

ASX and MEDIA RELEASE

19 November 2018

Roots granted Australian patent for its RZTO ‘smart pipe’ system that provides targeted heat and cooling delivery to plant roots at increased energy efficiency and lower capital expenditure

- Patent solidifies Roots innovation and IP leadership and provide additional barriers to any competitor who may wish to emulate Roots’ RZTO technology capability.
- The patent runs until April 2035 with 29 approved claims including the manufacturing process and root zone heating and cooling ground-source heat-exchange systems.
- The Australian patent serves a precedent and strong reference for other countries where Roots has also filed patents as part of local operations.
- Saves farmers capital costs due to one pipe system now being able to heat or cool crops and emit fluids, thus eliminating the need for two separate heating and cooling pipe and drip irrigation systems.
- Smart pipe developed with and exclusively manufactured by WFI.

Roots Sustainable Agricultural Technologies Limited (ASX: ROO, Roots or Company) has been granted a patent by the Australian Patent Office for a key part of its unique Root Zone Temperature Optimization (RZTO) technology which optimises plant physiology for increased growth, health, productivity and quality by stabilising the plant’s root zone temperature.

The patent titled *Heat delivery system and method* (WO 2015/155763, application number AU 2015246007) relates to a multi-purpose ‘smart pipe’ system which diffuses heat or cold only directly at a plant’s root zone level, rather than between plants, where pipe system segments are insulated. The pipe, at alternating pressures, can also act as an emitter of fluids (water or fertigation) at root zone level. These features, in a single pipe system, will save farmers considerable expenditure as it negates the need for separate root zone heating and cooling pipes and drip irrigation pipes.

The Australian patent runs until April 2035 and provides a precedent and strong reference for other countries such as Israel, China, United States, South Korea and Spain where Roots has also filed patents as part of local operations.

Dr Sharon Devir, CEO and co-inventor said, "The granting of this patent is significant for the company as it solidifies Roots’ innovation and intellectual property leadership in root zone temperature management. We have proved through successful pilots on several crops in different countries that our unique RZTO technology can substantially increase crop quality and yield, mitigate extreme heat or cold stress and improve farm efficiency through quicker crop rotations while using less energy than other irrigation systems and making optimal use of available water."

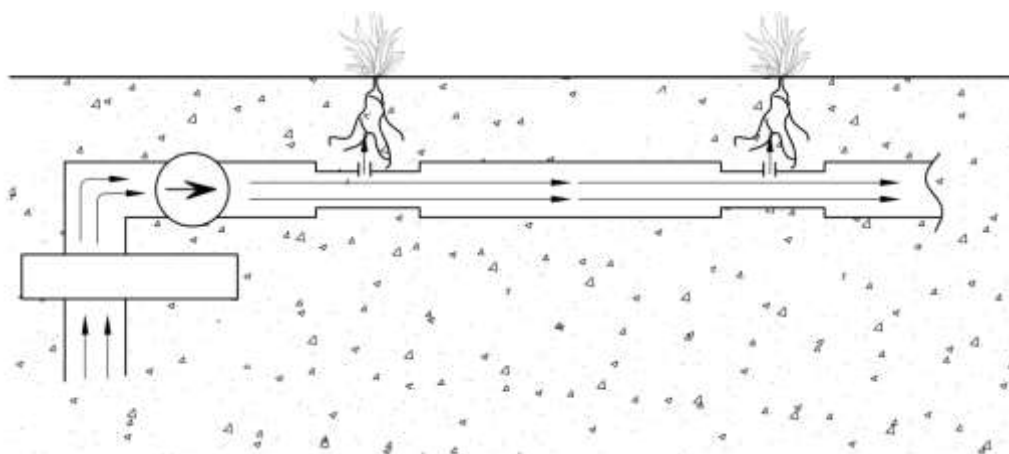
"This patent also ensures Roots’ competitors who may wish to emulate this disruptive technology with an additional barrier for entry, delaying and obstructing their plans to enter the root zone heating and cooling sector with anything like our advanced system that offers so much value to farmers in several countries."

The smart pipe is developed and manufactured exclusively through a joint venture arrangement between Roots and WFI, a leading Israeli plastic extrusion manufacturer that specialises in advanced technology applications in the construction and piping industries.

“The addition of the ‘smart pipe’ system to Roots’ RZTO technology will allow farmers who use underground drip irrigation to save money as they no longer need multiple pipe systems to drip irrigate or heat or cool crop root zones, and the smart pipes reduce energy loss between plants and optimise the RZTO system's overall energy use.”

The scope of the patent is broad encompassing 29 approved features including:

- specially manufactured monolithic pipes, with alternate heat insulated segments and heat transferring segments;
- heat transferring segment which correspond with the location of a respective heat ‘consumer’ (plant);
- heat insulated segments and heat transferring segments made from different materials, which provide different heat transfer coefficients;
- a heat delivery system that includes a fluid emitting system comprising at least one emitting pipe with several different types of drip irrigation or spray emitters;
- a ground source heat exchange and delivery system comprising piped buried in the ground, allowing flow of a heat-accommodating fluid through it and transferring heat from the ground around it through the sidewalls. And a second piping within it that allows heat accommodating fluid to transfer heat to plant root zones; and
- the method of manufacture for agricultural applications.



Roots’ patented ‘smart pipe’ system provides targeted heat and cooling delivery to plant roots at increased energy efficiency due to insulation of the pipe between the plants

About Roots Sustainable Agricultural Technologies Ltd:

Israeli-based, Roots Sustainable Agricultural Technologies Ltd. is developing and commercialising disruptive, modular, cutting-edge technologies to address critical problems faced by agriculture today, including plant climate management and the shortage of water for irrigation. Roots has developed proprietary know-how and patents to optimise performance, lower installation costs, and reduce energy consumption to bring maximum benefit to farmers through their two-in-one root zone heating and cooling technology and off the grid irrigation by condensation technology.

Roots is a graduate company of the Office of the Israeli Chief Scientist Technological Incubator program.

More information www.Rootssat.com

About Root Zone Temperature Optimization (RZTO):

Root Zone Temperature Optimization (RZTO) optimises plant physiology for increased growth, health, productivity and quality by stabilising the plant's root zone temperature. Leveraging the principle of Ground Source Heat Exchange (GSHE), Roots installs a closed-loop system of underground coils for heat charging and pipes at the root zone area for heat discharging. The lower part is installed at a depth where soil temperature is stable year-round and not affected by weather extremes, and the upper part in the target crop's root zone just below the soil surface. The water discharged at the lower coils, heats (or cools) the crop roots, depending on the season.

By stabilising and optimising the root zone temperature with very little energy use, the technology significantly increases yields, improves quality, mitigates extreme heat and cold stress and allows for off-season planting and growing.

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