CODEX ALIMENTARIUS COMMISSION E

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Agenda Item 11 **CX/CF 15/9/10-Add.2**

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

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PROPOSED DRAFT REVISION OF THE CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF MYCOTOXIN CONTAMINATION IN CEREALS (CAC/RCP 51-2003)

Comments at Step 3 submitted by Canada, El Salvador, Ghana, Republic of Korea and AU

CANADA

Canada supports this work and has contributed, as a member of the eWG, to the proposed draft revisions. Subsequent to the completion of the eWG's work on the proposed draft revisions, Canada was made aware of some additional changes, detailed below, that have the potential to further improve the CoP, as well as additional information that has only just been published.

As such, Canada supports holding the Code of Practice for another year in order to allow for additional proposed draft revisions to be prepared by an eWG. In the meantime, Canada would like to offer the following suggestions for the consideration of the Committee but is also prepared to submit them for the consideration of a re-established eWG, if it is ultimately the decision of the Committee to allow for another year of work on the CoP.

Comments and suggestions for CAC/RCP 51-2003 (CX/CF 15/9/10):

Para 5: "The complete prevention of dissemination **of mycotoxins** by pre-harvest and post-harvest mycotoxigenic fungal species is not practically achievable, even when GAP and GMP are followed. Therefore, ~~the intermittent and~~ **the** presence of mycotoxins in cereal grains destined for food and animal feed use is to be expected."

Para. 6, last sentence: "This Code of Practice ~~applies~~ **is expected to apply** to all cereal grains and cereal products relevant ~~for~~ **to** human **dietary intake and** health and international trade."

Para. 7: "It is important for grain producers to realize that GAP, including storage and handling methods, represent the primary line of defense against contamination of cereals with mycotoxins, followed by the implementation of GMP during the handling, storage, processing and distribution of cereals for human food and animal feed. **Processing i**~~i~~ndustr~~y~~**ies** ha~~s~~**ve** the role to implement GMP where required, mainly during **grain sorting, cleaning and** processing."

Para 8: "Cereal grain producers should be trained to follow GAP and maintain a close relationship with agricultural advisors, extension services and national authorities to obtain information and advice regarding the choice of appropriate **cereal grain** cultivars and plant protection products suitable for use in their respective production regions **so as to reduce incidence and levels of mycotoxins**."

Sub-heading before para. 11: "**Planting and Crop Rotation"**

Para. 11, last sentence: "When used in the same rotation, inclusion of soybeans, oilseed and pulse **and forage crops** may reduce the incidence and severity of pre-harvest infection."

Para. 14: "When available, grow grain varieties (cultivars) developed **and selected** for **their traits of providing at least partial** resistance to toxigenic fungi and insect pests and for lower mycotoxin accumulation. ~~Seed~~ **It is important to plant** only those varieties recommended for use in a particular area of a country **by virtue of their specific physiological and agronomic traits**."

Para. 17: "Where possible, minimize insect damage and fungal infection in the vicinity of the crop by proper use of ~~registered~~ **approved** ~~insecticides, fungicides~~ **pesticides** and other appropriate practices within an integrated pest management program. Predictive **weather** models could be used to plan the best application tim~~e~~**ing and mode of** ~~for~~ pesticide application."

Para. 18: "**As competition from weed species during crop development can increase plant stress, it is important to ~~C~~c**ontrol weeds in the crop by using mechanical methods, registered herbicides or other safe and suitable weed eradication practices utilizing an integrated pest management program."

Para. 19. "Minimize mechanical damage to plants during cultivation, irrigation and pest management practices. Minimize lodging of plants to prevent contact of the **~~ear~~ aerial (above ground) parts of the plants** with soil**, particularly at the flowering stage of the crop**. **Soil and soil water are sources of inoculum (spores) of toxigenic fungal species.**"

Para. 21: "Plan to harvest grain at low moisture content and full maturity, unless allowing the crop to continue to full maturity would subject it to extreme heat, rainfall or drought conditions. Delayed harvest of grain already infected by *Fusarium* species may cause a**n ~~significant~~** increase in the mycotoxin content of the crop. **If mechanical drying equipment is available, earlier harvest may be helpful in limiting mycotoxin production during the final stages of crop maturation.** Models could be used to predict the mycotoxin production based on environmental conditions, such as climate conditions and agricultural production conditions, being a guide to timely monitoring and surveying of mycotoxin levels."

Para. 21, comment on the second sentence: *Canadian research has shown that harvest date/delay have only minor, if any, impact on Fusarium and many other plant pathogens. Hence, it is suggested to remove the word "significant" as shown above for para. 21.*

Para. 24. "**Methods of harvest and equipment used vary widely among grain-producing countries. Cutting of grain into swaths prior to combining or threshing by other means can contribute to contact with the soil and exposure to fungal spores.** As far as possible, avoid mechanical damage to the grain and avoid contact with soil during the harvesting operation. **Mechanized harvest methods such as the use of combines result in large amounts of crop residue (plant parts other than the grain kernels) being left in the field. Where crop rotations and related tillage practices permit, it is preferable to incorporate this crop residue into the soil by ploughing or cultivation by other means.** Steps should be taken to minimize the spread of infected seed heads, chaff, stalks, and debris onto the ground where spores may inoculate future crops."

Para. 26. "**~~In transport in closed containers or trucks should avoid grains with high moisture content remain long period these conditions before drying. When necessary it is recommended that the trucks and containers to be opened, to increase aeration and minimize the condensation effects.~~ Harvested grain that has not been mechanically dried to a safe storage moisture level should not be stored in bins, wagons or trucks for prolonged periods of time. Transit time for movement from field to storage should be minimized unless the grain is already at acceptable storage moisture levels before harvest."**

Sub-heading before para. 27: "**Drying and Cleaning Before Storage"**

Para. 28. "~~When necessary pre-cleaning before drying can be carried out. Sorting and washing methods can be utilized to clean the grain.~~ **It is not essential to sort or clean grain prior to drying or storage, other than to remove large amounts of straw or other plant material that can carry mold or mold spores. However, if cleaning equipment is available, it is advantageous to mechanically clean grain to remove foreign material, seeds of other plant species and crop residues prior to transfer to storage structures. ~~However I~~** It is important that the grain not be damaged during the procedure and that it is dried thoroughly if washing is used."

Para. 29. "Freshly harvested cereals should be dried immediately in such a manner that damage to the grain is minimized and moisture levels are lower than those needed for fungal growth during storage. **It is very important to ensure that moisture levels in harvested grains are low enough to permit safe storage for even relatively short periods of time ranging from a few days to a few months. A maximum level of 15% moisture is generally considered to be low enough to prevent further growth of pre-harvest fungi and germination of spores of fungi that typically infest grain and impart mycotoxins during storage, such as *Penicillium* and similar toxigenic molds.** After drying, …"

Para. 30. **"While both moisture and temperature of grain can be reduced after harvested grain is transferred to storage bins and silos using mechanically forced aeration, it is preferable to reduce grain moisture content to an acceptable level prior to transfer to storage bins and other storage structures.** ~~Drying could also be done using mechanical dryers.~~ **Mechanical drying is preferred.** Flat bed and re-circulating batch driers are adequate for small scale operations while using a continuous flow-dryer **is** preferred for large scale drying for long storage periods. Grains should not be **excessively** dried or at excessively high temperatures to avoid deterioration **in nutritional** quality including grian damage **and suitability for milling or other processing. Avoid accumulating too much grain in the pre-drier storage or "wet tank", especially when field conditions are warm. Store only enough that can be easily dried in a suitable time period. If mechanical means of drying are not available,** ~~**Ss**~~un drying **and open air drying** should be done on clean surfaces; grains should be protected from rain and dew during this process. For even and faster drying, mix or stir grains frequently in thin layers to dry evenly and quickly. **Any grain that is washed as a method of cleaning must be dried as soon as possible to an acceptable moisture level before being transferred to a storage structure, regardless of expected duration of storage."**

Para. 31: "Determine moisture content of the lot, and if necessary, dry the crop to the moisture content recommended for storage. ~~**The f**~~**F**ungal growth in grain is closely related with water activity (a_w)**, commonly defined in foods as the water that is not bound to food molecules (such as milled grain products) that can support the growth of bacteria, yeasts, and fungi**. Although the appropriate moisture content for fungal growth on various grains is different, the **maximum** a_w **to avoid fungal growth** is basically the same…"

Para. 32: "~~**An integrated pest management program should also be applied during storage.**~~ **Ongoing monitoring of the condition of stored grain is essential to ensure the grain is kept at acceptable temperature and moisture levels and substantially free of rodents and stored product pests such as grain beetles, weevils and mites. Significant fluctuations in grain temperature and increases in grain moisture can provide favourable conditions for mold growth and production of mycotoxins. Physical damage to grain kernels caused by rodents and stored product pest such as insects and mites can also contribute to moisture increases and mold growth.**"

Para. 33: "~~**Make sure that the storage facilities include dry,**~~ **It is important that bins, silos, sheds and other buildings intended for grain storage are dry,** well-vented structures that provide protection from rain, **snow,** ~~**drainage of**~~ ground water, **moisture condensation,** ~~**protection from**~~ **and the** entry of rodents, birds and insects **that can not only contaminate grain but damage grain kernels to make them more susceptible to mold infection. Ideally, storage structures should be designed so as to** ~~**and**~~ minimize ~~**the impact of**~~ **wide fluctuations in the** temperature-~~**fluctuations**~~**of the stored grain**. ~~**When possible, the storage structure may have dust collection system.**~~"

Para. 34: "The storage facility should be ~~**frequently**~~ cleaned **prior to receiving grain** to remove dust, fungal spores, ~~**rest of**~~ grains, **crop residues, animal and insect excreta,** soil, insects and ~~**other source of contamination**~~ **foreign material such as stones, metal and broken glass**."

Para. 35, Suggestion: *The contents of paragraph 35 are reflected in the proposed changes to paragraphs 31 to 33. Therefore, paragraph 35 can be deleted if the changes to paragraphs 31 and 32 are accepted.*

Para. 37, Comment: *Regarding paragraph 37, in North America, on-farm field storage of harvested grain in huge bags is becoming more popular; the CoP may benefit from a discussion specific to these types of grain bags as well.*

Para. 38 – Note that the green font below represents text that has been recommended be moved to a point later in the paragraph:

"~~**Where possible, aerate the grain by circulation of air through the storage area to maintain proper and uniform temperature levels. Grain can also be transferred from one storage container to another to promote aeration and disruption of potential hot spots during storage.**~~ **To more effectively monitor the condition of stored grain, it is advisable, if possible, to measure** ~~**Check moisture content and**~~ **the** temperature **and humidity of the storage facilities and** ~~**in**~~ the stored grain at regular **time** intervals during ~~**the**~~ storage ~~**period**~~. A grain temperature rise of 2-3°C may indicate microbial growth and/or insect infestation. **If temperature or moisture become unacceptably high,** ~~**W**~~**where possible, aerate the grain by circulation of air through the storage area to maintain proper and uniform temperature levels. Aeration should be conducted during periods of low ambient relative humidity of air being forced through the mass of stored grain. Aeration during periods of high relative humidity can actually increase condensation and water activity in stored grain whose temperature is below ambient air temperature. Grain can also be transferred from one storage container to another to promote aeration and disruption of potential hot spots during storage.**"

[The latter half of paragraph 38 could be split to create a new one at this point.] "**If grain spoilage or mold growth in grain is observed, S**~~**S**~~eparate the apparently infected portions of the grain and send samples for analysis **for the presence of mycotoxins**. **When spoiled grain is removed, it is extremely important to minimize the mixing of the spoiled grain with the remaining portion of grain that appears to be in good condition. Small quantities of highly contaminated grain can greatly increase mycotoxin levels in grain that is otherwise in good condition. After** ~~When~~ ~~**separated**~~**spoiled grain has been removed**, **it may be necessary to aerate the remaining grain to** lower the temperature ~~**of the remaining grain and aerate**~~**to acceptable levels**. ~~**Avoid using moldy grain for food or feed production.**~~"

Para. 39: "Measure the temperature and humidity of the storage facilities at several fixed time intervals during storage. **It is important to note that reduction of grain temperature below 15 degrees Celsius that can occur during colder months of temperate grain producing regions will contribute to safe storage and prevention of mold growth and mycotoxin production. Extremely cold temperatures will also inhibit insect growth and reproduction, reducing risk of insect damage in turn facilitating mold growth.**"

Para 40: "Use good housekeeping procedures to minimize the levels of rodent pests, insects and fungi in storage facilities. This may include the use of suitable, registered insecticides and fungicides or appropriate alternative methods within an integrated pest management program. Care should be taken to select **and use** only those ~~**chemicals**~~ **pest control products** that will not create a safety concern based on the intended end use of the grains and ~~**should be strictly limited**~~ **the maximum levels of pesticide residue dictated by regulation or buyer specifications**. Since rodent pests can damage the crop during storage, the storage facility must be ~~**made rodent proof**~~ **kept free of rodents such as rats and mice to the extent possible**."

Para. 43: "Transport containers**, vehicles such as trucks and railway cars, and vessels (boats and ships)** should be dry and free of old grain, grain dust, visible fungal growth, **musty odour,** insects and any contaminated material **that could contribute to mycotoxin levels in lots and cargoes of grain**. As necessary…"

Sub-heading before para. 46: "**Cleaning and Processing After Storage"**

Comment: *This section is does not cover information relevant to various other processes. For example, malting is a big business where safety of barley grain is paramount to the entire process and end use quality i.e. in brewing and wort extraction. Also, oats are treated in many different ways that are not mentioned in any of these paragraphs. This section could be expanded or written in such a way that it does not refer to particular processing chains covering just the basics of cereal grain processing.]*

Para. 46: "Sorting and cleaning are effective processes to remove contaminated grains and reduce mycotoxin content in cereals. ~~**Winnow out small, shriveled grain which may contain higher levels of mycotoxin than healthy normal grain.**~~ **Visibly M**~~**m**~~**old**~~**y**~~ infected and/or damaged kernels should be discarded in order to prevent their entry into the food ~~**chain**~~ and **livestock** feed ~~**manufacturing process**~~ **supply chains**."

Para. 47: "**Analytical testing can be used to monitor mycotoxin concentrations throughout the supply chain.** It is important that ~~**the cereal lot**~~ **lots from** ~~**cereal grains removed from storage for transport is**~~**are** tested **at loading or unloading** for mycotoxin concentration**s** before going into ~~**further**~~ **storage at grain** processing **facilities such as flour mills and feed manufacturing facilities**, especially when the risk of mycotoxin contamination is high **as a consequence of unfavourable conditions during grain production and harvest**. Lots containing higher **but acceptable** levels of mycotoxin should undergo processing that significantly decreases mycotoxin levels to guarantee a safe product to consumers."

Para. 48. "Brushing, scouring and peeling **to remove hulls and bran layers of** the grain **can** significantly reduce mycotoxin content **in grain destined for direct human consumption and milled grain products produced from the inner portions (endosperm) of the grain kernels**, as the outer parts of the kernel contain higher mycotoxin levels or adhering contaminated dust. **If separated hull and seed coat (bran layer) fractions are to be used for food or feed, care must be taken to ensure that mycotoxin levels are not so high that they would negatively affect the safety of the food and/or feed products as consumed."**

Para. 49: "**Industrial dry milling of grain to produce whole grain products containing all portions of the unprocessed kernels in their naturally occurring relative proportions will not reduce mycotoxin levels from those observed in the unprocessed grain.** Dry milling ~~**processing**~~ **processes that segregate some or all of the hull and bran layers** of **the** grain can **significantly** reduce the mycotoxin content of milled products **derived from grain endosperm (inner portions of kernels)** used as food ingredients **to levels below those present in the unprocessed grain**. **Industrial** ~~**W**~~**w**et milling of maize grain isolates most mycotoxins from the starch fraction**s** used as food ingredients.

Para. 49, Comment: *If maize/corn is considered to be a cereal for the purposes of this CoP, additional aspects related to control of aflatoxins should be included*

Para. 50: "**Milled grain products that are stored for long periods of time are also susceptible to mold growth and increased mycotoxin levels imparted by the mold species. It is therefore important to Aa**void ~~**keeping**~~ **storing** flour **and other milled grain products** for long periods of time, but if it is unavoidable then ~~**it**~~ **the products** should be stored in proper storage containers and conditions at safe moisture levels with minimum temperatures changes. Such containers must deter insect and rodent infestation.

Para. 51: "For **grain** products **and grain-derived foods** that pass through ~~**to the**~~ **a** fermentation step, poorly preserved starter cultures ~~**are**~~ **can be** significant sources of mycotoxin contamination. The starter cultures should be maintained pure, viable and sealed to prevent water entrance and other contamination.

52. All ~~**processes**~~ **grain processing activities** should follow good hygiene practices and **HACCP-based (Hazard Analysis and Critical Control Points)** G**ood** M**anufacturing** P**ractices**.-The HACCP system is an important tool to define which steps of the processing should be controlled to minimize the presence of mycotoxins in food and feed.

EL SALVADOR

In general we support the advancement of the proposed draft and the continuation of the work in the Annexes 1 to 6.

1. We support the comment by Sudan in document CX/CF 15/9/10-Add.1:

"Infection versus contamination.

Some mycotoxigenic fungi are saprophytes such as Aspergillus spp. and Penicilium spp. others are pathogens such as Fusarium graminearum and Clavicepts spp. Throughout this document starting para. 2 line 3 the terms" infection" and "contamination" have been used in a synonymous manner. We suggest to confine 'infection' to the pathogenic mycotoxigenic fungi and the term 'contamination' to the saprophytic ones and propose to revise this document accordingly."

2. Proposal for paragraph 17:

Where possible, minimize insect damage and fungal infection in the vicinity of the crop by proper use of registered insecticides, ~~and~~ fungicides, **biopesticides** and other appropriate practices within an integrated pest management program. Predictive models could be used to plan the best application time and **technique** for pesticide application.

Additions are in **bold** and deletions ~~struck through~~.

GHANA

COMMENT

Ghana supports the revision of the COP with the inclusion of the Sorghum measures.

RATIONALE

The current COP was adopted in 2003 (CAC/RCP 51-2003), the document is about twelve years old. Many trends and scientific data on mycotoxin contamination have changed since then. Revising the standard will allow current and more relevant information on newer technologies and practices currently available to prevent and reduce mycotoxin contamination in cereals to be incorporated into the document.

REPUBLIC OF KOREA

"Planting" section

The Republic of Korea suggests removing "peanuts" and "cotton" from Table 1 since they do not belong to cereals.

Annex 3

The Republic of Korea proposes to revise the moisture content in paragraph 7 of Annex 3 from "less than 16%" to "less than 15%" since HACCP for various products in Republic Korea suggests the moisture content to be less than 15%. We also propose to revise the grain temperature in the same paragraph from "lower than 20°C" to "lower than 18°C" since occurrences of fungi has been reported at 18°C-19°C.

Annex 5

The Republic of Korea proposes to include full names of the aflatoxin producing fungi in the paragraph 1 in order to avoid any confusion (example. Aspergillus flavus, A. parasticus). In addition, since genera other than Aspergillus also produce aflatoxin all the alfatoxin producing genera of fungi should be addressed.

AFRICAN UNION

AU supports the revision of the COP	• AU supports this revision because the current COP was adopted in 2003 (CAC/RCP 51-2003) and much time has lapsed since then. • This revision will therefore update the COP with current and more relevant information on newer technologies and practices currently available to prevent and reduce mycotoxin contamination in cereals. • This Code recommends practices based on GAP and GMP and are generally consistent with Hazard Analysis Critical Control Points (HACCP) principles which are incorporated into current food safety practices and certification schemes now in global use in production, storage, handling, transportation, processing, distribution and trade. The implementation of HACCP principles will minimize mycotoxin contamination through applications of preventive control measures especially during storage and processing of cereals.
AU supports the inclusion of the Sorghum measures in the revised COP	From the CCCF 8 Meeting it was agreed that the revised draft annex for the prevention and reduction of aflatoxins and ochratoxin A contamination in sorghum prepared by the EWG led by Nigeria be incorporated into this revised COP Sorghum is a major staple for several African countries. This sorghum document was intended to provide member countries and the sorghum industry with guidance to prevent and reduce aflatoxin (AF) and ochratoxin A (OTA) contamination in sorghum during production, storage and distribution to the point of usage of the cereal. It is therefore important that we ensure its integration into the new document. All sections of the sorghum document have been incorporated into the new document though not into as much detail as outlined in the sorghum document. This is understood since this new COP is aimed at mycotoxins in cereals and not sorghum alone. A new section on processing (paragraphs 46 – 52) has been developed in the new document and this section has integrated the processing section in the earlier sorghum document. Other new sections in the current document include sections on “Tillage and Preparation for Seeding (Planting)” (Paragraphs 12 – 16) and “Drying and Cleaning” (Paragraphs 27 – 30)
The inclusion of the Annex on ergot and ergot alkaloids (Annex 6) is acceptable but AU is of the opinion that though it is necessary to have this Annex, a separate discussion is needed to accept its inclusion in the COP at this stage.	There has not been any prior mention or discussion of the need to include an Annex on ergot and ergot alkaloids in the COP