RWANDA STANDARD

DRS 230

Second edition

2019-mm-dd

(Reaffirmed 2019-mm-dd)

Post Harvest Handling and Storage (PHHS) of milled rice — Guidelines

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ICS 65.040.20

Reference number

DRS 230: 2019

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 230 was prepared by Technical Committee RBS/TC 3, Cereals, pulses, legumes and cereal products.

Committee membership

The following organizations were represented on the Technical Committee on Cereals, pulses, legumes and cereal products (RBS/TC 3) in the preparation of this standard.

Paragraph of participants

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Rwanda Standards Board (RSB) – Secretariat

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Introduction

Post harvest losses for wheat can occur at many points after harvest during drying, threshing, shelling, winnowing, sorting, aggregation, transport and storage. Reducing post-harvest losses can increase the volume and value of grains within the market and available for consumption and sale.

This standard has been developed to take into account:

a) the needs of the market for the quality wheat grains;

b) the need to facilitate fair domestic, regional and international trade and prevent technical barriers to trade by establishing a common trading language for crop producers, buyers and sellers;

c) the needs of the producers in gaining knowledge of market standards, conformity assessment and post harvest handling;

d) the need to transport the product in a manner that ensures keeping of quality until it reaches the consumer;

e) the quality and safety parameters of the product should meet before they are put on the market; and

f) the need to promote good agricultural practices that will enhance wider market access, involvement of small-scale traders and hence making farming a viable means of generating income

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Post Harvest Handling and Storage (PHHS) of milled rice (oryza *ssp.*) — Guidelines

1 Scope

This Draft Rwanda Standard specifies the guidelines for Post Harvest Handling and Storage (PHHS) of milled rice (Oryza *spp*.).

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.

1) RS 218, *Warehouse for bagged storage of cereals and pulses — Requirements*

2) RS 231, *Guidelines for storage of grains and pulses with practical recommendations*

3) RS EAS 128, *Milled rice – Specification*

3 Terms and definitions

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

3.1

milled rice

whole or broken kernels of rice (Oryza spp) from which the hulls and at least the outer bran layers have been removed

3.2

harvesting

operation of gathering the crop with matured earheads

3.3

threshing

operation of separating the grains from the crop with matured earheads using manual or power operated thresher

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3.4

winnowing

operation of separating the clean and matured grains from the threshing wastes like chaffy, immature grains, soil particles and other foreign materials

3.5

drying of grains

operation during which the threshed grains are dried to the safe storage moisture content of 13% so as to undergo the next operations of cleaning, packaging and storage

3.6

parboiling

pre-milling operation of soaking the paddy in water, steaming and drying to impart hydrothermal treatment to paddy so as to retain all the nutrients

3.7

parboiled milled rice

milled rice in which the starch has been gelatinized by soaking, steaming, and drying

3.8

grain cleaning

operation of separating the clean and matured grains from the milling wastes like hull, stones, immature grains, soil particles and other foreign materials

3.9

destoning

rice is passed through a specific gravity table that separates the product by density. Stones are separated from the rice

3.10

husking

husk is removed from the paddy by passing the paddy through two tightly pressing spinning rubber roles in which one roll is spinning faster than the other

3.11

bran

by product from rice milling consisting of the outer (pericarp) layers of the kernel with part of the germ

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3.12

foreign matter

all organic and inorganic material other than rice grains, broken kernels, other grains and filth

3.13

moisture content

amount of moisture in the grain expressed as percentage of the total weight of the sample on wet basis

3.14

storage management

storage management includes the prophylactic treatment using the spraying of chemicals and the curative treatments like fumigants and insecticides

3.15

transportation

process of moving of paddy/rice from one location to other location during different unit operations of post harvest handling

3.16

post harvest losses

measurable quantitative and qualitative loss of rice occurred during the various post harvest operations like harvesting, shelling, drying, cleaning, transporting and storage.

4 Requirements

Throughout the whole process of PHHS the following should be considered:

g) the products being handled shall comply with RS EAS 128;

h) hygiene conditions shall be maintained throughout the whole process of PHHS;

i) materials and equipment used shall comply with the requirements of relevant Rwanda standards;

j) chemicals and their use shall comply with national standards and regulations; and

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5 Specific guidelines

5.1 Pre-harvesting

Farmers should be well prepared for the harvesting of paddy by arranging labours, harvesting tools, drying and threshing yard, store room, protecting the grain in the field from birds etc. Some of the guidelines for pre-harvesting are:

a) prior to the harvest, it is important that farmers are already prepared for their postharvest activities and they should ensure that:

   1) the equipment needed for their harvest and post harvest activities is available and in good working condition;

   2) they have identified the place of important activities like drying and threshing yard;

   3) there will be sufficient storage space for the crop;

   4) the grain stores and used sacks have been thoroughly cleaned and disinfected; and

   5) the residues of the old harvest (last season's crop) has been removed from all cracks and crevices and disposed in a hygienic manner.

b) farmers should ensure the timely harvest of the paddy crop to avoid losses and the following should be considered:

   1) the time of harvesting can be identified by the change of colour of the plant from green to yellow showing the maturity of grains;

   2) do not wait for stalks and leaves to dry because they remain green in some of the hybrid and composite varieties;

   3) drain out the water from paddy field about a week or 10 days before the expected harvesting time, which helps in employing mechanical harvesters;

   4) paddy cultivated for obtaining kernels (grains) should be harvested when the kernels are physiologically matured with 22 % - 25 % of moisture content; and

   5) farmers can open a paddy in the field itself and test the hardness, size, shape and maturity of the grain inside the paddy and decide the time of harvesting.

c) avoid pest infestation prior to harvesting; and

d) when paddy is in the stage of ready to harvest, the problem of eating of the grains by the birds should be controlled to minimize post harvest losses, the following measures should be followed in different unit operations.

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5.2 Harvesting

Harvesting activity shall be done as follows:

a) the paddy crop is to be cut at the stalk 5 cm - 7 cm above the ground level;

b) paddy should be harvested when the grains are hard and matured with optimum moisture percentage of 20 % - 25 % to avoid field loss of grains by shattering;

c) harvesting before maturity means a low milling recovery and also a higher proportion of immature seeds, high percentage of broken rice, poor grain quality and more chances of disease attack during storage of grain;

d) delay in harvesting results in grain shattering and cracking of rice in the husk and expose the crop to insects, rodents, birds and pests attack, as well as lodging;

e) avoid harvesting during wet weather conditions;

f) harvesting should be done by adopting proper method and avoid missing of the secondary tiller panicles;

g) the harvested crop should be tied into a bundle and carry it to threshing yard without much transportation loss;

h) harvested material shall be protected from the rain and excessive dew by covering;

i) harvested paddy should be kept separately for each variety, to get true to type variety (grains);

j) harvesting too much dried paddy crop leads to more field and transportation losses;

k) the contact of the earheads with soil shall be avoided as it can be source of contamination or attack by insects; and

l) harvested rice crop should be transported immediately to the threshing yard.

5.3 Threshing

Threshing shall be done as follows:

a) the machine used for threshing shall comply with Rwanda relevant standards

b) threshing may be done by manual methods like beating the earheads with wooden sticks on a clean floor or by power operated multi crop thresher for large quantities;

c) techniques that cause damage to the grains such as severe beating with sticks shall be avoided to prevent the damage of grains;

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d) when power operated power operated threshers are used, the clearance between the concave and cylinder should be adjusted so that the percentage of broken grains shall be avoided;

e) power operated thresher should have operator safety arrangements like the belt and pulley guard as per the relevant standard; and

f) threshing machine should not be a source of contamination including by rust, paint, grease etc,.

5.4 Drying of grain

The following shall be considered in drying of milled rice:

a) the drying of the grains shall be done immediately after threshing;

b) the rice grains shall be dried to 13.5 % moisture content prior to packaging and storing;

c) the drying area (concrete floor, mat, etc) shall be clean and not be a source of contamination to the grains; and

d) where heated air is used to dry the grains, temperature and drying time shall be synchronized so that they do not result in adverse effect on the nutritional composition and quality of the grains in its intended use.

5.5 Cleaning and sorting

Cleaning may be done manually or by using machine:

a) when power operated cleaning machine is used, care should be taken by adjusting the fan speed to reduce the loss of grain in the chaffy outlet;

b) the grains shall be aspirated to remove all the straws, chaff and leafy vegetative matter;

c) defective (mouldy, discoloured, shrivelled, rotten, broken, insect damaged, etc) grains shall be removed;

d) sorting shall be done before grading and any treatment; and

e) grading shall be in accordance with RS EAS 128.

5.6 Packaging

Milled rice shall be packaged according the following:

a) rice shall be packaged in clean and food grade packaging materials;

b) rice shall be packed in containers which will safeguard the hygienic, nutritional, and organoleptic qualities of the products;

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c) each package shall contain rice grains of the same type and of the same grade designation;

d) packaging container shall be free from pests and contaminants; and

e) each container shall be securely closed.

5.7 Transportation

Transportation of soybeans shall consider the following:

a) the grains may be transported in vehicle itself (bulk) or in transportable container then the vehicle and container shall be clean, dry and free from undesirable odours and infestation;

b) rice grain should be handled and transported in such a way so that they remain well protected from sun, rain or other sources of excessive heat, objectionable odour and from any type of cross infestation;

c) if the vehicle is not fully enclosed, it should have a covering such as tarpaulin to keep out of the rain or any form of water

d) transported grains should be well ventilated with dry air to remove moisture resulting from respiration of the grains and to prevent moisture condensation; and

e) transportation of rice grains with chemicals and products in liquid form shall be avoided.

5.8 Storage

Storage facility and management should be in such ways that preserve the safety and quality of rice grains and shall comply with RS 231 and RS 218.

6 Major storage pests and their control measures

Measures should be taken to control insect infestation using either physical, chemical, mechanical or biological means or combinations of these methods. The prevalent storage pest and their control measures are given in Annex A

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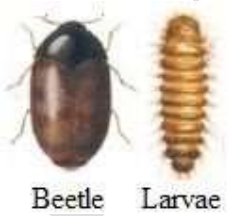
Annex A
(normative)

Major storage pests and their control measures for milled rice

The damages of major stored grain pests of rice along with their control measures are given below:

Name of pest and figure of pest	Damage	Control measures
1. Rice weevil *Sitophilus oryzae (Linn.)* 	Adults and Larvae both bore into grains and feed on the grains	Two types of treatments are followed to control the infestation **A)Prophylactic treatment.** Use following Insecticides to prevent infestation in godown and stock of paddy/rice. **Malathion (50 % E.C.):** Mix 1 litre in 100 Liter of water. Use 3 litre prepared solution per 100 square meter area. **D.D.V.P. (76 5 E.C.):** Mix 1 litre in 150 litre of water. Use 3 litre prepared solution per 100 square metre area. Do not spray on stock. Spray on walls and floors of the godown as and when required or once in a month. **3 Deltamethrin (2.5 % WP) :** Mix 1 kg. In 25 litre of water. Use 3 litre prepared solution per 100 square metre area. Spray on gunny bags after 3 months interval.
2. Lesser grain borer *Rhizoperth dominica (fabr.)* 	Beetles and larvae both penetrate the grain and feed. Sometimes, larvae feed on the waste flour produced by the adults. Heavy infestation makes the grain warm and moist, which leads to mould formation. It eats maily paddy kernels but may also damage milled rice.	
3. Khapra beetle *Trogoderma granarium*  	Larvae are a serious stored pest but the beetle itself does not damage. First the larvae feed germ portion and later other parts of the grains	
4. Saw toothed grain beetle *Oryzaephilus surinamensis (Linn.)*	Both beetle and larvae feed broken grains and damaged grains of other insects. They are usually found as a secondary pest together with other grain pests.	

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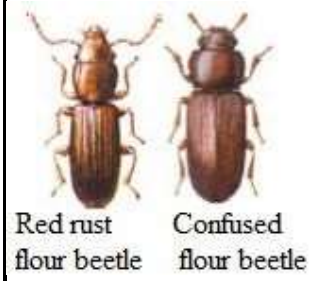
5. Red rust / Confused flour beetle *Tribolium castaneum (Herbst.) Tribolium confusum (J.du V.)*  	Beetle and larvae both do not cause damage to whole grain but feed on broken and damaged grains produced by milling and handling or infested / damaged grains of other insects	B) CURATIVE TREATMENT: Use following fumigation insecticide to control infested stock / godown of paddy/rice in airtight condition. **1. Alluminium Phosphide:** For stack fumigation use 3 tablets/tonne and put polythene cover on infected stock. For godown fumigation, use 120 to 140 tablets per 100 cubic metre area and keep godown structure airtight and closed for 7 days.
6. **Tropical ware house moth** *Ephestia cautella* (walk) 	The moth is usually found in warehouses. The larvae feed on damaged or processed grains leaving the whole grains undamaged. In heavy infestation, larvae cover all available surface with webbing.	
7. **Rice moth** Corcyra *cephalonica* (Staint) 	Larvae feed broken and processed paddy/rice. Larvae produce dense webbings. Whole grain kernels are bound into lumps.	

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8. Rodents 	Rodents eat whole grains, broken grains, flour etc. They spill more grains than they eat. Rodents also contaminate rice grains with hair, urine and feces, which cause diseases like	**Rat cage :** Different types of rat cages are available in the market. Rates caught in cage can be killed by
	cholera, food poisoning, ringworm, rabies etc. They also damage the storage structures and other accessories of store like wire and cable etc.	dipping in water. **Poison baits :** Anti-coagulant pesticide like zinc phosphate is mixed with bread or any other food stuff used as bait. Baits are kept for a week. **Rat burrow fumigation:** Tablets of Aluminum phosphate are put in each hole and burrow and holes are blocked by mud mixture to make airtight.

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