CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture Organization of the United Nations

World Health Organization

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Agenda Item 7a **CX/ASIA 14/19/7**
August 2014

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

FAO/WHO COORDINATING COMMITTEE FOR ASIA

Nineteenth Session

Tokyo, Japan, 3 – 7 November 2014

PROPOSED DRAFT REGIONAL STANDARD FOR LAVER PRODUCTS

(N14-2011)

(at Step 3)

Prepared by the Electronic Working Group led by Republic of Korea and co-chaired by Japan

Governments and international organizations in Observer status with the Codex Alimentarius Commission wishing to submit comments at Step 3 on the renamed Proposed Draft Regional Standard for Dried Laver, Roasted Laver and Seasoned Laver Products (see Appendix I) are invited to do so **no later than 15th September 2014** to the Secretariat for CCASIA: National Bureau of Agricultural Commodity and Food Standards (ACFS), 50 Phaholyothin Rd., Chatuchak 10900 Bangkok, Thailand (E-mail: codex@acfs.go.th); Food Safety and Consumer Policy Division, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo, 100-8950, Japan (E-mail: ccasia@nm.maff.go.jp), with a copy to the Secretariat, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy (E-mail: codex@fao.org).

In order to facilitate the compilation of comments and prepare more useful comments' document, Members and Observers, which are not yet doing so, are requested to provide their comments under the following headings:

(i) General Comments
(ii) Specific Comments

Specific comments should include a reference to the relevant section and/or paragraph of the document that the comments refer to.

Report of the Electronic Working Group on the Proposed Draft Regional Standard for Laver Products

BACKGROUND

1. The 18th Session of the FAO/WHO Coordinating Committee for Asia (CCASIA) agreed to establish an Electronic Working Group **(**EWG), led by the Republic of Korea and co-chaired by Japan, open to all Members of the Region and observers and working in English only.

2. The mandate for the EWG was to (i) prepare a proposed draft Standard for Laver Products for circulation for comments at Step 3 and consideration by the next Session of CCASIA; and (ii) consider whether a general reference to the GSCTFF is sufficient for Laver Products and prepare recommendations for the consideration by the next session of CCASIA accordingly[1].

3. A kick-off message was sent out to all Members of the Region and observers to invite them to participate in the EWG (06/02/13). In reply to the invitation, four countries (three Members and one Observer) and one organization expressed their interest in participating in the EWG: China, Thailand, Indonesia, USA and IADSA, including Republic of Korea and Japan. The list of participants is included in Appendix III.

[1] Rep13/ASIA para 124

4. In response to the 1st draft circulated in June, 2013, comments were received from two participants, namely Japan and USA.

5. The 2nd draft was circulated in January, 2014 and comments were received from China, Japan and USA.

6. For the 3rd draft circulated in May, 2014, China, Japan and USA provided their comments.

7. Those responses received were thoroughly considered and integrated into the renamed Proposed Draft Regional Standard for Dried Laver, Roasted Laver and Seasoned Laver Products as much as possible.

8. The comments that were not integrated into the Proposed Draft Regional Standard will be further discussed at the 19th session of CCASIA.

9. As for the Report of consideration on the section of Contaminants in Laver Products, the draft was circulated in July 2014, and the comment was submitted by one Member.

Specific Comments from EWG to the Proposed Draft Standard (See Appendix I)

Name of the Standard

The name of the standard would be “Proposed Draft Regional Standard for Dried Laver, Roasted Laver and Seasoned Laver Products”.

1. Scope

To comply with the name of the standard, the text in this section is amended.

2.2 Products Types

As one country commented that the most widely consumed form is not necessarily the sheet form at present, the sentence “However, the most widely consumed form is a sheet.” is deleted.

To clarify the description of roasted laver “without seasoning” is added.

Products to be covered by this regional standard include a variety of products which are produced through a different combination of several processing procedures, especially for Seasoned Laver Products. One country suggested including a different type of seasoned laver product which needs hot water to be added unlike other products that can be eaten directly. In addition to this, considering other types of seasoned laver products other than the products already defined, the product types of seasoned laver products have three sub-categories; seasoned laver, brewing seasoned laver and other seasoned laver, as defined in section 2.2.3.

3.1.2 Optional Ingredients

To provide the adequate amount of use for the optional ingredients (a) and (h), a conditional clause is added; not exceeding X% of the total weight of the product.

3.2 Quality Factors

To be consistent with the product types, the quality factors are adequately modified especially for newly added categories; brewing seasoned laver and other seasoned laver. The acid value for the products fried or treated with edible oil is modified to ‘no more than 3.0 mg KOH/g’.

4. Food Additives

Neither additives nor processing aids are permitted for dried laver and roasted laver. Considering that one country of the EWG is still collecting the related materials and data, the section is left in the square for further discussion in the plenary session.

6. Hygiene

Considering the processing of raw materials, ‘clean seawater’ is added in the last text as “~, the seaweeds shall be treated with potable water or clean seawater”, based on the suggestion of two countries.

7. Weight and Measures

The recommended sizes A and B for the sheet form are deleted because some countries expressed their opinions that the specific description of sizes is not necessary, and there are different sizes of sheet form produced.

9.2 Sensory and Physical Examination

This section is added because to be consistent with the subsection 3.2 as one country mentioned. Generally, in most fishery products Codex standard, *Guidelines for the sensory evaluation of fish and shellfish in laboratories* (CAC/GL 31-1999) is used in this section, however, the existing guideline does not include seaweed. Therefore, it is according to ISO 4121 which are generally used for the use of quantitative response scales in foods.

10. Definition of Defectives

One country proposed to add sub-provisions for foreign matter and odor/flavor/texture/color. The section for odor/flavor/texture/color is added as a new sub-section; however, the general description suggested for foreign matter could not apply to laver products considering their natural characteristics and processes, and it is already covered in section 2.1 in the standard.

Consideration on the Section of Contaminants; the Proposed Draft Regional Standard for Laver Products (see Appendix II)

In order to consider whether a general reference to the GSCTFF is sufficient for Laver Products and to prepare recommendations for the consideration by the 19th session of CCASIA, the EWG conducted preliminary long-term exposure assessment of inorganic arsenic, cadmium and lead, as a priority, in laver products based on the their occurrence data and consumption data of laver products provided by the EWG members (the full report is attached as Appendix II).

RECOMMENDATIONS

The Committee is invited to consider:

- the proposed draft standard (Appendix I) for advancement in the step process.
- the recommendation of the EWG regarding the use of a general reference to the GSCTFF in the proposed draft standard (see Appendix II paras 34 and 35).

Appendix I

Proposed Draft Regional Standard for Dried Laver, Roasted Laver and Seasoned Laver Products

(at Step 3)

1. SCOPE

This standard applies to dried laver, roasted laver and seasoned laver products of the genus *Pyropia*, which are defined in Section 2 below.

2. DESCRIPTION

2.1 Product Definition

(a) Laver products are those prepared mainly with raw laver which belongs to the genus *Pyropia*, a group of marine red algae. Depending on the product type, the products are subsequently dried, roasted, fried, treated with edible oil and/or seasoned.

(b) Laver products shall be packaged in a manner to protect and maintain hygienic, nutritional and quality attributes of the products to the extent reasonably practical. In addition, the products shall be packaged to protect them from moisture.

2.2 Product Types

2.2.1 Dried Laver

(a) Dried laver is the product raw laver which is washed, chopped/cut, molded, dehydrated and dried (1st dried products). It may go through a re-drying process (2nd dried products) for long-term storage. The product which is dried directly after harvesting without undergoing any other processes is also included in this type.

(b) Product may come in various forms such as a round lump, a shredded fragment, a sheet, a rolled-sheet, etc.

(c) In the case of sheet form, the product may contain holes, torn or rolled parts and/or edible foreign matters[2].

2.2.2 Roasted Laver

Roasted laver is the product in which the dried laver, defined in Section 2.2.1, is roasted by direct fire or any recognized methods without seasoning, so that its physicochemical characteristics such as color, moisture and texture may change.

2.2.3 Seasoned Laver Products

2.2.3.1 Seasoned Laver

Seasoned laver is the product in which the dried laver, defined in Section 2.2.1, is seasoned whether or not it is roasted, fried, treated with edible oil.

2.2.3.2 Brewing Seasoned Laver

Brewing seasoned laver is the product in which the dried laver, defined in Section 2.2.1, is broken, roasted/stir-fried, and then packed. The product can be seasoned and needs to add hot water to brew before consumption.

2.2.3.3 Other Seasoned Laver

Other seasoned laver is the product whether or not it is roasted, fried, treated with edible oil other than the products defined in Sections 2.2.3.1 and 2.2.3.2.

3. COMPOSITION AND QUALITY FACTORS

3.1 Composition

3.1.1 Basic Ingredients

Raw laver which belongs to genus *Pyropia,* a group of marine red algae, stated in 2.1.

[2] Sea creatures or sea plants which are not harmful to a human body and mixed unintentionally, unavoidably or naturally during the growing process in the sea

3.1.2 Optional Ingredients

The ingredient stated in (a) below may be used for the products defined in Sections 2.2.1, and the following ingredients in (b) through (g) may be used for the product defined in Section 2.2.3 and the ingredient, (h) may be used for the product defined in Section 2.2.3.3.

a) Green laver (*Ulva* spp.); not exceeding 30% of the total weight of the product

b) Edible oil

c) Salt (sodium chloride)

d) Soybean sauce

e) Sugars in accordance with the Standard for Sugars(CAC/STAN 212-1999)

f) Spices and culinary herbs (dehydrated, dried, crushed, cracked, ground)

g) Other natural flavouring substances in accordance with the *Guideline for the Use of Flavourings* (CAC/GL 66-2008)

h) Nuts and seeds, anchovy, shrimp; not exceeding 10% of the total weight of the product

3.2 Quality Factors

The final product shall maintain its own flavor and color, which represent its raw materials and processing methods and it shall be free from off-flavors.

3.2.1 Dried Laver

Moisture: no more than 15% (7.0% for the 2nd dried products)

3.2.2 Roasted Laver

Moisture: no more than 5%

3.2.3 Seasoned Laver Products

a) Moisture

2.2.3.1(Seasoned Laver), 2.2.3.3(Other Seasoned Laver): no more than 5%

2.2.3.2(Brewing Seasoned Laver): no more than 10%

b) Acid value:

no more than 3.0 mg KOH/g (only for the products fried or treated with edible oil)

c) Peroxide value:

no more than 60.0 meq/kg (only for the products fried or treated with edible oil)

4. FOOD ADDITIVES

4.1 Dried Laver and Roasted Laver

Neither additives nor processing aids are permitted.

[4.2 Seasoned Laver Products]

Food Additives except colors used in accordance with Tables 1 and 2 of the *Codex General Standard for Food Additives* in food category 04.2.2.2 and 04.2.2.8 or listed in Table 3 of *the General Standard for Food Additives* are acceptable for use in this product.

5. CONTAMINANTS

The products covered by this standard shall comply with the Maximum Levels of the *General Standard for Contaminants and Toxins in Food and Feed* (CODEX/STAN 193-1995). And the products covered by this standard shall comply with the maximum residue limits for pesticides established by the Codex Alimentarius Commission.

6. HYGIENE

Seaweeds used for laver products shall be grown and processed in areas and water appropriate for cultivation and processing of seaweeds for direct human consumption. In the final process of raw material, the seaweeds shall be treated with potable water or clean seawater.

The final product shall be free from any foreign material that poses a threat to human health or that is not suitable for human consumption including a piece of wood and feather.

It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the *General Principles of Food Hygiene* (CAC/RCP 1-1969), and other relevant Codex texts, such as Codes of Hygienic Practice and Codes of Practice.

The products should comply with any microbiological criteria established in accordance with the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CAC/GL 21-1997).

7. WEIGHTS AND MEASURES

The weight of the product shall be expressed in the unit of “g” or “kg”. In the case of sheet form, the unit of product may be expressed with the number of sheets together.

The weight shall be measured by the minimum package unit, and the following tolerance is allowed.

[Weight]	[Tolerance]
5g≤, ≤50g	9%
50g<, ≤100g	4.5g
100g<, ≤200g	4.5%
200g<, ≤300g	9g
300g<, ≤500g	3%
500g<, ≤1kg	15g
1kg<, ≤10kg	1.5%
10kg<, ≤15kg	150g
15kg<	1%

8. LABELLING

In addition to the provisions of the *General Standard for the Labeling of Pre-packaged Foods* (CODEX STAN 1-1985), the following specific provisions apply:

8.1 The Name of the Product

(a) The name of the products shall be in line with Section 2.2. Other appropriate names may be used if they are allowed by national legislation in the country where the products are distributed.

(b) When a product contains holes, torn or rolled parts and/or edible foreign matter as described in Section 2.2.1(c), the grade of products may be labeled according to the legislation of the country where the product is distributed.

8.2 Labelling of Non-Retail Containers

Information on non-retail containers shall be given either on the container or in accompanying documents, except that the name of the products, lot identification, and the name and address of the manufacturer and/or packer shall appear on the container. However, lot identification, and the name and address of the manufacturer and/or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

9. METHOD OF ANALYSIS AND SAMPLING

9.1 Sampling

Sampling of lots for examination of the product shall be in accordance with the *General Guidelines on Sampling* (CAC/GL 50-2004).

9.2 Sensory and Physical Examination

Samples taken for sensory and physical examination shall be assessed by persons trained in such examination and in accordance with ISO 4121.

9.3 Determination of Moisture

9.3.1 Apparatus

a) Aluminum dish

b) Convection oven

c) Air-tight desiccator

9.3.2 Preparation of Test Sample

Remove packaging materials from the test sample. Grind the sample with a grinder and store in a tightly sealed plastic bag.

9.3.3 Determination

According to AOAC 925.45 (drying at atmospheric pressure)

9.4 DETERMINATION OF ACID VALUE

9.4.1 Extraction

9.4.1.1 Apparatus

a) Rotary evaporator

b) Water bath

9.4.1.2 Test Sample Preparation

Remove packaging materials from the test sample. Grind the sample with a grinder and store in a tightly sealed plastic bag.

9.4.1.3 Extraction Method

Weigh 50 g[3] of test sample into 1000mL Erlenmeyer flask. Add 500mL of petroleum ether to the flask followed by replacing air in the flask by N2 gas. Put a stopper on the flask and let stand for 2 hours. Decant the extracted solution (A) through a filter paper (Advantee No.2), on which Na2SO4 is mounted to remove moisture, on a funnel into 1000mL round flask-flat bottom. Add additional 250mL of petroleum ether to residue in the Erlenmeyer flask and decant the extracted solution (B) into the round flask-flat bottom again as done previously. Evaporate the whole extracted solution (mixture of solution A and B) on the rotary evaporator in vacuo less than 40.

9.4.2 Titration

According to AOCS Cd 3a-63

9.5 DETERMINATION OF PEROXIDE VALUE

9.5.1 Extraction

According to the method described in Section 9.2.1

9.5.2 Titration

According to AOCS Cd 8-53

10. DEFINITION OF DEFECTIVES

A sample unit that fails to meet one or more of the applicable quality requirements, set out in Section 3.2 or that fails to meet the requirements, stated in Section 7, shall be considered as “defective”.

10.1 Odor/Flavor/Texture/Color

Laver products affected by persistent and distinct objectionable odors, flavors, texture or colors indicative of decomposition and/or rancidity; or other objectionable odors, flavors, textures and colors not characteristic of the product.

11. LOT ACCEPTANCE

A lot shall be considered as meeting the applicable quality requirements referred to in Section 3.2 and Section 7 when the number of “defectives”, as defined in Section 10, does not exceed the acceptance number (c) of the appropriate sampling plan with an AQL of 6.5.

[3] In case the determination is difficult due to the low acid value take more samples.

Appendix II

Consideration on the section of Contaminants;

the Proposed Draft Regional Standard for Laver Products

INTRODUCTION

1 At the 18th Session of the FAO/WHO Coordinating Committee for Asia (CCASIA), Members discussed the proposed draft regional standard for laver products, and it was recognized that the consideration on contaminants in laver products was necessary. The Committee agreed to establish an electronic working group (EWG), led by the Republic of Korea and co-chaired by Japan, with the terms of reference (ToR) to: (i) prepare a proposed draft Standard for laver products for circulation for comments at Step 3 and consideration by the next session of CCASIA; and (ii) consider whether a general reference to *the Codex General Standard for Contaminants and Toxins in Food and Feed* (GSCTFF) (CODEX STAN 193-1995) is sufficient for laver products and prepare recommendations for the consideration by the next session of CCASIA accordingly (REP 13/ASIA para. 124). In this discussion paper, the second ToR is addressed.

2 The Codex Procedural Manual Section II: Elaboration of Codex texts: Relations between Commodity Committees and General Subject Committees states that commodity committees shall examine the GSCTFF with a view towards incorporating a reference to the General Standard. It also states that "Should the committees consider that a general reference to the GSCTFF does not serve its purpose, a proposal should be prepared and forwarded to the Committee on Contaminants in Foods for consideration of starting new work, amendments to the GSCTFF, or endorsement of proposed provisions, as appropriate."

3 The EWG addressed the following points in this discussion paper for the consideration at the 19th Session of CCASIA:

- Legislation on contaminants in laver products
- Identification of contaminants in laver products
- Summary of collected occurrence and consumption data
- Preliminary exposure assessment

LEGISLATION ON CONTAMINANTS IN LAVER PRODUCTS

4 The current GSCTFF sets Maximum Levels (MLs) and Guideline Levels (GLs) for Mycotoxins, Heavy Metals, Radionuclides and Others in foods. While the GSCTFF does not have specific MLs or GLs for laver products or seaweed, the ML of Melamine and GLs of Radionuclides, Acrylonitrile and Vinyl Chloride Monomer apply to Food as a whole, and thus they can apply to laver products.

5 Some Members set MLs for contaminants in seaweed in their legislations. For arsenic (inorganic), Australia and New Zealand set the ML of 1.0 mg/kg (at 85% hydration) for seaweed (1). For cadmium, EU sets the ML of 3.0 mg/kg for Food supplements consisting exclusively or mainly of dried seaweed or products derived from seaweed (2). For lead, China sets the ML of 1.0 mg/kg (dry-weight) for seaweed and its products (except spirulina and its products) (3).

IDENTIFICATION OF CONTAMINANTS IN LAVER PRODUCTS

6 It is known that some seaweed such as Hijiki (*Sargassum fusiforme*) are contaminated with inorganic arsenic or other metals (4, 5). Thus, in this discussion paper, the contamination with metals was considered as a priority.

7 The GSCTFF sets MLs for arsenic, cadmium, lead, mercury, methylmercury and tin as metals. Among them, the EWG collected occurrence data on arsenic, cadmium and lead for which some Members set MLs, in laver products as well as consumption data for the preliminarily exposure assessment of those contaminants.

SUMMARY OF COLLECTED OCCURRENCE AND CONSUMPTION DATA

(1) Occurrence data

8 Occurrence data on arsenic, cadmium and lead in laver products were provided by two Members: Japan and the Republic of Korea (Table 1). Japan provided the occurrence data of total 439 samples whose origins were Japan. For each sample, the data on all of total arsenic, cadmium and lead were available. All of the data provided were dry weight basis. A same analytical method was used for all sampling years, but it was not validated(Annex). The Republic of Korea provided the data of total 118 samples whose origins were

the Republic of Korea. Among them, 31 samples had the data of total arsenic, cadmium and lead; 57 samples had the data of cadmium and lead; and 30 samples had the data of total arsenic only. All of the data were dry weight basis. Different analytical methods were used for each sampling year, and some of them were internationally validated methods such as AOAC 973.34 for cadmium (Annex).

Table 1. Overview of data provided by Japan and the Republic of Korea(ROK)

Origin of sample	Sampling year	Product type	Number of data		
			Total arsenic	Cadmium	Lead
Japan	2006-2009	Dried laver	439	439	439
The Republic of Korea (ROK)	2003, 2006, 2010, 2012	Dried laver	61	88	88

9 Those occurrence data were summarized below by contaminant (Table 2-4; Fig 1-3). As the contamination of laver products might be affected by marine environments of growing areas, the data were also summarized by the origin of sample. Although some of the occurrence data provided were analyzed by different methods, those data were simply combined due to the limited data availability.

Table 2. Summary of occurrence data on total arsenic (dry weight)

Country	N	N of <LOQ	Min (mg/kg)	Max (mg/kg)	Mean (mg/kg)	Median (mg/kg)	90%ile (mg/kg)
Japan	439	0	9.8	43	24	24	31
ROK	61	0	8.5	39	23	24	30

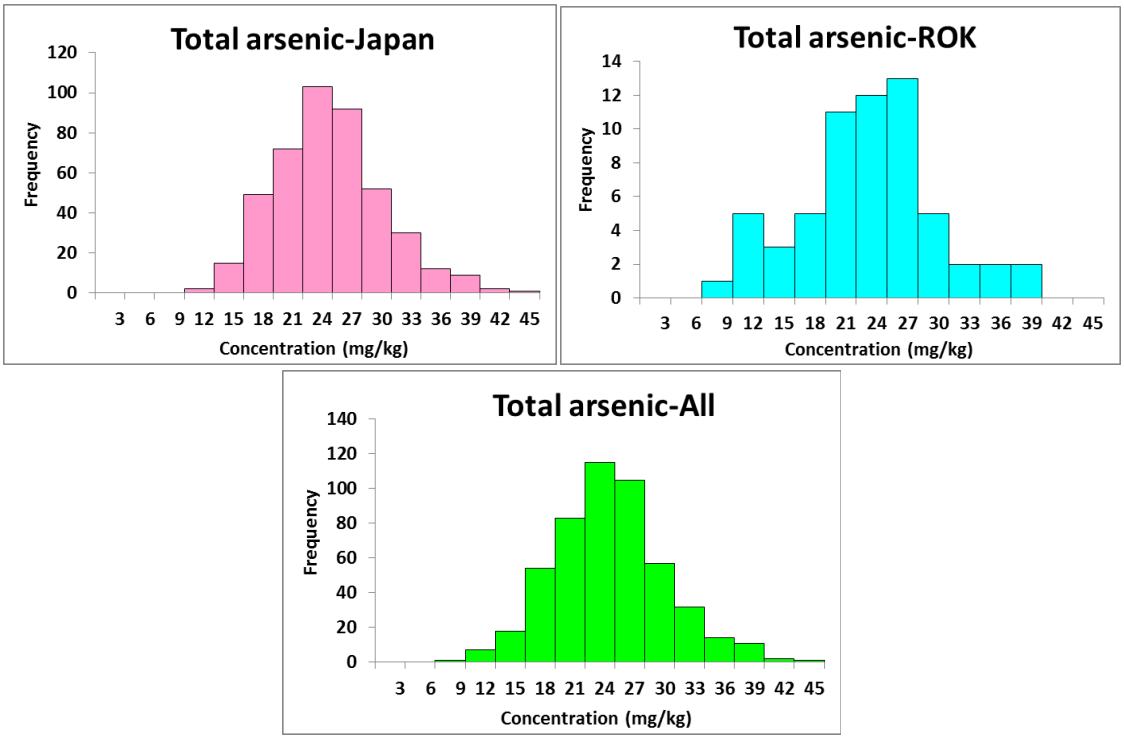

Fig 1: Histogram of total arsenic concentrations in laver products

Table 3: Summary of occurrence data on cadmium (dry weight)

Country	N	N of <LOQ	Min (mg/kg)	Max (mg/kg)	Mean (mg/kg)	Median (mg/kg)	90%ile (mg/kg)
Japan	439	0	0.026	1.2	0.35	0.31	0.61
ROK	88	0	0.044	2.6	0.98	0.79	1.7

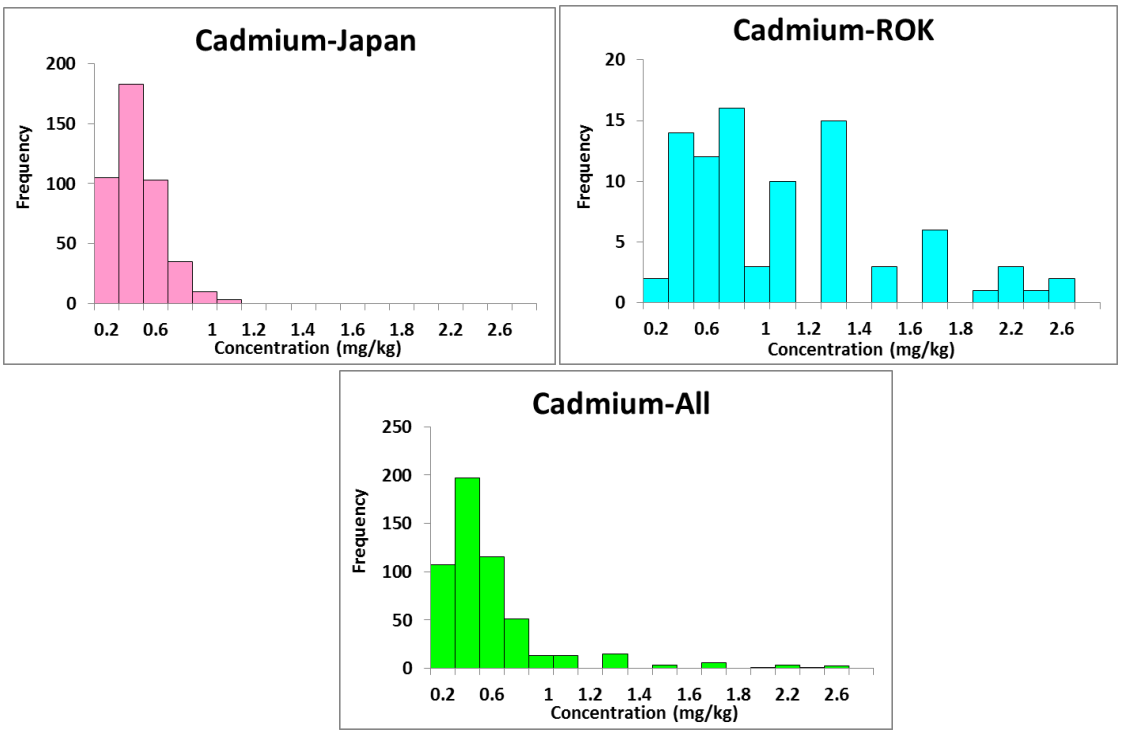

Fig 2: Histogram of cadmium concentrations in laver products

Table 4. Summary of occurrence data on lead (dry weight)

Country	N	N of <LOQ (*)	Min (mg/kg)	Max (mg/kg)	Mean (mg/kg)	Median (mg/kg)	90%ile (mg/kg)
Japan	439	278	< 0.05	0.98	0.22(**)	-(***)	0.40
ROK	88	0	0.010	0.42	0.16	0.16	0.26

(*) The values of LOQ and LOD depend on analytical methods.

(**) Since the proportion of <LOQ is more than 60%, the mean was calculated by replacing the data of <LOD with LOD and those of ≥LOD and <LOQ with LOQ.

(***) Since the proportion of <LOQ is more than 50%, the median was not available.

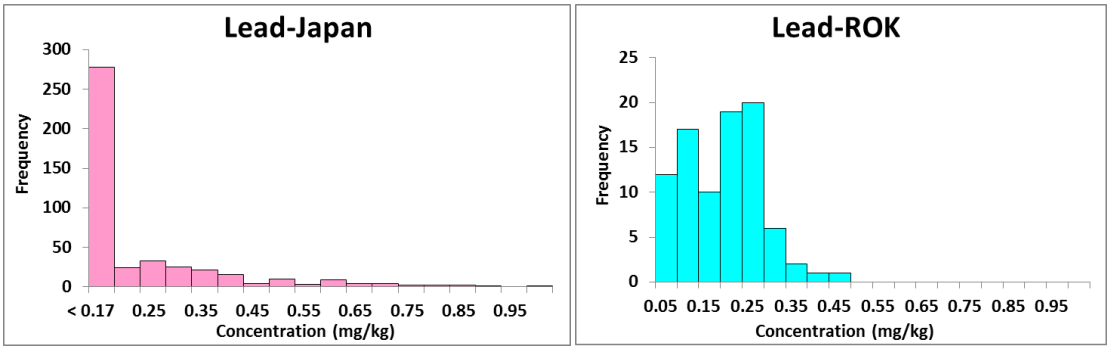

Fig 3: Histogram of lead concentrations in laver products (*)

(*) For lead, the histogram of lead concentrations which combines the data from Japan and Republic of Korea were not created, as some of the data from Japan were less than LOQ.

(2) Consumption data

10 Consumption data of laver products were provided by two Members: Japan and the Republic of Korea. With regard to the consumption data of Japan, the estimated mean was 0.004 g/kg bw/day. The consumption data provided by the Republic of Korea were annual maximum, 90%ile and 95%ile data for dried/roasted and roasted/seasoned laver products in 2008-2010. The summary of the data provided by the Republic of Korea is shown in Table 5.

Table 5: Summary of consumption data provided by the Republic of Korea

Product type	Year	90%ile (g/kg bw)		95%ile (g/kg bw)		Max (g/kg bw)	
		UB(*)	LB(**)	UB(*)	LB(**)	UB(*)	LB(**)
Dried, Roasted Laver	2008-2010	0.018	0.015	0.042	0.035	3.7	0.73
Roasted, Seasoned Laver	2008-2010	0.093	0.057	0.15	0.095	2.8	1.8

(*) Upper Bound (UB) indicates the highest annual consumption data between 2008 and 2010.

(**) Lower Bound (LB) indicates the lowest annual consumption data between 2008 and 2010.

PRELIMINARY EXPOSURE ASSESSMENT

11 For each contaminant, the FAO/WHO Joint Expert Committee on Food Additives (JECFA) performed the risk assessments of long-term toxicity because the end point of the long-term toxicity is lower than the acute or short-term toxicity. Thus, the EWG conducted preliminary long-term exposure assessment based on the occurrence and consumption data provided by the EWG members.

(1) Arsenic

12 Long-term exposure to inorganic arsenic can lead to chronic arsenic poisoning such as cancer and skin lesions. For long-term exposure assessment, the mean or median of occurrence and consumption data are usually used. For occurrence data, while one Member was of the opinion that the data of inorganic arsenic should be used, the data of total arsenic were used for this assessment because the data of inorganic arsenic were not available.

13 The means and medians of occurrence data on total arsenic were 23 and 24 mg/kg, and the higher value of 24 mg/kg was used for the assessment. As only total arsenic data were provided, based on the results of the existing study, in which the ratio of inorganic arsenic to total arsenic in laver products was found to be 0.5-1.6 % (6), the EWG assumed that 2% of total arsenic was inorganic as a conservative approach. As for consumption, according to the procedural manual, the data of GEMS/Food Consumption Cluster Diets should be used. As the data set did not have a category for laver products or related products, consumption data provided by the EWG members were used in this assessment. The mean consumption data available was only that provided by Japan, and thus 0.004 g/kg bw/day was used.

14 As a result, the exposure to inorganic arsenic by the consumption of laver products was estimated to be 2×10-3 µg/kg bw/day. The benchmark dose for a 0.5% increased incidence of lung cancer (BMDL0.5) for inorganic arsenic was determined by the 72nd meeting of JECFA in 2010 (7). Compared to the BMDL0.5 of 3.0 µg/kg bw/day, the intake of inorganic arsenic from laver products was estimated to be 0.06% of the BMDL0.5.

15 Additionally, the exposure assessment of high-level consumers was also conducted. For this assessment, the 90%ile of consumption data of roasted and seasoned laver products provided by the Republic of Korea, which was 0.093 g/kg bw/day, was used. As a result, the exposure to inorganic arsenic by the consumption of laver products was estimated to be 4.5×10-2 µg/kg bw/day. This was 1.5% of the BMDL0.5. As the exposure from dried and roasted laver products should also be considered, the total intake of inorganic arsenic from laver products should be higher.

16 According to the exposure assessment conducted by JECFA in 2010 (7), for countries where rice is the staple food, rice and water are the major contributors to total inorganic arsenic dietary exposures, with wheat and vegetables being minor contributors. JECFA also states that the exception is for populations (e.g. Japan) or individuals in other populations who consume high amounts of seaweed and other edible algae, some species of which are high in inorganic arsenic and consumption of which can make a significant contribution to inorganic arsenic dietary exposure. In this regard, while Hijiki (*Sargassum fusiforme*) contains high level of inorganic arsenic, the levels in laver products are much lower (4, 6). Furthermore, the consumption of laver products is about 2% of total seaweed consumption in Japan. Thus, the contribution of laver products to the dietary intake of inorganic arsenic can be considered small in Japan.

17 One Member noted the EWG that existing study had found that seaweed had protective effect against subchronic toxicity of inorganic arsenic, which was observed in the experiments with rats (8), and noted that protective effect should be taken into account in the risk assessment.

(2) Cadmium

18 Cadmium accumulates primarily in the kidneys, and this accumulation may lead to renal tubular dysfunction. For long-term exposure assessment, the mean of occurrence data provided by the Republic of Korea, which was 0.98 mg/kg, and the consumption data of Japan were used. The number of days in a month was assumed to be 31 days.

19 As a result, the exposure to cadmium by the consumption of laver products was estimated to be 0.1 µg/kg bw/month. JECFA established a provisional tolerable monthly intake (PTMI) for cadmium of 25 µg/kg body weight in 2010 (9). Compared to the PTMI, the intake of cadmium from laver products was estimated to be 0.5% of the PTMI.

20 The exposure assessment of high-level consumers was conducted for cadmium, too, using the 90%ile of consumption data of roasted and seasoned laver products provided by the Republic of Korea. The exposure to cadmium by the consumption of laver products was estimated to be 2.8 µg/kg bw/month. This was 11% of the PTMI. When the exposure from dried and roasted laver products is considered, the total intake of cadmium from laver products should be higher.

21 In the risk assessment conducted by JECFA in 2010 (9), the food categories that contributed most to cadmium exposure are reported for several countries and region. Those include cereals/grains, vegetables, or fish and shellfish, etc. In the Republic of Korea, the main sources of cadmium in the diet are reported to be rice, vegetables/seaweed and seafood, while, for the category of vegetables/seaweed, respective contributions of vegetables and seaweed are not provided.

(3) Lead

22 Chronic lead exposure commonly causes hematological effects, such as anemia, or neurological disturbances. For long-term exposure assessment, the mean of occurrence data provided by Japan, which was 0.22 mg/kg, and the consumption data of Japan were used.

23 As a result, the exposure to lead by the consumption of laver products was estimated to be 9×10-4 µg/kg bw/day. JECFA, in its review of the latest scientific evidence in 2010, withdrew the PTWI and concluded that it was not possible to establish a new PTWI (9). Thus, instead of PTWI, the result of dietary exposure assessment conducted by JECFA in 2010 was referred. For the total/adult population, the estimated mean exposures ranged from 0.02 to 3 µg/kg bw/day, and consequently, the estimated intake of lead from laver products was calculated to be 0.03 to 4% of the estimated exposure.

24 The exposure assessment of high-level consumers resulted in 2.0×10-2 µg/kg bw/day. Compared to the estimated mean exposures for the total/adult population calculated by JECFA, the estimated intake of lead from laver products was calculated to be 0.62 to 100%. The total intake of lead from laver products should be higher when the exposure from dried and roasted laver products is considered, although it is less than 100%.

25 The most important contributors to overall dietary exposure were reported for some countries in the risk assessment by JECFA (9). Among them, vegetables, cereals, or grains are identified as important contributors, while seaweed is not.

DISCUSSION

26 While the current GSCTFF does not have specific MLs or GLs for laver products, the ML of Melamine and GLs of Radionuclides, Acrylonitrile and Vinyl Chloride Monomer apply to Food as a whole including laver products. Thus, in the Standard, the GSCTFF should be referred at least.

27 One Member proposed that the occurrence data of Radionuclides, Acrylonitrile and Vinyl Chloride Monomer should first be collected in order to determine whether laver products are actually contaminated with those substances. The Member further proposed that the risk assessments on those contaminants in laver products should be carried out using those occurrence data.

28 The Procedural Manual stipulates the criteria for selecting foods or food groups that contribute significantly to total dietary exposure of a contaminant; (a) 10 % or more of the tolerable intake in one of the GEMS/Food Consumption Cluster Diets; (b) 5 % or more of the tolerable intake in two or more of the GEMS/Food Consumption Cluster Diets; or (c) food that may have a significant impact on exposure for specific group of consumers, although exposure many not exceed 5 % of the tolerable intake in any of the GEMS/Food Consumption Cluster Diets.

29 While a tolerable intake is established for cadmium only, based on the results of preliminary exposure assessment with limited data available of arsenic, cadmium and lead for average consumers, laver products do not seem to meet the criteria in terms of inorganic arsenic, cadmium and lead. JECFA does not identify seaweeds as important contributors to overall dietary exposure of those contaminants either. While vegetables/seaweed is identified as one of main contributors to cadmium exposure in the Republic of Korea, respective contributions of vegetables and seaweed are not known. Therefore, new MLs/GLs or other risk management measures for laver products would not be necessary for arsenic, cadmium or lead. As the consumption of laver products should be the largest in Asian regions, the same conclusion would be drawn for other regions.

30 One Member noted that, for inorganic arsenic in laver products, the protective effect against subchronic toxicity should be taken into account.

31 On the other hand, the EWG identified data gap for risk assessment: for example, consumption data are not available in GEMS/Food database and occurrence data for arsenic, cadmium and lead were submitted only from 2 members. For further consideration, it would be necessary to collect consumption data of laver products and occurrence data for arsenic, cadmium and lead from other members.

32 It was also noted that the preliminary assessment was conducted only for arsenic, cadmium and lead, and that other contaminants might be necessary to be considered as well.

33 Furthermore, as laver is usually grown in coastal area where could be affected by land-based pollutions which are conveyed by rivers, the contamination with pesticides might also be necessary to be considered. As the Procedural Manual stipulates, the Committee should examine the provisions on residue limits of pesticides adopted by the Codex Alimentarius Commission with a view towards incorporating a general reference as indicated in the section on contaminants in the Format for Codex Commodity Standards. Should the Committee consider that the general reference above does not serve its purpose, a proposal should be prepared and forwarded to the Committees on Pesticide Residues as appropriate, for consideration of new work or revision of the adopted residue limits.

RECOMMENDATION

34 While the GSCTFF should be at least referred in the Standard, the specific ML/GLs or other risk management measures of arsenic, cadmium or lead for laver products would not be necessary based on the results of preliminary exposure assessment.

35 On the other hand, the 19th Session of CCASIA should consider the followings:

- Collection of more occurrence and consumption data for more robust exposure assessment of arsenic, cadmium and lead in laver products;
- Collection of the occurrence data of Radionuclides, Acrylonitrile and Vinyl Chloride Monomer in laver products for their risk assessments;
- Whether the consideration on other contaminants are necessary; and
- Whether the consideration on the contamination with pesticides are necessary.

REFERENCE

1. Australia New Zealand Food Standards Code - Standard 1.4.1 - Contaminants and Natural Toxicants.
2. Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs.
3. GB2762-2012 (in Chinese)
4. Food Standards Australia New Zealand. “SURVEY OF INORGANIC ARSENIC IN SEAWEED AND SEAWEED-CONTAINING PRODUCTS AVAILABLE IN AUSTRALIA” (http://www.foodstandards.gov.au/science/monitoring/surveillance/documents/Survey%20of%20inorganic%20arsenic%20in%20seaweed%20and%20seaweed%20.pdf) (accessed at June 13, 2014)
5. Canadian Food Inspection Agency (http://www.inspection.gc.ca/food/information-for-consumers/fact-sheets/specific-products-and-risks/chemical-hazards/inorganic-arsenic/eng/1332268146718/1332268231124) (accessed at June 13, 2014)
6. Almela C. et al. 2006. “Total arsenic, inorganic arsenic, lead and cadmium contents in edible seaweed sold in Spain”. Food and Chemical Toxicology. 44: 1901-1908.
7. JECFA. 2011. “Seventy-second report of the Joint FAO/WHO Expert Committee on Food Additives”.
8. Jiang Y. et al. 2013. “Protective effect of edible marine algae, Laminaria japonica and Porphyra haitanensis, on subchronic toxicity in rats induced by inorganic arsenic”. Biological trace element research. 154 (3): 379-386.
9. JECFA. 2011. “Seventy-third report of the Joint FAO/WHO Expert Committee on Food Additives”

Annex

SUMMARY OF ANALYTICAL METHODS FOR DETERMINATION OF TOTAL ARSENIC, CADMIUM AND LEAD IN LAVER PRODUCTS USED BY MEMBERS

Table 1: Summary of information on analytical methods for total arsenic in laver products used by Members

Country	Detection method	LOD (mg/kg)	LOQ (mg/kg)	Reference	Note
Japan	ICP-MS	0.02	0.066		
Korea	AAS	0.0001	-	AOAC 963.21	Used in the sampling year of 2003
	ICP-MS	0.000073	0.00024	EN 14084:2003	Used in the sampling year of 2006
	ICP-MS	0.00008	0.00018		Used in the sampling year of 2012

Table 2: Summary of information on analytical methods for cadmium in laver products used by Members

Country	Detection method	LOD (mg/kg)	LOQ (mg/kg)	Reference	Note
Japan	ICP-MS	0.005	0.0165		
Korea	-	0.0001	-	AOAC 973.34	Used in the sampling year of 2003
	ICP-MS	0.0002	0.0004		Used in the sampling year of 2010
	ICP-MS	0.00002	0.00005		Used in the sampling year of 2012

Table 3: Summary of information on analytical methods for lead in laver products used by Members

Country	Detection method	LOD (mg/kg)	LOQ (mg/kg)	Reference	Note
Japan	ICP-MS	0.05	0.165		
Korea	AAS	0.001	-	AOAC 972.25	Used in the sampling year of 2003
	ICP-MS	0.0002	0.0004		Used in the sampling year of 2010
	ICP-MS	0.0003	0.0006		Used in the sampling year of 2012

Appendix III

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