THAI AGRICULTURAL STANDARD

TAS 4403-2010

GOOD MANUFACTURING PRACTICES FOR RICE MILL

National Bureau of Agricultural Commodity and Food Standards
Ministry of Agriculture and Cooperatives

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Good Agricultural Practices (GAP) for Thai Hom Mali Rice and GAP for Rice were promulgated by Ministry of Agriculture and Cooperatives to be used as guidelines for the development of rice production system at the farm level. Thus, for rice quality improvement throughout the rice production processes in the supply chain, the Agricultural Standards Committee deems it necessary to establish a standard on Good Manufacturing Practices for Rice Mill in order to provide rice products of safe and good quality suitable for consumption or being used as raw materials for further rice production processes.

This standard provides all activities involved in rice milling operations. Rice mill owners may select only activities related to their operations.

This standard is based on the following documents:

National Bureau of Agricultural Commodity and Food Standards. Ministry of Agriculture and Cooperatives. B.E. 2550 (2007). Thai Agricultural Standard (TAS 9023-2007). Code of Practice: General Principles of Food Hygiene.

National Bureau of Agricultural Commodity and Food Standards. Ministry of Agriculture and Cooperatives. B.E. 2551 (2008). Thai Agricultural Standard (TAS 4001-2008). Thai Aromatic Rice.

National Bureau of Agricultural Commodity and Food Standards. Ministry of Agriculture and Cooperatives. B.E. 2551 (2008). Thai Agricultural Standard (TAS 4401-2008). Good Agricultural Practices for Rice.

NOTIFICATION OF THE MINISTRY OF AGRICULTURE AND COOPERATIVES
SUBJECT: THAI AGRICULTURAL STANDARD:
GOOD MANUFACTURING PRACTICES FOR RICE MILL
UNDER THE AGRICULTURAL STANDARDS ACT B.E. 2551 (2008)

Whereas the Agricultural Standards Committee deems it necessary to establish an agricultural standard on Good Manufacturing Practices for Rice Mill as a voluntary standard in accordance with the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodity to meet its standard on quality and safety.

By virtue of Section 5, Section 15 and Section 16 of the Agricultural Standards Act B.E. 2551 (2008), the Minister of Agriculture and Cooperatives hereby issues this Notification on the Establishment of Thai Agricultural Standard: Good Manufacturing Practices for Rice Mill (TAS 4403-2010), as a voluntary standard, details of which are attached herewith.

Notified on 7 October B.E. 2553 (2010)
Mr. Theera Wongsamut
Minister of Agriculture and Cooperatives

THAI AGRICULTURAL STANDARD

GOOD MANUFACTURING PRACTICES FOR RICE MILL

1 SCOPE

This standard establishes good hygienic practices for rice mill and its entire production processes including paddy receiving, drying, cleaning, dehusking, polishing, grading, packing, storage, and transportation, in order to provide rice products of safe and good quality suitable for consumption or being used as raw materials for further rice production processes.

2 DEFINITIONS

For the purpose of this standard, the following definitions and terminologies corresponding to the Notification of the Ministry of Commerce, entitled Thai Rice Standard, B.E. 2540 (1997), and the Thai Agricultural Standard on Good Agricultural Practices for Rice (TAS 4401-2008) are applied:

2.1 **Rice mill** means an establishment used for paddy milling to be milled rice or brown rice by using machinery. This also includes the milling of parboiled rice (optional).

2.2 **Establishment** means rice mill and areas assigned for paddy receiving and storage, drying, cleaning, soaking and steaming, dehusking, polishing, grading, packing and storage of rice product including packaging materials, waste disposal, chemical storage, supply storage, and other areas within the rice mill.

2.3 **Rice** means non-glutinous and glutinous rice from *Oryza sativa* L.

2.4 **Paddy** means un-husked rice.

2.5 **Brown rice or husked rice** means paddy which only its husk is removed whilst its germ and pericarp are retained.

2.6 **Milled rice or white rice** means husked rice which is polished to remove parts of germ and pericarp.

2.7 **Parboiled rice** means brown or milled rice from paddy that has been soaked, steamed, and dried, before milling and polishing.

2.8 **Rice products** mean products of brown rice, milled rice brokens and small brokens.

2.9 **By-product** means husk and bran.

2.10 **Yellow kernels** mean milled rice that parts of its kernel turn into yellow during storage.

3 REQUIREMENTS AND INSPECTION METHODS

Requirements and inspection methods shall be as in Table 1.

Table 1 Requirements and Inspection Methods

(Section 3)

Items	Requirements	Inspection Methods
1. Establishment 1.1 Location	1.1.1 The establishment shall be located in an area with no adverse impact to the communities.	1.1.1 Visual inspection of surrounding environment and/ or check preventive measures against pollution.
	1.1.2 The establishment shall not be located in an area that may cause contamination to rice products.	1.1.2 Visual inspection of surrounding environment and check preventive measures against product contamination.
1.2 Building and operating areas 1.2.1 Drying area	1.2.1.1 Floor shall be made of smooth concrete, clean, no water logging, and free of rubbish. In case the floor is not concrete, it shall be covered with materials that are able to prevent contamination.	1.2.1.1 Visual inspection of the operating area and and/or interview the operators.
	1.2.1.2 The drying area shall be protected from the entry of pets and disease carrier animals, and/or installed with fences.	1.2.1.2 Visual inspection of drying area and preventive measures.
1.2.2 Soaking and steaming areas	1.2.2 Building structure shall be made of strong and durable materials, easy to clean and maintain with good drainage.	1.2.2 Check building structure and operating area, particularly drainage and water treatment areas.
1.2.3 Storage areas for paddy, rice products and by-products	1.2.3.1 For normal storage: (1) Designated areas for each product shall be provided separately in order to prevent the mix-ups and contamination. (2) Building structure shall be strong, easy to clean and maintain. (3) Storage areas shall be able to prevent the entry of pests and disease carrier animals.	1.2.3.1 Check storage areas, structure, and control measures against pests, disease carrier animals and moisture.

Items	Requirements	Inspection Methods
	4) Storage areas shall be able to protect against moisture. (5) Adequate ventilation shall be provided.	
	1.2.3.2 For silo storage: (1) Silo shall be designed in order to allow effective circulation of paddy or rice products by the basis of first-in and first-out system without any leftover. (2) Silo structure shall be strong, easy to clean and maintain. (3) Silo shall be able to prevent the entry of pests and disease carrier animals. (4) Silo shall be able to protect against moisture. (5) Adequate ventilation or ambient temperature and relative humidity control systems shall be provided.	1.2.3.2 Check , silo, structure, ventilation and records of ambient temperature and relative humidity.
1.2.4 Areas assigned for paddy cleaning, dehusking, polishing grading and rice product packing	1.2.4.1 Areas shall be designed to have adequate working spaces and clearly separated from one another which are able to prevent contamination from pests and disease carrier animals.	1.2.4.1 Check the layout of the building and operating areas.
	1.2.4.2 Building structure shall be strong, made of durable materials, easy to clean and maintain.	1.2.4.2 Check building structure and operating areas.
1.3 Equipment, machinery and utensils	1.3.1 Specifications, types and sizes of equipment, machinery and utensils used in the production shall be appropriate for production capacity.	1.3.1 Check equipment, machinery and utensils and/or interview the operators.
	1.3.2 Equipment, machinery and utensils shall be strong, durable and made of appropriate materials that do not cause contamination harmful to the consumer and shed any particulate matter to rice products.	1.3.2 Check equipment, machinery and utensils and check preventive measures against contamination.
	1.3.3 Equipment, machinery and utensils shall be regularly cleaned and maintained.	1.3.3 Check the work plan and operations.
	1.3.4 The equipment, machinery and utensils shall be checked for accuracy before use.	1.3.4 Check the test records of equipment, machinery and utensils.

Items	Requirements	Inspection Methods
1.4 Facilities	1.4.1 Adequate ventilation shall be provided in the production area.	1.4.1 Check ventilation in the production area.
	1.4.2 Adequate lighting shall be provided in the quality control areas where the quality is visually inspected.	1.4.2 Check the light intensity.
	1.4.3 Water used in the rice polishing process shall be sufficient and meet the standards of potable water.	1.4.3 Check records of analytical results of water quality used in rice polishing process.
	1.4.4 Adequate number of cleaning facilities shall be provided and ready for use.	1.4.4 Check availability and sufficiency of cleaning facilities.
	1.4.5 Adequate systems and facilities for drainage and waste disposal shall be provided.	1.4.5 Check systems or facilities for drainage and waste disposal and records of waste disposal.
	1.4.6 Adequate facilities for personal hygiene and toilets shall be provided.	1.4.6 Check necessary personal hygiene facilities and toilets.
	1.4.7 Hazardous substances shall be stored in a secure and separated area.	1.4.7 Check chemical storage area and practices.
2. Control of operation 2.1 Paddy receiving	2.1.1 Paddy to be received shall be from: (1) Those fields that have been certified in Good Agricultural Practices for Rice (TAS 4401-2008), or (2) Those fields that have followed the Good Agricultural Practices for Rice (TAS 4401-2008), or (3) Known sources of production which can be traced.	2.1.1 Check records of paddy receiving and operation and/ or interview.
	2.1.2 Clear criteria for purchasing paddy shall be established and implemented.	2.1.2 Check the purchasing operation and records of paddy quality inspection and/or interview.
	2.1.3 The accuracy of equipment used for paddy quality inspection (paddy husker, polisher, round sieve used for sorting broken kernels) and amylose assay kit shall be checked according to the manual.	2.1.3 Check records of the accuracy of equipment used for paddy quality inspection and amylose assay kit.

Items	Requirements	Inspection Methods
	2.1.4 Weighing equipment, and paddy moisture meters shall be calibrated at least once a year.	2.1.4 Check report of calibration.
2.2 Soaking and steaming	2.2.1 Water used in soaking and steaming processes shall be clean and free of residues harmful for consumption.	2.2.1 Check record of water quality analytical results.
	2.2.2. Containers used in soaking and steaming processes shall be thoroughly cleaned after use	2.2.2 Check the record of operation and interview.
	2.2.3 Weighing equipment, volumetric flasks and thermometers shall be calibrated at least once a year.	2.2.3 Check the report of equipment calibration.
2.3 Drying	2.3 Paddy that has moisture content above 15% shall undergo the drying process within 24 hours prior to storage	2.3 Check the record of drying or sampling for quality control inspection and/or interview.
2.4 Paddy storage	2.4.1 Paddy shall be stored according to the duration for safe storage and moisture content as shown in Appendix A.2.4.1.	2.4.1 Check the stored paddy and randomly check the moisture content.
	2.4.2 Adequate ventilation shall be provided.	2.4.2 Check the paddy storage area and record of operation
	2.4.3 Circulation of paddy shall be properly controlled to ensure that there is no quality deterioration of paddy leftover.	2.4.3 Check the operation and the record.
2.5 Dehusking, polishing and grading	2.5.1 Specific systems or preventive measures shall be provided for the control and elimination of dust generated during the production processes.	2.5.1 Check the environment both inside and outside the production area as well as the performance of dust control and elimination system.
	2.5.2 Dehusker, polisher, grader, color sorter, stone and metal debris separators shall be calibrated at least once a year.	2.5.2 Check the record of equipment calibration.
	2.5.3 Supervisors shall pass specific training.	2.5.3 Check records of specific training and/or interview supervisors.

Items	Requirements	Inspection Methods
2.6 Packing of ricebproducts	2.6.1 Conveyors and rice packing machines shall be prevented from contamination of dust and other objectionable substances like debris of metal, glass, plastic, or chemicals.	2.6.1 Check the operations and preventive measures against contamination.
	2.6.2 Clean rice containers shall be provided, ready for use and non-defective. Do not use the containers that have been used for hazardous substances.	2.6.2 Check rice containers and check the record of rice container quality inspection.
	2.6.3 Weighing equipment and rice packing machines shall be calibrated at least once a year.	2.6.3 Check records of such equipment calibration.
2.7 Storage of rice products	2.7.1 Stacks of rice products shall be neatly and orderly arranged according to their categories and clearly indicated.	2.7.1 Check storing practices and storage area.
	2.7.2 Rice products shall not be stored with pesticides, fertilizers or other chemicals harmful for consumption.	2.7.2 Check storing practices and storage area.
	2.7.3 Rice products shall not be directly placed or piled up on the floor.	2.7.3 Check storing practices.
2.8 Storage of by-products	2.8 By-products shall be handled and stored properly in such a way to prevent the mix-ups to rice products.	2.8 Check storage area of by-products and preventive measures against mix-ups.
2.9 Transportation	2.9 Vehicles used for transporting rice products shall be clean, tightly closed and able to prevent the products from rain.	2.9 Check vehicles and the record of vehicle cleaning.
2.10 Record keeping	2.10.1 The following information shall be recorded: (1) General information of rice mill owner. (2) Paddy receiving (3) Quality grading of rice products	2.10.1 Review records.

Items	Requirements	Inspection Methods
	(4) Cleaning and maintenance (5) Quality parameters to be monitored (6) Performance test of machinery (7) Validation and calibration of equipment, machinery and utensils (8) Control and prevention of disease carrier animals (9) Storage of paddy, rice products, and by-products (10) Transportation of rice products (11) Historical records of personnel, training and annual medical examination.	
	2.10.2 All records shall be maintained for at least 3 years.	2.10.2 Check the records and their maintenance.
3. Maintenance and Sanitation 3.1 Cleaning and maintenance	3.1 Cleaning and maintenance of buildings and areas including equipment, machinery and utensils shall be regularly practised.	3.1 Check the cleaning and maintenance programmes and their records.
3.2 Controls of insects and disease carrier animals	3.2 Effective methods for prevention of insects and disease carrier animals shall be provided to prevent the contamination to rice products	3.2 Check the control programmes and records, particularly for paddy drying ground and storage of paddy, rice products and by-products as well as rice packing area.
3.3 Disposal of waste, unused or unrelated materials	3.3.1 Unqualified rice products shall be stored separately in order to prevent the mix-ups to the qualified rice products.	3.3.1 Check the storage areas, record of operations and/or interview.
	3.3.2 Rubbish and waste shall be immediately removed from production area and disposed hygienically.	3.3.2 Check the storage areas, record of operations and/or interview.
	3.3.3 Unused equipment, machinery and utensils shall be removed from production area.	3.3.3 Check operating area and/or interview.
4. Personal Hygiene	4. Personnel and visitors who are allowed to enter production area shall adhere strictly to the personal hygienic practices.	4. Check the personal hygiene instruction of the manufacturer and the personal hygiene of on-duty personnel and visitors and/or interview.

Items	Requirements	Inspection Methods
5. Training	5.1 Relevant personnel shall be trained on good hygienic practices and food safety.	5.1 Check the training programme and the record of training and/or interview.
	5.2 Machinery and quality control supervisors and personnel working in a product quality control laboratory shall be trained according to the duties and responsibility.	5.2 Check the training programme and the historical records of personnel and/or interview.

4. GUIDANCE ON GOOD MANUFACTURING PRACTICES FOR RICE MILL

Guidance on Good Manufacturing Practices for Rice Mill is intended to provide recommendations for rice mill operators in order to produce safe and suitable quality rice products for consumption including to be used as raw materials for further processing. The details are described in Appendix A.

APPENDIX A

GUIDANCE ON GOOD MANUFACTURING PRACTICES FOR RICE MILL

A.1 ESTABLISHMENT

A.1.1 Location

A.1.1.1 The establishment shall be located in an area with no adverse impact to the communities. Effective preventive measures against pollution caused by noise, dust and smoke, generated during the production operations of rice mill shall be in place. A new rice mill establishment shall be located away from the community.

A.1.1.2 The establishment shall not be located in an area that may cause contamination to rice products, such as waste disposal dump sites. If it is unavoidable, effective preventive measures against the contamination caused by disease carrier animals and other contaminants that may adversely affect to the quality of rice products shall be in place.

A.1.1.3 The establishment should be located in an area not subject to flooding. The location area should be stable without crack or shrinkage which may result in the ground breaking or sinking.

A.1.1.4 The selected area should have sufficient open spaces to provide areas for operation separated from office space, accommodation, parking area, waste water treatment system and other necessary facilities.

A.1.1.5 The location shall be in an area that is easy to transport and access. Adequate infrastructures shall be available.

A.1.2 Building and operating areas

A.1.2.1 Drying area

A.1.2.1.1 Floor shall be made of smooth concrete, clean, no water logging, and free of rubbish. In case the floor is not concrete, it shall be covered with materials that are able to prevent contamination and moisture absorbance from the ground.

A.1.2.1.2 The drying area shall be protected from the entry of pets and disease carrier animals, and/or installed with fences.

A.1.2.2 Soaking and steaming areas

A.1.2.2.1 Building structure shall be made of strong and durable materials, easy to clean and maintain.

(1) Wall, partition and floor shall be water-proof, non-absorbent, and made of non-toxic materials suitable for its intended use.

(2) Wall, partition and floor should have smooth surfaces.

(3) Floors should be designed for good drainage and no water-logging.

A.1.2.3 Storage areas for paddy, rice products and by-products

A.1.2.3.1 For normal storage with no control of temperature and relative humidity, the paddy arrangements can be categorized into two methods, bulk and bag storage, such as gunny bags or plastic bags etc. Such area shall have the following characteristics:

(1) Designated areas for each product shall be provided separately in order to prevent the mix-ups and contamination, and to allow piles of paddy, rice products and by-product to be arranged according to types.

(2) Building structure shall be made of durable materials, strong, water-proof, with smooth surface and non-toxic, and easy to clean and maintain.

(3) Storage areas shall be able to prevent the entry of pests and disease carrier animals, such as rodents and birds.

(4) Storage areas shall be able to protect against moisture.

(5) Adequate ventilation shall be provided to remove heat and moisture out of piles of products in order to minimize the damage caused by fungi and storage pests.

A.1.2.3.2 For silo storage, at present, there are three types of silo; (1) single control of temperature, (2) single control of relative humidity, (3) combination of temperature and relative humidity controls. Good design of silo shall be as follows:

(1) Silo shall be able to allow effective circulation of paddy or rice products by the basis of first-in and first-out system without any leftover. In addition, silo and its surrounding area shall be clean, dry, no drains or any outlet that be able to allow an access of pests and disease carrier animals, such as rodents.

(2) Silo structure shall be strong and easy to clean and maintain.

(3) Silo shall be able to prevent the entry of pests and disease carrier animals.

(4) Silo shall be able to protect against moisture.

(5) Silo shall have adequate ventilation, or ambient temperature and relative humidity control systems in order to prevent the accumulation of heat and moisture affecting the damage to rice, including the formation of mold and the growth of microorganisms as well as to prevent the breeding ground of rice pests.

A.1.2.4 Areas assigned for paddy cleaning, dehusking, polishing, grading and rice product packing

A.1.2.4.1 Areas shall be designed to have adequate ~~operational~~ working spaces and clearly separated in a logical order corresponding to the sequence of operations in order to facilitate the operations and provide effective protection against the contamination from pests and disease carrier animals. Particularly, a separate area for packing of rice products shall be provided in a closed system as much as practicable so as to minimize the potential risk of contamination of rice products since the contamination cannot be eliminated after this stage.

A.1.2.4.2 Building structure shall be strong and made of durable and non-toxic materials, smooth, easy to clean and maintain.

A.1.2.4.3 Adequate areas assigned for paddy receiving and temporary storage of bags containing polished rice for transport should be at least five times larger than the packing area being used currently.

A.1.2.4.4 In case a rice product packing room is constructed, the followings should be taken into account:

(1) The packing room shall be a closed system.

(2) The building structure shall be durable and strong. Floor and wall shall be strong, smooth without cracks, made of non-toxic materials, easy to clean and maintain.

(3) The packing room shall be clean. Effective cleaning programme shall be provided. Personal hygiene shall be controlled.

(4) Effective preventive measures against moisture, dust, pests and disease carrier animals shall be established and implemented.

(5) Adequate lighting shall be provided in proper positions and installed with protection covers so as to prevent the contamination of glass debris.

A.1.3 Equipment, machinery and utensils

A.1.3.1 Equipment, machinery and utensils appropriate for production capacity shall be designed and installed by selecting accurate specifications, types and sizes corresponding to each production stage with sufficient numbers for operation, and ready for use. In addition, they should be installed in the positions convenient for operations, cleaning and maintenance, by taking into account the potential risk of causing contamination.

A.1.3.2 All equipment, machinery and utensils used in the production shall be strong, durable and made of materials appropriate for operations in each stage of production processes, provided that they do not cause contamination harmful to the consumer and shed any particulate matter such as metal and stone particles, paints or lubricant by which the rice products can be contaminated.

A.1.3.3 All equipment, machinery and utensils used in the production shall be regularly cleaned and maintained in order to ensure their readiness for use.

A.1.3.4 The equipment, machinery and utensils shall be checked for accuracy before use, especially moisture meters, mechanical driers, silos used for paddy and rice storage, stone and metal particle separators, colour sorters and rice packing machines in order to ensure that they can perform correctly and effectively.

A.1.4 Facilities

A.1.4.1 Appropriate and adequate ventilation shall be provided in the production area.

A.1.4.2 Appropriate and adequate lighting shall be provided in the quality control areas where the quality is visually inspected. In general, the light intensity should be as follows:

(1) Inspection areas 540 lux

(2) Operating areas 220 lux

(3) Other areas 110 lux

A.1.4.3 Water used in rice polishing process shall be sufficient and meet the standards of potable water conforming to the Notification of Ministry of Public Health, entitled “Drinking Water in Sealed Containers”. The water should be used hygienically.

A.1.4.4 Adequate number of cleaning facilities appropriate to its intended use shall be provided, ready for use and kept separately in proper areas.

A.1.4.5 Adequate systems and facilities for drainage and waste disposal shall be provided in the production area. Adequate amount of waste containers with lid covers shall be provided with the procedures that detailed the identification, separation, and elimination of waste or unqualified rice products away from the production area. The manufacturer shall ensure that these areas do not allow the harbourage of germs and disease carrier animals such as birds and rodents.

A.1.4.6 Adequate facilities for personal hygiene shall be provided, such as caps, hair nets, mouth cover masks, hand gloves, hand wash basins and toilets.

A.1.4.6.1 Personal Protective Equipment shall be provided, such as dust mask, hearing protection and others including safety symbols in the production area.

A.1.4.6.2 Toilets shall be separate from the production area or not directly open to the production area. In addition, the toilets shall be maintained in hygienic conditions, ready for use, and equipped with hand wash basins in front of the toilets with soap or detergent, and hand drier facilities.

A.1.4.7 Storage and use of hazardous substances

A.1.4.7.1 All hazardous substances, such as disinfectants and pesticides, shall be clearly identified with labels and stored in an appropriate and secure areas isolated from the production area in order to prevent contamination.
A.1.4.7.2 All hazardous substances including pesticides shall not be stored in the production area, rice packing area as well as paddy and rice product storage areas.

A.1.4.7.3 Information of receiving and dispensing hazardous substances including the amounts of use and storage shall be recorded.

A.1.4.7.4 Personnel in charge of operating hazardous substances shall be regularly trained to acquire specific knowledge on the proper uses of hazardous substances.

A.2 Control of operation

A.2.1 Paddy receiving

A.2.1.1 Paddy to be received shall be from those fields that have been certified in Good Agricultural Practices for Rice (TAS 4401-2008), or those fields that have followed the Good Agricultural Practices for Rice (TAS 4401-2008), or known sources of production which can be traced.A.2.1.2 Clear criteria or specific requirements for purchasing paddy shall be established and implemented, such as paddy condition, foreign matters, paddy moisture content and milling quality. Random sampling for quality control inspection shall be carried out before purchasing. The quality requirements, such as variety, cleanliness, foreign matters, moisture content, milling quality and contamination of pests, shall be inspected. In case there is any doubt, random sampling for pesticide residue analysis shall be carried out in order to receive paddy of required quality. In case of purchasing Hom Mali paddy rice, amylose contents shall be determined for quality identification.

A.2.1.3 The accuracy of equipment used for paddy quality inspection, i.e., paddy husker, polisher, round sieve used for sorting broken kernels and amylose assay kit, shall be checked according to the manual.

A.2.1.4 Weighing equipment, and paddy moisture meters shall be calibrated at least once a year.

A.2.2 Soaking and steaming

A 2.2.1 Water used in soaking and steaming processes shall be clean and free of residues harmful for consumption. It shall be used in a hygienic manner. Recycled water should not be used as this may present the build-up contamination of microorganisms during the soaking process, which consequently forms sour odour in the paddy.

A 2.2.2 Containers used in soaking and steaming processes shall be thoroughly cleaned after use by completely removing all residues of rice or dirt from the containers, followed by washing with clean water in order to prevent the contamination and the accumulation of mould.

A. 2.2.3 Weighing equipment, volumetric flasks and thermometers shall be calibrated at least once a year.

A.2.3 Drying

Paddy that has moisture content above 15% shall undergo the drying process within 24 hours prior to storage in order to minimize the risk of mould formation and the occurrence of yellow kernel.

A.2.3.1 Sun drying: Appropriate thickness of paddy layer for sun drying is approximately 5 to 10 cm. The layer should be turnovered at frequent intervals or every two hours or four times a day in order to permit the rapid and uniform reduction of moisture content. Too long period of drying should be avoided. Drying period depends on the initial moisture content, thickness of paddy layer, turnover frequency and the required moisture content. Generally, the drying should be ceased when the moisture content is reduced to 14% or less.

A.2.3.2 Mechanical drying: Initial moisture content of paddy shall be at a maximum of 25% or less. Drying shall be performed at a maximum temperature of not over 50^{0}C with the relative humidity less than 60%. In addition, drying rate should not be too fast or the paddy will be damaged.

A.2.3.3 Fluidized bed drying: This drying method uses hot air at a minimum temperature of 80^{0}C to blow the paddy to reduce the moisture content. The paddy should not be dried to less 19% moisture content, otherwise it will be broken. After the moisture content is reduced to 19%, the paddy should be piled up, left to cool down and followed by mechanical drying to allow gradually reduction of the moisture content until it reaches the requirement or 14% approximately.

A.2.4 Paddy storage

A. 2.4.1 Paddy to be stored shall be clean and free of foreign matters, such as straw, stubble, weed, gravel, stone, soil and sand. Duration for safe storage depends on the moisture content of paddy as follows:

Storage duration (months)	**Moisture content (%)**
2	14
8 to 12	12 to 13

A.2.4.2 Temperature and relative humidity inside the paddy storage should be controlled to be lower than the conditions that promote the growth of microorganism and pest (Optimum conditions for microbial growth are at 30°C to 40°C and more than 65% relative humidity. For storage pest, favourable conditions for their growth are at 25°C to 35°C and 65% to 80% relative humidity). If temperature and relative humidity are too high, they will adversely affect the paddy quality.

A.2.4.3 Circulation of paddy shall be controlled so that the former is used first and the latter is stored efficiently. Paddy of deteriorated quality shall be managed to be completely removed from the storage area.

A.2.4.4 Thermometer and air moisture meters shall be calibrated at least once a year.

A.2.4.5 Cleanliness of paddy storage area and the surroundings shall be maintained. Floors shall be dry, without water-logging and damp surfaces. Adequate drainage systems shall be installed with drain covers in order not to permit the accumulation of rubbish and waste as well as harbouring areas for disease carrier animals, such as birds, rodents, cockroaches and ants.

A.2.4.6 The stored paddy shall be inspected regularly for at least once a week, depending on the quality and quantity of paddy as well as the level of risk in order to prevent the damage caused by pests, birds, rodents or microorganisms. Random sampling for the inspection of pest infestation shall be carried out for at least once a month. In case of rot or quality deterioration of rice products is found, they shall be removed from the storage area immediately.

A.2.4.7 When the temperature and moisture content within a pile of paddy increase, those piles should be relocated or turned over periodically in order to release the excess of heat and the humidity accumulated within the pile.

A.2.5 Dehusking, polishing and grading

A.2.5.1 Specific systems or preventive measures shall be provided for the control and elimination of dust generated during dehusking, polishing and grading operations in order not to permit its emission into the air. A rice polishing machine should be in a closed system and able to control dust emission generated during the polishing operation into the external environment not exceeding the level established by law. For the rice mills that have the production capacity over than 20 tons per day, effective preventive measures shall be implemented to control the concentration of dust or particles emitted during the production processes. During the operations, the difference of concentrations of dust or particles with the sizes less than 10 microns measured at the windward and leeward points shall not exceed

0.100 mg/m^3 (100 microgram per cubic meter) or in accordance with the Notification of Ministry of Natural Resources and Environment, entitled “Emission Standard for Rice Mills”.

A. 2.5.2 Dehusker, polisher, grader, color sorter, stone and metal debris separators shall be calibrated at least once a year. The accuracy of such machines and equipment shall be checked according to the operation manual. The performance testing of dehusker, miller and rice quality sorter shall be carried out prior to the operations.

A.2.5.3 Supervisors of dehusking, polishing, sizing and quality sorting shall pass specific training to gain their competency or have skill and experience to control the operations accurately and efficiently in order to obtain the rice products of good quality.

A.2.5.4 Production plan should be properly elaborated in order to avoid any leftover supply of paddy and rice products such as brown rice and milled rice in conveyors or processing equipment.

A.2.5.5 Piles of paddy shall not be remained in the production area. They should be removed and stored in the paddy storage area and timely delivered just enough for each production. Excessive paddy shall not be piled up in the production area.

A.2.5.6 Proper and clear instruction manuals for the following operations should be available:

(1) Performance testing of dehusker

(2) Performance testing of polisher

(3) Performance testing of grader

(4) Performance testing of colour sorter

(5) Performance testing of foreign matter separator

A.2.6 Packing of rice products

A.2.6.1 Conveyors and rice packing machines shall be prevented from contamination of dust and other substances like debris of metal, glass, plastic, or chemicals such as lubricant and grease generated during the maintenance.

A.2.6.2 Clean rice containers shall be provided. Do not use the containers that have been used for hazardous substances. The containers should be made of non-toxic materials, ready for use without any defect and able to prevent contamination and moisture. The containers shall be regularly inspected for quality control and kept in clean areas.

A. 2.6.3 Weighing equipment and rice packing machines shall be calibrated at least once a year. The accuracy of such machines and equipment shall be regularly checked prior to the operations.

A.2.6.4 Rice packing area should be located in a designated area separate from other areas in order to prevent cross-contamination and should be in a closed system. Preventive measures against the entry of insects and disease carrier animals into working areas can be achieved by installation of efficient insect trapping devices within the rice packing area as well as sealing all openings and cracks with appropriate materials, such as door seal, silicone or other durable materials. The insect trapping devices shall be regularly monitored to ensure their functional conditions.

A.2.6.5 Rice products should be packed immediately in containers, such as gunny or plastic bags, not be remained in the packing area but transferred to designated storage areas everyday.

A.2.6.6 Readiness and cleanliness of conveyors, equipment, machinery and utensils should be inspected before and during the operations. When the operations finish each day, the conveyors, equipment, machinery and utensils used in production processes should be effectively cleaned and maintained.

A.2.6.7 Personal hygiene and clothing should be examined to prevent the contamination to rice products. Personnel in the production area should refrain from non-hygienic behaviour, for example smoking, spitting, and chewing during the operations.

A.2.7 Storage of rice products

A.2.7.1 Stacks of rice products shall be neatly and orderly arranged according to their categories and clearly indicated in order to prevent the mix-ups.

A.2.7.2 Rice products shall not be stored with pesticides, fertilizers or other chemicals harmful for consumption. Their storage area shall be separated.

A.2.7.3 Rice products shall not be directly placed or piled up on the floor. Stacks of sacks or containers used for storing rice products shall be arranged on floor covering materials or pallets. The use of wooden pallets shall be avoided as they can be the breeding grounds for rice pests. If pallets are unavailable, the sacks or the containers shall be placed on other proper materials that can avoid direct contact of such containers to the floor in order to prevent contamination and moisture absorbance from the floor.

A.2.7.4 When pest infestation is found, fumigation with chemicals shall be applied carefully in compliance with the instructions prescribed on the labels or official recommendations in order not to pose a hazard to operators and contamination to rice products.

A.2.7.5 Stacking of gunny bags containing 50 - 100 kg of rice shall not be higher than 5.25 m per pile. Whereas, for stacking of plastic bags, the height of each pile shall not be over than 3.5 meters as the plastic bags is slippery and not stable as gunny sacks. A too high stacking pile may cause an accident injuring the operators.

A.2.7.6 Adequate space between stacks of rice products shall be provided for ease of working and inspection. The wall space should be at least 0.50 m and between stacks should be around 1 m for good ventilation and ease of inspection and cleaning. Besides, the rice stacks should provide a space of at least 1.5 meters away from the roof.

A.2.8 Storage of by-products

By-products from the production processes, such as husk and bran, shall be handled and stored properly in such a way to prevent the mix-ups to rice products, for example, the by-products should be stored separately outside the production area or kept in sealed containers to avoid any dispersion.

A.2.9 Transportation

Vehicles used for transporting rice products shall be clean, tightly closed or able to prevent the products from rain, and should not be used for loading soil, animals and waste, fertilizers, chemicals or pesticides except that the effective cleaning is properly done before use. Effective preventive measures against contamination from insects, disease carrier animals, water, chemicals, and other foreign matters shall be in place, for example, inspection and cleaning should be conducted prior to loading of rice products onto the vehicle, and the rice products shall be handled with care during the transportation in order to avoid product deterioration. Personnel engaged in transportation and handlings shall follow good hygienic practices in order to prevent contamination or risk to rice product safety.

A.2.10 Record keeping

A.2.10.1 Record forms shall include at least as follows:

(1) General information of rice mill owner

(2) Paddy receiving

(3) Quality grading of rice products
(4) Quality parameters to be monitored

(5) Validation and calibration of measuring equipment, machinery and utensils

(6) Performance test of machinery used for the storage of paddy, rice products and by-products

(7) Control and prevention of disease carrier animals

(8) Cleaning and maintenance

(9) Transportation of rice products

(10) Historical records of personnel, training and annual medical examination

A.2.10.2 All records and important documents related to the operations shall be maintained for at least 3 years. For the records of personnel, equipment, machinery and utensils, they shall be maintained until the discontinuation of application.

A.2.10.3 All information related to production processes should be recorded. All documents or records should be regularly updated for each batch production. When entries are made in records, these should be countersigned by both operators in charge and supervisors. Records shall be kept systematically in order to be easy for searching, investigating and retrieving.

A.3 Maintenance and Sanitation

A.3.1 Cleaning and maintenance

A.3.1.1 Cleaning programme specifying cleaning methods, frequency, and personnel in charge shall be established.

A.3.1.2 Cleaning, maintenance and repair of floors, walls, ceilings and other facilities, fixed on the walls or on the ceilings, as well as inspection of all openings and cracks shall be regularly practised.

A.3.1.3 Building, operating and surrounding areas shall be kept clean without water-logging and damp surfaces. Adequate drainage systems shall be installed with the drain covers in order to avoid accumulation of rubbish and waste which can be potential harbouring areas for disease carrier animals, such as rodents, cockroaches and ants.

A.3.1.4 Equipment, machinery and utensils used in production processes shall be cleaned and maintained in a functional condition for efficient use. After cleaning, they should be kept separately in designated areas.

A.3.1.5 Effective operating programmes for application, inspection, maintenance and repairing of equipment, machinery and utensils used in production processes shall be established.

A.3.2 Controls of insects and disease carrier animals

A.3.2.1 Effective methods for control and prevention of the entry of insects, pets and disease carrier animals into the production area, particularly paddy drying area, paddy/rice product/by-product storage areas, and rice product packing area. Buildings should be regularly maintained and repaired to be in good conditions. Potential breeding grounds for insects and disease carrier animals shall be eliminated. All gaps, drains and areas where disease carrier animals are likely to access should be sealed, for example by mesh net, mesh screen or plastic screen. However, control measures against disease carrier animals shall be firstly emphasized on the prevention by regular inspection of operating areas, investigation of trace of disease carrier animals, damage and body parts in order to control them promptly.

A.3.2.2 Elimination of insects and disease carrier animals by chemicals or physical or biological methods should not adversely affect the safety of rice products. If such chemicals are used in the production area, the potential risk of contamination to rice products should be considered and the preventive measures should be taken.

A.3.2.3 Good hygienic practices should be employed to avoid creating an environment conducive to the entry of disease carrier animals into the production area, for example cleanliness of production area for both inside and outside should be regularly maintained and unqualified rice products and wastes should be discarded. Keep all waste and unqualified product in sealed containers and disposed or handled hygienically in order to eliminate potential breeding sites.

A.3.3 Disposal of waste, unused or unrelated materials

A.3.3.1 Unqualified rice products shall be stored separately and clearly identified in order to prevent the mix-ups to the qualified rice products.

A.3.3.2 A proper system shall be established for separation and removal of rubbish and waste from the production area. Identification, storage, and disposal shall be done hygienically by taking into account the risk of contamination to rice products and environment.

A. 3.3.3 Unused, out of order or unrelated equipment, machinery and utensils to the production processes shall be removed from the production area and stored separately in the designated area.

A.3.3.4 Buildings and surrounding areas shall be provided with good drainage. Debris from the production shall not be remained in drains. The drains shall not be designed in such a way that they are in the middle of the building or the production area as they can be an access route for disease carrier animals.

A.4 Personal Hygiene

A.4.1 Personnel shall be regularly examined for good hygienic practices in order to minimize the risk of contamination to paddy and rice products. Personal hygiene and dressing should be recorded.

A.4.1.1 Personnel shall have good health and not suffer from an infectious disease. All personnel whose duties take them into the production area shall receive medical health examination for at least once a year. Records of medical health examination shall be retained.

A.4.1.2 Personnel shall wear clean clothing suitable for the operations with which they are involved, for example personnel working in rice packing areas shall wear hair net, head cover and clothing that is made without wrist buttons. Wearing any accessory is not allowed during the operations.

A.4.1.3 Personal hygiene should be regularly maintained for example by thoroughly cleaning hand, nail and arm before and after working, including wearing hand gloves, footwear, mouth covering mask, hair net and head cover during the operations in rice packing areas.

A.4.1.4 Personnel working in the production area should refrain from non-hygienic behaviour, such as smoking, spitting, and chewing during the operations.

A.4.1.5 Visitors who are allowed to enter the production area shall receive prior permission and adhere strictly to the personal hygiene instruction according to the specified rules or the requirements referred to in Sections A.4.1.2 and A.4.1.4.

A.5 Training

A.5.1 Basic training on food hygiene is essential. All personnel shall be trained on good hygienic practices and food safety in order to acquire knowledge and realize their roles and responsibility for safe product handlings.

A.5.2 Machinery and quality control supervisors, personnel who work with hazardous substances and personnel working in a product quality control laboratory shall be trained according to duties and responsibility.

APPENDIX B

SAMPLE OF RECORD FORM
GENERAL INFORMATION OF RICE MILL OWNER

(Section A.2.10.1 (1))

1. Name of rice mill.....

2. Address of rice mill No. .....Moo.....Road.....Sub-district.....

District.....Province.....Postal code.....

Tel..... Mobile phone No. ..... Fax .....

3. Registration number of Department of Industrial Works.....

4. Production capacity (per day).....

5. Name of contact person.....

Identification number ☐☐☐☐☐☐☐☐☐☐☐☐☐

Position.....

Contact address: No. .....Moo.....Road..... Sub-district.....

District.....Province.....Postal code.....

Tel..... Mobile phone No. ..... Fax.....

6. Name of the product requested for certification.....

.....

7. Scope or process to be certified.....

.....

.....

8. Map of rice mill location showing transportation route and significant places nearby

SAMPLE OF RECORD FORM
PADDY RECEIVING

(Section A.2.10.1 (2))

Date of paddy receiving..... Time.....	
Name of deliver..... Identification number ☐☐☐☐☐☐☐☐☐☐☐☐☐ Address …….No. .....Moo.....Road..... Sub-district.....District.....Province..... Postal code.....Tel..... Mobile phone No.	
Vehicle plate number	
Weight of vehicle before unloading of paddy (kg)	
Weight of vehicle after unloading of paddy (kg)	
Net weight of paddy (kg)	
Type/variety of paddy	
☐ GAP certification No.	
☐ No GAP certification but the field has followed the GAP. Name of grower ..... Field location: Moo..... Sub-district.....District..... Province.....Postal code..... Date of harvest (Date/Month/Year).....	
Paddy quality	
% moisture content	
% foreign matters	
% head rice	
% brokens	
Abnormal appearance (i.e. yellow kernels, immature kernels, wet paddy, paddy with unpleasant odour)…….....	
Storage location	

Sign of recorder..... **Sign of supervisor**.....

(.....) **(.....)**

SAMPLE OF RECORD FORM
MACHINERY OPERATIONAL INSPECTION

(Section A.2.10.1 (3))

Section/Division……

Code of Machine	Name/type of Machine	Date/Month/Year	Time	Operation		Trouble/Correction	Name of recorder
				Normal	Abnormal		

Sign of supervisor……

(……)

SAMPLE OF RECORD FORM
CALIBRATION PLAN

(Section A.2.10.1 (4))

Section/Division..... Date.....

Code of equipment	Name/type of equipment	Measuring range	Calibrating range	Correction	Accuracy	Date of previous calibration	Calibrated by	Date of next calibration	Name of Recorder

Sign of supervisor.....

(.....)

SAMPLE OF RECORD FORM
QUALITY GRADING

(Section A.2.10.1 (5))

1. Date of production ...../...../..... Time		
2. Type/variety of rice:		
3. Storage location of paddy:		
4. Lot No. of paddy:		
5. Weight of paddy (kg):		
Polishing Quality	**Weight of Products**	
	Kilogram	**Percentage by weight**
1. Whole kernels		
2. Head rice		
3. Large brokens		
4. Medium brokens		
5. Small brokens		
6. Degree of polishing		
7. Storage location of rice products		

Sign of recorder.....

(.....)

Sign of supervisor.....

(.....)

SAMPLE OF RECORD FORM
STORAGE OF PADDY AND RICE PRODUCTS

(Section A.2.10.1 (6))

Division..... Storage location..... ☐ Paddy ☐ Rice products (specify).....

Date	Time	Storage condition		Condition of paddy/rice products			Cause/Correction	Name of Recorder
		Temperature(^{o}C)	Relative humidity (%)	Temperature (^{o}C)	Moisture content (%)	Abnormality		

Sign of supervisor.....

(.....)

SAMPLE OF RECORD
CONTROL OF INSECTS AND DISEASE CARRIER ANIMALS

(Section A.2.10.1 (7))

Place/ Division	Date	Time	Trace evidence (e.g. body/feces/ footprints/smell/body parts)	Correction	Result of investigation		Name of Recorder
					Satisfied	Unsatisfied	

Sign of supervisor.....

(.....)

SAMPLE OF RECORD FORM
CLEANING AND MAINTENANCE PROGRAMMES OF PRODUCTION AREA

(Section A.2.10.1 (8))

Place/ Division	Date	Time	Cleaning Items	Maintenance Items	Name of Recorder

Sign of supervisor.....

(.....)

SAMPLE OF RECORD FORM
CLEANING AND MAINTENANCE PROGRAMMES OF EQUIPMENT, MACHINERY AND UTENSILS

(Section A.2.10.1 (9))

Division……

Serial No.	Name/type	Date	Time	Cleaning		Maintenance		Name of Recorder
				Before production	After production	Before production	After production	

Sign of supervisor……

(……)

SAMPLE OF RECORD FORM
TRANSPORTATION OF RICE PRODUCTS

(Section A.2.10.1 (10))

Date.....**…… Departure time**.....

Name of customer.....

Name of delivery place/distribution center.....

Address: No. .....Moo.....Road.....Sub-district.....

District.....Province.....Postal code.....

Vehicle plate number.....**….**

Name of driver.....

Vehicle condition .....

☐ Cleanliness (specify).....

☐ Product protection (specify).....

Product item to be delivered.....(Lot No.) .....

Deliver quantity (kg).....

Product condition: moisture content (%)..... Temperature (^{o}C).....

Defects .....

.....

Correction.....

.....

Sign of recorder..... **Sign of supervisor**.....

(.....) (.....)

SAMPLE OF RECORD FORM
RECORD OF TRAINING/ON-THE-JOB TRAINING (OJT)

Section A.2.10.1 (11)

1. Name..... Employee I.D.....

2. Date of commencement.....

3. Employment record

3.1 Position/Section/Division..... Starting date.....

3.2 Position/ Section/Division..... Starting date.....

3.3 Position/ Section/Division..... Starting date.....

4. Record of training/OJT (according to position and responsibility)

Training date	Name of training course	Organiser	Certificate		Name of Recorder
			Yes	No	

5. Record of training according to quality systems/personal hygiene

Training date	Name of training course	Organiser	Certificate		Name of Recorder
			Yes	No	

Sign of supervisor.....

(.....)

APPENDIX C

UNITS

The units and symbols used in this standard and the units recognized by the International System of units (*Le Système International d' Unités*) or SI are as follows:

Type of Measurement	**Name of Unit**	**Symbol**
Length	centimetre	cm
	metre	m
Density	millilitre/litre	ml/l
Mass	milligram	mg
	kilogram	kg
Temperature	degree Celsius	◦C
Light intensity	lux	lux