



## ***Grand Challenge on Electronics and ICT driven solution towards fermented food safety in North-Eastern (NE) Food: e-GUNA Grand Challenge (e-GGC)***

**Implemented by:** C-DAC, Kolkata in collaboration with Institute of Bioresources & Sustainable development (IBSD), Imphal, Indian Institute of Technology (IIT), Hyderabad, National Institute of Technology (NIT), Nagaland

**Funded by:** Ministry of Electronics and Information Technology, Government of India

### **Background**

Ministry of Electronics and Information Technology, Government of India (MietY) has sanctioned an R&D project to C-DAC, Kolkata in collaboration with IBSD Imphal, NIT Nagaland, IIT Hyderabad on sensor-based technology development for North Eastern food safety monitoring in general and fermented food quality estimation in particular.

Under this project present Grand Challenge competition has been arranged to encourage innovative minds of India towards sensor development for North Eastern ethnic food safety and quality estimation. In the light of the main topic here some thematic R&D areas have been identified. Intellectual ideas on new areas (must focus on sensor development for North Eastern Food safety) other than the mentioned ones are also encouraged. So hereby call for proposals are being invited on the mentioned areas.

Mentorship, fund, and suitable platform will be provided to qualified individuals or teams to implement innovative, out-of-the-box, cost-effective R&D ideas into a real product.

### **Topic**

Electronics and ICT driven sensory solution towards food safety in North-Eastern Food

### **Thematic R&D area**

1. Novel receptor development for detection of cyanogenic glycosides and pathogenic bacteria **(Except enzyme and nanofiber-based approach)**
2. Sensor development towards potential food contaminants **(Except Cyanogenic glycosides and bacteria).**
3. Sensor development for ethnic foods of NE **(Excluding Bamboo and Soybean)**
4. Any other suitable area on sensor development for North Eastern Food safety

### **Problem statement**

The proposed solutions should focus on:

## 1. Novel receptor development for detection of cyanogenic glycosides and pathogenic bacteria.

- a. Development of the receptor for detection of cyanogenic glycosides and pathogenic bacteria in food products should be focused on novel bio-receptors other than enzymes and nanofibers. The implementing team can explore different other types of receptors including Synthetic receptors like Aptamers, DNA, RNA, DNAzymes and nanozymes, molecularly imprinted polymer, antibodies, and so on.
  - b. The receptors must detect cyanogenic glycosides in food directly or indirectly (by-products of cyanogenic glycoside hydrolysis like HCN/CN<sup>-</sup>, Glucose etc.). A receptor array for the detection of cyanogenic glycoside and bacteria is also encouraged.
  - c. Proper stability analysis must be incorporated in the receptor development process.
  - d. The receptor may provide the provision of incorporation with optical or electrochemical transduction principles.
  - e. The developed receptor may be immobilized effectively onto solid surfaces like 96 well plates, Glassy Carbon electrodes, Screen Printed Electrodes, etc.
  - f. Repeatability, sensitivity, and selectivity analysis should be incorporated in the receptor development process.
  - g. The developed solution should be cost-effective.
- ⊙ **Deliverable: Synthetic bio-receptor or receptor array** excluding enzyme and nanofibers for detection of cyanogenic glycoside and pathogenic bacteria in North Eastern ethnic food in general and fermented food in specific.

## 2. Sensor development towards potential food contaminants

- a. Sensor development towards potential food contaminants should be focused on contaminants other than cyanogenic glycosides and pathogenic bacteria. The implementing team may focus on several harmful chemicals and biological toxicants like heavy metals, fungal pathogens, microbial toxins, allergens, etc.
- b. The development of sensors will be mainly focused on bio-sensors that may include enzymes, Synthetic receptors like Aptamers, DNA, RNA, DNAzymes and nanozymes, molecularly imprinted polymer, antibodies, etc. Nanoparticle and nanofiber-based interventions will also be encouraged.
- c. The sensors may be incorporated with suitable transduction processes like optical, electrochemical, etc. for the sensing system development.
- d. Sensor array for detection of potent food contaminants is also encouraged.
- e. Solid surfaces like 96 well plates, Glassy Carbon electrodes, Screen Printed Electrodes, or suitable transducer may be considered for sensor development purposes.
- f. Repeatability, sensitivity, and selectivity analysis may be incorporated into the sensor development process
- g. Proper stability analysis must be incorporated in the sensor development process.
- h. The developed solution should be cost-effective.

- ⊙ **Deliverable: Biochemical sensor or sensor array** with optical or electrochemical transduction principle for detection of food contaminants like heavy metals, fungal pathogens, microbial toxins, allergens, etc in North Eastern ethnic food in general and fermented food in specific.

### 3. Sensor development for ethnic foods of NE

- a. Sensor development for other ethnic foods of NE must be focused on ethnic foods other than fermented bamboo shoots and fermented soybean products. The implementing team can focus on several other ethnic foods like **fermented** vegetable (gundruk, sinki, anishi), **fermented** cereal and pulse **foods** (Sel roti, Poita bhat), fermented and smoked fish products (ngari, shidal, hentak), preserved meat products, milk beverages (Chhurpii, Mohi, Doi), non-food mixed amylolytic starters, and alcoholic beverages (Atingba, Apong), etc.
- b. The sensors may be developed for the major quality parameter (single analyte) or overall quality estimation that may include several parameters like nutritional content, bacterial load, availability of toxins, acid content, water activity and so on.
- c. Sensor array for detection of overall quality is also encouraged.
- d. The development of sensors will be mainly focused on bio-sensors that may include enzymes, Synthetic receptors like Aptamers, DNA, RNA, DNAzymes and nanozymes, molecularly imprinted polymer, antibodies, etc. Nanoparticle and nanofiber-based interventions will also be encouraged. Moreover, several chemical sensors may be incorporated also.
- e. The sensors may be incorporated with suitable transduction processes like optical, electrochemical, etc. for the sensing system development.
- f. Solid surfaces like 96 well plates, Glassy Carbon electrodes, Screen Printed Electrodes, or suitable transducer may be considered for sensor development purposes.
- g. Repeatability, sensitivity, and selectivity analysis may be incorporated into the sensor development process
- h. Proper stability analysis must be incorporated in the sensor development process.
- i. The developed solution should be cost-effective.

- ⊙ **Deliverable: Biochemical sensor or sensor array** with optical or electrochemical transduction principle towards overall food quality measurement of North Eastern ethnic food products excluding fermented bamboo shoots and fermented soybean products.

### 4. Any other suitable area on sensor development for North Eastern Food safety

Any relevant intellectual R&D proposals on new areas (must focus on sensor development for North Eastern Food safety estimation) other than the mentioned areas are also encouraged.

- ⦿ **Deliverable:** Novel **sensor or sensor array** towards North Eastern Food safety estimation.

### Terms and conditions

- ⦿ **Target audience:** The below mentioned target audiences of Indian nationality are eligible to apply under the call for proposal:
  - Start-ups
  - MSEs
  - Students and Scholars (with affiliation)
  - Any individual/stratup/industry with affiliation and relevant work experience in these fields
- ⦿ **Duration:** Maximum 10 months' timeline for completing the proposed objective.
- ⦿ **Application procedure:** Two-stage evaluations will be made. The brief procedure is as follows:
  1. Concept note (Format attached as '**ANNEXURE I**') submission to ***gcegunacdac@gmail.com***
  2. Evaluation and invitation for presentation.
  3. Request for submission of full proposal with detailed methodology and plan of implementation.
  4. The signing of MoU and project implementation.
- ⦿ **Mentorship:** The funding agency may provide the mentorship of experienced scientists and professors from C-DAC, Kolkata, IBSD, Imphal, NIT, Nagaland, and IIT, Hyderabad. Participants may also propose a qualified panel of expert mentors to guide them in the implementation of the project.
- ⦿ **Publication of Call for Proposal (CFP):** The call for proposal will be published on the official social media accounts of the Organizing project partners C-DAC (Kolkata), IBSD (Imphal), NIT (Nagaland), IIT(Hyderabad).
- ⦿ **Evaluation of Proposals:** The project selection and progress monitoring will be conducted by an Expert Committee.
- ⦿ **Award:** The funding agency will be awarded **three (3) proposals** with **INR 15 lakhs for each project** (Maximum budget/project). The award money will be disbursed to the awardee in the project mode and phase-wise (preferably quarterly basis) on the submission of a satisfactory progress report.



- ⦿ **Budget constraints:** No 'Non-Recurring budget' will be allocated under the project for procurement of any capital instrument or facility creation, any type of civil work. Only 'Recurring budget' will be allowed.
  
- ⦿ **Site of implementation:** The implementing team should work at any national incubation center or national R&D facilities with the approval of the competent authority. The lab usage charges/rent will be supported by the funding agency (as part of the project cost).
  
- ⦿ **Intellectual property rights (IPR) including patent, publications etc.:** IPR will be jointly shared among the organizer project team, Grand Challenge implementing project team, and MeitY.
  
- ⦿ **Reporting:** The implementing team must submit technical updates periodically, once each 15 days.
  
- ⦿ **Completion report:** On completion of the proposed project, the implementing team must submit a detailed Standard operating procedure (SOP), detailed Techniques and Technologies to the funding agency.
  
- ⦿ Final decisions on any occasion will be taken by the selection committee.



## ANNEXURE I

Proforma for submission of Concept note on e-GUNA Grand Challenge (Maximum three pages with Times new roman, 12, single space, A4 pages)

1. Title of the Concept Note:

2. Coordinator/Principal Investigators/Co-investigators:

Name:

Affiliation with legal status:

Address:

Mobil no:

Email:

Expertise (with developed prototype information if any):

3. Background of work including state-of-art information:

4. Objectives:

5. Networking Approach/complementary between the partners (If collaborator available):

6. Methodology (The entire chain right from ideas to product should be clearly defined):

7. Expected output (in quantifiable terms month-wise):

8. Budget & Justification:

Head	Phase wise break up		Total (in Lakh)
	1 <sup>st</sup> phase (0-5 months)	2 <sup>nd</sup> phase (6-10 months)	
Consumables			

Manpower			
Travel			
Contingencies (Including the training, Domain Expertise, Incubation centre rent, consultancy and expenditure at Field trial)			
Overheads (10%)			
<b>Total</b>			
<b>Grand Total</b>			

⊙ **Justification of consumables:**

⊙ **Justification of manpower:**

⊙ **Justification of travel:**

⊙ **Justification of contingencies:**