



RHODES UNIVERSITY

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Department of Ichthyology and
Fisheries Science

Rhodes University

1 July 2022

Call for quotes to construct various components of an aquaponics system at Rhodes University, Makhanda. Quotes will be assessed, accepted/rejected based on the Rhodes University procurement policies. It should be noted that the assessment of the quotes will be based on cost, evidence of a successful system operation and similarity to the specifications detailed in these calls.

Quotes must be delivered in pdf format, addressed to: Mr Sibu Ngxingo; email address: s.ngxingo@ru.ac.za

The quote should clearly indicate either "Quote 1" or "Quote 2" in the pdf file name and in the heading at the start of the quote document.

Closing date for quotes will be 10 March 2023.

Quote 1 - Commercial aquaponics system (including plant production system only; the quote should exclude system housing and should exclude fish production system):

Detailed description of a commercial-scale aquaponics system with production footprint of 5.5m x 35m to fit into a housing structure of 12m x 35m:

With plant production capability of at least 200 reproductive fruiting plants in tidal media beds, 2550 plant stations in floating rafts, and 320 reproductive fruiting plant stations in grow buckets:

- 8 x Tidal Media Beds,
- 30 rafts;
- 80 grow Buckets in linear modular format
- Commercial aquaponics module should include mineralisation and nitrification.

The plant production unit in more detail:

1. Tidal Primary Media Beds:

- 4 x Proven, functional Primary Food Grade, UV Stabilised Virgin Plastic or Gel-Coated Fibre-Resin Tidal Media Beds of 1,2m x 1,2m x 0,4m with appropriate weight bearing Modular Steel Frame stands with all associated Drain syphons and Delivery Plumbing to contain inert, graded gravel media of no less than 19mm;
- all associated Drain syphons and Delivery Plumbing and appropriate 24VDC Variable Speed Drive pumps;
- 1 x Oxidising Solids Bio-Reactor to facilitate solids management and removal with all associated Drain and Delivery Plumbing;
- 2 x Dual inlet Chamber Midi Mineralizing Solids Traps with all associated Drain and Delivery Plumbing to fit below Tidal media beds and

2. Tidal secondary Renitrifying Media Beds:

- 4 x Proven, functional Renitrifying Food Grade, UV Stabilised Virgin Plastic or Gel-Coated Fibre-Resin Tidal Media Beds of 1,2m x 1,2m x 0,4m to contain inert, graded gravel media of no less than 14mm with appropriate weight bearing Modular Steel Frame stands;
- all associated Drain syphons and Delivery Plumbing and appropriate 24VDC Variable Speed Drive pumps;

3. Deep Water Culture (DWC):

- 6 troughs of 6,3m x 1,25m (internal dimensions) Insulated (at least 30mm), modular steel Braced Deep Water Troughs with Food-Grade UV stabilised Vinyl liners;
- 30 x High Density, Food Grade Slotted, pre-drilled floating Deep Water Culture Rafts of 1,2mx1,2m x 60mm
- all associated Drain and Delivery Plumbing and associated Air pumps & air diffusers with carrier hosing & control valves to achieve 4 diffusers per DWC Raft;

4. Grow Buckets:

- 80 x Grow Buckets (20L, UV stable, food grade) with associated structural support, including lintels, irrigation, delivery and drain infrastructure,
- associated 24VDC Variable Speed Drive Pumps with all associated Drain and Delivery Plumbing to contain inert graded gravel media of no less than 19mm;

5. Reverse Osmosis water purification System to produce 2000L Permeate per Day with 2 x Dedicated Reserve Tanks of 5000L each

6. 4 x Dual Tank Modular Red-Wriggler Farms with Bio Tea Mineralization and 4 x 1000L Tea Brewing Tanks with internal anaerobic mineralization components and aeration,

7. Electrical: Rhodes University will provide a 220AC Single Phase Earthed electrical point at two locations on the site. All Electrical installations to the system from this point forward is the responsibility of the contractor, and must comply with the following:

- a. **No 220VAC power in the Aquaponics system.** All components in contact with water must be driven by 24VDC, so that there is no electrical liability for the University.
 - b. A dual tier Electrical supply is required, where all 220VAC components are secured outside the system, away from any damp environs, and all components making contact with water or in the space where students will frequent, must be 24VDC. All electrical installations must comply with SABS standards as set forth by the Electrical Contractors Board of South Africa and a Certificate of Compliance is required where necessary.
8. A proven Wireless Instrumentation and real-time, system parameters monitoring and reporting hardware with accompanying software and App to include:
- a. Dissolved Oxygen levels in solution
 - b. Real-Time pH of solution
 - c. Temperature of both solution and ambient air
 - d. Real-Time Relative humidity and historic trends
 - e. Power out Alarm
 - f. Real time Barometric Pressure
 - g. Media Bed Syphon Trigger fail alarms
 - h. Data history of 2 years to be retained
 - i. All WiFi components and connections to be included in the costing
9. Graded gravel media and concrete lintels to be included in costing
10. Installation, Travel and Accommodation costs for the above

Quote 2 - Housing for plant and fish sections of commercial aquaponics system, and the fish production system:

(A) Detailed description of plant-system housing with a footprint of 12 m x 35 m that houses plant systems described in 1-above (note that this housing must be sufficient to hold two of the systems described above):

- 1. Associated appropriate Ventilated Modular Steel Housing for plant section, with impervious roof, Gutters, Downpipes and Rainwater Harvesting infrastructure, where Peak height should be 3m and Eaves no less than 1,8m, Ventilated ripstop hortinet sidewalls;
- 2. FOOTPRINT: 12 m x 35 m. with the single module installed, tested and functional in one half of the plant structure, leaving the other half vacant for system duplication.
- 3. Installation, Travel and Accommodation costs for the above

(B) Detailed description of fish-system housing with a footprint of 8,5m x 7,3m and a fish production system:

1. Associated appropriate Double Glazed Ventilated Modular Steel Housing (to be erected over concrete and brick structure as described in Civils section with sunken sump of 2,535m x 7,735m x 1,2m, and Platform for Fish Tanks) for Fish section, with:
 - a. 4 x 2000L independent fish Tanks Decoupled Low Profile, Food-Grade, UV Stabilised first generation Plastic or Gel-coated Fibre-Resin Dual Fish Tanks with external Power-Flush Solids Lifting Overflows (SLO) to be housed in double insulated Temperature controlled Fish housing System and associated Air pumps, delivery lines & air diffusers with carrier hosing & control valves to achieve a minimum of 5mg/L dissolved Oxygen in Fish Tanks;
2. 4 x Appropriately sized 24VDC Submersible water pumps to deliver water to (a) the fish tanks and (b) Primary Media Beds;
3. Custom Dual Sumps - Low Profile, Food-Grade, UV Stabilised first generation Plastic or Gel-coated Fibre-Resin Tanks with height of no more than 1,1m to hold a total sump Water Volume of 10 000L;
4. Efficient and effective indirect System Thermal Variance Reduction water heating and cooling unit with thermostatic controls and dedicated insulated reserve tanks to run on Ethylene Glycol antifreeze heat exchanger fluid;
5. impervious roof, Gutters, Downpipes and Rainwater Harvesting infrastructure, where Peak height should be 3,5m and Eaves no less than 1,8m, Ventilated hortinet sidewalls
6. Installation, Travel and Accommodation costs for the above.



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Quote 3 - Civils for the commercial aquaponics system:

(A) Detailed description of complete civils needed for plant and plant housing section described in 1 and 2-above:

- **35 m x 12 m concrete slab, as follows:**
 - a) Lower section of floor: 24m long x 12m wide, compacted surface, topped with 100mm reinforced broom finished, level concrete.
 - b) Upper section of floor, contiguous to lower section (a-above) but stepped up by 400mm (step needs to be weight-bearing, solid concrete). This upper section should



Quote 4 - Electrical and supply

A 220AC single phase earthed electrical point will be needed at two locations on the site; one next to the fish production system and one next to the plant production system.

Quote 5 - Water supply

Two taps connected to the municipal water supply will be needed; one next to the fish production system and one next to the plant production system.



8.6 x 7.3 m

12 x 35 m

Approximate position of
aquaponics system