A triple win? Agrivoltiacs - the use of land for both crops and solar power generation – has been shown to significantly reduce water use and increase yields.

As the UN puts it, "efficiency measures along the entire agrifood chain can help save water and energy, such as precision irrigation based on information supplied by water providers, and protection of ecosystems alongside agriculture and energy production."

Technologies that save water have knock-on positive benefits for agriculture and energy.

"Building climate resilience is also building water resilience and it has to be understood as such," says Olson-Sawyer. "If you really want to tackle climate change you have to address the problems with water-related risks. Just look at Pakistan, this year they had an incredible drought and then suddenly one third of the country was inundated. Agriculture will have to adapt with this reality. **Water security is food security.**"

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Subirrigation using treated wastewater

We spoke to Ruud Bartholomeus, Chief Science Officer & Principal Scientist Ecohydrology at KWR Water Institute, about how sub-irrigating crops with treated wastewater can reduce agriculture's water footprint.

What are some of the water-related challenges facing the agricultural sector?

Agricultural crop yields depend largely on soil moisture conditions in the root zone. Climate change leads to more prolonged drought periods that alternate with more intensive rainfall events. With unaltered water management practices, reduced crop yield due to drought stress will increase.

Both farmers and water management authorities must search for opportunities to manage risks of decreasing crop yields. The good news is that strategies are being developed to control these risks and to secure long-term supplies of freshwater. These include increasing regional self-sufficiency in meeting the demand for freshwater and improving the utilisation of the available water sources.

How do you think the water industry can help agriculture overcome some of these challenges?

Available groundwater sources for irrigation purposes are increasingly under pressure due to regional coexistence of land use functions that depend on groundwater levels or compete for available water. At the same time, treated wastewater from industries and domestic wastewater treatment plants is quickly discharged via surface water towards the sea. Exploitation of these freshwater sources may be an effective strategy to balance regional water supply and agricultural water demand.

Treated wastewater (both from domestic and industrial origin), that is usually discharged from a catchment, can be used for local-scale water supply by subirrigation. The goal of subirrigation is to raise the groundwater level and improve the soil moisture conditions for plant growth through capillary rise.

The use of these treated wastewater for subirrigation purposes may be an effective strategy to contribute to both improved water availability for crops and a reduced pressure on the regional groundwater system.

What water technologies and innovations will be important?

Besides the technology of subirrigation itself, the quality of the water source used for subirrigation is key. In order to use treated wastewater for irrigation in agriculture, further purification of wastewater will be needed.

The development of sewage treatment plants towards so called 'water factories' will contribute to the responsible reuse of treated wastewater in agriculture.

How does you organisation help agriculture build resilience?

Water availability for subirrigation, for instance, is generally not limited and could lead to negative impacts to other users of the water system, if not implemented well. We provide analyses of the propagation of (climate) adaptation measures through the hydrological system including a clear visualisation to support water managers. We guide water managers to a responsible implementation of the measures, integrating aspects of water quality, water quantity, water treatment and governance. Additionally, we execute pilot studies to quantify the risks and benefits of adaption measures like water reuse.