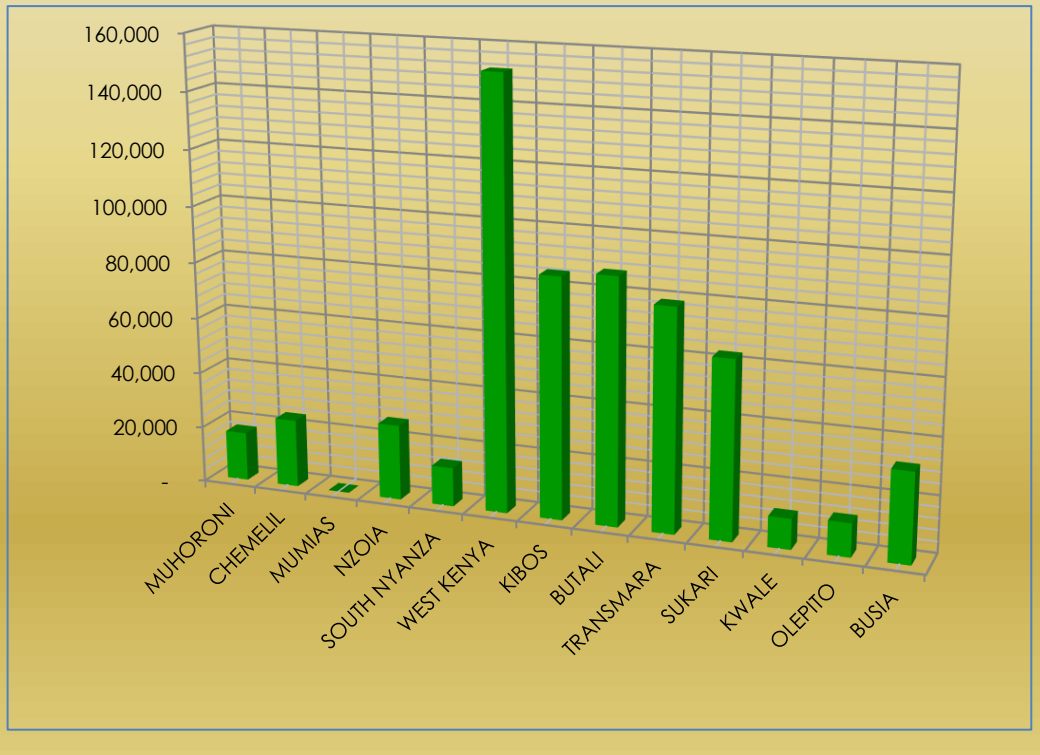
YEAR BOOK OF
SUGAR STATISTICS
2020

COMPARATIVE SUGAR PRODUCTION IN 2020 (MT)



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KENYA SUGAR INDUSTRY
YEAR BOOK OF
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The Crops Act, 2013 consolidates and repeals various statutes relating to crops, to provide for the growth and development of agricultural crops. As a result, all the institutions earlier established under the repealed laws ceased to exist and with the commencement of the Crops Act in August 2014 became directorates of AFA. The Sugar Directorate is one of the eight Directorates under the Agriculture and Food Authority (AFA).

AFA MISSION

"To sustainably develop and promote scheduled crops value chains through effective regulation for economic growth"

AFA VISION

"To be a world class regulator in the agricultural sector"

CORE VALUES

Professionalism, Integrity, Customer Focus, Team work and Innovativeness

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CONTENTS

SECTION III

DEFINITIONS AND ACRONYMS USED IN THE SUGAR INDUSTRY

AFA	Agriculture and Food Authority
Annual Maintenance	The longer period set aside for comprehensive equipment rehabilitation and some new installations. In the tropics, it is erroneously refered to as out-of-crop (OOC), yet cane is not seasonal and is available in the farm all year round
Ash content	Solid residue determined gravimetrically after incineration in the presence of oxygen. In analysis of sugar products, sulfuric acid is added to the sample, and this residue as sulfated ash heated to 525 ˚C is taken to be a measure of the inorganic constituents. Sometimes determined indirectly by measurement of electrical conductivity of the product in solution (see conductivity ash)
Bagacillo	1. Fine fraction of bagasse obtained by screeining or pneumatic separation, generally used as a filter aid in filtration
	2. Very small particles of bagasse separated either from pre-clarification juices or from the final bagasse for filtration or other purposes
Bagasse	Cane residue leaving mills after extraction of juice
BOD_5	Five days biological oxygen demand
Boiling house	That part of the sugar mill in which the processes of production of sugar from raw juice are carried out. It is also referred to as back end or raw house
Boiling House Recovery	The percentage ration of pol actually recovered in sugar to sucrose in mixed juice. If based on pol in mixed juice it is referred to as Boiling House Pol Recovery
Brix	1. 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
	2. Refractometer brix - the term used when a refractometer equiped 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 acqueous 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
Bulk Density	The mass of material per unit of total volume occupied
Cane to Sugar Ratio	Tonnes of cane required to produce one tonne of *tel quel* sugar
Color	Attenuation index, determined by absorption of light under defined conditions. Generally measured using the ICUMSA method at 420 nm and refered to as ICUMSA units or IU.
Conductivity Ash	Estimate of ash content by measurement of the conductivity of the solution.
Crystal Content	The percentage by mass of crystalline sugar present in a massecuite, magma or similar material
CU	Capacity utilization
Dissolved solids	All solute material which is in solution, including sucrose, monosaccharides, ash and other oganic impurities
Dry Substance	1. The 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
	2. A measure of total solids obtained from evaporating a solution or massecuite under vacuum to dryness
Extraction	1. Proportion of sugar extracted from cane in the extraction plant; equals mass of sugar in raw juice as a percentage of mass of sugar in cane
	2. The percentage ratio of sucrose in mixed juice to sucrose in cane.If based on pol it is referred to as Pol Extraction

DEFINITIONS AND ACRONYMS USED IN THE SUGAR INDUSTRY

Extraneous matter	All cane leaves and tops, mud, soil, roots, rocks, stones and tramp iron delivered with the cane.
Fibre	1. The dry fibrous insoluble structure of the cane plant. Generally taken to mean all insoluble material in the cane delivered to a mill, and therefore includes soil or other extraneous insoluble matter in cane
	2. The water insoluble matter of cane and bagasse from which the brix-free water has been removed by drying. Where associated with brix-free water, fibre is often called natural fibre
Filter Cake	The residue removed from process by filtration including any added filter aid.
FTE	Factory Time Efficiency
ICUMSA	International Commission for Uniform Methods of sugar analysis
Imbibition	1. The process of adding water to the extraction plant to increase extraction. Sometimes incorrectly referred to as maceration (steeping cane in juice). Water added is called imbibition water
	2. The process in which water or juice is put on bagasse to mix with/dilute the juice present in the latter. The water so used is termed imbibition water. General terms in use are: single imbibition, double imbibition, compound imbition, depending on the manner in which water is applied
Invert sugar	Mixture of approximately equal parts of glucose and fructose (monosaccharides) resulting from the hydrolysis of sucrose (inversion)
ISO	International Sugar Organisation
ISA	International Sugar Agreement
KEBS	Kenya Bureau of Standards
kg	Kilogram
Molasses	The mother liquor separated from the crystals by centrifuging A, B, or C massecuites. Molasses is derived from the corresponding massecuites. C molasses is also referred to as final molasses
MT	Metric Tonnes
Nonsugar	Common overall term for dissolved solids other than sugar contained in any process stream
Nonsurose	Disolved solids contained in any process stream other than sucrose
OTE	Overall Time Efficiency
PI	Preparation Index
Polarization (or pol)	1. Relative rotation of plane polarised light as a measure of sucrose concentration
	2. The 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
	3. 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
ppm	Parts per million

DEFINITIONS AND ACRONYMS USED IN THE SUGAR INDUSTRY

Purity	1. The true purity is the sucrose content as a percent of the dry substance or dissolved solids content. The solids consist of sugar plus nonsurcose components such as invert, ash, and colorants. Apparent purity is expressed as poloarization divided by refractometer Brix, multiplied by 100.
	2. The 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 ration of pol to refractometer brix. G.C. sucrose refractometer brix purity: The percentage ratio of GC sucrose torefractometer brix.
R-	Reduced or parameters standardise at agreed conditions
Raw Juice	Juice obtained from the cane extraction process. Also referred to as mixed juice (from mills) or draft juice (from diffusers).
Raw Sugar	Brown sugar produced in a raw sugar mill generally destined for further processing to white sugar in a refinery.
RBHR	Reduced boiling house recovery
Reducing Sugars	Generally referred to and /or interpreted as invert sugar determined by measuring reducing substance countent by laboratory analysis.
Refining	Purification of sugar through chemical and physical methods generally including some or all of clarification, filtration, decolorization and recrystallization.
Refractometric dry solids (RDS)	Measurement of total dissolved solids in a sugar liquor or syrup using a refractometer. For solutions containing only sugar and water, % RDS = % sugar by mass.
Rendement	Sugar made % cane
RME	Reduced Mill Extraction
ROR	Reduced Overall Recovery
Safety factor	Number to indicate keeping quality of raw sugar, calculated from pol and moisture content (Moisture (g)/100g sugar)/ (100-pol).
Sonysugar	South Nyanza Sugar Company Limited
Sucrose	The pure disaccharide a -D-glucopyranosyl-β-D-fructofuranoside, known commonly as sugar.
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.
SD	Sugar Directorate
SRI	Sugar Reaserch Institute
TC/TS ratio or TC:TS	Cane and Sugar ratio by weight
TCD	Tonnes of Cane per Day
tel qel	Apparent quantity
USD	United State of America Dollar
TREO	Tax Remission for Export Office

PARAMETERS AND COMPUTATION OF STATISTICAL DATA

PARAMETERS	No	METHOD
Weight of cane	1	Obtained by weighing
Weight of mixed juice	2	Obtained by weighing
Weight of imbition water	3	Obtained by weighing
Moisture % bagasse	4	Mean of daily analyses
Pol (or sucrose) % bagasse	5	Mean of daily analyses
Brix % bagasse	6	$\frac{\text{Pol \% bagasse (5) x100}}{\text{Purity last expressed juice}}$
Purity last expressed juice		Mean of daily analyses
Fibre % bagasse	7	100- Moisture % bagasse (4)- Brix % bagasse(6)
Weight of bagasse	8	(1) + (3) - (2)
Bagasse % cane	9	(8) ÷ (1) x 100
Weight of fibre	10	(8) x(7) ÷ 100
Fibre % cane	11	(10) ÷ (1) x 100
Mixed Juice % cane	12	(2) ÷ (1) x 100
sucrose % mixed juice		Mean of daily analyses
Brix % mixed juice		Mean of daily analyses
Weight of Brix in mixed juice	13	(2) x Brix % mixed juice ÷ 100
Weight of sucrose in mixed juice	14	(2) x sucrose % mixed juice ÷ 100
Weight of Brix in bagasse	15	(6) x (8) ÷100
Weight of sucrose in bagasse	16	(5) x (8) ÷100
Sucrose In bagasse % cane	17	(16) ÷ (1) x 100
Weight of absolute juice	18	(1) - (10)
Weight of Brix in absolute juice	19	(15) + (13)
Weight of sucrose in absolute juice	20	(16) + (14)
Brix % absolute juice	21	(19) ÷ (18) x 100
Sucrose % absolute juice	22	(20) ÷ (18) x100
Gravity purity absolute juice	23	(20) ÷ (19) x100
Weight of absolute juice extracted	24	(13) ÷ (21) x100

PARAMETERS AND COMPUTATION OF STATISTICAL DATA

PARAMETERS	No	METHOD
Absolute juice % cane	25	(18) ÷ (1) x100
Absolute juice extracted % cane	26	(24) ÷ (1) x 100
Weihgt of absolute juice in bagasse	27	(18) - (24)
Imbibition water % cane	28	(3) ÷ (1) x 100
Imbibition water % absolute juice	29	(3) ÷ (18) x 100
Weight of dilution water	30	(2) - (24)
Dilution water % cane	31	(30) ÷ (1) x 100
Dilution water % absolute juice extracted	32	(30) ÷ (24) x 100
Evaporation % clarified juice	33	(Syrup Brix - Clarified juice Brix)x100 / Syrup Brix
syrup Brix		Obtained by analysis
Weight of sucrose in cane	34	=(20)
Weight of Brix in cane	35	=(19)
Sucrose % cane	36	(34) or (20) ÷ (1) x 100
Java Ratio	37	sucrose % cane (36) x100 / Sucrose % 1st expressed juice
Sucrose % 1st expressed juice		Obtained by analysis
Mill extraction (M.E)	38	(14) ÷ (34) X 100
Reduce mill extraction(R.M.E)	39	100- [100-(38)][100- (11)] / 7x(11)
Sucrose in bagasse % sucrose in cane	40	(16) ÷ (34) x 100
Extraction ratio	41	100- (38) x100 / (11)
Mill Loss	42	(16) ÷(10) x 100
First mill extraction (stuart formula)	43	(Pm-P2) P1 x e * / (P1-P2)Pm where: Pm = Pol % mixed juice P1 = Pol % 1st mill juice P2 = Pol % 2nd mill juice e = mill extraction
Weight of raw sugar	44	Obtained by weighing
POL of raw sugar	45	Polarisation of mean sugar sample
Moisture %sugar	46	Moisture of mean sugar sample

PARAMETERS AND COMPUTATION OF STATISTICAL DATA

PARAMETERS	No	METHOD
Dilution indicator (DI)	47	=(46) X 100 100- (45) -(46) Where: DI less than 35 is SAFE DI between 35-50 is DOUBTFUL DI above 50 indicates DETERIORATION DI below 25 is strong fire hazard
Weight of sucrose in raw sugar	48	(44) x (45) ÷ 100
Boiling house recovery (RHR)	49	(48) ÷ (14) X 100
Reduce Boiling House recovery (RBHR) (Purity mixed juice = 85)	50	100- { 100- (49) } purity of mixed juice 5.667 (100- pty. M.J)
Purity of mixed juice		sucrose % mixed juice X 100 Brix % mixed juice
Purity of raw sugar	51	45 x 100 100- (46)
SJM recovery (available sucrose)	52	S (J-M) X 100 J (S-M) Where: S= gravity pty raw sugar J= gravity pty mixed juice M= gravity pty molasses
Weight of available sucrose in mixed juice	53	(14) x (52) ÷100
Boiling house efficiency (BHE)	54	(48) ÷ (53) X 100
Daily estimation of raw sugar production	55	(14) x (52) x (54) x 100 '(45)
Overall recovery	56	(48) ÷ (34) x 100
Reduced overall recovery	57	(39) x (50) ÷ 100
Raw sugar extracted % cane	58	(44) ÷ (1) x 100
Sucrose extracted % cane	59	(48) ÷ (1) x 100
Weight of filter cake	60	Obtained by weighing
Sucrose (or Pol) % filter cake	61	Mean of daily analyses
Moisture % filter cake	62	Mean of daily analyses
Weight of sucrose (or pol) in filter cake	63	(60) x (61) ÷ 100
Sucrose (or pol) in filter cake %cane	64	(63) ÷ (1) x 100

PARAMETERS AND COMPUTATION OF STATISTICAL DATA

PARAMETERS	No	METHOD
Weight of final molasses	65	Obtained by weighing
Sucrose of final molasses	66	Obtained by analysis
Weight of sucrose in final molasses	67	(66) x (65) ÷ 100
Sucrose in final molasses % cane	68	(67) ÷ (1) x 100
Total real losses % cane	69	(36) - (59)
Total industrial losses % cane	70	(69) - (17)
Undetermined losses % cane	71	(70) - (64) -(68)
Total crushing hours per day	72	Daily mill crushing hours
Hours of stoppages (exclusive of cane shortage and planned stops)	73	Daily mill stoppage hours
Nett crushing hours per day	74	(72) -(73)
Tonnes cane crushed per hour	75	(1) ÷ (74)
Overall time efficiency	76	$\frac{74}{24(\text{hours})}$ x 100
Mechanical time efficiency	77	$\frac{74}{(74) + (73)}$ x100

SUMMARY OF RECOVERIES

PARAMETERS	No	METHOD
Weight of sucrose in mixed juice	4	
SJM Recovery	52	
Weight of available sucrose in mixed juice	53	(53)=(14)x(52)÷100
Weight of raw sugar	44	
weight of sucrose in raw sugar	48	(48)=(44)x(45)÷100
Boiling House Recovery, BHR	49	(49)=(48)÷(14)x100
Boiling House Efficiency, BHE	54	(54)=(48) ÷ (53) x 100
Daily estimation of raw sugar to be produced	55	(55)= $\frac{(14)x(52)\ x(54)\ x\ 100}{4.50E+01}$
Overall Recover, OR	56	(56) = (48) ÷ (34) x 100
Reduced Overall Recovery, ROR	57	(57) = (39) x (50) ÷ (100)

PARAMETERS AND COMPUTATION OF STATISTICAL DATA

SUMMARY OF LOSSES

PARAMETERS	No	METHOD
Weight of cane crushed	1	
Weight of sucrose in cane	34	
Sucrose % cane		= (34) ÷ (1) x 100
Weight of sucrose in raw sugar extracted	48	
Sucrose extracted % cane		= (48) ÷ (1) x 100
Weight of sucrose lost in filter bagasse	16	
Sucrose lost in bagase % cane		= (16) ÷ (1) x 100
Weight in sucrose lost in filter cake	63	
Sucrose lost in filter cake % cane		= (63) ÷ (1) x 100
Weight of sucrose lost in molases	67	
Sucrose lost in molasses % cane		(68) = (67)÷(1)x100

EXAMPLE FOR COMPUTING LOSSES

			Losses	
			% cane	% Sucose
	METHOD	VALUE		
Weight of cane (1)	1	3,257,000.00	0	0
Weight of sucrose in cane (34)	34	420,390.00	0	0
Weight of sucrose in raw sugar (48)	48	376,230.00	0	0
Total weight of sucrose lost	= (34) - (48)	44,160.00	1	11
Weight of sucrose lost in bagase	16	14,160.00	0	3
Weight of sucrose lost in filter cake	63	2,840.00	0	1
Weight of sucrose lost in final molasses	67	25,764.00	1	6
Total accountable sucrose losses	=(16)+(63)+(67)	42,764.00	0	0
Undetermined losses	71	1,466.00	0	0
Industrial losses	70	30,070.00	1	7