

EXPRESSION OF INTEREST for TRANSFER OF TECHNOLOGY

“GrainEx System”

An Artificial Intelligence (AI) based Expert Solution for Quality Analysis of Multiple Crops



Issued by

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1. Introduction

Centre for Development of Advanced Computing (C-DAC), Kolkata in collaboration with ICAR IARI PUSA, New Delhi has developed a product, namely, “GrainEx – An Artificial Intelligence (AI) based Expert Solution for Quality Analysis of Multiple Crops”. C-DAC, Kolkata has designed and developed the hardware setup alongside crafting the AI-based image analysis solution for the quality analysis of multiple crops. Whereas, ICAR IARI Pusa has contributed domain expertise regarding crop quality parameters, providing crop samples, and validation of the solutions developed by C-DAC, Kolkata.

Centre for Development of Advanced Computing (C-DAC) invites “**Expression of Interest**” (EOI) from Indian companies for transfer of technology (ToT) from C-DAC to manufacture, market, sell and deploy **GrainEx system**, An Artificial Intelligence (AI) based Expert Solution for Quality Analysis of Multiple Crops.

This document gives details about

- The product
- The terms and conditions for companies to propose their Expression of Interest (EOI) and
- How to enter into Transfer of Technology (ToT) agreement based on the terms given herein.

2. Brief about C-DAC

Centre for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Ministry of Electronics & Information Technology (MeitY), Government of India for carrying out R&D in IT, Electronics and associated areas. Different areas of C-DAC, had originated at different times, many of which came out as a result of the identification of opportunities.

C-DAC is working on strengthening national technological capabilities in the context of global developments in the field and responding to change in the market needs in selected foundation areas. In that process, C-DAC represents a unique facet working in close junction with MeitY to realize the nation’s policy and pragmatic interventions and initiatives in electronics and information technology. As an institution for high-end Research and Development (R&D), C-DAC has been at the forefront of the Information Technology (IT) revolution, constantly building capacities in emerging/enabling technologies and innovating and leveraging its expertise, caliber, skill sets to develop and deploy IT products and solutions for different sectors of the economy, as per the mandate of its parent, the Ministry of Electronics and Information Technology (MeitY), Government of India and other stakeholders including other funding agencies, collaborators, users and the market-place.

C-DAC, Kolkata is one of the 12 Centres of C-DAC in India and situated at most privileged and strategic location at Kolkata, India for pursuing R&D activities in the area of electronics & IT.

C-DAC Kolkata’s laboratory infrastructure and manpower have got unique strength of pursuing R&D activities in the fields blended with electronics & sensing system, machine vision and image processing, advanced instrumentation, soft computing and software development.

3. Brief about ICAR-IARI

The ICAR-Indian Agricultural Research Institute is the premier agricultural institute and is the seat of the Indian green revolution. Since its establishment in 1905, it has served the cause of science and society with distinction through cutting edge research, generation of appropriate technologies and development of human resources. The mandate of the institute is conducting basic, strategic and anticipatory research in field and horticultural crops for enhanced productivity and quality; research in frontier areas to develop resource use efficient integrated crop management technologies for the sustainable agricultural production system and to serve as a centre for academic excellence in the areas of higher education and human resources development in agricultural science and allied fields. The institute also provides national leadership in agricultural research, education, extension and technology assessment and transfer by developing new concepts and approaches and serving as a national reference point for quality and standards.

4. Brief description about the technology to be transferred

GrainEx- An Artificial Intelligence (AI) based Expert Solution for Quality Analysis of Multiple Crops.

GrainEx represents an innovative approach to appearance-based quality analysis across various crops. This conveyerized machine vision system offers a reliable and objective means of evaluating the quality of diverse crops such as Tur (Arhar Whole), Moong (Whole), Masoor (Whole), Bengal gram, Sorghum and Wheat. The single hardware platform and crop-specific software are the unique features of the developed solution. By examining images of samples captured under controlled conditions with an overhead scanner while passing on a conveyor belt, GrainEx facilitates rapid and accurate assessment of crop quality parameters like immature, damage, foreign matter, good and provides output in percentage of equivalent weight.

System Setup: The GrainEx system is a conveyerized setup consisting of essential components such as a hopper equipped with an automated sample spreader, a conveyor belt, and electro-mechanical mechanisms for controlling conveyor speed. A computer, linked to the conveyor via a USB cable through a data Acquisition module, governs conveyor operations. To avoid redundant frame analysis, the conveyor belt is segmented into four distinct frames using colored rubber strips. Adjacent to the conveyor belt, a proximity sensor senses the position of the strip and initiates and halts conveyor movement at the optimal positions for image capture.

Enclosed within a cabinet to mitigate external interference, the scanner captures high resolution images of the grain samples. The GrainEx software, installed on the computer, manages the conveyor system's operation. This software orchestrates the conveyor's start and stop actions by sensing the signal from the proximity sensor, captures images of the grains passing through the conveyor belt, and conducts grain analysis, generating percentages for various quality attributes. This process iterates continuously until the user triggers the "Stop" command.

Utilizing a user-friendly graphical interface (GUI), the software presents comprehensive reports of analyzed samples, allowing users to access real-time results or retrieve reports from past analyses with ease.

4.1. Product Specification and features

4.1.1. Major Features

- Image analysis technology
- Grain specific software loaded in a computer
- Table-top Conveyorized operation facilitates the handling of reasonable volume of sample
- Single hardware platform and grain specific software
- User-friendly graphical interface for online image capturing, analysis, report generation.
- Analysis report is stored in database for future reference and retrieval
- Graphical display of quality analysis results (e.g. immature %, damage %, foreign matter %, good %) by correlated weight as per Indian standard
- Operated with a computer with Windows ® 10 and above operating system
- Power supply – 220 Volt, 50 Hz AC
- Product dimension (LxWxH): 810 mm X 550 mm X 750 mm



Fig. GrainEx System.

4.1.2. Prospective End Users

- Agriculture Market (APMCs, AMCs)
- Research Laboratories
- Agri/ Food Quality Control Laboratory
- Educational institutes

5. Invitation for Expression of Interest

- a) C-DAC invites “Expression of Interest” (EOI) from Indian Companies in the format given in Annexure-1 (Part A & Part B) and Annexure-II. Companies can become transfer of technology (ToT) partner of C-DAC based on the information furnished in Annexure – I (Part A & Part B) and Annexure-II subject to the assessment by the C-DAC.
- b) This invitation of EOI will be open till 23rd June 2024. Techno-commercial and financial bids received after this closing date will not be considered.
- c) The EOI offers received from the vendors shall be evaluated by C-DAC as per C-DAC ToT rule.
- d) The transfer of technology to selected party / parties will be done in a non-exclusive manner.
- e) C-DAC reserves the right in selecting a single party or multiple parties and the C-DAC decision in this selection process is final.
- f) The selected party / parties need to sign an agreement with C-DAC to be eligible for obtaining this technology.
- g) Participation in this EOI does not guarantee any association with C-DAC, unless the ToT agreement is signed.
- h) The submission of the EOI shall include all such documents specified herein to prove the authenticity of their offer and any claim made therein. All cost and expenses associated with the submission of EOI shall be borne by the bidder while submitting the EOI and C-DAC shall have no liability, in any manner in this regard, or if it decides to terminate the process of short listing for any reason whatsoever.
- i) There is neither a business guarantee nor any commitment for funding support from C-DAC to the selected ToT partner.
- j) C-DAC Kolkata reserves the right to extend the above mentioned bid submission deadline, in which case, all rights and obligations of C-DAC Kolkata and the bidders relevant to the previous bid submission deadline shall remain same for the extended deadline.
- k) C-DAC Kolkata also reserves the right to amend the EOI bid documents already published which would be binding on all the interested bidders. The amendment will be made available on C-DAC’s website, i.e., www.cdac.in , well in advance.
- l) EOI bids that are incomplete in any respect or those that are not consistent with the requirements as specified in this EOI document or those do not adhere to the format given below under Annexure-I (Part-A and Part-B) and/or Annexure-II, may be liable for rejection and no further correspondences will be entertained with such bidders.
- m) During the evaluation process of the submitted EOI bids, C-DAC Kolkata may ask the concerned bidder to provide clarifications, if any, on its submitted EOI bid. The request for clarification from C-DAC Kolkata and the response from the bidder/s shall be in writing. No post-submission of EOI bids and/or clarification/s at the initiative of the bidder shall be entertained.
- n) Bidders of the received EOI bids may be called for making a presentation before C-DAC Kolkata’s ToT Committee for their business plan.
- o) Representative/s of C-DAC Kolkata may visit bidder's premises, with prior information, to inspect and assess their facilities mentioned in their EOI bids.

- p) After the evaluation process of the received Annexure-I (Part A & Part B), C-DAC Kolkata will evaluate the Financial Bids (Annexure-II) of the selected bidders based on Annexure-I.
- q) C-DAC Kolkata reserves the right to reject all or any applications without assigning any reason thereof.
- r) Canvassing in any form would summarily disqualify the bidder.

6. Who can Apply

Any Indian Company or start-up willing to acquire ToT for manufacturing, marketing and selling the 'GrainEx system' can apply.

7. How to Apply

Interested companies may send hardcopy of expression of interest by filling the template as per Annexure – I (Part A & B) and Annexure –II along with supporting documents to

Group Head, AEE Group

Centre for Development of Advanced Computing

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Hardcopies of Annexure-I(Part A & B) and Annexure-II need to be sent in separate sealed envelopes only and marked on top as

“Annexure-I-(Company Profile and Technical Details)-EOI for ToT of GrainEx System”

and

“Annexure-II-(Financial Bid)-EOI for ToT of GrainEx System”

respectively along with the name and address of the bidder.

For any clarifications, may contact to the following emails.

Email: alokesh.ghosh@cdac.in;

Also, mark a copy to the following email ids: amitava.akuli@cdac.in; abhra.pal@cdac.in;

8. ToT Agreement

- a) The ToT partner is selected based on the expression of interest submitted by interested companies.
- b) If selected, the company shall pay onetime ToT subscription fee (Upfront price) plus applicable taxes and sign the ToT agreement to become ToT partner of C-DAC. Onetime ToT subscription fee finalised by C-DAC shall be informed to all the bidders who have participated in the EOI.
- c) C-DAC shall sign the technology transfer agreement with the company on receiving the onetime ToT fee.
- d) The ToT will be granted on Non-Exclusive basis.
- e) The “GrainEx System” technology shall be transferred only after completing the full ToT payment.
- f) The software product activation licence key shall be procured by the ToT partner from C-DAC for each unit manufactured and sold to the client on payment of the royalty charges plus applicable taxes in advance. C-DAC will provide a single-user software licence for 6 crops free of cost along with ToT.
- g) No company will be allowed to quote for “GrainEx System” or participate in the bid for product selling unless he/she enters into an agreement and pays the full ToT fees. The ToT fees are non-refundable. If any party offers/quotes the rates without an agreement with C-DAC, C-DAC will not be responsible for any such event.
- h) ToT will be done as per CDAC ToT guidelines.

9. Validity & Renewal of ToT agreement

- a) Payment of ToT fee grants the partner for manufacturing, marketing and selling “GrainEx System” for a period of **5 years** from the date of signing of the agreement
- b) For continued support beyond **5 years**, the partner shall be required to renew the ToT agreement by paying the renewal charges on mutually agreed-upon terms before the expiry of the valid ToT agreement, which will be valid for a further extended period of **five years**.
- c) If the renewal is initiated after the stipulated period, a fresh ToT agreement needs to be signed by the company based on the EOI conditions prevailing at that time.
- d) If the renewal is initiated before ending the stipulated period (i.e.. five years, from the date of signing the ToT agreement), the ToT agreement will be renewed by C-DAC based on the terms and conditions prevailing at that time.
- e) Any customization requirements of the ToT partner may be entertained by C-DAC only if a valid ToT subscription exists. Such customizations may be undertaken by C-DAC at cost basis on mutually agreed terms and conditions.

10. C-DAC Deliverables

A. After paying the full ToT fees and signing the ToT agreement, C-DAC shall provide the following items to the ToT partner for production and product marketing.

The deliverables will be

- ToT Partnership certificate
- Technical Documentation of the product (e.g. technical specifications, Mechanical drawings, Schematic and PCB design with Gerber files, Manufacturing know-how, etc)
- Bill of Materials and sourcing details
- Test plan and procedure
- User manual
- Training to the technology recipients (upto 3 days training program) at C-DAC, Kolkata.
- Handholding support following ToT (One year after ToT)
- Single user Crop-specific software licence: 6 sets, e.g. Tur (Arhar Whole), Moong (Whole), Masoor (Whole), Bengal gram, Sorghum and Wheat) (Source code of the software will not be provided)

B. Software licence (To be procured separately for each installation)

- The software product activation licence key shall be procured by the ToT partner from C-DAC for each unit manufactured and sold to the client in advance upon payment of the royalty charges plus applicable taxes. Crop-specific software licence (6 sets, e.g. Tur (Arhar Whole), Moong (Whole), Masoor (Whole), Bengal gram, Sorghum and Wheat) (Single user licence for 6 crops has been included in the upfront fees) (Source code of the software will not be provided)
- Optional: One-unit hardware setup as a demonstration module may be available with an additional payment of Rs. 4,50,000/- (excluding GST as applicable), excluding the cost of PC/ Laptop (With one-year warranty against manufacturing defect)

For any queries, please contact:

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Annexure –I

(To be submitted in a separate sealed envelope marked on top as “Annexure-I-(Company Profile and Technical Details)-EOI for ToT of GrainEx System” and the name and address of the bidder)

Annexure –I (Part-A)

Company Profile of the bidder

A.	Company Profile
1.	Name of the Organization: Website:
2.	Name of the Contact Person: Address: Mobile: Landline: Fax: E-Mail:
3.	Year of Incorporation:
4.	Type of Organization a. Public Sector/ Limited/Private Limited/ Partnership/Proprietary/ Society/ Any other b. Whether ‘Foreign Equity Participation (Please give name of foreign equity participant and percentage thereof) c. Names of Directors of the Board/ Proprietors d. Name and address of NRI(s), if any
5.	Category of the firm: Large/Medium/Small scale unit / Others
6.	Address of the Registered Office: (Include Certificate of Registration)
7.	Number of Offices with addresses (Excluding Registered Office): India, Abroad:.....
8.	Certificate of registration as a manufacturing unit
9.	Permanent Account Number
10.	GST Reg. No.
11.	ISO or any equivalent Certification

Annexure – I (Part-B)

Technical Details of the bidder

1.	The organization must be a reputed firm/company/SME/startup/R&D company incorporated in India.
2.	The turnover is to be supported by financial statements of accounts/ Annual reports duly certified by a Chartered accountant/ Balancesheets of last 3 years/ Income tax returns for the last 3 years period.
3.	Company profile, giving details of current activities and management/ personnel structure including evidence of incorporation. The company should be registered and ISO or equivalent certified.
4.	Details of absorption of technology for a product/knowhow that has been taken up on production scale in the past may also be given
5.	The manpower strength (Technical:Mechanical, Electrical, Electronics, Software & NonTechnical etc.) at various levels to be furnished Technical: a. B.E./ B.Tech / M.Tech / PhD b. DIPLOMA c. SKILLED TECHNICIANS d. UNSKILLED
6.	The list of machine tools /equipment/software/facilities available related with work to be furnished.
7.	The in-house technological expertise available to be furnished
8.	The list of equipment available for inspection and quality control to be furnished.
9.	The industry should have adequate space for undertaking this work. Available space - Covered & Open and location details to be furnished.
10.	List of products/technologies worked with as regular activity in last three years. Give the list of products/technologies with general specifications and the customers.
11.	List of PSUs/Govt..customers – with contact details (Address,Telephone no., Contact Person)
12.	The details of sales, marketing and maintenance network to be furnished
13.	The list of technical collaborators for various ongoing products may be furnished
14.	The bidder shall provide details of the sub-vendors in case they propose to employ for Partwork.
C.	Expression of Interest: Spell out the extent of interest and envisaged market potential

I hereby declare that the above information is true to the best of my knowledge.

Signature with Name & Seal:

Place:

Date:

Annexure-II

Financial Bid Format

(To be submitted in a separate sealed envelope marked on top as “Annexure-II-(Financial Bid)-EOI for ToT of GrainEx System” and name and address of the bidder)

Price bid - One Time ToT subscription cost and Royalty

Sl. No.	Product	Company status	ToT cost for 5 years in Rs. (excluding taxes) (Upfront fees)	Royalty per unit selling with software licence for 6 crops (for 5 years) in Rs. (excluding taxes)
1	GrainEx system with 6 crops (e.g. Tur (Arhar Whole), Moong (Whole), Masoor (Whole), Bengal gram, Sorghum and Wheat)			

Additional cost:

I am interested to buy one GrainEx system for demonstration purpose? (YES/ NO)

If YES, an additional cost of Rs. 4,50,000/- (excluding GST as applicable), excluding the cost of PC/ Laptop, needs to be paid to C-DAC, Kolkata at the time of ToT.


I hereby agree with the terms and conditions of ToT by C-DAC and am submitting the financial offer.

Signature with Name & Seal:

Place:

Date:


Annexure – III – PRODUCT BROCHURE



eQuality Electronic Quality Assessment Solution of Agricultural Commodities for eNAM

Developed under the project, titled, "AgriEnics: National Programme on Electronics and ICT Applications in Agriculture and Environment", funded by: Ministry of Electronics and Information Technology (MeitY), Govt. of India.

Nodal Institute: C-DAC Kolkata Collaborating Institute: ICAR-IARI, New Delhi



GrainEx

An Artificial Intelligence (AI) based Expert Solution for Quality Analysis of multiple Crops

Name of Crops:

Tur, Moong, Masoor, Maize, Bengal Gram, Kabuli Chana, White Peas, Urad Whole, Soya Bean, Wheat, Peanut Kernel and Rajma

System Features:

- Bench-top mini conveyerised sample feed system.
- Electronic vision and digital image processing based rapid and non-invasive inspection.
- Computer based real time automated image capturing and analysis solution.
- Overhead scanning device with built-in LED based controlled illumination for image acquisition.
- Automated sample spreading.
- Crop specific feeding mechanism for sample spreading on conveyor.
- Flexible Sample size and Non-invasive image analysis technology.
- Automatically stop the system operation when analysis is over.
- Crop specific software with user friendly graphical interface for online image capturing and analysis.
- Online data presentation, data archival and traceability.
- Report generation, searching printout and email facility.




Table-top GrainEx Conveyorized

Target Beneficiaries:

- Farmers, Traders and Exporters
- APMCs, Mandies and Processing Industries
- Commercial Agriculturists
- Research and Quality Control Laboratories
- Govt. Authorities and Stakeholders of Agri Marketing at all levels

Benefits:

- Meets requirement of crop specific quality standards of FCI, AGMARK etc.
- Useful and appropriate quality data made available to remote users on virtual marketing platform with nationwide outreach.
- Ensure right price of commodities to farmers and shield them from intermediaries.
- Ensure transparency of dealings at all levels of Agri-Marketing.

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2. Dr. Amitava Akuli, Associate Director, C-DAC, Kolkata (Mobile No.: 9830560405)

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