

# Food Forward: circular horticulture

The stepping stones towards a circular economy

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# In short

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How is the horticultural sector making the transition towards the circular economy? In this Food Forward paper, three experts look at this question from three angles: present, past and future.

## **The present**

According to Eric Poot, team leader and senior researcher at Wageningen University and Research (WUR) in greenhouse horticulture and flower bulbs, the circular economy is the 'new magic word' in the sector. WUR looks at various elements that contribute to the circular economy, such as: how do we shift the food production to be more plant-based (e.g. soy), so that people start to consume less meat? And how do you recycle possible residual flows of food production in the best way? Also, WUR is working hard to tackle the amounts of plastics within the horticulture sector.

## **The past**

Piet van Adrichem, now a retired horticulturist from Pijnacker, already took an important step towards the circular economy back in the early 1970s. He discovered in a ROCKWOOL greenhouse in Sweden that cucumbers had the ability to grow on stone wool, while needing much less nutrition and water compared to cucumbers growing in soil. Together with Royal Brinkman, Piet introduced 'precision growing' to greenhouses in the Netherlands. This new, more sustainable way of growing attracted the attention of people from all over the world and is being used on a big scale today.

## **The future**

With the arrival of stone wool to the Netherlands, a waste pile of used substrates arose. However, according to Marc van Buijtene, Area Manager at Renewi, waste does not exist at all. "We consider waste as a raw material. Soon there will be a huge shortage of it." In 1991, waste processor Van Vliet Contrans, now known as Renewi, discovered that used substrate was an ideal component to make bricks. And now, almost 20 years later, there are countless examples of how residual flows from horticulture are reused. Marc van Buijtene, Area Manager at Renewi, "Looking at 2050, we aim high: achieving 100 percent recycling. And we are on track: we already recycle 93 percent."

# Present

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## **What is circular horticulture?**

At what stage is the horticulture sector at the moment in its transition to a circular economy?

“First, let’s define what we mean by circular economy within the horticulture sector,” says Eric Poot, team leader and senior researcher in horticulture and flower bulbs at Wageningen University & Research (WUR). “Because circular economy is certainly the new buzzword within the sector.”

## **Making better use of residual flows and new cycles**

According to Carola Schouten, Minister of Agriculture, Nature and Food Quality in the Netherlands, we are talking about ‘making better use’ of residual flows (such as waste) and ‘closing new cycles’. In doing so, the focus is not on producing the maximum amount of food as cheaply as possible. Instead, in the transition towards a circular economy, the focus is

more on sustainable food production by using natural resources such as soil, air and water. In recent years, for example, the purification and reuse of filter rinse water within the greenhouse has been improved, so that water does not have to be discharged.

“At WUR, we concentrate on a number of fundamental questions that apply to the circular economy,” explains Poot, the son of a tomato grower in the Westland horticultural region. “For example, how do we shift food production to more vegetable sources, such as soya, so that people consume less meat? And what’s the best possible way to recycle waste streams for food production?”

## **Plastic soup as a spearhead**

A new spearhead that is currently being worked on is tackling the flow of plastic soup within greenhouses. “Plastic is all over the

place,” says Poot. “It’s very noticeable in the annual clear-out of the greenhouses, when we sweep out not only all the plant residue, but also a whole lot of strings, metals and plastic – lots of plastic.” Ideally, these flows should actually be clean and compostable at the end of the cultivation cycle. But that is not quite the case yet, so research is being done into it. “It’s also necessary to have a clean residual flow for initiatives like extracting fibers from tomato stems, which can be used in cardboard boxes.”

“That’s great because then tomato growers can sell their produce in boxes made from their own residual materials. Highly sustainable, very circular and also a wonderful story from a marketing perspective: storytelling at its best.”

# The past

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## **Piet from Pijnacker**

No story about Dutch horticulture's transition to a circular economy would be complete without mentioning the name of Piet van Adrichem, now a retired horticulturist from Pijnacker. He and his brother Wim were the first to venture into a new way of growing: on mineral wool mats, with no soil involved.

## **Visiting ROCKWOOL: 'A huge opportunity'**

Actually, it all started with an article in a trade magazine, which triggered Piet in particular, somewhere in 1969. "I read that there was a ROCKWOOL test greenhouse in Sweden where cucumbers were grown on stone wool. That was something I had to see. So, somewhere in the autumn of 1975, we went on a work visit to Sweden, and also to Denmark." They couldn't import stone wool from Denmark themselves and their cooperative didn't dare to take the risk. ROCKWOOL only supplied to subcontractors. "So I contacted the company Royal Brinkman, who were willing to take up the challenge. We set off together with Royal Brinkman's Gerrit Dijkstra."

First, they took a morning flight to Denmark, where they found the remains of failed mats in a small field behind the factory, with plants growing on them. This gave Grodan the idea of professionalizing this into a viable concept for growing fruits and vegetables. The next day, they traveled on to a Swedish town just below Stockholm to see the test greenhouse. "We soon realized there was a huge opportunity there."

## **Thinking and a lot of trying**

Even before their journey, they had immersed themselves in the options offered by stone wool. Internet didn't exist yet, so it came down to "thinking and trying," says Van Adrichem. "A lot of trying. We just had to. We were looking for an alternative way of controlling a virus that had contaminated our soil. Steaming took a lot of energy to kill this virus."

## **Extra energy = extra yield**

Cultivation is all about how much water is available for your plant. "If you plant a cucumber in soil, the plant has to use energy to obtain water and nutrition. But on stone wool, the cucumber needs a lot less

energy. The plant will then put the stored energy into its fruit. However, back then we had no idea that the extra yield would be so high."

## **Better and much tastier cucumber**

On their visit to ROCKWOOL, Van Adrichem and Dijkstra already ordered four hundred square meters of mats through Royal Brinkman. And they got straight to work. Van Adrichem: "Back in 1975, together with my brother Wim, I leveled our entire greenhouse in Pijnacker, laid all the mats and switched over completely. It was an instant success. These cucumbers proved to have a better shelf life and better taste, and they even shone more."

## **The start of precision growing**

Helped by Royal Brinkman, Van Adrichem learned how to minimize water wastage in cultivation. They found the solution in Israel: a system with drip irrigation. It turned out to be the start of precision growing. "Drip irrigation is now common all over the world, from fruit trees to grapes," says Van Adrichem, "saving lots of water worldwide. The technology was





invented in Israel, but because it was used at an early stage on such a wide scale in the Netherlands, it has attracted attention from all over the world.”

#### **The Grodan branch in Roermond**

“After Grodan settled in Roermond, the Netherlands, in 1978, things went really fast. They produced special stone wool for our companies in the Netherlands. Starting with three growers in 1976, by the 1990’s almost all greenhouse growers in the country had adopted

stone wool substrate. Less than two years later, in the 1980’s, branch advisors from all over the Netherlands were on our doorstep out of curiosity. Because we could help save lots of water.”

In short, the savings that could be made with stone wool were mainly in energy. Van Adrichem: “The soil no longer needed to be steamed or heated in winter. Meanwhile, production increased by 15 percent per square meter with less energy consumption and no extra crop

protection products – all thanks to precise drip irrigation. You can irrigate the soil completely or give the plant exactly what it needs.”

#### **Recycling stone wool into bricks**

Meanwhile, a solution had already been found for the waste heap of used substrate that suddenly arose as a result of increased demand. The solution was developed in collaboration with waste processor Van Vliet Contrans, now Renewi. “They discovered that the used substrate was an ideal substance for making bricks. It’s extremely durable and completely circular. It was the prelude to many more innovations. It just goes on and on. If you look at what they’re working on now for the period up to 2050, it’s really impressive.”



# The future

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## 2050

There are plenty of examples of how residual flows from horticulture are reused. They also show directly how high the bar is for the future.

“Looking at 2050, we’re setting high standards,” says Marc van Buijtene, Area Manager at Renewi, and born and bred in the region. “Very high indeed.”

Turning iron back into iron, turning wood into chipboard, making paper from paper and creating new rubber bands from old ones. That’s Renewi’s goal, according to Van Buijtene. “In short: achieving 100 percent recycling. And we’re well on track, as our recycling level is already at 93 percent.”

### Waste no more

‘Waste no more’ is Renewi’s motto and guiding principle. “We see waste as a raw material,” Van Buijtene emphasizes. “There’ll soon be a huge shortage of raw materials. Oils and minerals are running out; our planet is not inexhaustible. And, of course, most residual products were once raw materials themselves. So we simply turn them back into raw materials.”

It may take a while before they get things right, but at Renewi they never give up. “It took us ten years of pioneering work before we were able to turn used stone wool into bricks, in 1991. It wasn’t the process or technology that took us so long, but our efforts to make it clear to factories why it was so important for their organization.”

### Turning plastic back into oil

Take the approach to plastic, for example. “Plastic is made from oil, so it can be cracked and turned



back into oil again for new products,” says Van Buijtene. “We’re now using 98 percent recycled plastic and we’re determined to get that 2 percent out as well. We can also recover energy from plastic, instead of extracting new oil, coal or gas from the ground.”

### Economic recycling as a sport

However, there is still the problem of who is going to pay the bill. Van Buijtene: “There are still too many customers who often see waste as waste, so they wonder why they should have to pay for it. That’s our challenge: how do we get this so-called waste back into the recycling process in a cost-effective way?”

Van Buijtene laughs. Things have certainly developed quickly in his business. “When I started out as a driver in 1984, I hitched a container to my truck, drove it to a landfill and then tore off again as fast as I could. I didn’t dare tell anyone

about my work. But now when I mention recycling and our vision of the future at a birthday party, everyone hangs on my every word.”

### Piet from next door

Or he might start talking about his old neighbor, the founder of circular horticulture: Piet van Adrichem. “We lived in the same street in Pijnacker. We lived at number 63, and Piet and his brother Wim lived at number 75. It used to be a deserted street where we played as kids.” But the deserted road got busier and busier. More and more people came to see Piet - the inventor - and his brother Wim - the grower. ‘That Piet is crazy!’ you often heard. ‘Doesn’t know what he’s doing!’ And now look what’s happened. Piet from Pijnacker has made our country and the world a little more beautiful. And cleaner. It’s nice to be doing my bit for the future on behalf of Renewi, as Pijnacker boys together. On to a fully circular economy in 2050. Following Piet’s footsteps.”

# Bios

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## **Eric Poot**

Eric Poot is team leader and senior researcher in greenhouse horticulture and flower bulbs at Wageningen University & Research. Born and raised in the Westland region as the son of a tomato grower, Eric studied horticulture at Wageningen University.

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## **Piet van Adrichem**

Piet van Adrichem from Pijnacker discovered a way to minimize water wastage in cultivation. The retired grower introduced stone wool substrate for the greenhouse horticulture sector in the Netherlands.

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## **Marc van Buytene**

Raised in Pijnacker like Piet van Adrichem, Marc van Buytene started out as a waste truck driver and worked his way up to become Area Manager at recycling company Renewi, formerly Van Vliet Contrans. In the Netherlands, Renewi provides recycling services for the customers of Grodan.

Grodan supplies innovative, sustainable mineral wool substrate applications for professional horticulture, based on the Precision Growing principle. These applications are used for the growing of vegetables and flowers, such as tomatoes, cucumbers, capsicums, aubergines, roses and gerberas. Grodan supplies stone wool substrates in combination with customized advice and innovative tools to support growers with Precision Growing. This facilitates sustainable production of healthy, safe and delicious fresh produce for consumers.

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