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DRAFT TANZANIA STANDARD

Good Agricultural Practices (GAP) for sustainable production and post-harvest handling of Cereals

TANZANIA BUREAU OF STANDARDS

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First Edition

0. Foreword

Cereals production is the backbone of most Tanzanian agriculture, with a much coverage of the land used for annual crops. Its mostly driven primarily by smallholder to large scale farmers to ensure food security and drive economic growth.

The need to ensure sustainable cereal grain production require development of sustainable agronomic practices. This standard shall provide guidance to all production and post-harvest handling of cereal grains to attain sustainable production requirements. Following this standard, all cultivation practices should consider sustainability aspects and all inputs should be considered while paying attention to food safety, quality and workers health. Therefore, this standard provides guidelines to promote sustainable, climate-resilient and environmentally sound production of quality and safe cereal grains.

1. Scope

This standard provides guidelines for Good Agricultural Practice for sustainable production and post harvest handling of of cereals including maize (*Zea mays* L.), paddy rice (*Oryza sativa* L.) and wheat (*Triticum aestivum* L.) intended for food consumption . This applies to all production steps from cultivating to post-harvest handling.

1.1 This standard excludes sweet corn and upland paddy rice.

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:

TZS 438/EAS 2*, Maize grains - Specification*
TZS 437/EAS 51*, Wheat grains – Specification*
TZS 1675/EAS 764*, Rough (paddy) rice - Specification*
TZS 2067*, Water for irrigation - Specification*

3. Terms and definitions

For the purpose of this standard, the following definitions apply.

3.1 aflatoxin
toxic compounds produced by *Aspergillus flavus* and *Aspergillus parasiticus* fungi that contaminate grains

3.2 Alternate Wetting and Drying (AWD)
water saving irrigation practice for rice where fields are allowed to dry to 15–20cm below soil surface before re-flooding.

3.3 bread wheat
common wheat (*Triticum aestivum*), used for bread making

3.4 brown rice
dehusked rice with bran layer intact.

3.5 conservation agriculture
farming system that conserves natural resources of soil and water resulting in improved and sustainable agricultural production

3.6 Deoxynivalenol (DON)
mycotoxin produced by several *Fusarium spp. including Fusarium graminearum*

3.7 direct seeding
sowing pre-germinated or dry seeds directly into the field (for rice) or into dry soil (for maize and wheat), using manual or mechanical methods.

3.8 fall armyworm
an invasive lepidopteran pest (*Spodoptera frugiperda*) that causes severe damage to maize, especially in vegetative stages.

3.9 Falling Number (Hagberg Falling number)
a measure of alpha-amylase activity in wheat

3.10 fumonisin
mycotoxin produced by *Fusarium* species (especially *Fusarium verticillioides*) commonly found in maize

3.11 fusarium head blight (scab)
fungal disease caused by *Fusarium graminearum* in wheat

3.12 Golden Apple Snail (GAS)
an invasive mollusc (*Pomacea canaliculata*) that feeds on young rice seedlings.

3.13 grain hardness
physical property of wheat kernels: soft ,medium, hard or very hard

3.14 Integrated Pest Management (IPM)
an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides

3.15 maize cob
the central cylindrical core of the maize ear to which kernels are attached.

3.16 maize grain
dried, shelled maize kernel (caryopsis) after removal from the cob.

3.17 Maize Lethal Necrosis (MLN)
viral disease of maize caused by co-infection of maize chlorotic mottle virus (MCMV) and a potyvirus

3.18 maize shelling
the process of removing grains from the cob.

3.19 Maize Streak virus (MSV)
viral disease of maize transmitted by leafhoppers (*Cicadulina* spp.), causing stunting and yield loss.

3.20 Maximum Residue Limit (MRL)
the highest legally permitted pesticide residue level in grain safe for human consumption.

3.21 milled rice
rice after removal of husk and bran (white rice).

3.22 nursery
prepared bed where rice seedlings are raised for 14–30 days before transplanting.

3.23 orange wheat blossom midge
dipteran pest (*Sitodiplosis mosellana*) that feeds on developing wheat kernels.

3.24 paddy rice
rice grain with husk after threshing, also known as rough rice.

3.25 Pre-Harvest Interval (PHI)
minimum time in days between the last pesticide application and harvest

3.26 Pre-Harvest Sprouting (PHS)
premature germination of wheat grain in the head before harvest, caused by wet weather at maturity.

3.27 puddling
intensive tillage of saturated soil to reduce water percolation and create a soft seedbed for transplanting rice.

3.28 rice blast
fungal disease of rice caused by *Pyricularia oryzae* (teleomorph *Magnaporthe grisea*) affecting leaves, nodes, and panicles.

3.29 russian wheat aphid
serious pest of wheat (*Diuraphis noxia*) causing leaf rolling

3.30 stem borer
major insect pests of rice including *Scirpophaga incertulas* (yellow stem borer) and *Chilo suppressalis* (striped stem borer).

3.31 striga (witchweed)
parasitic weed (*Striga asiatica* and *Striga hermonthica*) that attaches to maize roots, causing severe yield reduction in sandy, low-fertility soils.

3.32 traceability
ability to track the history, use or location of a product by means of recordedidentification

3.33 weedy rice
unwanted rice biotypes (*Oryza sativa* f. *spontanea*) that compete with cultivated rice and reduce yield and quality.

3.34 wheat gluten
protein complex in wheat responsible for dough elasticity and strength.

3.35 wheat grain
dried wheat kernel (caryopsis).

3.36 wheat rusts
fungal diseases of wheat including stem rust (*Puccinia graminis* f. sp. *tritici*), leaf rust (*P. triticina*), and stripe rust (*P. striiformis* f. sp. *tritici*).

3.37 wheat stem sawfly
pest of wheat (*Cephus cinctus*) that tunnels in wheat stems, causing lodging

3.38 Wheat Streak Mosaic Virus (WSMV)
virus of wheat transmitted by wheat curl mite (*Aceria tosichella*).

3.39 operator
person engaged in the food business including one's agent and is responsible for ensuring the requirements of food safety are met by the food business under one's control

3.40 recall
removes unsafe produce from consumers and the supply chain due to serious health or safety risks

3.41 withdrawal
take produce out of the supply chain before it reaches the final consumer

3.42 grower/farmer
person responsible for the management of primary production and handling of food crops

3.43 aggregator
a business, cooperative, or middle entity that collects and groups crops from many small farms into large commercial volumes

3.44 riparian
strip of land directly next to a stream, river, lake, or wetland

3.45 biobed
an on-farm containment and biological treatment system designed to capture and break down pesticide residues from sprayer washings, spills, and rinsate

3.46 soak pit
an underground hole filled with rocks or gravel that safely catches and drains extra water, runoff, or treated farm wastewater into the earth

4. MANAGEMENT SYSTEM

4.1 General requirements

4.1.1 The management system shall be established, documented, implemented and maintained to ensure compliance of this standard.

4.1.2 The management system shall be audited at least annually by an competent internal or external auditor. The audit report shall be documented and made available for inspection by recognized auditors upon request.

4.1.3 A documented procedure for addressing customer complaints shall be established and implemented. Complaints shall be recorded and responded within 14 days of complaint receipt.

4.1.4 Non-compliance with any requirement of this standard shall be recorded using a non-conformance report (NCR). Corrective measures shall be implemented and verified within 30 days of identification.

4.2 Operator responsibilities

4.2.1 The operator shall be legally responsible for compliance, day-to-day management, and implementation of this standard.

4.2.2 The operator shall conduct review meeting at least once a year

4.2.3 The operator shall provide access to third parties including authorised inspectors and certification bodies to carry out verification of compliance

4.2.4 The operator shall ensure compliance with specific customer requirements (e.g. aflatoxin-free certification, organic certification, fair trade, or for wheat: high protein content, low DON).

4.2.5 The operator shall develop, document, and implement an environmental management plan covering soil conservation, water use, waste disposal, and biodiversity protection.

4.2.6 The operator shall ensure that all employees, outgrowers, and seasonal workers receive information, instruction, and training necessary to implement this standard. Training records shall be maintained for at least two years.

4.3 Input procurement

4.3.1 The operator shall have a procedure for procure all agricultural inputs (seed, fertilizer, pesticides, fuel) from suppliers registered and/or licensed by the relevant authority.

4.3.2 The operator shall establish, communicate and implement strictly policy prohibiting the use of Genetically Modified Organisms (GMOs).

5. Traceability

5.1 The operator shall implement and maintain an effective traceability system that links the following elements:

i. Seed source and batch number
ii. Field (with unique identifier)
iii. Harvest lot (by field and date)
iv. Drying batch
v. For maize: Shelling batch
vi. Storage bin or warehouse
vii. Transport consignment
viii. Final product shipment

5.2 Recall and withdrawal

5.2.1 The operator shall establish, document, maintain and test procedures for the recall and withdrawal of cereals that may be unsafe, non conforming or otherwise subject to removal from the supply chain.

5.2.2 The recall procedure shall enable complete and rapid recall of any implicated lot of cereal at any stage of the supply chain.

5.2.3 Recall and withdrawal procedures shall be tested atleast annually through a documented mock exercises that verify traceability, communication and response time.

5.2.4 Each actual or simulated recall or withdrawal shall be reviewed for effectiveness and corrective action shall be taken where objective are not met

5.3 Growers, aggregators, and storage operators shall maintain programmes for effective lot identification to trace the sites and agricultural inputs involved in primary production and the origin of incoming cereals in case of suspected contamination.
5.4 Grower information (name, village, field code, harvest date, variety) shall be linked with storage operator information to enable traceability throughout the supply chain.
5.5 For exported cereal, traceability shall extend to the port of entry in the destination country.

6. Record keeping

6.1 The operator shall ensure that all records are accurate, retrievable, legible, and up to date.
6.2 Records shall be protected from damage (e.g due to water, fire, pests) or loss.
6.3 Records of grain production and distribution shall be kept for at least two years (or longer if required by specific customers) to facilitate recall and food safety investigations.
6.4 The operator shall keep records of all agricultural activities in paper and/or electronic format , including:

a) Production site information (field code, area in hectares or acres, GPS coordinates, altitude, soil type).

b) Supplier information for agricultural inputs (seed, fertilizer, pesticides), including receipts, batch/lot numbers, and certificates of analysis.

c) Planting records: date, variety, seed rate (kg/ha), planting method, spacing.

d) Fertilizer application records: date, field code, product name, N-P-K grade, batch number, application rate (kg/ha), method of application, applicator name, weather conditions.

e) Pesticide application records: product name, active ingredient, target pest, application date, rate, pre-harvest interval (PHI), applicator name, equipment used, weather conditions.

f) Pest and disease monitoring logs: scouting dates, pest/disease identified, population levels or severity score, action taken.

g) Irrigation records (if applicable): water source, date, volume applied (mm or m^3/ha), method.

h) Harvest records: date, field code, area harvested, yield (tons/ha), moisture content at harvest (%), harvest method and operator name.

i) Post-harvest records: drying method, drying duration, final moisture content (%), storage bin number, storage temperature (°C) and humidity (%).

j) Mycotoxin records: date, sampling plan, lot number, test method, result (µg/Kg or mg/Kg), laboratory name.

k) For wheat only: Grain quality records: protein content % (12% moisture basis), Falling number (seconds), test weight (kg/hl), vitreous kernel percentage (%), foreign matter (%).

l) Workers' health safety and welfare records: including training records, PPE issuance, medical check-ups, and accident reports.

m) Waste management records: waste types, quantities (kg or tons), disposal methods, and collection receipts.

n) Sales records: buyer name, quantity (tons), lot number, certificate of analysis, date of sale, and transport vehicle details.

6.5 Storage operators shall keep records for each lot, including:

a) Incoming grain records: grower information, lot number, moisture content (%), test weight (kg/hl), foreign matter percentage (%), mycotoxin (µg/Kg or mg/Kg), .
For wheat: *also protein content and Falling number.*

b) Pest control programs: rodent and insect monitoring logs, bait station check records, fumigation dates, products used, concentration, exposure time.

c) Storage conditions: daily temperature and humidity logs.

d) Chemicals used in post-harvest treatments: grain protectants, fumigants, application dates, PHI before release for consumption.

e) Cleaning schedules for premises, facilities, equipment, and containers.

f) Workers' health, safety, and welfare records.

g) Waste management records.

7. Planting materials (seed)

7.1 General requirements

7.1.1 The operator shall procure seed from registered seed companies, or certified seed multipliers/ distributor.

7.1.2 Farm-saved seed shall be tested for germination (minimum 85%) and purity (minimum 98%) at an approved laboratory before use.

7.2 Seed treatments and dressings

7.2.1 When seed treatments are applied, the operator shall document the justification (e.g., control of seed-borne fungi, early season insect pests).

7.2.2 Seed treatment products shall be registered for use on the specific crop by the relevant authority.

7.2.3 Advice on seed treatment products shall be obtained from a competent person (agronomist, or licensed agro-dealer).

7.2.4 Where treatment products are used, all pest control product requirements in clause 12 shall apply, including PPE use, record keeping, and safe disposal.

7.3 Planting rates and spacing

7.3.1 The operator shall comply with the recommended planting rates per acre/ hecter

7.3.2 When using farm-saved seed with lower germination, the seed rate shall be increased by 20–30% above the recommended rate.

7.3.3 Planting depth shall comply with the recommended depth per specific crop.

7.3.4 For rice only (transplanted system):

i. Seedlings shall be transplanted at 15–30 days (4–5 leaf stage).
ii. Seedlings older than 40 days shall not be used.
iii. Seed soaking: seeds shall be soaked in clean water for 24 hours, then incubated (wrapped in moist jute bags) for 24– 48 hours until radicle emergence (1–2 mm).

8. Site history and land preparation

8.1 Site selection and risk assessment

8.1.1 Before planting, the operator shall conduct and document a risk assessment for each field, taking into account:

i. Potential contaminants (heavy metals, pesticide residues from previous crops)
ii. Soil type and drainage characteristics
iii. Erosion risk (slope percentage)
iv. Prior use of land (history of pests, diseases, or contaminants)
v. Proximity to water sources (buffer zones shall be maintained)

8.1.2 Crop-specific site requirements:

Crop	**Additional site requirements**
Maize	Soil pH 5.5 – 7.0; sandy loam to clay loam; no waterlogging
Paddy rice	Clay or clay-loam soil; pH 5.5–7.0; slope 1–2% for irrigated lowland; sustainable water source

Wheat	Altitude 900–2,500 m above sea level; loam to clay-loam; soil pH 5.5 –7.0; no waterlogging

All findings shall be recorded and retained.

8.1.3 The operator shall establish a corrective action plan for identified controllable risks (e.g., liming for acid soils, drainage improvement, crop rotation).

8.1.4 The site shall not be used for cereal production when risk assessments identify non-controllable aspects critical to human health and the environment.

8.1.5 The operator shall establish a field identification system with a unique code for each field or block (e.g., F01-M02 for farm 1, maize field 2).

8.2 Land preparation requirements

8.2.1 Conservation agriculture principles (minimum soil disturbance, permanent soil cover, crop rotation) shall be implemented where applicable.

8.2.2 Land preparation shall comply with recomended crop-specific requirements:

For maize:

i. Conventional tillage: primary ploughing to 15–25 cm depth; secondary harrowing to achieve clod size <5 cm.
ii. Ridge-furrow system (75–90 cm spacing) for areas with erratic rainfall.
iii. Minimum tillage with planting basins (30cm x 30cm x 15cm) for semi-arid areas.

For paddy rice:

i. Primary tillage to 15–20 cm depth.
ii. Secondary tillage: 2–3 passes of harrowing.
iii. Laser leveling to achieve slope <0.5% for uniform water distribution.
iv. Puddling: 2–4 passes of puddler or tractor in standing water (5–10 cm) to achieve water percolation ≤5 mm/day.
v. Bund construction: bunds shall be 50–60 cm high and 30–40 cm wide, plastered with mud to prevent leakage.

For wheat:

i. Fine, firm seedbed required.
ii. Conventional tillage: primary ploughing to 15–20cm depth; secondary harrowing (2–3 passes) to achieve clod size <2cm.
iii. Conservation agriculture: direct seeding into previous crop residue using no-till planter.

8.2.3 Weed control before planting: Fields shall be cleared of weeds at least 2 weeks before planting.

9. Soil management

9.1 Soil analysis requirements

9.1.1 The operator shall carry out soil analysis before the first planting and every two years thereafter. Analysis shall be conducted at an approved laboratory.

9.1.2 Based on soil analysis, the operator shall develop and implement a soil management plan including:

i. Lime application if pH is below the acceptable range.
ii. Organic matter addition (manure, compost, cover crop incorporation).
iii. Micronutrient application if there is deficient.
iv. **For paddy rice:** Iron toxicity management through drainage, organic matter addition, and use of tolerant varieties.

9.2 Soil erosion control

9.2.1 The operator shall implement measures to minimize soil loss, including:

i. Contour ploughing on slopes >3%.
ii. Strip cropping with legumes along contours.
iii. Grass strips (e.g., vetiver grass) on contour lines.
iv. Terracing on slopes >10% gradient (only with approved Environmental Impact Assessment).

9.2.2 For paddy rice*:* Bund stabilization with grass and contour leveling in terraced fields.

9.2.3 The operator shall implement practices to improve soil drainage and prevent waterlogging:

i. Raised beds in areas with high rainfall or poor drainage.
ii. Surface drainage channels at 50–100m intervals.

9.3 Crop rotation

9.3.1 The same grain crop shall not be planted on the same land for more than two consecutive seasons without a break crop.

9.3.2 Where rotations are not practiced, the operator shall provide documented justification (e.g., land tenure constraints, documented market demand for continuous production).

10. Plant nutrition and fertilizer use

10.1 Fertilizer use plan

10.1.1 The operator shall develop and document a fertilizer use plan based on soil analysis and/or plant tissue analysis, following research recommendations.

10.1.2 Nitrogen (N) shall be applied in three rounds as per recommendations.

10.1.3 Fertilizer placement requirements:

i. Basal fertilizer shall be placed 5 cm below and 5 cm to the side of the seed. Fertilizer shall not contact the seed.
ii. Side-dress nitrogen shall be placed 5–10 cm from the plant row and 5 cm deep.

10.1.4 Runoff water from land where fertilizer has been applied shall not drain directly to any water source (river, lake, dam). Buffer strips of 5–10 m width shall be maintained along water bodies.

10.1.5 The person responsible for fertilizer application shall be competent, having received training from relevant authority or an approved extension service.

10.2 Records of application

10.2.1 The operator shall maintain records of each fertilizer application including: date, field code, fertilizer type, batch number, application rate (kg/ha), method (broadcast, band, side-dress), applicator name, and weather conditions.

10.2.2 A written work instruction for fertilizer application shall be documented and signed by a competent person, specifying who, when, where, and how to apply.

10.3 Application equipment

Fertilizer application equipment (spreaders, side-dress applicators) shall be maintained, routinely verified, and calibrated at the start of each season. Calibration records shall be kept.

10.4 Fertilizer storage

10.4.1 Fertilizers shall be stored in structures that are dry, cool, well-ventilated, rodent-proof, with impermeable flooring.

10.4.2 Fertilizer shall not be placed directly on the floor; pallets or racks shall be used.

10.4.3 The fertilizer store shall be located at least 50 m from water sources and from residential areas.

10.4.4 An up-to-date fertilizer stock inventory shall be maintained, including incoming quantities, batch numbers, expiry dates, used quantities, and remaining stock.

10.4.5 Fertilizers shall be stored separately from pest control products, acids, produce, food and feedstuffs, planting materials, and any living quarters.

10.5 Organic fertilizers

10.5.1 Where organic fertilizer (compost, farmyard manure, poultry litter) is used, the operator shall conduct and document a risk assessment including testing for heavy metals, pathogens (such as *E. coli*, *Salmonella*), and weed seeds.

10.5.2 Organic fertilizer shall be stored covered on an impermeable surface to prevent environmental contamination.

10.5.3 Organic fertilizer application records shall include type, source, analysis results, application rate, incorporation method, and date.

10.5.4 Human sludge (sewage sludge) shall not be used on grain farms under any circumstances.

10.5.5 Green manure crops (e.g.,Mucuna, sunn hemp, lablab, clover, vetch) shall be grown during fallow periods and incorporated 2–3 weeks before planting.

11. Water management and conservation

11.1 General requirements

11.1.1 For irrigated grain production, the operator shall conduct and document a risk assessment of irrigation water, including:

i. Water source sustainability (river flow, groundwater recharge)
ii. Microbiological contaminants (such as *E. coli*, coliforms)
iii. Chemical contaminants (such as heavy metals, pesticide residues)
iv. Salinity (electrical conductivity)

11.1.2 For rainfed grain production, the operator shall implement water conservation measures.

11.1.3 The operator shall establish and implement a documented water management plan based on the risk assessment (for irrigated systems) or rainfall patterns (for rainfed systems).

11.1.4 The operator shall maintain water management records including:

i. Rainfall data (daily if rain gauge available, or from nearest weather station)
ii. Irrigation dates, volume applied (mm or m^3/ha), and method
iii. Observations of crop water stress (leaf rolling, wilting)

11.1.5 Irrigation personnel shall be trained and competent. Training records shall be maintained.

11.2 Water requirements

11.2.1 For rainfed maize and wheat: Planting shall occur at the onset of the rainy season to ensure that the most sensitive growth stage coincides with peak rainfall. Early-maturing varieties shall be used in areas with short rainy seasons.

11.3 Irrigation methods (where applicable)

11.3.1 For paddy rice– Alternate Wetting and Drying (AWD):

i. AWD shall be implemented where feasible.
ii. Fields shall be allowed to dry to 15–20 cm below soil surface (measured by perforated water tube) before re-flooding.
iii. AWD shall not be applied during flowering (panicle development).
iv. AWD implementation dates shall be recorded.

11.3.2 For paddy rice only – Mid-season drainage:

i. Fields shall be drained for 10–14 days at maximum tillering.
ii. Drainage dates shall be recorded.

11.3.3 Recommended water conservation measures for all grains (rainfed and irrigated) shall be implemented;

i. Mulching (crop residue, straw, or plastic mulch) to reduce evaporation.
ii. Rainwater harvesting (farm ponds, roof catchment).
iii. Conservation tillage (minimum tillage, planting basins) for moisture conservation.

11.3.4 For irrigated systems:

i. Drip irrigation is preferred for high-value grain (seed maize, seed wheat).
ii. Furrow irrigation: furrows shall be shallow (10–15cm deep) between rows; over-irrigation and runoff are prohibited.
iii. Sprinkler irrigation: application during high winds or midday heat is prohibited.

11.4 Quality of irrigation water

11.4.1 Water used for irrigation shall complies to the specifications given in TZS 2067 and be analyzed based on the risk assessment at least once per year. Analysis results shall be documented.

11.4.2 Untreated sewage water and raw effluent shall not be used for irrigation of grain for human consumption.

12. Integrated Pest Management (IPM)

12.1 General requirement

The operator shall have a documented crop protection plan specific to each grain grown, updated annually based on previous season's pest pressure.

12.2 IPM competence and documentation

12.2.1 The operator or designated IPM manager shall be trained and demonstrate competence on Integrated Pest Management (IPM) for the relevant grain. Proof of training shall be kept on record.

12.2.2 The operator shall have a documented IPM plan including:

i. Monitoring and scouting schedule (weekly during vegetative and reproductive stages)
ii. Action thresholds (economic injury levels) for key pests
iii. Cultural, mechanical, biological, and chemical control options
iv. Record keeping templates

12.2.3 The operator shall maintain a current list of major pests and diseases for each crop and demonstrate knowledge of their identification.

12.2.4 The operator shall demonstrate IPM implementation through:

i. Scouting records
ii. Use of documented action thresholds
iii. Conservation of natural enemies

12.3 Action thresholds for key pests

12.3.1 For maize – Fall armyworm (FAW):

i. No control required for large larvae (>1.5 cm).
ii. Control shall be triggered at 20% infestation with small larvae (1st–3rd instar) in whorl stage.

12.3.2 For maize – Striga (witchweed):

For fields with history of striga infestation, the following controls are mandatory:

i. Grow striga-resistant/tolerant varieties.
ii. Intercrop with desmodium (push-pull technology).
iii. Rotate with non-host crops (cowpea, soybean, sunflower).
iv. Apply nitrogen fertilizer (striga suppresses in high Nitrogen conditions).

12.3.3 For paddy rice – *Stem borer:* Control shall be triggered at 2 egg masses per m².

12.3.4 For paddy rice – *Golden apple snail:* Control shall be triggered at 5 snails per m² in seedling stage.

12.3.5 For wheat – *Rusts:* Control shall be triggered when rust severity reaches 10% on flag leaves.

12.3.6 For wheat – *Fusarium head blight:* Preventive application shall be considered when flowering coincides with wet weather.

12.4 Pest and disease monitoring

12.4.1 The operator shall monitor pests and diseases using:

i. Pheromone traps (for FAW, stem borer, and wheat aphids) with weekly counts.
ii. Sweep nets (for rice planthoppers and leafhoppers).
iii. Light traps (for stem borer moths).
iv. Yellow sticky traps (for leafhoppers).
v. Visual inspection for egg masses, larvae, and leaf damage.

12.4.2 Tools and equipment (sprayers, hoes) shall be disinfected using 10% bleach solution after use in infested fields before use in clean fields.

12.4.3 Water used for mixing crop protection products shall be clean (pH of 6.5–7.5, free from sediment and microbial contaminants).

12.5 Personal Protective Equipment (PPE)

Each operator involved in crop protection (mixing, loading, application) shall use appropriate PPE: long-sleeved shirt, long pants, chemical-resistant gloves, boots, face shield or goggles, and respirator where required by the product label.

12.6 Pest control products – Selection

12.6.1 Pesticides shall be registered by relevant authorities for use on the specific crop.

12.6.2 The operator shall maintain documentation of pesticide restrictions

12.6.3 The technical person responsible for pesticide choice and application shall hold a valid training/ pesticide applicator license.

12.6.4 The operator shall maintain documented justification for each pesticide choice.

12.6.5 The operator shall rotate among at least three different mode of action groups per season to prevent resistance. Use of the same mode of action group for more than two consecutive applications per season is prohibited.

12.6.6 The application rate and dilution rate shall comply exactly with the product label. Where a choice exists, the product with lower toxicity and shorter environmental half-life shall be selected.

12.7 Storage of pest control products

12.7.1 Pest control products shall be stored in a store constructed to as per relevant authority guidelines with the following minimum specifications:

i. Locked, with access restricted to authorized personnel only.
ii. Well-ventilated, dry, and cool (temperature ≤30°C).
iii. Impermeable concrete floor with bunding capable of containing 10% of total store volume.
iv. Fire-resistant construction (non-combustible walls).

12.7.2 Only approved pesticides in original labelled containers shall be held in the store. No other commodities (seed, fertilizer, food, fuel, animal feed) shall be stored with pesticides.

12.7.3 Warning signs in English/ Swahili, and/ local language shall be displayed on the outside of the pesticide store, including: "NO SMOKING", "NO NAKED FLAMES", "DANGER – PESTICIDES", "KEEP OUT".

12.7.4 Stock shall be inspected monthly for leakage, container damage, and expiry dates. Stock inventory records shall be maintained.

12.7.5 Written procedures for handling accidents, fire, spillage, or poisoning of personnel shall be displayed in accessible areas.

12.7.6 The store shall be equipped with firefighting equipment: dry chemical fire extinguisher (minimum 2 kg) and sand bucket. Extinguishers shall be inspected monthly and serviced annually; records shall be kept.

12.7.7 Shelves shall be made of non-absorbent, non-flammable material (plastic or coated metal). A spill kit (sand, shovel, broom, absorbent pads, empty disposal bin) shall be available.

12.7.8 Adequate washing facilities (water, soap, paper towels) shall be available within 10 meters of the store.

12.7.9 The store shall be bunded (raised lip at door, sloped floor to collection sump) to contain spillages.

12.7.10 Drainage from the store shall be directed to a sump or adequate wastewater area located at least 100 m from all water sources, with no discharge into riparian land.

12.7.11 Personnel working in pesticide stores shall have access to suitable PPE stored adjacent to the store but outside the hazardous area.

12.7.12 Pesticides and fertilizers shall be stored separately with a minimum separation of 5 meters or a solid wall.

12.7.13 The pesticide store shall be located at least 100 m from wells, rivers, dams, and other water sources.

12.8 Application conditions

12.8.1 Pesticides shall not be applied under the following conditions:

i. Wind speed >10 km/h
ii. Rain expected within 4 hours of application
iii. During overhead irrigation
iv. High mid-day temperatures (>30°C)

12.8.2 Application shall be conducted in early morning (6:00–9:00) or late afternoon (16:00–18:00).

12.9 Dispensing of pesticides

12.9.1 A separate area for dispensing pesticides shall be provided with:

i. Impermeable, easy-to-clean work bench.
ii. Running water supply within 5 meters.
iii. Emergency eyewash station.
iv. Accurate measuring equipment (graduated cylinders, syringes, scales dedicated for pesticides only).
v. Suitable containers for pre-mixing (plastic, not for food use).
vi. Clear red colour coding on all dispensing equipment to indicate pesticide-only use.

12.9.2 Personnel dispensing pesticides shall wear apron, chemical-resistant gloves, face shield, and rubber boots.

12.10 Worker protection during application

12.10.1 Signs restricting personnel access to areas under pesticide application shall be displayed. Signs shall remain in place until the re-entry interval (REI) has elapsed.

12.10.2 All spray operators and supervisors shall be trained by a recognized institution. Annual refresher training is required.

12.10.3 The employer shall provide all PPE to workers.

12.10.4 Spray operators shall not wear personal home clothing when spraying. Separate lockers shall be provided for personal clothing and work clothing/PPE.

12.10.5 Dressing rooms and double individual lockers shall be provided for each worker (one for street clothes, one for work clothes/PPE).

12.10.6 All PPE shall be cleaned after use (washing with soap and water, air drying). Contaminated PPE shall not be taken out of farm site.

12.10.7 All application equipment shall be cleaned immediately after use. Chemical wastewater shall be channeled to a soak pit or biobed located at least 50 m from water sources.

12.10.8 Protective overalls shall be laundered after each use and kept separate from other clothing. Laundering shall be done on-site or by a service that understands pesticide contamination risks.

12.10.9 Staff involved in pesticide use shall have a medical check-up at least twice per year, including blood cholinesterase testing for organophosphate and carbamate exposure.

12.10.10 Records shall be maintained for: application logs, training certificates, PPE issuance, and medical check-up reports.

12.10.11 Spray equipment shall be inspected weekly, calibrated at the start of each season and every 10th use, and serviced annually. Defective equipment shall be repaired or replaced immediately.

12.10.12 Each application shall be accompanied by a written instruction signed by the farm manager or IPM specialist, specifying location, dosage, and technique.

12.10.13 All workers not wearing appropriate PPE shall vacate the area prior to spraying. Warning signs shall be posted at field gates stating: date and time of application, pesticide common name and active ingredient, and re-entry interval.

12.10.14 Material Safety Data Sheets (MSDS) for all pesticides used shall be kept on file and accessible to workers.

12.10.15 Pregnant and nursing mothers and persons under age 18 shall not handle, mix or apply pesticides.

12.10.16 Pesticides with high leaching potential or high aquatic toxicity shall not be used within 200 meters of open water sources.

12.10.17 The operator shall establish a documented re-entry policy. Minimum REI shall be 24 hours for most pesticides; 48–72 hours for highly toxic pesticides as per label.

12.10.18 Spot spraying is preferred over blanket spraying to protect non-target organisms (bees, fish, frogs, beneficial insects).

12.10.19 The pre-harvest interval (PHI) for each applied pesticide shall be recorded, and the first harvestable date shall be documented in the field log. No harvest shall occur before the PHI has elapsed.

12.11 Records of pesticide application

12.11.1 The operator shall maintain a dedicated pesticide register.

12.11.2 Each spray record shall include: date, field code, target pest, product name, expiry date, active ingredient, concentration, application rate (L/ha or kg/ha), equipment used, weather conditions (wind speed, temperature, humidity), applicator name, and PHI.

12.11.3 The operator shall maintain spray operator training records (certificates, refresher dates).

12.11.4 An accident and incident diary shall record all accidents, spillages, poisoning cases, sicknesses, and absences from work, with remedial actions taken.

12.11.5 Emergency procedures, contact persons, and telephone numbers (fire brigade, hospital, poison control centre) shall be posted.

12.11.6 At least one trained First Aid personnel per 50 workers shall be on the premises; training records shall be kept.

12.11.7 The operator shall maintain a record of obsolete or expired pesticides and empty containers, including quantities, dates, and disposal methods.

12.11.8 Additional records required:

i. Agrochemical stock record (running inventory)
ii. List of all chemicals used on the farm (updated annually)
iii. Disposal records for expired pesticides and containers (including receipts from licensed waste collectors)

12.12 Disposal of surplus pesticides and containers

12.12.1 Written procedures for safe disposal of dilute pesticides and empty containers shall be documented and communicated to all handlers.

12.12.2 Obsolete and expired pest control products shall be clearly segregated and marked "OBSOLETE AND EXPIRED – DO NOT USE".

12.12.3 Disposal of obsolete and expired pesticides shall be done through return to supplier or approved incineration by Competent Authority, with records kept.

12.12.4 Surplus spraying mix and tank washings shall be disposed of by spraying onto a designated, non-cropped biobed area away from water sources.

12.12.5 Disposal sites (biobeds, soak pits) shall be securely fenced, locked, and labelled with warning signs.

12.12.6 Where disposal services are outsourced, the disposal agent shall be approved by relevant outhorities, and disposal records (receipt, certificate of destruction) shall be kept.

12.12.7 Empty pest control product containers shall not be reused for any purpose.

12.12.8 A secure storage point for empty containers (triple-rinsed, punctured) shall be provided.

12.12.9 Containers awaiting disposal shall be labelled "EMPTY PESTICIDE CONTAINER – DO NOT REUSE".

12.12.10 Disposal shall be through registered recyclers or cement kilns.

12.13 Pesticide residue monitoring

12.13.1 The operator shall document a Maximum Residue Limits (MRLs) risk assessment considering the pesticides used, market requirements and national MRLs.

12.13.2 MRL monitoring shall be conducted based on the MRL risk assessment:

i. For exported grain: testing shall be done per shipment.
ii. For domestic grain: at least one test per season per variety.

12.13.3 The operator shall maintain access to up to date MRL requirements as per National product standards

12.13.4 The operator shall provide evidence of residue testing conducted by an accredited laboratory.

12.13.5 The operator shall establish a written action plan for MRL exceedance, including:

i. Immediate hold of affected lot
ii. Investigation of cause
iii. Disposal or re-routing of non-compliant grain (domestic market if legal, animal feed, or destruction)
iv. Corrective actions to prevent recurrence (increase PHI, change pesticide, retrain applicator)

13. Harvesting and post-harvest handling

13.1 Harvest timing

13.1.1 Grain shall be harvested at the following moisture contents:

Crop	Harvest moisture content
Maize	18–25% for mechanical shelling
Paddy rice	20–25% (80–85% of grains straw-yellow)
Wheat	13–18% for mechanical harvest; 16–18% for bread wheat to reduce shattering

13.1.2 For maize*:* Black layer formation at kernel base (physiological maturity) and dry, brown, loose husks indicate harvest readiness.

13.1.3 For paddy rice: Harvest shall not be delayed beyond 30 days after flowering.

13.1.4 For wheat*:* Pre-harvest sprouting management in areas prone to rains during harvest:

i. Early-maturing varieties shall be planted.
ii. Harvest shall occur as soon as grain moisture reaches 18%; immediate drying is required.

13.1.5 Harvest should not be unnecessary delayed as it increase risk of contamination, pests, sprouting and weather damage.

13.2 Harvest methods

13.2.1 Manual harvesting requirements:

Crop	Method
Maize	Ears snapped from stalks by hand or corn snapper; placed in clean, dry bags or baskets; dropping on bare soil prohibited
Paddy rice	Cut with sickles at 15–20 cm above ground; placed in clean, dry bags or baskets; dropping on bare soil prohibited
Wheat	Cut with sickles at 10–15 cm above ground; tied into sheaves; placed in clean, dry bags or baskets; dropping on bare soil prohibited

13.2.2 Mechanical harvesting requirements:

i. Combine harvester settings shall be adjusted to minimize kernel damage.
ii. Maximum harvest losses: 3% of yield.

13.2.3 Harvest records shall include: date, field code, variety, area harvested, yield (tons/ha), moisture content at harvest (%), harvest method, and operator name.

13.3 Post harvest handling; Shelling and threshing

13.3.1 For maize*:* Shelling shall be done when grain moisture is at least 15% (lower moisture increases breakage).

13.3.2 For paddy rice*:* Threshing shall be done within 24 hours of cutting. Manual threshing shall be done on clean tarpaulins. Mechanical threshers shall be cleaned between different lots.

13.3.3 For wheat*:* Threshing shall be done when grain moisture is at least 14%. manual threshing shall be done on a hard, clean surface.

13.4 After shelling/threshing, grain shall be cleaned (winnowed or aspirated) to remove dust, chaff, cob fragments, and light kernels.

13.5 Grain cleaning and quality testing

13.5.1 After threshing, grain shall be cleaned to remove:

i. Chaff, straw fragments, dust
ii. Shrunken and broken kernels
iii. Foreign material (stones, soil, weed seeds)
iv. **For wheat***:* Ergot sclerotia (purple-black bodies larger than grain)

13.5.2 The produces shall comply to the respective product standards (TZS 437/EAS 51, TZS 438/EAS 2, TZS 1675/EAS 764).

13.5.3 For wheat only – additional required tests:

Parameter	Method	Acceptable range
Test weight	Weight per hectoliter	>72 kg/hl (bread wheat); >74 kg/hl (durum)
Protein content	Near-infrared (NIR), Kjeldahl	>12% (bread); >13% (durum)
Falling number	Hagberg falling number	>300 seconds

13.5.4 Test results by lot number shall be recorded and maintained for at least 2 years.

13.6 Post-harvest handling and drying

13.6.1 Grain shall be dried to safe moisture levels within the following time limits:

Grain	Maximum time from harvest to start drying
Maize	48 hours
Paddy rice	24 hours from threshing
Wheat	24 hours

13.6.2 Target moisture levels for storage:

Grain	Short-term storage (<3 months)	Long-term storage (>3 months)
Maize	13–14% (max 14%)	12–13% (max 13%)
Paddy rice	14%	12–13%
Wheat	13–14% (max 14%)	12–13% (max 13%)

13.6.3 Sun drying requirements:

i. Drying shall be done on raised platforms, clean tarpaulins, or concrete drying floors.
ii. Drying on bare soil or roadsides is prohibited.
iii. Maximum layer thickness: 10 cm for maize cobs, 5 cm for shelled grain; 5 cm for rice paddy; 5 cm for wheat grain.
iv. Grain shall be turned every 2–3 hours.
v. Grain shall be covered at night and during rain.

13.6.4 Mechanical drying requirements:

Crop	Maximum temperature
Maize (shelled)	60°C (lower for seed maize)
Paddy rice (non-parboiled)	42°C
Wheat	45°C

13.6.5 Drying records shall include: method, start moisture (%), final moisture (%), duration, temperature (if mechanical), and operator name.

13.7 Mycotoxin management

13.7.1 The operator shall implement a recommended mycotoxin management plan including but not limited to:

Pre-harvest:

i. Use resistant varieties where available.
ii. Avoid drought stress during grain fill (maize, wheat).
iii. Control insect pests (insect damage provides entry points for *Aspergillus* and *Fusarium*).
iv. Harvest promptly at maturity (refer clause 13.1).

Post-harvest:

i. Dry to safe moisture within specified time limits (refer clause 13.3.1).
ii. Sort out visibly damaged, discolored, shriveled, or moldy kernels (hand sorting or color sorting machines).
iii. Store in hermetic conditions (low oxygen inhibits fungal growth).

13.7.2 Testing requirements:

i. Each lot shall be tested for the relevant mycotoxins (refer section 6.4(j)).

ii. Testing shall be done at an accredited laboratory.

13.7.3 Mycotoxin limits:

Mycotoxin	Crop	Limit
Aflatoxin (total)	Maize, Paddy rice	⩽10 µg/kg (domestic);
Aflatoxin B1	Maize, paddy rice, wheat	⩽ 5 µg/kg
Fumonisin	Maize, paddy rice, wheat	⩽2 mg/kg
Ochratoxin A	Wheat	⩽5 µg/kg

13.8 Storage

13.8.1 Storage facilities shall:

i. Be registered with relevant outhorities.
ii. Be rodent-proof, bird-proof, waterproof, with proper flooring.
iii. Have good ventilation (or be hermetic for sealed storage).
iv. Have a dedicated mycotoxin management zone for suspect lots.

13.8.2 Warehouse hygiene requirements:

i. Cleaning schedule: weekly sweeping, monthly disinfestation.
ii. Pesticides, fertilizers, and other chemicals shall not be stored in the grain storage area.
iii. First In, First Out (FIFO) system shall be used for stock rotation.

13.9 Transport

13.9.1 Transport vessels (trucks, trailers, carts) shall:

i. Be clean, dry, and free from previous cargo residue (especially fertilizers, chemicals, animal products, and moldy grain).
ii. Be covered during transport to prevent rain, dust, and bird contamination.
iii. Have a dedicated grain transport policy (no mixed loads with chemicals, manure, or strongly odorous products).

13.9.2 Loading and unloading shall be done on clean, dry surfaces (concrete or tarpaulin).

13.9.3 Transport records shall include: vehicle registration, driver name, origin, destination, lot numbers, certificate of analysis number, quantity (tons), and date.

14. Workers health, safety and welfare

14.1 Machinery safety

14.1.1 Machinery with internal combustion engines (tractors, threshers, pumps, dryers) shall not be used in confined areas without ventilation.
14.1.2 Only trained operators shall operate machinery. Training records shall be kept.
14.1.3 All machinery shall have safety guards in place (PTO shafts, belts, cutting blades, roll-over protection structures on tractors).

14.2 Health requirements

14.2.1 Personnel who come into direct contact with grain during or after harvest shall not have infectious diseases or open wounds without waterproof covering.
14.2.2 Potable water shall be available to staff at all times. Containers or outlets of water unsuitable for drinking shall be marked "NOT DRINKABLE".
14.2.3 First aid kits (one per 50 workers, plus at each field site) shall be provided and stocked. At least one trained first aid personnel per 50 workers shall be on hand.
14.2.4 Written accident and emergency procedures shall be displayed permanently and prominently, with contact telephone numbers for hospital, clinic, and ambulance.
14.2.5 Workers' changing rooms, eating and resting areas, clean toilets (minimum 1 per 20 workers), hand washing facilities, and food-grade soap shall be provided.
14.2.6 The operator shall conduct health examination at least after every six months to personnels (waterborne diseases, skin conditions, respiratory issues).

14.3 Safety measures

14.3.1 The operator shall document a worker health and safety risk assessment covering: pesticide exposure, machinery accidents, heat stress, snake/insect bites, ergonomic hazards (bending, lifting).
14.3.2 The operator shall document an occupational health and safety policy and communicate it to all workers (posted in English and/ Swahili).
14.3.3 Machinery shall be equipped with operational safety devices (emergency stop buttons, guards).
14.3.4 Fire extinguishers (dry chemical type, minimum 2 per storage facility), sand buckets, and fire blankets shall be easily accessible and maintained (monthly visual check, annual professional service).
14.3.5 Fire alarms shall be fitted to exit doors. Evacuation drills shall be conducted at least once per year and documented.
14.3.6 Emergency exits shall be clearly marked and fitted with fire safety break locks or remain unlocked during working hours.

14.3.7 Relevant safety rules and precautionary safety measures shall be clearly displayed in Swahili/English and/ pictograms in production, storage, and handling areas.

14.3.8 The emergency plan and accident procedures shall be displayed on common noticeboards.

14.4 Worker welfare

14.4.1 The height of grading tables, threshing stations, and other work facilities shall be appropriate for worker comfort (adjustable stools, anti-fatigue mats).

14.4.2 Food provided to workers (if any) shall meet public health requirements (clean preparation, covered storage, no cross-contamination).

14.4.3 Suitable resting areas (shaded, with seating) and where possible a canteen shall be provided, separated from working areas (minimum 10 m).

14.4.4 Employees whose work requires standing for long periods (sorting, bagging) shall be provided with chairs or stools.

14.4.5 Occupational health and safety, first aid, and hygiene training shall be provided at induction and annually thereafter.

14.4.6 Employees working with machinery or processes likely to cause bodily injury shall be fully instructed as to dangers and precautions, with signed acknowledgement.

14.4.7 All machinery shall be fully guarded and well maintained. Maintenance records (dates, actions, person responsible) shall be kept.

14.4.8 Signs shall be displayed regarding:

i. All sores and cuts shall be covered with waterproof dressing.
ii. Handwashing facilities with soap and paper towels (not cotton) shall be available.
iii. Powder shall not be used on hands.
iv. Fingernails shall be clipped short.
v. Protective clothing (overalls, head coverings) shall be worn in packing, storage, and handling areas.
vi. PPE shall be laundered weekly minimum and kept separate from personal clothing.
vii. Smoking, eating, and drinking are prohibited in all grain handling areas.
viii. No false nails, nail varnish, watches or jewellery (except plain wedding ring), chewing gum, or open shoes (sandals, slippers) shall be allowed in packhouse, store, or handling facility.

14.5 Crop-specific worker safety additions

14.5.1 For maize and wheat*:* Workers handling grain shall wear dust masks when cleaning, shelling/threshing, or handling dusty grain to reduce inhalation of fungal spores (including *Aspergillus* and *Fusarium*).

14.5.2 For maize*:* Workers sorting fungal-damaged kernels shall wear gloves and wash hands thoroughly after work.

14.5.3 For wheat*:* Workers fumigating wheat (e.g., with phosphine) shall be trained and competent, wear appropriate respirators and work in teams of at least two.

Workers sorting ergot-infected grain shall wear gloves and wash hands thoroughly after work (ergot alkaloids are toxic).

15. Labour, employment and social issues

15.1 A clearly identified, named member of management shall have documented responsibility for ensuring compliance with national labour legislation and implementation of the worker welfare policy.

15.2 In addition to the Labour Institutions Act and the Employment and Labour Relations Act ; the operator shall meet the following minimum requirements:

i. **Wages:** At least minimum wage per sector as published by the relevant Ministry responsible for employment and Labour, paid on time (monthly or weekly).
ii. **Staff recruitment and promotions:** Transparent, non-discriminatory process.
iii. **Induction and training:** All workers receive written or verbal induction on safety, hygiene, and rights.
iv. **Work contracts:** Written contracts for permanent workers; written terms for seasonal workers (duration, wages, tasks).
v. **Work hours and leave days:** Maximum 48 hours per week, 8 hours per day; overtime paid at 1.5x; annual leave of at least 28 days; sick leave with pay.
vi. **Expectant and nursing mothers:** No heavy lifting, no pesticide exposure, 12 weeks paid maternity leave, nursing breaks.
vii. **Termination:** In accordance with labour law (notice period, severance where applicable).
viii. **Workman's compensation:** Insurance coverage for workplace injuries (Workers Compensation Act).
ix. **Freedom of association and participation:** Right to join unions or worker committees.
x. **Grievance and disciplinary procedures:** Written, accessible and without retaliation.

xi. **Forced labour:** Prohibited. No retention of identity documents, no recruitment fees charged to workers.

xii. **Discrimination/harassment:** Prohibited based on race, gender, religion, ethnicity, pregnancy, HIV status, disability.

xiii. **Child labour:** No person under 15 years (or minimum school-leaving age) shall be employed. No person under 18 shall handle pesticides or operate heavy machinery.

xiv. **Record keeping:** Personnel files with contracts, attendance, pay records, training, and disciplinary actions shall be maintained.

15.3 Where a collective bargaining agreement is negotiated, it shall comply with the Labour Institutions Act and Labour Relations Act.

15.4 Separate sanitary facilities (toilets with water, soap, sanitary disposal bins) shall be provided.

15.5. For paddy rice - pregnant women shall not be assigned to transplanting or harvesting in flooded fields (risk of schistosomiasis and falls).

15.6 For contract farming schemes (outgrowers):

The contracting company shall provide written contracts in Swahili or English specifying:

i. Seed variety and input credit (seed, fertilizer, pesticide)

ii. Technical support

iii. Buy-back price with minimum guaranteed price

iv. Quality standards (moisture, aflatoxin level for maize; protein content, Falling number, DON for wheat; broken grain percentage)

v. Payment terms

16. Environmental management

16.1 The operator shall have a documented environmental risk assessment covering:

i. Soil erosion and degradation

ii. Water pollution (fertilizer runoff, pesticide drift)

iii. Greenhouse gas emissions (methane from flooded rice; nitrous oxide from fertilizers; CO_2 from machinery)

iv. Deforestation or grassland conversion (if applicable)

v. Biodiversity loss

vi. Waste (crop residues, plastic, pesticide containers)

vii. **For paddy rice***:* Methane emissions from flooded fields

16.2 An environmental management plan shall be developed based on the risk assessment, including:

16.2.1 Soil conservation:

i. Minimum tillage or conservation agriculture
ii. Contour ploughing and strip cropping on slopes
iii. Crop rotation with legumes

16.2.2 Crop residue management (stover/straw):

i. Burning of maize stover, rice straw, or wheat straw in the field is prohibited.
ii. Residue shall be incorporated into soil, used for mulch, animal feed, mushroom substrate, briquetting, or composting.

16.2.3 Water conservation:

i. Rainwater harvesting
ii. Mulching to reduce evaporation
iii. Irrigation runoff prohibited

16.2.4 Buffer zones:

i. Maintain 20 m buffer from rivers, lakes, and dams where no fertilizer or pesticide is applied.
ii. Maintain 50 m buffer from human dwellings for pesticide application.

16.2.5 Greenhouse gas reduction (rice only):

i. Mid-season drainage (10–14 days at maximum tillering)
ii. Alternate wetting and drying (AWD) implementation
iii. Use of low-emission rice varieties

16.3 The environmental management plan shall be reviewed and updated as per relevant regulations.

17. Energy management

17.1 The operator should have an energy management policy committing to:

i. Reducing fossil fuel use
ii. Improving energy efficiency
iii. Using renewable energy where feasible

17.2 The operator should have a written energy management plan including:

17.2.1 Tractors and field machinery:

i. Regular maintenance (clean air filters, correct tyre pressure) to reduce fuel consumption by 5–10%.

ii. Minimum tillage to reduce tractor passes.

17.2.2 Irrigation pumps:

i. Regular servicing (quarterly) to maintain efficiency.

ii. Solar-powered pumps preferred where feasible.

17.2.3 Dryers and shellers:

i. Use of biomass (maize cobs, rice husk) as fuel where applicable.

ii. Maintain dryer insulation.

17.2.4 Transport:

i. Route optimization for grain collection.

ii. Avoid partially filled trucks.

17.3 The operator should monitor energy use (litres of diesel, kWh of electricity, kg of biomass fuel) per ton of grain produced or handled. Records shall be kept quarterly.

18. Waste management

18.1 The operator shall have a documented waste management plan.

18.2 The operator shall provide separate disposal bins for different waste types (colour-coded: green for organic, yellow for hazardous, black for general).

18.3 Holding areas for fuel and oils shall be bunded, roofed, with impermeable floor, and labelled.

18.4 Wastewater treatment and disposal systems shall comply with National regulations.

18.5 Hazardous waste shall be disposed of using a licensed waste contractor. Records (consignment notes) shall be kept for five years.

19. Biodiversity conservation

19.1 The operator shall have a documented conservation policy complying with national legislation (Wildlife Conservation Act, Environmental Management Act,).

19.2 All non-cropped areas (field margins, contours, roadsides, bunds, irrigation channel banks) shall be managed to encourage biodiversity:

i. Native grasses or flowering plants shall be planted to support pollinators and natural enemies.

ii. Vegetation strips (minimum 2 m wide) shall be maintained along water bodies.

iii. Clearing of trees or shrubs on field boundaries without a permit is prohibited.

19.3 The operator shall practice activities that promote conservation:

i. Maintain or restore at least 5% of farm area as natural habitat (grassland strips, hedgerows, field corners, riparian zones).

ii. Protect and maintain trees (agroforestry where applicable).
iii. For maize*:* Use push-pull technology (desmodium + brachiaria grass) for pest control without pesticides.
iv. Protect beneficial organisms: spraying during flowering is prohibited; reduce broad-spectrum insecticides.

19.4 Conversion of native grasslands, wooded grasslands, or natural wetlands to grain cultivation shall not occur without Environmental Impact Assessment (EIA) approval for areas >50 hectares.

19.5 For existing grain fields in wetlands (rice): minimum 20 m buffer of natural vegetation shall be maintained.

20. Legal and contractual obligations

20.1 Legal compliance

The operator shall comply with applicable national laws and regulations

20.2 Contractual obligations

20.2.1 Operators in contract farming (outgrower schemes) shall:

i. Provide written contracts in Swahili/English input credit (seed, fertilizer, pesticide), technical support, purchase price (with minimum guaranteed price), quality parameters, and payment terms.

20.2.2 Compliance with specific buyer requirements

20.3 Non-compliance

Non-compliance with legal or contractual obligations shall be recorded, and corrective actions shall be implemented within specified time frame.