DIRECTORATE OF RESEARCH
DR. RAJENDRA PRASAD CENTRAL AGRICULTURAL UNIVERSITY
PUSA (SAMASTIPUR)-848 125, BIHAR

NOTICE INVITING TENDER

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

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[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/ RPCAU, 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.

M.R 2/2/2021

Director Research

2/2/2021

CC : O/I, ARIS Cell, RPCAU, Pusa (along with the soft copy and hard copy) with a request to place the quotation notice and bidding documents on the University website .

D.No. 684
03/02/2021
ARIS Cell

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 m^2 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).

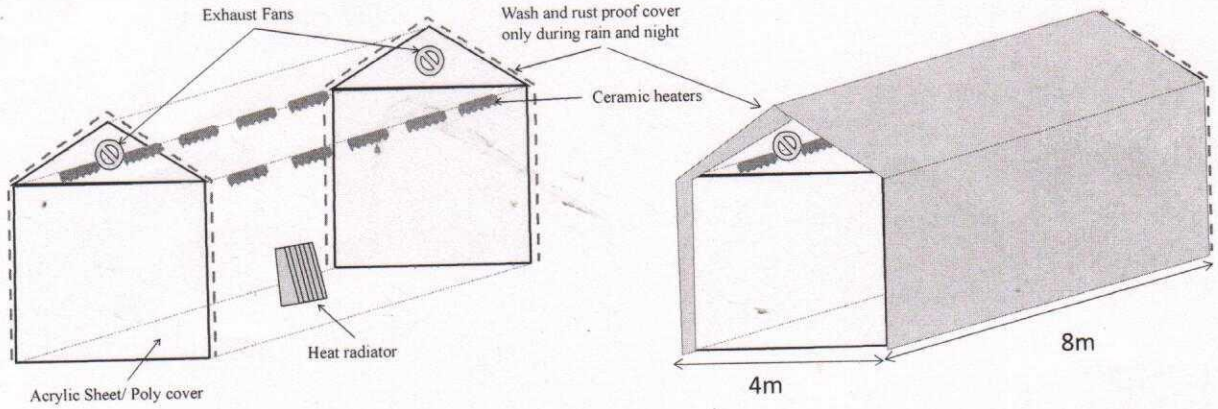

Figure. Structure of phenotypic platform in open and closed view. The roof of the tent can be open/closed manually or based on automatic motor-based system. The facility would require electricity supply to run heaters and radiators.

Detailed specifications of the components:

S. No.	Item	Detailed specification	Number of units required	Remark/Justification
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.
2.	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. Dimeter (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
3.	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 heatershould not	16	These heater would increase air temperature within heat tents during the treatment

		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		period during the day time
5.	Heavy Duty High RPM air circulating/exhaust fans	Heavy duty Copper winding motor Heavy duty fins Sweep = ≥250mm Power input ≥45 to < 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 & foreign material 3. Must have exhaust and fresh air circulation mode with switch to change mode	8	These fans would circulate warm air within tent area during the day time while exhaust mode would expel access CO_2 accumulated in the closed mode during the night time
6.	Polyvinyl Chloride (PVC) Sheet	Thickness up to ≥ 1.5mm to <3mm. Transparency≥ 85% High Gloss. Double polish finish Satisfy High Cosmetic Standard. Colour: Transparent clear Hardness: 35 to 55 phr 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**	4	This sheet would be used to closed the roof structure of the tent
7.	Waterproof Submersible Electric wire cable (preferably round) for electricity supply and leak proof wiring in four field based heat tents	Round 3 core Size >6 to < 14 sq mm Voltage= ≥ 100 V	200 m	For electricity for electricity supply and leak proof wiring in four field based heat tents

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

II. Environmental Sensors equipped with Logger for Filed 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) *Canopytemperature:* 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 bethe intrinsic features of the facility.

(ix) Additional sensors to measureplant surface temperature, soil moisture, soil temperature and soil conductivitywith 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 though wi-fi.

S. No.	Item	Detailed specification	Number of units required	Remark/Justification
1.	Environmental Sensors equipped with Logger for Filed Phenotyping Study	**Key specifications:** 1. Sensor & Logger should be portable, light weight and suitable to install in any weather conditions and can be easily re-install at any sight. 2. System should have Inbuilt battery for run the instrument for ≥6 months 3. Should have four independentlogger units withdefault Air Temp. & RH Sensors and compatible to accommodate ≥ 12 additional sensorsfor Soil Temperature, Soil moisture, UV Light, Quantum/PAR, CO_2, Leaf Temp.). At a time,each Data-logger hub should have option to connect at least 4 sensors or higher would be preferred. 4. Each data-Logger should have non-wired (Wireless/GSM/GPRS/any) communication to transmit the data till 500m or higher distance. 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 (> 6-month life), Connect minimum 4 sensors or higher **Specification of individual Sensors attached to system:** 6. Air Temp. & RH (total 4Qty.): Air Temp. range and accuracy: 0 to 100°C, ±0.5°C RH Sensors range and accuracy: 0 to 100% RH, ±3% RH 7. Soil Temperature range and accuracy (total 3 Qty.): 0 to 100°C, ±0.5°C 8. Soil moisture range and accuracy (total 3 Qty.): 0-50%(Saturation), ±3% 9. UV Light range and accuracy (1 Qty.): 0 to 200 µmol $m^{-2}s^{-1}$, ±5% 10. Quantum/PAR range and accuracy (2	This system should be able to work as **one** unit	All the sensors and data loggers would record crop phenotyping data and environmental parameters from the micro-climate of heat tents.

		Qty.): 0 to 3000 µmol $m^{-2}s^{-1}$, ±5% 11. CO_2 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		

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