

REQUEST FOR PROPOSALS

Analysis of protein bioavailability from processed millet- and pulse-based ingredients and plant-based meat products

BUDGET: Up to ₹20,00,000 (inclusive of all taxes and expenses)

Issue date: Mar 13, 2025

Deadline for the submission of proposals: Apr 11, 2025 (no later than 6 PM IST)

Primary contact:

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indiacollab@gfi.org

DESCRIPTION: Through this Request for Proposals (RFP), the Good Food Institute (GFI) India seeks proposals from scientists or faculty members working as regular employees in any Indian academic institution, national laboratory or any other recognised R&D institution in the Science, Technology, Engineering, and Mathematics (STEM) disciplines, to conduct a study on the bioavailability of protein from processed millets and pulse-based ingredients as a function of their degree of secondary processing and defined formats of plant-based meat products after cooking. The findings of this study are expected to provide scientific insights into the effects of processing, composition, and structure on protein bioavailability from plant-based proteins and meat alternatives. Further, inferences from this technical analysis are anticipated to form the basis of strategic recommendations for producing plant-based ingredients and end products with high-quality protein.

The maximum estimated cost for this project is up to ₹20,00,000 (inclusive of all taxes and expenses related to project implementation).

REQUIREMENTS:

The proposals must be emailed to indiacollab@gfi.org by the due date and time specified. No hard copy submissions or late proposals will be accepted. Any information or document, including all Addenda issued by GFI India, will be provided via email by the Primary Contact listed above.

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RFP INSTRUCTIONS

- 1) **PRE-PROPOSAL INFORMATION:** In preparing proposals, Respondents are advised to rely solely upon the contents of this Request for Proposal (RFP) and any written clarifications or Addenda issued by the Primary Contact listed on the cover page of this RFP. If any changes are made to this RFP document by any party other than GFI India, the original RFP document and associated Addenda in GFI India's files shall take precedence.
- 2) **QUESTIONS AND CLARIFICATIONS:** If a Respondent finds a discrepancy, error, or omission in the RFP package or requires any written clarification thereto, the Respondent may notify the Primary Contact listed on the cover of this RFP.
- 3) **MODIFICATIONS/ADDENDA:** Clarifications, modifications, or amendments may be made to this RFP at the sole discretion of GFI India. Any and all Addenda issued by GFI India will be sent via email to those Respondents that submit a proposal in a timely manner. It is the responsibility of the Respondent to obtain the available Addenda and acknowledge them on the Proposal Form of this RFP. Failure to acknowledge Addenda may result in the proposal being deemed non-responsive and rejected without further evaluation.
- 4) **PROPOSAL SUBMISSION:**
 - a) Proposals must be submitted via email to indiacollab@gfi.org on or before the deadline listed on the cover of this RFP (Apr 11, 2025). Late proposals will not be accepted.
 - b) A single PDF file is preferred for submission. However, multiple PDF files are acceptable if a single PDF exceeds the attachment size limits.
 - c) Submission of a proposal establishes a conclusive presumption that the Respondent is thoroughly familiar with this RFP and that the Respondent understands and agrees to abide by the stipulations and requirements contained herein.
 - d) Respondents who have worked with GFI India in the past are not exempt from submitting required documents or meeting other requirements listed in this RFP.
 - e) All costs incurred in preparing and presenting the proposal are the Respondent's sole responsibility. No pre-proposal costs will be reimbursed.
 - f) Proposals must be valid for a minimum of ninety (90) days.
 - g) Proposals must be signed by an authorised signatory of the Respondent's institution. Each signature represents a binding commitment of the Respondent to fulfil the objectives of this RFP and demonstrate the deliverables, if the Respondent is awarded the project.
- 5) **WITHDRAWAL:** Proposals may be withdrawn prior to the proposal deadline listed on the cover page of this RFP. Proposals may not be withdrawn after that deadline.

- 6) **REJECTION:** GFI India reserves the right to reject any/all proposals or to accept or reject any proposal in part and to waive any minor irregularity in proposals received if it is determined by the Primary Contact to be in the best interest of GFI India.
- 7) **CONTRACT AWARD:** GFI India reserves the right to award the proposal to one (1) Respondent, in the best interest of the execution of the project to the optimum quality-to-cost ratio. Research partnerships may include individuals or groups within the respondent's organisation but must represent a different department, discipline, and skillset (e.g., another department or division within the same university or institution). The description of this collaboration should highlight how it will bring new expertise, perspectives, and technologies to the subject area of this project. Total budgets (including indirect costs) for applicants, including such collaborations, should not exceed ₹20,00,000 (inclusive of all taxes and expenses related to project implementation). The successful Respondent will be notified of GFI India's intent to award the project at the earliest possible date.

STATEMENT OF WORK

1) BACKGROUND AND PURPOSE:

Selection of suitable crop sources (single source or blends/composites) and processing approaches govern the digestibility and bioavailability of plant-based proteins. India's indigenous crops, such as millets and pulses, are subjected to different levels of primary (dehulling, soaking and germination) and secondary processing (grinding, extraction process to obtain protein concentrates or isolates, extrusion cooking, homogenisation) to obtain ingredients including plant proteins and end products such as plant-based meat and dairy. While the [influence of primary processing on protein bioavailability](#) is well-documented, the effects of secondary processing approaches involved in the production of plant proteins, product composition, and structure of plant-based meat products remain underexplored and inconclusive.

The findings of [GFI India's technical analysis on the nutritional aspects of plant-based meat and egg products \(2024\)](#) revealed that the average protein content (9.1-20.8%) of different plant-based meat products in the Indian market exceeds FSSAI's regulatory requirement to be claimed as a 'source of protein' (5.4 g per 100 g)¹. Besides, most plant-based meat formats meet the requirement for the 'high-protein' claim. These findings are promising in highlighting the nutritional benefits of plant-based meat products. However, the nutritional quality of a food product that is claimed as a 'source of protein' or 'high-protein' or 'protein-rich' is not just determined by the quantity of protein, but depends on its amino acid composition and bioavailability. Inferences from the published literature on protein bioavailability from plant-based meat products have not led to any conclusive evidence yet. While some studies credit the nutritional quality of plant-based meat products to their formulation, others report the lower bioavailability and incomplete amino acid profile of plant-based proteins and suggest fortification or protein complementation as a solution. This reflects the intricacy of the topic and the complex matrix of plant-based meat products that determine protein digestion and bioavailability.

2) CORE OBJECTIVES

- To determine the *in vitro* bioavailability of protein from processed millets and pulse-based ingredients as a function of their degree of secondary (2°) processing.
- To quantify the effects of cooking on the *in vitro* protein bioavailability of plant-based meat products as a function of their formulation, processing methodology and food matrix structure, vis-à-vis the corresponding animal-derived products.

¹Food Safety and Standards Authority of India (FSSAI); [FSSAI \(2018: last updated in December 2022\). Food Safety and Standards \(Advertising and Claims\) Regulations.](#)

- To develop standardised test protocols for estimating the bioavailability of proteins from plant-based protein and meat alternatives using a static, semi-dynamic, or dynamic *in vitro* model (which could probably be extended to analyse the bioavailability of other macronutrients and micronutrients from these products in the future, beyond the scope of this study).
- To provide detailed and actionable recommendations to the manufacturers of plant proteins and plant-based meat products to improve the nutritional quality of their ingredients and end products.

3) SCOPE AND DESCRIPTION OF WORK:

This project will focus on the protein bioavailability of processed millet and pulse-based ingredients obtained from India's indigenous varieties of millets and pulses. These ingredients are to be selected as a function of their degree of secondary processing and relevance of the 2^o processing approach for plant-based protein production. In addition, this project would consider plant-based meat products that are representative of the minced-type (second-generation) and whole-cut (third-generation) categories.

- i) **Millet and pulse-based flours rich in protein** with protein content ranging from 10-25%.
- ii) **Millet and pulse-based protein concentrates** with protein content ranging from 50-80%.
- iii) **Millet and pulse-based protein isolates** with protein content ranging from 80-95%.
- iv) **Plant-based meat products:** Plant-based meat products belonging to the following formats/categories: patties, keema, kebabs, chunks, High Moisture Meat Analogues (HMMA)/whole-cut plant-based meats.

The number of samples to be tested under each of the above categories **must not be less than ten**. The rationale of sample size and experimental design must be detailed in the Research Design and Work Plan sections of the proposal (please refer to [Section 6](#)).

The following ingredients and products **do not fall** within the scope of this study:

- Proteins from other plant-based sources such as cereals, soybeans, leaf proteins, jackfruit and other oilseeds, fruits and vegetables.
- Plant-based meat products such as sausages, nuggets, momos, samosas, curries, biryani, and chicken fingers
- Plant-based egg and dairy products

Animal studies **must not** be carried out to fulfil the objectives of this study.

DETAILED DESCRIPTION OF WORK:

Informed by the initial tasks of determining the bioavailability of protein from processed millet- and pulse-based ingredients and selected formats of plant-based meat products, a thorough secondary research or review of the current national and international knowledge base in this line of research followed by comprehensive primary research must be conducted. This will involve the following key activities (not necessarily in the sequence listed below):

1. Review of literature
 - Compile inferences and identify gaps on the bioavailability of proteins from plant proteins and plant-based meat products and the influence of primary and secondary processing approaches, product formulation and structure from published literature.
2. Determination of the *in vitro* protein bioavailability from processed millets and pulses as a function of their degree of 2^o processing approaches
 - Estimate the protein bioavailability of processed protein-rich ingredients obtained from India's indigenous varieties of millets and pulses (including but not limited to sorghum, pearl millet, finger millet, pea, chickpea, mung bean, black-eyed pea or cowpea) with suitable protein content and functionality for the production of plant-based meat products.
 - Focus on secondary processing approaches involved in the production of plant-based protein ingredients (flour, protein concentrate, protein isolate) and plant-based meat products (including but not limited to extrusion).
 - The Principal Investigator can choose to conduct the bioavailability analysis on samples of processed millet and pulse-based protein ingredients (complying with specifications mentioned in Section 2) prepared in their laboratory or procure commercially available products in the Indian market.
3. Determination of the *in vitro* protein bioavailability from cooked plant-based meat products
 - The plant-based meat products for the bioavailability analysis must be selected based on their formats (specified in Section 2), protein source, composition, method of processing (emulsification, forming, mincing, steaming, high-moisture extrusion, and so on), and food matrix structure.
 - The Principal Investigator is expected to conduct the bioavailability analysis on samples of uncooked and cooked plant-based meat products (complying with specifications mentioned in Section 2) and their animal-derived counterparts belonging to different formats and compare the results to evaluate the influence of cooking and product matrix on the protein bioavailability.

4. Development of strategic recommendations based on the analysis of data derived from this project
 - Present a set of recommendations to the plant-based industry on the processing approaches to improve the bioavailability of protein from plant-based ingredients, considering its application in a stand-alone format and when incorporated within an end product.
5. Final report and presentation
 - Compile all the findings and inferences from this study in the form of scholarly open-access publication(s).
 - Prepare a technical brief to summarise the findings and put forth a set of recommendations to the plant-based food industry, in coordination with the primary contact listed on the cover page of this RFP.
 - Prepare a slide deck/presentation to communicate the results to stakeholders in the plant-based smart protein sector.

4) PROPOSED FINAL DELIVERABLES:

1. **Literature review report:** A 20-30 page state-of-the-art literature review report providing a time-based overview of the current state of knowledge pertaining to the research discipline of this RFP.
2. **Open-access research publication:** Minimum one research article in a peer-reviewed open-access journal, based on the findings and inferences derived from this project.
3. **A technical brief:** A 30-page report to summarise the findings of this study and provide a set of strategic recommendations to the plant-based food industry
4. **Presentation:** Slide deck(s) to present the findings to the scientific fraternity, government, and startup/industry stakeholders.

5) TIMELINE AND BUDGET

GFI India's maximum estimated cost for the project is **₹20,00,000 (inclusive of all taxes and expenses related to project implementation)**. The financial proposal's cost competitiveness within this budget will play a crucial role in the scoring assessment during the evaluation.

We seek to begin the project by May 2025 and anticipate it to last for **one year** from the notification date of GFI India's intent to award the project. This does not include the additional time required for the Principal Investigator to participate in a webinar after the report and/or a research article is published (approximately 4-8 weeks after the work is completed).

The following project phases are guidelines for the release of payment:

Milestone	Timeline
Formal awarding of the project and acceptance of the research agreement by the Principal Investigator	May 2025 One-time payment of the approved budget
Literature review report	June 2025
Quarterly reviews of progress by GFI India's scientists	July 2025 October 2025 January 2026 April 2026
Preparation of manuscripts for the open-access research article and a technical brief	December 2025
Review and finalisation of the drafts; communication of the manuscript to an open-access, peer-reviewed scientific journal and technical brief to be submitted to GFI India for design, typesetting and publication on GFI India's website	January 2026
Revision & publication of the manuscript	[Tentative] April 2026 or as communicated by the journal
Publication of the technical brief on GFI India's website	[Tentative] April 2026 or whenever the research article is published online

6) EVALUATION CRITERIA AND SUBMISSION REQUIREMENTS

1) **EVALUATION:** Proposals will be evaluated on merit and completeness by an Evaluation Team. Proposals will be evaluated using the following criteria:

- Qualifications, experience, and specific research expertise of the Principal Investigator in the subject area of this RFP **(20 percent)**
- Technical quality of the proposal **(40 percent)**
- The PI's research group must have prior experience in developing *in vitro* models validated against *in vivo* studies to quantify the bioavailability of proteins from foods (desirably, but not necessarily alternative protein ingredients/products) **(20 percent)**
- Financial proposal **(20 percent)**

The Evaluation Team may consider the past performance of the Principal Investigator on other contracts with GFI India (if any). GFI India reserves the right to conduct additional due diligence as deemed necessary and may require the submission of additional information at its sole discretion.

2) GENERAL PROPOSAL REQUIREMENTS:

- **Electronic proposal:** Send proposals by email to indiacollab@gfi.org by Apr 11, 2025 . Late proposals will not be accepted.
- **Proposal format:** Proposals should include research goals that can be achieved within a period of twelve (12) or fewer months. It is preferred that proposals are assembled in the order of the *specific proposal requirements* listed below. Applicants may submit one single PDF file only.

3) SPECIFIC PROPOSAL REQUIREMENTS: Failure to include a complete response to each of the following items, and to the RFP's Evaluation Criteria, may result in the proposal being deemed non-responsive:

- **Technical proposal:** Project plan that responds to the scope of work with discussion on study design and methodology proposed. This must include a detailed timeline, including intermediate milestones, that shows the Respondent's ability to work within the timeline specified. This will account for 40 percent of the weightage during proposal evaluation. The proposal will request the following information and materials.
 - **Project details (mandatory)** - Including organisational information, project title, summary, key personnel, and information about proposed human subject, animal, and hazardous material use.
 - **Research design (mandatory) - 6-page limit**
 - Up to one page describing the research team, summarising qualifications and background. Up to five pages describing project aims, research design, methods, collaborations within the PI's organisation (if applicable), and references.
 - **Work plan (mandatory) - 1-page limit**
 - One page outlining the project objectives, milestones, tasks, and dependencies included in your research design. You may choose the format, but Gantt charts and timeline diagrams are often preferred. Please use general timeframes rather than specific calendar dates.
 - **Budget (mandatory) - 1-page limit**
 - Itemise costs by budget category for your organisation. Budget requests must be in INR. Please provide a detailed budget breakdown for the entire study, including manpower costs, travel expenses, data collection, analysis, reporting, article processing charges (APC) for open-access publication, and any other relevant expenses. As mentioned earlier, cost competitiveness within the provided maximum estimated cost will account for 20 percent of proposal evaluation. Indirect costs must be

included in the total budget limit and may not represent more than 10 percent of the requested direct costs. Indirect costs must support administrative or overhead costs directly associated with the proposed research. This guidance applies to both applicant and subaward organisations.

- **Budget justification (mandatory) - 2-page limit**
 - Detail and justify the resources requested for the project for all budget categories.
 - Applicants are advised to base their budget on the actual estimated cost of the proposed research. We encourage applicants to request the funding required for the success of their project while building a conservative and realistic budget.
- **Impact strategy (mandatory) - 2-page limit**
 - Provide a detailed description of your plans to achieve meaningful outcomes and maximise the impact of the proposed research. Funds may be requested within the budget for costs associated with the proposed plan.
- **Qualifications, experience, and expertise:**
 - Proof in the form of published articles or preliminary findings from the PI's previous work that is ideally related to plant-based alternative proteins and characterisation of nutrition parameters.
 - Proof-of-concept or published studies from the PI's research group on the development of *in vitro* models for the analysis of nutrient bioavailability from food products and their validation vis-à-vis *in vivo* models.
 - A list of project team members who would be significantly involved, including their areas of expertise and proposed roles.
- All proposal document uploads should be in PDF format, use Arial font size 11 pt or larger, have document margins of 0.5", and use a standard A4 page size.
- Please verify that your proposal follows the budget and page limits. **Proposals exceeding the page limits will not be reviewed.**
- Proposals may be submitted until the deadline listed on the first page of this RFP. **Proposals will not be accepted after the deadline for any reason.**

GFI's POLICIES SURROUNDING RESEARCH WITH POTENTIAL IMPLICATIONS FOR HUMAN HEALTH, ANIMAL WELFARE, OR THE ENVIRONMENT

GFI aims to improve environmental sustainability, human health, and animal welfare. To that end, we want to be cognisant of how the research we support impacts these areas. Researchers must demonstrate a good-faith effort to identify any aspects of their research that present environmental, human health, and animal welfare hazards and to attempt to find suitable alternatives that mitigate these hazards.

While GFI seeks to avoid funding research activities that could reasonably be expected to cause harm and/or death to animals, in some instances, GFI policy may allow limited activities in this area (e.g., cell line isolation from living or dead animals) with appropriate institutional approval.

Proposals must provide a description of any activities that may impact human health, animal welfare, or the environment. Describe how you will minimise use and/or impact, and provide a clear justification for why the activities and/or resources are needed.

CONTACT INFORMATION

If you have questions about your submission, please contact Dr. Padma Ishwarya, S., Science & Technology Specialist (Plant-based), GFI India (indiacollab@gfi.org).

ABOUT THE GOOD FOOD INSTITUTE INDIA

The Good Food Institute India (GFI India) is the leading organisation and expert convening body for India's emerging smart protein sector. As part of an international network of organisations across the U.S., Brazil, Europe, Israel, Japan, and APAC, we are on a mission to build a secure, sustainable, and equitable global food system for all. Working alongside scientists, businesses, and policymakers, GFI India's team focuses on making alternative proteins delicious, affordable, and accessible. Leveraging India's unique strengths—indigenous crops and agrarian economy, low-cost technologies and infrastructure, abundant talent pool, and biomanufacturing prowess—we are pioneering an ecosystem that can put smart protein on every plate.