SORGHUM (CLASSIFICATION AND GRADING) REGULATIONS

(*under section 19*)

(*18th June, 1976*)

ARRANGEMENT OF REGULATIONS

S.I. 81, 1976.

PART I
Preliminary (regs 1-3)

1. Citation

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

2. Interpretation

In these Regulations, unless the context otherwise requires-

"bulk probe" means a double tube probe with multiple openings on the same side of both tubes;

"defective sorghum" means-

(*a*) pieces of grain sorghum; or

(*b*) grain sorghum-

(i) which is broken, rotten, mouldy, smutty, or otherwise diseased;

(ii) of which the embryo skin is cracked;

(iii) which has a green colour or shows other signs of immaturity;

(iv) which has been damaged by insects, heat or any other means, but does not include weather-stained sorghum;

(v) which passes through a 1,8 mm slotted sieve;

"foreign matter" means all material other than sorghum such as sticks, stones, clods, dung, chaff, other portions of the sorghum plant, other plants and seed kernels of other plants;

"grain sorghum" means the threshed seed of the plant *Sorghum vulgare* excluding broom corn, hay sorghums and sweet sorghums;

"**1,8 mm slotted sieve"** means a sieve made of metal of 1 mm thickness which complies with the following specifications-

(*a*) the inner measurements of the sieve shall be 200-210 mm in length and 200-210 mm in width and at least 50 mm deep;

(*b*) the sieve shall have 8 parallel rows of slotted perforations measuring 20 mm in length and 1,8 mm width;

(*c*) the slotted perforations in the different rows shall run in columnar formation and not in chess board formation;

(*d*) the ribs between the slotted perforations in the same row shall be 2,4 mm wide; and

(*e*) the sieve shall fit into a solid bottom pan;

"**10-mesh handsieve"** means a handsieve with a wire mesh surface of 300-310 mm by 300-310 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 300-310 mm by 300-310 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;

"red", in relation to grain sorghum, means that the colour of the pericarp ranges from yellow through pink, red to reddish brown, irrespective of any purplish anthocyanic blotches in or on the pericarp;

"sorghum of another colour", in relation to-

(*a*) white sorghum, means sorghum of a colour other than white, irrespective of purplish anthocyanic blotches in or on the pericarp, or which has a dark nucellar layer;

(*b*) red sorghum, means sorghum of a colour other than one ranging from yellow through pink, red and reddish brown, irrespective of purplish anthocyanic blotches in or on the pericarp, or which has a dark nucellar layer;

"unthreshed sorghum" means sorghum or pieces of sorghum still enclosed in glumes;

"weather-stained sorghum" means sorghum of which more than one-third of the surface is distinctly discoloured by the weather:

Provided that purplish anthocyanic blotches in or on the pericarp shall not be regarded as discolouration by the weather;

"weevily sorghum" means sorghum infested with live weevils or other live insects injurious to stored grain, irrespective of whether such insects are present in the sorghum or on the containers thereof;

"white", in relation to grain sorghum, means that the colour of the pericarp does not display any of the shades of colour ranging from yellow through pink, red to reddish brown, irrespective of any purplish anthocyanic blotches in or on the pericarp.

3. Scope of Regulations

These Regulations shall apply to grain sorghum 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 sorghum 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 sorghum stipulated by the foreign buyers is different from those specified herein.

PART II

Classification and Grading (regs 4-8)

4. Classes

There shall be four classes of grain sorghum, namely-

(*a*) white sorghum, i.e. sorghum consisting of not less than 90 percent (weight by weight) white sorghum, irrespective of any purplish anthocyanic blotches in or on the pericarp, and which does not have a dark nucellar layer provided that it complies at least with the Grade SW2;

(*b*) red sorghum, i.e. sorghum consisting of not less than 90 percent (weight by weight) sorghum of any colour ranging through yellow, pink, red and reddish brown, irrespective of any purplish anthocyanic blotches in or on the pericarp, and which does not have a dark nucellar layer, provided it complies at least with the Grade SR2;

(*c*) mixed sorghum, i.e. sorghum consisting of not less than 90 percent (weight by weight) sorghum of any colour and which does have a dark nucellar layer, provided it complies at least with the Grade SM3; and

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

5. Grades

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

Class of sorghum

White sorghum

.....and SW2

Red sorghum .....and

SR2

Mixed sorghum .....,

SM2 and SM3.

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

(3) The sorghum shall-

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

(*b*) be free from foreign matter;

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

(*d*) be of the colour of the respective class;

(*e*) not contain weather-stained sorghum;

(*f*) not contain sorghum of another class;

(*g*) be free from defective sorghum;

(*h*) be free from unthreshed sorghum;

(*i*) not be distinctly blackened by smut or not contain 10 or more smut balls or parts of smut balls which are collectively equivalent to 10 or more smut balls per 100 grammes of sorghum;

(*j*) be free from live weevils or other live insects injurious to stored grain, irrespective of whether such insects are in the sorghum or on the containers thereof;

(*k*) be free from poisonous chemical substances which may render such sorghum unsuitable for human or animal consumption; except if such sorghum is intended for seed purposes and the container in which the seed is packed is clearly marked to indicate that it contains sorghum which has been treated with a chemical substance; and

(*l*) have a moisture content not exceeding 12 percent (weight 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 (weight by weight) deviations allowed						
Grade	*Defective sorghum*	*Unthreshed sorghum*	*Sorghum of another colour*	*Sorghum of other classes*	*Foreign matter*	*Weather Stained sorghum*	*Moisture*
SW1	5,0	4,0	4,0	4,0	1,5	50	2,0
SW2	10,0	8,0	8,0	8,0	2,0	50	2,0
SR1	5,0	4,0	4,0	4,0	1,5	50	2,0
SR2	10,0	8,0	8,0	8,0	2,0	50	2,0
SM1	5,0	8,0	[i]+	[ii]+	1,5	50	2,0
SM2	10,0	12,0	[iii]+	[iv]+	2,0	50	2,0
SM3	20,0	20,0	[v]+	[vi]+	3,0	50	2,0

7. Sample grade sorghum

Grain sorghum which does not comply with the requirements of regulations 5 and 6 or which contains *Datura spp*. seed shall be sample grade sorghum.

8. Weevily sorghum

The designations of the respective classes and grades of sorghum referred to in regulations 4 and 5 shall, notwithstanding anything to the contrary, include the words "weevily sorghum" in the case of sorghum infested with live weevils or other live insects injurious to stored grain, irrespective of whether such live insects are present in the sorghum or on the containers thereof, provided that the word "weevily" shall be added to and made part of the class designation.

PART III
Packing (reg 9)

9. Packing of sorghum

(1) Sorghum 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 sorghum is either bought or sold or bought and sold shall be new or good second-hand grain bags which-

(*a*) are manufactured from jute or phormium or jute and phormium;

(*b*) have a superficial measurement of not less than 7484 cm^2 and not more than 8065 cm^2 and which have been woven with porter and shot (warp and weft threads) of not less than-

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

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

(iii) in the case of B-Twill bags, 24 warp and 32 weft threads per 100 mm;

(*c*) are strong enough for the conveyance of 100 kg net sorghum 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 sorghum;

(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 10-13)

10. Sampling and determination of defects

In the determination of the grade of sorghum the following methods shall be employed-

(*a*) *Sampling*-

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

(i) in the case of sorghum in bags, this shall consist of withdrawing, by means of a hollow spear-probe (Trier), 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 sorghum, this shall consist of withdrawing samples, by means of a bulk grain-probe from various points and from various depths, chosen at random, of the bulk;

(iii) in the case of moving bulk sorghum, 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 Sample Divider to ensure an homogeneous sample before being submitted to analysis for grading.

(*b*) *Determination of percentage (weight by weight) of defective sorghum*-

The percentage (weight by weight) of defective sorghum shall be determined in the following manner:

Take a sample of 50 g of grain sorghum, obtained in the manner prescribed in paragraph (*a*), from which all foreign matter and unthreshed grain sorghum has been removed before determining the weight thereof. Place the grain sorghum in the 1,8 mm slotted sieve already placed in position on the pan. Screen the grain sorghum by moving the sieve to and fro, alternately away from and towards the operator, the direction of the motion being kept in line with the long axis of the slotted perforations of the sieve. Each to and fro movement constitutes one stroke and 30 such strokes complete the screening process. In each stroke the sieve is moved 230 mm to 305 mm away from and back to the operator, with the sieve resting on a table or other suitable smooth surface. The speed of the stroke movement shall be such that the prescribed 30 strokes are completed in 25 to 30 seconds. Hereafter the defective grain sorghum is separated by hand from the portion that remained in the sieve, including the grain

sorghum and pieces of grain sorghum sticking in the slotted perforations of the sieve. The weight of the defective grain sorghum thus separated by hand together with the grain sorghum and pieces of grain sorghum that passed through the sieve is then calculated as a percentage of the total weight of the sample.

(*c*) *Determination of unthreshed sorghum-*

The percentage of unthreshed sorghum shall be determined by separating by hand from a sample of 50 g, obtained in the manner prescribed in paragraph (*a*), and from which all the foreign matter has been removed before weighing, all unthreshed sorghum, and by calculating the weight of the unthreshed sorghum thus obtained as a percentage of the total weight of the sample.

(*d*) *Determination of sorghum of another colour-*

The percentage of sorghum of another colour shall be determined by separating by hand from a sample of 50 g, obtained in the manner prescribed in paragraph (*a*), and from which all the foreign matter, unthreshed sorghum and defective sorghum have been removed before weighing, all sorghum of another colour and by calculating the weight of the sorghum of another colour thus obtained as a percentage of the total weight of the sample.

(*e*) *Determination of sorghum of another class-*

The percentage of sorghum of another class shall be determined by separating by hand from a sample of 50 g, obtained in the manner prescribed in paragraph (*a*), and from which all the foreign matter, unthreshed sorghum and defective sorghum have been removed before weighing, all the sorghum of other classes, and by calculating the weight of the sorghum of other classes thus obtained as a percentage of the total weight of the sample.

(*f*) *Determination of foreign matter-*

The percentage of foreign matter shall be determined by separating by hand from a sample of 100 g, obtained in the manner prescribed in paragraph (*a*), all foreign matter, and by calculating the weight of the foreign matter thus obtained as a percentage of the total weight of the sample.

(*g*) *Determination of weather-stained sorghum-*

The percentage of weather-stained sorghum shall be determined by separating by hand from a sample of 25 g, obtained in the manner prescribed in paragraph (*a*), and from which all the foreign matter, unthreshed sorghum and defective sorghum have been removed before weighing, all the weather-stained sorghum, and by calculating the weight of the weather-stained sorghum thus obtained as a percentage of the total weight of the sample.

11. Anthocyanic blotches

The presence of purplish anthocyanic blotches in or on the pericarp shall be deemed not to affect the colour of sorghum which is otherwise white or red.

12. Determination of weights

The scale used for the determination of any weight for the purpose of grading shall be such that the relevant weights can be accurately determined to within one-half of a gramme.

13. Determination of moisture content

The moisture content of a quantity of sorghum 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 sorghum 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 bulb is fully

exposed to the free air in the room or store.

A quantity of not less than 100 g and not more than 110 g of a representative sample (obtained in the manner prescribed in regulation 10(*a*)), of the sorghum to be tested for moisture content, shall be ground in a hand grain mill or coffee mill which has been so adjusted that at least 90 percent by weight of the milled product will pass through a 10-mesh hand sieve and not more than 75 percent by weight thereof will pass through a 20-mesh hand sieve. (This result can generally be obtained by adjusting the milling plates as tightly as possible by means of the adjusting screw and then by loosening the latter about one-quarter turn.) The mill shall be operated at a uniform speed which allows the entire sample being ground in a period of not less than 30 seconds and not more than 60 seconds. The milled sample shall immediately be placed in a screw cap glass jar of between 350 and 450 cubic centimetres capacity. After the jar has been 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 milled sample and the metal plunger shall be placed into 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 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 eventual 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*
1	10,0	10	11,5
2	10,2	11	11,7
3	10,3	12	11,8
4	10,5	13	12,0
5	10,6	14	12,2
6	10,8	15	12,4
7	11,0	16	12,6
8	11,1	17	12,8
9	11,3	18	13,0

19	13,2	33	16,4
20	13,4	34	16,6
21	13,6	35	16,9
22	13,8	36	17,2
23	14,1	37	17,5
24	14,3	38	17,8
25	14,5	39	18,0
26	14,7	40	18,3
27	15,0	41	18,6
28	15,2	42	18,9
29	15,4	43	19,3
30	15,6	44	19,6
31	15,9	45	19,9
32	16,1		

The result thus obtained shall be corrected for temperature by increasing it by 0,1 for each degree centigrade that the temperature reading is below 20 °C. and by decreasing it by 0,1 for each degree centigrade the temperature reading is above 20 °C.

The test shall be carried out in duplicate without interruption with separate quantities of the original milled 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 sorghum 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 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.

When a moisture determination is made by means of this method it should be seen to 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 would 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 after which the test shall be repeated.