MAIZE (CLASSIFICATION AND GRADING) REGULATIONS

(*under section 19*)

(*18th June, 1976*)

ARRANGEMENT OF REGULATIONS

S.I. 80, 1976.

PART I
Preliminary (regs 1-3)

1. Citation

These Regulations may be cited as the Maize (Classification and Grading) Regulations.

2. Interpretation

In these Regulations, unless the context otherwise requires-

"10-mesh handsieve" means a handsieve with a wire mesh surface of 300 mm to 310 mm by 300 mm to 310 mm which is made of light plated steel wire with a nominal diameter of 0,45 mm and with meshes of 2,09 mm by 2,09 mm;

"20-mesh handsieve" means a handsieve with a wire mesh surface of 300 mm to 310 mm by 300 mm to 310 mm which is made of light plated steel wire with a nominal diameter of 0,30 mm and with meshes of 0,97 mm by 0,97 mm;

"defective maize kernels" means maize kernels-

(*a*) which are wizened or obviously immature, maize kernels which have a distinctly chalky texture throughout or which are mouldy or discoloured, excluding normal browning by

oxidation, discolouration limited to the connecting tip of the kernel and pinking;

(*b*) which are sprouted, including kernels of which the growing point (plumule) in the germ is visibly discoloured;

(*c*) with cavities in the germ or endosperm caused by insects or rodents;

(*d*) which are visibly contaminated by smut, soil, smoke or coal dust;

(*e*) pieces of maize kernels which pass through a screen with 6,35 mm round holes;

(*f*) which are otherwise clearly of inferior quality; and

(*g*) of cultivars other than *Zea mays indentata* or *Zea mays indurata* such as bread maize (flour-corn), popcorn, sweet corn and waxy maize;

"foreign matter" means any matter other than maize;

"maize" means the threshed seed of the plant *Zea mays indentata* or *Zea mays indurata*;

"maize kernels of another colour", in relation to-

(*a*) white maize, means maize kernels of a colour other than white, excluding pinked maize kernels;

(*b*) yellow maize, means maize kernels of a colour other than yellow, excluding pinked maize kernels;

"pinked maize kernels", in relation to-

(*a*) white maize, means maize kernels of which the endosperm is white and of which the pericarp or part thereof is of a red or pink colour;

(*b*) yellow maize, means maize kernels of which the endosperm is yellow and of which the entire surface of the pericarp is of a red colour;

"white maize" means the threshed white seed of the plant *Zea mays indentata* or *Zea mays indurata*;

"yellow maize" means the threshed yellow seed of the plant *Zea mays indentata* or *Zea mays indurata*.

3. Scope of Regulations

These Regulations shall apply to maize which-

(*a*) is either bought or sold or bought and sold by the Board commencing with the 1974/75 crop, but shall not apply to any stocks of maize held by the Board from any earlier crop;

(*b*) is imported into or exported from Botswana by the Board, but shall not apply to any exports from Botswana for which the classification or grade of maize stipulated by the foreign buyer is different from those specified herein.

PART II
Classification and Grading (regs 4-7)

4. Classes

There shall be five classes of maize, namely-

(*a*) white dent, i.e. maize consisting of not less than 90 percent (by weight) maize of the white dent type, provided it complies at least with the requirements of the Grade WD3;

(*b*) white flint, i.e. maize (other than maize of the class white dent as described in paragraph (*a*)) consisting of not less than 95 percent (by weight) white maize of any type, provided it complies at least with the requirements of the Grade WF2;

(*c*) yellow flint, i.e. maize consisting of not less than 90 percent (by weight) maize of the yellow flint type, provided it complies at least with the requirements of the Grade YF1;

(*d*) yellow flint-and-dent, i.e. maize (other than maize of the class yellow flint as described in paragraph (*c*)) consisting of not less than 95 percent (by weight) yellow maize of any type, provided it complies at least with the requirements of the Grade YM3;

(*e*) sample-grade, i.e. maize other than maize of any of the above-mentioned classes.

5. Grades

(1) The grades for the different classes of maize (excluding the class sample-grade) shall be as follows-

Class of maize
White dent .....,
WD2 and WD3
White flint
.....and WF2
Yellow flint .....
Yellow flint-and-dent .....,
YM2 and YM3.

(2) Subject to the allowable deviations prescribed in regulation 6, maize of any of the grades referred to in subregulation (1) shall comply with the requirements prescribed in subregulation (3).

(3) The maize shall be-

(*a*) free from a musty, sour or other objectionable odour;

(*b*) free from foreign matter;

(*c*) of a standard which makes it suitable for the manufacture of maize products for human consumption;

(*d*) free from defective maize kernels:

Provided that maize kernels which are chipped or cracked, or pieces of maize kernels which are in a sound condition shall not be regarded as defective maize kernels except in the case of such maize kernels and pieces of maize kernels which will pass through a 6,35 mm round-hole screen;

(*e*) free from maize kernels of another colour and pinked maize kernels; and

(*f*) free of any moisture content in excess of 12 percent (by weight).

6. Deviations

The maximum deviation from the requirements prescribed under regulation 5 which may be allowed in respect of any of the said grades shall be as follows-

		Maximum percentage (by weight) of deviation allowed								
		White dent			*White flint*		*Yellow flint*		*Yellow flint and dent*	
		WD1	*WD2*	*WD3*	*WF1*	*WF2*	*YF1*	*YM1*	*YM2*	*YM3*
(i)	Defective maize kernels	7	13	20	10	25	9	9	20	30
(ii)	Maize kernels of another colour	2	3	5	2	5	2	2	5	5
(iii)	Foreign matter (excluding stones, pieces of coal or glass and manure)	0,3	0,5	0,75	0,3	0,75	0,3	0,3	0,5	0,75
(iv)	Defective maize kernels, maize kernels of another colour, and foreign matter collectively, provided such deviations are individual within the limits specified above	7	13	20	10	25	9	9	20	30
(v)	Pinked maize kernels	12	12	12	12	12	7	7	7	7
(vi)	Moisture	2	2	2	2	2	2	2	2	2

7. Weevily maize

The designations of the respective classes and grades of maize referred to in regulations 4 and 5 shall, notwithstanding anything to the contrary, include the words "weevily maize" in the case of maize infested with live weevils or other live insects injurious to stored grain irrespective of whether such insects are present in the maize or on the containers thereof.

PART III
Packing (reg 8)

8. Packing of maize

(1) Maize shall either be bought or sold or bought and sold by the Board either in bulk or in grain bags.

(2) Grain bags in which maize is either bought or sold or bought and sold shall be new or good second-hand grain bags which-

(*a*) shall be manufactured from jute or phormium or jute and phormium;

(*b*) shall have a superficial measurement of not less than 7 484 cm^2 and not more than 8 065 cm^2 and which have been woven with porter and shot (warp and weft threads) of not less than-

(i) in the case of a jute bag and a jute-and-phormium bag, 32 warp and 32 weft threads per 100 mm;

(ii) in the case of a phormium bag, 36 warp and 40 weft threads per 100 mm; and

(iii) in the case of a B-Twill bag, 24 warp and 32 weft threads;

(*c*) are strong enough for the conveyance of 100 kg net maize and are not so weathered or worn that they will break during normal handling, or, when empty, will tear if one end is held down with the flat heel and the other end is pulled by hand;

(*d*) be clean and not stained by any colouring substance or impregnated by any liquid capable of imparting stains, excluding trade marks or normal discolouration due to exposure to the sun;

(*e*) be free from holes but may be darned with twine of which the tensile strength shall be not less than 40 newtons, or patched where necessary:

Provided that-

(i) none of the darns shall exceed 26 cm^2 and that such darns shall overlap the small holes on all sides by at least 13 mm;

(ii) the darns shall be cross-stitched by hand with jute twine or machine-darned in such a manner that the darns correspond in closeness to the weave of the bag and that the material of the bag is not pulled together, thereby causing the snapping or displacement of the strands of the bag or the darns when the bag is filled with maize;

(iii) except for not more than two patches (one on each side) of not more than 38 mm by 254 mm each allowed at the mouth of the bag to cover cuts and affixed as indicated in paragraph (v), none of the other patches shall exceed 39 cm^2;

(iv) patches, whether stitched or affixed with an adhesive, shall not overlap;

(v) patches shall be properly hand-sewn to the bags with jute twine or properly machine-darned over the entire surface of the patch with twine, the tensile strength of which shall be not less than 40 newtons;

(vi) patches affixed with an adhesive shall be properly affixed and will not be allowed to be closer than 150 mm from the mouth of the bag; and

(vii) bags of which the mouth sections have been replaced shall not be acceptable.

PART IV
Calculation and Testing Methods (regs 9-12)

9. Sampling and determination of defects

In the determination of the grade of maize, the following methods shall be followed-

(*a*) *Sampling.*

Samples of maize to be graded shall be taken in such manner as to be representative of such maize-

(i) in the case of maize in bags, this shall consist of withdrawing, by means of a hollow spear-probe, samples from not less than 10 percent of the bags in any one

lot, chosen at random, except that no total sample in respect of any one lot shall weigh less than 500 grammes;

(ii) in the case of static bulk maize, this shall consist of withdrawing, by means of a bulk grain-probe, samples from various points and from various depths, chosen at random, of the bulk;

(iii) in the case of moving bulk maize, this shall consist of taking samples from the moving stream of grain at regular intervals whilst the grain is in motion;

(iv) samples drawn in the manner prescribed in subparagraphs (i), (ii) and (iii) shall be thoroughly mixed either by hand or by Boerner Sampler to ensure an homogeneous sample before being submitted to analysis for grading.

(*b*) *Determination of percentage (weight by weight) of defective maize kernels*-

The percentage (weight by weight) of defective maize kernels shall be determined by screening a sample of 100 grammes (taken in the manner prescribed in paragraph (*a*)) through a screen with 6,35 mm round holes and hand-picking the remaining portion and by calculating the weight of the defective maize kernels thus hand-picked together with that of the pieces of maize kernels and maize kernels which passed through the screen as a percentage of the total weight of the 100 grammes samples.

(*c*) *Determination of percentage (weight by weight) maize kernels of another colour*-

The percentage (weight by weight) maize kernels of another colour shall be determined by separating by hand from a sample of 200 grammes (taken in the manner prescribed in paragraph (*a*)) the maize kernels of another colour and by calculating the weight of such maize kernels of another colour as a percentage of the total weight of the sample.

(*d*) *Determination of percentage (weight by weight) of foreign matter*-

The percentage (weight by weight) of foreign matter shall be determined by separating by hand from a sample of at least 200 grammes (taken in the manner prescribed in paragraph (*a*)) the foreign matter and by calculating the weight of such foreign matter as a percentage of the total weight of such foreign matter as a percentage of the total weight of the sample.

(*e*) *Determination of percentage (weight by weight) of pinked maize kernels*-

The percentage (weight by weight) of pinked maize kernels shall be determined by separating by hand from a sample of 100 grammes (taken in the manner prescribed in paragraph (*a*)) the pinked maize kernels and by calculating the weight of such pink maize kernels as a percentage of the total weight of the sample.

10. Determination of weight of samples

The scale used for the determination of the weight of a sample of maize or other coloured kernels or of pinked maize kernels or of defective maize kernels or of foreign matter in the sample shall be such that the relevant weight can be accurately determined to within 0,5 grammes.

11. Determination of net weight of maize

The net weight of maize in grain bags shall be calculated by subtracting from the gross weight of the maize 1,1 kg per each bag plus the weight represented by moisture in excess of 12 percent (weight by weight) in the maize (if the moisture content of the maize at the time of sale exceeds 12 percent (weight by weight)).

12. Determination of moisture content

The moisture content of a quantity of maize shall be determined by the Marconi electrical resistance method, as follows-

The apparatus for moisture determination shall consist of the Marconi Moisture Meter Model TF 933 or TF 933A or TF 933B by which moisture content in maize is determined through electrical resistance. The apparatus shall be placed away from draughts and the direct rays of the sun in a permanent position in a room or store where all moisture

determinations shall be carried out. A Celsius thermometer shall be attached to the outside of the instrument case of the apparatus so that the thermometer bulk is fully exposed to the free air in the room or store.

A quantity of not less than 70 grammes and not more than 80 grammes of a representative sample of the maize to be tested for moisture (taken in the manner prescribed in regulation 9(*a*)) shall be ground in a hand grain mill or coffee mill which has been so adjusted that at least 90 percent (weight by weight) of the ground product will pass through a 10-mesh sieve and not more than 75 percent (weight by weight) thereof will pass through a 20-mesh sieve. (This result can generally be obtained by adjusting the grinding plates as tightly as possible and then loosening the latter about one-quarter turn.) The mill shall be operated at a uniform speed which allows the entire sample to be ground in a period of not less than 30 seconds and not more than 90 seconds. The ground sample shall immediately be transferred to a screw-up glass jar of between 300 ml and 400 ml capacity. After the jar has been properly closed by screwing the cap on tightly, the contents shall be thoroughly mixed by shaking the jar for at least 30 seconds. Immediately thereafter the test cell of the Marconi apparatus shall be filled approximately half full with the ground sample, and the metal plunger shall be placed in position on it. Care shall be taken to ensure that the surface of the sample is level in the cell and that the parts of the cell fit properly into one another. The cell shall be handled only by the outer insulating material surrounding it. Immediately thereafter the cell (with the metal plunger facing upwards) shall be fitted into the clamp which forms part of the Marconi apparatus and screwed tight until the two parts of the cylindrical spring housing mounted on the screw are flush. The clamp containing the cell shall have a proper electric contact with the main apparatus. The switch shall now be turned to the "zero" position, and the galvanometer pointer shall thereafter be adjusted by means of the "Setzero" knob above the dials until the pointer is exactly opposite the horizontal line. When setting to zero, the left-hand dial shall be at any one of the positions 1 to 5. The switch shall then be turned to the "Read" position and the dials immediately adjusted until the galvanometer pointer returns to the position of the horizontal line.

The dial reading shall now be taken and the temperature be read (to the nearest degree) from the thermometer attached to the main apparatus. Any gradual movement of the pointer, after having been correctly adjusted, shall be disregarded. Not more than one minute shall elapse between the placing of the samples in the cell and the taking of the final dial reading. Whenever possible, readings shall only be taken on the black or positive values on the dials. Dial reading shall be converted into percentages according to the following table-

Dial reading	*Percentage*	*Dial reading*	*Percentage*
0	8,6	26	13,1
1	8,8	27	13,4
2	8,9	28	13,6
3	9,0	29	13,8
4	9,2	30	14,0
5	9,3	31	14,2
6	9,5	32	14,5
7	9,6	33	14,7
8	9,8	34	14,9
9	10,0	35	15,1
10	10,1	36	15,4
11	10,3	37	15,7
12	10,5	38	16,0
13	10,6	39	16,3
14	10,8	40	16,6

15	11,0	41	16,8
16	11,2	42	17,1
17	11,3	43	17,4
18	11,5	44	17,7
19	11,7	45	18,0
20	12,0	46	18,3
21	12,2	47	18,6
22	12,3	48	19,0
23	12,5	49	19,4
24	12,7	50	19,9
25	12,9	51	20,3

The result thus obtained shall be corrected for temperature by increasing it by 0,1 percent for each degree Celsius that the temperature reading is below 20℃ and by decreasing it by 0,1 percent for each degree Celsius that the temperature is above 20℃. The test shall be carried out in duplicate without interruption with separate quantities of the original ground sample, and if the two results thus obtained do not differ by more than 0,3 the average of the two results shall be taken as the percentage moisture content of the maize from which the sample was taken. If the results of the two determinations differ by more than 0,3 the determination shall be repeated with further quantities of the original ground sample until two results are obtained which do not differ by more than 0,3. Care shall be taken that the mill used for the grinding of the sample, the jar used for mixing the sample and the pressure cell of the apparatus are clean and dry before each determination is commenced. The moisture meter shall be in equilibrium with the temperature of the ambient air in order to obviate the generation of thermo-electric currents in the instrument which may cause errors in the dial reading. For this reason it is imperative that the moisture meter shall remain in one position for an appreciable time before a moisture test is carried out. If for some special reason the moisture meter has to be moved to another position or some other locality, it should be left undisturbed for at least one hour in the new position to allow the instrument to come into thermal equilibrium with the ambient air before a moisture test is carried out. If it is not possible to affix the thermometer to the case of the instrument, it should be placed in a convenient horizontal position on top of the apparatus at least 15 minutes before a moisture test is started. In those cases, too, where the thermometer can be affixed to the apparatus but does not remain in that position permanently, it should be placed in that position at least 15 minutes before the commencement of a moisture test.

When a moisture determination is made by means of this method, it shall be ensured that the apparatus is in good working order by short circuiting the two topmost sockets on the main apparatus with a short piece of wire and turning the switch to "zero" and adjusting the galvanometer pointer until it is opposite the horizontal line. After the switch has been turned to "Read", the reading on the dials, taken in the manner described above, should be approximately 60.

The wire shall then be removed. Thereafter the clamp shall be connected electrically with the main apparatus, as described above, the switch turned to "zero", the galvanometer pointer adjusted to the position opposite the horizontal line and the base of the test cell kept in its normal position in the clamp. A piece of metal wire or silver paper (tin foil) shall be placed across the exposed electrodes (the metal parts) of the test cell and pressed down so as to cause a short circuit. After the switch has been turned to "Read", the dial reading, taken in the manner described above, should be approximately 60. Thereafter the base and the insulator ring of the test cell shall be placed in the clamp and screwed down without the plunger until they just fit tightly, the switch turned to "zero" and the galvanometer pointer adjusted to the position opposite the horizontal line. After

the switch has been turned to "Read" the reading on the dials in this instance will be nil or lower, but if the reading is higher than nil the base of the test cell may be exposed to sunlight or reasonably warm air for a few minutes and the test repeated.