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QUALITY MANAGEMENT IN RICE PRODUCTION

Farmers Guide

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QUALITY MANAGEMENT IN RICE PRODUCTION

The demand for higher quality rice increases as economies in the country grow. However, the quality and safety of produced paddy and milled rice is low due to inappropriate management techniques in all aspects of grain production and postproduction handling; including harvesting, threshing, drying and milling. So far there has been little emphasis on quality management in the pre- and post-production phases, and majority of key players are not aware of the general principles for maintaining grain quality.

These principles involve good land preparation (appropriate tillage , good levelling) and other agronomic practices such as use of good quality seed ; disease, weed and pest control; appropriate fertilizer application ; appropriate soil and water management that take into account the needs of all developmental stages of the crop; and management of grain moisture content throughout the post-production system to prevent grain damage, by timely drying paddy to 14% moisture content (MC) to minimise grain spoilage, and by avoiding reabsorption of moisture during storage to prevent fissuring.

As a result, the rice business environment is characterized by a lack of transparency in transaction costs and volumes, quality standard enforcement, farm-to-market traceability and enforcement of regulations. This environment leads to several malpractices such as smuggling and blending of different local varieties or with imported rice. These practices undermine trust and create significant inefficiencies within the chain thereby making local rice less competitive than imported rice.

Safety considerations are also often ignored. Yet without appropriate postharvest management, especially inadequate drying and storage, instances of microorganisms, yeasts and moulds are encountered. These cause significant quantity and quality losses and health hazards. The Tanzania Bureau of Standards (TBS), in accordance with the East Africa Standard, has issued specifications (TZ 1675:2014 – EAS 764:2013 ICS: 67.060 and TZS 592:2014 – EAS 128: 2013 ICS: 67.060) which if enforced, would guarantee the safety and quality of the marketed rice. Failure to implement these standards is associated with lack of awareness and absence of control and enforcement mechanisms – internal quality control systems/ quality management systems (QMS).

Food safety and QMS schemes in the agro-food chain are new systems that are less recognized in the country. Knowing the potential to undermine the integrity of Tanzania food and agricultural produce and impede competitiveness, a QMS manual for the rice has been developed based on the good agricultural practices (GAPs) requirements to enhance the agricultural standards (GAP – QMS) that assures the safety and quality of the rice produced in the region. The document provides information relating to on-farm food safety and quality management for rice production.

Quality Management in Rice Production at Pre-harvest Level: Preparation and Use of Good Quality Seeds

Hazard/Risk

Contrasting varieties/crop seeds

These are rice plants of other variety that are of a different colour, size, or shape from the rice plants of the variety designated

Weeds and noxious weeds

Noxious weeds are seed of weeds that have been gazetted as harmful to crops, humans and animals

Inert matter

These are foreign matter other than weed seeds e.g. chuff, plastic, glass, stones, sand, etc.

Moisture content

A measure of how much water is in the grain (how wet it is), measured using moisture meter. Higher water content reduces percentage seed germination

Presence of Prohibited pesticides

A pesticide for which it has been burned for all uses, for health or environmental reasons.

BANNED PESTICIDES

1970 - Edrin	1984 - Ethyl parathion	1988 - Arsenic (arsenites
1976- DDT	1984 - Methyl parathiom	& ardenates)
1980 - Chlordimeform	1986 - Aldrin	1988 - Hepatachlor
1980 - Dieorin	1986 - Lindane	1989 - Laptophos
1980 - Phosphamidom	1987 - HCH Mixed	1989 - Laptophos
1980 - Thallium sulpht	Isomers	Captafol
1984 - 2, 3 5-T	1987 - Mercury cpds	1990 - Dichloropropone

Operating limit

Characteristics	Rice Seed
Variety purity, % (min)	98
Other contrasting varieties (grains /500 g of seed)	2
All noxious weed seeds	Absent
Total weed seeds, % (max)	0.08%
Inert matter, % (max)	2%
Red rice (grains /500g)	0
Germination, % (min)	80
Moisture content, % (max)	14
Prohibited pesticides, mg/kg	0

Control Measure

Use improved/certified seed with good germination

Use seed from reliable source

Weed on time/keep the field free of weeds

Seed dressing

Apply proper seed dressing technique to improve seed quality and germination rate

Dry seeds to a proper storage moisture content

Control pests and diseases using approved pesticides

Quality Management in Rice Production at Pre-harvest Level: Farm and crop management

Hazard/Risk

High immature/shrivelled grain

Due to unlevelled field and drought or inadequate irrigation at blooming and grain filling stage

Chemical and microbial contamination

Use of untreated sewage/contaminated water to irrigate crops

Weeds, pests and microbial contamination

Use of fresh manure directly to crops

High chalky grains, nitrate and cadmium content

Excessive use of N and P fertilizers

High pest damaged & discoloured grains

Inefficient or incorrect use of pesticides to control pests and diseases

High pesticides residues (MRL)

Pesticides loses and incorrect doses due to poorly calibrated sprayer

Operating limit

Immature & shrivelled grains

Unripe or underdeveloped kernels (shrivelled over the entire surface

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Immature/ shrivelled grains	1	1.5	2

Chalky grains

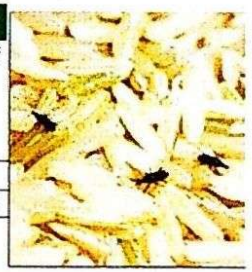
Have opaque floury appearance

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Chalky grains	1	1.5	2

Pest damaged grains

Grains with obvious hole or evidence of boring or tunnelling, indicating the presence of insect webbing or insect refuse

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Pest damaged grains	0.5	0.75	1



Pesticides residues

Any specified substance in food, agricultural commodities or animal feed resulting from the use of pesticide. Most pesticides contain chemicals that can be harmful to people, animals or the environment.

Pesticides residue	Maximum limit for all grades, mg/kg
Malathion	2
Glyphosate	2
Permethrin	0.1
Methomyl	0.05

Control Measure

Irrigate rice field appropriately based on crop's development needs

Do not use untreated sewage water to irrigate crops and keep water source free from contamination

Use well decomposed manure to crops

Apply recommended fertilizer type and quantity according to crop requirements

Use of un-expired or un-adulterated pesticide as directed by manufacturer
Make regular calibration of sprayer

Quality Management in Rice Production at Harvest Level: Cutting, Threshing and Cleaning

Hazard/Risk

High broken, chalky and immature/shrivelled grains

Due to earlier or late harvesting

Other contrasting varieties

Admixing grains to the produce through harvesting/handling equipment

High broken grains

Due to delayed threshing

High discoloured and moulds damaged grains

Due to delayed threshing

Contamination by organic matter

Due to improper cleaning

Contamination by inorganic matter

Due to threshing of Paddy on a bare ground.

Operating limit

Broken grains

Pieces of rice < ¾ of the average length of whole kernels

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Broken grains	5	15	25

Other contrasting varieties

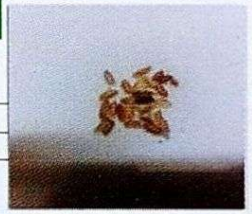
Paddy of other variety that are of a different colour, size, or shape from the paddy of the variety designated

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Other contrasting varieties	1	2	3

Discoloured grains

Paddy with ground, weather, germ and moulds damage, smut and stains.

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Discoloured grains	0.1	0.5	1



Organic matter

Foreign matter of plant origin e.g. other seeds, leaves, stalks, chuffs etc.

	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Organic matter	5	15	25

Inorganic matter

e.g. plastic, glass, stones, sand, etc.

Characteristics	Maximum limit for all grades, % m/m
Inorganic matter	0.1

Control Measure

Harvest at optimum maturity (30 – 35 days after 50% flowering, and at least 85% of the kernels in the rice panicle have a full yellow colour

Harvest different varieties separately Clean harvesting equipment before moving to different variety

Thresh paddy immediately after cutting

Ensure proper cleaning of harvested paddy

Quality Management in Rice Production at Post-harvest Level: Drying, Storage and Handling

Hazard/Risk

High heat damage and broken grains

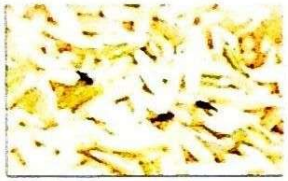
Due to high drying or storage temperature

Moulds contamination and high discoloured grains

Due to delayed drying or storage of wet paddy

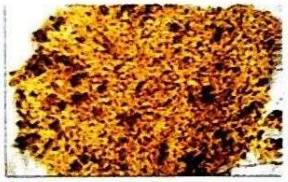
High pest damaged grains

Due to poor control of storage pests



Contamination by filth

Due to presence of animals close to threshing, drying and storage areas



Other contrasting verities

Due to admixing grains to the produce during drying, storage or handling

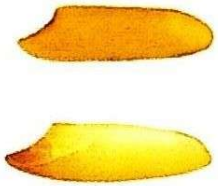
Occurrence of natural mycotoxins

Due to improper storage and produce handling e.g. wet storage, or pilling paddy direct on the

Operating limit

Heat damaged grains

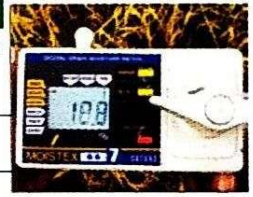
Grains damaged by heat due to exposure to severe heat during drying or storage



	Maximum Limit, % m/m		
Characteristics	Grade1	Grade2	Grade3
Heat damaged grains	0.1	0.2	0.5

Moisture content

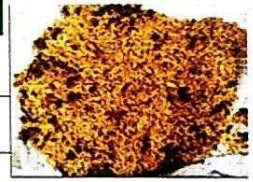
A measure of how much water is in the grain (how wet it is), measured using moisture meter.



Characteristics	Maximum limit for all grades, % m/m
Moisture	14

Filth

Foreign matter of animal origin e.g. fur, hair, droppings, etc.



Characteristics	Maximum limit for all grades, % m/m
Filth	0.5

Yeast and moulds

Natural occurring microorganism come from soil and air and grow when paddy are handled poorly

Characteristics	Maximum limit for all grades, cfu per g.
Broken grains	104

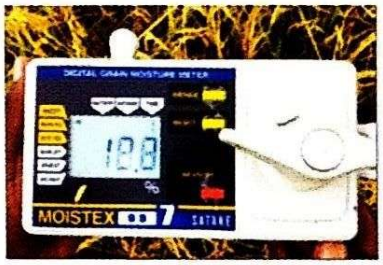
Total Aflatoxins and Fumonisin

Natural occurring poisons released by certain moulds.

Characteristics	Maximum limit for all grades
Total Aflatoxin (AFB1+ AFB2+AFG1+AFG2),ppb	10
Aflatoxin B1, ppb	5
Fumonisin, ppm	2

Control Measure

Dry paddy immediately after harvest on mats/water proof tarpaulins
Avoid high drying temperature



Store paddy at recommended moisture content (14%)
Use moisture meter to determine safe storage moisture of paddy

Control storage pests and rodents with recommended methods
Keep the storage clean and dry all the time

Store different varieties separately, in intact container with proper label