CODEX ALIMENTARIUS COMMISSION

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World Health Organization

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

Tenth Session

Rotterdam, The Netherlands, 4 – 8 April 2016

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF ARSENIC CONTAMINATION IN RICE

(Prepared by the Electronic Working Group chaired by Japan and co-chaired by China)

Codex Members and Observers wishing to submit comments at Step 3 on the proposed draft Code of practice for the prevention and reduction of arsenic contamination in rice (Appendix I), including possible implications for their economic interests, should do so in conformity with the *Uniform Procedure for the Elaboration of Codex Standards and Related Texts* (Codex Alimentarius Commission Procedural Manual).

Codex Members and Observers are also invited to provide their views on the recommendations on how to proceed with work on the Code (paragraph 16). The recommendations in the paper are based on information provided by members of the EWG and following discussion within the EWG.

Comments must be submitted before **15 March 2016** and should be directed:

to:	with a copy to:
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INTRODUCTION

1. The Codex Committee on Contaminants in Food (CCCF) at its 8th Session (March 2014) agreed to propose new work on a Code of Practice (COP) for the Prevention and Reduction of Arsenic Contamination in Rice for approval by the 37th Session of the Commission[1]. The Commission approved the elaboration of the COP as new work[2].

2. The CCCF at its 9th Session (March 2015) considered Sections 1 (Introduction) and 2 (Scope) of the COP as the important starting points and agreed to the texts on these sections. The CCCF agreed to re-establish the EWG, led by Japan and co-chaired by China to further develop the COP in light of comments submitted and decision taken at this session[3].

3. As shown in the list of participants (Appendix II), 22 Members and 2 observers participated in the EWG.

4. The EWG requested its Members to provide information and data on measures that have already been implemented and/or are under consideration in countries/region, in particular information on the following:

   - Measure(s) taken/ to be taken (e.g. use of soil amendment, intermitting ponding)
   - Summary of the measure
   - Supporting scientific evidence, if available
   - Name of entity/ government in charge of the measure with contact information

1 REP14/CF, paras 93-95 and Appendix VIII
2 REP14/CAC, para. 96 and Appendix VI
3 REP15/CF, paras 70 - 74

5. The EWG also asked its Members to provide information/data on studies that are relevant to prevention and reduction of arsenic contamination, whether finished or not, in particular information on the following:

   - Measure(s) that can be supported by the study(ies)
   - Brief summary of the study, if available
   - Expected date when the result is available (if the study is underway)
   - Name of entity in charge of the study with contact information

COMMENTS AND INFORMATION PROVIDED

6. Information and data on effective/ implemented/ proved measures to be used in the draft COP have not been provided. However, the EWG received the following information on relevant ongoing studies.

7. Japan conducts multi-year field studies in several areas in Japan to investigate appropriate irrigation measures. The final report will be available by March 2019.

8. The Philippines conducts studies to determine the levels of total Arsenic in rice grown near natural and anthropogenic sources during the wet and dry season to establish, based on risk assessment, the Arsenic levels in rice that will best reflect the Philippine position for recommendation to Codex and to predict the futuristic effect of climate change on the levels of Arsenic in rice using appropriate programs for environmental assessment and formulation of mitigating measures. The final report will be available in January to February 2019. These studies involve similar investigations on Cadmium.

9. The United States informs the EWG that some manuscripts have already been published[4] and that a manuscript on a multi-year field test in California with irrigation variation is in review.

10. Uruguay conducts research aiming to understand Arsenic dynamics on Uruguayan rice production with a 2 to 3-year field experiments on four widely used varieties, with two irrigation regimes in two soil types which represent the main rice regions in the country (North and East). The final report will be available in 2017.

11. Responses of EWG members to the questions tabled by the Chair and Co-chair of the EWG on ways forward are available in Appendix III and are for information only.

DISCUSSION

12. Taking into account the information above and the necessity of the measures proven to be effective for prevention and reduction of Arsenic contamination in rice, seven EWG Members commented on the following points:

    1) As the information currently included in the draft COP (see Appendix I) is regarded by the Chair and Co-Chair as insufficient for completion of the COP, we think that the EWG/CCCF should collect further information on effective and feasible measures. To collect sufficient information to proceed with discussion and elaboration, the CCCF should propose to postpone discussions pending results of the studies described above. After outcomes from all of the above-mentioned studies become available (likely to be by March 2019), the CCCF should resume work on the topic at the Session in [2019] [2020].

       If additional information on measures is readily available, please provide it to the EWG for consideration. If sufficient information for elaboration of a COP is provided, it would not be necessary to postpone discussions.

    2) Arsenic in rice may have significant public health implications. Therefore, the CCCF shall proceed as soon as possible. If the CCCF agrees to postpone pending results of studies, there is a need to revise the time line in the Project Document with 2017 as completion year. The finalisation of a COP would be in [2020] [2021] at the earliest. In this case, the CCCF has to adopt a proposed draft COP at Step 5/8 at the Session of one year after resuming discussion.

    3) If the postponement is not agreed, please propose any other way forward, for example, compilation of measures for prevention and reduction of arsenic contamination in rice available in the scientific literature. If it is a way forward, a volunteer Codex member should be sought.

[4] (1) Anders et al., Effect of Water Management on Brown Rice Yield, and Total As and Cd Concentrations, in proc. International Plant Nutrition Colloquium 2013: Istanbul, Turkey
(2) Linquist BA, Anders MM, Adviento-Borbe MA, Chaney RL, Nalley LL, Da Rosa EFF, Kessel Van C. 2015. Reducing greenhouse gas emissions, water use, and grain arsenic levels in rice systems. Global Change Biology. 21: 407-417.
(3) Song W-Y, Yamaki T, Yamaji N, Ko D, Jung K-H, Fujii-Kashino M, Gynheung A, Martinoia E, Lee Y, Ma JF. A rice ABC transporter, OsABCC1, reduces arsenic accumulation in the grain. PNAS. 111(44): 15699-15704.

13. Five members supported postponement pending results of studies.

14. One member, while not to object to postponing, said that at minimum the CCCF should provide some compilation of available information on current best practices to reduce or prevent arsenic in rice.

15. One member was of the view that a short, simple COP with information currently available should be elaborated in 2017 and the CCCF could revisit to update the COP with additional information that become available.

RECOMMENDATION

16. The CCCF should decide whether it should postpone discussions on the elaboration of a COP for prevention and reduction of contamination of arsenic in rice.

- If the CCCF agrees to postpone, it should decide when it resumes work and a new target year.
- If the CCCF agrees not to postpone:
  - The CCCF may decide to finalise a draft COP with currently available information. It should be noted that all of the currently available information has already been taken into account in elaboration of the draft COP (Appendix I) and that a COP should contain measures that are proven to be effective for prevention and reduction of arsenic in rice.
  - Instead of a COP, it is possible to compile measures currently available.

APPENDIX I

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF ARSENIC CONTAMINATION IN RICE

1. INTRODUCTION

Soil of rice paddy fields contains arsenic naturally and also can be polluted by arsenic from anthropogenic sources, such as mining and smelting, through irrigation water, rain and air and materials for agricultural and livestock production. Rice plants absorb arsenic from soil, especially when soil is in reducing conditions, and accumulate it in grain and straw. Rice may contain inorganic arsenic (arsenite and arsenate) and organic arsenic (monomethylarsonic acid and dimethylarsinic acid).

The effectiveness of measures in the Code of Practice can vary depending on local environmental conditions (e.g. soil properties, management regimes and, temperature). Field studies should be conducted to identify measures that are feasible and effective for local or regional conditions. If possible, the field studies should be conducted across crop years because arsenic uptake in rice crops is highly variable from year to year. Implementation of measures that are likely to result in insufficient supply of rice to the market should be avoided.

2. SCOPE

2.1 The Code intends to provide national or relevant food control authorities, producers, manufacturers and other relevant bodies with all possible guidance to prevent and reduce arsenic contamination in rice as follows:

i. Source directed measures; and

ii. Agricultural measures

2.2 The Code also includes guidance on monitoring and risk communication.

3. DEFINITIONS [to be added/ reconsidered in respond to the discussion in the following sections if necessary]

3.1.1 ***Paddy rice*** (rice grain) is rice (species *Oryza sativa* L.) which has retained its husk after threshing (GC 0649[1]).

3.1.2 ***Husked rice*** (brown rice or cargo rice) is paddy rice from which the husk only has been removed. The process of husking and handling may result in some loss of bran (CM 0649[1]).

3.1.3 ***Polished rice*** (milled rice or white rice) is husked rice from which all or [part of] the bran and germ have been removed by milling (CM 1205[1]).

3.2.1 ***Arsenic*** is a metalloid and is found in the environment both from natural occurrence and from anthropogenic activity.

Note: In this paper, the term “arsenic” refers to inorganic and organic arsenic.

3.2.2 ***Organic arsenic*** is an arsenic compound that contains carbon[, including monomethylarsonic acid and dimethylarsinic acid].

3.2.3 ***Inorganic arsenic*** is an arsenic compound that does not contain carbon, including As(III) and As(V).

3.3 ***Flooded condition*** of a paddy field where rice is grown is a condition that a paddy field is filled or covered with water during growth.

3.4 ***[Aerobic condition*** of soil in a paddy field where rice is grown is a condition that a paddy field is more aerobic than flooded condition.] [Aerobic rice technology is a production system in which rice is grown in well-drained, non-puddled, and nonsaturated soils.]

3.5 ***[Intermittent ponding*** means a variety of possible water management practices in which a paddy field is alternately in flooded and aerobic/nonflooded condition.]

[3.6 Production under irrigation]

[1] Classification of Foods and Animal Feeds (CAC/MISC 4-1993)

4. MEASURES TO PREVENT AND REDUCE ARSENIC CONTAMINATION

4.1 Source Directed Measures

4.1.1 Sources of arsenic in the environment are: 1) natural sources, including volcanic action, elution from soil or sediment such as Holocene sediments, geogenic weathering and low temperature volatilization,; and 2) anthropogenic sources, including emission from industries, especially from mining and smelting of non-ferrous metals; burning of fossil fuels; use of arsenic pesticides; and disposal of timber treated with copper chrome arsenate(CCA). In the paddy environment, use of soil amendments and fertilizers contaminated with significant concentration of arsenic are also sources of arsenic[2].

4.1.2 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 of Food with Chemicals* (CAC/RCP 49-2001). In particular, authorities can consider whether measures in the following areas are appropriate for their countries:

- Irrigation water;
    - Identification of irrigation water with high arsenic concentration
    - [Elimination][Reduction] of arsenic from irrigation water with high arsenic concentration [adjusting to permitted limits]
    - Avoidance of [use of] irrigation water with high arsenic concentration for rice production
- Soil;
    - Identification of paddy fields in which arsenic concentration in soil is high and/or rice produced from that soil has high inorganic [or organic] arsenic concentrations
- Atmospheric emissions and waste water from industries;
- Materials used in agricultural and livestock production such as pesticides, veterinary medicines, feed, soil amendments and fertilizers; and
- Waste containing arsenic, such as timber treated with copper chrome arsenate.

4.2 Agricultural Measures

4.2.1 National or relevant food control authorities should educate rice producers about practices to prevent and reduce arsenic concentration in rice. Education programmes may include:

- Publishing and disseminating technical guidance on rice cultivation techniques to reduce arsenic in rice
- Establishing farmer field schools

4.2.2 Aerobic conditions or intermittent ponding during rice production, instead of flooded conditions, may reduce arsenic concentration in rice. [If the risk from cadmium in rice is of concern in the region, risk managers should be careful that implementation of the measure would not result in posing risk from cadmium as the measure may increase cadmium concentration in rice[3]. If appropriate, risk managers may also consider implementation of source directed measures for cadmium in soil, water or fertilisers used for rice production[4].]

It is also noted that implementation of aerobic or intermittent ponding conditions may result in decrease of rice production in some areas. Aerobic growth may also have to be balanced with the use of flooding for weed control or temperature control in cooler areas.

4.2.3 National or relevant food control authorities may identify rice cultivars that [contain][absorb] arsenic at low concentration [in husked and/or polished rice] and/or encourage public research institute and/or private nursery developer to develop rice cultivars that result in husked and/or polished rice with low arsenic concentration. Producers could select such rice cultivars, if available and suitable.

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[2] Many fertilizers contain trace levels of arsenic. “Contaminated” should not be interpreted as equivalent to trace levels of arsenic.

[3] Use of some rice cultivars that absorb little amount of cadmium, if available, may be a solution.

[4] See the *Code of Practice concerning Source Directed Measures to Reduce Contamination of Food with Chemicals* (CAC/RCP 49-2001)

5. MONITORING

5.1 The effectiveness of measures should be monitored by arsenic concentration in rice.

5.2 If agricultural land or ground waters used for growing rice are widely contaminated by natural sources, non-point source or past activities, monitoring arsenic concentration in soil and/or irrigation water may also be necessary.

6. RISK COMMUNICATION

6.1 National or relevant food control authorities should share information on risks and benefits of consuming polished and/or husked rice among stakeholders in the light of arsenic concentrations and nutrient components [, noting that there are health benefits associated with consumption of husked rice.]

6.2 National or relevant food control authorities should share the following information with distributors and consumers and encourage them to implement the practices, which would reduce arsenic concentration during processing and cooking.

- It is known that during polishing process more arsenic is removed from husked rice that contains higher concentration of arsenic and that husked rice polished at the higher polishing rate results in polished rice with lower arsenic concentration. Polished rice contains less inorganic arsenic than husked rice, because polishing removes inorganic arsenic in the bran layer. [Thus, husked rice containing high concentration of arsenic can be distributed and safely consumed after it is appropriately processed into polished rice.] [However, there are also health benefits associated with consumption of husked rice.]
- Arsenic concentration in polished rice can be reduced by washing polished rice, “rinse-free”[5] treatment or cooking with large amounts of water followed by discarding excess water.

6.3 When water used for cooking is highly contaminated with arsenic, national or relevant food control authorities should inform consumers to avoid using such water for washing and cooking rice, since rice absorbs arsenic in water, and encourage use of water that contains less arsenic instead.

7. COMPLEMENTARY INFORMATION FOR FURTHER CONSIDRATION OF MEASURES

The results of ongoing or further research studies on the effectiveness of measures to prevent and reduce arsenic concentration in rice should be considered to develop the Code. Research on the following topics may help in developing a better Code of Practice:

- Effects of soil amendments and fertilizers (e.g. silicates, phosphates and organic materials) on arsenic concentrations in rice, including the effects of applying different amounts or applying the materials with different timing and frequency (e.g. one-off or repeated use in each season);
- Side effects (e.g. change of yield, cadmium concentration in rice) of implementing the measures to reduce arsenic concentrations in rice;
- Effects of applying flooded/aerobic conditions with different timing and duration in the rice growth period;
- Estimation of arsenic concentration in rice from the arsenic concentration in soil and/or other factors affecting arsenic concentration in rice (e.g. iron, silicates, phosphates etc.) before cultivation; and
- Efficiency and cost of removing arsenic in soil using agricultural crops that absorb and accumulate arsenic from the soil or using chemical compounds that absorb arsenic and are easily separated from the soil.

[5] “Rinse-free” rice, also known as “Musemmai”, is rice whose bran that may remain on the surface after polishing is completely removed and thus it is not necessary to wash before cooking.

APPENDIX II

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APPENDIX III

FOR INFORMATION ONLY

COMMENTS PROVIDED BY EWG MEMBERS IN RESPONSE TO THE QUESTIONS POSED BY CHAIR/ CO-CHAIR OF THE EWG

Question 1: As the information currently included in the draft COP is regarded by the Chair and Co-Chair as insufficient for completion of the COP, we think that the EWG/CCCF should collect further information on effective and feasible measures. To collect sufficient information to proceed with discussion and elaboration, the CCCF should propose to postpone discussions pending results of the studies described above. After outcomes from all of the above-mentioned studies become available (likely to be by March 2019), the CCCF should resume work on the topic at the Session in [2019] [2020].

If additional information on measures is readily available, please provide it to the EWG for consideration. If sufficient information for elaboration of a COP is provided, it would not be necessary to postpone discussions.

CANADA

Canada appreciates all the efforts put forward by Japan and China to develop this discussion paper on elaborating a CoP for prevention and reduction of arsenic contamination in rice.

We have no objection to either postponing the development of the CoP until further studies have been completed or moving forward with the information that is available. However, if the consensus is to postpone the CoP, considering that Codex has adopted a maximum level for inorganic arsenic in polished rice and will likely move forward with finalizing a maximum level for inorganic arsenic in husked rice, we believe the Committee should at minimum provide some compilation of available information on current best practices to potentially reduce or prevent arsenic in rice to allow growers and manufacturers to make all possible efforts to maintain arsenic concentrations in rice to levels that are as low as reasonably achievable.

CHILE

Chile agrees with postpone discussions for the elaboration of this COP until the results of the studies mentioned in this discussion paper become available.

DOMINICAN REPUBLIC

The Dominican Republic agrees with views expressed by the President and Co-Chair of the electronic Working Group (Japan and China) for the preparation of the Draft Code of Practice for the prevention and reduction of arsenic contamination in rice, as the available data, submitted at the time by the countries is insufficient for carrying out a code of practice (COP) and we agree, that the CCCF should propose to postpone discussions until countries have conclusive evidence to present their research.

JAPAN

Japan supports postponement of development of the COP pending outcome of ongoing studies because a COP should contain practices that are feasible and effective for prevention and reduction of arsenic in rice.

PHILIPPINES

We agree with proposal no. 1 which applies to Philippines as we are currently doing a study on this work and the study will end in 2018 as it is a three-year study. However, during the course of the study we can submit data, twice a year because sampling will be every harvest season as we would like to know the effect of climate change in As levels and of other factors mentioned in the COP.

THAILAND

Thailand has no objection the proposal to postpone discussions for the elaboration of this COP until the results of the studies mentioned in this discussion paper become available and also agree with the proposal to revise the time line in the Project Document with 2017 as completion year.

UNITED STATES OF AMERICA

The U.S. believes that the current EWG, as chaired by China and Japan, has identified sufficient information on practices to prevent and reduce arsenic contamination in rice to finalize a short, simple COP in 2017, as proposed in the original project document. As outlined in the draft, the COP could include source directed measures (such as identifying sources of pollution and elevated arsenic in irrigation water), agricultural measures (such as aerobic growth, intermittent ponding, and identifying rice cultivars that contain or absorb arsenic at low levels), and risk communication for reducing arsenic during processing and cooking (such as use of water containing low arsenic levels for washing and cooking and cooking in large volumes of water).

Examples of short, simple COPs that CCCF has adopted and that can be used as models are the *Code of Practice for the Prevention and Reduction of Ethyl Carbamate Contamination in Stone Fruit Distillates* (CAC/RCP 70-2011) and the *Code of Practice for the Prevention and Reduction of Ochratoxin A Contamination in Wine* (CAC/RCP 63-2007).

In three to four years after the short, simple COP for arsenic in rice is established, CCCF can revisit and update the COP with additional information and data that become available.

The U.S. believes establishing a COP in 2017 is important to support CCCF work on MLs for arsenic in polished and husked rice.

FoodDrinkEurope

While we note that the CoP is only open to members to highlight errors, FoodDrinkEurope would like to nevertheless stress its support for Paragraph 14 of this draft COP for prevention and reduction of arsenic contamination in rice. We find it important to publish what is already available in 2016/2017 as starting point (either a compilation or a short CoP) and not to wait until 2020/2021 to publish the final CoP.

Question 2: Arsenic in rice may have significant public health implications. Therefore, the CCCF shall proceed as soon as possible. If the CCCF agrees to postpone pending results of studies, there is a need to revise the time line in the Project Document with 2017 as completion year. The finalisation of a COP would be in [2020] [2021] at the earliest. In this case, the CCCF has to adopt a proposed draft COP at Step 5/8 at the Session of one year after resuming discussion.

CHILE

Chile also agrees with revise the time line in the Project Document with 2017 as completion year.

PHILIPPINES

This item should also be revised as this is affected by proposal no. 1.

Question 3: If the postponement is not agreed, please propose any other way forward, for example, compilation of measures for prevention and reduction of arsenic contamination in rice available in the scientific literature. If it is a way forward, a volunteer Codex member should be sought.

(No comments have been submitted)