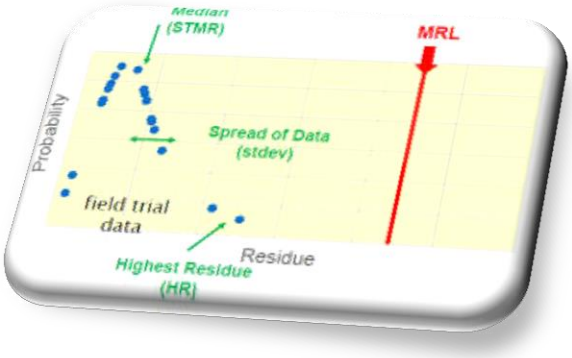
PEST CONTROL PRODUCTS BOARD

GUIDELINES FOR RESIDUE DATA EXTRAPOLATION AND CROP GROUPING



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Introduction

Residue extrapolation is the process by which the residue levels on representative commodities are utilised to estimate residue levels on related commodities in the same commodity group or subgroup for which residue trials have not been conducted. Based on existing information and findings it can be assumed that, taking the least favourable trial conditions, the behaviour of residues in/on plants or plant products is comparable, under certain conditions. Under such scenarios, existing knowledge about the residue behaviour in one situation can be transferred to another, and the scale of the residue trials for the comparable situation can be reduced, or need for trials may be waived completely. Residue extrapolation is a common consideration utilised by regulators internationally for ensuring that data requirements are only at a level that is scientifically justified in conducting risk assessment and to ensure the regulatory process does not become unnecessarily burdensome for various crop uses.

Food safety standards have different effects on consumption and trade flows. Primarily they aim to maintain consumer safety through defined sets of limits and regulations, but these regulations could have a trade deterring effect when exporters cannot comply with the standards. As one of the food safety standards, MRLs set maximum levels of pesticide residue that can be traced in food and food products to ensure food safety. CODEX Alimentarius defines CODEX maximum limit for pesticide residues as "the maximum concentration of a pesticide residue recommended by the CODEX Alimentarius Commission to be legally permitted in or on food commodities and animal feeds". MRLs are based on good agriculture practice (GAP) data generated through supervised residue trials. Foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable.

This document provides criteria for crop grouping for purposes of residue data generation, selection of representative commodities; and proposes suitable representative commodities in Kenya. The document describes the principles of extrapolation regarding residues of plant protection products intended for residue extrapolations. Guidelines on extrapolation for pesticide residues in food and raw agricultural commodities are provided. The document aims at providing guidance to the Pest Control Products Board, Agrochemical industry and accredited institutions in the context of the registration of plant protection products. It also provides detailed lists of acceptable extrapolations organized by crop groups for use in Kenya.

In these guidelines, residue situations which are assumed to be comparable on the basis of currently available information are described, and recommendations are made as to the type and scale of the residue trial results which have to be submitted. However, new findings may result in a change of assessment of comparability and extrapolations.

Rationale of Extrapolation

The use of pest control products primarily aims at enhancing agricultural productivity. The international markets access for Kenyan agricultural produce require adherence to strict food safety standards thus demanding increased pesticide regulatory data and residue trials on many crops. There is increasing awareness of food safety by consumers in international trade hence increasing demand for reassurance of the quality and safety of various food commodities. Private standards such as GlobalGAP (EUREPGAP), British Retail Consortium (BRC) have introduced more stringent requirements, limiting the variety of pest control products available to the growers for use on edible crops. Notifications due to residues have raised concerns on the safety of fresh produce from Kenya. Some cases of non-compliance to MRL requirements for some of the export crops e.g. passion fruits had also been notified through the EU Rapid Alert System for Food and Feeds (RASFF). During an audit by the EU- Food and Veterinary Office (FVO) inspectors in 2013, it was observed that some growers of minor crops e.g. passion fruits, avocadoes and Asian vegetables were using pesticides registered for other uses due to the unavailability of approved pesticides for the specific crops. Key findings following the EU Audit on Kenyan registrations, was the general broad label recommendations. One of the recommendations was to review the recommended uses on label claims to reflect specific crop-pest combination. This requires more specific data to be generated and submitted to PCPB.

The current PCPB registration procedures require that residue data must be provided for all edible crops prior to registration. The Agrochemical companies find it difficult to justify the registration costs of products based on this requirement. The need to generate considerable amount of data makes the authorisation process very expensive. It is therefore preferable to explore other possibilities for determining the residues in various groups of crop commodities rather than those based on specific crops and pesticide combinations using some guiding principles.

General Principles

Properties of active substances

In certain cases the residue behaviour of different active ingredients such as stability, persistence, volatility, mode of action, uptake and distribution are comparable. This presupposes that sufficient information (i.e. metabolism, physical-chemical properties, and residue results) already exists for these active ingredients. If comparability is assumed, then this must be carefully substantiated with the existing information.

Good Agricultural Practices

Trials must be carried out as a matter of principle using the maximum number of applications provided for in the registered GAP. The last application prior to harvest is crucial to residue behaviour in the harvested crop. The number of applications prior to flowering, on the other hand, is generally of lesser importance. In the case of relatively persistent residues in plants, the

results can be assumed to be comparable if the number of applications are increased or reduced by not more than 25 %. In the case of relatively non-persistent residues in plants, the results can also be assumed to be comparable if the number of applications are increased or reduced by not more than 25 %. Persistence should be defined on a case-by-case basis on the basis of residue-decline studies.

Different application methods and rates, do not produce comparable residue results, and must therefore be documented separately. The results from normal spraying and low-volume spraying may be comparable for a comparable rate of application for the active substance per ha. However where both, low-volume and normal spray applications, are the usual methods, both methods of application ought to be documented according to standard application practice in the basic data set submitted (SANCO 7525/VI/95 Rev. 10.2, 2016).

Proportionality means that when increasing or decreasing the application rate the residue level increases or decreases in the same ratio. In an ideal situation it means that doubling the application rate results in doubling the residue. Proportionality implies that the relationship between application rates and residues is linear.

The stage of development of the crop at the time of application and the time intervals between applications, especially between the last two applications, are important factors influencing the level of residues (SANCO 7525/VI/95 Rev. 10.2, 2016). Because the least favourable residue situation is the determining factor when establishing maximum residue limits (MRLs), then applications at later stages of development will encompass applications made at earlier stages of development, just as applications at shorter intervals before harvesting will encompass applications at longer intervals before harvesting.

In the case of changes in pre-harvest interval of not more than 25 %, experience has shown that the residue results can be assumed to be comparable.

Situation of use

The results of outdoor trials are not normally comparable with the results of trials carried out under other conditions of application. The climatic conditions, above all, under glass, under plastic, or in climate-controlled chambers or in stores, but also the other parameters that differ from those in outdoor trials, generally create markedly different residue situation than that found in outdoor testing. Therefore, separate studies are necessary for each area of application even when applied on the same crop species unless a 'worst case' can be clearly identified.

Number of data sets

For residue data generated locally, three sets of data or supervised residue trials for representative commodities shall be submitted. In certain occasions data from FAO/WHO Joint meeting for pesticides residues (JMPR), European food safety authority (EFSA), United states Environmental protection agency (US EPA) or any other source recognized by the regulatory

authority (PCPB) may be acceptable.

Comparable residue behaviour in different crops

It is essential to know the metabolism, uptake, distribution, and expression of residues in plants of the active substance in question. It is also desirable to know the mode of action to help explain the possible behaviour of the active substance in the plants. If this is not known, then nothing can be stated about the possibility of extrapolation in advance.

Extrapolation of residue data for different crops presumes that the following are comparable:

1. Conditions of use with regard to the amount of active substance applied, the time of application, the number of applications, and the interval between applications;
2. Application methods (e.g. by-hand, type of machines, seeding rate);
3. Formulation used and presence of synergists/adjuvants;
4. Climatic conditions.
5. Soil characteristics (acid, basic) and its texture (particularly for herbicides)

The applicant must substantiate with documentary evidence that all variables including Good Agricultural Practice (GAP) are comparable. In all cases, all the available facts must be considered by the regulatory authority in order to make the evaluation.

Seed treatment

When a systemic active substance is applied to seeds the levels of residues in the harvested product would probably be below the limit of quantification, but this needs to be demonstrated. Data may not necessarily be needed for all crops. If studies for 2 major crops representative of the crop groups treated, e.g. cucurbits and cucumber show no quantifiable residues, then no further studies are necessary for the other crops or groups of crops. The trials should preferably be carried out on crops with a short vegetation period. However, when contrary to expectations, quantifiable residues are found, results must be obtained on all potential crops.

When a non-systemic active substance is applied to seeds, no residues should normally be found in plants or plant products and therefore normally no residue trials are necessary. However, a special consideration should be given to the root vegetables for which a contamination from the treated seed could occur. In this case, a no-residue situation cannot be granted only on the fact that the active substance is a non-systemic one.

Post-harvest pesticides applications

In the case of post-harvest treatments there exists a broad range of different uses. In the case

of post-harvest uses, not only plant products, but also processed (including dried) products, are treated. If the active substances are shown to be stable and if it can be demonstrated that the plant protection product could be distributed uniformly, no residue trials may be necessary, since in such a case the application rate determines the residue.

Crop grouping for pesticide residues and principles of conducting supervised residue trials.

In order to address consumer safety concerns, trade issues, minor crops, minor use and the data sets required for registration of pest control products for use in edible crops, the concept of crop grouping was considered and adopted. Reference was made to a number of guidelines on crop grouping when developing these guidelines. The main reference documents were European Union guidelines and Codex guidelines. It was observed that Kenya has been participating in Codex committee meetings on pesticides residues (CCPR) and the Codex alimentarius commission regularly and given inputs in the development of the guidelines. It was proposed that the current version and future revisions of the Codex crop grouping would suffice for purposes of guiding in data generation on respective groups of vegetable crops.

A. VEGETABLES

Table 1: Vegetable crop grouping

Codex Group code	Codex Group	Subgroups
Group 009	**Bulb vegetables**	Subgroup 009A, Bulb
		Subgroup 009B, Green Onions
Group 010	**Brassica vegetables (except Brassica leafy vegetables)**	Subgroup 010A, Flowerhead Brassicas, Subgroup 010B, Head Brassicas, Subgroup 010C, Stem Brassicas
Group 11	**Fruiting vegetables, Cucurbits**	Subgroup 11A, Fruiting vegetables, Cucurbits , Cucumber and Summer squashes
		Subgroup 11B, Fruiting vegetable- Cucurbits: Melons, Pumpkins and Winter Squashes
Group 012	**Fruiting vegetables, other than Cucurbits**	Subgroup 12A, Tomatoes
		Subgroup 12B, Pepper and pepper-like commodities
		Subgroup 12C, Eggplant and eggplant-like commodities
Group 013	**Leafy vegetables (including Brassica leafy vegetables)**	Subgroup 013A, Leafy greens
		Subgroup 013B, Brassica leafy vegetables
		Subgroup 013C, Leaves of root and tuber vegetables

		Subgroup 013D, Leaves of trees, shrubs and vines
		Subgroup 013E, Leafy aquatic vegetables
		Subgroup 13 F, Witloof
		Subgroup 13 G, Leaves of Cucurbitaceae
		Subgroup 13 H, Baby leaves
		Subgroup 13 I, Sprouts
Group 14	**Legume vegetables**	Subgroup 14A, Beans with pods
		Subgroup 14B, Peas with pods
		Subgroup 14C, Succulent beans without pods
		Subgroup 14D, Succulent peas without pods
		Subgroup 14E, Underground immature beans and peas
Group 15	**Pulses**	Subgroup 15A, Dry beans
		Subgroup 15B, Dry peas
		Subgroup 15C, Dry underground pulses
Group 16	**Root and tuber vegetables**	Subgroup 16A, Root vegetables
		Subgroup 16B, Tuberous and corm vegetables
		Subgroup 16C, Aquatic root and tuber vegetables
Group 17	**Stalk and stem vegetables**	Subgroup 17A, Stems and petioles
		Subgroup 17B,Young shoots
		Subgroup 17C, Others
Group 18	**Edible fungi**	Mushrooms

It is important to ensure that the trials are carried out in accordance with the principles of Good Laboratory Practices (GLP) and the data generated meets the requirements as stipulated in the Codex Alimentarius Commission procedural manual, Principles and Guidance for Application of The Proportionality Concept For Estimation of Maximum Residue Limits For Pesticides, such as observing the threshold variations in the application rates in supervised residues trials.

The setup of trials and data generation for minor crops should follow the guidance provided in the Codex Alimentarius Commission procedural manual, Guidance to Facilitate the Establishment of MRLs for Pesticides for Minor Crops eg in terms of the number of trials, Global data sets for residue trials from different regions of the world

While adopting the tables for crop grouping the following key principles were considered critical in crop grouping.

1) Crop morphology e.g height, leaf sizes
2) Growth habit (spreading, upright)
3) Edible/consumed part, nature, open or closed, underground, above ground, edible peels or non-edible peels, residue potential
4) Length of growth period

5) Taxonomic relationship
6) Habitat of growth i.e flooded vs dry areas
7) Processing-consumed raw, fresh, ripening, method of processing
8) GAP: Dose, timing, no. of application and PHI, method of application e.g seed treatment. Foliar spray, fumigation
9) Size of grains
10) Product characteristics e.g mode of action, distribution in the plant
11) Stage of harvest e.g succulent pods, dry grains
12) Protected or non-protected areas e.g field or greenhouse

Representative commodities for vegetable commodity groups

Representative commodities within each vegetable group were selected based on principles of data extrapolation in the Codex guidelines. The vegetable groups and subgroups were adopted from the Codex classification of food and feeds. The selected representative crops that are commonly grown in Kenya were preferred as representative crops, thus there are some minor variations from the Codex representative commodities for vegetable group. The proposed representative commodities for the vegetable groups in Kenya are summarized the Table 2 below.

According to Codex guidelines, representative commodities within each commodity group and subgroup can be selected and proposed, based on consideration of all available information. The following principles were used for the selection of representative commodities:

1) A representative commodity is most likely to contain the highest residues.
2) A representative commodity is likely to be major in terms of production and/or consumption and high value crop
3) A representative commodity is most likely similar in morphology, growth habit, pest problems and edible portion to the related commodities within a group or subgroup.

The application of the three principles in the selection of representative commodities is based on the assumption that all of the commodities, within a group or subgroup are produced following a similar use pattern or good agricultural practice (GAP).

In situations where a representative commodity does not meet all three of the above principles, a representative commodity that at least meets the first two principles (likely to contain the highest residues and also major in terms of production and/or consumption and high value) was selected.

When representative commodities are utilised to extrapolate residue levels to other members of a commodity group, it is on the assumption that residues in other members of the commodity group will not be significantly different to residues found in the representative commodity. That is, the representative commodities are good indicators of the upper range of residues likely to be encountered for the group or subgroup, based on the same or comparable GAP and other available information.

Extrapolation rules:

1. Whether the crop is considered as a representative.

2. Whether the extrapolation regards a single crop or a group of crops.

3. The timing of the application of the plant protection product. For example for seed and post-harvest treatments fewer trials are required.

Authorities use targeted data sets and data extrapolation to provide sufficient data for exposure assessment or for setting MRLs for both individual major and minor crop commodities, and crop commodity groups. Data extrapolation provides the mechanism for extending field trial data from several representative crop commodities to related crop commodities in the same crop group or subgroup. Identification of the representative crop commodities is key in maximizing the ability to use a targeted data set determined for representative crop commodities to support minor uses.

Table 2: Representative commodities for vegetable commodity groups

Codex Group / Subgroup	Examples of Representative Commodities [1]	Extrapolation to the following commodities
Group 009 Bulb vegetables	Bulb onion and Spring onion or leek	Bulb vegetables (VA 0035): Chives; Chives, Chinese; Daylilly; Elegans hosta; Fritillaria (bulb); Fritillaria (green); Garlic; Garlic chives; Garlic, Great-headed; Garlic, Serpent; Kurrat; Lady's leek; Leek; Lily; Onion, Beltsville bunching; Onion, Bulb; Onion, Chinese; Onion, fresh; Onion macrostem; Onion, pearl; Onion, potato; Onion, Welsh; Shallot; Silverskin onion; Spring onion; Tree onion; Wild leek
Subgroup 009A, Bulb Onions	Bulb onion	Bulb Onions (VA 2031): Daylilly; Fritillaria (bulb); Garlic; Garlic, Great-headed; Garlic, Serpent; Lily; Onion, Bulb; Onion, Chinese; Shallot; Silverskin onion
Subgroup 009B, Green Onions	Spring onion or leek	Green Onions (VA 2032): Chives; Chives, Chinese; Elegans hosta; Fritillaria (green); Garlic chives; Kurrat; Lady's leek; Leek; Onion, Beltsville bunching; Onion, fresh; Onion macrostem; Onion, pearl; Onion, potato; Onion, Welsh; Spring onion; Tree onion; Wild leek
Group 010 Brassica vegetables (except Brassica leafy vegetables)	Broccoli (Could be partly replaced by Cauliflower) and Cabbage, Head or Chinese cabbage (type Pe-tsai) and	Brassica vegetables (except Brassica leafy vegetables), Flowerhead cabbages (VB0040) : Broccoli; Brussels sprouts; Cabbages, Head; Chinese cabbage (type Pe-tsai); Cauliflower;

	Brussels sprouts and Kohlrabi	Kohlrabi; Stem mustard
Subgroup 010A, Flowerhead Brassicas	Broccoli (Could be partly replaced by Cauliflower)	Flowerhead Brassicas (VB 0042): Broccoli; Cauliflower
Subgroup 010B, Head Brassicas	Cabbage, Head or Chinese cabbage (type Pe-tsai) and Brussels sprouts	Head Brassicas (VB 2036): Brussels sprouts; Cabbages, Head; Chinese cabbage (type Pe-tsai)
Subgroup 010C, Stem Brassicas	Kohlrabi	Stem Brassicas (VB 2016): Kohlrabi; Stem mustard

Codex Group / Subgroup	**Examples of Representative Commodities** [1]	**Extrapolation to the following commodities**
Group 11 Fruiting vegetables, Cucurbits	Cucumber And Squash, Summer and/or gourd and Melon *(Cucumis melo)*	Fruiting vegetables, Cucurbits (VC 0045): African horned melon; Balsam apple; Bitter melon; Bottle gourd; Casabanana; Chayote; Chieh-qua; Chinese cucumber; Cucumber; Cucumber, exploding; Cucumber, stuffing; Gac; Gherkin; Gherkin, West Indian; Gourd, bitter snake; Gourd, buffalo; Gourd, fluted; Gourd, Malabar; Gourds, other; Gourd, pointed; Gourd, round; Indian spine gourd; Ivy gourd; Japanese snake gourd; Loofah, angled; Loofah, Smooth; Melons, except watermelon; Melon, nara; Pumpkins; Snake gourd; Squash, Summer; Tacaco; Watermelon; Wax gourd (mature fruit); Winter squash
Subgroup 11A, Fruiting vegetables, Cucurbits - Cucumber and Summer Squashes	Cucumber and Squash, Summer and/or gourd	Fruiting vegetables, Cucurbits - Cucumber and Summer Squashes (VC 2039): Balsam apple; Bitter melon; Bottle gourd; Chayote; Chieh-qua; Chinese cucumber; Cucumber: Cucumber, stuffing; Gherkin; Gherkin, West Indian; Gourd, bitter snake; Gourd, buffalo: Gourd fluted; Gourd, Malabar; Gourds, other; Gourd, pointed; Gourd, round; Indian spine gourd; Ivy gourd; Japanese snake gourd; Loofah, Angled; Loofah, Smooth; Snake gourd; Squash, Summer; Tacaco
Subgroup 11B, Fruiting vegetable, Cucurbits - Melons, Pumpkins and	Melon *(Cucumis melo)*	Fruiting vegetables, Cucurbits Cucurbits - Melons, Pumpkins and Winter Squashes (VC 2040): African horned melon; Casababana;

		Melons, except Watermelon; Melon, nara; Pumpkins; Watermelon; Wax gourd (mature Fruit); Winter squash
Group 012 Fruiting vegetables, other than Cucurbits	One cultivar of large variety Tomato and one cultivar of small variety Tomato and Sweet Pepper and Chili pepper and One cultivar of large variety eggplant and one cultivar of small variety eggplant	Fruiting vegetables, other than Cucurbits (VO 0050): African eggplant; Bush tomato; Cherry tomato; Cocona; Currant tomato; Eggplant; Garden huckleberry; Goji berry; Ground cherries, Martynia; Okra; Pea eggplant; Pepino; Peppers, Chili; Peppers, sweet; Roselle; Scarlet eggplant; Sunberry; Tomatillo; Tomato; Thai eggplant
Subgroup 12A, Tomatoes	One cultivar of large variety Tomato and one cultivar of small variety Tomato	Tomatoes (VO 2045): Bush tomato; Cherry tomato; Cocona; Currant tomato; Garden huckleberry; Ground cherries; Sunberry; Tomatillo; Tomato
Subgroup 12B, Pepper and pepper-like commodities	Sweet Pepper and Chili pepper	Peppers (VO 0051): Martynia; Okra; Peppers, Chili; Peppers, sweet; Roselle

Codex Group / Subgroup	Examples of Representative Commodities [1]	Extrapolation to the following commodities
Subgroup 12C, Eggplant and eggplant-like commodities	One cultivar of large variety eggplant and one cultivar of small variety eggplant	Eggplants (VO 2046): African eggplant; Eggplant; Pepino; Scarlet eggplant; Thai eggplant
Group 013 Leafy vegetables (including Brassica leafy vegetables)	Head lettuce and/or Leaf lettuce and Spinach and Mustard greens or Kale or Broccoli, Chinese or radish leaves and Sweet potato leaves or Arrowroot leaves and Ben moringa leaves and	Leafy vegetables (including Brassica leafy vegetables) (VL 0053): Acacia shoots; African Eggplant leaves; African nightshade; Agretti; Alexanders leaves; Alfalfa sprouts; Amaranth leaves; Arrowroot leaves; Aster, Indian; Ayoyo; Baby leaves; Balsam pear leaves; Bambara groundnut leaves; Barley shoots; Bell flower, Chinese leaves; Ben moringa leaves; Bitawiri; Bitter leaf; Blackjack; Boxthorn; Broccoli, Chinese; Broccoli raab; Cabbage, Abyssinian; Cabbage, Seakale; Cassava leaves; Cat's Wiskers; Chamchwi; Chamnamul; Chamssuk; Chard; Chayote leaves; Chervil; Chicory leaves; Chili pepper leaves; Chinese cabbage (type Pak-choi); Chinese flat cabbage; Chipilin; Cress, Garden; Cress, Upland; Chrysanthum, edible

	Watercress and Witloof chicory (sprouts) and Pumpkin leaves and Leaf lettuce or any crop intended to use as baby leaves (harvested up to 8 true leaf stage) and Mung bean sprouts	leaved; Common bean leaves; Corn salad; Cos lettuce; Cosmos; Cowpea leaves; Dandelion; Danggwi; Daylily leaves; Dock; Dolnamul; Ebolo; Endive; Fame flower; Feather cockscomb; Flowering white cabbage; Glasswort, common; Godeulppaegi; Gomchwi; Goosefoot leaves; Grape leaves; Hanover salad; Iceplant; Ivy gourd leaves; Japanese honewort; Jute; Kahurura; Kangkung; Kale; Kohlrabi leaves; Komatsuna; Lettuce, bitter; Lettuce, Head; Lettuce, Leaf; Maca leaves; Mallow leaves; Melientha; Mizuna; Monkey-bread tree leaves; Mungbean sprouts; Mustard greens; Mustard, tuberous rooted leaves, Chinese; New Zealand spinach; Okazi leaves; Orach; Papaya leaves; Peanut leaves; Perilla leaves; Plantain leaves; Polygonatum leaves; Pumpkin leaves; Purple-stem mustard; Purslane; Purslane, Winter; Radish leaves; Radish sprouts; Rampion leaves; Rape greens; Roselle leaves; Rucola; Rutabaga greens; Salsify leaves; Sanmaneul leaves; Shepherd's purse; Sichuan pepper sprouts; Sowthistle; Soya bean leaves; Soya bean sprouts; Spider plant; Spinach; Spinach, Indian; Ssam cabbage; Seumbagwi; Sweet potato, leaves; Tanier spinach; Tannia leaves; Taro leaves; Toona sinensis; Turnip greens; Ullucu leaves; Velvet plant leaves; Violet, Chinese; Wasabi leaves; Water clover; Watercress; Water mimosa; Water shield; White lead tree; Wild Rocket; Witloof chicory (sprouts); Yam leaves

Codex Group / Subgroup	**Examples of Representative Commodities** [1]	**Extrapolation to the following commodities**
Subgroup 013A, Leafy Greens	Head lettuce and/or Leaf lettuce and Spinach	Leafy greens (VL 2050): African Eggplant leaves; African nightshade; Agretti; Amaranth leaves; Aster, Indian; Ayoyo; Bambara groundnut leaves; Barley shoots; Bitawiri; Bitter leaf; Blackjack; Boxthorn; Cat's Whiskers; Chamchwi; Chamnamul; Chamssuk; Chard; Chervil; Chicory leaves; Chili pepper leaves; Chipilin; Chrysanthum, edible leaved; Common bean leaves; Corn salad; Cos lettuce; Cosmos; Cowpea leaves; Dandelion; Danggwi; Daylily leaves; Dock; Dolnamul; Ebolo; Endive; Fame flower; Feather cockscomb; Glasswort, common; Godeulppaegi; Gomchwi; Goosefoot leaves;

		Iceplant; Japanese honewort; Jute; Lettuce, bitter; Lettuce, Head; Lettuce, Leaf; Mallow leaves; New Zealand spinach; Orach; Peanut leaves; Perilla leaves; Plantain leaves; Polygonatum leaves; Purslane; Purslane, Winter; Sanmaneul leaves; Sowthistle; Soya bean leaves; Spider plant; Spinach; Spinach, Indian; Seumbagwi; Tanier spinach; Violet, Chinese
Subgroup 013B, Brassica leafy vegetables	Mustard greens or Kale or Broccoli, Chinese, or radish leaves	Leaves of Brassicaceae (VL 0054): Broccoli, Chinese; Broccoli raab; Cabbage, Abyssinian; Cabbage, Seakale; Chinese cabbage (type Pak-choi); Chinese flat cabbage; Cress, Garden; Cress, Upland; Flowering white cabbage; Hanover salad; Kale; Kohlrabi leaves; Komatsuna; Maca leaves; Mizuna; Mustard greens; Mustard, tuberous rooted leaves, Chinese; Purple-stem mustard; Radish leaves; Rape greens; Rucola; Rutabaga greens; Shepherd's purse; Ssam cabbage; Turnip greens; Wasabi leaves; Wild Rocket
Subgroup 013C, Leaves of root and tuber Vegetables	Sweet potato leaves or Arrowroot leaves	Leaves of root and tuber vegetables (VL 2052): Alexanders leaves; Arrowroot leaves; Bell flower, Chinese leaves; Cassava leaves; Rampion leaves; Salsify leaves; Sweet potato, leaves; Tannia leaves; Taro leaves; Ullucu leaves; Velvet plant leaves; Yam leaves
Subgroup 013D, Leaves of trees, shrubs and vines	Ben moringa leaves or Grape leaves	Leaves of trees, shrubs and vines (VL 2053): Acacia shoots; Ben moringa leaves; Grape leaves; Melientha; Monkey-bread tree leaves; Okazi leaves; Papaya leaves; Roselle leaves; Sichuan pepper sprouts; Toona sinensis; White lead tree
Subgroup 013E, Leafy aquatic vegetables	Watercress	Leafy aquatic vegetables (VL 2054): Kangkung; Water clover; Watercress; Water mimosa; Water shield
Subgroup 13 F, Witloof	Witloof chicory (sprouts)	Witloof chicory sprouts (VL 2832): Witloof chicory (sprouts)

Codex Group / Subgroup	Examples of Representative Commodities [1]	Extrapolation to the following commodities
Subgroup 13 G, Leaves of Cucurbitaceae	Pumpkin leaves	Leaves of Cucurbitaceae (VL 2056): Balsam pear leaves; Chayote leaves; Ivy gourd leaves; Kahurura; Pumpkin leaves
Subgroup 13 H, Baby Leaves	Leaf lettuce or any crop intended to use as baby leaves (harvested up to 8 true leaf stage)	Baby leaves (VL 2057): Baby leaves
Subgroup 13 I, Sprouts	Mung bean sprouts	Sprouts (VL 2058): Alfalfa sprouts; Mungbean sprouts; Radish sprouts; Soya bean sprouts
Group 14 Legume Vegetables	Beans with pods (*Phaseolus* spp.) and/or Peas with pods (Garden pea or podded pea) and Succulent beans without pods (*Phaseolus* spp.) and Garden pea and Bambara groundnut (immature seeds)	Legume vegetables (VP 0060): Beans with and without pods (*Phaseolus* spp.); Beans with and without pods (*Vigna* spp.); Bambara groundnut; Ben moringa; Broad bean; Broad bean; Catjang; Chick-pea; Common bean (poroto); Cowpea; Garden pea; Goa bean; Grass pea; Guar; Jack bean; Lablab bean; Lentil; Lima bean; Lupin; Moth bean; Mung bean; Peas with and without pods (*Pisum* spp.); Peanut (immature); Pigeon pea; Podded pea; Rice bean; Scarlet runner bean; Soya bean; Stink bean; Sword bean; Urd bean; Velvet bean; Winged pea; Yard-long bean;
Subgroup 14A, Beans with pods	Beans with pods (*Phaseolus* spp.)	Beans with pods (VP 2060): Beans with pods (*Phaseolus* spp.); Beans with pods (*Vigna* spp.); Broad bean; Catjang; Common bean (poroto); Cowpea; Goa bean; Guar; Jack bean; Lablab bean; Moth bean; Mung bean; Rice bean; Scarlet runner bean; Soya bean; Stink bean; Sword bean; Urd bean; Yard-long bean
Subgroup 14B, Peas with Pods	Peas with pods (Garden pea or podded pea) and/or Beans with pods (*Phaseolus* spp.)	Peas with pods (VP2061): Peas with pods (*Pisum* spp.); Ben Moringa; Chick-pea; Garden pea; Grass pea; Lentil; Pigeon pea; Podded pea; Winged pea
Subgroup 14C, Succulent beans without pods	Succulent beans without pods (*Phaseolus* spp.)	Succulent beans without pods (VP 2062): Beans, without pods (*Phaseolus* spp.); Beans, without pods (*Vigna* spp.); Broad bean, without pods; Catjang; Common bean; Cowpea; Goa bean; Jack bean; Lablab bean; Lima bean; Lupin; Moth bean; Scarlet runner bean; Soya

		bean; Stink bean; Velvet bean
Subgroup 14D, Succulent peas without pods	Garden pea	Succulent peas without pods(VP 2063): Peas (*Pisum* spp.) without pods; Chick-pea; Garden pea; Lentil; Pigeon pea

Codex Group / Subgroup	**Examples of Representative Commodities** [1]	**Extrapolation to the following commodities**
	Bambara groundnut (immature seeds)	Underground beans and peas (VC 2064): Bambara groundnut (immature seeds); Peanut (immature)
Group 15 Pulses	Beans, dry (*Phaseolus* spp.) and/or Peas, dry (*Pisum* spp.) and Soya bean, dry and Bambara groundnut (dry)	Pulses (VD 0070): Beans (*Phaseolus* spp.); Beans (*Vigna* spp.); Adzuki bean; African yam bean; Bambara groundnut; Broad bean; Chick-pea; Common bean; Common Vetch; Cowpea; Field pea; Goa bean; Grass-pea; Guar; Horse gram; Jack bean; Kersting's groundnut; Lablab bean; Lentil; Lima bean; Lupin; Morama bean; Moth bean; Mung bean; Peas; Peas (*Pisum* spp.); Pigeon pea; Rice bean; Scarlet runner bean; Soya bean; Sword bean; Tepary bean; Thick bean; Urd bean; Velvet bean; Vetches; Winged pea; Yardlong bean
Subgroup 15A, Dry Beans	Beans, dry (*Phaseolus* spp.) and/or Peas, dry (*Pisum* spp.) and Soya bean, dry	Dry beans (VD 2065): Beans (*Phaseolus* spp.); Beans (*Vigna* spp.); Adzuki bean; African yam bean; Broad bean; Common bean; Common Vetch; Cowpea; Goa bean; Guar; Horse gram; Jack bean; Lablab bean; Lima bean; Lupin; Morama bean; Moth bean; Mung bean; Rice bean; Scarlet runner bean; Soya bean; Sword bean; Tepary bean; Thick bean; Urd bean; Velvet bean; Vetches; Winged pea; Yardlong bean
Subgroup 15B, Dry peas	Peas, dry (*Pisum* spp.) and/or Beans, dry (*Phaseolus* spp.)	Dry peas (VD 2066): Peas (*Pisum* spp.); Chick-pea; Field pea; Grass-pea; Lentil; Pigeon pea
Subgroup 15C, Dry underground pulses	Bambara groundnut (dry)	Dry underground pulses (VD 2067): Bambara groundnut (dry); Kersting's groundnut
Group 16 Root and tuber vegetables	Carrot and Radish and Sugar Beet or Beetroot and	Root and tuber vegetables (VR 0075): Alocasia; American potato bean; Arracacha; Arrowhead; Arrowroot; Arrowroot, Guinea; Arrowroot, Polynesian; Banana, Abyssinian; Beetroot;

	Potato or Sweet potato and Arrowhead	Bellflower, Chinese; Burdock, greater or edible; Canna, edible; Caraway, black root; Carrot; Cassava; Cattail; Celeriac; Chayote root; Chervil, Turnip-rooted; Chicory roots; Chinese artichoke; Chinese potato; Chinese water chestnut; Cowpea, wild; Dandelion root; Deodeok; Earthnut pea; Elephant foot yam; Gastrodia tuber; Giant swamp taro; Ginseng; Goa bean root; Horseradish; Jerusalem artichoke; Kaffir potato; Konjac; Kudzu; Ladybell root; Lotus tuber; Maca; Madeira vine; Mashua; Mauka; Murnong; Mustard, tuberous rooted Chinese; Oca; Olbanggae; Parsley, Turnip-rooted; Parsnip; Pencil yam; Pignut; Potato; Radish; Radish, Black; Radish, Japanese; Rampion roots; Salsify; Salsify, Spanish; Scorzonera; Skirret; Sugar beet; Swede; Sweet potato; Tannia; Taro; Tiger nut; Ti palm; Turnip, Garden; Ullucu; Yacon; Yams; Yam vean

Codex Group / Subgroup	**Examples of Representative Commodities** [1]	**Extrapolation to the following commodities**
Subgroup 16A, Root Vegetables	Carrot and Radish and Sugar beet or Beetroot	Root vegetables (VR 2070) Beetroot; Bellflower, Chinese; Burdock, greater or edible; Caraway, black root; Carrot; Celeriac; Chervil, Turnip-rooted; Chicory roots; Dandelion root; Deodeok; Ginseng; Horseradish; Kudzu; Ladybell root; Maca; Madeira vine; Mauka; Murnong; Mustard, tuberous rooted Chinese; Parsley, Turnip-rooted; Parsnip; Pencil yam; Radish; Radish, Black; Radish, Japanese; Rampion roots; Salsify; Salsify, Spanish; Scorzonera; Skirret; Sugar beet; Swede; Ti palm; Turnip, Garden
Subgroup 16B, Tuberous and corm vegetables	Potato or Sweet potato	Tuberous and corm vegetables (VR 2071): Alocasia; American potato bean; Arracacha; Arrowroot; Arrowroot, Guinea; Arrowroot, Polynesian; Banana, Abyssinian; Canna, edible; Cassava; Chayote root; Chinese artichoke; Chinese potato; Cowpea, wild; Earthnut pea; Elephant foot yam; Gastrodia tuber; Giant swamp taro; Goa bean root; Jerusalem artichoke; Kaffir potato; Konjac; Mashua; Oca; Pignut; Potato; Sweet potato; Tannia; Taro; Tiger nut; Ullucu; Yacon; Yams; Yam bean
Subgroup 16C, Aquatic root and tuber vegetables	Arrowhead	Aquatic root and tuber vegetables (VR 2072): Arrowhead; Cattail; Chinese water chestnut; Lotus tuber; Olbanggae
Group 17 Stalk and stem vegetables	Celery and Asparagus and/or	Stalk and stem vegetables (VS 0078): Agave; Artichoke, globe; Asparagus; Bamboo shoots;

	Artichoke, globe	Burdock, edible, tops; Cardoon; Celery; Celtuce; Dokhwal shoot; Dureup young shoot; Eumnamu shoot; Fennel, Bulb; Ferns, edible; Giant butterbur; Palm hearts; Prickly pear pads; Rhubarb; Kale, sea; Sweet potato stems; Taro stems; Udo; Water celery; Zuiki
Subgroup 17A, Stems and petioles	Celery	Stems and petioles (VS 2080): Burdock, edible, tops; Cardoon; Celery; Celtuce; Fennel, Bulb; Giant butterbur; Rhubarb; Sweet potato stems; Taro stems; Zuiki
Subgroup 17B,Young Shoots	Asparagus	Young shoots (VS 2081): Agave; Asparagus; Bamboo shoots; Dokhwal shoot; Dureup young shoot; Eumnamu shoot; Ferns, edible; Kale, sea; Udo
Subgroup 17C, Others	Artichoke, globe	Other stalk and stem vegetables (VS 2082) Artichoke, globe; Palm hearts; Prickly pear pads, Water celery

Codex Group / Subgroup	**Examples of Representative Commodities** [1]	**Extrapolation to the following commodities**
Group 18 Edible fungi	Mushrooms	Edibe fungi (VF 2084): Fungi, Edible, except mushrooms; Black poplar mushroom; Blewitt; Bunashimeji; Cauliflower mushroom; Cep; Chanterelle; Enoke; Hirmeola; Ink mushroom; Maitake; Morel; Mushrooms; Nameko; Net bearing Dictyophora; Oyster mushroom; Pine mushroom; Pom pom; Reishi mushroom; Shiitake mushroom; Shimeji; Straw mushroom; Stropharia; Truffle; Wangsongi; White jelly mushroom; Wood ears mushroom

B. CEREAL GRAINS

Representative commodities for residues in cereal grains commodity group

Representative commodities within cereal grains and sub groups were selected based on principles of data extrapolation in the Codex guidelines. The cereal group and subgroups were adopted from the Codex classification of food and feeds. The selected representative crops that are commonly grown in Kenya were preferred as representative crops. Codex guidelines on selection of representative commodities were applied when identifying representative commodities for cereals. The proposed representative commodities for the cereals in Kenya are summarized in Table 1 below.

Table 1: Sub groups of Cereal grains and representative commodities

Codex Group / Subgroup	Representative Commodities	Extrapolation to the following commodities
Group 020 Cereal Grains	Wheat and Barley and Rice and Sorghum Grain and Maize and Sweet corn[1]	Cereal grains (GC 0080): Amaranth, grain; Baby corn (immature corn); Barley; Buckwheat; Buckwheat, tartary; Chia; Corn-on-the-cob (kernels plus cob with husk removed); Maize; Millet; Oats; Popcorn; Quinoa; Rice; Rye; Sorghum; Sweet corn (whole kernel without cob or husk); Teff; Triticale; Wheat;
Subgroup 020A, Wheat, similar grains and pseudocereals without husks	Wheat	Wheat, similar grains, and pseudocereals without husks (GC 2086): Amaranth, grain; Chia; Quinoa; Rye; Triticale; Wheat
Subgroup 020B, Barley, similar grains, and pseudocereals with husks	Barley	Barley, similar grains, and pseudocereals with husks (GC 2087): Barley; Oats
Subgroup 020C Rice cereals	Rice	Rice Cereals (GC 2088): Rice;
Subgroup 020D Sorghum Grain and Millet	Sorghum Grain	Sorghum Grain and Millet (GC 2089): Millet; Sorghum Grain; Teff
Subgroup 020E Maize Cereals	Maize	Maize; Popcorn
Subgroup 020F Sweet corns	Sweet corn[2] (Corn-on-the-cob) (kernels plus cob with husk removed) or Baby corn	Sweet corns (GC 2090): Baby corn; Sweet corn (Corn-on-the-cob) (kernels plus cob with husk removed); Sweet corn (whole kernel without cob or husk)

Notes

[1] where the word "and" is used in column 2 for representative commodities residue, data must be provided for all listed commodities for extrapolation to the cereal group in column 3. Where the word "or" is used, data from any of the mentioned representative commodities may be provided.

[2]Sweetcorn can only be used as a representative commodity for extrapolation to Baby corn where residue decline studies on sweet corn corresponding to the GAP on baby corn are provided, in addition to the supervised trial residue data.

For the sub group, residue data has to be provided for the representative commodity within the subgroup for extrapolation to crops in column 3.

NB: For other commodities not included in the table, refer to the Codex guidelines on crop grouping.

C. HERBS AND SPICES

Representative commodities for residues in herbs and spices commodity group

Representative commodities within herb or spices group were selected based on principles of data extrapolation in the Codex guidelines. The herb and spices groups and subgroups were adopted from the Codex classification of food and feeds. The selected representative commodities for spices are as they appear in the codex guidelines. The document recognizes that spinach in Kenya is interpreted to mean Swiss chard (*Beta vulgaris*) but for the purpose of this guideline the representative commodity for herbs subgroup herbaceous plants in column 2 was identified as *Spinacia olearacea*. The proposed representative commodities for herbs and spices groups in Kenya are summarized the Table 1 below.

Table1: Representative commodities for the sub-groups of Herbs and Spices

Codex Group / Subgroup	Representative Commodities	Extrapolation to the following commodities
Subgroup 027A, Herbs (herbaceous plants)	Basil or Mint or Leaf lettuce or *Spinacia oleracea*	Herbs (HH 2095): Agrimony; Angelica, leaves; Anise, leaves; Avarum; Azetec sweet herb; Balloon pea; Balm, leaves; Barrenwort; Basil, leaves; Bisongrass; Blue mallow; Boneset; Borage; Borage, Indian; Burnet; Calamint; Calendula, leaves; Caltrop; Caraway, leaves; Catmint; Catnip, Japanese; Celandine, greater; Celandine, lesser; Celery, leaves; Centaury; Chaste tree; Coriander, leaves; Coriander, Bolivian; Coriander, Vietnamese; Costmary; Cover fern; Culantro, leaves; Curry plant; Cut leaf; Dill, leaves; Dokudami; Epazote; Evening

		primose; Fennel, leaves; Fennel, Spanish; Fenugreek, leaves; Feverfew; Field pennycress; Fumitory; Gambir; Geranium, leaves; Germander, golden; Greater burnet saxifrage; Gypsywort; Heal-all; Honewort; Horehound; Hyssop; Hyssop, anise; Jasmine; Labrador tea; Lavender; Lemongrass; Lemon savory; Lovage, leaves; Marigold, leaves; Marjoram; Marshmallow; Meadowsweet; Mint; Mint, Korean; Mioga, shoots and flower buds; Monarda; Motherwort; Mountainmint; Mullein; Nasturtium, leaves; Nettle; Oregano, Mexican; Pandan, leaves; Pansy, leaves; Parsley, leaves; Pennywort; Perilla, leaves; Phak paew; Rice paddy herb; Rosemary; Sage and related Salvia species; Santolina; Savory, Summer and Winter; Sorrel, common; Southernwood; Stevia; Sweet cicely; Tarragon; Thyme; Toon, Chinese; Veronica; Wasabi, stem; Waterpepper, Japanese; Wild betle leaf bush; Winter cress, common, American; Wintergreen leaves; Yarrow; Yellow gentian; Yerba santa; Yomogi
Subgroup 027B Leaves of woody plants	Any commodity in this subgroup or Leaf Lettuce or *Spinacia oleracea*	Leaves of woody plants (HH 2096): Aniseed myrtle; Boldo; Curry, leaves; Damiana; Japanese pepper, leaves; Kaffir lime, leaves; Laurel, leaves; Lemon myrtle; Linden; Mulberry leaves; Myrtle; Native mint; Pepper, leaves; Pepperbush, leaves; Rue; Siamese cassia; Sassafras leaves; Tejpat, leaves
Subgroup 027C Edible flowers	Any commodity in this subgroup or Leaf Lettuce or *Spinacia oleracea*	Edible flowers (HH 3200): Calendula, flowers; Courgette, flowers; Daylily, flowers; Daisy, common, flowers; Geranium, flowers; Marigold, flowers; Nasturtium, flowers; Violet, flowers and other edible flowers
Group 028 Spices		
Subgroup 028A Spices, seeds	Any commodity in this subgroup	Spices, seeds (HS 0190): Achiote, seed; Ajwain; Ambrette, seed; Angelica, seed; Anise, seed;

		Annatto, seed; Basil, seed; Black bread weed; Black caraway; Calabash nutmeg; Candlenut; Candlebush; Caraway, seed; Celery, seed; Chervil, seed; Chinese nutmeg tree; Coriander, seed; Cubeb, seed; Culantro, seed; Cumin, seed; Daharian angelica, seed; Dill, seed; Fennel, seed; Fennel flower, seed; Fenugreek, seed; Grains of Paradise, seed; Guarana; Honewort, seed; Lovage, seed; Mahaleb; Malabar tamarind; Marjoram, seed; Milk thistle; Nutmeg; Parsley, seed; Wattle seed
Subgroup 028B Spices, fruit or berry	Any commodity in this subgroup	Spices, fruit or berry (HS 0191): Anise pepper; Ashwagandha, fruit; Batavia-cassia, fruit; Belleric myrobalan; Caper, berries; Cardamom, pods and seeds; Cassia, fruit; Chasteberry, berry; Chinese hawthorn; Chinese-pepper; Cinnamon, fruit; Coriander, fruit; Cumin, black; Dorrigo pepper, berry; Eucalyptus, fruit; Fennel, fruit; Gambooge; Gardenia, fruit; Grains of Selim; Juniper, berry; Luo han guo; Miracle fruit; Pepper, Black, White, Pink, Green; Pepper, Cubeb; Pepper, long; Pepper, Sichuan; Pepperbush, berry; Peppertree; Pimento, fruit; Saunders, red; Star anise; Sumac; Tamarind, sour varieties; Tasmanian pepper berry; Tonka bean; Tsao-Ko; Uzazi; Vanilla, beans; West African pepper
Subgroup 028C Spices, bark	Any commodity in this subgroup	Spices, bark (HS 0192): Angostura, bark; Canella bark; Cascada buckthorn, bark; Catechu, bark; Cinnamon bark; Copaiba; Eucalyptus, bark; Eucommina, bark; Frankincense; Galbanum; Guaiac; Guggul; Gum arabic; Gum ghatti; Gum karaya; Gum tragacanth; Haw, black; Magnolia, bark; Mastic; Myrrh; Pine, maritime; Pygeum; Quassia, bark; Quebracho, bark; Quillaja; Red cinchona; Simaruba, bark; Slippery elm
Subgroup 028D Spices, root or	Any commodity in this	Spices, root or rhizome (HS 0193):

rhizome	subgroup or commodity from Root and Tuber Vegetables, applying an appropriate concentration factor	Angelica, root; Asafoetida, root; Calamus-root; Cat's claw, root; Chinesetree, root; Coptis; Coriander, root; Elecampane, root; Fingerroot; Galangal, rhizome; Ginger, rhizome; Jalap; Liquorice, root, Lovage, root; Temulawak; Tumeric, root; Yellow gentian, root; Zedoary
Subgroup 028E Spices, buds	Any commodity in this subgroup	Spices, buds (HS 0194): Caper, bud; Cassia, bud; Cloves, bud; Nasturtium, pod;
Subgroup 028F Flower or stigma	Saffron	Spices, flower or stigma (HS 0195): Golden-and-silver honeysuckle; Kewra, flowers; Saffron Subgroup
Subgroup 028G Spices, aril	Mace	Spices, aril (HS 0196): Mace
Subgroup 028H Citrus peel	Any commodity in this subgroup	Spices, citrus peel (HS 0197): Kaffir lime, peel; Lemon, peel, Orange, peel, Satsuma mandarin, peel; Yuzu, peel Subgroup
Subgroup 028I Dried Chili peppers	Any commodity in this subgroup	Peppers, Chili, dried

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