NOTICE INVITING TENDER

[A] Structure of unique field based tents with moving roof, leak proof electric wiring, heating system and air circulation system.

&

[B] Supply and installation of environment sensors equipped with loggers as one compatible working system

Sealed tenders/quotations are invited in two bid systems – (1) Technical Bid and (2) Financial Bid from reputed Firms, Manufacturers / or their authorized dealer with 10 years work experience in the field. The details can be downloaded from university website www.rpcau.ac.in. The tenders should reach to the office of undersigned on or before 22.02.2021 through registered post/ speed post only.

(Note :- Separate bid for A & B)

Director Research

Memo No. 1054 /DoR/ RPZCAU, Pusa dated 02-02-2021

Copy forwarded to Consultant (I & P) with a request to publish the above quotation notice (size 8 x 8 cm approx) once in Patna and Delhi Edition of Hindustan Times, English Daily at the earliest on DAVP rates. The bill in duplicate along with the tear sheet of the advertisement may kindly be sent to the undersigned for payment.

Director Research

CC : O/I, ARIS Cell, RPZCAU, Pusa (along with the soft copy and hard copy) with a request to place the quotation notice and bidding documents on the University website.
TENDER [A] *Structure of unique field based tents with moving roof, leak proof electric wiring, heating system and air circulation system.*

I. Structure of Field based Tents with open-close roof and heating system:

There would be different components in the field tents that would require electric inputs.

(i) There would be total four tents. Each tent structure would have 8m x 4m x 3m dimension taking 32 m² land area.

(ii) The whole structure would be made up of corrosion resistant Galvanised Iron (GI)-pipes for longer durability and sturdiness. The outline skeleton of the platform is explained in Figure 1 in open (left) and close condition (right). Platform would be in open condition at all time except if it’s raining for drought experiment and at night if high night temperature is one of the treatments.

(iii) This facility would require electric input to run hence a leak-proof wiring to all the components would be essential for safety and proper functioning. Major components that would run on electricity would be heaters (radiators and ceramic heaters) and exhaust fans.

(iv) Ceramic heaters would be used specifically to increase heat at canopy level during open tents condition (day time), while the heat radiators would increase overall air temperature in closed tents (night time).

![Diagram of tent structure with components labeled: Exhaust Fans, Wash and rust proof cover, Ceramic heaters, Acrylic Sheet/ Poly cover, Heat radiator.]

Figure. Structure of phenotypic platform in open and closed view. The roof of the tent can be open/closed manually or based on automatic motor-based system. The facility would require electricity supply to run heaters and radiators.
Detailed specifications of the components:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Detailed specification</th>
<th>Number of units required</th>
<th>Remark/Justification</th>
</tr>
</thead>
</table>
| 1      | Galvanized Steel pipes (rectangle shape)  | 1. Corrosion free, rust proof, durable water resistant heavy duty pipes  
2. Should thrive under continuous flooding continuous under mud mixed water and able to bear heavy load on the structure.  
Dimension (1.0 inch x 2.0 inch) heavy load type  
W. T. = ≥ 3.0mm  
Weight = ≥ 3.30 kg/m  
Length per piece ≥ 6m | 120                        | These pipes would be used to make skeleton of the tents, where the roof of the tent would be closed (night) and open (day) on daily basis. Structure needs to be sturdy and able to bear heavy load of moving roof.                                                                    |
|        | Galvanized Steel tubes (round tubes)      | 1. Corrosion free, rust proof, durable water resistant heavy duty pipes  
2. Should thrive under continuous flooding continuous under mud mixed water and able to bear heavy load on the structure.  
Dimension (1.0 inch) heavy load type  
Outside diameter Minimum = ≥33.3mm  
Maximum = ≥34.2mm  
W. T. = ≥ 4.0mm  
Weight (P/E) = ≥ 2.93 kg/m  
Weight (S/S) = ≥ 2.95 kg/m  
Length per piece ≥ 6m | 10                        | These pipes would be used in the structure of moving roof and manual handles                                                                                                                          |
|        | Heat radiators                            | Oil filled heat radiators with ≥13 fins  
(preferably waved fins for effective heating)  
Wattage = 2900 W  
Heat settings: ≥3 Power Settings – viz.  
1000 W, 1500 W & 2500 W with at least one additional ≥400 W (PTC heater + Fan)  
Additional 1 N pair wheel set, 1 N pair U ring with nut, & 1 N Detailed Instruction Manual  
≥ 2 years product warranty with onsite technical support | 3                        | These heater would increase air temperature within heat tents during the treatment period in the night                                                                                                                                 |
| 4      | Ceramic Infrared Heaters                  | Full Length ≥245 mm x 60 mm  
Wattage >250 to <400 W.  
The material of the heaters should not | 16                        | These heater would increase air temperature within heat tents during the treatment                                                                                                                                                                                                 |
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>oxidize. Heater should be made with proper insulation on the backside with highly efficient heat insulation material. Heater should have a very long life even with regular uses. At least 2 years warranty period</td>
<td></td>
<td>period during the day time</td>
</tr>
<tr>
<td>5.</td>
<td>Heavy Duty High RPM air circulating/exhaust fans</td>
<td>Heavy duty Copper winding motor Heavy duty fins Sweep = ≥250mm Power input ≥45 to &lt; 70 Watts Speed = ≥ 1400 rpm Air delivery = ≥ 720cmm Must include: 1. Regulator to change fan speed (slow to high) 2. Bird screen for protection against birds &amp; foreign material 3. Must have exhaust and fresh air circulation mode with switch to change mode</td>
<td>8</td>
</tr>
<tr>
<td>6.</td>
<td>Polyvinyl Chloride (PVC) Sheet</td>
<td>Thickness up to ≥ 1.5mm to &lt; 3mm. Transparency ≥ 85% High Gloss. Double polish finish Satisfy High Cosmetic Standard. Colour: Transparent clear Hardness: 35 to 55 shr Anti-Mold, Anti-Mildew, Low Toxic, Cold Crack resistant, Fire Retardant, Anti-Static Dimension required to be customized for 20m x 20m area per unit</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>Waterproof Submersible Electric wire cable (preferably round) for electricity supply and leak proof wiring in four field based heat tents</td>
<td>Round 3 core Size &gt;6 to &lt; 14 sq mm Voltage = ≥ 100 V</td>
<td>200 m</td>
</tr>
</tbody>
</table>
TENDER [B] *Supply and installation of environment sensors equipped with loggers as one compatible working system*

II. Environmental Sensors equipped with Logger for Field Phenotyping Study

Continuous monitoring of environmental and crop parameters through different sensors connected to single logging system, able to send data to output device (Computer)

(i) *Air temperature and humidity:* recording would be every 30 minutes interval throughout the year or can be specifically used during the cropping season.

(ii) *Canopy temperature:* An infra-red radiometer would continuously measure air and canopy temperature to calculate canopy temperature depression, which is one of the most promising traits under stress conditions.

(iii) *Tissue temperature:* A thermocouple sensor attached with logger would measure inner temperature of tissue such as spikelet, sheath, pod etc. This is the most critical trait to phenotype heat/drought stress tolerance at sensitive growth stage of any crop.

(iv) *Carbon dioxide:* This would monitor flux of CO$_2$ within tents to measure CO$_2$ uptake and release from the plants as community diurnally. This sensor would also provide seasonal changes in CO$_2$ flux due to community photosynthesis/ respiration across the crops.

(v) *Soil conductivity (EC):* Change in soil property (concentration of ions) under flooded to aerobic to drought conditions would be monitored.

(vi) *Soil temperature:* Change in soil temperature under flooded to aerobic to drought conditions would be monitored.

(vii) *Soil moisture:* Change in soil moisture content across the aerobic to different levels of water deficit stress would be recorded in real time.

(viii) Weather parameters such as rainfall, wind speed, solar radiations, UV-radiation should be the intrinsic features of the facility.

(ix) Additional sensors to measure plant surface temperature, soil moisture, soil temperature and soil conductivity with dedicated data loggers for survey measurements.

(x) Data logger would be housed in a corrosion free, water proof, thermally protected dry chamber. All the data recorded can be visualize through a computer system in real time transferred through wi-fi.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Detailed specification</th>
<th>Number of units required</th>
<th>Remark/Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Environmental Sensors equipped with Logger for Field Phenotyping Study</td>
<td><strong>Key specifications:</strong>&lt;br&gt;1. Sensor &amp; Logger should be portable, light weight and suitable to install in any weather conditions and can be easily re-install at any sight.&lt;br&gt;2. System should have Inbuilt battery for run the instrument for ≥6 months.&lt;br&gt;3. Should have four independent logger units with default Air Temp. &amp; RH Sensors and compatible to accommodate ≥12 additional sensors for Soil Temperature, Soil moisture, UV Light, Quantum/PAR, CO₂, Leaf Temp.). At a time, each Data-logger hub should have option to connect at least 4 sensors or higher would be preferred.&lt;br&gt;4. Each data-logger should have non-wired (Wireless/GSM/GPRS/any) communication to transmit the data till 500m or higher distance.&lt;br&gt;5. Data-logger should have Keypad/Button operation, Indicator for battery status, data communication status, Inbuilt Wireless communication, Data Storage (Data of ≥6 months), Inbuilt batteries (&gt; 6-month life), Connect minimum 4 sensors or higher</td>
<td>This system should be able to work as one unit</td>
<td>All the sensors and data loggers would record crop phenotyping data and environmental parameters from the micro-climate of heat tents.</td>
</tr>
</tbody>
</table>
Qty.): 0 to 3000 μmol m⁻²s⁻¹, ±5%

11. CO₂ range and accuracy (1 Qty.): 0-2,000 ppm, ± 5%

12. Leaf Temp. range and accuracy (1 Qty.): 0 to 100°C & Accuracy: ±0.5°C

Additional Sensor with observation logging Meter:

13. Research Grade IR-Thermometer (1 Qty), (Range & Repeatability: 0 to 100°C accuracy ±0.05°C

14. Soil Moisture Meter (with Temp. & EC) (1 Qty), (Range & Accuracy: 0-50%, ±3%)

15. Software, communication cable, Battery, Charger/Adapter etc. for ready to use.

16. In addition to above specification,

(i) the system should provide four rust proof heavy-duty water-resistant Tripod stand system to fit all the sensors and loggers in the field condition (flooded rice field to dry field crops).

(ii) Suppliers are requested to attach original printed brochure and same should be available on their website.

(iii) Supplier should attach manufacturer authorization certificate/document