

TERMS OF REFERENCE FOR A DIRECTED WRC PROJECT

KEY STRATEGIC AREA: Water Utilisation in Agriculture.

THRUST 1: Water Utilisation for Food and Fibre Production.

PROGRAMME 1: Water – efficient production methods in relation to soil, crops and technology in rain – fed and irrigation agriculture.

<u>Title</u>: Increasing water use, productivity and savings in full bearing macadamia orchards under micro-irrigation

Objectives:

<u>General</u>: To determine the impact of water stress at different phenological stages on the yield and quality of macadamia orchards over two seasons, and to optimise irrigation practices in different macadamia cultivars.

Specific objectives:

- (a) To determine the thresholds for water stress in macadamia trees in terms of physiological parameters.
- (b) To assess possible differences in leaf and xylem anatomy between different macadamia cultivars and between different production regions in South Africa.
- (c) To optimise irrigation strategies (both drip and micro-sprinkler irrigation) for macadamia orchards through careful assessment of water use efficiencies and plant physiological responses
- (d) To quantify water use efficiency and water use productivity per ha and per ton of full bearing macadamia orchards

Rationale:

According to the latest macadamia report, the macadamia industry in South Africa has seen rapid expansion in the past 10 years, with current estimates reporting an area of about 44 776 ha under macadamias across South Africa. Although the rapid expansion in the cultivated area under macadamia is mostly driven by the global demand and accompanying high prices, further increase is being hampered by the unavailability of suitable land, and limited freshwater resources for irrigation. Some of the largest macadamia producing countries like Australia and South Africa are facing

extreme water scarcity challenges, and the situation is compounded by the increasing frequency and intensity of droughts and high temperatures in recent years. Shifts in rainfall patterns have seen supplementary irrigated macadamia orchards becoming fully irrigated, where water is available, and rain-fed macadamia orchards becoming rather unproductive. However, the high value of macadamia nuts has seen growers acquiring increased volumes of water by either purchasing freshwater at exorbitant prices or applying for increased water licencing allocations. Both options, although feasible, create a range of social problems, especially when considering that in times of drought, communities are also faced with water restrictions and human consumption of water takes precedence over commercial agriculture. Furthermore, in the era of food labelling, macadamias are not seen as a sustainably produced product given negative perceptions of their water footprints, and may in fact, result in decreased demand by its affluent consumers.

It is on this background that the Water Research Commission (WRC), in partnership with the Macadamias South Africa intend to support research on water use, productivity and savings in full bearing macadamia orchards under micro-irrigation in South Africa. The main aim of the project is to determine the thresholds for water stress in macadamia trees in terms of physiological parameters and subsequent refinement of irrigation practices. The project duration will be 4 (four) years at a maximum available budget of R4 000 000.

Deliverables:

- 1. Review of available knowledge on measuring and modelling water use of Macadamia tree orchards, published water use efficiency as well as water use productivity standards of Macadamia tree crop;
- 2. Report on key soil, crop and climate parameters for measurement and modelling of macadamia tree orchard water use;
- 3. Interim and final reports on measuring and modelling transpiration and evaporation of full bearing macadamia orchards under micro-irrigation;
- 4. Interim and final reports on macadamia yield and quality of open and full bearing Macadamia orchards;
- 5. Interim and final reports on quantifying water use efficiency and water use productivity per ha and per ton of full bearing macadamia orchards;
- 6. Interim and final reports on quantifying water use savings per ha and ton with micro-irrigation under full bearing Macadamia orchards;
- 7. Interim and final reports on explaining the components of reduction of water use through transpiration and evaporation;
- 8. Interim and final reports on workshops and information sessions/ demonstration sessions with farmers and macadamia Commodity Group,
- 9. Farmer field days and information sessions during the course of the project to explain provisional and final research results;
- 10. Practical illustrative guide to producers on water savings which are achievable with full bearing Macadamia orchards;
- 11. Popular articles in farmer magazines, conference papers and scientific articles in published journals;
- 12. Annual progress and capacity building reports;
- 13. Final integrated research report

Time frame:

Start	:	01 October 2021
End	:	01 October 2025

Budget:

AVAILABLE BUDGET OVER THE PROJECT PERIOD OF FOUR YEARS: **R 4 000 000**

	WRC	SAMAC
2021/2022:	R 500 000	R 500 000
2022/2023:	R 500 000	R 500 000
2023/2024:	R 500 000	R 500 000
2024/2025:	R 500 000	R 500 000
Total	R 2 000 000	R 2 000 000

20% retention in 2024/25 for final report is R800 000 on both WRC & SAMAC funding.