



DRAFT TANZANIA STANDARD

Code of hygienic practices for fresh leafy vegetables

DRAFT FOR STAKEHOLDERS' COMMENTS

TANZANIA BUREAU OF STANDARDS

0 Foreword

Fresh leafy vegetables are grown, processed and consumed in multiple ways and in diverse conditions throughout the world and marketed both locally and globally to provide year round availability to consumers and are sold in fresh forms.

This code was prepared due to raised concerns on the outbreaks and illnesses linked to fresh leafy vegetables as a result of the presence of microbial pathogens including Enterohemorrhagic *Escherichia coli*, *Salmonella enterica*, *Campylobacter* spp, *Shigella* spp, Hepatitis A virus, Norovirus, *Cyclospora cayetanensis*, *Cryptosporidium parvum*, *Giardia lamblia*, *Yersinia pseudotuberculosis* and *Listeria monocytogenes*.

This code should be used in conjunction with the TZS 109, *Food processing unit — code of hygienic practices* and TZS 1743, National Standard Good Agricultural Practices and Good Handling Practices for fresh fruits and vegetables

In the preparation of this code assistance was derived from CAC/RCP 53-2003 *Code of hygienic practice for fresh fruits and vegetables* published by the Codex Alimentarius Commission.

1 Scope

This code provides guidance related to the production, harvesting, packaging, processing, storage, distribution, marketing, and consumer use of fresh leafy vegetables that are intended for direct human consumption without further microbiocidal steps.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 109, *Food processing unit — code of hygienic practices*

TZS 538, *Packaging and labeling of foods*

TZS 1003, *Guide to the pre-packaging of fresh fruits and vegetables*

3 Terms and definitions

For purposes of this Tanzania Standard, the following terms and definition shall apply;

3.1 fresh leafy vegetables

include all vegetables of a leafy nature such as (lettuce, spinach, cabbage, chicory, endive and radicchio and fresh herbs such as coriander/cilantro, basil, and parsley) where the leaf is edible and intended for consumption

3.2 agricultural inputs

any material (e.g. seeds, fertilizers, water, agricultural chem

icals, plant support, etc.) used for the primary production of fresh fruits and vegetables

3.3 agricultural worker

any person who undertakes one or more of the following: cultivation, harvesting and packing of fresh fruits and vegetables

3.4 antimicrobial agents

any substance of natural, synthetic or semi-synthetic origin which at low concentrations kills or inhibits the growth of micro-organisms but causes little or no host damage

3.5 biological control

use of competing biological agents (such as insects, micro-organisms and/or microbial metabolites) for the control of , pests (such as mites, insects, weeds, plant pathogens and spoilage organisms)

3.6 biosolids

sludge and other residue deposits obtained from treatment of sewage plants; urban and industrial wastes (food industries or other types of industry)

3.7 clean water

water that does not compromise food safety in the circumstances of its use

3.8 composting

managed process in which organic materials are digested aerobically or anaerobically by microbial action

3.9 cultivation

any agricultural action or practice used by growers to allow and improve the growing conditions of fresh fruits or vegetables grown in the field (with or without cover) or in protected facilities (hydroponic systems, greenhouses)

3.10 environment

surroundings or conditions in which a person, animal or plant lives or operates

3.11 farm

any premise or establishment in which fresh fruits and/or vegetables are grown and harvested where the surroundings are under the control of the same management

3.13 grower

person directly responsible for the management of the primary production of fresh fruits and vegetables

3.14 harvester

person directly responsible for the management of the harvesting of fresh fruits and vegetables

3.15 Hazard Analysis Critical Control Points (HACCP)

system which identifies, analyses, and controls hazards which are significant for food safety

3.16 hazard

any biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect

3.17 hazardous material

any compound which, at specific levels, has the potential to cause adverse health effects

3.18 hydroponics

growing of plants in a water medium

3.19 manure

animal excrement which may be mixed with litter or other material, and which may be fermented or otherwise treated and it can be used as natural fertilizer

3.20 micro-organisms

organisms which are too small to be visible by naked eye. Include yeasts, moulds, bacteria, viruses and microscopic parasites. When used as an adjective, the term "microbial" is used

3.21 microbiocidal

agent that kills microscopic organisms (bacteria, fungi and viruses)

3.22 packer

person responsible for the management of post-harvest processing and packing of fresh fruits and vegetables

3.23 packing

action of putting fresh fruits and vegetables in a package. This may take place in a field or in an establishment

3.24 packing establishment

any indoor establishment in which fresh fruits and vegetables receive post-harvest treatment and are packaged

3.25 primary production

steps involved in the growing and harvesting of fresh fruits and vegetables such as planting, irrigation, application of fertilizers, application of agricultural chemicals, etc

3.26 vegetables

tender edible shoot, leaf, blossom, fruits, root and tubers of plant that are eaten whole, in part, raw or cooked, as a supplement to starch foods and meats/fish

3.27 processor

person directly responsible for the management of the activities associated with the production of ready-to-eat fresh pre-cut fruits and vegetables

3.28 potable water

water that is safe and suitable for human consumption

4 Primary production of fresh leafy vegetables**4.1 Environmental hygiene**

Potential sources of environmental contamination should be identified prior to production activities. Assessment of environmental conditions is particularly important because subsequent steps may not be adequate to remove contamination that occurs during production and in some cases may lead to conditions that enable the growth of microbial pathogens.

Particular attention should be given to potential sources of faecal contamination in the production area, on near-by sites and to vectors which may introduce faecal contamination to the production and handling areas. These vectors include, but are not limited, to humans, domestic and wild animals, or indirectly via contaminated water, insects, workers, or fomites such as dust, tools and equipment. More details of the requirements to be considered are as follows;

4.1.1 Location of the production site

Production sites (indoor and outdoor) should be located to minimize the probability of microbial contamination to the growing sites from the nearby sites. Consideration of land location should include evaluating the slope, topographical, flood risk, and hydrological features of nearby sites in relationship to the production site.

Assessing environmental hygiene is particularly important in evaluating risks that arise from use of land nearby the production sites, for example feed lots, other animal production operations, hazardous waste sites, municipal and industrial waste treatment facilities, The presence of such sites should be evaluated for their potential to contaminate the production site with microbial or other environmental hazards via, for example, run-off, faecal material, aerosols or other organic waste.

Where the environment presents a risk to the production site, measures should be taken to minimize the contamination of the fresh leafy vegetable production sites. Landscape changes, such as the construction of a shallow ditch, to prevent runoff from entering the field or in the case of aerosols, construction of an effective wind-break (natural such as trees or constructed) or use of a covering are examples of measures that can be used to reduce pathogen contamination of the production site.

4.1.2 Previous and current use of the site

If the evaluation of previous and present usage of the primary production area and the nearby sites identifies potential microbial hazards that are at levels that pose a risk to humans, including faecal and other organic

waste contamination and potential environmental hazards, fresh leafy vegetables should not be grown on the land until the risks have been reduced to acceptable levels.

4.1.3 Wild and domestic animals and human activity

Domestic and wild animals and human activity can present a risk both from direct contamination of the crop and soil as well as from contamination of surface water sources and other inputs.

- a) domestic and wild animals should be excluded from production and handling areas.
- b) production and handling areas should be properly maintained to reduce the likelihood of vector attraction.
- c) existing hygienic practices should be reviewed to assess the prevalence and likelihood of deposits of animal faeces coming into contact with crops. Efforts should be made to protect fresh leafy vegetable growing areas from animals. Where appropriate, this may require the use of physical barriers (e.g. fences), active deterrents (e.g. noise makers, scarecrows, images of owls, foil strips) and/or cultural methods (e.g. crop rotation).

4.2 Hygienic primary production of fresh leafy vegetables

4.2.1 Water for primary production

An appropriate and adequate supply of water of a suitable quality for use in different operations in the primary production of fresh leafy vegetables should be available. The source of the water used for production and the method of delivery can affect the risk of contamination for fresh leafy vegetables. Growers should seek appropriate guidance on water quality and delivery methods to minimize the potential for contamination with microbial pathogens.

The quality of water may vary. Water for primary production that has substantial contact with the edible portion of the leafy vegetable should meet the standards for potable water.

4.2.1.1 Water for irrigation

Water used for irrigation purposes should be of suitable quality for its intended use. The type of irrigation or application method affects the risk of contamination. The timing, the quality of water used, and whether the water has direct contact with the edible portion of the plant should all be considered when selecting the type of irrigation or application method to use.

Growers should evaluate the water distribution system to determine if a contamination source is evident and can be eliminated and establish no-harvest zones if irrigation source water is known to or likely to contain human pathogens and where failure at connections results in overspray of plants or localized flooding.

4.2.1.2 Water for fertilizers, pest control and other agricultural chemicals

Clean water should be used in the application of aqueous fertilizers, pesticides, and other agricultural chemicals that are directly applied to edible portions of the fresh leafy vegetables, especially close to harvest. Human pathogens can survive and grow in many agrichemicals including pesticides. The application of pesticide solutions contaminated with human pathogens to the surface of leafy vegetables is known to constitute a risk, particularly near harvest time.

4.2.1.3 *Water for harvesting and other agricultural uses*

Water for other agricultural uses includes dust reduction, hydration, as a lubricant, and to maintain roads, yards, and parking lots should be clean so that they do not constitute a source of contamination in areas where fresh leafy vegetables are exposed. If sprinkling water using mechanical means to minimize dust on roads within or near the fields, then use clean water to avoid the aerosolization and spread of pathogens.

Fresh leafy vegetables may be sprayed with small amounts of water during machine harvest or in the field container just after harvest to hydrate crops. Water may also be used to facilitate the handling of leafy vegetables in the field.

4.2.2 *Manure, biosolids and other natural fertilizers*

Manure, biosolids and other natural fertilizers may contain human or animal waste, animal parts or products, or be composed primarily of plant materials. Because of this, natural fertilizers and other soil amendments may contain human pathogens that may persist for weeks or even months, particularly if treatment of these materials is inadequate. Proper treatment of biosolids, manures and by-products (e.g. physical, chemical, or biological treatment) will reduce the risk of potential human pathogen survival.

Fresh leafy vegetables may be contaminated through direct contact with contaminated soil amendments. Therefore untreated and/or partially treated manure, biosolids, and other natural fertilizers should not be applied to leafy vegetables after plant emergence unless it can be demonstrated that product contamination will not occur. Field soil contaminated with human pathogens may also provide a means of fresh leafy vegetables contamination via rain splash or plant uptake. Therefore, establishing suitably conservative pre-plant fertilizer intervals appropriate for specific regional and field conditions is an effective step towards minimizing risk.

4.2.3 *Indoor facilities associated with growing and harvesting (protective agricultural structures)*

Protective agricultural structures, including greenhouses, high tunnels, hoop houses, and shade house structures, provide some degree of control over various environmental factors.

4.2.3.1 *Location, design and layout*

Some protective agricultural structures are located in the field (hoop houses, high tunnels, etc.) Factors that influence the magnitude and frequency of the transfer of pathogenic microorganisms in the field, such as the climate, weather, topology, hydrology and other geographic characteristics in or nearby the field may pose a similar risk for certain protective structures.

The methods for adequate maintenance of the environment around the structures include, but are not limited to:

- a) properly storing equipment, removing litter and waste, and cutting weeds or grass within the immediate vicinity of the plant buildings or structures that may constitute an attractant, breeding place, or harborage for pests.
- b) adequately draining areas that may contribute contamination to food by
 - i providing a breeding place for pests
 - ii runoff, leakage, or pooled/settled water flowing into food growing areas,
 - iii transfer of contaminants via equipment or foot traffic

- c) the land nearby certain protective structures (high tunnel, hoop house, *etc.*) should not be a significant source of contamination. Appropriate measures should be taken to minimize any relative risks from surrounding land use or environment. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards.

4.2.3.2 Drainage and waste disposal

- a) good drainage should be maintained around the structure to eliminate standing water.
- b) waste disposal systems and facilities should be provided. All refuse should be disposed of in containers with lids and stored away from the facility to prevent harbourage of pests.
- c) waste containers should be emptied regularly.

4.2.3.3 Cleaning, maintenance and sanitation

- a) workers and visitors should take effective measures (e.g. wash hands) before entering greenhouses.
- b) plant debris and cull piles should be removed promptly from inside the structure. There should be no plant refuse around the outside of the structure or nearby to attract or harbour pests.

4.2.4 Personnel health, hygiene and sanitary facilities

Personnel hygiene and sanitation should be maintained in all production areas to ensure:

- a) each businesses operating primary production have written Standard Operating Procedures (SOPs) that relate to health, hygiene, and sanitary facilities. The SOPs should address worker training, facilities and supplies to enable workers to practice proper hygiene, and company policies relating to expectations for worker hygiene as well as illness reporting.
- b) all workers properly wash their hands using soap and clean, running water before handling leafy vegetables, particularly during harvesting and post-harvest handling. Workers should be trained in proper technique for hand washing and drying.
- c) if gloves are used, a procedure for glove use in the field be documented and followed. If the gloves are reusable, they should be made of materials that are readily cleaned and sanitized, should be cleaned as needed and stored appropriately. If disposable gloves are used, they should be discarded when they become torn, soiled, or otherwise contaminated.
- d) non-essential persons and casual visitors, particularly children, not be allowed in the harvest area as they may present an increased risk of contamination.

4.2.4.1 Personal hygiene and sanitary facilities

- a) eating should not be allowed in the field and growers should provide areas away from the field and packing lines for workers to take breaks and eat. For worker convenience, these areas should contain toilet and hand washing facilities so that workers can practice proper hygiene.
- b) all workers should be trained in proper use of hygienic facilities. Training should include toilet use, proper disposal of toilet paper or equivalent, and proper hand washing and drying procedures.

As far as possible, such facilities should be located close to the field and readily accessible to the work area:

- a) sanitary facilities should be located in a manner to encourage their use and reduce the likelihood that workers will relieve themselves in the field. Facilities should be in sufficient number to accommodate personnel (e.g. 1 per 10 people) and be appropriate for both genders if workforce contains males and females.
- b) portable facilities should not be located or cleaned in cultivation areas or near irrigation water sources or conveyance systems. Growers should have a standard plan that identifies the areas where it is safe to put portable facilities and to prevent traffic in case of a spill.
- c) facilities should include clean running water, soap, toilet paper or equivalent, and single use paper towels or equivalent.

4.2.4.2 Health status

The following should be considered:

- a) farm and packing house managers should be encouraged to observe symptoms of diarrhoea or food transmissible communicable diseases and reassign workers as appropriate.
- b) employees should be encouraged to notice and report symptoms of diarrhoea or food transmissible communicable diseases.
- c) medical examination of food handlers should be carried out if clinically or epidemiologically indicated.

4.2.4.3 Personnel cleanliness

When personnel are permitted to continue working with cuts and wounds covered by water proof dressings, they should wear gloves to cover the bandages thereby providing a secondary barrier between them and the fresh leafy vegetables they handle. Workers should wear clean clothes and bathe daily.

4.2.4.4 Personal behaviour

Agricultural workers should refrain from behaviour which could result in the contamination of food, for example: smoking, spitting, chewing gum or eating, or sneezing or coughing over unprotected fresh leafy vegetables

Personal effects such as jewellery, watches, or other items should not be worn or brought into fresh leafy vegetables production areas if they pose a threat to the safety and suitability of the food.

4.2.5 Equipment associated with growing and harvesting

Growers and harvesters should adopt the following sanitary practices:

- a) employees should be trained to follow SOPs for the maintenance requirements of equipment used for growing and harvesting.
- b) all safety guards should be used and maintained according to manufacturers' instructions. Such equipment should be maintained in good order.
- c) equipment used to harvest leafy vegetables by cutting or mowing should be thoroughly cleaned and sanitized before use and cutting edges should be kept smooth and sharp.

4.3 Handling, storage and transport

4.3.1 Prevention of cross-contamination

During handling, storage and transportation of fresh leafy vegetables the following should be considered in order to prevent contamination:

- a) the field should be evaluated for the presence of hazards or contamination prior to harvest to determine safety procedures during harvesting.
- b) written SOPs should be in place for appropriate handling, storage, and transport.
- c) excessive dirt and caked mud should be removed from product and/or containers during harvest.
- d) clean water should be used to remove dirt and debris from leafy vegetables in the field.

Harvesting methods vary depending upon the characteristics of the product. Mechanical harvesting provides opportunity for increased surface contact exposure and may cause damage that could lead to penetration of plant tissues by microorganisms. Specific control measures should be implemented to minimize the risk of contamination from microorganisms associated with the method, such as prevention of sucking up soils and other field contaminants and components that may damage or cut plants.

- a) personal hygiene is critical with manual harvesting due to the amount of human handling that could lead to contamination of the leafy vegetables.
- b) proper cleaning and sanitation of equipment is also important for manual and mechanical harvesting, since knives and other equipment used can wound fresh leafy vegetables, lead to cross contamination, and provide entry for contaminants that may be in soil and water.
- c) over-filling of carts and bins should be avoided to prevent transfer of contaminants to produce during stacking.

4.3.2 Storage and transport from the field to the packing facility

Food may become contaminated, or may not reach its destination in a suitable condition for consumption, unless effective control measures are taken during transportation.

Fresh leafy vegetables may be transported to the packing, cooling and cold storage facility by numerous modes of transportation. Transportation should be managed to reduce or control the risk of contamination. Each transporter should have its own SOP for shipping containers/trailers to verify that they are clean, sanitary, and in good structural condition.

Fresh produce should not be transported in vehicles used previously to carry animal manure or biosolids. Receptacles in vehicles and/or containers are not to be used for transporting anything other than foodstuffs where this may result in contamination. Where conveyances and/or containers are used for transporting anything in addition to foodstuffs or for transporting different foodstuffs at the same time, there is, where necessary, to be effective separation of products.

Fresh leafy vegetables are perishable products that should be carefully handled. Damage will adversely affect the quality of the product and may increase its potential for microbial contamination. Damaged product should be discarded.

4.4 Cleaning, maintenance and sanitation

During cleaning, maintenance and sanitation the following should be adhered;

4.4.1 *Cleaning programmes*

The following should be considered:

- a) harvesting containers that come into direct contact with leafy vegetables should not be utilized for purposes other than holding product (e.g. should not hold personal items, waste, etc.).
- b) single use primary containers such as cardboard boxes or clamshells should not be reused in food contact applications.
- c) containers should be covered and stored in a location and in a manner to prevent possible contamination (e.g. pests, birds, rodents, dust, water, etc.).
- d) damaged containers should be repaired or replaced.
- e) containers that come into direct contact with the soil should not be stacked in such a manner as to allow soil and debris to contaminate fresh leafy vegetables.
- f) policies should be established for the control of equipment when it is not in use, including policies for the removal of equipment from the work area or site and for the use of scabbards, sheathes or other storage equipment.
- g) harvesting equipment, including hand harvesting implements (knives, pruners, corers, machetes) that come in direct contact with fresh leafy vegetables, should be cleaned and sanitized at least daily or as the situation warrants.
- h) clean water should be used to clean all equipment directly contacting fresh leafy vegetables, including farm machinery, harvesting and transportation equipment, containers and implements.

4.4.2 *Cleaning procedures and methods*

The following should be considered:

- a) cleaning and disinfection programmes should not be carried out in a location where the rinse might contaminate fresh leafy vegetables.
- b) where appropriate or necessary, cleaning and sanitizing procedures should be tested to ensure their effectiveness.

5 Packing establishment: design and facilities

Packing activities can occur in the field or in the facilities. Field pack operations should implement the same sanitary practices where practical or modify as needed to minimize risks.

5.1 Establishments

The following should be considered:

- a) floors and walls should be of a material that is easily cleanable and does not pose a risk for harbourage or growth of foodborne microorganisms.

- b) pipes should not leak and condensation should be minimized to avoid dripping on product or packing equipment
- c) Establishment layout should ensure product flow is one way to prevent cross-contamination

5.2 Drainage and waste disposal

Adequate drainage is critical to packing, cooling and processing facilities to avoid the risk of contaminating the fresh leafy vegetables. To ensure adequate drainage of standing water the following should be considered:

- a) drainage in the facility should be designed with sloped floors to effectively drain standing water.
- b) floors should be kept as dry as possible using appropriate methods.
- c) food handlers should have proper training to remove standing water or push standing water to the drains.
- d) drains should be cleaned periodically to prevent build-up of biofilms that may contain organisms of concern (e.g. *Listeria monocytogenes*).
- e) areas for garbage recyclables and compostable waste should be identified and all waste should be stored and disposed of in a manner to minimize contamination.
- f) waste should be disposed of on a frequent basis to avoid attracting pests (e.g. flies, rodents).

6. Establishments: Control of operations

6.1 Control of fresh leafy vegetable hazards

Establishments should pay special attention to product flow and segregation from incoming soiled to outgoing washed product to avoid cross-contamination. Leafy vegetables should also be packed in accordance with TZS 1003

6.2 Key aspects of hygiene control systems

6.2.1 Receipt and inspection of raw materials

Prior to preparation, damaged or decayed material (both at harvest and at the processing plant) should be trimmed and/or discarded.

6.2.2 Post-harvest water use

The following should be considered:

- Water quality management will vary throughout all operations. Packers should follow GMPs to prevent or minimize the potential for the introduction or spread of pathogens in processing water. The quality of water to be used should depend on the stage of the operation. For example, clean water could be used for initial washing stages, whereas water used for final rinses should be of potable quality.
- Clean or preferably potable water should be used when water is applied under pressure or vacuum during washing as these processes may alter the leaf structure and force pathogens into plant cells.

- Where appropriate, the pH, hardness, temperature of the post-harvest water should be controlled and monitored, e.g., where these impact the efficacy of the antimicrobial treatments.
- Water re-circulated for reuse in the establishment should be treated and maintained in conditions that do not constitute a risk to the safety of fresh leafy vegetables. For example the following may be used to maintain the suitability of the water: primary screening, secondary filtration, and antimicrobial treatment process.

6.2.3 Chemical treatments

Certain post-harvest treatments, i.e. paraffin and fungicides, should not be used for fresh leafy vegetables.

6.2.4 Cooling of fresh leafy vegetables

Fresh leafy vegetables can be cooled immediately after harvest by either, using ice (parsley), forced-air cooling, vacuum cooling (iceberg lettuce), hydro-cooling, or spray-vacuum (hydrovac) cooling. Water used in post-harvest operations may contaminate fresh leafy vegetables if there is direct contact of water containing human pathogens with edible portions of the plant.

For fresh leafy vegetables and the control of inputs such as water used for cooling, particular attention should be paid to:

- a) water used to cool fresh leafy vegetables should be free from human pathogens.
- b) water that is used in hydrovac should be clean or preferably potable. Water that is used only once and is not recirculated is preferable. If recirculated water is used, water disinfectant at sufficient levels to reduce the potential risk of cross-contamination should be used and monitored.
- c) cooling equipment should be cleaned and sanitized on a regular basis according to written procedures to ensure that the potential for cross contamination is minimized.

6.2.5 Cutting, slicing, shredding and similar pre-cut processes

Procedures should be in place to minimize contamination with physical (e.g. metal) and microbiological contaminants during cutting, slicing, shredding or similar pre-cut processes.

The following should be considered:

- a) maintain sharpness and condition of knives and cutting edges to ensure product quality and safety.
- b) cutting equipment should be cleaned and sanitized on a regular basis according to written procedures to ensure that the potential for cross contamination is minimized.

6.3 Microbiological and other specifications

Microbiological testing can be a useful tool to evaluate and verify the effectiveness of safety and sanitation practices, provide information about an environment, a process, and even a specific product lot, when sampling plans and methodology are properly designed and performed. The intended use of information obtained (e.g. evaluating the effectiveness of a sanitation practice, evaluating the risk posed by a particular hazard, etc.) can aid in determining what microorganisms are most appropriate to test for. Test methods should be selected that are validated for the intended use. Consideration should be given to ensure proper

design of a microbiological testing programme. Trend analysis of testing data should be undertaken to evaluate the effectiveness of food safety control systems.

6.4 Documentation and records

A comprehensive written food safety control plan that includes a written description of each of the hazards identified in assessing environmental hygiene and the steps that will be implemented to address each hazard should be prepared by the businesses operating primary production. The description should include, but is not limited to: an evaluation of the production site, water and distribution system, manure use and composting procedures, personnel illness reporting policy, sanitation procedures, and training programmes.

The following are examples of the types of records that should be retained:

- a) microbiological testing results and trend analyses;
- b) water testing results;
- c) employee training records;
- d) pest control records;
- e) cleaning and sanitation reports;
- f) equipment monitoring and maintenance records;
- g) inspection/audit records; and
- h) employee health check-up records.

6.5 Traceability

The traceability system should be designed and implemented to enable the withdrawal of the products, where necessary.

- a) Detailed records should be kept that link each supplier of the product with the immediate subsequent recipient of the fresh leafy vegetables throughout the food chain. The information needed to link each supplier should include, if available, the packer name, address, and phone number, date packed, date released, type of fresh leafy vegetables (e.g lettuce, spinach, cabbage, chicory, endive, amaranth and fresh herbs such as coriander/cilantro, basil, and parsley) e.g. cantaloupe, waterfresh leafy vegetables, etc.) including brand name, lot identification and number of lots, and transporter.
- b) the following are examples of the types of records that should be retained to facilitate traceability:
 - i Shipping documents
 - ii Invoices
 - iii Other records maintained by the firm that identifies the supplier and the buyer (Out growers contract)
 - iv Operators such as growers and producers and, in cases where contract harvesters are used, harvesters should keep current all relevant information on agricultural activities such as

information concerning each lot, date harvested, grower contact information, harvest practices, if water used in harvesting, water quality.

- c) In fresh-cut, pre-cut or ready-to-eat salad operations, multiple ingredients from different sources may be combined in a single package. This practice can complicate efforts to trace leafy vegetables to their source. The processors should consider establishing and maintaining records to identify the source of each ingredient in the product.

6.6 Product recall

In the event of a foodborne illness outbreak associated with fresh leafy vegetables, maintaining appropriate records of production, processing, packaging and distribution may help to identify the source of contamination in the fresh leafy vegetables food chain and facilitate product recalls. Growers/packers/processors/distributors should consider developing and maintaining recall procedures. The recall procedures should be designed and implemented accordingly to enable the withdrawal of the products, where necessary.

7 Establishment: maintenance and sanitation

To facilitate the continuing effective control of fresh leaf vegetable hazards, pests, and other agents likely to contaminate fresh leafy vegetables, establishment should have effective systems to:

- a) ensure adequate and appropriate maintenance and cleaning;
- b) control pests;
- c) manage waste; and
- d) monitor effectiveness of maintenance and sanitation procedures.

7.1 Cleaning and maintenance

7.1.1 General

Establishments and equipment should be kept in an appropriate state of repair and condition to:

- a) facilitate all sanitation procedures;
- b) function as intended
- c) prevent contamination of fresh leafy vegetables, e.g. from metal shards, flaking plaster, debris and chemicals.

Cleaning should remove food residues and dirt which may be a source of contamination. Disinfection may be necessary after cleaning.

Cleaning chemicals should be handled and used carefully and in accordance with manufacturers' instructions and stored, where necessary, separated from food, in clearly identified containers to avoid the risk of contaminating food.

7.1.2 Cleaning procedures and methods

Cleaning can be carried out by the separate or the combined use of physical methods, such as heat, scrubbing, turbulent flow, vacuum cleaning or other methods that avoid the use of water, and chemical methods using detergents, alkalis or acids.

7.2 Cleaning programmes

Cleaning and disinfection programmes should ensure that all parts of the establishment are appropriately clean, and should include the cleaning of cleaning equipment.

Cleaning and disinfection programmes should be continually and effectively monitored for their suitability and effectiveness and where necessary, documented.

Where written cleaning programmes are used, they should specify:

- a) Areas, items of equipment and utensils to be cleaned;
- b) Responsibility for particular tasks;
- c) Method and frequency of cleaning; and
- d) monitoring arrangements.

Where appropriate, programmes should be drawn up in consultation with relevant specialists.

7.3 Pest control systems

7.3.1 General

Pests pose a major threat to the safety and suitability of food. Pest infestations can occur where there are breeding sites and a supply of food. Good Hygiene Practices should be implemented to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

7.3.2 Preventing access

Buildings should be kept in good repair and condition to prevent pest access and to eliminate potential breeding sites. Holes, drains and other places where pests are likely to gain access should be kept sealed. Wire mesh screens, for example on open windows, doors and ventilators, will reduce the problem of pest entry. Animals should, wherever possible, be excluded from the grounds of factories and food processing plants.

7.3.3 Harbourage and infestation

The availability of food and water encourages pest harbourage and infestation. Potential food sources should be stored in pest-proof containers and/or stacked above the ground and away from walls. Areas both inside and outside food premises should be kept clean. Where appropriate, waste should be stored in covered, pest-proof containers.

7.3.4 Monitoring and detection

Establishments and surrounding areas should be regularly examined for evidence of infestation.

7.3.5 Eradication

Pest infestations should be dealt with immediately and without adversely affecting food safety or suitability. Treatment with chemical, physical or biological agents should be carried out without posing a threat to the safety or suitability of food.

7.4 Waste management

Suitable provision must be made for the removal and storage of waste. Waste must not be allowed to accumulate in food handling, food storage, and other working areas and the adjoining environment except so far as is unavoidable for the proper functioning of the business.

Waste stores must be kept appropriately clean.

7.5 Monitoring effectiveness

Sanitation systems should be monitored for effectiveness, periodically verified by means such as audit pre-operational inspections or, where appropriate, microbiological sampling of environment and food contact surfaces and regularly reviewed and adapted to reflect changed circumstances.

8 Transportation

Fresh leafy vegetables may become contaminated, or may not reach its destination in a suitable condition for consumption, unless effective control measures are taken during transportation, even where adequate hygiene control measures have been taken earlier in the food chain. Measures should be taken where necessary to:

- a) protect fresh leafy vegetables from potential sources of contamination;
- b) protect fresh leafy vegetables from damage likely to render the food unsuitable for consumption; and
- c) provide an environment which effectively controls the growth of pathogenic or spoilage microorganisms and the production of toxins in fresh leafy vegetables.

The design of the food transportation unit should be such as to avoid cross contamination due to simultaneous or consecutive transport. There should be appropriate facilities conveniently available for cleaning and, where appropriate disinfecting of the food transportation unit.

9. Product information and consumer awareness

9.1 Product information

Insufficient product information, and/or inadequate knowledge of general food hygiene, can lead to products being mishandled at later stages in the food chain. Such mishandling can result in consumer illnesses, or products becoming unsuitable for consumption, even where adequate hygiene control measures have been taken earlier in the food chain.

Products should bear appropriate information to ensure that:

- a) adequate and accessible information is available to the next person in the food chain to enable them to handle, store, process, prepare and display the product safely and correctly;
- b) the lot or batch can be easily identified and recalled if necessary.

9.2 Marking and labelling

Prepackaged fresh leafy vegetables should be labelled with clear instructions. In addition to TZS 538, each package should also bear the following particulars legibly and indelibly marked:

- a) name and address of the packer and/or dispatcher;
- b) name of the produce by common name; including variety/cultivar;
- c) origin of the produce – Name of the producing country, region and district where grown;
- d) commercial specification, i.e. type, class, size expressed as minimum and maximum diameter;
- e) net weight; and
- f) brand or trade mark, if any.

9.3 Consumer education

Health education programmes should cover general food hygiene. Such programmes should enable consumers to understand the importance of any product information and to follow any instructions accompanying products, and make informed choices. In particular consumers should be informed of the relationship between time/temperature control and foodborne illnesses. Consumer should prevent contamination and growth or survival of food borne pathogens by storing, preparing and using it correctly.

All stakeholders along the supply chain including government, industry, consumer organizations and the media - should work together to communicate clear consistent messages on handling fresh leafy vegetables safely to avoid giving contradictory advice and causing confusion.

Consumer information on handling fresh leafy vegetables safely should cover:

- a) selecting produce in the marketplace (supermarkets, retailers). Many fresh leafy vegetables such as lettuce are fragile and should be handled with care to avoid mechanical damage and to minimize microbiological contamination.
- b) transporting to home. Increases in product temperatures during transportation can be considerable. Time in transit for fresh leafy vegetables between retail/markets and the home should be kept as short as possible.
- c) storage/refrigeration of fresh leafy vegetables.
- d) washing leafy vegetables as appropriate with potable running water. Products labelled washed and ready-to-eat should not be rewashed.
- e) correct hand washing methods using soap and potable water before handling fresh leafy vegetables should continue to be promoted to consumers.
- f) cross-contamination. Consumers need to handle, prepare and store fresh leafy vegetables safely to avoid cross-contamination with pathogens from various sources e.g., hands, sinks, cutting boards, raw meats.
- g) Specific information for fresh-cut, pre-cut or ready-to-eat bagged salads. Consumers need specific and clear guidance on how to safely handle fresh-cut, pre-cut or ready-to-eat (RTE) leafy

vegetables. Clear labelling is therefore important. There is anecdotal evidence to suggest that some consumers find it difficult to distinguish between products that can be consumed without further washing.

10 Training

10.1 Awareness and responsibilities

Education and training should be a priority for all personnel involved in the fresh leaf vegetable supply chain.

10.2 Training and education programmes

Personnel involved in fresh leafy vegetable operations should receive training appropriate to their tasks and should be periodically assessed while performing their duties to ensure tasks are being completed correctly. Training should be delivered in a language and manner to facilitate understanding of the information and expectations. Training programmes should be designed to help personnel understand what is expected of them and why and it should emphasize the importance of using hygienic practices. A well-designed training programme considers the barriers to learning of the trainees and develops training methods and materials to overcome those barriers.

To accommodate the complexity of situations that exist in fresh leafy vegetable operations, the following or any other relevant trainings should be addressed:

- a) longstanding entrenched trainee behaviors, attitudes and social taboos
- b) transient nature of workforce with no prior training in food safety and hygiene
- c) children/infants, who may accompany parents working in the field with the potential for transfer of pathogens with a human reservoir
- d) diverse cultural, social and traditional practices
- e) literacy and education level
- f) language and dialect of trainees
- g) need to make food safety practices realistic and easy to implement (identify enabling factors, motivators and incentives)
- h) raising awareness among trainees of symptoms and signs of disease and encourage them to act upon it (take personal responsibility for health)
- i) importance of food safety when new crops are being grown for the first time.

Training programmes should be regular, updated particularly when there is a change in product variety or process recorded, monitored for effectiveness and modified when necessary.

Increased emphasis on training in cold chain logistics and management is recommended in line with advancing knowledge and technologies for both refrigeration and temperature monitoring and expanding international trade.

DRAFT FOR STAKEHOLDERS' COMMENTS