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Sugar industry — Code of practice

Part 1:

Primary production

KS 2977-1: 2023

TECHNICAL COMMITTEE REPRESENTATION

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Ministry of Health – Food Safety Unit
Kenya Industrial Research and Development Institute
National Public Health Laboratory Services
Government Chemist's Department
Kenya Revenue Authority
University of Nairobi — Department of Food Science and Technology
Kenafric Industries Ltd.
Consumer Information Network
Trufoods Ltd.
Brookside Ltd.
Kenya Sweets Ltd.
Mars Group Ltd.
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West Kenya Sugar Company Ltd.
Sukari Industries Limited
Butali Sugar mills Ltd.
Chemilil Sugar Company Ltd.
Kibos Sugar and Allied companies
Transmara Sugar company Ltd.
KALRO- Sugar Research Institute
Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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Sugar industry — Code of practice

Part 1:

Primary production

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Foreword

This Kenya Standard was prepared by the Sugar and Sugar Products Technical Committee under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards

The Kenyan sugar industry has over the years experienced numerous operational challenges in primary production, processing and marketing. This Part 1 of this standard provides a framework and guidance to industry players to embrace industry best practices, law and order, harmony, fair play, competitiveness, discipline and self-regulation among others in primary production.

This Code of Practice is aimed at providing guidance to all stakeholders in the value chain to conduct all activities in a manner that ensures food safety and quality; personnel safety and welfare; environmental protection and sustainability. It also intends to enhance compliance with statutory and regulatory requirements in Kenya.

KS 2977 consists of the following parts, under the general title Sugar industry — Code of practice:

- Part 1: Primary production
- Part 2: Cane harvesting, processing and trade
- Part 3: Environmental and socio-economic and sustainability

This Part 1 of this standard provides guidelines and covers recommended best practices and requirements for primary production of sugarcane.

During the preparation of this standard, reference was made to the following document:

KALRO Sugarcane growers guide.

Acknowledgement is hereby made for the assistance derived from this source.

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Sugar industry — Code of practice

Part 1:

Primary production

1 Scope

This Kenya Standard provides guidelines for achieving requirements for food safety and quality; worker health, safety and welfare; environmental protection and sustainability by value chain actors during primary production of sugar in Kenya.

The standard applies to all players in the primary production including but not limited to growers, harvesters, transporters, county governments and relevant government agencies.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CAC/RCP 1, *Recommended International Code of Practice General Principles of Food Hygiene*

KS EAS 38, *Labelling of pre-packaged foods — General requirements*

KS EAS 39, *Hygiene in the food and drink manufacturing industry — Code of practice*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 audit

systematic and functionally independent examination to determine whether quality and food safety activities and results comply with planned procedures and whether these procedures are implemented effectively and are suitable to achieve objectives

3.2 documentation

collection, classification and dissemination of information relating to a process or procedure usually in written or electronic form

3.3 erosion

mechanical movement of the land surface by wind, rain, running water or moving ice resulting in the wearing away of land or soil

3.4 food safety

assurance that food will not cause harm to the consumer when it is prepared and consumed according to its intended use

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**3.5
off-type**
any seed or plant not a part of the variety in that it deviates in one or more characteristics from the variety as described

**3.6
integrated pest management (IPM)**
consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep plant protection products and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment

**3.7
traceability**
ability to follow the movement of a feed or food through specified stage(s) of production, processing and distribution

**3.8
manure**
decomposed or otherwise treated materials used to maintain or improve plant nutrition and soil properties

**3.9
seed cane**
sections of the stalk of immature cane used for planting

**3.10
value chain actors**
individual producers of primary agricultural products including propagators and breeders; growers, associations and cooperatives; processors and packers; trading companies (including exporters), shippers, consolidators and cargo handlers

**3.11
pest**
any injurious, noxious or troublesome insect, fungus, bacterial organism, virus, weed, rodent or other plant or animal

**3.12
pest control products**
product, device, organism, substance or thing that is manufactured, represented, sold or used as a means for directly or indirectly controlling, preventing, destroying, attracting or repelling any pest

**3.13
risk**
probability of a hazard occurring

**3.14
sett**
piece of cane stalk with 3-5 eye-buds used as planting material.

**3.15
brix**
measure of dissolved solids in sugar liquor or syrup using a refractometer, otherwise referred to as refractometric dry solids. For solutions containing only sugar and water, Brix = % sugar by mass. Spindle Brix is determined using a hydrometer but is now seldom used

**3.16
refractometer brix**
term used when a refractometer equipped with a scale, based on the relationship between refractive indices at 20°C and the percentage by mass of total soluble solids of a pure aqueous sucrose solution, is used instead of a hydrometer to test the solids concentration of a sucrose containing solution. The sugar industry is now standardized on refractometer brix

3.17**dissolved solids**

all solute material which is in solution, including sucrose, monosaccharides, ash and other organic impurities

3.18**dry substance**

- material remaining after drying a product to constant mass, or for a specified period. The mass of dry substance can also be found by deducting from the mass of the product, the mass of moisture, as determined in a specified manner; or
- measure of total solids obtained from evaporating a solution or massecuite under vacuum to dryness

3.19**extraction**

- proportion of sugar taken out from cane in the extraction plant; equals mass of sugar in raw juice as a percentage of mass of sugar in cane; or
- percentage ratio of sucrose in mixed juice to sucrose in cane. If based on pol it is referred to as Pol

3.20**filter cake (scum or filter mud)**

residue removed from process by filtration including any added filter aid

3.21**polarization (pol)**

- relative rotation of plane polarised light as a measure of sucrose concentration; or
- apparent sucrose content of any substance expressed as a percentage by mass and determined by the single or direct polarisation method. The term is used as if it were a real substance; or
- The apparent sucrose content expressed as a mass percent measured by the optical rotation of polarized light passing through a sugar solution. This is accurate only for pure sucrose solutions.

3.22**purity**

- true purity is the sucrose content as a percent of the dry substance or dissolved solids content. The solids consist of sugar plus non-sucrose components such as invert, ash, and colorants. Apparent purity is expressed as polarization divided by refractometer Brix, multiplied by 100.
- percentage ratio of sucrose (or pol) to the total soluble solids (or brix) in a sugar product. The following terms are in general use: Refractive apparent purity: The percentage ratio of pol to refractometer brix. G.C. sucrose refractometer brix purity: The percentage ratio of GC sucrose to refractometer brix.

3.23**R**

reduced or parameters standardise at agreed conditions

3.24**raw juice**

juice obtained from the cane extraction process. Also referred to as mixed juice (from mills) or draft juice (from diffusers)

3.25**refining**

purification of sugar through chemical and physical methods generally including some or all of clarification, filtration, decolourization and recrystallization

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3.36

sucrose

pure disaccharide α -D-glucopyranosyl- β -D-fructofuranoside, known commonly as sugar

3.37

sugarcane

botanically a tall grass of the genus *Saccharum* and agriculturally the crop produced from hybrids which are the progeny of a number of *Saccharum* species commonly referred to as cane. For determination and payment of sucrose in cane it is the raw material accepted at the mill for processing

4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviated terms apply.

NEMA – National Environment Management Authority

KS – Kenya Standard

EAS – East Africa Standard

FIFO – First In First Out paragraph

5 General requirements

5.1 General

5.1.1 Stakeholders within the sugar value chain should undertake production, processing, distribution and trading of sugar in a manner that ensures high productivity and efficiency; food safety and quality; worker health, safety and welfare; environmental protection and sustainability.

5.1.2 Adequate measures should be taken, as appropriate throughout the value chain in accordance with relevant Kenya Standards to achieve the following:

- a) high productivity and efficiency by adopting industry best practices;
- b) safety by identifying practices, control measures, and monitoring hazards associated with the product at each step;
- c) quality by identifying factors that compromise sugar quality and implement measures to ensure conformity to product specifications;
- d) environmental protection by adopting sustainable practices; and
- e) worker health, safety and welfare by adhering to relevant legislation.

5.2 Documentation and record keeping

5.2.1 An organized system of record keeping should be documented and implemented for all records pertinent to this code and should remain legible, readily identifiable and retrievable.

5.2.2 The value chain actor should keep copies of the list of relevant international and national policies, laws and regulations where applicable.

5.2.3 Records should be maintained for a period of at least two years or as required by law.

5.2.4 The value chain actors should ensure that employees charged with record keeping are trained to do so accurately and that they are adequately supervised.

5.2.5 Records should be clearly written, dated and signed (including the name) by a responsible person.

5.2.6 Recording of data showing non-conformity with standards should be followed up with a written corrective action to be taken.

5.2.7 All records should be available for inspection by authorized persons.

5.2.8 The value chain actors should undertake at least one self-assessment per year which should be documented.

5.2.9 All the non-conformities generated from the internal audit should be documented and corrective actions taken.

5.2.10 Documentation should include but not limited to the following:

- a) policies and manuals for all activities along the value chain including for sugar quality and food safety, environmental protection, and worker welfare and health;
- b) procedure for management of non-conforming products;
- c) procedure for traceability, withdrawal and recall;
- d) records of personnel training;
- e) records of updated sugarcane growers ;
- f) records of soil and leaf-tissue analysis;
- g) records of prequalification of suppliers of materials, services and transport;
- h) records of stocked and applied fertilizer and crop protection products;
- i) programs and records for pests and disease incidences and control;
- j) records of pesticide residue monitoring;
- k) personnel hygiene policy;
- l) statutory certificates and licenses [food handlers health certificates and other relevant licences, certificates and permits];
- m) records for harvested cane quality;
- n) records of production, processing and distribution;
- o) procedures and programs for cleaning and disinfection;
- p) records of heavy metals monitoring; and
- q) records of plant machinery and equipment.

5.3 Competence

5.3.1 A capacity development system should be established and maintained to ensure personnel at each stage of the value chain are equipped, through appropriate training, with knowledge and skills that ensure best practices.

5.3.2 The trainings should include; enterprise diversification, protection of environment, workers' health and safe handling of products.

5.4 Safety and security

Measures should be established and implemented to control access to the cane production and processing areas, storage and handling facilities.

6 Primary production/field operations

6.1 General

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Agronomic practices should comply with Good Agricultural Practices (GAP) as recommended in approved cane producer manuals.

6.2 Site selection

6.2.1 Cane should be grown in recommended agro-ecological zones complying with relevant national legislative requirements for industrial crop production.

6.2.2 The following should be considered when selecting land for cane production:

- a) farmers' ability to grow, maintain, supply and market the crop;
- b) land size;
- c) soil suitability and fertility;
- d) land accessibility and terrain; and
- e) land ownership/lease agreement.

6.2.3 Farmer recruitment/registration should be undertaken by millers and out-grower institutions through cane farming contracts.

6.2.4 In case of forested land or land use change, an environmental impact assessment (EIA) licence from NEMA should be obtained in line with Environmental Management and Coordination Act (EMCA).

6.3 Land preparation

6.3.1 Sugarcane remains in the fields for many years and this requires good land preparation for higher yields. Land preparation techniques (time, methods and technology) that minimize soil erosion and compaction and safeguard the environment should be applied.

6.3.2 Land preparation should involve the following key practices;

- a) land survey;
- b) land clearance (e.g. bush clearing, de-stumping, removal of debris & back-filling, use of recommended herbicides);
- c) primary cultivation (e.g. disc/mouldboard ploughing, ripping);
- d) secondary cultivation (e.g. harrowing/furrowing); and
- e) construction of in roads/drainages.

6.3.3 During land preparation, where necessary, soil pH and fertility correction should be based on soil analysis reports.

6.4 Soil sampling, analysis and recommendation

6.4.1 Soil testing should be a requirement to cane establishment to guide the grower on soil fertility status and fertilizer application schedule.

6.4.2 Farmers should consult extension officers from relevant/qualified/appropriate institutions on methods of soil sample collection and delivery to laboratories for analysis and on the interpretation and practical implication of the soil analysis results.

6.4.3 The recommendations from soil analysis results should inform the farmer on the nutrient regime of the field.

6.5 Nurseries

6.5.1 General

Nurseries should be established and managed in a manner that ensures sustainability of plant health, protection of the environment and workers' safety. In particular:

- a) Nursery A should be established by the institution responsible for sugar research and millers for primary seed quality.
- b) Nursery B should be established by the institution responsible for sugar research, millers and seed merchants for secondary seed quality.
- c) The nursery site should have adequate water supply.
- d) The nursery soils should have top soils with neutral pH of between 6.5 – 7.5.
- e) Sites excavated for nursery soils should be rehabilitated.
- f) Nursery construction and management practices should comply with the recommendations in the approved sugar producer manuals.
- g) Fertilizers use, type and application rates be as per sugar grower's handbook or approved producer manual.
- h) Biodegradable materials are recommended but where non-biodegradable materials such as polythene used in the nursery should be disposed of in accordance with Environmental Management and Coordination Act (EMCA).
- i) Planting material used should be approved in accordance with the Seed and Plant Varieties Act, Biosafety Act and other relevant legislations; and
- j) Use of agrochemicals for pest and disease control should be limited to those approved for use in the sugar industry and in accordance with applicable legislations on chemical use.

6.5.2 Seed certification

The general seed certification procedures should be complied with as provided for in the Plant Protection Acts.

6.5.3 Land requirement

Land should be kept free from sugarcane residues and drainage from other sugarcane fields.

6.5.4 Nursery field standards

6.5.4.1 General requirements

Sugarcane seed production fields should be isolated from other fields with a minimum distance of 5 m to avoid mechanical admixture with other varieties.

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6.5.4.2 Specific requirements

Table 1 — Specific requirements for nursery field

Factor	Stage of field inspection	Maximum permissible limits (%)	
		Foundation	Certified
Off-types	I, II, III	Nil	Nil
Plants affected with designated diseases			
		A Nursery	B nursery
Ratoon stunting disease (RSD)	III	Nil	Nil
Smut	I	0.5 ^a	0.5 ^a
	II	0.2 ^a	0.2 ^a
	III	Nil	0.01
Leaf scald	II	0.01 ^a	0.05 ^a
	III	Nil	Nil
Red rot	I, II, III	Nil	Nil
Plants affected by designated insect-pests			
Shoot borer	II, III	5	5
Stalk borer	III	5.0 ^c Nil ^b	5.0 ^a Nil ^b
Scale insects, mealy bug	III	5.0 Nil ^b	5.0 Nil ^b
Key ^a Subject to immediate rouging of the whole clump. ^b In areas where the presence of the pest has not been recorded. ^c It gives around 0.5%-affected buds.			

6.5.5 Designated diseases

The following are the designated diseases:

- Smut (*Ustilago scitaminea* Sydow);
- Ratoon stunting disease (RSD) (*Leifsonia xyli subsp. xyli*);
- Leaf scald (*Xanthomonas albilineans* Ashby) Dowso; and
- Red rot (*Glomerella tucumanensis* Speg) Arx and Muller.

6.5.6 Designated insect-pests

6.5.6.1 The following are the designated insect-pests:

- Shoot borer (*Scirpophaga excerptalis* Wlk);
- Stalk borer (*Eldana saccharina.*);
- Scale insect (*Melanaspis glomerata*);

- d) Mealy bug. (*Sacchariphagus sacchari* Cockerell); and
- e) Yellow aphids (*Sipha flava*).

6.5.6.2 All off-types and diseased plants should be rogued out along with roots and destroyed.

6.5.6.3 Maximum permissible limits for the stripping of dry foliage should be 2.0 % (there are varieties that are self detaching).

6.5.6.4 The crop should not have more than 10 % lodged cane.

6.5.6.5 Seed cane should not have nodal roots.

6.5.6.6 Moisture in seed cane should not be less than 65 % on wet weight basis.

6.5.6.7 Genetic purity of seed should be 100 %.

6.5.6.8 Physical purity of seed should be 98 %.

6.5.7 Assessment of off-types, presence of designated diseases and pests

From a random position within a seed cane field, an inspector should walk for ten (10) metres along a row which translates into thirty stools, skip the next three rows and repeat the same on the fifth row, ninth row until the count is achieved.

In each count, the inspector should be taking note of the off-types, designated diseases and pests.

Table 2 — Minimum number of counts

Area (Acres)	Minimum counts	Number of plants
Up to 2	33	1000
2.1 – 4.0	66	2000
4.1 – 6.0	99	3000
6.1 -8.0	132	4000
8.1- 10.0	165	5000

6.5.8 Heat treatment /Aerated Steam Therapy (AST)

Seed cane to should establish Nursery A which should be hot water treated at 50 °C for 2 h; Nursery B should be established from the progeny of Nursery A.

6.6 Cane establishment

6.6.1 Seed cane preparation

6.6.1.1 Certified seed cane of recommended varieties for a specific zone should be used.

6.6.1.2 The seed cane should be plant crop or first ratoon obtained from nursery 'B', true to type, free from pests and diseases.

6.6.1.3 Seed cane average age depending on variety should be 7- 9 months for coastal areas and 9-12 months for upland areas preferably 1.5 m in height.

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6.6.1.4 Cutting knives should be sterilized regularly using appropriate disinfectants to minimize the risk of spreading diseases such as smut, ratoon stunting disease (RSD) and pineapple disease.

6.6.1.5 Seed cane should be harvested with trash, loaded, transported and off loaded with care to avoid damage to the eye-buds.

6.6.1.6 Transport equipment for seed cane from nurseries to the field should be thoroughly cleaned before use in order to minimize spread of diseases.

6.6.1.7 Prepared seed cane should be planted immediately.

6.6.2 Planting

6.6.2.1 Setts

6.6.2.1.1 Planting should be done when there is adequate soil moisture supply from rain or irrigation.

6.6.2.1.2 Setts should be treated with appropriate fungicides and/or insecticides to control major diseases and pests e.g. termites.

6.6.2.1.3 3-5 eye budded setts should be planted at a seed rate of 6-8 T/Ha (2.4-3.2 T/Acre) depending on the variety and inter row spacing.

6.6.2.1.4 Planting fertilizers (Phosphatic, Potassic and manures e.g. filter cake) based on site-specific recommendations should be applied.

6.6.2.1.5 Setts should be placed end-to-end or slightly overlapped depending on soil moisture level and quality of the seed cane.

6.6.2.1.6 Furrows should be covered properly with soil.

6.6.2.2 Single-eye bud plantlets

6.6.2.2.1 Healthy freshly harvested cane stalks of 9-11 months are to be selected.

6.6.2.2.2 Bud chips should be excised using a machete manually or mechanically by a bud chipping machine to attain a bud size of 2.54 cm × 2.54 cm.

6.6.2.2.3 The buds will be treated with organic or chemical disinfectants to avoid pest and disease infestation. Treated buds will be placed in a plastic bag and then immersed in a prepared solution of either 20 ml malathion or 5g carbendazim for 10 - 15 min.

6.6.2.2.4 Treated bud chips will be dried for 2-3 h under shade before planting in trays filled with soil and farm yard manure mixtures or filter press mud or planted in mini-plots.

6.6.2.2.5 Bud chips will be planted in an upright position. 2-3 budded sugarcane setts will be used for planting.

6.6.2.2.6 For mini plots, a thin soil layer will be applied on top. Both planting methods will be tightly covered with polythene sheets and kept for 7-8 days in the same position to protect from extreme weather conditions.

6.6.2.2.7 After 7 days the polythene sheet cover will be removed. The trays with sprouted buds will be aligned side by side in beds on the ground to facilitate watering and other nursery management practices.

6.6.2.2.8 Fertilizer will be applied at the rate of 1g urea 46 % per bud or foliar feed spraying between 15 and 25 days after planting.

6.6.2.2.9 Healthy seedlings at the age of 45-60 days will be transplanted in well prepared fields. An inter-row spacing of 1.2 m and plant to plant spacing of 0.6m will be adopted.

6.6.2.2.10 The seedlings will be deprived of moisture one day before transplanting. This will loosen the soil in cones and help in easy lifting of seedlings for transplanting.

6.6.2.2.11 Seedlings will be planted in the moistened soil with a gentle thrust.

6.6.3 Germination assessment and gap filling

6.6.3.1 Germination count should be carried out after 45 days from the date of planting.

6.6.3.2 Wide gaps of more than 60 cm (2 ft) should be filled with healthy seed cane setts/plantlets of the same variety.

6.7 Crop protection

6.7.1 Weed control

Weed control may entail cultural, manual, mechanical and chemical methods and/or integrated weed management operations.

6.7.1.1 Manual weed control

Plant crops should be weeded timely using hand hoes (jembes). This may be done up to 4 to 6 times depending on the field weed condition & cane growth stage.

6.7.1.2 Chemical weed control

Chemical weed control involves the use of different pre-emergence and post emergence herbicides. Specific combinations (cock - tails) of chemicals for each agro-ecological zone may be obtained from the extension officer. In ratoon cane, a pre-emergence herbicide treatment is applied after inter-row cultivation. Herbicides can be applied manually through use of knapsacks or mechanically through use of boom sprayers. Tractor mounted Boom sprayers can be utilized on large-scale farms.

6.7.1.3 Mechanical weed control

This is most suited for ratoon crops but can also be conducted in plant cane at 4 – 6 months with utmost care to minimize crop damage. Inter-row cultivation may be done by oxen-drawn plough or tractor mounted ridger or tines. The operations include:

- a) Animal draft: Use of animal-drawn mouldboard ploughs
 - i) 3 passes per row are recommended;
 - ii) Suitable for small plots;
 - iii) Can be used even in wet moisture regime; and
 - iv) Has limited soil penetration.
- b) Ripping / sub soiling -
 - i) To break the hard pan to allow easier root penetration, water infiltration and aeration;
 - ii) Aims at 45 to 60 cm depth; and

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- iii) Cut old roots to allow development of new roots.
- c) Disc bedding/ ridging and tine cultivation -
 - i) Use of light machines and implements on high floatation tyres to avoid soil compaction;
 - ii) Appropriate after fertilizer application; and
 - iii) Better penetration achieved up to a depth of 18 cm.
- d) Trash shredding -
 - i) Use manual labour to spread the trash uniformly on the field surface; and
 - ii) Use tractor drawn shredder to cut trash into smaller pieces to facilitate the subsequent operations and decomposition.

6.7.1.4 Cultural weed control

Good seedbed preparation, timely planting, use of cover crops and trash mulching are recommended.

6.7.1.5 Integrated weed management

A combination of manual, chemical, mechanical and cultural methods is more efficient and cost effective. This is highly recommended.

The critical weed control period should be within 3 months and 6 months of planting in the Coast and West Kenya sugar belt, respectively.

6.7.2 Pest management

6.7.2.1 Sugarcane growers should regularly visit their farms to identify pest attack and report to extension officers in their areas.

6.7.2.2 Integrated pest management (IPM) strategies should be used to keep pest levels below economically damaging thresholds using the most appropriate combination of biological (use of natural enemies), cultural, mechanical/physical, and chemical (plant protection products) methods.

6.7.3 Diseases management

6.7.3.1 Sugarcane growers should regularly visit their farms to identify diseases and report to extension officers in their areas.

6.7.3.2 An integrated approach involving a combination of chemical, cultural, hot water treatment as well as roguing should be employed in the management of sugarcane diseases.

6.8 Crop protection products

6.8.1 The grower should use crop protection products that are approved for use in sugar crops and applied in a manner that protects the worker and the environment in accordance with approved manuals and relevant legislations in Annex B.

6.8.2 The choice of crop protection products, their storage and application, should be appropriate and in accordance to the instructions on the material safety data sheet /label.

6.8.3 All products used should be registered by the Pest Control Products Board.

- 6.8.4** Where its technically feasible, recognized IPM techniques should be applied.
- 6.8.5** An up to date and complete list of all the crop protection products that are used and/or stored on the farm should be maintained.
- 6.8.6** All applications of crop protection products should be recorded, including: field identification (number or code, location), application date, product trade name (brand), name of the operator/supervisor, application machinery (e.g. knapsack) and name of pest or diseases controlled.
- 6.8.7** Application and measuring equipment should be well maintained and where necessary calibrated regularly to ensure accuracy of application rates.
- 6.8.8** All crop protection products should be transported safely to minimize danger to people, food products and the environment.
- 6.8.9** When an original package is broken or damaged, and the product is transferred to another package, the new package should contain key information of the original label.
- 6.8.10** Storage facilities should be appropriately designed with safety features, and a product inventory and manufacturer's safety information should be maintained.
- 6.8.11** Empty containers of crop protection products should not be re-used in any form or manner. Such containers should be safely stored and later disposed in accordance with material safety data sheet.
- 6.8.12** Surplus application mixes and wash downs should be disposed of safely.
- 6.8.13** Obsolete crop protection products should be labelled and disposed in accordance to material safety data sheet.

6.9 Plant nutrition

- 6.9.1** Farmers should undertake routine soil analysis to determine nutrient levels in the soil.
- 6.9.2** Fertilizers should be applied based on nutrient requirements of the crop.
- 6.9.3** Fertilizer used should not contain potentially harmful substances and should comply with relevant Kenya Standards.
- 6.9.4** Fertilizer application equipment and machinery should be kept in good condition, calibrated and maintained in a manner that will ensure accurate delivery rate.
- 6.9.5** Fertilizers should be stored in a defined area that gives protection for stock with minimum risk to employees and environment.
- 6.9.6** Use of organic manure for maintenance and improvement of soil fertility should be encouraged. It should be composted and stored in a designated area to prevent the risk of contamination of the environment.
- 6.9.7** Records of fertilizer stocks, application indicating location, date of application, type and quantity of fertilizer applied should be maintained.

6.10 Enterprise diversification

- 6.10.1** Growers should diversify into other recommended farm-based enterprises for additional revenue streams and food and nutritional security.
- 6.10.2** County governments should take lead in farm-based enterprise diversification.

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6.11 Crop husbandry and farm management

6.11.1 Principle

To develop and implement policies and procedures on input procurement, use/ application, storage and disposal of unwanted inputs and their residues.

6.11.2 Criterion

The operator should ensure that the chemical input procured are in compliance with applicable laws and regulations (both local and international) in view of, registration, banned substances and transportation both in the country of origin and country of use.

6.11.3 Indicators

6.11.3.1 The operator should ensure that all stores located away from water sources in compliance with existing legislations and regulations. The stores should be lockable. The operator should document and maintain a stock control management plan. Within the store, there should be adequately stocked first aid facility and availability of well-known spillage and emergency response procedures.

6.11.3.2 The farm should have the necessary equipment for carrying out activities such as mixing and applying agrochemicals. Procedures should be developed and implemented concerning calibration, repair and maintenance of equipment and records maintained.

6.12 Pesticide use and management

6.12.2.1 To promote the use of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides.

6.12.2.2 The operator should have an integrated pest management programme based on ecological principles for the control of harmful pests (insects, plants, animals and microbes). The programme should give priority to the use of physical, mechanical, cultural and biological control methods, and the least possible use of agrochemicals. The program should include non-chemical pest monitoring, scouting, record of non-chemical practices re-entry intervals and sound disposal of pesticide containers.

6.12.2.3 The operator should have a plan for eliminating the use of all endocrine disruptions and cholinesterase inhibiting substances, carcinogenic and mutagenic causing substances WHO Class 1a and 1b, WHO Class II and all highly hazardous chemical substances under the Stockholm convention on persistent organic pollutants (Pops Convention).

6.12.2.4 The operator should ensure that dosage/rates, re-entry periods and postharvest intervals are strictly observed. Measures should be put in place to ensure that this information is documented and publicly communicated.

6.12.2.5 The operator should ensure all employees engaged in any chemical application are trained on safe use of chemicals; provided with adequate personal protective equipment and trained on their safe usage.

6.13 Extension services

Extension services should be provided by competent and qualified personnel, mobile and web-based applications such as Miwa bora mobile application.

Annex A (normative)

Relevant legislations

The following is a list of legislations that apply to the sugar industry:

- The Constitution of Kenya, 2010.
- The Agriculture, Fisheries and Food Authority Act (AFFA) 2013 (Revised, 2016).
- The Crops Act, 2013.
- Kenya Agricultural and Livestock Research Organization Act, 2013.
- The Employment Act, Cap. 226.
- The Environmental Management and Coordination Act, 1999.
- Occupational Safety and Health Act, 2007.
- Work Injury Benefits Act, 2007.
- The Food, Drugs and Chemical Substances Act, Cap. 254.
- The Public Health Act, Cap. 242.
- The Irrigation Act, Cap. 347.
- The Lakes and Rivers Act, Cap. 409.
- The National Hospital Insurance Fund Act, Cap. 255.
- The National Social Security Fund Act, Cap. 258.
- The Physical Planning Act, 1996.
- The Regulation of Wages and Conditions of Employment Act, (ROWA) Cap. 229.
- The Standards Act, Cap. 496.
- The Trade Disputes Act, Cap. 234.
- The Children's Act, 2001.
- The Sexual Offences Act,
- The Trade Union Act, Cap. 233.
- The Water Act, Cap. 372.
- Seeds and Plant Varieties Act, Cap. 326.
- The Pest Control Products Act, Cap. 346.
- The Plant Protection Act.
- Weights and Measures Act, Cap 513.
- Land Act No. 6 of 2012.
- The Fertilizers and Animal Foodstuffs Act, Cap 345.
- Factories and Other Places of Works Act, Cap 514.
- Co-operative Societies Act Cap 490.
- The Crops (Sugar) (General) Regulations, 2020.
- The Crops (Import, Export and By-products) Regulations, 2020.

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- The Labour Institutions Act No. 12 of 2007.
- The Labour Relations Act No. 14 of 2007.
- Retirement Benefit Act No.3 1997.

Annex B
(normative)

Product diversification

Millers should diversify their production to include the following:

- Brown/mill white sugar
- Refined white sugar
- Sugar cane jaggery
- Raw cane sugar
- Fortified sugar
- Icing sugar
- Molasses
- Bagasse
- Carbonized briquettes for household
- Non-carbonized briquettes for industrial
- Ethanol
- Co-generation
- Filter mud
- Fly ash
- Fibre boards
- Pulp and paper

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