CODEX ALIMENTARIUS COMMISSION

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

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

(Prepared by the Electronic Working Group led 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, 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) before **28 February 2015**. Comments should be directed:

to:	with a copy to:
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Note: In submitting comments at Step 3, Codex members and observers are kindly invited to note the discussion that took place in the Electronic Working Group as well as the recommendations put forward in paragraph 18.

INTRODUCTION

1. The Committee on Contaminants in Food (CCCF) at its 7th Session (April 2013) discussed the possibility to develop a code of practice (COP) for the prevention and reduction of arsenic (As) contamination in rice. While the CCCF generally supported development of a COP, it could not reach agreement on the development of the COP at that stage. The CCCF agreed to re-establish an electronic working group (EWG) led by China and co-chaired by Japan to further develop the discussion paper, and to look into management practices identified in the discussion paper to determine which risk management measures were readily available to the extent that they could provide the basis of the preliminary development of a COP, and, if so, to attach a proposed draft COP for consideration by the 8th Session of the CCCF[1].

2. The CCCF at its 8th Session (March 2014) considered the discussion paper and agreed to initiate new work on a Code of Practice for the Prevention and Reduction of Arsenic Contamination in Rice for approval by the 37th Session of the Codex Alimentarius Commission (CAC)[2]. The Commission approved the new work on the elaboration of the COP[3].

3. The CCCF agreed to establish an EWG, led by Japan and co-chaired by China to develop the COP for comments at Step 3 and consideration at the next session of the Committee[4].

1 REP13/CF, paras 104-107
2 REP14/CF, paras 93-95 and Appendix VIII
3 REP14/CAC, para. 96 and Appendix VI
4 REP14/CF, para. 96

DISCUSSION

4. The 1st proposed draft COP was shared among the EWG members in July 2014 and comments on the paper were submitted from Argentina, China, Indonesia, Iran, Japan and the United States of America. The COP was developed based on the comments submitted by the EWG members (see list of participants in Appendix II).

5. Besides editorial matters, the following matters were considered:

1. Introduction

6. Field studies should be conducted across crop years because arsenic uptake in rice crops was highly variable from year to year. The information was added to the draft text.

7. Further consideration is needed in relation to proposals to "large scale" in front of field studies and to replace "should" with "could" in the 2nd sentence of the 2nd paragraph consequently, they were included in the draft text in square brackets.

3. Definitions

8. Definitions for arsenic, inorganic arsenic and organic arsenic were included in the text to address the difference between inorganic and total arsenic. For the content of the COP, further information to address the difference should be collected by the EWG as most of the data and scientific information currently available were for total arsenic and little is known about the reduction of inorganic arsenic. The COP should make clear which practices are known to affect total arsenic and which are known to affect inorganic arsenic specifically.

9. The term "rice grain" was replaced with "paddy rice" for consistency with the *Codex Standard for Rice* (CODEX STAN 198-1995) and the scientific name for rice was inserted for clarification.

10. More specific definitions for "aerobic condition" and "intermittent ponding" would be helpful. These definitions of the current version were put in square brackets for further consideration.

4.1 Source directed measures

11. As to whether the terms "low temperature volatilization" and "disposal of timber treated with copper chrome arsenate" are necessary, it was clarified that "low temperature volatilization" referred to volatile arsenic compounds that were released from other forms of arsenic in soil by microorganisms and that "disposal of timber treated with copper chrome arsenate (CCA)" was one of the typical anthropogenic sources of arsenic to contaminate soil and air.

4.2 Agricultural measures

12. Examples of measures to educate rice producers were added.

13. Source directed measures on cadmium should be included as some measures to reduce arsenic contamination may result in high concentrations of cadmium in rice if soil is highly contaminated with cadmium. The COP should also address the fact that cadmium uptake varies regionally and may not be a problem everywhere. This information was thus included in the first paragraph of Section 4.2.2.

4.3 Processing and Cooking Measures

14. The COP should not recommend that husked rice should be processed into white rice, noting that the goal of the COP is not to remove husked rice from the marketplace and consequently texts about benefits of consumption of husked rice should be included. As this matter is related to communication with consumers, it may be more appropriate to include it in the section on risk communication. Thus, a proposed text in square brackets was inserted in both sections for further consideration.

15. An explanation of "rinse-free rice" was added as a footnote for clarity.

Conclusion

16. The EWG generally agreed on the sections for Introduction and Scope although some texts are still in square brackets. For the later sections, further information and discussion are still necessary although the EWG has collected several practices to prevent and reduce arsenic contamination in rice that are supported by scientific evidence. The EWG was aware of several studies that are ongoing in some countries, the results of which would help to improve the COP. The EWG, thus, agreed to recommend the CCCF to wait for the outcome of these studies before finalisation of the COP.

17. Note that the decision will not result in delay of the finalisation of the work as completion of the COP for final adoption by the Commission is scheduled for 2017.

RECOMMENDATIONS

18. The EWG recommends the Committee:

- To discuss the draft texts of the Introduction and Scope sections in Appendix I; and
- To re-establish an EWG for additional collection of information and data and further elaboration of the proposed draft COP for circulation for comments and consideration at the 10th Session of the Committee.

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). Ideally, [large scale] field studies [could][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;

ii. Agricultural measures; and

iii. Processing and cooking 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[5]).

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.

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 apaddy field is alternately in flooded and aerobic/nonflooded condition.]

4. MEASURES TO PREVENT AND REDUCE ARSENIC CONTAMINATION

[Please note that further work is necessary for elaboration of the following sections so as to reflect new findings. Comments submitted in the EWG will be considered later.]

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

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[6].

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 of arsenic from irrigation water with high arsenic concentration
    - Avoidance 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 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[7]. If appropriate, risk managers may also consider implementation of source directed measures for cadmium in soil, water or fertilisers used for rice production[8].

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 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.

4.3 Processing and Cooking Measures

4.3.1 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.

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

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

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

- 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"[9] treatment or cooking with large amounts of water followed by discarding excess water.

4.3.2 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.

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.]

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.

[9] "Rinse-free" rice, also known as "Musenmai", 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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