

# CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture  
Organization of the  
United Nations



World Health  
Organization

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REP22/CF15

**JOINT FAO/WHO FOOD STANDARDS PROGRAMME**

**CODEX ALIMENTARIUS COMMISSION**

**45<sup>th</sup> Session**

**21 - 25 November and 12 – 13 December 2022**

**REPORT OF THE 15<sup>th</sup> SESSION OF THE  
CODEX COMMITTEE ON CONTAMINANTS IN FOODS**

**(virtual)**

**9-13 and 24 May 2022**

## TABLE OF CONTENTS

Summary and Status of Work .....	page iii
List of Abbreviations .....	page vi
List of CRDs .....	page vii
Report of the 15 <sup>th</sup> Session of CCCF .....	page 1
	<b>Paragraphs</b>
Introduction .....	1
Opening of the Session .....	2 - 5
Adoption of the Agenda (Agenda Item 1) .....	6 - 7
Matters referred to the Committee by Codex Alimentarius Commission and/or its subsidiary bodies (Agenda Item 2) .....	8 -15
Matters of interest arising from FAO, WHO including the JECFA (Agenda Item 3) .....	16 - 39
Matters of interest arising from other international organizations (Agenda Item 4) .....	40 - 41
<u>Industrial, environmental and naturally occurring toxicants</u>	
Maximum levels for cadmium in cocoa powder (100% total cocoa solids on a dry matter basis (Agenda Item 5) .....	42 - 61
Code of practice for the prevention and reduction of cadmium contamination in cocoa beans (Agenda Item 6) .....	62 – 68
Maximum levels for lead in certain food categories (Agenda Item 7) .....	69 - 104
Maximum levels for methylmercury in certain fish species and associated sampling plan (orange roughy and pink cusk eel) (Agenda Item 8)	
Methylmercury in fish (Agenda Item 13).....	105 – 112
<u>Toxins</u>	
Maximum levels for total aflatoxins in certain cereals and cereal-based products including foods for infants and young children and associated sampling plans (Agenda Item 9) .....	113 - 155
Maximum level for total aflatoxins in ready-to-eat peanuts and associated sampling plan (Agenda Item 10) .....	156 - 180
Maximum levels for total aflatoxins and ochratoxin A in nutmeg, dried chili and paprika, ginger, pepper, and turmeric and associated sampling plans (Agenda Item 11) .....	181 - 193
Code of practice for prevention and reduction of mycotoxin contamination in cassava and cassava-based products (Agenda Item 12) .....	194 - 200
<u>Discussion papers</u>	
Pyrrrolizidine alkaloids (Agenda Item 14) .....	201
<u>General issues</u>	
Guidance on data analysis for development of maximum levels and for improved data collection (Agenda Item 15) .....	202 - 208
Review of methods of analysis for contaminants (Agenda Item 16) .....	209 - 211
<u>Future work</u>	
Forward work-plan for CCCF: Review of staple food-contaminant combinations for future work of CCCF (Agenda Item 17) .....	212 - 214
Review of Codex standards for contaminants (Agenda Item 18) .....	215 - 218
Follow-up work to the outcomes of JECFA evaluations and FAO/WHO expert consultations (Agenda Item 19) .....	219 - 224
Priority list of contaminants for evaluation by JECFA (Agenda Item 20) .....	225 - 228
<u>Other matters</u>	
Other business (Agenda Item 21) .....	229
Date and place of next session (Agenda Item 22) .....	230 - 231

**Appendices**

	<b>Pages</b>
Appendix I - List of Participants .....	29
Appendix II – Maximum levels for cadmium in chocolates and cocoa powder.....	49
Appendix III – Code of practice for the prevention and reduction of cadmium contamination in cocoa beans.....	50
Appendix IV – Maximum levels for lead in certain food categories .....	55
Appendix V – Maximum levels for methylmercury in certain fish species (orange roughy and pink cusk eel).....	56
Appendix VI – Part I: Maximum levels for total aflatoxins in certain cereals and cereal-based products including foods for infants and young children Part II: Consequential amendment to the Maximum Level for Deoxynivalenol.....	57
Appendix VII - Proposed draft code of practice for the prevention and reduction of mycotoxin contamination in cassava and cassava-based products.....	59
Appendix VIII - Methods of analysis for contaminants.....	65
Appendix IX - Priority list of contaminants for evaluation by JECFA .....	71

Responsible Party	Purpose	Text/Topic	Code	Step	Appendices & Paragraphs
Members and Observers CCEXEC83 CAC45	Comments Critical Review Adoption	Editorial amendment to the MLs for cadmium in chocolates containing or declaring <30% total cocoa solids on a dry matter basis and chocolates containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis	CXS 193-1995	-	Appendix II para. 58
		MLs for cadmium in cocoa powder (100% cocoa solids on a dry matter basis)		5/8	Appendix II para. 59
Members and Observers CCEXEC83 CAC45	Comments Critical Review Adoption	Code of practice for the prevention and reduction of cadmium contamination in cocoa beans	-	8	Appendix III para. 68
Members and Observers CCEXEC83 CAC45	Comments Critical Review Adoption	MLs for lead in cereal-based foods for infants and young children, white and refined sugar, corn and maple syrups, honey and sugar-based candies	CXS 193-1995	5/8	Appendix IV para. 102(i).
CCEXEC83 CAC45 EWG (Brazil) Members and Observers CCCF16	Comments Critical Review Adoption Discussion Comments Consideration	ML for lead in ready-to-eat meals for infants and young children	CXS 193-1995	5	Appendix IV para. 102(ii)
CCEXEC83 CAC45	-	MLs for lead in fresh eggs, dried garlic and molasses	CXS 193-1995	Discontinued	para. 102(iii).
JECFA EWG (Brazil) Members and Observers CCCF17	Discussion Comments Consideration	MLs for lead in ready-to-eat meals for infants and young children (exclusion of certain foods) and brown and raw sugars, culinary herbs (fresh/dried) and spices (dried)	CXS 193-1995	2/3	para. 102(iv)
Members and Observers CCEXEC83 CAC45	Comments Critical Review Adoption	MLs for methylmercury in orange roughy and pink cusk eel	CXS 193-1995	5/8	Appendix V para. 112(i)
CCCF15	-	ML for Patagonian toothfish and on a separate guidance paper for the management of methylmercury in fish	CXS 193-1995	Discontinued	para. 112(ii)
EWG (New Zealand and Canada) Members and Observers CCCF17	Discussion Comments Consideration	Sampling plans for methylmercury in orange roughy and pink cusk eel	CXS 193-1995	-	para. 112 (iii. – v)

Responsible Party	Purpose	Text/Topic	Code	Step	Appendices & Paragraphs
Members and Observers CCEXEC83 CAC45	Comments Critical Review Adoption	MLs for total aflatoxins in maize grain, destined for further processing; flour meal, semolina and flakes derived from maize; husked rice; polished rice; sorghum grain, destined for further processing; cereal-based food for infants and young children (excluding foods for food aid programs), and cereal-based food for infants and young children for food aid programs	CXS 193-1995	5/8	Appendix VI, Part I para. 154(i)
Members and Observers CCEXEC83 CAC45	Critical Review Adoption	Consequential amendment to the ML for DON in cereal-based foods for infants and young children	CXS 193-1995	-	Appendix VI, Part II para. 154(iii)
EWG (Brazil and India) Members and Observers CCCF16	Discussion Comments Consideration	Sampling plans for total aflatoxins for maize grain and flour, meal, semolina, and flakes derived from maize, as well as for cereal-based foods for infants and young children	CXS 193-1995	-	para. 154 (iv. – vi)
JECFA EWG (India and Senegal) Members and Observers CCCF16	Discussion Comments Consideration	MLs for total aflatoxins in ready-to-eat peanuts and associated sampling plan	CXS 193-1995	2/3	para. 180
JECFA EWG (India) Members and Observers CCCF16	Discussion Comments Consideration	MLs for total aflatoxins and ochratoxin A in nutmeg, dried chili and paprika, ginger, pepper, and turmeric and associated sampling plans	CXS 193-1995	2/3	para. 193
CCEXEC83 CAC45 EWG (Nigeria and Ghana) Members and Observers CCCF16	Critical Review Adoption Discussion Comments Consideration	Code of practice for prevention and reduction of mycotoxin contamination in cassava and cassava-based products	-	5	Appendix VII para. 200
EWG (EU, Japan, The Netherlands and USA) CCCF16	Discussion Consideration	Guidance on data analysis for development of MLs and improved data collection	-	-	para. 208
CCMAS42	Consideration/ endorsement	Review of methods of analysis for contaminants	CXS 234–1999 CXS 228-2001	-	Appendix VIII para. 211
Codex/JECFA/ Host Country Secretariats CCCF16	Discussion/ Consideration	Forward work plan for CCCF	-	-	para. 214
WG (Canada) CCCF16	Discussion/ Consideration	Review of Codex standards for contaminants	-	-	para. 218

<b>Responsible Party</b>	<b>Purpose</b>	<b>Text/Topic</b>	<b>Code</b>	<b>Step</b>	<b>Appendices &amp; Paragraphs</b>
JECFA Members and Observers WG (EU) CCCF16	Comments Discussion Consideration	Follow-up work to the outcomes of JECFA evaluations and FAO/WHO expert consultations	-	-	para. 224
EWG (EU) CCCF16	Discussion Consideration	Discussion paper on Pyrrolizidine alkaloids	-	-	para. 224(i)
EWG (USA and EU) CCCF16	Discussion Consideration	Discussion paper on a Code of practice or guidelines to prevent or reduce ciguatera poisoning			para. 224(ii)
JECFA Members and Observers WG (USA) CCCF16	Evaluation Comments Discussion Consideration	Priority list of contaminants for evaluation by JECFA	-	-	Appendix IX para. 228
Codex Secretariat/ CCEXEC83	For action/ information	Monitoring the use and impact of Codex standards: review of COPs for contaminants	-	-	para. 14
CCCF (2027)	Consideration	Review of MLs for AFT in for maize grain destined for further processing; flour, meal, semolina, and flakes derived from maize, husked rice, sorghum grain destined for further processing, cereal-based foods for infants and young children (excluding foods for food aid programs); and cereal-based foods for infants and young children for food-aid programs	-	-	paras 128, 133 139, 142, 150 para. 154(ii),

## LIST OF ABBREVIATIONS

AF(s)	Aflatoxin(s)
AFT	Total aflatoxins
ALARA	As Low As Reasonable Achievable
CAC	Codex Alimentarius Commission
CCCF	Committee on Contaminants in Foods
CCEXEC	Executive Committee of the Codex Alimentarius Commission
CCFA	Codex Committee on Food Additives
CCMAS	Codex Committee on Methods of Analysis and Sampling
CCNASWP	FAO/WHO Coordinating Committee for North America and South West Pacific
CL	Circular Letter
COAG	FAO Committee on Agriculture
CoP	Code of Practice
CRD	Conference Room Document
DON	Deoxynivalenol
EU	European Union
EFSA	European Food Safety Authority
EWG	Electronic Working Group
FAO	Food and Agriculture Organization
FERG	Foodborne Disease Burden Epidemiology Reference Group
GEMS/Food	Global Environment Monitoring System
GSCFF	General Standard for Contaminants in Food and Feed
IAEA	International Atomic Energy Agency
IOC-UNESCO	Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization
ISO	International Organization for Standardization
JECFA	Joint FAO/WHO Expert Committee on Food Additives
LAC	Latin America and the Caribbean
LOQ	Limit of Quantification
ML(s)	Maximum Level(s)
OIE	World Organisation for Animal Health
OTA	Ochratoxin A
PCBs	Polychlorinated biphenyls
RTE	Ready-To-Eat
TEF	Toxicity equivalent factor
TWI	Tolerable weekly intake
UK	United Kingdom
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
VWG	Virtual Working Group
WG	Working Group
WHO	World Health Organization
WFP	World Food Programme

## LIST OF CONFERENCE ROOM DOCUMENTS

CRD No.	Agenda Item	Submitted by
01	Division of Competence	EU (Division of Competence between EU and its Member States)
02	18	Canada
03	19	EU
04	20	USA
05	16	Brazil
06	18	Canada
07	19	EU
08	20	USA
09	16	Brazil
10	15	EU
11	5, 6, 7, 9, 10, 11	Indonesia
12	5-10, 12, 19, 20	Uganda
13	6	Brazil
14	5, 6, 8	Nigeria
15	16	UK
16	7, 8, 11, 13, 16	EU
17	6, 11, 15, 20	USA
18	5-12, 15	Thailand
19	5-11, 16	Republic of Korea
20	5-13, 16	Ghana
21	9, 10	Iran
22	5, 7, 8, 10, 12	Senegal
23	5	Dominican Republic
24	5-11	India
25	9	Brazil
26	7	Brazil
27	12	Nigeria
28	8, 13	NHF
29	5-11, 13	AIDSMO
30	5-10, 15	Ecuador
31	6	Peru
32	Opening remark	-
33	10	India



## INTRODUCTION

1. The Codex Committee on Contaminants in Foods (CCCF) held its 15<sup>th</sup> Session virtually, from 9 to 13 and 24 May 2022, at the kind invitation of the Government of The Netherlands. The session was chaired by Dr. Sally Hoffer, Manager, Food Safety and Sustainable Food, Directorate Plant Agro Food Chains, Ministry of Agriculture, Nature and Food Quality, The Netherlands. The session was attended by 85 Member Countries, 1 Member Organization and 17 observer organizations and Palestine. The list of participants is contained in Appendix I.

## OPENING OF THE SESSION

2. Mr. Steve Wearne, the Chairperson of CAC, delivered opening remarks. He stated that, while working virtually had allowed for greater levels of participation in discussions, contributing to enhanced transparency and collaboration, it was imperative to nurture, renew and grow the personal and professional relationships and the opportunities for informal discussion.
3. Mr. Tom Heilandt, Codex Secretary, also addressed the meeting and highlighted the importance of exploring new ways of working more effectively to achieve consensus in plenary and keeping within deadlines in order to remain responsive and relevant to Codex members' needs and priorities. He further noted that this was particularly important in CCCF where there might be a need to balance risks and benefits, ensuring food safety while enabling trade, and so the need to work in a spirit of compromise to complete work for adoption by the Commission.
4. CCCF held a minute of silence in memory of the recently passed Ms Tanja Åkesson, the former CCP for the Netherlands and the member of the CCCF host secretariat.

## Division of Competence

5. CCCF noted the division of competence between the EU and its Member States, according to paragraph 5, Rule II of the Rules of Procedure of the Commission.

## ADOPTION OF THE AGENDA (Agenda Item 1)<sup>1</sup>

6. CCCF noted that:
  - i. Items 8 and 13 would be discussed together.
  - ii. Decision on Item 14 would be made under Item 19.
  - iii. Item 17 would not involve discussions, but a short update on the next steps for this item would be given.
  - iv. No issues would be considered under Item 21.
7. CCCF adopted the provisional agenda as its Agenda for the session.

## MATTERS REFERRED TO THE COMMITTEE BY THE CODEX ALIMENTARIUS COMMISSION AND/OR ITS SUBSIDIARY BODIES (Agenda Item 2)<sup>2</sup>

8. CCCF noted that some of the matters were for information and that certain issues would be considered under the relevant agenda items as follows.
  - The Code of practice for the prevention and reduction of cadmium contamination in cocoa beans (Item 6).
  - MLs for methylmercury in orange roughy and pink cusk eel (Item 8).
  - The Code of practice for the prevention and reduction of mycotoxin contamination in cassava and cassava-based products (Item 12).
9. CCCF further took the following decisions.

60<sup>th</sup> anniversary
10. CCCF encouraged members and observers to plan and implement activities to build awareness of Codex and to engage high-level support for Codex work.

Operationalization of the Statements of Principle, the future of Codex and how to address cross-cutting, overarching and emerging issues
11. CCCF noted the ongoing/upcoming discussion in CCEXEC on the operationalization of the Statements of Principle; the future of Codex and on how to address cross-cutting, overarching and emerging issues in Codex; and encouraged members and observers to actively engage in opportunities to contribute to the discussion in CCEXEC through their regional coordinators and/or by providing replies to relevant CLs to be distributed in this regard.

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<sup>1</sup> CX/CF 22/15/1

<sup>2</sup> CX/CF 22/15/2

Monitoring the use and impact of Codex Standards

12. CCCF welcomed the project on monitoring the use and impact of Codex standards and in this regard recalled its discussion and agreement at CCCF13 (2019) for a proposal to launch a pilot project to review the implementation of Codes of Practice in the context of the forward workplan, especially in view of the importance of implementation of CoPs for ML setting and other work in the Committee.<sup>3</sup>
13. CCCF further recalled that CCCF14 (2021) had agreed that the Codex Secretariat, in consultation with FAO, WHO and the Host Country Secretariat, would continue to look at ways of taking this pilot project to review CoPs emanating from CCCF forward in the context of monitoring the use of Codex standards.<sup>4</sup>
14. CCCF reiterated its support for this approach and encouraged the Codex Secretariat to ensure that evaluation of the CoPs would be considered in the broader phased-approach of the project to monitor the use and impact of Codex standards; and, to inform CCEXEC of the importance of this area of work for CCCF when considering monitoring the use and impact of Codex standards.

General Guidelines on Sampling (CXG 50-2004)

15. CCCF encouraged members and observers to provide relevant comments on the revision to the *General Guidelines on Sampling*.

**MATTERS OF INTEREST ARISING FROM FAO AND WHO INCLUDING JECFA (Agenda Item 3)<sup>5</sup>**

16. The WHO and FAO Representatives provided an update on WHO and FAO's work; in particular, they highlighted the following points:

WHO work on dioxin and dioxin-like compounds

17. Since the early 1990's, WHO has organized expert meetings with the objective to harmonize the TEFs for dioxin and dioxin-like compounds on the international level, thereby giving recommendations to national regulatory authorities. The latest WHO TEFs for dioxin and dioxin-like compounds were established by WHO in 2005.
18. New data indicate a need to update the 2005 WHO TEFs and therefore WHO has established an advisory group of international experts that advises WHO about the kind of data needed to derive new TEF values. WHO in collaboration with EFSA and some external consultants has collected the needed data that WHO experts will need to derive new TEF values.
19. An expert consultation aimed at re-evaluating the TEFs for dioxin and dioxin-like compounds is being organized for October 2022. WHO has just published an open call for experts who wish to take part in this exercise. The link to the call is available on WHO homepage.
20. The JECFA Secretariat informed CCCF that JECFA93 (2022) evaluated the HT-2 and T-2 and the monograph and the report will be published later in 2022.

WHO activities on dietary and inhalation exposure to microplastic particles

21. Microplastics in the environment is an emerging contaminant that has generated intense public concern. Questions have been asked about the human health impacts of the exposure to microplastic particles, from the polymers themselves, to the monomers as well as additives used to make the plastic material, adsorbed chemical contaminants and associated biofilms.
22. Recognizing this, WHO has reviewed the state of evidence on microplastics in drinking-water and published a report assessing the risks to human health in August 2019. To continue WHO's effort to assess the potential health risks associated with exposure to microplastics, a project aiming to look at the exposure from the environment, including exposure via food, water and air had been undertaken.
23. Working with a group of international experts, WHO has assessed human health risks arising from exposure to microplastic particles from the environment, identified research needs and outlined the scope of future work needed on microplastic particles. A virtual expert consultation was held in March 2022 and a final report was adopted by the working group. The report is being prepared for publication and it is expected to be published during the second half of 2022.

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<sup>3</sup> REP19/CF, paras. 179 - 181

<sup>4</sup> REP21/CF14, paras. 224 - 227

<sup>5</sup> CX/CF 22/15/3

### Drinking water quality

24. In March 2022, WHO published the updated Guidelines for Drinking-Water Quality. WHO re-established a guideline value for manganese. In this updated guideline, a provisional guideline value of 0.08 mg/L was established. The guideline value is provisional due to the high level of uncertainty in the database.

### WHO Global Strategy for Food Safety

25. The WHO Global Strategy for Food Safety covering the period 2022-2030 was endorsed by the WHO Executive Board in February 2022. It updates the last strategy to address current and emerging challenges, incorporate new technologies and include innovative approaches for strengthening national food safety systems.
26. In developing this strategy WHO has had support from a broad range of scientific experts and international partners such as FAO and the OIE and WHO Member States.
27. The WHO Global Strategy for Food Safety has been developed to guide and support Member States in their efforts to prioritize, plan, implement, monitor and regularly evaluate actions needed to reduce the burden of foodborne diseases.

### Burden of foodborne diseases

28. Given a new WHO mandate to update its global burden estimates of foodborne diseases by 2025, WHO re-established in May 2021 its technical advisory group, “*Foodborne Disease Burden Epidemiology Reference Group (FERG)*” with 26 new members.
29. Two expert meetings were organized in 2021 and a third meeting was held in April 2022.
30. FERG is finalizing its work on three primary activities, (1) estimating the global burden of foodborne diseases, (2) providing country support on the national estimation of foodborne disease burden and (3) developing a methodology to monitor progress against the new global food safety strategy with appropriate indicators and targets.
31. WHO plans to expand a list of hazards that will be included in the next estimates, including chemicals and toxins, expecting to further improve the methodology to understand the burden.
32. To support future work in this area, WHO published a new guidance entitled, “*Estimating the burden of foodborne diseases: A practical handbook for countries*” in 2021, aiming to help Member States assess causes, magnitude and distribution of foodborne diseases through the estimation of the public health burden of foodborne diseases at the national level.

### FAO’s case study “*Food safety considerations to achieve best health outcomes under limited food availability situations*”<sup>6</sup>

33. This FAO report lays out some food safety considerations that might be helpful in situations where the impact of limited food availability is mitigated through food aid. The case study, by using two scenarios (lead in maize and fumonisins in cereal grains), provides risk management recommendations on how to best protect food safety while considering food security.

### FAO’s report on Food Safety Foresight

34. The FAO publication “Thinking about the future of food safety – A foresight report”<sup>7</sup> analyses some important emerging issues in food and agriculture with a focus on food safety implications, including climate change, changing consumer behaviour, new food sources and food production systems (e.g. edible insects, jellyfish, seaweed, plant-based alternatives and cell-based food production), technological innovations, microbiome science, circular economy and food fraud.

### Microplastics in food

35. FAO has developed a report that compiles most up to date information on microplastics in all food commodities. The report was finalized during an expert meeting and will be published later in 2022. This process sets up the basis for future risk assessment exercises and provides information that can be used for the formulation of risk management options.

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<sup>6</sup> <https://www.fao.org/documents/card/en/c/cb8715en>

<sup>7</sup> <https://www.fao.org/documents/card/en/c/cb8667en>

Risk-Benefits of Fish consumption

36. Over the last ten years, new evidence has become available regarding the risks and benefits of fish consumption. For this reason, FAO and WHO will update the advice given by the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption in 2010<sup>8</sup>. The new report will be based on the deliberations of a new expert consultation on the health benefits and risks associated with fish consumption.

Seaweed and food safety

37. Increased cultivation and utilization of seaweed are expected to be essential pillars of sustainable food security and become an integral part of the aquatic economy. However, legislation and guidance documents on seaweed production and utilization are generally lacking. In this regard, FAO and WHO developed a report identifying food safety hazards linked to the consumption of seaweed and aquatic plants, which can serve as a basis for undertaking further work in this area. The document was finalized during an expert meeting and will be published in 2022.

FAO Strategic Priorities for Food Safety within the FAO Strategic Framework 2022-2031

38. The FAO Strategic Priorities for Food Safety are articulated around four Strategic Outcomes that resulted from an iterative consultative process led by FAO with its Members and international partner organizations, including, notably, WHO and Codex. FAO expects the Strategic Priorities to encourage a more consistent integration of food safety in the development of sustainable and inclusive agri-food systems, food security policies and agriculture development strategies. The FAO Strategic Priorities for Food Safety will be discussed at the upcoming session of the FAO COAG (July 2022) prior to submission to the FAO Council in December 2022.
39. CCCF noted the information provided and thanked FAO and WHO for their continued support to the work of CCCF.

**MATTERS OF INTEREST ARISING FROM OTHER INTERNATIONAL ORGANIZATIONS (Agenda Item 4)<sup>9</sup>**

40. The representative of the Joint FAO/IAEA Centre introduced the item and summarized the information provided in the written report related to nuclear and related techniques for food safety and control plus radioactivity in food. This included an update on ongoing international work on radionuclides in food, feed and drinking water in non-emergency situations. This technical work was concluding. Three documents were in preparation, one was already published online as preprint FAO, IAEA and WHO Safety Report 114 '*Exposure due to Radionuclides in Food Other Than During a Nuclear or Radiological Emergency. Part 1: Technical Material*'. It includes information on the observed distributions of concentrations of key natural radionuclides in various foods, the use of dietary surveys to assess ingestion doses arising from exposure to radionuclides and it also provides information on radionuclide concentrations in natural mineral waters, in aquaculture and in other foods collected from the wild. A part 2 document is also *in press*. It will put forward proposals that competent authorities could use to implement radiation safety standards as they relate to radioactivity in food in existing exposure situations. The third document in preparation is the information document that will be presented at the next CCCF after circulation to Codex Members for comments.

Conclusion

41. CCCF noted the information provided and thanked the Joint FAO/IAEA Centre for their work on contaminants in food and feed.

**MAXIMUM LEVEL FOR CADMIUM IN COCOA POWDER (100% total cocoa solids on a dry matter basis) (at Step 4) (Agenda Item 5)<sup>10</sup>**Editorial Amendment to the MLs for cadmium adopted by CAC44 (2021)

42. The Codex Secretariat informed CCCF that the template to present MLs for adoption by CAC and inclusion in the *General Standard for Contaminants in Food and Feed* (CXS 193 – 1995) required information on the “portion of the commodity to which the ML applies” and that this information was missing for the MLs for cadmium for the two categories finalized at CCCF14 and adopted by CAC44.
43. The Codex Secretariat noted that the same description that applied to the other categories of chocolates adopted by CAC42 (2019) would also apply and would be presented to CAC for adoption as an editorial amendment to the MLs for chocolates containing or declaring <30% total cocoa solids on a dry matter basis and chocolates containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis.

<sup>8</sup> [Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption. Rome, 25-29 January 2010](#)

<sup>9</sup> CX/CF 22/15/4

<sup>10</sup> CL 2022/14-CF; CX/CF 22/15/5; CX/CF 22/15/5-Add.1 (Canada, Chile, Ecuador, Egypt, EU, Iraq, Kenya, Peru, Syrian Arab Republic, Tonga, Uganda, USA, AU, FoodDrinkEurope, IFT and ICA)

Maximum level for cadmium in cocoa powder (100% total cocoa solids on a dry matter basis)

44. Ecuador, as Chair of the EWG, speaking also on behalf of the co-Chair Ghana, introduced the item and provided a summary of the discussion held at CCCF14 including the mandate of the EWG, the work process followed in the development of the MLs as well as key points of discussion, conclusions and recommendations for consideration by CCCF.
45. The EWG Chair recalled that CCCF14 had considered 2 scenarios based on (1) analysis of GEMS/Food data and (2) proportionality, where 2 sets of MLs were proposed for each scenario accompanied with rejection rates on a worldwide and regional basis, in particular, for the LAC region, which presented the highest regional rejection rates and that data in GEMS/Food for cocoa powders did not clearly show the declared percentage of cocoa in the analysed samples and whether they referred to intermediate or final products. Following a JECFA call for data issued in December 2021 on “cocoa powder containing or declaring 100% total cocoa solids ready for consumption”, the EWG reconsidered the data from GEMS/Food as well as comments submitted at CCCF14, in particular the relevance of the non-fat solids fraction for the calculation of MLs for chocolates and cocoa powder,. It was therefore decided to follow the ALARA Principle and present only the data analysis based on GEMS/Food and not on the proportionality approach. The EWG Chair further recalled that focus of the discussion was on trade harmonization, as the JECFA Secretariat had already indicated that at global level, there was no health benefit (i.e., a reduction in dietary exposure to cadmium) gained from establishing an ML on any cocoa containing products.
46. The Chair recalled that CCCF14 had agreed to postpone discussion on the MLs for this category by one year to allow more data submission and proposals for MLs and that if no new data were submitted, the current data set would be used to derive the ML and thus encouraged delegates to work to complete work on this ML at the present session.

**Discussion**

47. CCCF considered the ML proposals ranging between 2.0 and 3.0 mg/kg for cocoa powder (100% total cocoa solids on a dry matter basis) ready for consumption and noted the following comments:
48. A member organization indicated that cocoa products were an important contributor to the exposure to cadmium in their region and that many of their consumers exceeded the EU TWI and that cocoa products are important contributors to the EU exposure. It was therefore important to establish a stricter ML of 0.60 mg/kg for cocoa powder to ensure a high level of health protection for all consumer groups especially the more vulnerable young consumers. The member organization further noted that the ALARA Principle should be applied on data, which were obtained from crops on which good practices were applied and highlighted the importance of finalizing the Code of practice for the prevention and reduction of cadmium contamination in cocoa beans to enable the implementation of good practices, which would lead to the reduction of cadmium contamination in cocoa beans and their products and thus assist in achieving levels that ensure a sufficient level of health protection, in particular of children, a vulnerable group of the population. As an alternative, the member organization could agree not to set an ML for this category, as cocoa powder was a commodity of less significance for international trade.
49. Other members also in favour of MLs lower than 2.0 to 3.0 mg/kg indicated that:
- A stricter ML of 0.6 mg/kg was in line with their national regulations.
  - More time/research was needed to collect data to contribute to the establishment of a more geographical representative ML.
  - An ML of 1.3 mg/kg would be a compromise to ensure food safety and to ensure fair practices in food trade especially for regions like Africa as the main role of Codex was to protect consumer’s health and not to reduce rejection rates.
50. Members in favour of the application of the proportionality approach indicated that:
- An ML of 1.3 – 1.5 mg/kg was proportional to the MLs that had been adopted for the 4 categories of chocolates, were consistent with the approach agreed by CCCF for the establishment of MLs for chocolates and other cocoa-derived products such as cocoa powder and was in line with values presented at CCCF14.
  - CCCF had previously agreed to consider proportionality based on total cocoa solids. An ML of 2.0 mg/kg could be supported considering the proportionality approach and the issues raised in relation to the non-fat component of cocoa powder. An ML of 3.0 mg/kg was not proportional to the MLs established for the different categories of chocolates by CCCF.

51. Members in favour of an ML of 2.0 mg/kg indicated that:
- An ML of 2.0 mg/kg based on global GEMS/Food data indicated that this ML was protective of consumer's health while ensuring a minimum negative impact on trade as the rejection rate was 5%. It was noted that, following the finalization and implementation of the Code of practice for the prevention and reduction of cadmium contamination in cocoa beans, the ML could be reassessed within some years and this approach was consistent with decisions made by CCCF on other MLs for contaminants.
52. Members in favour of an ML between 2.0 – 3.0 mg/kg indicated that:
- An intermediate ML between 2.0 – 3.0 mg/kg could be a good compromise to ensure an acceptable rejection rate for all regions, especially those regions producing cocoa beans, noting that an ML closer to 3.0 mg/kg could result in relatively small intake reduction comparing with 2.0 mg/kg, which would result in a significant increase in the rejection rates for regions, especially the LAC region.
53. Members in favour of an ML of 3.0 mg/kg indicated that:
- MLs set by CCCF are based on independent international scientific advice provided by JECFA which concluded that the total cadmium exposure including for high consumers of cocoa and cocoa products was not considered to be a health concern at a global level.
  - MLs for cadmium in cocoa products have no impact on public health, but on fair practices in trade and should thus be based on achievability and fairness to reduce any negative impact on trade. There was therefore a need to achieve trade harmonization with the lowest possible rejection rates.
  - Countries with geological conditions that may result in naturally high concentrations of cadmium in the soil should not be penalised where there is no public health concern nor safety benefit from setting an ML.
  - The ML was a reasonable global compromise from the perspective of practical achievability while an ML of 2.0 mg/kg would result in unacceptably high reject rates for cocoa powder that would unnecessarily penalize one producing region (i.e., LAC producing countries).
  - The ML would be consistent with a target rejection rate of up to 5% on a worldwide basis as well as on a regional basis.
  - The ML complemented the MLs for chocolates with different percentages of total cocoa solids on a dry matter basis agreed to by CCCF.
54. Two observers supported the proposed ML range of 2.0 – 3.0 mg/kg as provided in their written comments (CX/CF 22/15/5-Add.1).
55. The FAO JECFA Secretariat noted that as many delegations pointed out, JECFA had performed an evaluation of the exposure to cadmium from all foods. It had been demonstrated in the reports of JECFA that the exposure to chocolate or cocoa products in general was rather minimal compared to other dietary sources of cadmium. Hence lower MLs would have no appreciable or very limited appreciable health benefits. The health concern expressed by some delegations in relation to the dietary exposure of children to cadmium in cocoa powder was not supported on a global level by JECFA's scientific conclusion.
56. The WHO JECFA Secretariat reminded CCCF that as JECFA had noted in their assessment of dietary exposure to cadmium from cocoa, cocoa is not a major contributor to cadmium exposure – even through children in some regions with a high intake of chocolate are exposed to higher intake of cadmium than children in regions with a lower intake of chocolate. He further noted that a high intake of especially chocolate with a high fat content might raise other health concerns than the concerns that relate to cadmium.
57. A member organization noted that their regional food safety authority had established a lower TWI and that JECFA91 (2021) had concluded that the cocoa products can contribute up to 9% of the exposure of European children and when cocoa products come from the Latin American region, that it could even go up to 39% of the exposure. The Member Organization indicated that this justified the need to set a strict ML for cadmium from cocoa products for their consumers.

### **Conclusion**

Editorial amendment to the MLs for chocolates containing or declaring <30% total cocoa solids on a dry matter basis and chocolates containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis

58. CCCF agreed to forward the editorial amendment to the MLs for the aforesaid categories of chocolates for adoption by CAC (Appendix II).

MLs for cocoa powder (100% cocoa solids on a dry matter basis)

59. CCCF agreed to advance an ML of 2.0 mg/kg for cocoa powder (100% total cocoa solids on a dry matter basis) to CAC for adoption at Step 5/8 (Appendix II).
60. Reservations to this decision were expressed as follows:
- The EU expressed its reservation as per the rationale provided in paragraphs 57.
  - Cameroon expressed its reservation as they favoured a lower ML of 1.3 mg/kg as a compromise solution to ensure food safety especially of the most vulnerable groups i.e., children as well as fair practices in trade.
  - Egypt expressed its reservation in view of the enforcement of a lower ML of 0.6 mg/kg.
  - Uganda expressed its reservation as they were in the process of generating data that could contribute to the discussion on the establishment of a ML for cocoa powder and would therefore not support the establishment of an ML for cocoa powder at this point in time.
61. The Chair reminded CCCF that all technical issues had been thoroughly discussed and urged Codex members to respect the decision made at this session and not to reopen such discussions at CAC.

**CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF CADMIUM CONTAMINATION IN COCOA BEANS (at Step 7) (Agenda Item 6)<sup>11</sup>**

62. Peru, as Chair of the EWG, speaking also on behalf of the co-Chair, Ecuador, introduced the item and recalled that the CoP had been adopted at Step 5 by CAC44 and that the EWG had further revised the CoP based on the comments submitted to and made at CCCF14. The EWG Chair explained that a further revised CoP had been prepared taking into account the comments submitted in reply to CL 2022/15-CF which resulted in the removal of measures that were still experimental, thus the CoP focused primarily on those measures that were shown to be effective in practice, the definitions had been revised for purposes of clarification and that the CoP had been restructured to separate out measures recommended for short and medium-term practices from those recommended for long-term practices under the different sections of the Code. He proposed that CCCF consider the revised CoP in CRD31.

**Discussion**

63. CCCF agreed with most of the revised proposals presented in CRD31 and in addition to editorial amendments and amendments to improve clarity or for flexibility, CCCF took the following additional decisions:

Definitions

64. CCCF agreed to replace the definition for “cachaza” with a definition for “cane by-product (bagasse)” as more appropriate for the Code and to replace the term “cachaza” with “cane by-product (bagasse)” throughout the text.

Section 4.1.1

65. CCCF agreed to:
- amend paragraph 11 to better explain the reason why it was recommended to consult a qualified professional and to delete the reference to “endophologist” as the term was not well understood;
  - retain paragraph 14. While there were no recommendations on cadmium levels in cocoa growing areas, it was important to indicate that acidity of soil affects acceptable cadmium soil levels, while not referring to any specific soil pH or related concentration of cadmium in the soil;
  - retain paragraph 17, as it contained useful information for producing countries to shade cocoa plants at the beginning on a temporary basis for a better assimilation or uptake of nutrients despite the efficacy of agroforestry not being demonstrated in changing cadmium concentrations in cocoa beans; and
  - retain paragraph 18 as it was important to avoid exposure of cocoa plantations from emissions from combustion engines but agreed to make the provision more flexible by including “if possible”.

Section 4.2.1

66. CCCF agreed to make the recommendation in paragraph 23 more flexible by inserting “where available” since it was possible that some countries did not have accredited laboratories or available certified reference materials for soil analysis.

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<sup>11</sup> CL 2022/15-CF; CX/CF 22/15/6; CX/CF 22/15/6 Add.1 (Canada, Chile, Ecuador, Egypt, EU, Iraq, Kenya, Saudi Arabia, Uganda, USA, AU, FoodDrinkEurope, ICUMSA and ICA)

Section 4.3

67. CCCF agreed to:

- delete “export organization” and to rephrase paragraph 45 to clarify that fermentation of cocoa beans was carried out by producers to develop chocolate flavours; and
- indicate that the use of *Saccharomyces cerevisiae* was still experimental in paragraph 47 but was useful to retain in the CoP for reference.

Conclusion

68. Noting that all issues had been resolved, CCCF agreed to forward the Code of practice for the prevention and reduction of cadmium contamination in cocoa beans to CAC for adoption at Step 8 (Appendix III).

**MAXIMUM LEVELS FOR LEAD IN CERTAIN FOOD CATEGORIES (at Step 4) (Agenda Item 7)<sup>12</sup>**

69. Brazil, as Chair of the EWG, introduced the item and provided a summary of the discussion held at CCCF14 including the mandate of the EWG and presented revised proposals for MLs for the food categories under consideration based on written comments submitted in reply to CL 2022/16-CF. The EWG Chair provided a description of the methodology used to review the MLs and the rationale for the new proposals as presented in CRD26.

**General matters**

70. The EWG Chair clarified that the cut-off value of 5% was used as the maximum rejection rate for an ML, but not as the target. Therefore, rejection rates may vary below 5%.

**Discussion on MLs**

71. CCCF agreed to consider the revised proposed MLs as follows:

Eggs

72. The EWG Chair invited CCCF to consider either:

- establishing an ML of 0.25 mg/kg for fresh eggs (chicken and ducks) considering the performance criteria laid down in the Procedural Manual of the CAC and that the methods used to analyse 95% of the egg samples had an LOQ of 0.05 mg/kg; or
- to not establish an ML for this category considering its low relevance for international trade and the low occurrence levels observed.

Conclusion

73. CCCF agreed to discontinue work on MLs for lead in fresh eggs based on the rationale provided above.

Cereal-based foods for infants and young children

74. The EWG Chair invited CCCF to consider a lower ML of 0.02 mg/kg for cereal-based foods for infants and young children expressed as “as is” following a review of the dataset by which samples with an LOQ > 0.02 mg/kg were removed and would result in a rejection rate of less than 5% of the samples.

Discussion

75. Delegations, while generally supporting an ML of 0.02 mg/kg, posed the following questions for clarification:

- The availability of suitable methods of analysis to meet the performance criteria to enforce an ML of 0.02 mg/kg as only 15% of the samples in the GEMS/Food dataset had an LOQ < 0.02 mg/kg. It was noted that occurrence data available, for instance, in the EU, showed that this ML was achievable from the ALARA and analytical point of view.
- This food category may be presented in dry and wet formulation and may also include multi-ingredient meals. It was not clear whether the cereal-based foods for infants and young children expressed as “as is” in the GEMS/Food database would account for the whole category and whether there would be analytical methods suitable to analyse the different types of presentation or ingredients under this category. If the dataset of this category contains both dried and wet type foods, the current proposed ML may be inadvertently high for wet type foods. For high level health protection of infants and young children, the ML could apply to the commodity on a “dry matter basis” as in the case of the ML for deoxynivalenol (DON) for this category.

<sup>12</sup> CL 2022/16-CF; CX/CF 22/15/7; CX/CF 22/15/7-Add.1 (Canada, Chile, China, Cuba, Ecuador, Egypt, Iraq, Kenya, New Zealand, Peru, Saudi Arabia, Singapore, Syrian Arab Republic, Türkiye, Uganda, USA, FoodDrinkEurope, IACFO and ICA)



- The wording “as is” does not clearly describe the format and basis to which the ML for lead for ‘cereal-based foods for infants and young children’ applies. In order to advance an ML of 0.02 mg/kg for lead in this commodity, it was recommended that wording in the ‘Portion of the Commodity/Product to which the ML Applies’ column of the GSCTFF read as follows: “as sold; not reconstituted or otherwise prepared for consumption”. The wording used to describe MLs in cereal-based foods for infants and young children should align for all MLs if they apply to the same form and basis of the same food commodities. Further, the wording used to describe the DON ML for this commodity (the “ML applies to the commodity on a dry matter basis”) was not intended to apply to fully desiccated food products containing 0% moisture, but rather to the form in which it is typically sold, which are expected to contain between approximately 1 and 9% moisture, depending on the food. It was therefore proposed that wording to describe the lead, aflatoxin and DON MLs for ‘cereal-based foods for infants and young children’ in the ‘Portion of the Commodity/Product to which the ML Applies’ column would be aligned to read as follows: “as sold; not reconstituted or otherwise prepared for consumption”.

76. A Member further noted that, while supporting an ML of 0.02 mg/kg, they could also support further work on this food category, based on the issues raised on analytical methods and clarity on the food commodities to which the ML applies.
77. An Observer supported the establishment of an ML for this food category that was globally achievable but questioned whether further work on this food category, including more geographic representative data, might be desirable to ensure that the ML was globally achievable. They also supported the addition of text to better clarify what was meant by “as is”.
78. Another Observer noted that there was no safe level of exposure that could be identified for infants and young children. They supported the establishment of a lower ML with a rejection rate higher than 5% given the public health concerns associated with dietary exposure of infants and young children to lead through these products for both cereals-based foods for infants and young children and ready-to-eat meals for infants and young children.

#### Conclusion

79. CCCF agreed to:
- forward an ML of 0.02 mg/kg for lead in cereal-based foods for infants and young children to CAC for adoption at Step 5/8; and
  - clarify that the ML applies to the product “as sold; not reconstituted or otherwise prepared for consumption”.

#### Ready-to-eat meals for infants and young children

80. The EWG Chair invited CCCF to consider the revised proposed ML of 0.02 mg/kg for ready-to-eat meals for infants and young children following a review of the dataset by which samples with an LOQ > 0.02 mg/kg were removed and the rejection rate was less than 5% of the samples.

#### Discussion

81. Delegations generally supported an ML of 0.02 mg/kg for this food category.
82. A Member noted that there are certain foods that are very nutritious but may have slightly higher occurrence levels, e.g. certain root vegetables, which might require a separate treatment. It was suggested to advance the ML to Step 5 to allow additional time to review this category to identify if any foods need to have a separate ML, similar to the decision taken by CCCF on the separate MLs for lead in grape juices and berry/small fruit juices. This view was supported by an Observer who stressed the need to establish MLs that were globally achievable and that an ML of 0.02 mg/kg for certain food commodities such as root vegetables might be difficult to comply with and more time might be needed to review data for these food types.
83. Another Member expressed their support for an ML of 0.02 mg/kg for the entire food category. They noted that data from their region indicated that all different categories of baby foods could achieve this ML and that for these foods the ingredients should be selected in such a way that this ML can be achievable.

#### Conclusion

84. CCCF agreed to forward an ML of 0.02 mg/kg for lead in ready-to-eat meals for infants and young children to CAC for adoption at Step 5 and further consideration in the EWG as per the possible exclusion of certain foods that may not be able to achieve this ML for consideration at CCCF16 (2023).

#### Culinary Herbs

85. The EWG Chair invited CCCF to consider MLs for fresh culinary herbs (excluding rosemary), rosemary (fresh) and dried culinary herbs and explained that no lower values could be proposed based on the available GEMS/Food dataset. She indicated the proposed MLs as follows:

- 0.25 mg/kg for fresh culinary herbs (excluding rosemary)
- 0.5 mg/kg for rosemary (fresh)
- 2 mg/kg for dried culinary herbs

86. As an alternative, the EWG Chair proposed to discontinue work on MLs for fresh culinary herbs as they were not significantly traded at the international level. She further noted that to better address comments submitted to this session in relation to the proposed ML for dried culinary herbs, and in view of the inconsistencies identified in the GEMS/Food dataset, an additional call for data could be issued to further review this category/ML.

#### Discussion

87. CCCF noted the following comments:

- Work on fresh culinary herbs should continue as there was a growing international market for these products and there was sufficient data available from GEMS/Food to propose an ML while there was still a need to further assess the possible exclusion of other commodities and rejection rates associated with the MLs proposed. A higher ML of 0.3 mg/kg with a rejection rate of 3.8%, the same as for leafy vegetables, could be supported as opposed to 0.25 mg/kg with a rejection rate of 4.5% which would avoid any practical difficulties for competent authorities when implementing the ML for both fresh leafy vegetables and fresh culinary herbs.
- Other commodities besides rosemary, e.g. fresh oregano/thyme, might also need to be excluded from the ML for fresh culinary herbs as they might not achieve an ML of 0.25 or 0.3 mg/kg thus resulting in unacceptable rejection rates. An ML of 0.25 mg/kg excluding rosemary, oregano and thyme could be supported.
- Work can continue but should also consider other widely used fresh herbs such as cilantro which were not included in the analysis of the EWG.
- Work could continue on fresh and dry culinary herbs, however, no ML should be set at this Session and instead more data should be collected to establish an ML that is geographically representative and globally achievable.
- There was sufficient data available to set MLs for fresh and dried culinary herbs, however, a new call for data could be issued but in case that no new or few data are submitted, CCCF should proceed to establish MLs with the available data.

88. The EWG Chair explained that it would be useful that data submitters could differentiate between fresh and dried culinary herbs and to better specify the food categories under the two broader categories. This would allow a refinement of the data assessment carried out by the EWG. She emphasized that this would only be possible if there was commitment from members to submit such data.

89. The JECFA Secretariat noted that it could be difficult to re-edit data already submitted on GEMS/Food but in any case, a new call for data could be issued with specific requirements to facilitate the work of the EWG in making proposals for MLs for this category for consideration by CCCF.

#### Conclusion

90. CCCF:

- agreed to return the MLs to Step 2/3 for further consideration by the EWG based on a new JECFA call for data in 2022; and
- encouraged interested Codex members to submit data with clear identification of the dried/fresh state of the samples to GEMS/Food to consider proposals for MLs for fresh and dried culinary herbs at CCCF17 (2024) and if no agreement is reached at CCCF17 to discontinue work on this category.

#### Spices

91. The EWG Chair indicated that, based on the comments received in reply to CL 2022/16-CF, there was no support to establish an ML for dried garlic, there was already an ML of 0.1 mg/kg for fresh garlic in GSCTFF and invited CCCF to consider discontinuation of work on dried garlic. In addition, she noted that it was not possible to further refine the assessment performed by the EWG to provide revised MLs for consideration by CCCF in view of inconsistencies found in the GEMS/Food dataset and recalled the previous discussion on fresh and culinary herbs. She proposed that a new call for data be issued to address these inconsistencies to allow the EWG to reassess/refine the data assessment and propose MLs for consideration by CCCF.

Conclusion

92. CCCF:

- agreed to discontinue work on an ML for lead in dried garlic;
- agreed to return the MLs for spices to Step 2/3 for further consideration by the EWG based on a new JECFA call for data in 2022 for dried spices;
- encouraged interested Codex members to submit data to GEMS/Food in order to consider proposals for MLs for dried spices at CCCF17 (2024); and
- noted the commitment of India to submit data on spices.

Sugars

93. Based on comments received in reply to CL 2022/16-CF, the EWG Chair explained that there was general support for an ML of 0.1 mg/kg for all sugars and an ML of 0.06 mg/kg for honey. Considerations could also be given to an ML of 0.1 mg/kg for honey due to some results being based on methodologies using higher LOQ values which might require a higher ML for this product. A separate ML for brown and raw sugar could be established as it is a high-value commodity in international trade that is likely to contain more lead than white or refined sugar .

94. Following a reassessment of the GEMS/Food dataset, the EWG Chair explained that for any sugar, rejection rates were less than 5% with a hypothetical ML of 0.1 mg/kg and thus a single ML of 0.1 mg/kg for white sugar and refined sugar, syrups and honey with rejection rates of less than 5% could be established. She further advised CCCF not to establish an ML for molasses due to the low sample size (n=20) and to consider the appropriateness of a separate ML for brown and raw sugar.

95. CCCF noted the following comments:

- A higher ML of 0.1 mg/kg for honey was preferable due to its lower consumption comparing to sugars; the lowest limit for lead in honey in international trade was 0.1 mg/kg; any ML below 0.1 mg/kg might have a negative impact on international trade; the data available on GEMS/Food was very limited as data from major producing countries were not represented.
- Separate MLs for blossom/nectar honey and honeydew honey as defined in the *Standard for Honey* (CXS 12-1981) were preferable as the lead concentrations were different due to environmental factors in production areas. It was reiterated that data available in GEMS/Food were very limited, missing data from major producing countries and did not specify to which honey the data applied. MLs of 0.15 mg/kg and 0.1 mg/kg for blossom/nectar honey and honeydew honey, respectively, could be established based on data available from a major producing country.
- Other international and national standards have established an ML of 0.5 mg/kg for white sugar. A country had set an ML of 0.2 mg/kg for white and refined sugars based on national data. More data would be needed to set an ML that is geographically representative to ensure global achievability. The implementation of the recently revised *Code of practice for the prevention and reduction of lead contamination in foods* (CXC 56-2004) could further assist in reducing lead contamination sources and allow the establishment of lower MLs.
- A single ML of 0.1 mg/kg for white sugar and refined sugar, honey and syrups could be established. However, the ML should not apply to all syrups but only to corn and maple syrups as data available in GEMS/Food might not support a general ML of 0.1 mg/kg to cover all syrups.
- A separate higher ML for brown and raw sugar should be established for the reasons given in paragraph 93.
- There was not sufficient data to establish an ML for molasses now, but data collection and work should continue on molasses.

Conclusion

96. CCCF agreed to:

- forward an ML of 0.1 mg/kg for lead in white sugar and refined sugar, honey, corn and maple syrups to CAC for adoption at Step 5/8;
- consider an ML for brown and raw sugars based on data available from GEMS/Food and to submit a proposal for consideration by CCCF16 (2023); and
- discontinue work on an ML for molasses.

Sugar-based candies

97. Based on the replies submitted to CL 2022/16-CF, the EWG Chair advised CCCF to discontinue work on an ML for candy powder as data available in GEMS/Food was from one country only. She noted that there was no consensus in the comments received on the proposed MLs for hard candies (including gummy and jellies) and soft candies and a single ML for all candies could be established as there was no justification for setting different values.
98. Following a reassessment of the GEMS/Food dataset, the EWG Chair advised CCCF to consider a single ML for all candies at 0.1 mg/kg which still provided a rejection rate below 5%.

Discussion

99. An Observer recommended not to set an ML for candies but only for the raw materials, e.g. sugars and that international harmonization of MLs for raw materials would already ensure the safety of the sugar-based products and facilitate trade.
100. A Member indicated that they would prefer to set a single ML for all candies including candy powder as data available on GEMS/Food came from their country and candy powder was an important potential source of lead exposure for children. CCCF concurred with this proposal.

Conclusion

101. CCCF agreed to forward an ML of 0.1 mg/kg lead in sugar-based candies to CAC for adoption at Step 5/8.

**General Conclusion**

102. CCCF agreed to:
- i. forward the MLs for lead in cereal-based foods for infants and young children at 0.02 mg/kg; white and refined sugar, corn and maple syrups, honey at 0.1 mg/kg and sugar-based candies at 0.1 mg/kg to CAC for adoption at Step 5/8 (see paragraphs 79, 96, 101) (Appendix IV);
  - ii. forward the ML for ready-to-eat meals for infants and young children at 0.02 mg/kg to CAC for adoption at Step 5 (see para. 84) (Appendix IV);
  - iii. Discontinue work on fresh eggs, dried garlic and molasses and to inform CAC accordingly (see paragraphs 73, 92, 96); and
  - iv. re-establish the EWG, led by Brazil, working in English only, to consider the following:
    - a. MLs for ready-to-eat meals for infants and young children (exclusion of certain foods) and brown and raw sugars based on data currently available on GEMS/Food for consideration by CCCF16 (2023).
    - b. MLs for culinary herbs (fresh/dried) and spices (dried) following a JECFA call for data in 2022 for consideration by CCCF17 (2024).
103. CCCF recommended that the EWG works in close collaboration with the EWG on data analysis to ensure consistency in the methodology applied to derive the MLs, as information becomes available.
104. CCCF also encouraged all interested Members to submit data to GEMS/Food in response to the JECFA calls for data on culinary herbs and dried spices to facilitate the work of the EWG and discussion and decision-making at CCCF.

**MAXIMUM LEVELS FOR METHYLMERCURY IN CERTAIN FISH SPECIES AND ASSOCIATED SAMPLING PLANS (ORANGE ROUGHY AND PINK CUSK EEL) (at Step 4) (Agenda Item 8)<sup>13</sup>****METHYLMERCURY IN FISH: FEASIBILITY TO ESTABLISH A MAXIMUM LEVEL FOR PATAGONIAN TOOTHFISH AND OTHER RISK MANAGEMENT RECOMMENDATIONS FOR METHYLMERCURY IN FISH (Agenda Item 13)<sup>13</sup>**

105. New Zealand, as Chair of the EWG, speaking also on behalf of the co-Chair Canada, introduced the item and provided the key points in relation to the proposals for the MLs for orange roughy and pink cusk eel, the possible ML for Patagonian toothfish, the sampling plans and the review of risk management measures for methylmercury in fish. She summarized the process followed by the EWG, the conclusions and recommendations for consideration by CCCF.

MLs for orange roughy and pink cusk eel

106. CCCF agreed with the ML of 0.8 mg/kg for orange roughy and 1.0 mg/kg for pink cusk eel and to advance these MLs to CAC for adoption at Step 5/8.

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<sup>13</sup> CL 2022/17-CF; CX/CF 22/15/8; CX/CF 22/15/8 Add.1 (Canada, Chile, Ecuador, Egypt, Iraq, Kenya, Peru, Saudi Arabia, Singapore, Uganda and USA)

Sampling plans

107. CCCF agreed to continue work on the sampling plans as outlined in CX/CF 22/15/8 and agreed that monetary value of the fish would not be included in the provisions of the sampling plans.
108. CCCF further agreed to request information on national sampling plans through a CL and that the work of CCMAS on the revision of the *General Guidelines on Sampling* (CXG 50 2004) should be considered in the work on sampling plans.
109. Noting that sufficient time should be provided to gather the information on national sampling plans and that CCMAS intended completion of its work on the revision of the *General Guidelines on Sampling* by June 2023, CCCF agreed that the recommendations for the sampling plans would be considered at CCCF17 (2024).

ML for Patagonian toothfish

110. CCCF agreed to abandon work on the establishment of an ML for Patagonian toothfish due to the lack of sufficient data following several calls for data. CCCF further noted that an ML for this species could be considered in the future when data became available and that any members could make a proposal for new work in the future.

Other risk management issues

111. CCCF agreed to abandon work on guidance on other risk management issues and to consider incorporating certain risk management measures (e.g. catch, sorting) in the sampling plan, if relevant.

Conclusion

112. CCCF agreed to:
- i. advance the MLs of 0.8 mg/kg for orange roughy and of 1.0 mg/kg for pink cusk eel (Appendix V) to CAC for adoption at Step 5/8;
  - ii. abandon work on the ML for Patagonian toothfish and on a separate guidance paper for the management of methylmercury in fish;
  - iii. re-establish the EWG chaired by New Zealand and co-chaired by Canada, working in English, to develop the sampling plan taking into account the:
    - a. Recommendation of the Committee in paragraphs. 107 and 108.
    - b. Work of CCMAS on the revision of the *General Guidelines on Sampling* (CXG 50-2004).
    - c. Information from national sampling plans.
  - iv. request the Codex Secretariat to issue a CL in 2022 for information on national sampling plans for methylmercury in fish or other contaminants in fish; and
  - v. consider the work of the EWG at CCCF17.

**MAXIMUM LEVELS FOR TOTAL AFLATOXINS IN CERTAIN CEREALS AND CEREAL-BASED PRODUCTS INCLUDING FOODS FOR INFANTS AND YOUNG CHILDREN AND ASSOCIATED SAMPLING PLANS (At Step 4) (Agenda Item 9)<sup>14</sup>**

113. Brazil, as Chair of the EWG, speaking also on behalf of the co-Chair India, introduced the item and summarized the EWG work process, analysis of the data and recommendations for consideration by CCCF. The EWG Chair also explained that the WG had taken into account the decisions of CCCF14 in its discussions. She further informed CCCF that comments received on the MLs indicated general support for the establishment of lower MLs than those proposed in the report of the EWG and that CRD25 had been prepared to respond to the points raised in the comments and proposed that CCCF consider the revised proposals for MLs presented in CRD25.
114. CCCF noted that recommendations on sampling plans following the virtual meeting of the WG held prior to the session were presented in CRD9 and would be considered in the discussion.
115. CCCF agreed to consider proposed MLs as revised in CRD25.

**MAXIMUM LEVELS**ML for maize grain, destined for further processing – 20 µg/kg

116. Diverse views were expressed on the proposed ML.

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<sup>14</sup> CL 2022/18-CF; CX/CF 22/15/9; CX/CF 22/15/9-Add.1 (Canada, Ecuador, Egypt, EU, Iraq, Kazakhstan, Kenya, Peru, Rwanda, Saudi Arabia, Singapore, Uganda, USA, AU, ICUMSA, IFT, MSF, UNICEF and WFP)

117. Those delegations opposed to the proposed ML expressed the view that aflatoxin was a potent carcinogen and reduced exposure to aflatoxin was an important public health goal; and that MLs should be established as low as reasonably achievable by applying good practices to prevent contamination.
118. Some of these delegations also stated that maize was a staple in their countries and that at the level of 20 µg/kg, public health protection would not be achieved. These delegations furthermore noted that:
- It was difficult to distinguish between maize destined for human consumption and feed in some of their countries.
  - Dry-milling was used to further process the maize grain, which did not necessarily lead to a significant reduction in aflatoxin levels.
  - An ML of 10 µg/kg was already implemented at a country or regional level.
119. Proposals were made for MLs of 10 µg/kg and 5 µg/kg, respectively.
120. Those delegations supporting the proposed ML of 20 µg/kg, reminded CCCF that the ML was for grain destined for further processing and not for direct consumption by the consumer (not ready-to-eat) and that further processing would result in significant reduction of aflatoxin. They also proposed that the note explaining “destined for further processing” as for other MLs for cereal grains (e.g. DON) should be added to the notes/remarks for this ML. A view was expressed that the ML of 10 µg/kg could be problematic, particularly when the climate is such that aflatoxin occurrence increases; and considering the year-to-year variation as agreed by CCCF14, the revised ML of 20 µg/kg was preferred. This ML also results in significant health protection and lower MLs have minimal further impact on reducing dietary exposure. Based on the rejection rates presented, an ML of 20 µg/kg would also appear to have the least possible impact on food security and trade.
121. The Chair, noting the diverse views, proposed to consider an ML of 15 µg/kg as a compromise and noted that CCCF could review the ML within 5 years’ time to see if it could be adjusted. She further noted that Members should continue to implement the *Code of Practice on for the Prevention and Reduction of Mycotoxin Contamination in Cereals* (CXG 51 – 2003) and to generate and submit data to GEMS/Food for the later review of the ML. The other option was to discontinue work on this ML.
122. The JECFA Secretariat urged delegates to take into consideration that most health benefit would be achieved already by setting an ML of 20 µg/kg. While a comparatively lower ML of 15 or 10 µg/kg, respectively, would realize further incremental gains in its protective value for public health, the magnitude of those increments was considerably lower than and paled in comparison to the public health benefits that is realized by setting the ML at the higher end of the proposed values, compared to setting no ML. He emphasized that while it was the prerogative of members to set an ML, if and when public health is at the forefront, compromising on a higher ML provides a vastly superior public health benefit than a failure to set any ML.
123. The Representative of WHO expressed the view that while WHO would like to see an ML as low as possible for a potent genotoxic carcinogen such as aflatoxin he also noted the differences in views of which ML to establish. Therefore, in order to best protect public health under these circumstances, WHO informed CCCF that from a WHO perspective an ML for aflatoxins was better than no ML.
124. There was support for the Chair’s proposal in the spirit of compromise, although views continued to be expressed also in favour of an ML of 10 µg/kg or 20 µg/kg. It was also noted that rejection rates higher than 5% for maize grain for further processing might not have a huge impact on trade, as maize could be destined for other uses other than human consumption.
125. Those who continued to support an ML 10 µg/kg reiterated their views that this ML was preferred and already being implemented in their countries; that the level of 15 µg/kg would still pose a risk to the health of their consumers due to the high consumption of maize in their countries; and that dry milling would not significantly reduce aflatoxin levels.
126. A proposal was made to exclude maize subject to wet milling to which the ML of 15 µg/kg would apply. It was understood that wet milling would result in food products with much lower levels of aflatoxins than dry milling and the concern was that without this exclusion, the ML might be applied to maize for wet milling which would not be necessary.
127. In relation to continued data generation and submission to GEMS/Food for review of the ML in the future, it was clarified that new data should indicate whether it was maize intended for further processing or maize for direct human consumption, as the current ML was derived based on all data being bundled together because it was not possible to differentiate between the two.

Conclusion

128. CCCF agreed on the ML of 15 µg/kg with the same explanation in the notes on 'destined for further processing' as done for the ML for DON and noted the reservations of Kenya, Rwanda and Uganda for the reasons expressed in paragraph 124. CCCF agreed to review the ML in 5 years' time, and that Members should continue to generate and submit data to GEMS/Food, with the details as expressed in paragraph 127, and should continue to implement the *Code of Practice on for the Prevention and Reduction of Mycotoxin Contamination in Cereals* (CXC 51 – 2003). In advance of the consideration of reviewing the ML in 5 years' time, CCCF will consider whether a call for data should be issued.

ML flour, meal, semolina and flakes derived from maize – 10 µg/kg

129. Diverse views were expressed on the proposed ML.
130. The EWG Chair noted that MLs of 5 µg/kg and lower than 5 would result in rejection rates that exceed 5% in certain regions and pointed out that even though higher rejection rates were considered for maize grain while analysing year to year and regional variations, a more conservative approach should be taken for flour, meal, semolina and flakes derived from maize. A member indicated that the high non-compliance in their data submitted was related to targeted sampling.
131. Those not in favour of the ML, reiterated their views that MLs should be set as low as reasonably achievable. It was further noted that there was a large year-to-year variation in all regions of the world. Proposals were made for lower MLs of 2.5 µg/kg or 4 to 5 µg/kg. It was noted that an ML of 2.5 µg/kg, for example, would result in a significant reduction for human exposure to aflatoxins, with an acceptable rejection rate of 4%.
132. The Chair reiterated that data could be reviewed again within 5 years' time similar for the maize grain, to see if the ML could be adjusted and that Members were encouraged to continue to generate and submit data to GEMS/Food.

Conclusion

133. CCCF agreed on the ML of 10 µg/kg for flour, meal, semolina and flakes derived from maize and noted the reservations of Egypt, EU and Kazakhstan for the reasons expressed in paragraph 131. CCCF agreed to review the ML in 5 years' time and that countries should continue to generate and submit data to GEMS/Food. In advance of the consideration of reviewing the ML in 5 years' time, CCCF will consider whether a call for data should be issued.

ML for Husked rice – 20 µg/kg

134. Diverse views were expressed on the proposed ML.
135. Those in favour of the ML noted that it was already a compromise proposal and lower than the 25 µg/kg initially proposed by the EWG, with an appropriate rejection rate of 2.7%.
136. Those not in favour of the ML, expressed the view that:
- The ML should be set as low as reasonably achievable.
  - High consumption of husked rice in their countries, particularly because of its promotion as part of a healthier diet coupled with such a high ML may pose a greater risk to their consumers.
  - Lower MLs were already implemented at country or regional level.
  - It was difficult to distinguish rice destined for further processing from rice for direct consumption.
137. Proposals were made for MLs of 10 µg/kg and 5 µg/kg, respectively.
138. The Chair reminded CCCF that the ML under consideration was already a lower ML than the originally proposed ML of 25 µg/kg and that the ML could be reviewed in 5 years' time and that Members were encouraged to continue to generate and submit data to GEMS/Food.

Conclusion

139. CCCF agreed:
- on the ML of 20 µg/kg for husked rice noting the reservations of Egypt, EU, Kazakhstan, Kenya, Singapore and Sudan for the reasons expressed in paragraph 136; and
  - to review the ML in 5 years' time and that countries should continue to generate and submit data to GEMS/Food. In advance of the consideration of reviewing the ML in 5 years' time. CCCF will consider whether a call for data should be issued

ML for polished rice – 5 µg/kg

140. CCCF agreed with the ML of 5 µg/kg noting the reservation of India who proposed a higher ML..

ML for sorghum grain, destined for further processing – 10 µg/kg

141. CCCF supported the ML, while noting that the data used to derive the ML was mainly from one country and ideally, MLs should be based on more representative data. A proposal was made to set the ML at 15 µg/kg at this time and that the ML should be reviewed in 5 years' time with more data from different regions, especially those with high consumption of sorghum.

Conclusion

142. CCCF agreed to the ML of 10 µg/kg on the understanding that the ML would be reviewed in 5 years' time, that the same description for 'destined for further processing' would be added to the notes to the ML as would be done for maize grain and that Members were encouraged to continue to generate and submit data to GEMS/Food. Members with high consumption of sorghum were particularly encouraged to submit data.

ML for cereal-based food for infants and young children – 5 µg/kg

143. Diverse views were expressed on the proposed ML.

144. Those opposed to the ML, expressed the views that:

- ML for aflatoxin should be set as low as reasonably achievable, in particular for foods destined for infants and young children. It was pointed out that these foods played an important role in the complementary feeding period for infants and other than milk, exclusive feeding of the products, made infants even more vulnerable to the dietary risk of contaminated cereals.
- A lower ML was achievable by sourcing cleaner ingredients.

145. Those in favour of the ML expressed the following views:

- While they could not support the initial EWG proposal of 10 µg/kg, the current proposal was more acceptable and that it was better to have at least an ML rather than none.
- By already lowering the ML from 10 µg/kg to 5 µg/kg, there would be a significant protection of the health of infants and young children and could be reasonably achieved.
- The ML could be reviewed at a later stage to see if it could be adjusted.

146. The Observer from WFP, informed CCCF that WFP provided cereal-based foods to children at risk of malnutrition in more than 75 countries on an annual basis and that organizations providing food aid were currently using the ML of 10 µg/kg as previously proposed by the EWG. This ML enabled WFP to maintain a pipeline on nutritious food for vulnerable children in need. The new proposed ML of 5 µg/kg or any lower ML could constrain humanitarian responses by impacting the availability of suitable suppliers at competitive prices especially in the context of crises driven by conflict and climate change. The Observer proposed that the ML of 10 µg/kg be considered or alternatively to establish an ML for corn-based cereal foods (maize-based cereal foods) separate from other cereal-based food noting the high risk of aflatoxin contamination in corn (maize) and that 85% of WFP supplies were corn-based while the rest were wheat-based. Several delegations spoke in favour of the latter proposal.

147. The Observer from UNICEF supported the intervention of WFP and further noted that food security should be at the centre when considering the ML; that both WFP and UNICEF supplied foods globally that were monitored for food safety but relied on global supply chains for these foods and that CCCF should consider that the foods supplied in food aid programs were not consumed for lengthy periods of time. The foods for humanitarian food aid were different from normal use of infant foods or complementary foods that might be given for several years.

148. In light of the interventions of WFP and UNICEF, the Chair proposed to establish an ML of 5 µg/kg for cereal-based foods for infants and young children excluding foods destined for food aid programs. Those countries who initially opposed the original proposal of 5 µg/kg for cereal-based foods for infants and young children continued to express their opposition to this proposal.

149. WFP, supported by UNICEF, made an alternative proposal to have a separate ML of 10 µg/kg for cereal-based foods for infants and young children for food aid programs and this proposal was put forward by the Chair for agreement WFP clarified that cereal based foods are not consumed by very young infants and that these foods are only for older infants beyond 6 months (in footnote last part)



Conclusion

150. CCCF agreed:

- on an ML of 5 µg/kg for cereal-based foods for infants and young children excluding products destined for food aid programs, noting the reservations of the Egypt, EU, Iran, Kenya, Kazakhstan, Russian Federation, Singapore, Uganda and the United Kingdom for the reasons expressed in paragraph 144; and
- on an ML of 10 µg/kg for cereal-based foods for infants and young children destined for food aid programs, noting the reservations of the Egypt and EU consistent with their reservations on cereals-based foods for infants and young children.
- that the MLs would apply to the same portion of the commodity product in line with the earlier decision on the ML for lead in the same food category (see paragraph 79) and to consequentially amend the ML for DON accordingly for this food category for consistency; and
- to review the MLs in 5 years' time. In advance of the consideration of reviewing the ML in 5 years' time, CCCF will consider whether a call for data should be issued.

Sampling plans

151. CCCF considered the proposals of the WG that met virtually prior to the Session as presented in CRD9.

152. CCCF noted the views that the EWG should continue work on the sampling plans for total aflatoxins for maize grain and flour, meal, semolina and flakes derived from maize, as well as for cereal-based foods for infants and young children, with the aim to align them with the existing sampling plans for DON and fumonisins, but only when reasonable to do so. Aflatoxins can be produced both in the field and during grain storage, resulting in a higher degree of heterogeneity and measurement error relative to DON and fumonisins. To reduce this error, the existing sampling plans for DON and fumonisins should consider these aspects, for example by increasing the size of the laboratory sample recommended in the existing sampling plans for DON and fumonisins. Sampling plans for total aflatoxins for these commodities therefore should be adjusted as needed so that the measurement error and subsequent risk of miss-classifying a non-compliant lot as erroneously compliant was considered reasonable and within the range of that associated with other mycotoxin MLs and their associated sampling plans.

Conclusion

153. CCCF agreed with the recommendations of the WG to consider harmonizing the sampling plans for maize grain and flour, meal, semolina and flakes derived from maize with the sampling plan for DON and fumonisins and the sampling plan for cereal-based food for infants and young children with the sampling plan for DON in cereal-based foods for infants and young children, when appropriate, and to collect data on:

- the typical ratio of the 4 aflatoxins in naturally contaminated samples of the cereals for which MLs have been established; and
- the variation in sampling, sampling preparation and analysis for husked rice, polished rice and sorghum grain.

General Conclusion

154. CCCF agreed to:

- i. advance the MLs for maize grain, destined for further processing; flour meal, semolina and flakes derived from maize; husked rice; polished rice; sorghum grain, destined for further processing; cereal-based food for infants and young children (excluding foods for food aid programs) and cereal-based food for infants and young children for food aid programs (Appendix VI, Part I) to CAC for adoption at Step 5/8 and to include the clarification notes agreed in paragraphs 128 and 142, noting the reservations from members as provided in paragraphs 128, 133, 139, 140, 150;
- ii. review the MLs for total aflatoxins (AFT) in maize grain destined for further processing; flour, meal, semolina and flakes derived from maize; sorghum grain destined for further processing; husked rice; cereal-based foods for infants and young children (excluding foods for food aid programs) and cereal-based foods for infants and young children for food aid programs in 5 years' time and encouraged Members to continue generating and submitting data to GEMS/Food; and to continue implementing the *Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cereals* (CXC 51 – 2003);
- iii. send the consequential amendment to the "Portion of the Commodity/Product to which the ML applies" column for DON in cereal-based foods for infants and young children to CAC for adoption (Appendix VI, Part II);

- iv. re-establish the EWG chaired by Brazil and co-chaired by India, working in English, to develop the sampling plan further taking into account the possibility to harmonize the sampling plans for maize grain; flour, meal, semolina and flakes with the sampling plan for DON and fumonisins; and the sampling plan for cereal-based foods for infants and young children with the sampling plan for DON, noting the points raised in paragraph 153;
  - v. request the Codex Secretariat to issue a CL to request data on:
    - a. the typical ratio of the 4 aflatoxins in naturally contaminated samples of the cereals for which MLs were established; and
    - b. the variation in sampling, sampling preparation and analysis for husked rice, polished rice and sorghum.
  - vi. consider the work of the EWG at CCCF16.
155. The Chair also reminded delegates to respect the decisions of the Committee and not to re-open technical discussions at CAC.

**MAXIMUM LEVEL FOR TOTAL AFLATOXINS IN READY-TO-EAT PEANUTS AND ASSOCIATED SAMPLING PLAN (at Step 4) (Agenda Item 10)<sup>15</sup>**

156. India, as Chair of the EWG, introduced the item and recalled that CCCF12 (2018) had agreed to hold the proposed ML of 10 µg/kg at Step 4 to ensure implementation of the *Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Peanuts* (CXC 55 – 2004) and to issue a call for data in three years' time. CCCF14 agreed to re-establish the EWG led by India to reconsider new/additional GEMS Food data and to prepare revised proposal for an ML for RTE peanuts for consideration by CCCF15.
157. The EWG chair explained the work process followed in the EWG, the data analysis and recommendations for an ML of either 10 or 12 µg/kg for AFT in RTE peanuts as well as a recommendation to apply the same sampling plan for AFT in peanuts intended for further processing as already described in GSCTFF to RTE peanuts.
158. The EWG chair also pointed out that:
- they took into account the JECFA83 (2016) conclusions that enforcing an ML of 10, 8 or 4 µg/kg would have little further impact on reducing dietary exposure to aflatoxins in the general population as compared to an ML of 15 µg/kg; and
  - the recommendations were consistent with the approach taken for the ML for AFT in RTE tree nuts (10 µg/kg) and tree nuts for further processing (15 µg/kg), i.e., a lower ML for the RTE than for the commodity intended for further processing.

**Discussion**

General discussion

159. To a question on whether the data extracted from GEMS/Food used for the derivation of the proposed ML was specific for RTE peanuts or for all peanuts (i.e., included both data for peanuts intended for further processing as well as RTE peanuts), the EWG chair clarified that there was no segregated data in GEMS/Food.
160. The EWG chair also clarified that the EWG had considered rejection rates but kept in mind the conclusions of JECFA83 with regard to health impacts.
161. The JECFA Secretariat reminded CCCF that JECFA83 had performed an assessment of the health impact of four hypothetical MLs and had published the results. JECFA83 had therefore addressed the health impact and the task of the EWG was to consider the ML that would result in a reasonable rejection rate.

MLs for AFT in RTE Peanuts

162. The Chair proposed to consider the ML of 10 µg/kg.
163. Diverse views were expressed on the proposed ML.
164. Those delegations in support of the proposed ML noted that:
- A lower ML should be set than the one for peanuts intended for further processing since there were effective processing procedures to reduce aflatoxins to achieve the ML of 10 µg/kg.

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<sup>15</sup> CL 2022/19-CF; CX/CF 22/15/10; CX/CF 22/15/10-Add.1 (Canada, Chile, Egypt, EU, Kazakhstan, Kenya, Peru, Philippines, Rwanda, Saudi Arabia, Singapore, Uganda, USA, AU, FoodDrinkEurope and ICA)

- Setting an ML at this stage would allow for future segregated data submission to allow a future review of the ML.
  - Peanuts were widely consumed in their countries, especially also by children and a higher level would put vulnerable consumers at risk.
  - The dataset consisted of both peanuts RTE and peanuts FFP, as these could not be segregated and therefore a higher rejection rate of more than 5% could be considered acceptable.
165. Those delegations opposed to the proposed ML of 10 µg/kg made proposals for either a lower ML or an ML of 15 µg/kg (the same ML for peanuts intended for further processing).
166. Those in favour of a lower ML than 10 µg/kg made the following observations:
- A lower ML should be established taking into account that there was already an ML of 15 µg/kg for peanuts intended for further processing and in view of the effective sorting and cleaning procedures as well as other physical treatments a lower ML than 10 µg/kg could be achieved in the interest of public health. In particular, attention was drawn to an opinion of their regional food safety authority in 2018 on the health impact if the current level in the EU of 4 µg/kg were revised upwards to 10 µg/kg that this would result in an increase in cancer risk for the European population.
  - The ALARA approach should be followed especially for a carcinogen such as aflatoxin.
167. Those in favour of an ML of 15 µg/kg expressed the following views:
- The current data supported an ML of 15 µg/kg and an ML of 15 µg/kg is health protective,
  - The ML of 10 µg/kg would result in a rejection rate of 8.9% exceeding the acceptable rejection rate of 5% or lower, as opposed to the rejection rate of 5.1% for an ML of 15 µg/kg, (add reference) and a lower ML would have no reduction in exposure according to JECFA83.
168. Proposals were made that it would be more appropriate to have an ML for RTE peanuts lower than the ML for peanuts intended for further processing and if data could be segregated in future, then the work should be postponed, until such data could be used for the derivation of the ML.
169. A proposal was made to combine the proposed ML for RTE peanuts with the existing ML of 15 µg/kg for peanuts intended for further processing which was consistent with applying the sampling plan for peanuts intended for further processing to RTE peanuts.
170. If work were postponed, then concerns on the data analysis and presentation of the analysis should be addressed, such as:
- The timeframe after the implementation of the *Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Peanuts* (CXC 55 – 2004) should be 2018 – 2021.
  - An analysis year-by-year and region-by-region both before and after the adoption of the CoP.
  - An analysis by geographic region would help to illustrate the impact of producer versus importer data. EU data could be used to reflect geographical variation based on origin, but it was evident that these data were not necessarily reflecting the situation in producing countries as the EU data were biased by the strict EU requirements for import.
  - A summary and justification on the inclusion or exclusion of data into the dataset used for data analysis should be provided as some data from GEMS/Food appeared to be missing and to address also what challenges were faced in the data review.
  - A clear presentation of the rejection rates for all proposed MLs should be provided.
171. Noting the divergent views, the Chair proposed that a group of interested Members consider a strategy to resolve the discussion on the methodology used to derive an ML.
172. Following the informal discussions of a group of interested Members, the EWG Chair introduced the discussion of this group and its recommendation as presented in CRD33 to adopt a compromise ML in the interest of the immediate trade impediments for RTE peanuts, generation of data specifically for RTE peanuts after implementation of the CoP and review in five years' time in line with decisions taken for other MLs in the Committee.
173. The Chair therefore proposed an ML 10 µg/kg for review in five years' time.
174. CCCF considered this proposal, but views remained divergent and the EU, Egypt, Singapore and Kazakhstan expressed their reservation to this proposal. Other delegations supported 15 µg/kg with five years' review.

175. As an alternative, some delegations proposed to delay the work by one year in order to undertake a more thorough analysis of the data and to present a revised proposal to CCCF16 and noted that this option had also been discussed in the informal discussion group.
176. A further proposal was made that if there were no agreement on an ML at this session, it could be taken up again in light of the possible future review of the ML for AFT in peanuts intended for further processing, which was identified in List A.2 of the pilot for review of Codex Standards given that it was established in 1999 (see Item 18). If prioritized for future review, the MLs for peanuts could be reconsidered, if necessary, in the context of available data and proportionality.
177. In addition to the points raised in paragraph 170, it was proposed that if work continued in the EWG, that:
- An ML should be based on a specific dataset on RTE peanuts, but that in its absence, it might be possible to look into the free text fields of the existing dataset and look at the information provided, such as whether the peanuts were sorted, blanched, roasted or in retail packages, which could give an indication whether the samples were RTE peanuts.
  - The EWG members should be consulted on the data review, what should be considered RTE and on which data should be considered in the data analysis and analysis should also include MLs in the range of 10 µg/kg to 15 µg/kg.
  - There should be at least two rounds of comments in the EWG on the Codex Forum.
178. The Representative of WHO speaking as the GEMS/Food administrator explained that he would look into the current data on GEMS/Food and to provide support the EWG by assisting with identifying and segregating data specific for RTE peanuts.

#### Sampling plans

179. CCCF agreed to apply the same principles for the sampling plan for peanuts intended for further processing in the *Standard for Contaminants in Food and Feed (CXS 193-1995)* and that the EWG should present the proposal to CCCF16.

#### Conclusion

180. CCCF agreed:
- i. to return the ML and associated sampling plan to Step 2/3 for further consideration;
  - ii. to re-establish the EWG chaired by India and co-chaired by Senegal, working in English to prepare:
    - a. new proposal for an ML for AFT in RTE peanuts; and
    - b. an associated sampling plan applying the same principles for the sampling plan for peanuts intended for further processing in the *Standard for Contaminants in Food and Feed (CXS 193-1995)*.
  - iii. that the EWG should carefully consider all the data and take into account all comments submitted to and made at the plenary session, in particular those in paragraphs 170 and 177 and identified in the report of CCCF14 (REP21/CF14 paragraph 140) and present a paper that clearly presents the data analysis for consideration by CCCF16.

#### **MAXIMUM LEVELS FOR TOTAL AFLATOXINS AND OCHRATOXIN A IN NUTMEG, DRIED CHILI AND PAPRIKA, GINGER, PEPPER AND TURMERIC (at Step 4) (Agenda Item 11)<sup>16</sup>**

181. India, as Chair of the EWG, introduced the item and recalled that the work had been suspended in 2018 for three years, to ensure implementation of the *Code of practice for the prevention and reduction of mycotoxins in spices (CXC 78 - 2017)*; and that CCCF14 had re-established the EWG to prepare revised proposals for MLs for AFT and OTA in nutmeg, chili and paprika, ginger, pepper and turmeric taking into account new or additional data available in GEMS/Food.
182. The EWG Chair explained the work process followed in the EWG, the data analysis and recommendations for MLs for the selected spices or groups of spices as well as a recommendation for a sampling plan.
183. The Chair noted that comments at Step 3 had not been requested on the proposed MLs due to the late submission of the document.

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<sup>16</sup> CX/CF 22/15/11

## Discussion

### Total aflatoxins (AFT)

184. CCCF agreed to start the discussion on the ML for AFT and to consider if a single ML of 20 µg/kg for all spices could be established.
185. CCCF noted that there was no consensus on a single ML for AFT in all spices and noted the following comments:
- Delegations supporting a single ML noted that a much lower ML could be set and proposed an ML of 10 µg/kg.
  - The proposed ML for AFT could be divided into two groups, one for dried chilies and paprika, nutmeg and ginger at 20 µg/kg and another for dried pepper and turmeric at an ML lower than 20 µg/kg.
  - An ML of 20 µg/kg could be established noting that spices were consumed in low amounts and had a lesser impact on public health concerns, but its trade was significant and that a harmonized ML for AFT in spices (and also an ML for OTA) would prevent trade impediments.
  - Further work was needed before a decision could be made and that a paper should be prepared for CCCF16 (2023) that includes a more elaborate data analysis and presentation thereof. In doing so, the following points should be clearly indicated:
    - which data were included or excluded,
    - whether the data were for ground or whole spices, and if possible, ground and whole spices should be examined separately;
    - the year-to-year variation by region; and
    - revised groupings could be proposed once the occurrence data were more carefully looked at and consideration should be given to whether MLs were needed for spices with very low rejection rates, such as turmeric and pepper.
186. In view of the issues raised, the Chair proposed to postpone the work for a year and that a paper clearly presenting a more elaborate data analysis is prepared for CCCF16.
187. In response to this proposal, it was proposed by certain members to either:
- establish a single ML at this stage noting that the ML was needed to facilitate trade rather than to impact human health and in line with decisions on earlier MLs, that it could be reviewed in 5 years' time; or
  - consider an ML of 20 µg/kg for chilies and nutmeg at this stage and to continue work on the ML for the other remaining spices in the coming year.
188. CCCF noted that there was no support for these proposals. Delegations who proposed continuation of the work reiterated their views on the need for better data analysis and presentation thereof for all spices and for more rounds of discussion in the EWG.

## Conclusion

### Total Aflatoxins (AFT)

189. CCCF agreed to continue work on the establishment of MLs for another year, taking into account comments made in paragraph 185.

### Ochratoxin A (OTA)

190. CCCF did not consider the recommendation presented by the EWG in light of the decision to continue work on establishment of an ML for AFT in spices.

### Sampling plans

191. CCCF considered the appropriateness of ISO 948 as proposed by the EWG. CCCF however noted that ISO 948 was not an appropriate sampling plan for the control of heterogeneously distributed contaminants, such as AFT and OTA and that the sampling plan had a number of shortcomings, e.g. it did not provide incremental sample size and size of the bulk aggregate sample, amongst others. CCCF noted an alternative proposal for a sampling plan addressing the shortcomings was presented in CRD16.

Conclusion

192. CCCF agreed that ISO 948 was not appropriate for use as a sampling plan and that further work was necessary to develop a sampling that should also take into account the ML to be established. CCCF agreed to circulate the sampling plan presented in CRD16 for comments and to call for information on other sampling plans.

General Conclusion

193. CCCF agreed:
- i. return the MLs and sampling plan to Step 2/3 for further consideration;
  - ii. to re-establish the EWG chaired by India, working in English to prepare:
    - a. new proposals for MLs for AFT and OTA in spices: nutmeg, dried chili and paprika, ginger, pepper and turmeric; and
    - b. an associated sampling plan.
  - iii. that the EWG should carefully consider all the data and prepare a paper that clearly presents a more elaborate data analysis, taking into account written comments submitted to and all comments made during this Session, in particular those in paragraphs 185 and 191; and
  - iv. to request the Codex Secretariat to issue a CL requesting comments on the sampling plan presented in CRD16 and information on other sampling plans for consideration by the EWG.

**CODE OF PRACTICE FOR PREVENTION AND REDUCTION OF MYCOTOXIN CONTAMINATION IN CASSAVA AND CASSAVA-BASED PRODUCTS (at Step 4) (Agenda Item 12)<sup>17</sup>**

194. Nigeria, as Chair of the EWG, speaking also on behalf of the co-Chair, Ghana, introduced the summary of discussions at the EWG, highlighting major focuses in the CoP for prevention or reduction of mycotoxins development in cassava and cassava-based products including the stages at which risk control practices should apply, processing conditions required to prevent or reduce mycotoxin contamination, critical parameters applicable to farm selection, farm preparation, cassava variety selection, planting to harvesting as well as post-harvest activities and preventive measures during transport and distribution. The EWG noted that a revised CoP was available in CRD27 incorporating comments submitted to this Session in reply to CL 2022/21-CF.

Discussion

195. There was general support for the revised CoP, as presented in CRD27 and to advance it to Step 5 for adoption by CAC.
196. CCCF noted the following comments:
- The scope should be clarified that the CoP was aimed at cassava and cassava-based products for human consumption rather than animal feed since a large proportion of cassava in the international market was used for feed.
  - The focus should be solely put on prevention or reduction of mycotoxin. Recommendations not directly related to reduction or prevention of mycotoxin such as the use of fertilizers and increase of yield of cassava should not be included in the CoP.
197. The EWG Chair confirmed that the CoP was aimed at cassava and cassava-based products for human consumption and not for animal feed and clarification as needed would be taken up in the further revision of the CoP including other comments made at this Session.
198. In response to a question that the discussions before CCCF16 would take place on the Codex online forum to ensure opportunities for interested members and observers to exchange opinions, the EWG Chair stated that the Codex online forum would be used for discussions in the EWG.
199. The Chair advised CCCF that Members would still have an opportunity to address those sections or provisions in the CoP that require further improvements and encouraged them to actively participate in the EWG in order to present a CoP for adoption at Step 8 at CCCF16 (2023).

Conclusion

200. CCCF agreed to:

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<sup>17</sup> CL 2022/21-CF; CX/CF 22/15/12; CX/CF 22/15/12-Add.1 (Brazil, Canada, Chile, Egypt, EU, Iraq, Kenya, Peru, Republic of Korea, Uganda, USA, IAEA and ICUMSA)

- i. advance the Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cassava and Cassava-Based Products to CAC for adoption at Step 5 (Appendix VII); and
- ii. re-establish the EWG, chaired by Nigeria and co-chaired by Ghana, working in English, to further revise the CoP taking into account the comments provided by CCCF with a view to finalizing the CoP at CCCF16 (2023).

#### **PYRROLIZIDINE ALKALOIDS (Agenda Item 14)**

201. CCCF noted that, as agreed under Item 1, this matter would be considered under Item 19.

#### **GUIDANCE ON DATA ANALYSIS FOR DEVELOPMENT OF MAXIMUM LEVELS AND FOR IMPROVED DATA COLLECTION (Agenda Item 15)<sup>18</sup>**

202. The EU, as Chair of the EWG, introduced the item and recalled that at CCCF14<sup>19</sup> the Committee noted that the discussion paper in the Annex to CX/CF 21/14/15 was prepared by the EWG Chair and that no consultation with the Co-Chairs and EWG members had taken place due to the late availability of the paper.
203. The EWG Chair clarified that this document was intended to be an internal guidance for CCCF to facilitate and harmonize the work within the different EWGs of CCCF working on the development of MLs. The Codex Secretariat explained that given that it is a document for internal use within CCCF, there was no need for a project document or to make a proposal for new work.
204. Following the mandate given by CCCF14, the EWG Chair explained that CL 2021/78-CF was issued in October 2021 requesting comments from Codex Members and observers on the different topics addressed in the guidance. Comments in reply to this CL were compiled in Appendix II to CX/CF 22/15/14 and considered by the EWG Chair to update the guidance together with comments submitted in plenary at CCCF14<sup>20</sup> in order to provide a revised document as contained in Appendix I to CX/CF 22/15/14. Due to the late availability of the paper, the guidance was not discussed with the co-chairs nor the members of the EWG and was presented to CCCF for information on the current status of the document.
205. The EWG Chair further explained that a virtual side event was held prior to CCCF15 to discuss the topics mentioned in paragraphs 10-11 of CX/CF 22/15/14, i.e., the workplan for next year and certain aspects of the guidance, in particular the structure and topics to be included in the guidance, with a view to formulating recommendations to the plenary. The report of the virtual side event is available in CRD10.
206. The EWG Chair summarized key points of discussion and recommendations relating to the content/structure of the guidance as well as the work process that should be followed to present the guidance for consideration at CCCF16 (2023) and noted that further details can be found in CRD10.
- A discussion amongst EWG members on certain aspects of the guidance document would be beneficial to conclude on the guidance document. The organization of virtual meetings of the EWG was advisable to obtain input and to advance the document at CCCF16.
  - The EWG could establish subgroups coordinated by the co-chairs to address specific topics of the guidance to speed up discussion. All EWG members will have access to these subgroups and could provide input into any of the document sections led by the co-chairs. The subgroups could discuss three topics as follows:
    - Data collection and data submission and extraction of data from GEMS Food database.
    - Data selection/clean-up of data and generating overview of data (aspect of data analysis).
    - Statistical analysis (aspect of data analysis)

Aspects related to data presentation are closely linked to the data analysis and should be discussed in connection with the data analysis in the relevant subgroup(s).

- As outlined in paragraph 192 of REP21/CF14, input from the (i) GEMS/Food Database administrator on what is possible and feasible as regards changes to the GEMS/food database and to provide clarifications as regards the use of the GEMS Food database and (ii) the JECFA Secretariat providing concrete information on how the different topics mentioned in the guidance document are handled by JECFA when evaluating available occurrence data for the exposure assessment is very important add value to the discussion in the EWG and its virtual meetings.
- The basis for the discussion should be the guidance as contained in Appendix I to CX/CF 22/15/14 split into parts in line with the responsibilities of the subgroups for discussion in the EWG/virtual meetings of the EWG.

<sup>18</sup> CX/CF 22/15/14

<sup>19</sup> REP21/CF14, paras. 186-210

<sup>20</sup> REP21/CF14, paras. 188-207

- It is important to clearly define the goals/objectives of the guidance to facilitate discussion on the scope and level of detail needed in the document. An outline of the goals/objectives was provided:
  - Data collection: to ensure that submitted occurrence data contain all information necessary for ML development.
  - Data analysis: to ensure that data are analysed in a way addressing all legitimate considerations raised when possible MLs are discussed (e.g. year-to-year variation, regional variation, etc.).
  - Data presentation: to ensure that data/data analysis are presented in a clear way providing (elements of) reply to legitimate considerations raised when possible MLs are discussed.
  - Other topics/aspects for possible future inclusion in the guidance document: Following a decision of CCCF16 (2023).

207. The EWG Chair noted that the details of the structure and topics/content of the guidance was provided in the Annex to CRD10. The structure and contents of the guidance document and appropriate location of certain elements/topics may need to be revisited after discussions in the EWG. He further summarized discussion in the side event as follows:

- The guidance should contain 4 sections: Preamble, Occurrence Data Collection/Submission, Occurrence Data Analysis and Data Presentation:
  - Preamble: This section should contain information on the scope of the document, the target users, the goals and objectives.
  - Occurrence Data Collection/Submission: This section needs further work. Certain elements mentioned under the section “Occurrence data analysis” needs also to be addressed under this section. The issue that those who upload the data may not be the ones who analyse data may need to be considered in different phases of the guidance. All aspects referred to in the instructions for electronic submission of data on chemicals in food and the diet in the GEMS/food database are relevant for this section.
  - Occurrence data analysis: This section should contain subsections on (i) Extraction of data from the GEMS/Food database; (ii) Data selection: clean-up of data; (iii) Data analysis – generating overview of data; and (iv) Data analysis – statistical analysis.
 

Data analysis and data presentation are closely related and that calculation of rejection rates is a separate issue from the selection of an appropriate rejection rate. The inclusion of analysis of rejection rates at hypothetical MLs and of effects of hypothetical MLs on the reduction of dietary exposure would be maintained under this section for the time being.
  - Data presentation: This section is closely related to the section on data analysis.

### **Conclusion**

208. Based on the summary provided by the EWG Chair, CCCF agreed:

- i. on holding of three virtual working group meetings in 2022 (September - November) to obtain input and to advance the document;
- ii. on the creation of three subgroups chaired by the Co-chairs and the following division of the topics to be discussed in the three subgroups (eventually subject to further fine tuning by the EWG Chair and co-chairs in case of need):
  - a. all topics related to data collection and data submission and extraction of data from GEMS Food database,
  - b. All topics related to data selection/clean-up of data and generating overview of data (aspect of data analysis),
  - c. All topics related to statistical analysis (aspect of data analysis), and
  - d. Aspects related to data presentation are closely linked to the data analysis and therefore to be discussed in connection with the data analysis in the relevant subgroups.
- iii. that the content of the three virtual working group meetings would reflect the division of the topics among the three subgroups;
- iv. on the status, goals/objectives and target user to be outlined in the Preamble of the guidance document (see Annex to CRD10);



- v. on the structure and content of the guidance document as outlined in the Annex to CRD10, with the understanding that further fine-tuning might be needed following the discussion in the EWG. The starting document for the virtual working group meetings and subgroups would be the document in Appendix I to CX/CF 22/15/14 split into three separate parts in accordance with the responsibilities of the subgroups for discussion in the virtual working group meetings/ subgroups; and
- vi. to re-establish the EWG chaired by EU, co-chaired by Japan, the Netherlands and USA, working in English only, with the understanding of the creation of 3 subgroups within the EWG, to elaborate a proposal for a general guidance on data analysis for ML development and improved data collection.

#### **REVIEW OF METHODS OF ANALYSIS FOR CONTAMINANTS (Agenda Item 16)<sup>21</sup>**

209. Brazil, introduced the document prepared by Brazil, with assistance of Japan and USA, and recalled that the work was in response to a request from CCMAS to review the methods for contaminants in the *General Methods of Analysis for Contaminants* (CXS 228-2001) for possible inclusion in the *Recommended Methods of Analysis and Sampling* (CXS 234-1999) and the decision of CCCF14 to assess the appropriateness of the methods or replacement by other more appropriate methods or possible conversion to performance criteria and emphasized that the work focused on those methods in CXS 228 relating to compounds that fell within the mandate of contaminant.
210. She informed CCCF that there was unanimous agreement in the virtual meeting of the WG, which met prior to CCCF15, with the recommendations in CX/CF 22/15/15, paragraph 9 and advised the Committee to endorse the recommendations as presented in CRD9.
211. CCCF agreed to the recommendations as follows:
- i. submit the performance criteria for lead and cadmium to CCMAS for inclusion in the *Recommended Methods of Analysis and Sampling* (CXS 234-1999) (Appendix VIII: Part I);
  - ii. request CCMAS to revoke the *General Methods for Contaminants* (CXS 228-2001), including the methods for copper iron and zinc because analytical methods for these metals in food are already listed in CXS234;
  - iii. request CCMAS to:
    - a. remove analytical methods listed in Appendix VIII: Part II from CXS 234;
    - b. transfer these methods to the column of “example of applicable methods that meet the criteria” in Appendix VIII: Part I if they meet the performance criteria established;
    - c. identify for which commodities the methods AOAC 2015.01 (heavy metals in food by ICPMS) and EN 15763 are applicable considering the performance criteria and include them as examples of methods that meet the performance criteria in Appendix VIII Part I;
    - d. identify and suggest examples of other applicable analytical methods meeting the performance criteria in Appendix VIII, Part I; and
    - e. evaluate the appropriateness of replacing the existing performance criteria in CXS 234 for lead and cadmium in natural mineral waters according to Appendix VIII, Part I.

#### **FORWARD WORK-PLAN FOR CCCF: REVIEW OF STAPLE FOOD-CONTAMINANT COMBINATIONS FOR FUTURE WORK OF CCCF (Agenda Item 17)<sup>22</sup>**

212. The Host Country Secretariat introduced the item, recalling that the discussion paper<sup>23</sup> on the review of staple food-contaminant combinations for future work of CCCF was developed by the Host Country, Codex and JECFA Secretariats and presented at CCCF14 (2021) as a result of the discussion on the forward plan at CCCF13 (2019), where it was agreed to focus on staple foods, as contamination in these foods could have a significant impact on exposure and thus be a health risk to populations. She further recalled that, in the discussion paper, a possible approach was introduced to identify staple food-contaminant combinations that may be of relevance to explore further in CCCF.

<sup>21</sup> CL 2022/22-CF; CX/CF 22/15/15; CX/CF 22/15/15-Add.1 (Canada, Chile, Cuba, Ecuador, Iraq, Peru, Saudi Arabia, Singapore, USA and FoodDrinkEurope)

<sup>22</sup> CL 2021/87-CF; CX/CF 22/15/16 (Australia, Canada, Chile, Cuba, Egypt, EU, Kenya, New Zealand, Republic of Korea, Saudi Arabia, United Kingdom and USA)

<sup>23</sup> CX/CF 21/14/17

213. She stated that the Host Country, Codex and JECFA Secretariats noted that the comments received on the approach/methodology proposed in the discussion paper in response to the CL 2022/87-CF were diverse and unclear about how to revise the discussion paper. While there was a suggestion to establish an EWG to further develop the work, she stated that it would be difficult to define a clear mandate without a detailed technical discussion on the methodology in the discussion paper. As such, she announced that a virtual workshop would be organized after CCCF15 to discuss the best way forward to continue with the consideration of this item and based on outcomes of this discussion, to develop a proposal for consideration by CCCF16 (2023).

#### **Conclusion**

214. CCCF noted that a virtual workshop on the review of staple food-contaminant combinations for future work of CCCF would be held in 2022 to address the issues raised in reply to CL 2020/87-CF and to propose a way forward for the consideration of this item at CCCF16 (2023).

#### **REVIEW OF CODEX STANDARDS FOR CONTAMINANTS (Agenda Item 18)<sup>24</sup>**

215. Canada, as Chair of the WG, introduced the summary of discussions at the WG held virtually prior to CCCF15 and highlighted the 10 recommendations made at the WG outlined in paragraphs 7 to 16 of CRD6, including recommendations for the edits, additions and deletions to the Lists A.1, A.2 and B as well as for adding four new prioritization criteria relevant to staple foods, the needs of developing countries, efficiencies with other work and Member country volunteers to take on new work. She also emphasized that the WG agreed that no new work to review an existing Codex standard be brought forward to this session of the Committee and that the overall highest priority list should be the focus and further developed.

#### **Discussion**

216. A proposal was made to include a disclaimer to the effect that the priority list is solely for the purpose of the review of standards based on the criteria and did not reflect the validity of existing standards in order to avoid possible confusion that the listed standards were outdated or obsolete.
217. Following the abovementioned observation, it was suggested to replace the word “review” with “evaluation” since reviewing implied changing something old to new and thus evaluation was more appropriate. The WG Chair responded that they would consider alternative terms to avoid any misinterpretation at the next session of the WG.

#### **Conclusion**

218. CCCF agreed to:
- i. endorse the recommendations of the WG as set out in paragraphs 7-16 of CRD6 (further details on these recommendations are provided in CRD6):
    - a. agreed to create a new Overall Highest Priority List of standards for review;
    - b. agreed to maintain, without further prioritization, Lists A.1, A.2 and B;
    - c. the Overall Highest Priority List should only include highest priority standards for review, based on the prioritization criteria and/or other clear, reasonable rationale;
    - d. standards recommended as highest priority for review should be removed from this list if rationale, based on the prioritization criteria or other reasonable rationale, is not provided in advance of CCCF16 (2023);
    - e. The WG Chair will provide a verification function, where possible, of rationales provided by Members recommending standards for inclusion in the Overall Highest Priority List;
    - f. agreed to the edits to Lists A.1, A.2 and B as provided in Annex I to CRD2;
    - g. agreed to the edits to and the four new proposed prioritization criteria as provided in Annex III to CRD2;
    - h. agreed to continue with the general process by which the trial period (2022-2024) is proceeding;
    - i. agreed that no new work to review an existing Codex standard should be taken up by this session of the Committee; and
    - j. agreed that Canada would continue to chair the WG on the review of Codex standards for contaminants

<sup>24</sup> CL 2021/90-CF; CX/CF 22/15/17 (Canada, Chile, Colombia, Cuba, Egypt, EU, Japan, Kenya, Peru, Republic of Korea, Uganda and USA)

- ii. CCCF also agreed to the recommendation made by the WG chair to add a footnote for clarity and guidance to the 3<sup>rd</sup> column of the list of prioritization criteria (it would be in Annex III, CF15/CRD2), to indicate the intention of how the numeric priority rankings are to be used: "Priority rankings are intended as a guide, not to generate a precise numeric ranking."
- iii. request the Codex Secretariat to circulate the tracking lists for comments, in the form of a CL, in advance of CCCF16 (2023) based on input from Canada, to aid in the development of the Overall Highest Priority List, and/or to also seek feedback on the tracking lists, prioritization criteria and process by which the trial period is proceeding; and
- iv. reconvene the WG chaired by Canada to meet prior to CCCF16 to consider the comments in reply to the CL and make recommendations to CCCF16.

**FOLLOW-UP WORK TO THE OUTCOMES OF JECFA EVALUATIONS AND FAO/WHO EXPERT CONSULTATIONS (Agenda Item 19)<sup>25</sup>**

219. The EU, as Chair of the WG, presented the recommendations made at the virtual meeting of the WG held prior to CCCF15 focusing on possible follow-up actions to the outcomes of the JECFA evaluations and FAO/WHO expert consultations, which were on pyrrolizidine alkaloids, ciguatoxins, tropane alkaloids and ergot alkaloids, T-2 and HT-2 toxin and diacetoxyscirpenol.

Pyrrolizidine alkaloids

220. The WG Chair recalled that CCCF14 agreed to establish an EWG chaired by EU, working in English, to prepare a discussion paper on pyrrolizidine alkaloids to look into the feasibility of possible follow-up actions for consideration by CCCF15. However, the paper was not presented to CCCF15.

Ciguatoxins

221. The WG Chair stated that, while no member countries supported starting work on setting regulatory levels on ciguatoxins, the development of risk management guidance to prevent or reduce ciguatera poisoning could be considered thereby building upon the work already undertaken by FAO in collaboration with IAEA and IOC-UNESCO.

Tropane alkaloids

222. The WG Chair noted divergent views expressed by Members and that CCCF15 should consider the most appropriate follow-up action. He recommended that an EWG be established to prepare a discussion paper on tropane alkaloids to look into the need and feasibility of possible follow-up actions for consideration by CCCF16.

Ergot alkaloids, T-2 and HT-2 toxin and diacetoxyscirpenol

223. The WG Chair reported that the full reports of the JECFA evaluations were not yet available and the JECFA summary report indicated a lack of geographically representative data and it was therefore premature to consider follow-up actions at this time.

**Conclusion**

224. CCCF agreed to:
- i. re-convene the EWG, chaired by the EU, working in English, to prepare a discussion paper on pyrrolizidine alkaloids to look into the feasibility of possible follow-up actions for consideration by CCCF16;
  - ii. establish an EWG chaired by USA and co-chaired by the EU, working in English to prepare a discussion paper on the development of a code of practice or guidelines to prevent or avoid ciguatera poisoning building upon the work already undertaken by FAO in collaboration with IAEA and IOC-UNESCO;
  - iii. reconsider follow-up actions on tropane alkaloids at CCCF16 (2023);
  - iv. request JECFA to issue a call for data on the occurrence of ergot alkaloids, T-2 and HT-2 toxin and diacetoxyscirpenol to be submitted to the GEMS/Food database; and
  - v. re-convene the in-session WG at CCCF16 chaired by EU.

<sup>25</sup> CL 2021/89-CF; CX/CF 22/15/18 (Canada, Chile, Cuba, Egypt, Kenya, Peru, Uganda and USA)

**PRIORITY LIST OF CONTAMINANTS FOR EVALUATION BY JECFA (Agenda Item 20)<sup>26</sup>**

225. The USA, as Chair of the WG, introduced the summary of discussions by the virtual session of the WG, referring to the updates made on the priority list about dioxins and dioxin-like polychlorinated biphenyls (PCBs), arsenic and scopoletin; and that trichothecenes (T-2 and HT-2) was removed from the list as the JECFA assessment had been completed with the summary published in April 2022.
226. The WG Chair highlighted new proposals from Members and recommendations by the WG that a request for establishment of MLs for sodium metabisulfite (sodium pyrosulfite) in meat/poultry products be referred to CCFA and that a proposal for inclusion of maximum levels for cadmium in processed root vegetable juice be considered as a proposal for new work rather than for JECFA evaluation. In addition, she noted that, due to the lack of occurrence and toxicity information, EU would provide information on phomopsins in response to the CL, to be issued by the Codex Secretariat after CCCF15, that would solicit comments from Members on the priority list for contaminants for evaluation by JECFA. As such, no additions were made to the priority list.
227. The WG Chair further informed CCCF of a WHO expert consultation to re-evaluate TEFs for dioxin and dioxin-like PCBs scheduled for October 2022 (see Item 3).

**Conclusion**

228. CCCF agreed to:
- i. endorse the priority list (Appendix IX);
  - ii. continue to request comments and/or information on the priority list for consideration by CCCF16; and
  - iii. re-convene the in-session WG at CCCF16 chaired by USA.

**OTHER BUSINESS (Agenda Item 21)**

229. CCCF noted that no other business had been proposed.

**DATE AND PLACE OF NEXT SESSION (Agenda Item 22)**

230. CCCF was informed that CCCF16 was scheduled to be held in approximately one year's time, the final arrangement subject to confirmation by the Host Country and the Codex Secretariats.
231. The Codex and Host Country Secretariats would look into the best way forward/approach to ensure as wide as possible participation of Codex members.

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<sup>26</sup> CL 2021/88-CF; REP21/CF14, Appendix VIII; CX/CF 22/15/19 (Canada, Chile, Colombia, Egypt, Kenya, Peru, Saudi Arabia, Uganda and USA)

**APPENDIX I**

**LIST OF PARTICIPANTS  
LISTE DES PARTICIPANTS  
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**APPENDIX II**

**MAXIMUM LEVELS FOR CADMIUM IN CHOCOLATES AND COCOA POWDER**

**PART I: Maximum levels for cadmium in chocolates containing or declaring <30% total cocoa solids on a dry matter basis and Chocolate containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis**

**Editorial Amendment:** Inclusion of provisions for the “portion of the commodity to which the maximum level applies”

(For adoption)

Commodity/ Product Name	Maximum Level (mg/kg)	Portion of the Commodity/Product to which the ML applies	Notes/Remarks
Chocolates containing or declaring <30% total cocoa solids on a dry matter basis	0.3	<u>Whole commodity as prepared for wholesale or retail distribution</u>	Including milk chocolate, family milk chocolate, milk chocolate couverture, Gianduja milk chocolate, table chocolate, milk chocolate Vermicelli/milk chocolate flakes.
Chocolate containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis	0.7	<u>Whole commodity as prepared for wholesale or retail distribution</u>	Including sweet chocolate, Gianduja chocolate, semi – bitter table chocolate, Vermicelli chocolate/chocolate flakes, bitter table chocolate, couverture chocolate.

**PART II: Maximum levels for cadmium in cocoa powder (100% total cocoa solids on a dry matter basis)**

(For Adoption at Step 5/8)

Commodity/ Product Name	Maximum Level (mg/kg)	Portion of the Commodity/Product to which the ML applies	Notes/Remarks
Cocoa powder (100% total cocoa solids on a dry matter basis) ready for consumption	2.0	Whole commodity as prepared for wholesale or retail distribution	The ML applies to 100% cocoa powder. The ML applies also to cocoa powder when used as an ingredient in other foods. The ML does not apply to cocoa powder-based drink mixes that contain other ingredients, such as milk powder and sugar.

**APPENDIX III****CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF CADMIUM CONTAMINATION IN COCOA BEANS****(For adoption at Step 8)****I. INTRODUCTION**

1. The objective of this Code of Practice (COP) is to provide guidance to countries and the cocoa production industry on the prevention and reduction of cadmium (Cd) contamination in cocoa beans during production and postharvest processing: fermentation, drying, storage and transportation.
2. Cd is a heavy metal that predominantly enters the environment through anthropogenic activities such as processing ores, burning fuels, contamination with industrial waste, livestock manure, and use of phosphate fertilizers. Cd can also enter the soil naturally by volcanic activity, from marine shale soils, erosion sea-salt aerosols, and sewage-containing fertilizers.
3. Cd is toxic and persistent in soil (estimated half-life for Cd in soils varying between 15 to 1100 years). Cd is absorbed and bio-accumulated by cocoa trees (*Theobroma cacao* L), which in some cases results in unacceptably high levels in cocoa beans, so measures may be needed to reduce both Cd in the soil and Cd absorption by cocoa trees.
4. Cd is not found in nature in its pure state. Its most common oxidation state is +2 and it is usually found associated with iron (Fe), zinc (Zn), lead (Pb), phosphorus (P), magnesium (Mg), calcium (Ca), or copper (Cu). The concentrations of Cd in soil depend mainly on soil pH, which affects Cd solubility and mobility. Most metals in the soil tend to be more available at acidic pH, which increases their bioavailability for uptake by plants.
5. Greater adsorption of Cd on the surface of soil particles is desirable, as this reduces the mobility of this contaminant in the soil profile and reduces its bioavailability to cacao trees, and consequently, its environmental impact. The concentration of Cd in soil solution and Cd bioavailability and mobility are mainly controlled by adsorption and desorption reactions on the surface of soil colloids. Soil factors that affect the accumulation and availability of cadmium include pH, texture, organic material, Fe, and manganese (Mn) oxides and hydroxides, Zn, carbonates, chlorinity, and cation exchange capacity.
6. At alkaline pH, elevated chloride content in soils tend to enhance chloride complex formation, which decreases the adsorption of Cd on soil particles, thereby increasing Cd mobility and bioavailability.
7. Over time, the development in our understanding of how various cropping systems contribute to or alleviate Cd contamination in cocoa beans could be used to develop integrated systems for the management of cadmium levels in cocoa beans.
8. Grafting as a genetic strategy with low cadmium accumulation varieties may be a viable option in various soil types and at different soil Cd levels, but has only been tried experimentally for reducing Cd in cacao trees.
9. To mitigate Cd levels in cocoa beans it is crucial to identify cocoa-growing areas with high Cd and develop strategies to address this problem, including mitigation measures that may be taken in the near term (e.g. soil testing and addition of soil amendments), while other measures will require longer time to implement (e.g. grafting of plants on rootstocks with low Cd uptake).

**II. SCOPE**

10. This Code of Practice provides guidance on recommended practices to prevent and reduce Cd contamination in cocoa beans before planting, for new or existing cocoa tree plantations and during the production stage through the harvest and post-harvest phases.

**III. DEFINITIONS**

- **Adsorption and Absorption:** “Adsorption refers to the physical or chemical attraction and retention of Cd to soil particles.” “Absorption refers to the net uptake of Cd from the soil by the roots of the cacao trees.”
- **Bioavailability:** Bioavailability of a mineral to plants and soils can be defined as its accessibility to normal metabolic and physiological processes as influenced by many factors including total concentration and speciation of metals, pH, redox potential, temperature, total organic content (both particulate and dissolved fractions), and suspended particulate content.
- **Biochar (biocarbon)** is a by-product of the pyrolysis of residual biomass. Biochar is a stable carbonate derivative produced from plant and/or animal biomass for application in agriculture.

- **Cane by-product (bagasse):** By-product of sugar cane through milling and pressing.
- **Cation Exchange Capacity (CEC):** A measure of the soil's ability to hold positively charged ions. The clay mineral and organic matter components of soil have negatively charged sites on their surfaces which adsorb and hold positively charged ions (cations). This electrical charge is critical to the supply of nutrients to plants because many nutrients (e.g. Mg, K and Ca) exist as cations.
- **Cocoa bean:** The seed of the cocoa fruit, which is composed of the epispem (also called integument, testa or shell), embryo and cotyledon.
- **Drying:** Cocoa beans are dried either under sunlight or in mechanical/solar dryers (or a combination of both) to reduce the moisture content (to less than 8 %) to make them stable for storage.
- **Fermentation:** A process designed to degrade the pulp or mucilage and initiate biochemical changes in the cotyledon by enzymes and microorganisms in the farm environment.
- **Humus:** The organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms.
- **Pruning:** Annual removal of branches that are dry, diseased, or unbalanced from shade trees and cocoa plants.
- **Pulp or mucilage:** Aqueous, mucilaginous and acidic substance in which the seeds are embedded.
- **Shading:** Growing cocoa plants with shade trees to reduce the amount of solar radiation and wind that reaches the crop. Shading is usually more or less 50% during the first 4 years of plant life after which the percentage of shade can be reduced to 25 or 30%.
- **Soil Amendments:** Any material added to the soil to improve its physical and chemical properties. The application of amendments depends on the characteristics of the soils, and may include compost, livestock manure, magnesium sulphate, vinasse, zeolite (minerals or adsorbents that hydrate and dehydrate reversibly), charcoal or biochar, calcium sulphate, lime, cane by-product (bagasse), zinc sulphate, dolomite (calcium magnesium carbonate), vermicompost, sugar cane, palm kernel cake, phosphate rock, and other organic matter.
- **Vinasse:** A by-product of the production of alcohol from sugarcane. Vinasse is obtained from the fermentation and distillation of molasses; it is the main organic residue in the production of alcohol.

#### IV. RECOMMENDED PRACTICES TO PREVENT AND REDUCE Cd CONTAMINATION IN COCOA BEANS

##### 4.1. Before planting – new plantations

##### 4.1.1. Recommended short and medium-term practices

11. The prevention and reduction of Cd in cocoa should begin with the physical-chemical analysis of the soil and be an integral part of the practices before planting a new plantation. Soil analysis is not limited to Cd measurement, but should also consider percent organic matter, cation exchange capacity, soluble zinc, and chlorinity. Physical analysis parameters are: sand %, clay %, silt %, textural class. Chemical analysis should consider where appropriate: pH, organic matter %, Total N %; Available ppm of P, K, Pb, Fe oxides and hydroxides, Mn carbonates, Cd and Zn; changeable (cmol (+) /kg) of Ca, Mg, K, Na, Al and, H; CEC, Bas. Camb %, Ac. Camb. %, and Sat. Al. It is recommended to consult a qualified professional ( ) for information on parameters that are relevant for cadmium uptake by plants and for interpretation of the results of these soil analyses.
12. National or relevant food control authorities should consider implementation of source directed measures in the *Code of Practice Concerning Source Directed Measures to Reduce Contamination in Foods with Chemicals* (CXC 49-2001).
13. In new plantations, the use of cover crops of perennial legumes should be considered. Cover crops improve soil organic matter and they can protect soil from erosion and reduce the loss of nutrients, improving soil productivity through greater availability of essential nutrients and reducing the bioavailability of metals.
14. No specific recommendation on Cd levels in cocoa growing areas has been identified. The acidity of the soil affects acceptable cadmium soil levels.
15. Irrigation waters can be monitored to determine if they are a potential source of Cd, e.g., higher than background levels due to point source contamination. As one possible guideline for higher levels, the World Health Organization (WHO) recommended Cd level for drinking water is 0,005 mg/L.

16. Although there are known benefits to agroforestry, data on the impact of agroforestry vs. monoculture on Cd levels, are preliminary. Studies that have systematically compared agroforestry with monoculture found no statistically significant difference in Cd uptake in cacao beans.
17. In agroforestry the most commonly used shade plant species with cacao trees are Musaceae (bananas, moles and cambures) for temporary shade in early cacao establishment and legume trees such as the pore or bucare (*Erythrina* sp.) and guabas (Ingas) for permanent shade trees. Other shading plant species that provide greater economic benefits include timber species (e.g. laurel, cedar, Colombian mahogany (*Cariniana pyriformis*), cenizaro or rain tree and terminalia) and / or fruit trees (e.g. citrus, avocado, sapote, breadfruit, date palm). It is advisable to plant short shade trees and use citrus or fruit trees for the borders of cacao plantations.
18. Establish plantations if possible in areas separate from roads or take measures to reduce the exposure of the cacao plantations to emissions from the combustion engines (e.g. in vehicles) because they may contain Cd. Likewise, they should be located in areas separated from dumpsites in cities, mining areas, smelting areas, industrial wastes, sewage and household wastewater because these could be sources of Cd.
19. Avoid flooded soils if the water sources are contaminated with Cd.

#### **4.1.2. Recommended long-term practices**

20. When planting new plantations, it is recommended to plant varieties of cacao trees that are less prone to cadmium uptake.

#### **4.2. From production to harvesting**

##### **4.2.1. Recommended short and medium-term practices**

21. Knowledge of the sources and the distribution of Cd in the soil is important. In general, it should be noted that any organic or inorganic amendment applied to the crop should be previously analysed for Cd, because depending on its source, it may contain Cd and become a Cd source for crops. Sewage sludge, fly ashes, and phosphate fertilizers can have high concentrations of Cd. The phosphate fertilizers applied should contain low Cd levels. To decrease Cd uptake, phosphate fertilizers for cacao farms should meet national criteria with respect to the ratio of Cd to phosphorus (Cd: P or Cd: P<sub>2</sub>O<sub>5</sub>).
22. Data suggest that there is a positive correlation between higher levels of Cd in soil (as measured by soil tests) and elevated levels of Cd in plant tissues and cocoa beans.
23. Where available, soil characterization analysis for cacao plantations should be conducted by accredited laboratories; using validated methods which include the use of certified reference materials and standards and provide associated uncertainties. In addition, it is very important to carry out soil analyses with internationally recognized methods. These methods should include appropriate ones for use by local farmers trying to export cocoa. These soil characterization analyses should not only include Cd but other nutrients too (see paragraph 11). Soil pH is the most important parameter to measure on an ongoing basis.
24. The soil sampling protocol should consider obtaining samples representative of each farm because Cd content could be variable in the same cocoa production area. Because of the natural variation in Cd and Zn levels in the soil, at least one composite soil sample (consisting of at least 20 subsamples) per hectare should be collected. The protocol should take into account international standards for taking soil samples in soils specifically contaminated with metals. The depth of soil sampling in surveys and field evaluation is 0-15 cm. Because litterfall of cocoa leaves and branches may contain higher Cd than the soil they are grown in, allowing litterfall to be metabolized on the soil can add Cd to the top 0-5 cm of soil. Taking 0-15 cm soil samples provides a more representative measure of soil Cd.
25. In areas where cocoa beans have relatively higher levels of Cd it is important to determine soil and irrigation water salinity (chloride salts) since the absorption of Cd by plants increases with increased chloride concentrations. However, this effect is most pronounced in alkaline soils (pH>7.0). Therefore, when Cd levels in cocoa beans are of concern and soil is alkaline, it is important to determine the electrical conductivity of soil and water which should be less than 2 mS/cm.

##### **4.2.2. Strategies to immobilize cadmium in the soil (medium and long term practices)**

26. When there is a deficiency of Zn in the soil, soil Zn levels should be increased. Cd competes with Zn for uptake by plants, and Cd is more likely to enter plants and accumulate in cocoa beans when Zn soil concentration is low. Moreover, national local authorities can specify critical levels of Zn for cocoa growing soils.

27. The application of zinc sulphate is carried out with fertilization that is conducted annually at the cacao plantation, according to the requirements of the crop and the Zn content of the soil. However, if zinc sulphate is added at high rates to inhibit Cd uptake from higher Cd soils (e.g., 25 kg Zn/ha), soil acidification could occur, requiring addition of limestone to counteract the effects of the acidification.
  28. The most effective method developed to date to decrease Cd bioavailability is through liming the soil when soil pH is below 6. Liming is an agronomic management practice that reduces Cd uptake by cacao trees cultivated on highly acidic soils, and its addition also might improve nutrition and production of cacao trees. However, it is important to verify that added lime does not contain cadmium.
  29. Soil pH should be managed with a goal of pH>6, but if Cd levels in the soil are high, a higher pH may be needed to reduce Cd accumulation by cacao trees. However, the pH should not be so high that it reduces the absorption of desirable minerals and micronutrients. Addition of Zn sulphate through fertilization also may be needed to ensure Zn levels are maintained.
  30. Apply lime in low doses (3 t/ha/year), preferably as dolomite  $\text{CaMg}(\text{CO}_3)_2$ , to gradually increase the pH and incorporate Ca and Mg, which are essential for the growth of cacao trees. This can help precipitate Cd and decrease its bioavailability. Over liming should be avoided as this can reduce micronutrient bioavailability.
  31. A greater amount of soil organic matter may increase soil Cd adsorption and thus may help to decrease Cd in cocoa beans, based on field studies. The use of organic fertilizers such as treated manure from stabled livestock, or compost, increases the organic matter content of the soil and improves its microbiological activity.
  32. For a successful cocoa production it is vital to supplement the soil with phosphate, because tropical soils have a very limited natural phosphate content. This can be best done via the use of organic fertilizers, which have a high phosphorous bioavailability and a low cadmium content. As phosphate fertilizers or sedimentary phosphorous rock may contain high cadmium concentrations, they should only be used when they have a demonstrated low cadmium content and they should in any case comply with cadmium limits established by national or regional competent authorities.
  33. In general, the formula for the ratio of nitrogen, phosphorus and potassium in NPK fertilizers to be applied to cocoa crops will vary according to the age of the plant and the characteristics of the soil. The heavy metal content of fertilizers needs to be verified through analysis prior to application to soil to ensure that Cd content is low.
  34. The application of soil amendments (magnesium, sulphate, dolomitic limestone, vinasse, zeolite, humus, charcoal, calcium sulphate ( $\text{CaSO}_4$ ), cane by-products (bagasse) and zinc sulphate ( $\text{ZnSO}_4$ )), can help decrease Cd concentrations in cocoa beans. The choice of amendments varies depending on the characteristics of the soils.
  35. Vinasse is a source of K that promotes the installation of fungi that form mycorrhizas in the roots of the cacao tree, thereby increasing the efficiency of P nutrition and immobilizing Cd.
  36. Lime and sugarcane cake can reduce the bioavailability of Cd in the soil profile. Zeolite is another option in soils with high sand content and in clay-textured soils. Apatite (or rock phosphate) which can contain Cd, should be avoided where possible.
  37. Biochar has been shown to reduce the uptake of Cd in cocoa beans. The reduction rates in uptake of Cd through the use of biochar are comparable to liming and can have an additive influence on liming.
  38. Biochar and compost have significant effects on soil physicochemical features, metal bioavailability (including Cd), and enzyme activities in heavy metal-polluted soil. Therefore, they help to mitigate Cd concentrations in the cacao trees.
  39. The cacao plant genotypes identified with low bioaccumulation of Cd have the potential to be used for Cd mitigation through grafting plants onto rootstocks with low cadmium uptake and obtaining new varieties that are not as prone to the absorption of Cd.
- 4.2.3. Avoiding further cadmium contamination of the soil (Recommended practices in the short and medium term)**
40. To reduce soil Cd contributions, remove pruned cocoa and shade tree limbs and leaves from the ground as they could contain Cd, which can be released into the top layers of the soil during decomposition. The practice should include removing pruned materials in orchards with high foliar Cd levels.
  41. Avoid the application of sewage sludge.

42. Avoid burial or incineration of household waste, which can contain metals, including Cd. Their burial can contaminate the groundwater, while incineration can cause contamination, release volatile metals into the atmosphere and consequently pollute soils
43. National or regional authorities should consider limiting main polluting industrial activities near cocoa plantations, such as non-ferrous mining and smelting, metal-using industries, leather tanning, coal combustion and phosphate fertilizer manufacturing.

#### **4.3 Post-harvest phase (Recommended practices in the short and medium term)**

44. The process of fermentation of cocoa beans is an important practice that producers carry out to develop chocolate flavours.
45. Mucilage draining improves the sensorial quality of cocoa beans in the process of fermentation reducing its acidity. Studies have shown that mucilage draining times up to 12, 24 or 36 hours reduces the cadmium concentrations, without affecting the organoleptic quality of the cocoa.
46. It is a recommended practice to make sure that during the fermentation of cocoa beans they are not contaminated with smoke, or with gases coming from dryers or vehicles, or industrial discharges.
47. *Saccharomyces cerevisiae* is a yeast strain, which absorbs Cd during cocoa fermentation. Therefore experimental studies have shown that increasing the concentration of *Saccharomyces cerevisiae* during the fermentation process can help to reduce the cadmium content in the beans.
48. After fermentation, cocoa beans should be dried on clean solid surfaces to avoid contamination by soil.
49. During storage, contamination of cocoa beans due to spills of fuels, exhaust gases or fumes should be prevented.

#### **4.4. Transport phase (Recommendations)**

50. It is recommended to carry out good practices during transportation of cocoa beans:
  - Cover loading/unloading areas to protect from rain.
  - Ensure that vehicles are well maintained and thoroughly cleaned.
  - Ensure that tarpaulins/covers are clean and free from damage.
  - Ensure that containers have not been used for chemicals or noxious substances and that they are well-maintained and clean.
  - Ensure that the humidity levels are as low as possible by using ventilated containers if available and cardboard/kraft paper lining.
  - For bagged cocoa: load bags carefully and cover with materials to absorb condensation.
  - For cocoa in bulk: use a sealable plastic liner if possible and ensure that it is kept clear of the roof of the container.
  - Ensure that the ventilation holes in containers are free from clogging.
  - ensure to the extent feasible that the cocoa is not exposed to temperature fluctuations and that it is not stored near noxious materials.

**APPENDIX IV**

**MAXIMUM LEVELS FOR LEAD IN CERTAIN FOOD CATEGORIES**

**(For adoption at Step 5/8)**

<b>Commodity/ Product Name</b>	<b>Maximum Level (mg/kg)</b>	<b>Portion of the Commodity/Product to which the ML applies</b>	<b>Notes/Remarks</b>
Cereal-based foods for infants and young children	0.02	Whole commodity as sold; not reconstituted or otherwise prepared for consumption	Relevant Codex commodity standard is CXS 74-1981. The ML applies to all cereal-based foods intended for infants (up to 12 months) and young children (12 to 36 months).
White and refined sugar, corn and maple syrups, honey	0.1	Whole commodity	Relevant Codex commodity standards are CXS 212-1999 (white and refined sugar) and CXS 12-1981 (honey).
Candies, sugar-based	0.1	Whole commodity	The ML applies all sugar-based candies.

**(For adoption at Step 5)**

<b>Commodity/ Product Name</b>	<b>Maximum Level (mg/kg)</b>	<b>Portion of the Commodity/Product to which the ML applies</b>	<b>Notes/Remarks</b>
Ready-to-eat meals for infants and young children	0.02	Whole commodity	Relevant Codex commodity standard is CXS 73-1981. The ML applies to all ready-to-eat meals intended for infants (up to 12 months) and young children (12 to 36 months).

**APPENDIX V**

**MAXIMUM LEVELS FOR METHYLMERCURY IN CERTAIN FISH SPECIES (ORANGE ROUGHY AND PINK CUSK EEL)**

(For adoption at Step 5/8)

Commodity/ Product Name	Maximum Level (mg/kg)	Portion of the Commodity/Product to which the ML applies	Notes/ Remarks
Orange roughy	0.8	Whole commodity fresh or frozen (in general after removing the digestive tract)	<p>Countries or importers may decide to use their own screening when applying the ML for methylmercury in fish by analyzing total mercury in fish. If the total mercury concentration is below or equal to the ML for methylmercury, no further testing is required, and the sample is determined to be compliant with the ML. If the total mercury concentration is above the ML for methylmercury, follow-up testing shall be conducted to determine if the methylmercury concentration is above the ML.</p> <p>The ML also applies to fresh or frozen fish intended for further processing.</p> <p>Countries should consider developing nationally relevant consumer advice for women of childbearing age and young children to supplement the ML.</p>
Pink cusk-eel	1.0		



**APPENDIX VI****PART I: Maximum levels for total aflatoxins in certain cereals and cereal-based products including foods for infants and young children****(For adoption at Step 5/8)**

<b>Commodity/ Product Name</b>	<b>Maximum Level (µg/kg)</b>	<b>Portion of the Commodity/Product to which the ML applies</b>	<b>Notes/Remarks</b>
Maize grain, destined for further processing	15	Whole commodity	“Destined for further processing” means intended to undergo an additional processing/treatment that has proven to reduce levels of AFs before being used as an ingredient in foodstuffs, otherwise processed or offered for human consumption. Codex members may define the processes that have been shown to reduce levels. The ML does not apply to maize destined to animal feed or wet milling.
Flour, meal, semolina and flakes derived from maize	10	Whole commodity	
Husked rice	20	Whole commodity	
Polished rice	5	Whole commodity	
Sorghum grain, destined for further processing	10	Whole commodity	“Destined for further processing” means intended to undergo an additional processing/treatment that has proven to reduce levels of AFs before being used as an ingredient in foodstuffs, otherwise processed or offered for human consumption. Codex members may define the processes that have been shown to reduce levels.
Cereal-based foods for infants and young children	5	Whole commodity as sold; not reconstituted or otherwise prepared for consumption.	Relevant Codex commodity standard is CXS 74-1981. The ML applies to all cereal-based foods intended for infants (up to 12 months) and young children (12 to 36 months).
Cereal-based foods for infants and young children	10	Whole commodity as sold; not reconstituted or otherwise prepared for consumption.	Relevant Codex commodity standard is CXS 74-1981. The ML applies to cereal-based foods destined for food aid programs intended for infants (6 to 12 months) and young children (12 to 36 months).

**PART II: Consequential amendment to the ML for Deoxynivalenol (DON)**  
**(changes shown in bold underlined font)**

(For adoption)

**Maximum level for Deoxynivalenol**

Commodity/ Product Name	Maximum Level (µg/kg)	Portion of the Commodity/Product to which the ML applies	Notes/Remarks
Cereal-based foods for infants and young children	200	Whole commodity <del>on a dry matter basis</del> <b><u>as sold; not reconstituted or otherwise prepared for consumption</u></b>	<b><u>Relevant Codex commodity standard is CXS 74-1981.</u></b> <b><u>The ML applies to</u></b> all cereal-based foods intended for infants (up to 12 months) and young children (12 to 36 months) <del>“as sold; not reconstituted or otherwise prepared for consumption”</del> .

**APPENDIX VII****PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF  
MYCOTOXIN CONTAMINATION IN CASSAVA AND CASSAVA-BASED PRODUCTS  
(For adoption at Step 5)****1. INTRODUCTION**

1. Mycotoxins are fungal toxins that can pose health and economic consequences. The most frequently occurring mycotoxins in cassava and cassava-based products are aflatoxins and ochratoxin A. Aflatoxins (AFs) are highly potent toxins that are reported in a wide variety of agricultural products. They are mainly produced by *Aspergillus flavus*, *Aspergillus parasiticus*, *Aspergillus nomius* and *Aspergillus minisclerotigenes*. Aflatoxins are among the most potent carcinogenic, teratogenic, and mutagenic compounds known. The major aflatoxins commonly found in agricultural commodities are aflatoxin B1, B2, G1, and G2, of which aflatoxin B1 is the most potent. Depending on the host species, these mycotoxins can act as nephrotoxins, hepatotoxins, immunotoxins, neurotoxins, teratogens, or carcinogen, however, the kidney is the primary target for toxicity.
2. The prevalence of several species of fungi that are implicated in mycotoxin production usually differs from one region to another. The fungi which can be found in soil and dust, residues of cultivated crops, stored cassava and cassava-based products at processing or storage facilities are usually associated with pre-harvest and/or post-harvest contamination of cassava and cassava-based products. Mould presence is associated with regions having climate and soil conditions that permit both small or large scale cassava cultivation.
3. The severity of pre-harvest fungal infection and propagation largely depends on the prevailing environmental and climatic factors, which may differ from year to year and from region to region. It also depends on the presence of inoculums, and the farming practice adopted. The degree of damage of the crop by rodents, insects and other organisms also influences the severity of contamination. Good agricultural practices (GAP) and good manufacturing practices (GMP) could play a major role in reducing the severity of contamination. Risk of postharvest fungal infection and production of mycotoxins in stored grain increases with the storage duration as indicated in the *Code of practice for the prevention and reduction of mycotoxin contamination in cereals* (CXC 51-2003).
4. There are many cultivars and species of cassava; however, they fall under one of two categories, bitter and sweet varieties, depending on the cyanogenic glucoside levels. The bitter and sweet varieties have high ( $\geq 100$  mg/kg) and low ( $\leq 50$  mg/kg) HCN content, respectively. Cassava is usually processed and consumed in various forms, which may differ across countries. Generally, one objective of cassava processing is to reduce its cyanogenic glucoside content to the lowest level possible. The intermittent presence of certain mycotoxins in cassava and cassava-based products destined for human food and animal feed use is to be expected. Therefore, it is important to diligently monitor products and processes for indications of the various conditions that promote fungal contamination and mycotoxin accumulation as indicated in the *Code of practice for the prevention and reduction of mycotoxin contamination in cereals* (CXC 51-2003).
5. This Code of Practice provides relevant information for all countries to contemplate in their efforts to prevent and reduce mycotoxin contamination in cassava and cassava based products.
6. The effectiveness of this Code of Practice will be determined by regulatory authorities, agriculture extension workers, farmers, producers, processors, distributors and food business owners in each country by considering the general principles and examples of GAP and GMP provided in the Code. As well, other local crops, climate, and agronomic practices should be examined to facilitate implementation of these practices where applicable. This Code of Practice is expected to apply to all cassava and cassava-based products relevant to human dietary intake and health, as well as international trade.
7. This Code of Practice provides information on general principles for the reduction of various mycotoxins in cassava and cassava based products; training and education of farmers, agricultural workers, processors, manufacturers, and distributors.

**SCOPE**

8. This Code of Practice intends to provide national and local authorities, farmers, producers, manufacturers, distributors and other relevant bodies with information and guidance to aid in the prevention and reduction of mycotoxins in cassava and cassava-based products. This guidance covers: Good agricultural practices, Good manufacturing practices, Good storage Practices and Good distribution practices.

## 2. RECOMMENDED PRACTICES APPLICABLE TO PRE-PLANTING STAGE

9. A fertile soil should be selected and this is considered critical. The most preferred is a loamy soil with good drainage. The farmer should avoid planting in valleys, to avoid flooding. Flood water could transport fungal inoculum from an infected farm. Where possible, ensure a proper planning for crop rotation in successive seasons. This will help in reducing inoculum in the farm which may be present from post-harvest waste that harbours toxigenic fungal spores. Particular crops have been found to be susceptible to certain species of toxigenic fungi and rotating planting with these crops should be monitored and evaluated. Crops that are said to be of low susceptibility to toxigenic fungi should be used in rotation to reduce the cross contamination from the inocula.

### 2.1 Farm land clearing and preparation

10. After the land selection, it should be cleared and waste properly disposed of to avoid contamination of the cassava roots with inocula from infected weed or other crops. The soil should be loosened by tilling with clean and suitable farm tools and equipment, to reduce stress to cassava roots particularly during the enlargement period and also to encourage healthy root development. Farmers should promote Good Agricultural Practices (GAP) to avoid soil erosion. Soil tests should be conducted, where possible, to determine whether there is a need to apply fertilizer and/or soil conditioners, in order to ensure adequate soil pH and plant nutrition to avoid plant stress. This should be done with the guidance of agricultural advisors.

### 2.2 Organic fertilizers

11. Organic fertilizers should be added during tilling to increase soil fertility or to address specific soil nutrient deficiencies. Ridges or mounds should be up to 0.75 m - 1 m apart. This should also be determined by the farming practice either with cassava alone or planted along with other crops. Healthy organic waste, such as pruning debris, peels and any other organic material that are free from fungal infestation and disease-free, should be used. Where needed, farmers should have access to approved inorganic fertilizers.

### 2.3 Cassava variety (cultivar) selection

12. Selection and use of improved, healthy, pest and diseases free cassava stems is important for good yield without rot. The following should be considered when selecting cassava variety: ability to sprout, ability to store well in the soil, ability to resist fungi and other plant pathogens; resistance to pests and diseases; longer shelf life and high starch content and cassava cuttings that are free of fungi should be planted.

## 3. RECOMMENDED PRACTICES APPLICABLE TO PLANTING AND PRE-HARVEST STAGE

### 3.1 Planting

13. To achieve maximum yield, stem cuttings of 25 cm in length are recommended for planting at a space of 1m x 1m; no dead stem should be planted. However, different producers may adopt slightly modified practices depending on cassava variety and the region. When cassava cuttings are to be planted, method, used depend on the climatic and rainfall conditions. Planting methods include:

**Horizontal Planting** involves placing the plants 5 – 10 cm deep into the soil in *dry climates*

**Vertical Planting** involves placing the cuttings vertically to avoid rot, especially *during the rainy season*

**Inclined Planting** involves placing the cuttings at 45 degrees and leaving 2 - 3 nodes above the ground. This is recommended in areas with the least rainfall. Planting should be done when the heat from the sun is minimal or absent, such as early morning or in the evening.

14. Avoid planting cassava on land where groundnut, maize, sugarcane or other highly susceptible crops were cultivated the previous year because such soils are likely contaminated with *Aspergillus flavus*, *Aspergillus parasiticus* and related species. The farmers should plant during the right month, based on geographical location.

### 3.2 Weed control

15. The use of post emergence herbicide could be recommended immediately once weeds are spotted on the field. In some cases, pre-emergence herbicides could be used before planting to minimize weed growth. Small-scale farms could use hoes and cutlasses to remove weeds but care should be taken to prevent mechanical injury of the plant. Large-scale farms could use mechanised equipment for weed removal. Note that, land preparation needs to be done properly to control the weeds at least for the first 3 months in order to achieve optimum yield.
16. Certain weeds can harbour toxigenic fungi and also increase plant stress when they are in competition for nutrients, during plant development. Either manual or mechanical approaches can be used for weed control; approved herbicides could also be used.

### 3.3 Fertilizer application

17. The type and quantity of fertilizer to be used are based on the cassava variety and nature of the soil. Fertilizers could be applied at around 4 - 8 weeks after planting and 16 weeks after planting, and be applied 6 cm in width and 10 cm from the stems or leaves of the cassava plant. Also, it is advisable to conduct a soil test to determine the type of fertilizer to apply.

### 3.4 Pesticide use

18. Approved pesticides could be used to minimize insect damage and fungal infection around the crop. Predictive weather models could be used to plan the best application timing and mode of pesticide application. Ensure safe use of spraying equipment and observe the application instructions for the pesticide formulation used to prevent harmful residues. Where needed, ensure access to agrochemicals authorized for use.

### 3.5 Irrigation

19. Where irrigation is used, ensure that it is applied evenly and that all plants in the field have an adequate supply of water. Irrigation is a valuable method of reducing plant stress in some growing situations. Excess precipitation during anthesis (flowering) makes conditions favourable for dissemination and infection by *Fusarium spp.*; thus irrigation during anthesis and the maturation of the roots should be avoided.

## 4. RECOMMENDED PRACTICES APPLICABLE TO HARVEST STAGE

### 4.1 Mechanical / Manual Harvesting

20. Harvesting should involve adequate planning in the areas of timing, age of products and methods to be used. Manual harvesting usually is labour intensive and expensive. For cost effectiveness in commercial operation, farmers are encouraged to consider using mechanical methods. In order to maintain quality and prevent crop wastage, the amount of roots to be harvested should also be determined depending on market needs and demand.
21. If mechanized processing materials are available, it is advisable to harvest cassava immediately after the roots mature. Harvesting manually by hand is done by raising the lower portion of the cassava plant stem and cutting off a part of the stem leaving a small portion at the base of the plant to serve as a handle to pull the cassava root out of the ground. Here, the cut portions of the stems are kept for reuse in the next planting season or sold to other cassava farmers. The leaves can also serve as animal feed.
22. Cassava should be harvested when the soil is slightly soft but has no excessive water, in order to easily remove soil from the roots and avoid contamination during peeling. However, cassava roots may be harvested all through the different climatic seasons to meet the market demand, necessary measures should be taken to prevent or reduce damages to harvested cassava roots especially when the soils are hard.

### 4.2 Conveyance tools

23. Containers and conveyances (e.g. trucks) used for collecting and transporting the harvested roots from the field to processing and storage facilities, should be clean, dry and free of crop residues, insects and visible fungal growth before use and re-use.

### 4.3 Holding conditions

24. Prior to the processing step, cassava roots should not be exposed to the sun, high temperatures, mechanical damage, or other conditions, which could promote fungal contamination, since the roots still have high water activity suitable for microbial development. The water activity at this stage varies from 0.922 to 0.996. A continuous progression from harvest to final product should be planned, in order that the roots will not be stored for a long period the ideal time is 2 to 3 days. .
25. Excess materials should be taken to a suitable raw material storage room. Enhanced storage methods for roots help to extend shelf life of fresh roots by 2 to 6 weeks. Other storage methods such as using low temperatures can be combined with fungicide treatment or waxing and are suitable for storing or exporting large amounts of roots. Food handlers that can afford specialized equipment with the necessary technical skills may use improved storage methods to store fresh roots for preservation.

## **5. RECOMMENDED PRACTICES APPLICABLE TO POST-HARVEST STAGES**

### **5.1 Cassava-based products**

26. Cassava roots can be processed into fermented or unfermented cassava-based products. These products, which depend on the region, have a wide range of applications including food for humans, animal feed, industrial uses such as fillers, and cloth starch among others. The processing steps by which these various products are arrived at differs and can be found in the *Code of practice for the reduction of HCN in cassava and cassava products* (CXC 73-2013). The approach here is to mention some of the various steps that may potentially influence fungal contamination but not under any specific product type. Processing of cassava should be initiated within 8-12 [within 24] hours of harvest to avoid spoilage.

#### **5.1.1 Washing**

27. After harvest, if cassava root is to be processed immediately, it should be washed to remove the surface dirt and soil acquired microbes. The source of water is an important factor not to be ignored. Water fit for its intended purpose should be used; treat other sources of water meant for washing to avoid contamination. Proper washing is vital to ensure sand or mud is removed from all parts of the root especially the contours.

#### **5.1.2 Peeling**

28. Immediately after washing, peeled cassava roots should be processed and should not be stored unprocessed. Peeling is either done manually using a knife or is done mechanically. It is done to remove the outer inedible portion of the cassava roots. Peeling should be carried out in a clean environment, and not in one where other crops have been stored, otherwise, it may serve as a source of contamination for the cassava.

#### **5.1.3 Boiling**

29. For the cassava roots of sweet varieties that can be consumed after peeling or boiling, it is recommended to boil roots immediately after peeling and washing. This will expose any fungus to temperatures they cannot survive. If not consumed immediately, adequate care should be taken to prevent fungal recontamination

### **5.2 Size reduction: Grating, pulping and slicing or chipping**

30. Where further processing of washed cassava roots includes any size reduction activities notwithstanding the size of the roots to be processed, varieties of cassava, as well as available equipment adequate care must be taken to ensure such unit processing do not lead to fungal contamination.

31. Where cassava chips or slices are dried at farm level or in a processing facility, the chips or slices should be dried on a cleaned, dry, raised platforms and at least 100 meters away from probable sources of contamination, such as refuse dumps or filling stations. Where sun-drying is carried out, it should be done on drying mats such as raffia palm, bamboo, oil palm mat, banana leaves, amongst others, that would ensure good hygienic practice.

32. If chips or slices are dried artificially, the dryers should be cleaned, maintained, as well as protected from smoke and fuel contamination.

33. Unhygienic practices at this stage could serve as potential sources of fungal inocula. The environment should be kept clean, and all the tools used for grating, pulping, slicing and chipping should be cleaned and washed after each use and adequately stored dry.

#### **5.2.1 Fermentation**

34. The fermentation of cassava roots is primarily used for further cyanide elimination, flavour development and product stability. Fermentation of cassava for traditional food processing is usually allowed to take a natural course, some optimization research has been carried out to the effect of using selected starter cultures, however this method is not widely used. The sack in which the grated pulp or the container in which the peeled root will be kept, allowing for 2 to 5 days fermentation should be kept clean at all times and especially well cleaned before use, to ensure it does not become a natural source of inoculum.

#### **5.2.2 Dewatering**

35. This process involves removing water from grated cassava roots and it is usually done by pressing. The dewatering process could last up to two days. Dewatering could be done before or after fermentation. Water removal should be optimal and care should be taken not to use contaminated processing materials such as sacks as they may become sources of fungi inoculum. Food grade sacks should be used. Adequate cleaning and sterilization of the sacks should be done frequently.

### 5.3 Cake breaking / granulating

36. The process involves feeding the cassava cake into a cassava grater that will break it into granules. Wet cakes can be sifted to remove lumps. Where a cassava grater is not available, a manual sifter is most often used to break the cake and sift the granules at the same time. The grater should be clean and the sacks containing cake or granules should not be placed on dirty surfaces (such as floors). Clean containers should be used to hold the wet granules to ensure product is not contaminated. Clean pans, bowls or sacks should be used in emptying the cakes.

### 5.4 Drying

37. This is a very important stage, fermented cassava pulp is usually spread in the open air to be dried under non-aseptic conditions, thus exposing them to insects and rodents as well as impurities carried in the air. Any of these could be sources of fungi inoculation. Drying should thereby be done in a controlled environment and monitored. Drying should be properly done to avoid moisture. High Microbial loads may be caused by use of unclean drying surfaces and materials such as sheets on raised platforms, so care must be taken to clean surfaces. Recommended temperatures should be; sun (30-40°C), Solar Dryer (50-60°C), Cabinet dryer (60-65°C) and Flash dryer (120-150). Drying cassava under the sun should be done during dry seasons only. Granules or chips should be properly spread per square meter of drying surface and should not be overloaded to allow for air circulation. Platforms for drying should be raised to prevent contamination such as dust, animals, and pests. Batches of granules not adequately dried should be spread out in a ventilated room until the product is dried. Drying surfaces and materials should be clean.

### 5.5 Milling

38. This process involves milling the dried granules or chips to a fine flour of particle size of approximately 250 microns to 500 microns). Care should be taken to ensure the mill is not overloaded. The environment should be monitored to prevent cross contamination from dust. The dried flour should be stored in a clean moisture-proof container. The milling machine should be cleaned and washed after use.

### 5.6 Sieving

39. The sieve to be used in further processing steps should be stored properly and cleaned with potable water and completely dried before use.

### 5.7 Frying

40. Frying of gari among other fermented cassava products should be done at high temperatures and monitored thus further discouraging fungal proliferation.

## 6. STORAGE

41. Storage facilities should be cleaned before materials are brought in, to remove dust, fungal spores, crop residues, animal and insect excreta, soil, insects, foreign material such as stones, metal and broken glass, and other sources of contamination. Sheds, silos, bins and other building materials intended for cassava and cassava-based products storage should be dried and well ventilated. Provide protection from ground water, moisture condensation, rain, entry of rodents, and insects whose activity makes the commodities more susceptible to mould infection. Ideally, storage areas should be able to prevent wide temperature fluctuations. Temperature and humidity can be monitored and controlled where possible
42. For bagged cassava products, ensure that bags are clean, dry, non-toxic and stacked on pallets or incorporate a water impermeable layer between the bags and the floor. The bags should facilitate aeration and be made of non-toxic food-grade materials that do not attract insects or rodents and are sufficiently strong to resist storage for longer periods as indicated in the *Code of practice for the reduction of mycotoxin contamination in cereals* (CXC 51-2003).
43. Determine moisture content of the lot, and if necessary, dry the product to the suitable moisture content recommended prior to storage. Fungal growth is closely related with water activity ( $a_w$ ), commonly defined in foods as the water that is not bound to food molecules that can support the growth of bacteria, yeasts, and fungi. Although the appropriate moisture content for fungal growth on various crops is different, the maximum  $a_w$  to avoid fungal growth is basically the same. It is recognized that fungal growth is inhibited at  $a_w$  of less than 0.70. In addition, safe storage guidance may be provided to reflect the environmental situation in each region.

**7. PACKAGING**

44. Cassava-based products mainly in the form of flour or granules may be stored in sacks, sealed prior to distribution and sales in the market. Packaging materials should be made of materials which should not easily absorb moisture when packed and sealed.

**8. TRANSPORTATION**

45. Transport containers, including vehicles such as trucks and railway vessels, boats and ships should be dry and free of old crop dust, visible fungal growth, musty odour, insects and any contaminated material that could contribute to mycotoxin levels in lots and cargoes of cassava and cassava-based products. As necessary, transport containers should be cleaned and disinfected with appropriate substances (which should not cause off-odours, flavour or contaminate the cassava and cassava-based products) before use and re-use and be suitable for the intended cargo. The use of registered fumigants or insecticides may be useful. At unloading, the transport container should be emptied of all cargo and cleaned as appropriate.
46. Shipments of cassava and cassava-based products should be protected from additional moisture by using covered or airtight containers or tarpaulins. Minimise temperature fluctuations and measures that may cause condensation to form on the cassava and cassava-based products, which could lead to local moisture build-up and consequent fungal growth and mycotoxin formation.
47. Avoid insect, bird and rodent infestation during transport by the use of insect-and rodent proof containers or insect and rodent repellent chemical treatments if they are approved for the intended end use of the cassava and cassava-based products.

**9. PERSONNEL HYGIENE**

48. Farmers, agricultural and hired workers should be trained on workplace and personal hygiene measures at each process step such as planting, harvesting, packing and storage techniques, to ensure quality cassava and cassava based products. Training and re-training should be done to ensure adherence with best practices. Processors should provide required training on workplace hygiene and keep a record of training dates. Personal protective clothing should be provided for the staff. Measures to monitor staff hygiene practices and health status should be put in place. Records should be kept to track serious illnesses and to avoid cross contamination. Washrooms and hand washing facilities should be made available and easily accessible. Areas for eating areas, drinking and smoking, should be kept separate from processing and packaging areas to avoid any contamination.

**10. INSTRUCTION FOR STORAGE AND PRODUCT USE**

49. Specific storage instructions for the cassava-based products should be provided on the packaging so as to ensure protection from unfavourable conditions, which may promote fungal growth and contamination. The instructions for storage and when opened should be in clear language and legible to maintain the product in a cool, dry, well-ventilated area. Educators should create awareness on product stacking in storage areas to avoid increased humidity and temperature, which encourage fungi growth.



**APPENDIX VIII**

**METHODS OF ANALYSIS FOR CONTAMINANTS**

(For consideration by CCMAS)

**PART I: Numeric performance criteria for lead and cadmium for endorsement and inclusion in the *Recommended Methods of Analysis and Sampling (CXS 234-1999)***

Numeric performance criteria for lead and cadmium in foods

Commodity	Provision	ML (mg/kg)	Method performance criteria						
			Minimum applicable range (mg/kg)	Limit of Detection (LOD) (mg/kg)	Limit of Quantification (LOQ) (mg/kg)	Precision (RSD <sub>R</sub> ) (%) No more than	Recovery (%)	Example of applicable methods that meet the criteria	Principle
Berries and other small fruits, except cranberry, currant and elderberry	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Cranberry	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Currants	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Elderberry	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Fruits, except cranberry, currants and elderberry	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Brassica vegetables, except kale and leafy Brassica vegetables	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Bulb vegetables	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Fruiting vegetables, except fungi and mushrooms	lead	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Leafy vegetables, except spinach	lead	0.3	0.127 <u>to</u> 0.473	0.03	0.06	38	80-110%		
Legume vegetables	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Fresh farmed mushrooms (common mushrooms ( <i>Agaricus bisporous</i> ), shiitake mushrooms ( <i>Lentinula edodes</i> ), and oyster mushrooms ( <i>Pleurotus ostreatus</i> ))	lead	0.3	0.127 <u>to</u> 0.473	0.03	0.06	38	80-110%		
Pulses	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		

Commodity	Provision	ML (mg/kg)	Method performance criteria						
			Minimum applicable range (mg/kg)	Limit of Detection (LOD) (mg/kg)	Limit of Quantification (LOQ) (mg/kg)	Precision (RSD <sub>R</sub> ) (%) No more than	Recovery (%)	Example of applicable methods that meet the criteria	Principle
Root and tuber vegetables	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Canned fruits	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Jams, jellies and marmalades	lead	0.4	0.180 <u>to</u> 0.620	0.04	0.08	37	80-110%		
Mango chutney	lead	0.4	0.180 <u>to</u> 0.620	0.04	0.08	37	80-110%		
Canned vegetables	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Preserved tomatoes	lead	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Table olives	lead	0.4	0.180 <u>to</u> 0.620	0.04	0.08	37	80-110%		
Pickled cucumbers (cucumber pickles)	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Canned chestnuts and canned chestnuts puree	lead	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Fruit juices, except juices exclusively from berries and other small fruits	lead	0.03	0.017 <u>to</u> 0.043	0.006	0.012	44	60-115%		
Fruit juices obtained exclusively from berries and other small fruits, except grape juice	lead	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Grape juice	lead	0.04	0.022 <u>to</u> 0.058	0.008	0.016	44	60-115%		
Cereal grains, except buckwheat, cañihua and quinoa	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Infant formula, formula for special medical purposes intended for infants and follow-up formula	lead	0.01	0.006 <u>to</u> 0.014	0.002	0.004	44	60-115%		
Fish	lead	0.3	0.127 <u>to</u> 0.473	0.03	0.06	38	80-110%		
Meat of cattle, pigs and sheep	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Meat and fat of poultry	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Cattle, edible offal of	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		

Commodity	Provision	ML (mg/kg)	Method performance criteria						
			Minimum applicable range (mg/kg)	Limit of Detection (LOD) (mg/kg)	Limit of Quantification (LOQ) (mg/kg)	Precision (RSD <sub>R</sub> ) (%) No more than	Recovery (%)	Example of applicable methods that meet the criteria	Principle
Pig, edible offal of	lead	0.15	0.054 <u>to</u> 0.246	0.015	0.03	43	80-110%		
Poultry, edible offal of	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Edible fats and oils	lead	0.08	0.045 <u>to</u> 0.115	0.016	0.032	44	60-115%		
Fat spreads and blended spreads	lead	0.04	0.022 <u>to</u> 0.058	0.008	0.016	44	60-115%		
Milk	lead	0.02	0.011 <u>to</u> 0.029	0.004	0.008	44	60-115%		
Secondary milk products <sup>1</sup>	lead	0.02	0.011 <u>to</u> 0.029	0.004	0.008	44	60-115%		
Natural mineral waters	lead	0.01	0.006 <u>to</u> 0.014	0.002	0.004	44	60-115%		
Salt, food grade	lead	1	0.52 <u>to</u> 1.48	0.1	0.2	32	80-110%		
Wine (wine and fortified / liqueur wine) made from grapes harvested before July 2019	lead	0.2	0.078 <u>to</u> 0.322	0.02	0.0400	41	80-110%		
Wine from grapes harvested after July 2019	lead	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Fortified / Liqueur wine from grapes harvested after 2019	lead	0.15	0.054 <u>to</u> 0.246	0.015	0.03	43	80-110%		
Brassica vegetables, except Brassica leafy vegetables	cadmium	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Bulb vegetables	cadmium	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Fruiting vegetables, except tomatoes and edible fungi	cadmium	0.05	0.028 <u>to</u> 0.072	0.01	0.02	44	60-115%		
Leafy vegetables	cadmium	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Legume vegetables	cadmium	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Pulses, except soya bean (dry)	cadmium	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		

<sup>1</sup> Note that CXS 234 has been updated following CAC44 (2021) and contains numeric performance criteria for lead in butter, edible casein products and whey powders. This proposal will allow these numeric performance criteria to apply to methods for determining lead in all secondary milk products (including butter, edible casein products and whey powders)

Commodity	Provision	ML (mg/kg)	Method performance criteria						
			Minimum applicable range (mg/kg)	Limit of Detection (LOD) (mg/kg)	Limit of Quantification (LOQ) (mg/kg)	Precision (RSD <sub>R</sub> ) (%) No more than	Recovery (%)	Example of applicable methods that meet the criteria	Principle
Root and tuber vegetables, except celeriac	cadmium	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Stalk and stem vegetables	cadmium	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Cereal grains, except buckwheat, cañihua, quinoa, wheat and rice	cadmium	0.1	0.032 <u>to</u> 0.168	0.01	0.02	44	80-110%		
Rice, polished	cadmium	0.4	0.180 <u>to</u> 0.620	0.04	0.08	37	80-110%		
Wheat (common wheat, durum wheat, spelt and emmer)	cadmium	0.2	0.078 <u>to</u> 0.322	0.02	0.04	41	80-110%		
Marine bivalve mollusks (clams, cockles and mussels), except oysters and scallops	cadmium	2	1.135 <u>to</u> 2,865	0.2	0.4	29	80-110%		
Cephalopods	cadmium	2	1.135 <u>to</u> 2,865	0.2	0.4	29	80-110%		
Natural mineral waters	cadmium	0.003	0.002 <u>to</u> 0.004	0.0006	0.0012	44	40-120%		
Salt, food grade	cadmium	0.5	0.234 <u>to</u> 0.766	0.05	0.1	36	80-110%		
Chocolate containing or declaring ≥ 50% to < 70% total cocoa solids on a dry matter basis, including sweet chocolate, Gianduja chocolate, semi – bitter table chocolate, Vermicelli chocolate / chocolate flakes, and bitter table chocolate	cadmium	0.8	0.403 <u>to</u> 1.197	0.08	0.16	33	80-110%		
Chocolate containing or declaring ≥ 70% total cocoa solids on a dry matter basis, including sweet chocolate, Gianduja chocolate, semi – bitter table chocolate, Vermicelli chocolate / chocolate flakes, and bitter table	cadmium	0.9	0.461 <u>to</u> 1.339	0.09	0.18	33	80-110%		

Commodity	Provision	ML (mg/kg)	Method performance criteria						
			Minimum applicable range (mg/kg)	Limit of Detection (LOD) (mg/kg)	Limit of Quantification (LOQ) (mg/kg)	Precision (RSD <sub>R</sub> ) (%) No more than	Recovery (%)	Example of applicable methods that meet the criteria	Principle
Chocolate containing or declaring < 30% total cocoa solids on a dry matter basis	cadmium	0.3	0.127 <u>to</u> 0.473	0.03	0.06	38	80-110%		
Chocolate containing or declaring ≥ 30% to <50% total cocoa solids on a dry matter basis	cadmium	0.7	0.346 <u>to</u> 1.054	0.07	0.14	34	80-110%		

**PART II: Removal of analytical methods for lead from CXS 234 and transfer to the column of “example of applicable methods that meet the criteria”, if they meet the performance criteria**

<i>Commodity</i>	<i>Provision</i>	<i>Method</i>	<i>Principle</i>	<i>Type</i>
<b>Fats and Oils and Related Products</b>				
Fats and Oils (all)	Lead	AOAC 994.02 / ISO 12193 / AOCS Ca 18c-91	Atomic absorption spectrophotometry (direct graphite furnace)	II
Named Vegetable Oils	Lead	AOAC 994.02 / ISO 12193 / AOCS Ca 18c-91	Atomic absorption spectrophotometry (direct graphite furnace)	II
Olive Oils and Olive Pomace Oils	Lead	AOAC 994.02 or ISO 12193 or AOCS Ca 18c-91	AAS	II
Butter	Lead	AOAC 972.25 (Codex general method)	Atomic absorption spectrophotometry	IV
Edible casein products	Lead	NMKL 139 (Codex general method) AOAC 999.11	Atomic absorption spectrophotometry	IV
Edible casein products	Lead	NMKL 161 / AOAC 999.10	Atomic absorption spectrophotometry	IV
Edible casein products	Lead	ISO/TS 6733   IDF/RM 133	Spectrophotometry (1,5-diphenylthiocarbazone)	IV
<b>Processed Fruits and Vegetables</b>				
Table olives	Lead	AOAC 999.11   NMKL 139 (Codex general method)	AAS (Flame absorption)	II
<b>Miscellaneous Products</b>				
Food grade salt	Lead	EuSalt/AS 015	ICP-OES	III
Food grade salt	Lead	EuSalt/AS 013	Atomic absorption spectrophotometry	IV

**APPENDIX IX**

**PRIORITY LIST OF CONTAMINANTS FOR EVALUATION BY JECFA (REP21/CF)**

Contaminants	Background and question(s) to be answered	Data availability (when, what)	Proposed by
Dioxins and dioxin-like PCBs	Full evaluation (toxicological assessment and exposure assessment) to update 2001 JECFA assessment and incorporate data on developmental effects from in utero exposures.	<p><u>EFSA</u>: Assessment available September 2018.</p> <p><u>WHO</u>: Finalizing review of TEF values in preparation for expert consultation in October 2022.</p> <p><u>Brazil</u>: Occurrence data on milk, raw eggs, fish, and fat (poultry and mammals).</p> <p><u>Canada</u>: Occurrence data on foods of animal origin.</p>	Canada
Arsenic (inorganic and organic)	<p><u>Inorganic</u>: 2011 JECFA evaluation based on cancer effects. This evaluation would focus on non-cancer effects (neurodevelopmental, immunological and cardiovascular) and could inform future risk management needs.</p> <p><u>NOTE</u>: Needs to be put in context to cancer risk assessment.</p> <p><u>Organic</u>: (exploratory)</p>	<p><u>Australia/New Zealand</u>: Total diet study; inorganic arsenic occurrence data in rice.</p> <p><u>Brazil</u>: Occurrence data on total arsenic in rice, poultry, pork, fish, and cattle meat, inorganic arsenic occurrence data in rice.</p> <p><u>Canada</u>: Occurrence data on inorganic and total arsenic in a variety of commercial foods.</p> <p><u>Chile</u>: Occurrence data on inorganic and total arsenic in algae, crustaceans, gastropods, bivalve molluscs and small fish.</p> <p><u>EU</u>: Inorganic arsenic occurrence data.</p> <p><u>India</u>: Occurrence data in rice.</p> <p><u>Japan and China</u>: Occurrence data on rice and rice products.</p> <p><u>Turkey</u>: Occurrence data in rice.</p> <p><u>USA</u>: Occurrence data on rice cereals, and rice and non-rice products; 2016 risk assessment; 2016 draft action level for inorganic arsenic in rice cereal.</p> <p><u>USA</u>: Studies</p> <ul style="list-style-type: none"> <li>• Neurodevelopmental studies of inorganic arsenic impacts on rat behavior (2019, 2022).</li> <li>• Toxicokinetic studies on metabolism and disposition of inorganic and organic arsenic and metabolites in mice (various life stages) (2018-20).</li> </ul>	USA

Contaminants	Background and question(s) to be answered	Data availability (when, what)	Proposed by
		<ul style="list-style-type: none"> <li>• Developmental toxicity test in <i>C. elegans</i> on inorganic arsenic (2018) and ongoing study on organic arsenic.</li> <li>• Non-governmental report, Effects of Inorganic Arsenic in Infant Rice Cereal on Children’s Neurodevelopment (2017).</li> </ul>	
Scopoletin	Full evaluation (toxicological assessment and exposure assessment) in fermented noni juice.	<p>CCNASWP still working on standard for noni juice and data availability, to be discussed at CCCNASWP16 (2023). CCNASWP15 agreed to request CCCF to retain scopoletin on the priority list and to call upon Codex members to generate and submit data to support the conduct of the safety evaluation by JECFA. CCNASWP15 also requested FAO and WHO to organize a new call for data for the safety evaluation of scopoletin. FAO reminded that a full dataset including exposure and toxicity is required.</p> <p>A consultant was hired by the Codex Secretariat to undertake a toxicological review of scopoletin as presented in the Annex to CX/CF 21/14/2-Add.1.</p>	CCNASWP