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GUIDELINES FOR THE CONTROL OF SHIGA TOXIN-PRODUCING *ESCHERICHIA COLI* (STEC) IN RAW BEEF, FRESH LEAFY VEGETABLES, RAW MILK AND RAW MILK CHEESES, AND SPROUTS (CXG 99-2023): PROPOSED DRAFT ANNEX II ON FRESH LEAFY VEGETABLES

(Prepared by the electronic working group chaired by Chile, New Zealand, Kenya, and the United States of America)

Codex Members and Observers wishing to submit comments on the discussion paper should do so as instructed in CL 2024/21-FH available on the Codex webpage/Circular Letters 2024: <https://www.fao.org/fao-who-codexalimentarius/resources/circular-letters/en/>

BACKGROUND

1. The 50th Session of the Committee on Food Hygiene (CCFH50) agreed to start new work on Guidelines on the control of Shiga-toxin producing *Escherichia coli* (STEC) in raw beef, fresh leafy vegetables, raw milk and raw milk cheeses, and sprouts. An electronic working group (EWG) was established, co-chaired by Chile and the United States of America (USA), working via the Codex Online Forum and open to participation by all Codex Members and Observers.
2. CCFH51 considered the report of the EWG on the guidelines for the control of STEC and focused on giving guidance on the terminology to be used for each of the commodities covered by the Guidelines, as well as the request to JEMRA for scientific advice. CCFH51 agreed to return the draft to step 2/3 for redrafting and to establish an EWG, chaired by Chile and co-chaired by the USA, France, and New Zealand.
3. Since CCFH52 was postponed due to the COVID19 pandemic, the revised texts were distributed in April 2021 by CL 2021/35/OCS-FH for comments by Members and Observers, further revised, and then distributed for comments in December 2021 via CL 2021/63/OCS-FH. A Virtual Working Group (VWG) met immediately prior to CCFH52 to get input on specific issues related to the three annexes.
4. CCFH52 considered the report of the EWG and the VWG (CCFH52/CRD5) and agreed with the proposals made in CRD5 and that these should be incorporated in the further elaboration of the Guidelines. CCFH52 agreed to return the proposed draft document to Step 2/3 for redrafting and circulation for comments and to establish an EWG, chaired by Chile and co-chaired by the United States of America, France, and New Zealand, and working in English.
5. CCFH 53 noting that there were no outstanding issues to be addressed in the general section and the annexes on raw beef and raw milk and raw milk cheeses, agreed to forward the proposed draft Guidelines and these two annexes for adoption at Step 5/8 by CAC46 (Appendix III); to return the annexes on fresh leafy vegetables and sprouts to Step 2/3 for redrafting and circulation for comments and to establish an EWG, chaired by Chile and co-chaired by New Zealand, Kenya, and USA, and working in English (noting that comments would also be accepted in Spanish). CAC46 adopted the general section and the annexes on raw beef and raw milk and raw milk cheeses (CXG 99-2023).

TERMS OF REFERENCE

6. The EWG was given the following terms of reference:
 - further develop the annex on fresh leafy vegetables using CRD13 as a basis and taking into consideration the general section of the guidance as agreed at CCFH53 and the CRDs submitted at CCFH53;

- continue the development of the annex on sprouts describing interventions relevant to control STEC, taking into consideration the written comments that were submitted through the Online Commenting System (OCS) in response to the CL 2022/56-FH, and CRDs submitted at CCFH53, as well as the general section of the guidance as agreed at CCFH53; and
- prepare a report and revised text to be submitted to the Codex Secretariat three months before CCFH54 for circulation for comments at Step 3;

PARTICIPATION AND METHODOLOGY

7. An invitation was sent to all Codex Members and Observers to participate in the EWG; participants from 27 Codex member countries and 1 observer organization registered for the EWG. The list of participants is attached as Appendix II. The EWG worked through the Codex Online Forum.

8. The EWG redrafted the Fresh Leafy Vegetables annex and Sprout annex, based on written comments submitted to CCFH53; and comments received through the Codex Online Forum in a round of consultation for each one of the annexes (July – September 2023).

SUMMARY OF DISCUSSION OF THE ANNEX ON FRESH LEAFY VEGETABLES

9. The following changes were made to the Annex on Fresh Leafy Vegetables after a round of consultation in the EWG

- Made changes suggested in comments received through the Codex Online Forum, including editorial changes.
- In the Objective section ‘consumer use’ was replaced by ‘consumer awareness’ to be consistent with the title of section 9.
- Section 2 was renamed as Scope, Use and Definitions to be consistent with the Sprout annex.
- In section 3.2.1 about Water for primary production, reference to the *Codex Guidelines for the safe use and reuse of water in food production and processing (CXG100/2023)* was added. After considering the suggestions to add more flexibility to the paragraph related to testing the water, it was decided that enough flexibility was added, since the recommendation is risk-based depending on the water source.
- In section 5.3 the term “dewatering” in the title was changed to “removal of water” for clarity.
- After discussion, the recommendation of < 7°C for cold storage was maintained with the flexibility for cold damage or quality loss. It is the interest of the co-chairs to continue the discussion during the pWG on the margins of CCFH 54 on whether to maintain or not the temperature reference.

10. Details of the discussions on the annex on sprouts are available in CX/FH 24/54/6

CONCLUSIONS

11. The EWG completed the tasks identified in its Terms of Reference; specifically, the EWG updated the Fresh Leafy Vegetable Annex (see Appendix I) taking into consideration the comments received during the rounds of consultation.

RECOMMENDATIONS

12. The EWG recommends that CCFH54 consider the proposed draft Annex 2 on Fresh Leafy Vegetables (see Appendix 1) and recommend whether it can be advanced in the Codex Step process.

PROPOSED DRAFT ANNEX II ON FRESH LEAFY VEGETABLES

INTRODUCTION

1. Fresh leafy vegetables are grown, processed, and consumed throughout the world. They are grown on farms of varying sizes; distributed and marketed locally and globally, providing year-round availability to consumers; and sold as fresh whole, fresh pre-cut or other ready-to-eat (RTE) products such as pre-packaged salads.
2. Outbreaks of illness caused by a broad range of microbial pathogens, including Shiga toxin-producing *Escherichia coli* (STEC), have been linked to the consumption of fresh leafy vegetables. Epidemiological evidence, outbreak investigations, research, and risk assessments have identified several possible contamination sources of fresh leafy vegetables with STEC, including water, domestic and wild animals, workers, and manure-based soil amendments¹. Fresh leafy vegetables are typically grown and harvested in large volumes, increasingly in locations where harvest and distribution of fresh leafy vegetables is efficient and rapid. Fresh leafy vegetables are packed in diverse ways, including field packed direct for market; field cored and prepared for later processing; and as pre-cut fresh leafy vegetable mixtures and blends with other vegetables. Control measures such as antimicrobial washes to minimize cross-contamination may be applied prior to packaging and/or shipment to market. As fresh leafy vegetables move through the supply chain, there is also the potential for the introduction and growth of pathogens, including STEC. The increasing worldwide use of pre-packaged fresh-cut leafy vegetables to expand the supply chain might increase the potential for the presence of contaminated product in the marketplace through cross-contamination with STEC, and STEC replication during distribution and storage if fresh-cut leafy vegetables are improperly handled. There is no processing treatment applied to fresh leafy vegetables that would eliminate or inactivate STEC, although contamination can be reduced by measures and treatments such as washing in water containing biocides. Examples of field level control measures provided in this document are illustrative only and their use and approval may vary by country.
3. It is recognized that some of the provisions in this Annex may be difficult to implement in areas where primary production is conducted in small holdings, whether in countries with developed or developing economies, and in areas where traditional farming is practiced. The Annex is, therefore, a flexible one, to allow for diverse systems of control and prevention of contamination for different cultural practices and growing conditions. Figure 1 provides a flow diagram illustrating a generalized process flow for fresh leafy vegetables. This flow diagram is for illustrative purposes only. Steps may not occur in all operations (as shown with dotted lines) and may not occur in the order presented in the flow diagram.

1. OBJECTIVE

4. The objective of this Annex is to provide guidance to reduce the risk of foodborne illness from STEC associated with fresh leafy vegetables intended for human consumption without cooking, during primary production, harvesting, packing, processing, storage, distribution, marketing, and consumer awareness.

2. SCOPE, USE AND DEFINITIONS

2.1 Scope

5. This Annex covers specific guidance for the control of STEC related to fresh leafy vegetables that are intended to be consumed raw. The Annex is applicable to fresh leafy vegetables grown in open fields or in fully or partially protected facilities (hydroponic systems, greenhouses/controlled environments, tunnels, etc.).

2.2 Use

6. This Annex should be used in conjunction with the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

2.3 Definitions

7. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003), including Annex I for Ready-to-Eat Fresh, Pre-cut Fruits and Vegetables and Scope of Annex III for Fresh Leafy Vegetables.

¹ "Soil amendments" are fertilizers soil improvers, conditioners, or other material added to a soil to improve nutrients or the soil's physical properties, such as water retention, permeability, water infiltration, and drainage.

- **Fresh leafy vegetables** - Vegetables of a leafy nature where the leaf is intended for consumption raw, including, but not limited to, all varieties of lettuce, spinach, cabbage, chicory, endive, kale, radicchio, and fresh herbs such as coriander/cilantro, basil, curry leaf, colocasia leaves and parsley, among other local products for foliar consumption.

3. PRIMARY PRODUCTION

8. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003). As noted in CXC 1-1969, some of the principles of HACCP can be applied at primary production and may be incorporated into Good Agricultural Practices for the production of fresh leafy vegetables to minimize contamination with STEC.
9. Most contamination of fresh leafy vegetables with STEC is thought to occur during primary production. Fresh leafy vegetables are grown and harvested under a diverse range of climatic and geographical conditions. They can be grown in production sites indoors (e.g., greenhouses) and outdoors, harvested, and either field-packed or transported to a packing establishment, using various agricultural inputs and technologies, and on farms of varying sizes. In each primary production area, it is necessary to consider the agricultural practices and procedures that could minimize the potential for contamination of fresh leafy vegetables with STEC, taking into account the conditions specific to the primary production area, type of products, and types of methods used in growing (including irrigation source and use of organic fertilization) and harvesting.

3.1 Location of the Production Site

10. Potential sources of STEC contamination should be identified prior to commencement of primary production activities and periodically evaluated for changes. Where possible, growers should evaluate present and previous uses of both indoor and outdoor fresh leafy vegetable primary production sites and the nearby and adjacent land (e.g., animal production, sewage treatment site) in order to identify potential sources of STEC. The assessment of environmental conditions is particularly important because subsequent interventions would not be sufficient to fully remove STEC contamination that occurs during primary production, and in some cases, conditions may enable the growth of STEC, thereby increasing the risk of illness for consumers.

3.1.1 Neighbouring animal farms

11. Animal production facilities located in proximity to sites where fresh leafy vegetables are grown and access to the growing site by wildlife can pose a significant likelihood of contamination of production fields or water sources with STEC. Concentrated animal feeding operations, dairy farms and cattle grazing lands present a significant risk of contamination of fresh leafy vegetables in the field; although guidelines exist for the distance between fields and nearby animal operations, the safe distance depends on factors that can increase or decrease the risk of contamination, such as topography of the land and opportunity for water runoff through or from such operations. Growers should evaluate the potential for such contamination and take measures to mitigate the risk of STEC contamination associated with runoff and flooding (e.g., terracing, digging a shallow ditch to prevent runoff from entering the field).

3.1.2 Environmental conditions

12. If the environment presents a likelihood of contamination of the primary production site with STEC, measures should be implemented to minimize the potential for contamination of fresh leafy vegetables at the site. When the likelihood of contamination cannot be managed or minimized, the production site should not be used for fresh leafy vegetable production.
13. The effects of some environmental events cannot be controlled and may need to be evaluated. For example, heavy rains or flood events may increase the exposure of fresh leafy vegetables to STEC. When heavy rains occur, growers should evaluate the need to postpone harvesting fresh leafy vegetables for consumption. Fresh leafy vegetables that contact flood waters should not be consumed. When permitted by the competent authority, a prior risk assessment can be undertaken and if necessary measures that mitigate risks from STEC to consumers should be undertaken. This does not include flooding of furrows for irrigation purposes, where the source of water is known and of appropriate quality and is not the result of a weather event.

3.1.3 Animal activity

14. Some wild and domestic animals present in the primary production environment are known to be potential carriers of STEC. Wild animals represent a particularly difficult risk to manage because their presence is

intermittent. The following are particularly important to minimize the potential for animal activity to contaminate fresh leafy vegetables with STEC:

- Appropriate methods should be used in order to exclude animals from the primary production and handling areas to the extent practicable. Possible methods include the use of physical barriers (e.g., fences) and active deterrents (e.g., noise makers, scarecrows, images of owls, foil strips).
- Primary production and handling areas should be properly designed and maintained to reduce the likelihood of attracting animals that can contaminate fresh leafy vegetables with STEC. Possible methods include minimizing standing water in fields, restricting animal access to water sources from use in production (e.g. irrigation and washing), and maintaining production sites and handling areas free of waste and clutter.
- Fresh leafy vegetable primary production areas should be regularly checked for evidence of the presence of wildlife or domestic animal activity (e.g., presence of animal faeces, bird nests, hairs/fur, large areas of animal tracks, burrowing, decomposing remains, crop damage from grazing), particularly near the time of harvesting. Where such evidence exists, growers should evaluate the risks to determine whether the fresh leafy vegetables in the affected area of the production site should be harvested for consumption without cooking.

3.2 Hygienic primary production of fresh leafy vegetables

3.2.1 Water for primary production

15. Several parameters may influence the likelihood of contamination of fresh leafy vegetables with STEC from water: the source of water used for irrigation and the application of fertilizers and pesticides, the type of irrigation (e.g. drip, furrow, sprinkler, overhead), whether the edible portions of fresh leafy vegetables have direct contact with irrigation or other water, the timing of irrigation in relation to harvesting and, most importantly, the occurrence of STEC in the water used for irrigation or application of pesticides or fertilizers. Growers should identify and evaluate the sources of water used on the farm for the likelihood of contamination with STEC and identify measures to prevent or minimize STEC contamination (e.g., from livestock, wildlife, sewage treatment, human habitation, manure, and composting operations, or other intermittent or temporary environmental contamination, such as heavy rain or flooding). (Refer to section 3.2.1.1 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).)
16. Growers should periodically test the water they use for appropriate indicator microorganisms and, in addition, where necessary, STEC, according to the risk associated with the production. The frequency of testing will depend on the water source (i.e., lower for adequately maintained deep wells, higher for surface waters), the risks of environmental contamination, including intermittent or temporary contamination (e.g., heavy rain, flooding), or the implementation of a new water treatment process by growers. If the intended water source is found to contain unacceptable levels of indicator microorganisms or is contaminated with STEC, corrective actions should be taken to ensure that the water is suitable for its intended use. Possible corrective actions to prevent or minimize contamination of water for primary production may include the installation of fencing to prevent large animal contact, the proper maintenance of wells, water filtering, chemical water treatment, the prevention of the stirring of the sediment when drawing water, the construction of settling or holding ponds or water treatment facilities. The effectiveness of corrective actions should be verified by periodic water testing. Where possible, growers should have a contingency plan in place that identifies an alternative source of water fit for purpose. Refer to the *Guidelines for the Safe Use and Reuse of Water in Food Production and Processing* (CXG 100-2023), including Annex 1 "Fresh Produce".
17. It is especially critical in hydroponic operations to maintain the quality of water used as the growth medium for fresh leafy vegetables to reduce the likelihood of contamination and survival of STEC; the nutrient solution used may enhance the survival or growth of STEC. (Refer to section 3.2.1.1.3 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).)

3.2.2 Manure, biosolids and other natural fertilizers

18. The use of manure, biosolids and other natural fertilizers in the production of fresh leafy vegetables should be managed to limit the potential for contamination with STEC. STEC can persist in these materials for weeks or even months, if treatment is inadequate. Composting can be effective in controlling STEC in manure, depending on factors that include time, temperature, indigenous microorganisms, moisture, composition of the compost, pile size, and turning of the pile. Another manure treatment method involves anaerobic digestion. Treatment methods should be validated to inactivate STEC. Refer to section 3.2.1.2 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003) for practices to minimize contamination of fresh leafy vegetables with microbial pathogens such as STEC in manure, biosolids and other natural fertilizers.

3.2.3 Personnel health, hygiene, and sanitary facilities

19. Hygiene and health requirements should be followed to ensure that personnel who come into direct contact with fresh leafy vegetables prior to, during or after harvesting will not contaminate them with STEC. Adequate access to, and use of, hygienic and sanitary facilities, including adequate means for hygienically washing and drying hands, are critical to minimize the potential for workers to contaminate fresh leafy vegetables. People known or suspected to be suffering from gastrointestinal illness should not be allowed to enter any area where handling fresh leafy vegetables occurs, including the harvest area. Refer to section 3.2.3 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003) for practices to minimize microbial pathogens such as STEC.

3.2.4 Harvesting

20. The field should be evaluated for animal intrusion, the presence of faecal deposits, or other sources of STEC contamination prior to harvest to determine if the field or portions thereof should not be harvested. Growers should avoid moving harvesting equipment across fields where manure or compost has been applied. Harvesting equipment should be designed and constructed to ensure that, when necessary, they can be cleaned, disinfected, and maintained to avoid the contamination of fresh leafy vegetables (e.g., if the equipment runs over an area with animal intrusion and faecal deposits). Containers stored outside and field containers to be re-used should be cleaned and, as appropriate, disinfected before being used to transport fresh leafy vegetables.

3.2.5 Field packing

21. When packing fresh leafy vegetables in the field, and noting that containers are often open-topped and stacked, care should be taken to avoid contaminating containers or bins by exposure to manure or other contamination sources. When fresh leafy vegetables are trimmed or cored in the field, knives and cutting edges should be cleaned and disinfected frequently to minimize the potential for cross-contamination with STEC.

3.2.6 Storage and transport from the field to the packing or processing facility

22. Fresh leafy vegetables should be stored and transported under conditions that will minimize the potential for STEC contamination and/or growth and noting that containers are often open-topped and stacked. Fresh leafy vegetables should not be transported in vehicles previously used to carry potentially contaminated materials (e.g., heavily soiled root vegetables, live animals, animal manure, compost, or biosolids). When vehicle receptacles or containers have been used for the transport of products other than fresh leafy vegetables, effective cleaning and disinfection should be carried out between loads to avoid cross-contamination.

4. PACKING OPERATIONS

23. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

4.1 Time and temperature control

24. Refer to the *General Principles of Food Hygiene* (CXC 1-1969). Time and temperature control during packing and storage is essential to prevent growth of any STEC that may be present, since an increase in numbers of STEC will increase the risk of illness.

4.2 Cooling fresh leafy vegetables

25. The cooling of fresh leafy vegetables should take place as rapidly as possible to minimize growth of any STEC that may be present, and in a manner that does not contribute to contamination of product with STEC. For example, fresh leafy vegetables can be cooled immediately after harvest by using ice (e.g., for parsley), forced-air cooling, vacuum cooling (e.g., for iceberg lettuce), hydrocooling or spray-vacuum (hydro-vac) cooling. When cold damage is not a concern, fresh leafy vegetables should be cooled to temperatures <7°C to prevent the growth of STEC. For fresh leafy vegetables susceptible to quality damage at temperatures <7°C, the growth of STEC should be minimized by cooling to temperatures as low as possible while avoiding quality damage.
26. If water, including ice, used for cooling comes into direct contact with fresh leafy vegetables, it should be fit for purpose to minimize the likelihood of cross-contamination. When biocides are used, the concentration and other appropriate parameters (e.g., pH and temperature) in this water should be controlled, monitored, and recorded to ensure [cross-contamination will be sufficiently minimized.] [that biocides are sufficient to reduce the potential risk of cross-contamination.]

4.3 Washing fresh leafy vegetables.

27. The washing of fresh leafy vegetables should follow good hygienic practices (GHPs) to prevent or minimize the potential for the introduction or spread of STEC in wash water. All water used for washing fresh leafy vegetables should be fit for purpose. When washing fresh leafy vegetables, biocides, when identified as necessary, should be added to wash water as per GHPs, with their levels monitored, controlled and recorded regularly during production to ensure the maintenance of effective concentrations. The characteristics of post-harvest water that may impact the efficacy of the biocidal treatments (e.g., the pH, turbidity and water hardness) should be controlled, monitored and recorded.

5. PROCESSING OPERATIONS

28. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003), including Annex III on Fresh Leafy Vegetables and Annex I on Ready-to-Eat, Fresh, Pre-Cut Fruits and Vegetables.
29. It is recommended that unprocessed fresh leafy vegetable handling areas be physically separated from processing areas to minimize contamination with STEC. Processing, with some exceptions (e.g., cooking) cannot fully eliminate STEC contamination that may have occurred during primary production of fresh leafy vegetables. Processors should ensure that growers, harvesters, packers, and distributors have implemented measures to minimize the contamination during primary production of the fresh leafy vegetables and also during subsequent handling in accordance with the provisions in the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

5.1 Time and temperature control

30. Refer to the *General Principles of Food Hygiene* (CXC 1-1969). Time and temperature control during pre-processing storage, processing and post-processing storage is essential to prevent growth of any STEC that may be present, since an increase in numbers of the STEC population will increase the risk of consumer illnesses. A temperature below 7°C will prevent growth of STEC and is appropriate for those fresh leafy vegetables that are not susceptible to cold injury.

5.2 Trimming, coring, cutting, and shredding of fresh leafy vegetables.

31. Cutting knives and other cutting tools, equipment, and any other contact surfaces, should be cleaned and disinfected frequently to minimize the potential for transfer of STEC.

5.3 Washing and removal of water/drying cut fresh leafy vegetables.

32. Washing and removal of water/drying are important steps in the control of STEC for fresh-cut leafy vegetables. See Section 4.3 above and section 5.2.2.5.1 of Annex I on Ready-to-Eat, Fresh, Pre-Cut Fruits and Vegetables of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

5.4 Cold storage

33. It is recommended that fresh leafy vegetables be maintained at appropriate temperatures after cooling to minimize growth of any STEC that may be present. When cold damage is not a concern, fresh leafy vegetables should be cooled to temperatures <7°C to prevent the growth of STEC. For fresh leafy vegetables susceptible to quality damage at temperatures <7°C, the growth of STEC should be minimized by cooling to temperatures as low as possible while avoiding quality damage. The temperature of the cold storage should be controlled, monitored, and recorded.

5.5 Microbiological and other specifications

34. Microbiological testing of fresh leafy vegetables and of water for primary production for STEC is currently of limited use due to difficulty in detecting STEC because of low and sporadic prevalence and when present, low numbers of the organism in fresh leafy vegetables and in water. Testing of fresh leafy vegetables for indicator microorganisms, supplemented, where appropriate, by testing for STEC strains considered to be a country's highest priority (e.g., those strains with virulence factors capable of causing severe illness or considered to cause significant illness in that country), can be a useful tool to evaluate and verify the safety of the product, the effectiveness of the control measures, and to provide information about an environment, a process or even a specific product lot when sampling plans and testing methodology are properly designed and performed. Measures to be undertaken in case of positive results for STEC (or when indicator microorganisms reach a pre-defined threshold) need to be established and defined. Refer to the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CXG 21-1997) and Principles and Guidelines for the conduct of microbiological risk management (MRM) (CAC/GL 63-2007).

5.6 Documentation and records

35. It is recommended that primary production, harvesting, processing, storage, and distribution records be retained long enough to facilitate STEC illness investigation and recalls if needed. This period may significantly exceed the shelf-life of fresh leafy vegetables. Refer to section 5.7 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003) for the types of records that should be maintained by growers, harvesters and packers that may be important when investigating foodborne illness outbreaks due to STEC.

6. ESTABLISHMENT: MAINTENANCE AND SANITATION

36. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

7. ESTABLISHMENT: PERSONAL HYGIENE

37. Refer to the *General Principles of Food Hygiene* (CXC 1-1969).

8. TRANSPORTATION

38. Refer to the *General Principles of Food Hygiene* (CXC 1-1969), the *Code of Hygienic Practice for the Transport of Food in Bulk and Semi-Packed Food* (CXC 47-2001) and the *Code of Practice for the Packaging and Transport of Fresh Fruits and Vegetables* (CXC 44-1995).

9. PRODUCT INFORMATION AND CONSUMER AWARENESS

9.1 Lot identification

39. Refer to the *General Principles of Food Hygiene* (CXC 1-1969).

9.2 Product information

40. Refer to the *General Principles of Food Hygiene* (CXC 1-1969).

9.3 Labelling

41. Refer to the *General Standard for the Labelling of Pre-packaged Foods* (CXS 1-1985) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

9.4 Consumer awareness

42. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

10. TRAINING

43. Refer to the *General Principles of Food Hygiene* (CXC 1-1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CXC 53-2003).

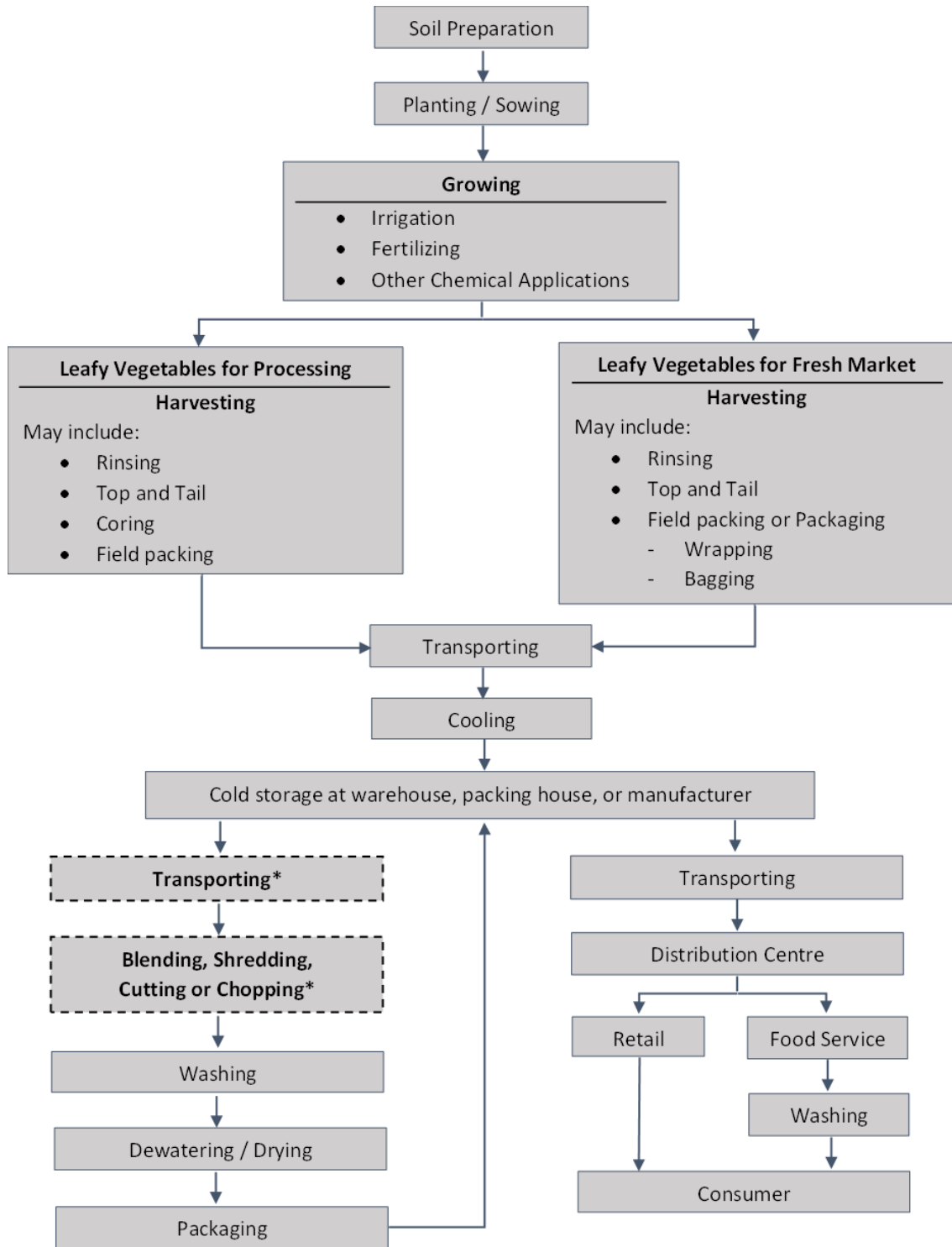
11. RETAIL AND FOODSERVICE

44. Fresh leafy vegetables (intact and pre-cut) should be held at an appropriate temperature to minimize growth of STEC. Cross-contamination from or to other food items should be prevented. Food business operators serving fresh leafy vegetables for consumption without cooking to consumers should take appropriate measures to

- prevent cross-contamination,
- maintain appropriate holding and storage temperature,
- thoroughly wash fresh leafy vegetables in accordance with section 4.3 prior to use, and
- ensure proper cleaning of tools and surfaces that may come in contact with these products.

45. When cold damage is not a concern, fresh leafy vegetables should be cooled to temperatures <7°C to prevent the growth of STEC. For fresh leafy vegetables susceptible to quality damage at temperatures <7°C, the growth of STEC should be minimized by cooling to temperatures as low as possible while avoiding quality damage.

Figure1: Process Flow for Fresh Leafy Vegetables²



² The diagram illustrates a generalised process flow for fresh leafy vegetables for illustrative purposes only. Steps may not occur in all operations and may not occur in the order presented in the flow diagram.

*Boxes with broken lines indicate steps that may not be included, depending in part on the commodity.

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