WATER-SMART AGRICULTURE

Blueberries that sip, not gulp: New research offers hope for water-smart farming of 'superfood'

In a country where every drop of water counts, growing the market of a thirsty crop, such as blueberries, can be challenging. New research has illustrated that these nutrient-rich berries can be grown more efficiently using less water – without sacrificing yield or fruit quality. Article by Lani van Vuuren.

The study, titled 'Effect of different growth media on water use, yield and soil properties of blueberry cultivated under shade net' and published in May, was led by the Cape Peninsula University of Technology (CPUT) together with the Agricultural Research Council (ARC), and funded by the Water Research Commission (WRC). Researchers explored how different growing media influence water use, plant growth, fruit quality, and soil health in blueberry production. The results could help reshape how blueberries are cultivated in water-scarce regions of South Africa.

The findings come at a crucial time. South Africa's agricultural sector continues to feel the effects of climate change, rising temperatures, recurring droughts, and increasing competition for limited water resources. "Water demand is expected to increase in South Africa in the future, driven by an increase in temperature and evaporation due to climate change effects. This will likely increase irrigation demand by crops," explained Francis Lewu, a Professor in the Department of Agriculture at CPUT and leader of the project.

Yet amid these challenges, blueberries are booming.

A berry industry on the rise

Blueberries have become one of South Africa's fastest-growing fruit industries. Demand has surged globally thanks to the fruit's reputation as a "superfood" packed with antioxidants, vitamins,

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and health benefits linked to heart health, brain function, and blood sugar regulation. According to the South African Berry Producers' Association, blueberries account for more than 70% of the total area planted under berries in South Africa, about 2 800 ha.

This is great news, especially for the rural economy, as cultivating blueberries is a labour-intensive industry. Each hectare of blueberries planted results in the direct employment of 2.64 full-time equivalent workers, on average. This is the highest employment intensity among the major fruits grown in South Africa.

South Africa has positioned itself as a major player in the international blueberry market. Around two-thirds of the country's blueberries are exported, contributing significantly to the economy and creating jobs throughout the agricultural value chain. The Western Cape remains the country's blueberry powerhouse, producing about 60% of South Africa's crop, followed by Limpopo, North West, Gauteng, the Eastern Cape, Free State, and Mpumalanga.

But there is a catch: blueberries are thirsty plants. Their shallow root systems make them highly sensitive to water stress, and growers often rely on precision irrigation to maintain fruit quality and yields, a process known as fertigation. In a water-scarce country, this raises important questions about long-term sustainability. That is where this new research becomes especially important, especially as blueberries remain notably under-researched in South Africa. As Prof Lewu points out, most knowledge regarding the water-efficient growth of blueberries stems from studies undertaken in the Northern Hemisphere.

Rethinking how blueberries are grown

The researchers set out to answer a practical question: can blueberries be grown using alternative growing media that reduce water demand while still supporting healthy plants and good yields? Instead of planting directly in soil, the study used potted blueberry plants cultivated under shade-net conditions at the Wellington campus of the CPUT in the Western Cape.

The plants were grown in different combinations of materials including coconut coir, peat moss, mushroom compost, and zeolite – a mineral known for its exceptional water-holding ability. Peat moss and mushroom compost were selected based on their organic matter content, reduced soil pH, and the ability to promote uniform root growth and distribution.

"A literature review revealed that growth media composition positively influences the growth and yield attributes of fruit crops such as strawberries. With previously conducted research, we understood that zeolite had the potential to conserve water. This triggered our interest to look at the different media in combination with zeolite as a possible solution to grow blueberries more efficiently," explains Prof Lewu.

The materials were also selected on their affordability and availability to farmers. "Coir, for instance, is a standard growth medium in the blueberry industry, and is the growth medium used mostly by blueberry farmers in the Western Cape."

The research team monitored the plants closely over several growing seasons, collecting detailed information on water use, plant growth, yield, nutrient uptake, enzyme activity, and fruit quality. Moisture probes linked to real-time software allowed the team to track exactly how much water each treatment required. The project also investigated how different nitrogen fertilisers influenced plant performance and water-use efficiency.

The breakthrough: less water, strong performance

One of the project's most important findings was that a type of growth medium dramatically affected how much water the blueberry plants needed. Plants grown in a mix containing

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80% coir and 20% zeolite used the least water. This treatment required about 4 litres of water daily, compared to 4.25 litres for plants grown in pure coir.

While the difference may seem small at first glance, across commercial blueberry operations with thousands of plants, the water savings could become substantial. Zeolite proved especially valuable because of its ability to retain water and nutrients within the root zone. This improved moisture stability, reduced irrigation needs, and supported more efficient water use.

Another promising treatment combined 60% coir with 40% peat moss. This mixture also showed strong potential for conserving water while maintaining productive plants.

In essence, the study indicates that blending different growth media allows farmers to tailor water-holding capacity and drainage to the shallow, sensitive root systems of blueberries, says WRC research manager, Dr Luxon Nhamo. "This ultimately reduces the need for frequent irrigation, improving blueberry crop-water productivity."

Water-smart farming for a drying future

The implications stretch far beyond blueberries alone. According to Dr Nhamo, the project forms an important part of the Commission's agricultural water use research portfolio. "Enhancing water use efficiency is a foundational strategy for the agricultural sector's adaptation to climate change as it enables sector resilience against shifting precipitation patterns, rising temperatures, and frequent droughts. It is important to supply irrigation water when and where it is needed through irrigation scheduling informed by technological information. A technology-driven agricultural system and irrigation scheduling increase productivity while reducing water losses."

The blueberry project is the latest in a series of studies funded by the WRC to improve the water use of crops. Other studies have focused on commodity groups such as pears, pecan nuts, avocados, pomegranate, and apples, among others. As most of these studies are undertaken in collaboration with industry partners, the results are implemented immediately – a huge plus for the agricultural sector. Plans are afoot to disseminate the results of the latest study to blueberry farmers.

The blueberry project demonstrated how careful irrigation scheduling, combined with improved growing media, can help producers adapt to these realities, says Prof Lewu. He highlights the importance for farmers to determine field capacity accurately and use available tools, such as moisture probes, to optimise irrigation.

The study also showed that cultivation practices matter just as much as the crop itself. Sustainable agriculture is no longer only about what farmers grow, but how they grow it.

Quality berries still matter

Saving water is important, but farmers also need profitable crops. Fortunately, the research showed that water-efficient growing media did not necessarily come at the expense of fruit quality. In fact, the study found differences in mineral content and nutritional composition across the different treatments, suggesting that growth media can influence both the nutritional value and storage characteristics of blueberries.

The researchers also measured compounds such as phenolics, which are linked to antioxidant activity and consumer health benefits. Interestingly, berries grown in pure coir recorded the highest phenolic content, likely due to mild physiological stress associated with higher irrigation demands.

This highlights the delicate balance growers must manage between water conservation, plant stress, and fruit quality, says Prof Lewu. As consumer demand for healthy foods continues to rise, these findings could help producers target both sustainability and premium-quality fruit.

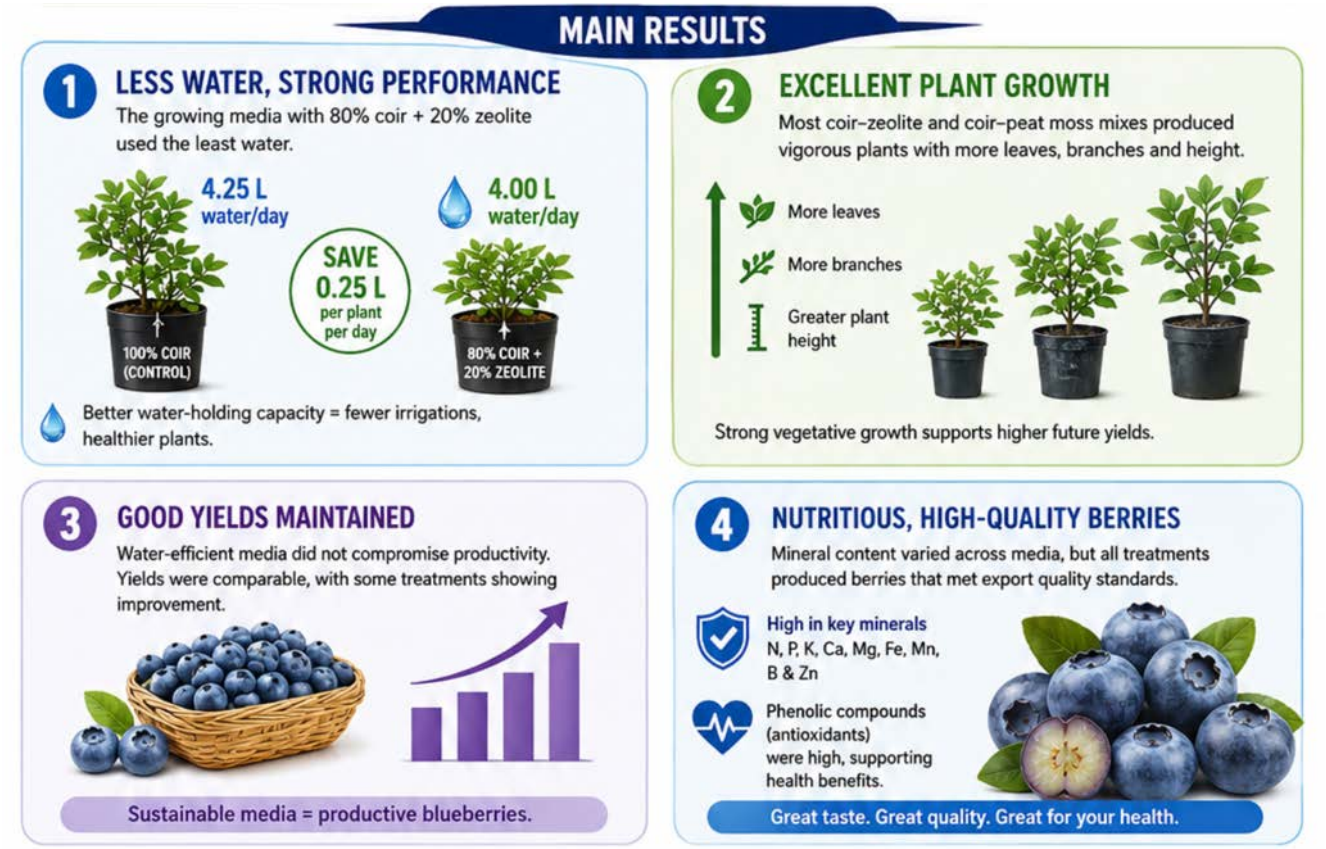
Finding the right fertiliser

The project also examined how different nitrogen sources affect blueberry growth. Blueberries prefer ammonium-based nitrogen, and the study found that ammonium sulphate consistently improved vegetative growth, nutrient uptake, and reproductive performance.

This is important because nitrogen management is closely linked to water use efficiency. Healthier root systems and improved nutrient uptake help plants cope better under water-limited conditions. The researchers noted that ammonium nutrition may improve drought tolerance by supporting root growth and helping plants regulate water loss more effectively. For farmers, this means that selecting the right fertiliser strategy can play a major role in building climate resilience.

Another fascinating aspect of the research was its focus on biological activity within the growth media. The team measured enzyme activity and nematode populations to better understand how the different substrates influenced microbial processes and soil health. Certain treatments promoted higher enzyme activity, especially β-glucosidase, which plays an important role in nutrient cycling.

Healthy microbial systems are increasingly recognised as essential components of sustainable agriculture. They help recycle nutrients, improve soil function, and support plant



The study shows that the use of growth media can help save water while protecting the quality of the crop.

growth naturally. In other words, sustainable farming is not only about conserving water above ground, but it is also about nurturing healthy biological systems below ground.

Why blueberries make sense for South Africa

At first glance, some may question whether expanding blueberry production in a water-scarce country makes sense. But the study suggests that with the right technologies and management practices, blueberries could become part of a more water-smart agricultural future.

Blueberries offer several advantages. They are high-value export crops that generate income, employment, and foreign exchange earnings. They also fit well into controlled-environment agriculture systems where water use can be monitored and managed precisely.

Importantly, the research demonstrates that innovation can significantly improve water productivity. Rather than abandoning water-intensive crops altogether, South Africa may need to rethink production systems to make them more efficient and climate-resilient.

A small berry with a big message

Ultimately, this blueberry project tells a much bigger story than fruit production alone. It shows that agriculture in a water-scarce country does not have to be trapped in a choice between productivity and sustainability. Through better science, smarter irrigation, improved growth media, and careful nutrient management, it is possible to grow high-value crops while using water more responsibly.

The humble blueberry may be small, but the lessons from this research are enormous.

As climate pressures intensify and water becomes increasingly precious, South Africa's future farmers will need crops and cultivation systems that can thrive with less. This research offers a glimpse of how that future might look: innovative, efficient, resilient – and still productive enough to compete on the global stage.

To access the report, ***Effect of different growth media on water use, yield and soil properties of blueberry cultivated under shade net*** (**WRC report no. 3245/1/26**), https://bit.ly/4wS0zjf