F.No. 70-1/P&S/2016(3)                               Dated : 21-10-2016
To

Subject:  Limited Tender Enquiry for Fabrication of different components and machines for establishment of 'Makhana Processing Pilot Plant' of capacity 100 kg/h (based on raw seeds)-reg.

Sir,

For and on behalf of the Secretary, ICAR, the Director, CIPHET invites sealed limited tenders /quotations under Two Bid System (Technical and Commercial Bid) for Fabrication of different components and machines for establishment of 'Makhana Processing Pilot Plant' of capacity 100 kg/h (based on raw seeds)-reg. as detailed in this schedule to tender. The cover containing tender should be superscribed as "Limited Tender for Fabrication of different components and machines for establishment of ‘Makhana Processing Pilot Plant’ of capacity 100 kg/h (based on raw seeds)-reg.

Last Date of the Receipt of the Limited Tenders is 21.10.2016 upto 1.00 PM
Date of Opening of Limited Tenders is 10.11.2016 at 2.30 PM onwards at CIPHET Committee Room

Tender received after prescribed date will not be considered.

Tender shall satisfy the following conditions:

1. The rates quoted shall be valid for minimum a period of 90 days from the last date fixed for the receipt of Tender.
2. The rates quoted shall be for free delivery and installation at CIPHET, Ludhiana – 141 004.
3. Full specifications of the article quoted for shall be given in the Tender along with literature/pamplet/drawing etc.
4. If taxes, duties or any other charges over and above the rates quoted Leviable, actual percentage of such taxes/duties/other charges should be clearly indicated.
5. Supply is to be made by any convenient mode of transport at supplier’s risk unless otherwise specified.
6. In case the material is supplied through an authorized agent, manufacturer shall be responsible for the successful installation of the equipment. The manufacturer shall be liable to any penal action for the shortcomings of the authorized agent. Any payment that is to be made separately to the agent if any shall be clearly mentioned in the Tender.
7. Tender must be accompanied with EMD/Bid Security @ 2% of the estimated value of the equipment/item, in the shape of Demand Draft drawn in favour of ICAR Unit-CIPHET, Ludhiana. Tenders received without the required EMD will be rejected without any communication to Bidder. The Bidder should write the Name of the Firm & the Name of the Equipment against which the E.M.D is being submitted clearly at the Back side of the Draft.
8. The EMD shall be refunded to the unsuccessful bidders after finalization of the Tender.
9. One year warranty has to be invariable provided by the firm.
10. Payment will be made by mode of e-payment to the supplier/firm after satisfactory completion of work and receipt of pre-receipt bills in triplicate.
11. Sealed Tender should be put in the “Tender Box” in the office of SAO, Room No. 10, CIPHET, PO: PAU, Ludhiana or sent through registered post/speed post/courier.

12. TIN/VAT/PAN/C.S.T. Nos may be given on the Tender and copy of relevant proofs should be enclosed with tender.

13. The terms & conditions, period of warranty, A.M.C and time required for supply/installation should be mentioned clearly.

14. The details regarding the infrastructures facilities to provide service support and the list of clients should be furnished. All the relevant broachers in printed form with full details of the equipment should be enclosed.

15. In the event of material supplied not in conformity with the same standard and specification furnished in the Tender, the items/material supplied is liable to be rejected and returned to the supplier at their cost.

16. The Director, CIPHET, Ludhiana does not bind himself to accept the lowest Tender or any other Tender and reserves the right to cancel any Tender or all Tender without any notice. The decision of the Director, CIPHET, Ludhiana is final.

17. The firms must be capable to supply the items within 60 days of the date of issue of supply order beyond which penalty will be imposed for delay in supply @ 0.5% per week subject to maximum of 10% of the value of Consignment. However, the Institute reserves the right to either further extend or cancel the contract after expiry of delivery date and recover the liquidated damages from the dues of the firm by legal means.

18. The firm must have trade registration certificate.

19. The tender from principal firm and authorized agent/dealer will not be accepted together.

20. The packing and preservation of the supplied goods shall be airworthy/seaworthy / roadworthy (as the case may be) so that they may provide their safety during transit period. The seller shall guarantee that the packing is strong enough to withstand the safety of the goods during transport. The packing should satisfy the security seal in the clearing warehouse and shall carry the fragile or other markings as required.

21. The dispute arising out of this contract shall be subject to the jurisdiction of Indian laws & court at Ludhiana. Sole arbitrator is appointed by the Secretary, ICAR, New Delhi. His decision will be final and binding to both parties (Supplier and Purchaser).

22. The technical & financial bids are to be prepared and placed in different sealed envelopes. The envelopes should then be placed in one single envelop. The envelope shall be addressed to the Director, CIPHET, Ludhiana and it should also bear the tender enquiry number and the words “Fabrication of different components and machines for establishment of 'Makhana Processing Pilot Plant' of capacity 100 kg/h (based on raw seeds)-reg.”. Do not open before 10.11.2016 at 2:30 PM. This envelope should then be put inside another envelope, which will also be duly sealed. The outer envelope will bear the full address of the purchaser.

The supplier must ensure that its tender, duly sealed as above, reached the purchaser on or before 10.11.2016 at 1:00 PM. The supplier may, at its choice, send the tender by registered post, speed post. However, CIPHET will not be responsible for any postal delay. Alternatively, the supplier may also hand deliver the tender into the tender box available in the office of the institute.

23. Unsealed tender or having overwriting and cutting without proper attestation and signature will not be considered.

24. In case of equipments technical and financial bids are to be prepared and placed on different sealed envelopes. The envelopes should then be placed in one single envelop and submitted.

25. Tender not complying with the above conditions are liable to be rejected.

Other Important Terms and Conditions

1. The design is liable to change at any time during the fabrication work. The change in design will be done on the basis of actual performance during testing and before final prototype completion. No additional amount will be paid for any such design change.

2. Progress of the fabrication will be monitored weekly by any member of project team. The manufacturer will allow testing of the units during fabrication for improvement in performance of machines. However, TA/DA of the project team member will be paid by ICAR-CIPHET, Ludhiana.

3. Raw material for testing of machines during fabrication will be provided by ICAR-CIPHET, Ludhiana while raw material for final trial of machine after completion of fabrication will be provided by the manufacturer.

4. Installation and commissioning of the systems will be done by the manufacturer at ICAR-CIPHET, Ludhiana without any extra charge.
5. In case there is any change required in the complete system after installation, the manufacturer will incorporate that change within one year of installation without any extra charge. No TA/DA will also be paid to employees of manufacturer for any such visit(s).

6. The manufacturer will sign a confidentiality agreement with ICAR-CIPHET, Ludhiana about the fabrication of system.

7. Any query about this fabrication you are free to contract with Dr. R.K. Vishwakarma, Sr. Scientist ICAR-CIPHET, Ludhiana in the office working day.

**Technical Specification of the equipment is enclosed:**

(B. Katoch)

I/c Sr. Administrative Officer

**Copy to:**

1. I/c AKMU, CIPHET, Ludhiana with the request to upload on institute website.
2. CPPP website.
Specifications for fabrication of different components and machines for establishment of ‘Makhana Processing Pilot Plant’ of capacity 100 kg/h (based on raw seeds)

The complete pilot plant comprises following machines and systems:
1. Raw makhana seed washer
2. Makhana seed grader
3. Makhana seed dryer
4. Seeds roasting machine for initial roasting of makhana
5. Roasting and popping machine (Available with ICAR-CIPHET, Ludhiana)
6. Popped makhana grader
7. Un-popped makhana grinder
8. Control panel for the pilot plant

All pilot plant components (except roasting and popping machine (S. No. 5)) has to be fabricated for this pilot plant. Detailed specifications and drawings of the machines for fabrication are given below.

1. **Raw makhana seed washer**

   **Purpose:** This machine will be used for washing and cleaning of raw makhana seeds taken from ponds. Seed membrane, snails, dead fish pieces, mud, stones, and other impurities will be removed by this machine.

   **Specifications:** It will be a batch type drum type of machine coupled with rotating brushes/emery inside the drum. The feed opening will be at the top of the machine on one side whereas the discharge gate will be on the other side of the machine at bottom side. The drum will be made of heavy duty perforated sheet metal. The brush assembly will rotate inside the drum placed on a central shaft. Four brushes will be fitted on the shaft. The brushes will be placed throughout the length of drum. Complete assembly will be covered with another mild steel drum in which a slope will be provided at the bottom for discharge of foreign matter and water.

   Alternative of this system comprises emery discs of 300 mm diameter and 50 mm thickness placed at 30 mm distance. Altogether 8 emery discs will be placed in a housing of perforated cylindrical concave. Clearance between emery disc and concave will be 25 mm. The other arrangements will remain similar as given above.

   Pressure water jet system will be placed in the machine. Array of GI pipes having holes will be placed above the perforated drum for sprinkling water so that foreign matter can be separated from the seeds.

   The machine will be fitted on a sturdy mild steel frame. The power transmission system should be well protected with guards and safety devices. Option for manual operation should also be made in the power transmission system.

   **Technical Specifications:**
   - Overall size: 2000mm × 1500mm × 1000 mm (L×W×H)
   - Electric load: 1.5 kW, 3 phase motor
   - Construction material: mild steel, galvanized iron, EN-8 etc.
   - Line diagram of the machine: Figure 1.

2. **Makhana seed grader**

   **Purpose:** This machine will be used for grading seeds on the basis of seed size. Seeds have to be graded into 7 sizes (3-5 mm; 5-7 mm; 7-9 mm; 9-11 mm; 11-13 mm; 13-15 mm, and >15 mm).

   **Specifications:** It will be a continuous reel type of grading machine. The machine will consists of a feed hopper (20-25 kg capacity) with a continuous feed control device, set of seven cylindrical screens, seed collection boxes along with discharge chute and bag holders, brushes to prevent clogging of perforations, drive mechanism, mechanism for changing the
inclination of reel assembly, and covers with inspection windows. The feed hopper will be at
the top of the machine on one side whereas the 7 collection boxes will be placed below each
screen. Eighth collection box will be placed at the other end of the reel to collect the oversize
foreign matter. Discharge gate will be on the other side of the machine at bottom side.
This grader will be fabricated into two pieces of reels placed alongside and each piece will be
2760 mm long. First the reel will be fitted with feed hopper whereas overflow from first reel
will be fed to the second reel. The first reel will be fabricated from the perforated sheets of 5
mm, 7 mm, and 9 mm diameter. Each screen of first reel will be 920 mm long and 500 mm in
diameter. Second reel will be fabricated from the perforated sheets of 11 mm, 13 mm, 15 mm
and 22 mm diameter. First screen (11 mm diameter) of the second reel will be 860 mm long,
second screen (13 mm diameter) of 800 mm length, third screen (15 mm diameter) of 600
mm length and fourth screen (22 mm diameter) will be 550 mm long whereas diameter of
each screen will be 500 mm.
Provision for changing the rotational speed of the reels should be made and each reel will
rotate at same speed.
To prevent clogging of screens, nylon brushes should be fixed on one side of every screen.
The machine will be fitted on a sturdy mild steel frame. The power transmission system
should be well protected with guards and safety devices. The machine should be covered
from top with mild steel cover with separate inspection window for every screen.
**Technical Specifications:**
- Capacity: 100 kg/h
- Overall size: 3000mm × 2000mm × 1500 mm (L×W×H)
- Electric load: 1.5 kW, 3 phase motor
- Construction material: mild steel, acrylic sheet, EN-8 etc.
- Line diagram of the machine: Figure 2.

3. Makhana seed dryer

**Purpose:** The machine will be fabricated for drying of graded raw makhana seeds from 35-
40% moisture content (wet basis) to 28-30% moisture content. Time and temperature
combinations will also be optimized for different grades of seeds.

**Specifications:** This machine will be a batch type hot air cabinet dryer for drying raw
makhana seeds in thin layer (50 mm bed thickness in each tray). The machine will consists of
an insulated chamber, 16-20 trays, slots for loading the trays, direct contact air heaters (15
kW), blower, air inlet and exhaust, air volume control gate, PID temperature controller-cum-
indicator, and heavy duty door to load and unload trays. The trays will be fabricated from
18/20 gauge GI or aluminium sheets with reinforcement at the borders. Each tray will have a
capacity to hold 8-10 kg raw makhana seeds and height of the tray must be 70 mm. The
blower should circulate the hot air throughout the chamber uniformly. Heaters may be placed
at the back side of the chamber whereas the chamber must be closed from five sides with
provision of door on one side. Temperature of air will be controlled by high quality PID
temperature controller-cum-indicator. The operating air temperature range will be from
ambient to 150°C. Provision for air entry to the heaters should be from outside whereas the
exhaust gate may be placed on the top side of the chamber. The drying chamber should be
made of mild steel (heavy duty structure), to provide machine long life and steadiness. Lining
of SS/aluminium may be placed inside the chamber. The machine should be powder coated
from all sides (internal as well as external surfaces (except SS, GI or aluminium fabrications).

**Technical Specifications:**
- Capacity: 120-150 kg/batch
- Overall size: 1200mm × 1200mm × 1500 mm (L×W×H)
- Electric load: 15 kW
- Construction material: mild steel, GI/SS/aluminium
- Line diagram of the machine: Figure 3.
4. Seeds roasting machine for initial roasting of makhana

**Purpose:** This machine will be used for initial roasting of raw makhana seeds. During this roasting process, the starch present in the seed is gelatinized and protein is denatured. This is the most important step of popped makhana production process and even a slight change in processing conditions affect the end product quality.

**Specifications:** This machine will be an indirect contact heating and batch type of system. Dried (28-30% moisture content) and graded makhana seeds will be roasted in this machine. The machine will be thermic oil based indirect heating system (similar to the heating system developed by ICAR-CIPHET, Ludhiana for second roasting of makhana for popping having different dimensions, without screw conveyor, and batch kind of feeding mechanism). The system will consist of a double wall cylindrical chamber. Thermic oil will be filled between the walls, which will be heated using thermic heaters. The thermic heaters will be placed in separate thick wall hollow cylindrical pipes and the pipe will be connected to the thermic oil cylinder through to pipes for oil circulation to maintain the temperature. Different arrangement of the thermic heaters may also be made such sump for oil heating and circulation through pump.

Capacity of the inner cylindrical vessel will be 50 kg (based on raw makhana seed) and in one batch at least 25 kg seed may be placed. A mixer will be placed in the inner cylinder to mix the material uniformly during the heating process. It may be a screw type agitator or flap type of rotating arms mounted on a centrally placed shaft.

This machine will be equipped with digital temperature controller cum indicator and working temperature will be 150-260°C and therefore the thermic oil to be used will have working temperature above 300°C. A timer will also be attached with the machine to control roasting time accurately. Provision for escape of vapour generated during roasting will be made or the feed end may also be used as escape gate for vapours. An exit gate will also be provided at the other end of the machine. Provision for tilting the cylindrical vessel (using hydraulic system) will be made for emptying the vessel after completion of roasting. A small opening should also be made in the vessel to take samples for inspection to verify whether roasting is completed.

The cylindrical chamber of the machine will be insulated from outside to reduce heat loss. The cylindrical vessel assembly should be covered properly for the safety of operator. All the moving parts will be well protected and electronic devices and controls will be placed on a separate panel to operate the system.

**Technical Specifications:**
- Capacity: 50 kg/batch (working capacity 25 kg)
- Overall size: 2000mm × 1200mm × 1350 mm (L×W×H)
- Electric load: 15 kW
- Construction material: mild steel, GI, thermic oil, thermic heaters, electronic control devices, hydraulic system etc.
- Line diagram of the machine: Figure 4.

5. Roasting and popping machine (Available with ICAR-CIPHET, Ludhiana)

This machine is available with ICAR-CIPHET, Ludhiana. Therefore this machine will be used in the line and fabrication of this machine will not be done. Slight changes may be required in this machine to fit into the processing line.

6. Popped makhana grader

**Purpose:** This machine will be used for separation of husk, unpopped whole seeds, unpopped decorticated kernels, partially popped makhana and popped makhana.

**Specifications:** It will be a continuous reel type of grading machine. The machine will consists of a feed hopper (20-25 kg capacity) with feed control device, set of four cylindrical screens, collection boxes along with discharge chute and bag holders, brushes to prevent
clogging of perforations, drive mechanism, mechanism for changing the inclination of reel assembly, and covers with inspection windows. The feed hopper will be at the top of the machine on one side whereas the 3 collection boxes will be placed below each screen. Fourth collection box will be placed at the other end of the reel to collect the grade-I makhana. This grader will be fabricated into one piece of reel of 2000 mm long. The reel will be fabricated from the perforated food grade stainless steel sheets of 5 mm slotted screen, 15 mm, 20 mm and 30 mm diameter round opening sieves. Each screen of first reel will be 500 mm long and 400 mm in diameter. Provision for changing the rotational speed of the reels should be made.

To prevent clogging of screens, nylon brushes should be fixed on one side of screen. The machine will be fitted on a sturdy mild steel frame. The power transmission system should be well protected with guards and safety devices. The machine should be covered from top with mild steel cover with separate inspection window for every screen.

Alternate of this machine may be air column based separation system. It will consists of an air column, feeding system, settling chamber, conveyor for removing settled material, aspirator, duct, and collectors.

**Technical Specifications:**
- Capacity: 100 kg/h
- Overall size: 2500mm × 1000mm × 1500 mm (L×W×H)
- Electric load: 1.5 kW, 3 phase motor
- Construction material: food grade SS, mild steel, acrylic sheet, EN-8 etc.

7. Un-popped makhana grinder

**Purpose:** This machine will be used for fine grinding of unpopped makhana kernels to produce the makhana flour. This flour will be used for preparation of value added products.

**Specifications:** It will be essentially a swinging arm type hammer mill of small capacity (20-30 kg/h). The hammers will be made from SS alloy whereas the chamber of the mill will also be lined with SS material. Set of screens will be required to produce the flour of different particle sizes. The feed hopper will be at the top of the machine whereas the discharge gate will be at the bottom of the machine.

The power transmission system should be well protected with guards and safety devices. The machine should be covered from top with mild steel/cast iron cover.

**Technical Specifications:**
- Capacity: 20-30 kg/h
- Overall size: 800mm × 800mm × 1200 mm (L×W×H)
- Electric load: 2 kW, 3 phase motor
- Construction material: food grade SS, mild steel, cast iron, EN-8 etc.

8. Control panel for the pilot plant

**Purpose:** This panel will control the operation of complete pilot plant from one place. Individual machines or complete plant can be operated at a time from one place.

**Specifications:** It will be a electronic and electrical based control panel. The power supply will be regulated from the panel. Each machine will be connected with the panel separately. It will consist of main switch, power break system, indicators, control/ on-off switches, main supply connection, safety devices etc. Separate indicators will be required for each machine.

**Technical Specifications:**
- Capacity: 40 kW load bearing capacity
- Overall size: 500mm × 500mm × 1500 mm (L×W×H)
- Construction material: powder coated mild steel box, electrical and electronic control and indicating devices, etc.
Figure 1: Raw Makhana Seed Washer

- Feed hopper
- Outer cover
- Perforated cylinder
- Water spray line
- Agitator
- Water pump
- Discharge outlet
- Belt drive
- Electric motor
- Agitator
G1, G2, . . ., G8 – Grade-1, Grade-2, etc.

1 – Hopper; 2 – Outer cover; 3 – Grading screen; 4 – Electric motor.
Figure 3: Makhana Seed Cabinet Dryer
Figure 4: Makhana Seed First Roasting Machine