# TERMS OF REFERENCE
# MANAGING AFLATOXIN CONTAMINATION IN ASIA USING ONE HEALTH STDF PROJECT PREPARATION GRANT (STDF/PPG/858)

## 1 BACKGROUND

1.1. According to the World Health Organization (WHO), among the various factors affecting plant health, aflatoxins (AF) pose a significant economic burden through contamination of about 25% of the world food crops. AF produced by Aspergillus spp. are an increasing concern regarding the safety of food products. The mitigation of AF has become a critical subject of the Codex Alimentarius Commission which provides guidance for Maximum Residue Limits (MRLs) of traded plant material/food products for countries.

1.2. Limited availability of food, lack of regulatory systems for monitoring and controlling AFs, and environmental conditions that favour fungal development are common factors that increase the likelihood of AF exposure. Therefore, preventing and mitigating AF exposure requires employing a One Health approach to protect human, plant, and animal health. Prevention and mitigation of AF contamination of food and feed, particularly in low- and middle-income countries (LMICs), that often lack expertise and infrastructure to effectively prevent AF contamination, is crucial to achieve positive health, trade, and income outcomes. AF mitigation in LMICs require multi-pronged, economically feasible, integrated approaches supported by private and public sector entities.

1.3. At its core, "One Health"[1] fosters a collaborative approach to issues that intersect human, animal and environmental health. Although One Health is not a new concept, it has become more important in recent years as illustrated by the COVID-19 pandemic. Interactions among people, animals, and the environment continue to change. The expansion of human and animal populations, changes in climate and land use, and increased international travel and trade provide opportunities for disease spread.

1.4. This application seeks to raise awareness and mainstream One Health in select Asian countries so that they are better prepared to identify, prevent, predict, detect, and respond to health threats raised by AF contamination. By way of example, the Rapid Alert System for Food and Feed (RASFF)[2] of the European Union identified 255 notifications from 2020 to 2022 on AF contaminated commodities being imported from Asia.

Plant health

1.5. In the context of plant health, inconsistent use of good agricultural practices (GAPs) and unavailability of biopesticides and/or robust management strategies to prevent AF contamination are some of the factors that can explain the development of AF by toxigenic *Aspergillus spp*. It is essential to educate farmers on AF prevalence and its implications. Similarly, aggregators, processors, vendors and consumers need to be sensitized on the risks of AF contamination. Proper irrigation, drying the produce to a safe moisture content below 10% before sorting, insect control,

[1] The One Health High Level Expert Panel (OHHLEP) which consists of FAO, WOAH, UNEP and the WHO, define the concept as: "One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development."

[2] See: https://food.ec.europa.eu/safety/rasff_en.

maintaining appropriate temperature and relative humidity during transportation and storage are known to significantly reduce fungal infection and AF development. In addition, use of bio control is a promising approach to control AF in both pre-and post-harvest stages.

Animal health

1.6. The nexus between animal health and AF contamination is a very interesting one. Commodities with high AF content that are rejected from entering markets because they are not suitable for human consumption, are allowed to be used for the production of animal feed. When such feed with high AF content is consumed by animals, they are known to cause a hepatotoxic effect (injury to liver function). When lactating mammals such as cows, sheep and goat are fed with Aflatoxin B1 (AFB1) contaminated feed, the ingested AFB1 is converted to Aflatoxin M1 (AFM1) through a chemical reaction in the liver of the animal. Up to 7% of AFB1 in feed is transformed to AFM1 in milk and constitute a health risk for consumer.

Human health

1.7. AF causes liver cancer and is classified as class 1 carcinogen by the International Agency for Research on Cancer. Chronic AF exposure is associated with stunting, immuno-suppression, and kwashiorkor (a severe form of malnutrition) while acute poisoning may lead to gastrointestinal disorders such as vomiting and diarrhea. Exposure to AF begins in the mother's womb, continues when babies are breastfed and subsequently from weaning foods.

1.8. Against this background, this application will bring together global expertise on One Health to develop a regional project proposal for the Asia-Pacific region to overcome challenges related to AF contamination. In addition, a One Health approach also recognizes that human impacts on the environment play an important role in *Aspergillus* growth and the production of AF.

## 2 PURPOSE AND EXPECTED OUTPUTS OF THE PPG

2.1. The purpose of this PPG thus is to develop a project proposal for consideration by the STDF and/or other donors with the idea of creating awareness on the One Health approach to mitigate AF along key value chains. The final outputs envisioned under this PPG would be a project proposal, including: i) a detailed mitigation action approaches for AF management considering environmental, plant, animal and human health aspects; ii) a bibliography of reference documents; and iii) a compendium of key activities carried out during the PPG. This PPG was requested by the Asia Pacific Association of Agricultural Research Institutions (APAARI) and approved by the STDF Working Group at its meeting on 30 November 2022, subject to some conditions.

2.2. Members of the STDF Working Group welcomed the PPG approach and provided valuable comments which could further strengthen the resulting outcomes of this project development work. Specifically, the Working Group recommended that the final selection of countries should be based on clear demand from stakeholders, in particular ministries of health, trade/commerce and agriculture. Members underscored the need to identify key government counterparts and ensure they are included in the consultations. The European Commission encouraged synergies with projects under the Better Training for Safer Food (BTSF) programme, through which projects on AF contamination, including in Indonesia, are being financed. Members recommended inclusion of practical risk management options such as local farmer/handler training, storage maintenance and strengthening surveillance systems in different regulatory environments.

2.3. APAARI is a membership-based, apolitical, multi-stakeholder, and inter-governmental regional organization. As an important intermediary in the region, it is bridging national, regional and global stakeholders to bring about collective change in agri-food systems in Asia-Pacific. APAARI's wide network of members and partners comprises of national agricultural research institutes and national agricultural research organizations, international agricultural research centres, higher education

institutions, civil society (farmers' organizations and non-governmental organizations), international development organizations and the private sector. This document sets out the Terms of Reference (ToRs) for APAARI to implement this PPG in close collaboration with relevant technical associated partners.

## 3 IMPLEMENTATION AND KEY TASKS RELATED TO THE PPG

3.1. APAARI will be responsible for the implementation of this PPG, including contracting relevant national and international experts. APAARI will carry the tasks detailed below, under the overall supervision of the STDF Secretariat, and in close collaboration with relevant technical associated partners.

3.2. The key tasks to be carried out by the implementing agency will include:

a. Key experts shall familiarize themselves with the activities proposed in the PPG application document.[3]

b. Identify critical actions to mitigate or minimize the incidence of AF contamination and to create awareness on One Health with AF as a case study.

c. Conduct an analysis of promising approaches to control AF contamination in both pre- and post-harvest stages while considering Asian conditions. Ideally, the analysis will also lay groundwork for knowledge sharing and disseminating solutions and good practices for safe food consumption. It will also shape the remainder of the work under the PPG, including clarification of roles and responsibilities of the different stakeholders (governments and private sector in countries) in addressing the challenges faced in AF contamination.

d. Consult stakeholders (e.g., government organizations, producers, exporters, industry associations, research institutes, consumer organizations, etc.) in Asia to incorporate their insights on where interventions would be appropriate/beneficial to ensure alignment with national development priorities and to enhance ownership of the resulting project. In particular, the following stakeholders should be consulted:

   i. Government departments (including Departments of Agriculture, Livestock, Health) and agencies charged with the implementation of food safety controls related to One Health and AF, and involved in agricultural development and trade more generally (Ministry of Trade/Commerce).
   ii. Research institutes, working groups, and academics working on AF mitigation and One Health.

e. Carry out an active exploration in the participating countries (Bangladesh, Iran, Malaysia, Pakistan, Philippines) to identify gaps and needs that are related to AF mitigation. Since most of the One Health approaches focus mainly on animal and human health factors, importance of bringing in plant health aspects will be prioritized, with AF as a case study. Strengthening the network of One Health groups in the region will be done through stakeholder engagements and discussions.

f. Carry out a detailed analysis of AF contamination in relevant value chains, in accordance with the One Health approach, responding to the following questions (which would be the basis for determining the appropriate selection of key value chains):

[3] A copy of the application document (STDF/PPG/858) will be made available to APAARI.

i. Are the prevailing product non-conformities due to breaches in SPS (e.g., AF contamination) or quality-related parameters?
ii. Is there evidence for competitive advantage in terms of quality differentiation and cost leadership for the specific value chain?
iii. Is there a critical mass of companies in the selected value chain that have the potential to have well-defined operating processes and methods, quality management systems, sufficiently qualified staff, to pursue AF mitigation?
iv. Would producers, processors, competent authorities, and government agencies be willing to accept forms of third-party inspection/verification/control processes?
v. What are the consumption patterns and health issues at the national/regional level?
vi. How is One Health linked to SPS in the different countries?
vii. How can the plant health factor be included in One Health groups - why is it important to include this plant health factor?
viii. How can AF contamination be linked with other food safety issues affecting the specific value chain? And what are the approaches currently available?

g. Take stock of other relevant ongoing and future projects supporting One Health and AF contamination and hold in-depth discussions with the relevant development partners to avoid duplication and to identify critical gaps, SPS capacity building needs, and possible synergies.

h. Consult international organizations, development partners, and bilateral donors with interest in One Health in the region (including the World Bank, USDA, FAO, ASEAN, SAARC, etc.) to explore opportunities to leverage funds to implement the project to be developed through this PPG. Based on the outcomes of these discussions, and the likelihood to secure donor funding, the project proposal produced may also be written in the format/template of one of these potential donors (rather than the STDF project template, which is available at: https://standardsfacility.org/funding).

i. Based on the detailed analysis of AF contamination in the identified value chains, discussions held and information obtained, develop a feasible, cost-effective and sustainable project proposal to tackle AF contamination based on the One Health approach for selected crops in specific countries. The project proposal/document should purpose to:

i. Clearly identify the specific causes of AF contamination in the selected value chains and consider the feasibility of various approaches or solutions to address the problems faced (e.g., rolling out training on GAPs, use of biocontrol agents, etc.).
ii. Take account of, and build on, what has worked in SPS capacity building interventions for AF mitigation to date and learn from other relevant experiences.
iii. Clearly elaborate the purpose, expected outcomes, outputs and activities of the proposed project, based on a coherent logical framework. The logical framework should include indicators to measure performance, sources of verification and key assumptions.
iv. Clearly identify the roles and responsibilities of all concerned public and private stakeholders and outline a practical mechanism for project implementation and management.
v. Include a detailed estimate of the budget (format in MS Excel) required to implement the proposed project activities and, where possible, identify possible donors and/or private sector investors.
vi. Clearly identify and map out linkages, synergies and complementarities to related activities and projects, supported by the governments, other donors and development partners, private sector investors, and direct beneficiaries.
vii. Include a detailed work plan and timetable for project implementation.

viii. Identify and assess the possible risks and challenges faced in the proposed project, as well as risk mitigation strategies to ensure its success and sustainability.

ix. The resultant project should also pay attention to spill-over effects on the domestic food safety situation.

x. Consider cross-cutting issues related to gender and environmental aspects affecting the particular value chains.

j. Present, discuss and validate the project proposal/document with all industry and government stakeholders and relevant development partners during a final stakeholder workshop.

k. Finalize successive versions of the project proposal based on feedback received from stakeholders consulted.

l. Write a brief PPG implementation report on the outcomes, including annexes (e.g. value chain analysis and bibliography of all documents reviewed/references and stakeholders consulted).

## 4 DELIVERABLES

4.1. APAARI shall deliver the following key outputs:

a. A preliminary analysis of AF contamination in the selected value chains, based on the One Health approach, as described in sub-paragraph f. above.

b. A complete final project proposal as described in sub-paragraph i. above.

c. A brief report of work carried out under the PPG, including the key activities, a bibliography of the documents consulted (with web links and/or electronic copies, where available), stakeholders met and consulted together their e-mail addresses, etc. The PPG implementation report should be provided within one month of PPG completion.

## 5 TIMEFRAME

5.1. The activities of this PPG will take place starting from **15 May 2023** until **31 January 2024**.

## 6 ESTIMATED BUDGET

6.1. The STDF will cover expenses related to implementation of this PPG ***up to*** a maximum amount of **US$44,500** and for implementation services rendered by APAARI to conduct this assignment up to a total of **US$5,340**, which represents 12 percent of the total STDF contribution to the PPG. Payments will be made in accordance with the conditions and schedule in the Contract. Should actual expenditure be inferior to the maximum figure of **US$49,840**, APAARI will return the difference between the projected and the actual expenditures. An indicative budget prepared by APAARI is provided below.

6.2. Over the course of the PPG implementation, experts identified below will carry out the following activities – **Phase I**: **Desk/Inception**, data collection and review of relevant reports/studies; **Phase II**: **Field Visits**, mapping of key AF mitigation challenges, based on One Health approach, against market requirements and conducting stakeholder consultations with producers/processors, sector/industry associations, research institutes, and trade support institutions to validate preliminary findings and to select country specific value chains; **Phase III**: **Synthesis**, drafting of a project document that proposes a feasible, cost-effective solution to addressing AF management constraints translated into specific activities, outputs, and outcomes; presentation of project

proposal to stakeholders for validation, and identification of potential donor funding / programmes to ensure complementarity and build synergies; **Phase IV**: **Dissemination**, editing and translation of preliminary AF mitigation analysis, consolidation of final project document, including a detailed budget, and preparation of executive report on the PPG work.

| ACTIVITY | Unit | Unitary cost | STDF | In Kind / Other |
|---|---|---|---|---|
| **Activity 1 - Inception workshop to agree on the components of the PPG in Bangkok and visit to partnering countries to analyse the impact of aflatoxin** | | | | |
| Face to face meeting in Bangkok - Two expert from Africa, three experts from in Asia, one expert from the US and ten other participants | | | | |
| **Staff Time** | | | | |
| Dr Ravi Khetarpal (Project Lead)<br>(3 days STDF+1 day in-kind) | 4 | $600 | $1,800 | $600 |
| Dr Ranajit Bandyopadhyay (APAARI Consultant – Technical Advisory Lead) (1 day STDF+1 day in-kind) | 2 | $450 | $450 | $450 |
| Dr Sasireka Rajendran (Technical Project Manager)<br>(6 days STDF+3 days in-kind) | 9 | $350 | $2,100 | $1,050 |
| Staff for managing Logistic and other support<br>(4 days STDF+3 days in-kind) | 7 | $250 | $1,000 | $750 |
| **Staff Time from Partners** | | | | |
| CABI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| IITA (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| ILRI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| University of Minnesota (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| Human Health (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| **Air Travel*** | | | | |
| Dr Sasireka Rajendran Travel 1 Trip<br>(Indian-Bangkok-Indian) | 1 | $600 | $600 | |
| Experts from Africa (ILRI and IITA) | 2 | $3,000 | $6,000 | |
| Expert from Asia (CABI, APAARI) | 3 | $700 | $2,100 | |
| Expert from USA (U of M) | 1 | $2,000 | $2,000 | |
| Other national potential participants | 8 | $700 | $5,600 | |
| **Daily Subsistence Allowance (DSA)*<br>(Per diem - hotel - food and incidentals)** | | | | |
| DSA for 16 Personnel for 3 days | 16 | $220 | $3,300 | |
| **Terminals & visas, COVID-19 Testing*** | | | | |
| Terminal and Visa for 16 Personnel | 16 | $150 | $2,250 | |
| Venue - 1 Day for 20 Personnel | 20 | $50 | $1,000 | |
| Workshop Supply | | | $1,000 | |
| **Subtotal** | | | **$30,950** | **$4,600** |
| **Activity 2 - Bilateral online meetings with the countries – Bangladesh, Iran, India, Pakistan, Philippines and Malaysia** | | | | |
| Dr Ravi Khetarpal (Project Lead)<br>(1 day STDF+1 day in-kind) | 2 | $600 | $600 | $600 |
| Dr Ranajit Bandyopadhyay (APAARI Consultant – Technical Advisory Lead) | 1 | $450 | $450 | |
| Dr Sasireka Rajendran (Technical Project Manager)<br>(3 days STDF+ 1 days in-kind) | 4 | $350 | $1,050 | $350 |
| CABI 2 Days<br>(1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| IITA (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |

| ACTIVITY | Unit | Unitary cost | STDF | In Kind / Other |
|---|---|---|---|---|
| ILRI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| University of Minnesota (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| Human Health (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| Zoom Platform | 1 | $150 | $150 | |
| IT Support and other staff support | | | | $1,000 |
| **Subtotal** | | | **$4,000** | **$3,700** |
| **Activity 3 - Drafting the project proposal based on the preliminary analysis** | | | | |
| Dr Ravi Khetarpal (Project Lead) (1 day STDF+1 day in-kind) | 2 | $600 | $600 | $600 |
| Dr Ranajit Bandyopadhyay (APAARI Consultant – Technical Advisory Lead) (1 day STDF+1 day in-kind) | 2 | $450 | $450 | $450 |
| Dr Sasireka Rajendran (Technical Project Manager) (7 days STDF+ 5 days in-kind) | 12 | $350 | $2,450 | $1,750 |
| CABI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| IITA (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| ILRI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| University of Minnesota (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| Human Health (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| **Sub Total** | | | **$5,250** | **$4,550** |
| **Activity 4 - Final validation workshop (online) - Present, discuss, and validate project proposal/document with all stakeholders** | | | | |
| Dr Ravi Khetarpal (Project Lead) (1 day STDF+1 day in-kind) | 2 | $600 | $600 | $600 |
| Dr Ranajit Bandyopadhyay (APAARI Consultant – Technical Advisory Lead) (2 days STDF) | 2 | $450 | $900 | |
| Dr Sasireka Rajendran (Technical Project Manager) (3 days STDF+ 1 day in-kind) | 4 | $350 | $1,050 | $350 |
| CABI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| IITA (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| ILRI (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| University of Minnesota (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| Human Health (1 day STDF+1 day in-kind) | 2 | $350 | $350 | $350 |
| IT Support and other staff support | | | | $1,000 |
| **Subtotal** | | | **$4,300** | **$3,700** |
| **Total of all activities** | | | **$44,500** | **$16,550** |
| APAARI Overhead @12% APAARI | | | $5,340 | |
| **Total funds requested from STDF** | | | **$49,840** | |
| Partner Matching Contributions | | | | **$16,550** |

* Reimbursed based on receipts an actual expenses