Circular Economy and Greenhouse Horticulture

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Circular Horticulture

The circular economy aims to ensure our economic activities do not exceed the carrying capacity of planet Earth. Formulated in 2012, the idea of a circular economy is a response to the foreseen depletion of raw materials and the increase in CO_2 emissions, which will eventually lead to global shortages and irreversible tipping points in natural ecosystems.

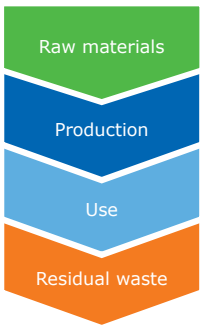
Solutions needed for new bottlenecks

The rapidly growing world population is consuming more and more, requiring the industry to churn out ever more products and resulting in an explosive increase in the consumption of raw materials and the associated pollution. Among others, this is leading to shortages of raw materials that are critical for global agriculture, such as freshwater, phosphate and potassium. These shortages could eventually endanger global food production, causing major economic fluctuations that could lead to humanitarian crises. There is currently widespread awareness of the need to switch to a different kind of economy: a more efficient, more sustainable form of economic cooperation in which reuse of raw materials and other resources becomes the norm and production systems are connected. This is known as the circular economy.

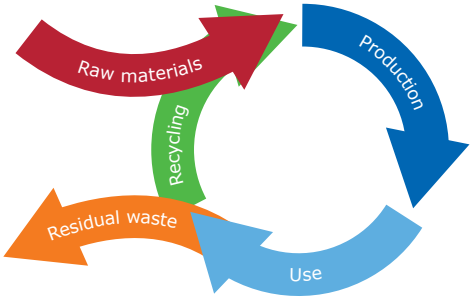
Linear and Circular Economy

These terms were first defined in a McKinsey report published in 2012. The linear economy is currently the norm: biotic and abiotic raw materials are extracted from the environment, consumed, and the remains are then dumped or incinerated. This is also jokingly called the Take, Make, Waste economy. It is estimated that currently, only 10% of all flows in the global economy are recycled. This model is not tenable in the long run. Among others, the transition to the circular economy will require the design of closed cycles so that more value can be derived from raw materials and resources than is currently possible.

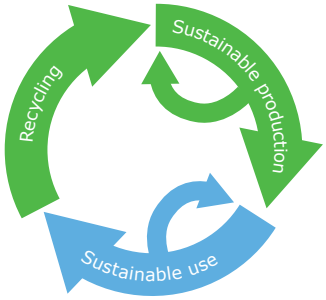
Linear economy



Economy with feedback loops



Circular economy



Facilitating and shaping the transition

Wageningen University & Research, Business Unit Greenhouse Horticulture is anticipating these developments by conducting basic research into potential bottlenecks in the transition of the greenhouse horticulture industry to a circular model. We will then set about resolving these bottlenecks, redesign the systems and establish a demonstration greenhouse that incorporates these designs as a source of inspiration for the industry. We will also develop crossovers with other agricultural sectors. Our goal is to prepare the sector for the future and safeguard its license to operate based on a greenhouse sector that meets the requirements of the circular economy. We see the expense associated with this transition as an investment that will eventually generate economic benefits, such as lower costs due to less waste than in our current, linear model. We also consider these developments to be an investment in the commercial position of the companies in the sector, who will be able to market this approach to sustainability around the world.

Market leaders will participate

The transition to a circular economy will likely be made mandatory through the implementation of European and national legislation, but in the meantime, the greenhouse industry will not be content to sit back and wait. They will want to be prepared for the future, and they will accept the need to meet the new social demands. They will need a vision on sustainability that they can present to customers who are already taking steps in this direction, such as the major retail chains. The good news is that, although there is still much to be done, greenhouse horticulture has a number of aces up its sleeve in this respect, such as its efficient water use and a number of subprocesses that are already 100% circular. Our vision for their future is an Efficient, Clean and Connected greenhouse horticulture sector.

Current state of affairs

The research starts with an analysis to quantify the flows of materials, energy and water in the greenhouse industry. By calculating the impact of these flows, we can identify the bottlenecks in the transition. We will then forge coalitions with individual businesses to resolve these bottlenecks based on a systematic approach and redesign the production systems to meet the requirements of the circular economy. We also want to develop an effective conceptual model to help make choices between various sustainability options, even when there are conflicting needs.

Case study
Tomato packaging made from the vines of previous harvests

Various tests have already been conducted using biobased consumer packaging based on fibres from tomato stems. In time, the foil packaging will also be manufactured from sap pressed from the same stems. Innovations in cultivation systems will make it easier and cheaper to process the fibres and improve their quality, leading to thinner but equally strong tomato packaging. The puzzle is not yet complete, but more and more knowledge is emerging on how to innovate circular systems so that value can be added to all the various side streams.

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