

# Students develop unique cannabis cultivation tech

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Credit: Wits University

Two master's students are developing new technologies aimed at disrupting the booming cannabis, or so called 'green gold,' industry.

Their novel cannabis cultivation technologies, uniquely developed for the African climate, have earned Constant Beckerling and Anlo van Wyk special recognition in the Biosciences category of the Gauteng Accelerator Programme (GAP) – an annual competition held by the

Innovation Hub, a subsidiary of the Gauteng Development Agency. The competition is aimed at tech entrepreneurs who develop technologies that can benefit the Gauteng, South African and African economies.

Even though they are both passionate cannabis growers, their focus is on developing agri-tech for the sector. To do this they have created a startup called AgriSmart Engineering (Pty) Ltd during COVID-19 lockdown last year. With a focus on closed-loop hydroponics and aquaponics, the AgriSmart team specializes in the design and implementation of automated smart growing systems.

## **Growing for gold**

Beckerling and Van Wyk are approaching their speciality of cannabis cultivation as an engineering problem and marrying their growers experience and intuition with their engineering and technical backgrounds.

"There is a matrix of factors for cannabis cultivation that we consider. As an engineering startup we are developing cultivation technologies for the African climate. For cannabis cultivation, South Africa faces shortcomings such as water stress and irregular electricity supply at a high cost. But the country also has strengths such as superior solar radiation and being one of the first countries that are in the process of commercializing cannabis," Beckerling says.

To strike 'green gold' early, Beckerling and Van Wyk, both doing their MSc in Electrical Engineering, entered a blueprint for a cannabis cultivation research facility they designed in the GAP competition. Their entry also included two main agro-processing offerings:

- cannabis specific LED grow lights in an automated Internet of Things (IoT) environment, customized for the research facility to

- accommodate the photobiology of the cannabis plants;
- and proprietary organic hydroponic nutrient, which they formulate based on the respective hormonal growth cycles of the plants.

"Our novel LED lighting is a technology which is set to disrupt the cannabis industry. This technology is brought about by combining one of South Africa's unique strengths, which is solar radiation, with engineering disciplines like artificial intelligence, electronic and mechanical engineering," says van Wyk.

The industry standard is currently to use high intensity discharge lighting (HID) lighting.

"Our LED lighting tech runs 2.5 times more efficient on electricity than High Pressure Sodium (HPS) lights and even more so compared to Metal Halide (MH) fixtures. The lifetime of our LED fixtures is also significantly longer than that of HID—about 15 times at the upper-end. This translates to about 80 000 hours of light compared to about 5 000 hours lifetime for the HID—leading to significantly lower maintenance costs." explains Beckerling.

According to Van Wyk the LED lighting fixtures are also dimmable. "So we could implement an artificial intelligence algorithm that takes in environmental input and based on those inputs it controls what the lighting output should be in that specific moment. This leads to optimisation of power consumption which brings down electricity costs."

For the competition they had to do financial projections around their fixtures and the potential benefits of their disruptive tech. The bottom line is that over five years the cultivator stands to save R 25 million per hectare in electricity costs just on the lighting alone, compared to industry standard HID fixtures.

The two engineers are also formulating their own organic hydroponic nutrients for cannabis. "Besides electricity, your biggest running cost in your facility is going to be your nutrient cost which increases with scale. It's therefore crucial to get the right nutrients that tailor to your plants' specific hormonal growth phases," says Beckerling.

Cannabis plants require different nutrients in different stages of their development and require these nutrients in different concentrations as they mature. "We are doing a cannabis-specific hydroponic nutrient that we formulate completely organically, and we are planning to register it as a type 2 organic fertilizer in line with the regulations of South African law," Beckerling explains.

The research and development of this nutrient takes time and money. Securing funding to develop and commercialize this nutrient, while producing it at more than 10 times cheaper than the current direct market competition, is one of their biggest stumbling blocks.

## **Into the near future**

Their next aim is to build a demonstration facility to show how their technologies are working on the ground. "The current growing technology is very archaic, so if one party does decide to use this new tech, it will force the rest of the industry to follow suite if they want to compete on price," Van Wyk says.

Beckerling adds: "We believe the market will settle at who can produce the most consistently at the cheapest price and at the highest quality."

The research facility will also provide an immense scope of research, particularly in engineering (chemical, electrical, mechanical and civil); computer science (machine learning, AI, big data, bio-informatics, robotics, software development and others); plant and biological

sciences; physical sciences; and pharmacology, psychology and medicine. They estimate that many companies can spawn from this facility through the commercialisation of new technologies.

Provided by Wits University

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