and his talk focused on the opportunity to link vertical farming and AD to take advantage of mutually beneficial waste streams.

**Dr Yangang Xing – Research Fellow at Welsh School of Architecture** - Yan is a building physicist and part of the P&A cluster, his talk concerned the predictive ability of modelling to aid in the design of vertical farms, particularly in co-located scenarios.

**Adam Dixon – Founder and CEO at Phytoponics Ltd** - Adam's Cardiff-based company Phytoponics have designed an innovation called the Hydrosac™, an inflatable deep water culture hydroponics

system. Adam is working closely with Aberystwyth University on the plant science and agronomic applications.

**Frederic Hoffman – Founder and CEO at Qincho** – Qincho is an innovation hub in London that helps to support new food-based projects with collaborative working space and business advice. Frederic spoke about the importance of co-locating expertise and creating a community.

### **The Attendees**

The workshop was attended by 62 people, the majority from commercial enterprises as well as Welsh Government and a select number of academics. They represented:

- Welsh Government
- Energy Producers
- AD manufacturers
- Urban Farmers/project operators
- Agricultural Business Organisations
- Food Producers & Farmers
- Social Entrepreneurs
- Professional organisations (i.e. CLA, CLBA, SWEA, AVF)
- Aquaculturalists
- Researchers

### **Outcomes**

- 1. We expect to stimulate discussion regarding the development of vertical farming in the Welsh economy** - In feedback collected after the event, 73% of respondents (n =23) said that they had either not considered the potential for vertical farming in Wales (48%) or had only done so to 'some extent' (35%). 96% of respondents said that they felt that they had a better understanding of vertical farming and the options for establishing it in Wales.
- 2. We expect to allow for a practical understanding of the challenges and benefits of co-location for vertical farming.** – The morning session of speakers covered a breadth of topics and gave a strong understanding of what was meant by co-location. The afternoon session featured 'games' focussed on developing the idea of co-location.
- 3. We expect to identify new partners with whom to generate new modelling data and funding proposals to further investigate the scientific elements of vertical farming co-location** - In feedback given after the event, 70% of respondents said that they had been unaware of the P&A cluster before the event. 100% said that they planned to further engage with the cluster or its members for the purposes of research, or project development. Furthermore, 96% of respondents said that they were able to make a new contact or establish a new relationship with another organisation/company during the workshop. We are currently discussing potential projects with several parties.
- 4. We expect to produce an academic paper on the opportunities of co-location and a policy guidance document translated from this paper which can be used by WG and regional authorities to help them develop strategies to promote the development of vertical farming in Wales.** – We will shortly publish a technical article through Farming Connect and are using the outputs from the gamestorming activities to produce an academic paper on co-location.

## Images



Attendees outside the St David's Lounge. Mid-way through the 'Gamestorming' activities.



Attendees taking part in one of the 'gamestorming' activities at the workshop.

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