Sub: Finalization of specification for establishment of protected cultivation structure under HADP Project No. 17 "Sensor Based Smart Agriculture".

As per the DPR of HADP Project No 17 "Sensor Based Smart Agriculture" a protected cultivation structures is to be established. The project team met on 08.08.2024 at 10:30 AM and finalized the following broad specification of the structure:

Hi-Tech Polyhouse
Area = 560 Sqm (approx.) (Centre height: 5.5 m, Side height: 3.5 m, Design/ Shape: Gothic/ Even span)

S.No.	Description of Material/ Work	Qty	Tentative Cost
A.	**Construction of Hi-tech Polyhouse**		
1.	**Structure**: Galvanized steel is used of 2mm thickness, pipe sections to be used for different structural member hot galvanized rectangular tube. Distance between pillars on lateral line: 2m distance between pillars on central line: 4m **Pillar**: 60mm x 60mm/ 70x50mm **Arc**: 48mm x 48mm x 2mm thickness **Trusses tie/ bracing:** 32mm. **Horizontal Bar:** 42mm x 2mm thickness.	Complete set	**25 lakh**
2.	**Pre-Entry Room & Doors:** Ante Room/ Vestibule: The chamber will have a specific pre-Entry Room of size-3m. X 2.0m. (L x W), made by 6mm polycarbonate sheet and galvanized tubular frame	Two Nos.	
3.	**Gutter:** 1.6mm thick, galvanized steel plate at both sides & centre with drainpipe line for water drain.	Complete set	
4.	**Bolts and Nuts**: Galvanized bolts and nuts, includes all the elements required for joining and fixing (such as fittings, clamps, screws and nuts plated against corrosion).	Complete set	
5.	**Cladding:** Cladding of Roof/Top, Front & Back Polycarbonate sheet 08 mm thick multiwall UV stabilized material	One set	
6.	**Doors:** 1.0x 2m single door complete with polycarbonate sheet glazing & Installation hardware. Qty 2	One set	
7.	**Evaporative Cooling System:** 1.5m height evaporative Cellulose 4" thick Cooling pad complete with all necessary framing material of required supporting distribution & returning piping, gutters down Drilled PVC Piping Pre-filter made of frame with 40 mesh Insect net. Water distributor profile Pad side frame – anodized extrusion. Cellulose distributor Cooling Media 100mm thick CELDEC 7090/500 etc. Water Storage Tank:- Cemented underground tank 1000 Ltr. Pump: capacity as per required (1.5HP) Slow Speed Axial Fan 54" single speed belt driven exhaust fan 1hp, 415V, 50 cycles, 3 phase) Qty.04	One set complete	
8.	**Environmental Control System:** To monitor and control temperature and humidity. It maintains chamber climate by optimum controlling of chamber equipment's like Cooling fan, heater etc. **Temperature Controller:** to control cooling (Fan & Pad) and heating Temp. Range: 0.1 to 99.9^{o}C. Accuracy: + 1^{o}C Hysteresis: 0.4^{o}C Sensor PT-100 **Humidity Control**: To control fogging system Control Type: ON/OFF Range: 50% to 90% RH: +2% + 1digit (at 45%)	One set complete	

9.	**Air Circulator:** air circulation fans hanging type	4Nos	
10.	**Heating Device:** 06 No. heat convectors with fan blower of standard design 2.4 Kw each to increase the temperature during winter season.	complete	
11.	**Misting System:** To increase the humidity up-to 80% ± 5% by providing fogging Nozzles hanging type (2.5 x 2.0m), with fin discharge (28-30 lh) at 4bar pressure, with pump 1.5 HP, Disc filter etc. complete **Drip Irrigation System:** Water Discharge: Inline dripper 2 LH each nozzles, Spacing L/L- 0.5m N/N- 0.5m, Fertigation ventury **Disc Filter, Pump**: 1.5 HP.	complete	
12.	**Internal Screen:** Aluminium thermal screen: specially designed for heat retention inside the chamber Mechanism 50:50 white shade net supported by polyester wire with high scuff strength for smooth operation and durability	complete	
13.	**Side ventilation:** Manual Roll-up poly film 200-micron UV stabilized open able up to 3 m. In height (open from up to down) on both sides 40 mesh nylon insect-screen (UV stabilized) to be fixed inside the curtain on sides.	complete	
14.	**Benching System:** 10' x 4' x 2' made of G.I. Square pipe 25 x 25mm Top with G.I. Jaali 30cm x 30cm	16 Nos.	
15.	**Civil Work** **Foundation wall:** 1' below earth's surface. 1' above earth's surface, 8-9" wide, **Foundation base block**: 80-85cm x 30 x 30cm each Cement concrete 1:2:4 below GL **Pathway:** 1 m wide Inside of wall side chamber made by PCC (1:6:8)75 mm thick then over that CC (1:2:4) 50 mm thick with dully plastered complete set **Floor:** Covered with 110 GSM ground cover (Weed Mat)	complete	
16.	**Painting:** Painting of walls with 2 or more coat of cement paint of approved colour/ shade	complete	
B.	**Specifications for Polyhouse Automation System**		
1.	**Overview** The polyhouse automation system is designed to enhance agricultural productivity by automating and controlling key environmental parameters using PLCs (Programmable Logic Controllers) and remote SIM-based systems. The system integrates fans, heaters, drip irrigation, and humidifiers, ensuring optimal conditions for plant growth. The control and monitoring can be performed locally via an interactive HMI (Human-Machine Interface) and remotely via and online platform. **System Components**		**15 Lakh**
2.	**2.1 PLC Control System** **a) Brand:** Delta/Schneider or equivalent **b) Functionality:** Centalized control and automation of fans, heaters, drip irrigation, and humidifiers. **c) Features:** i. Real-time control and monitoring ii. Data logging and historical data analysis iii. Fail-safe mechanisms and alarms iv. Scalability for future expansion **2.2 SIM-Based Remote Operating System** **a) Functionality:** Remote monitoring and control of polyhouse environmental parameters. **b) Features:** i. SIM-based connectivity for remote access ii. Secure communication protocols iii. Mobile and web application support **iv.** Real-time alerts and notifications **2.3 Interactive HMI** **a) Brand:** Delta/Schneider or equivalent **b) Functionality:** Local operation and monitoring interface **c) Features:** i. Touchscreen interface ii. User-friendly graphical displays		

iii. Customizable control panels
iv. Integration with PLC for real-time updates

Detailed Specifications

3.

3.1 Fans

a) **Control:** Variable speed control via PLC
b) Operation: Automated based on temperature and humidity sensors
c) Monitoring: Temperature and heater status on HMI and online system

3.2 Heaters

a) Control: Temperature-based control via PLC
b) Operation: Automated activation/deactivation to maintain optimal temperature
c) Monitoring: Temperature readings and heater status on HMI and online system

3.3 Drip Irrigation

a) Control: Time based control via PLC

3.4 Humidifiers

a) Control: Humidity-based control via PLC
b) Operation: Automated to maintain desired humidity levels
c) Monitoring: Humidity levels and humidifier status on HMI and online system

Monitoring and Control Parameters

4.

4.1 Temperature

a) Sensors: High-accuracy digital temperature sensors
b) Monitoring: Real-time humidity levels on HMI and online system
c) **Control:** Automated control of fans and heaters based on temperature thresholds

4.2 Humidity

a) Sensors: Precision humidity sensors
b) Monitoring: Real-time humidity levels on HMI and online system
c) Control: Automated control of humidifiers and fans based on humidity thresholds

Integration and Connectivity

5.

5.1 Local Integration

a) Connectivity: Wired connection between PLC and HMI
b) Integration: Seamless data exchange between sensors, PLC, and HMI

5.2 Remote Integration

a) Connectivity: SIM-based remote access
b) Integration: Secure remote connection to PLC for control and monitoring
c) Access: Mobile and web applications for remote operation

User Interface

6.

6.1 HMI Interface

a) Design: Intuitive and user-friendly
b) Functionality: Real-time monitoring, control, and data visualization

6.2 Online Interface

a) Design: Responsive web and mobile interface
b) Funcionality: Remote monitoring, control, alerts and data analysis
c) Customization: User-defined alerts and notifications

Safety and Security

7.

a) Data Security: Encrypted communications for remote operations
b) Safety Protocols: Automated shut-down procedures in case of failures
c) Access Control: User authentication for both local and remote access

8.	**<u>Installation and Maintenance</u>** **a) Installation:** Professional installation and setup by qualified technicians **b) Maintenance:** Regular maintenance schedules and remote diagnostics **c) Support:** Technical support and online		
	Total		**40 Lakh**