



THAI AGRICULTURAL STANDARD

TAS 4001-2008

THAI AROMATIC RICE

National Bureau of Agricultural Commodity and Food Standards

Ministry of Agriculture and Cooperatives

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50 Phaholyothin Road, Ladyao, Chatuchak, Bangkok 10900

Telephone (662) 561 2277 www.acfs.go.th

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Ad hoc Sub-Committee on the Elaboration of Standards for Rice

1. Ms. Ngamchuen Kongseree Chairperson
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19. Representatives of the Office of Commodity and System Standards,
National Bureau of Agricultural Commodity and Food Standards
Ms. Namaporn Attaviroj
Ms. Monthicha Sanpa-asa
Ms. Saowapan Palasuwan
Assistant Secretary

Thailand is the world major producer and exporter of the aromatic rice. Apart from the Thai Hom Mali Rice in accordance with the standard TAS 4000, there are other varieties of aromatic rice which have been produced and exported. In order to have a standard for other Thai aromatic rices for quality and safety improvement, for recognition both domestically and internationally, and also for consumer protection, the Ministry of Agriculture and Cooperatives deems it necessary to establish a standard for Thai Aromatic Rice.

This Thai Agricultural Standard is based on the result of the Study of a Key Characteristic Indices of Rice (Aromatic Rice) in terms of grain quality classification and sizing of the National Bureau of Agricultural Commodity and Food Standards in cooperation with the Rice Department, Ministry of Agriculture and Cooperatives.

The establishment of this standard is based on the information of the following documents:

Department of Foreign Trade B.E. 2546 (2003). Thai Rice Standard and Thai Hom Mali Rice Standard. The Teachers' Council of Thailand Publishing, Ladprao. Bangkok.

Ministry of Agriculture and Cooperatives B.E. 2546 (2003). Thai Agricultural Standard (TAS 4000-2003). National Bureau of Agricultural Commodity and Food Standards.

FAO/WHO. 1995. Codex Standard for Rice (CODEX STAN 198-1995). Joint FAO/WHO Food Standard Programme, FAO, Rome.

Remark:

The standard title has been revised from “Thai Agricultural Commodity and Food Standard (TACFS)” to “Thai Agricultural Standard (TAS)” in accordance with the enforcement of the Agricultural Standards Act B.E. 2551 (2008).



**NOTIFICATION OF THE NATIONAL COMMITTEE ON AGRICULTURAL
COMMODITY AND FOOD STANDARDS
SUBJECT: THAI AGRICULTURAL COMMODITY AND FOOD STANDARD:
THAI AROMATIC RICE
B.E. 2551 (2008)**

The resolution of the 1/2551 session of the National Committee on Agricultural Commodity and Food Standards dated 11 August B.E. 2551 (2008) endorsed the Thai Agricultural Commodity and Food Standard entitled Thai Aromatic Rice. This standard would be of benefits for quality improvement, facilitating trade and protecting consumers.

By virtue of the Cabinet Resolution on Appointment and Authorization of the National Committee on Agricultural Commodity and Food Standards dated 5 August B.E 2551 (2008), the Notification on Thai Agricultural Commodity and Food Standard entitled Thai Aromatic Rice is hereby issued as voluntary standard, the details of which are attached herewith.

Notified on 14 August B.E. 2551 (2008)

Mr.Somsak Prisana-nantakul

Minister of Agriculture and Cooperatives

Chairperson of the National Committee on Agricultural Commodity and Food Standards

THAI AGRICULTURAL STANDARD
THAI AROMATIC RICE

1. SCOPE

1.1 This Thai Agricultural Standard applies to Thai Aromatic Rice covering both non-glutinous aromatic rice and glutinous aromatic rice from *Oryza sativa L.*, of the genus Gramineae or Poaceae which contain a natural fragrant aroma depending on storing age. The standard includes paddy, brown rice and white rice which are derived from paddy of aromatic rice varieties produced in Thailand and are certified by the Department of Agriculture or the Rice Department or other agencies authorized by the Ministry of Agriculture and Cooperatives as the varieties of aromatic rice.

1.2 This standard excludes the standard for Thai Hom Mali Rice which was established under the TAS 4000-2003: the Thai Agricultural Standard on Thai Hom Mali Rice, and excludes vitamin fortified rice.

2. DEFINITIONS

For the purpose of this standard:

2.1 **Non-glutinous aromatic rice or non-waxy aromatic rice** means white aromatic rice, brown aromatic rice and paddy aromatic rice which their characteristics on white rice provides translucent appearance. Some of the grain may or may not contain an opaque spot.

2.2 **Glutinous aromatic rice** means white glutinous aromatic rice, brown glutinous aromatic rice and paddy glutinous aromatic rice which their characteristics on white glutinous rice provides opaque appearance. After being steam cooked, the grain turns to glutinous and sticks together.

2.3 **Paddy or rough aromatic rice or unhusked aromatic rice** means non-glutinous aromatic rice or glutinous aromatic rice retaining its husk after threshing.

2.4 **Husked aromatic rice or brown aromatic rice or cargo aromatic rice or loonzain aromatic rice** means non-glutinous aromatic rice or glutinous aromatic rice from which only the husk has been removed. Some parts of bran layer may be removed during husking process.

2.5 **White aromatic rice or milled aromatic rice or polished aromatic rice** means rice obtained by removing bran and the embryo from brown non- glutinous aromatic rice.

2.6 **White glutinous aromatic rice or milled glutinous aromatic rice or polished glutinous aromatic rice** means rice obtained by removing bran layer and the embryo from brown glutinous aromatic rice.

2.7 **Parts of rice kernels** mean each part of the whole kernel that is divided lengthwise into 10 equal parts.

2.8 **Whole kernels** mean rice kernel that are in whole condition without any broken part, including kernels which have at least nine parts.

2.9 **Head rice** means broken kernel whose length is more than those of broken but not reach the length of the whole kernel. This includes split kernels that retain at least 80% of the whole kernel area.

2.10 **Brokens** mean broken kernels whose lengths are at least 2.5 parts of a whole kernel, but less than the length of head rice. This includes split kernels that retain less than 80% of the whole kernel area as prescribed in Annex B.

2.11 **Red kernels** mean brown rice kernels that have red bran layer covering the kernels wholly or partly.

2.12 **Chalky kernels** mean non glutinous rice kernels that have opaque area like chalk covering at least 50% of the kernels.

2.13 **Undeveloped kernels** mean rice kernels that have not developed normally and are flat.

2.14 **Damaged kernels** mean rice kernels that are damaged by moist, heat, mould, insects or others that can be obviously observed.

2.15 **Yellow kernels** mean rice kernels that have some parts of the kernels turn into an apparent yellow. This includes parboiled rice kernel that is light brown partly or wholly.

2.16 **Immature kernels** mean rice kernels which are light green and smaller than normal grains.

2.17 **Wet grain aromatic rice or Wet paddy aromatic rice** means paddy aromatic rice which has been harvested and threshed immediately without receiving moisture reducing process. The moisture of wet paddy normally is not less than 18% by weight.

2.18 **Foreign matters** mean the other matter than rice kernel and includes rice husk and bran detached from rice kernels.

2.19 **Amylose** means a kind of starch fraction in rice kernels. When cooked, the texture of the rice kernels varies according to the content of amylose.

2.20 **Alkali spreading value** means rate of disintegration of the starch from white rice or white glutinous rice kernels after being soaked in 1.7% potassium hydroxide solution for 23 hours at 30°C temperature.

3. GRAIN TYPE AND GROUP OF AROMATIC RICE

3.1 Grain type of aromatic rice is classified into three types according to milling process as below:

3.1.1 Paddy aromatic rice;

3.1.2 Brown aromatic rice; and

3.1.3 White aromatic rice and white glutinous aromatic rice.

3.2 Aromatic rice is classified into four groups as below:

(1) Soft non-glutinous aromatic rice is the rice which its white rice starch contains low content of amylose (13% up to less than 20% by weight at 14% moisture content) and its alkali spreading value is in the range of 6 to 7. Its grains, when cooked, are soft and rather sticky texture;

(2) Loose non-glutinous aromatic rice is the rice which its white rice starch contains intermediate content of amylose (20% up to less than 25% by weight at 14% moisture content). Its grains, when cooked, are loose and rather soft texture;

(3) Hard non-glutinous aromatic rice is the rice which its white rice starch contains high content of amylose (at least 25% by weight at 14% moisture content). Its grains, when cooked, are loose and hard texture and

(4) Glutinous aromatic rice is the rice which its alkali spreading value is in the range 6 to 7. Its grains, when steam cooked, are glutinous and stick together.

See list of rice varieties and their characteristics in Annex A.

Analysis for amylose content, alkali spreading value and moisture content are described in Section 11.

4. QUALITY

4.1 GENERAL REQUIREMENTS

4.1.1 Non-glutinous aromatic rice and glutinous aromatic rice including paddy, brown rice, white rice and white glutinous rice shall be in compliance with the following minimum requirements:

- (1) Safe and fit for human consumption according to Section 7, 8 and 9;
- (2) Uniform in appearance according to its quality class prescribed in Section 4.2; and
- (3) Retain the characteristics of its varieties as prescribed in Annex A.

4.2 SPECIFIC REQUIREMENTS

4.2.1 Paddy aromatic rice shall be in compliance with the following specific requirements:

- (1) Grain, when milled to white rice or white glutinous rice, contains a natural fragrant aroma, depending on storing age and shall be free from abnormal odor. Aroma test is prescribed in Section 11;
- (2) Having a moisture content not exceeding 15% for paddy in trade, except freshly harvested paddy of aromatic rice which buyer shall immediately apply an appropriate drying process to obtain a moisture content not exceeding 15%. A method of moisture content analysis is prescribed in Section 11;
- (3) Paddy intended for storage, shall contain a moisture content not exceeding 14%;
- (4) Rice of the same group under Section 3.2 not less than 95%;
- (5) Other rice and foreign matters that may present shall not exceed the limit prescribed in Table 1; and

(6) Yielding not less than 34% of whole kernel and head rice when milled.

Table 1 Other rice and foreign matters that may present
(Section 4.2.1 (5))

Other rice and foreign matters that may be present	Percent by weight	
	Non-glutinous Paddy	Glutinous Paddy
Red kernels	2.0	2.0
Yellow kernels	1.0	1.0
Foreign matters and undeveloped kernels	2.0	2.0
Chalky kernels	6.0	-
Glutinous rice in Non glutinous Aromatic rice	2.0	-
Non glutinous rice in glutinous Aromatic rice	-	5.0

Remark: Methods of analysis are prescribed in Section 11

4.2.2 Brown aromatic rice, white aromatic rice and white glutinous aromatic rice shall be in compliance with the following specific requirements:

- (1) Contain a natural fragrant aroma, depending on storing age and shall be free from abnormal odor such as sour or acidic odor;
- (2) Free from living insects and mites;
- (3) Having a moisture content not exceeding 14%; and
- (4) Contain not less than 90% of the same group of rice prescribed in Section 3.2.

4.3 QUALITY CLASSIFICATIONS

4.3.1 Classification of paddy

Paddy of aromatic rice is classified in 10 classes (grades), depending on its milling quality (percentage of whole kernels and head rice per paddy) as prescribed in Table 2. In trade terms, if the milling quality of class one paddy is higher than 52%, additional sub-classes may be quoted under an agreement between traders.

Table 2 Classification of paddy
(Section 4.3.1)

Class	Milling quality not less than (percentage)
1	52
2	50
3	48
4	46
5	44
6	42
7	40
8	38
9	36
10	34

Remark: Method of analysis is prescribed in Section 11.

4.3.2 Classification of brown aromatic rice, white aromatic rice and white glutinous aromatic rice.

Classification of brown aromatic rice, white aromatic rice, white glutinous aromatic rice, provision for grain compositions, head rice, brokens, foreign matters that may be present, and milling degree shall be in accordance with the requirements prescribed in Annex B.

5. PACKAGING

5.1 PADDY AROMATIC RICE

In case of paddy packed in a container, such as in sacks, the sacks shall be clean, sturdy and well stitched or sealed in order to prevent contamination, mixing by rice of other quality, and possible damage.

5.2 BROWN AROMATIC RICE, WHITE AROMATIC RICE AND WHITE GLUTINOUS AROMATIC RICE

Rice shall be packed in such a way to protect the produce properly. The packaging material shall be clean and of a quality to prevent external contamination and quality deterioration, durable to damages during transportation. Labeling shall be made with a non-toxic ink or glue in order to prevent any harm to consumer.

6. MARKING OR LABELING

6.1 CONTAINERS DESTINED FOR FINAL CONSUMER

Each package shall have legible information without misleading or deceptive statement as follows:

- (1) Grain type of aromatic rice as prescribed in Section 3.1;
- (2) Group of aromatic rice as prescribed in Section 3.2;

In case of the varietal name of an aromatic rice is intended to be specified on the package, at least 90% by weight of the grains of the produce shall be the specified variety.

- (3) Class of rice;
- (4) Net weight in gram or kilogram;
- (5) Identification of producer or distributor;

By indicating name and address of producer, packer or distributor.

- (6) Date of production or packing and/or date of “best before”, except for brown aromatic rice date of “best before” shall be indicated;
- (7) Cooking instruction; and
- (8) Labeling in Thai for domestic market, however, labeling may be in other languages for export.

6.2 NON-RETAIL CONTAINER

Each package shall bear the following statements in an accompanying document or on the package in legible and indelible manners without misleading or deceptive statement as follows:

- (1) Grain type of aromatic rice as prescribed in Section 3.1;
- (2) Group of aromatic rice as prescribed in Section 3.2;

In case of the varietal name of an aromatic rice is intended to be specified on the package, at least 90% by weight of the grains of the produce shall be the specified variety.

- (3) Class of brown aromatic rice, white aromatic rice or glutinous aromatic rice (or paddy aromatic rice, if classified);
- (4) Net weight in kilogram;
- (5) Identification of producer or distributor;

By indicating name and address of producer, packer or distributor.

- (6) Date of production or packing; and
- (7) Labeling in Thai for domestic market, however, labeling may be in other languages for export.

6.3 CERTIFICATION MARK

The use of certification mark according to this standard shall be in compliance with the provisions and conditions established by the Committee on Agricultural Standards.

7. CONTAMINANTS

In compliance with the provisions of the relevant laws and requirements under the Thai Agricultural Standard on Contaminants.

8. PESTICIDE RESIDUES

In compliance with the provisions of the relevant laws and requirements under the Thai Agricultural Standard on Pesticide Residues: Maximum Residues Limits (TAS 9002) and on Pesticide Residues: Extraneous Maximum Residues Limits (TAS 9003).

9. HYGEINE

9.1 STORAGE

Storage area shall be clean, in good hygiene, capable to protect the rice from external wet and contamination from pests such as rodents, insects, and birds including pets in such a way that can lead to unsafe and unfit for consumption. Storage area, including storage operation, shall provide good ventilation to prevent moisture and heat accumulation. In case of rice stored in sacks, the stack of rice sacks shall be arranged in such a way that the space between the wall

and rice stack is well enough to introduce good ventilation, convenient for cleaning, and inspecting activities. It is recommended to regularly inspect the stored rice in order to estimate the damage and to set an appropriate management.

9.2 TRANSPORTATION

Carriage for transporting rice shall be clean with a good covering to prevent external contamination from hazardous substances and wetting.

10. METHOD OF SAMPLING

Sampling of aromatic rice for analysis mentioned in section 11 is prescribed in Annex C. Where necessary, method of sampling other than mentioned above can be done in accordance with the provision prescribed in relevant regulations.

11. METHOD OF ANALYSIS

11.1 Methods of analysis are prescribed in Table 3.

Table 3 Method of analysis

Provisions	Principles of analysis	Methods / Procedures
1. Amylose content (section 3)	Spectrophotometry	Annex D.1
2. Moisture content (section 4)	Drying in a hot air oven	Annex D.2
3. Foreign matters in paddy rice (section 4)	Air blowing, sieving and visual examination	Annex D.3
4. Aroma test	Boiling in salt solution, and smelling	Annex D.4
5. Milling quality (section 3 and 4)	Husking and milling to obtain brown rice or white rice, weight comparing in percentage between whole kernels with head rice to paddy	Annex D.5
6. Alkali spreading value test (for soft non-glutinous aromatic rice and glutinous aromatic rice)	Spreading of white rice in alkali solution	Annex D.6
7. Ratio of loose rice and hard rice in soft rice	Dyeing (paddy rice and brown rice, to be milled to white rice before analysis)	Annex D.7

11.2 Where necessary, method of analysis other than mentioned above can be done in accordance with the provision prescribed in relevant regulations and provision set in the Thai Agricultural Standard on Methods of Analysis and Sampling.

ANNEX A

VARIETY CHARACTERISTICS OF AROMATIC RICE

(As information for section 3 and 4)

Table A.1 Soft Non-Glutinous Aromatic Rice

Characteristics	Variety characteristics of each aromatic rice				
	Pathum Thani 1	Khao Jow Hom Khlong Luang 1	Khao Jow Hom Suphan Buri	Khao Jow Hom Pitsanuloke 1	RD33 (Hom Ubon80)
Growing seasons	all seasons	all seasons	all seasons	Wet or main seasons	all seasons
Paddy color	straw	straw	straw	straw	straw
Awn	few	non	non	non	non
Paddy length (mm)	9.3 to 12.0	10.1 to 11.5	10.3 to 11.3	9.8 to 10.8	9.7 to 11.5
Brown rice length (mm)	6.7 to 8.4	7.2 to 8.3	7.0 to 8.2	6.9 to 7.7	7.0 to 7.9
Brown rice length-width ratio	3.3 to 3.7	3.3 to 3.5	3.5 to 3.7	3.3 to 3.5	3.4 to 3.6
Average weight of 100 paddy grains (g)	2.7	3.2	3.0	2.9	2.8
Amylose content (%)	15 to 19	15 to 20	17 to 20	14 to 17	14 to 18
Alkali spreading value	6 to 7	6 to 7	6 to 7	6 to 7	6 to 7

Table A.2 Loose Non-glutinous Aromatic Rice

Characteristics	Variety characteristics of each aromatic rice	
	Nhang Mon S-4	Dok Pa-yom
Growing seasons	Wet or main seasons	Wet or main seasons
Paddy color	straw	straw with dark brown on grain tip
Awn	non	non
Paddy length (mm)	9.9 to 10.7	9.5 to 10.6
Brown rice length (mm)	7.2 to 7.9	6.6 to 8.0
Brown rice length-width ratio	3.1 to 3.3	3.1 to 3.7
Average weight of 100 paddy grains (g)	3.3	2.8
Amylose content (%)	19 to 21	20 to 25
Alkali spreading value	6 to 7	5 to 6

Table A.3 Hard Non-glutinous Aromatic Rice

Characteristics	Variety characteristics of each aromatic rice	
	Pathum Thani 60	Chai Nat 2
Growing seasons	Wet or main seasons	All seasons
Paddy color	straw	straw
Awn	non	non
Paddy length (mm)	9.4 to 10.3	10.4 to 11.2
Brown rice length (mm)	6.9 to 7.7	7.5 to 8.2
Brown rice length-width ratio	3.2 to 3.4	3.4 to 3.8
Average weight of 100 paddy grains (g)	3.0	3.0
Amylose content (%)	26 to 30	27 to 30
Alkali spreading value	6 to 7	6 to 7

Table A.4 White Glutinous Aromatic Rice

Characteristics	Variety characteristics of each aromatic rice			
	RD 6	Sakon Nakorn	Khao Pong Krai	R 258
Growing seasons	Wet or main seasons	all seasons	Wet or main seasons	all seasons
Paddy color	brown	straw	straw	straw
Awn	non	non	non	non
Paddy rice length (mm)	9.6 to 10.2	9.8 to 11.9	9.5 to 12.0	7.8 to 11.3
Brown rice length (mm)	6.7 to 7.2	6.8 to 8.8	7.1 to 8.7	6.0 to 7.7
Brown rice length-width ratio	3.0 to 3.2	3.5 to 3.7	2.4 to 2.6	2.1 to 2.3
Average weight of 100 paddy grains (g)	2.7	3.1	4.6	3.4
Alkali spreading value	6 to 7	6 to 7	6 to 7	6 to 7

ANNEX B

**CLASSIFICATION OF WHITE AROMATIC RICE, BROWN AROMATIC RICE
AND WHITE GLUTINOUS AROMATIC,
PROVISION FOR GRAIN COMPOSITION, HEAD RICE, BROKENS, RICE
AND MATTER THAT MAY BE PRESENT AND MILLING DEGREE OF EACH
CLASSES (GRADES) OF AROMATIC RICE
(Section 4.3.2)**

B.1 DEFINITION (In addition to the provision in section 2 of this standard)

B.1.1 **Small brokens C1** means small broken rice kernels that pass through round hole metal sieve No.7.

B.1.2 **Seive No. 7** means a round hole metal sieve that is 0.79 mm. (0.031 inch) thick and 1.75 mm. (0.069 inch) diameter.

B.1.3 **Other seeds** means seeds of other plant than rice.

B.1.4 **Milling degree** means the degree to which rice is milled.

B.1.4.1 **Extra well milled** means the removal of bran entirely to the extent that the rice kernels have and especially beautiful appearance.

B.1.4.2 **Well milled** means the removal of bran entirely to the extent that the rice kernels have a beautiful appearance.

B.1.4.3 **Reasonably well milled** means the removal of a large amount of bran to the extent that the rice kernels have a reasonably beautiful appearance.

B.1.4.4 **Ordinarily milled** means the removal of some portions of bran.

B.1.4.5 **Under milled** means white rice kernels that have the milling degree below that specified for each grade of rice.

B.2 WHITE AROMATIC RICE SHALL BE DIVIDED INTO SIX CLASSES (GRADES) AS FOLLOWS:

B.2.1 White rice 100%

B.2.2 White rice 5%

B.2.3 White rice 10%

B.2.4 White rice 15%

B.2.5 White broken rice A1 Extra super

B.2.6 White broken rice A1 Super

B.3 BROWN AROMATIC RICE SHALL BE DEVIDED IN TO FOUR CLASSES (GRADES) AS FOLLOWS:

B.3.1 Brown rice 100%

B.3.2 Brown rice 5%

B.3.3 Brown rice 10%

B.3.4 Brown rice 15%

B.4 WHITE GLUTINOUS AROMATIC RICE SHALL BE DIVIDED INTO TWO CLASSES (GRADES) AS FOLLOWS:

B.4.1 Glutinous rice 10%

B.4.2 Glutinous rice 25%

B.5^{1/} PROVISIONS FOR GRAIN COMPOSITION, HEAD RICE, BROKENS, RICE AND MATTER THAT MAY BE PRESENT AND MILLING DEGREE OF EACH CLASSES (GRADE) FOR WHITE RICE, WHITE BROKENS AND BROWN RICE SHALL BE COMPLIED WITH THOSE DESCRIBED IN TABLES B.1, B.2, B.3 AND B.4

^{1/} Source: Notification of the Ministry of Commerce on Rice Commodity Standards on 31 March B.E. 2540

Table B.1 White rice

Grades	Grain composition (%)					Size of head rice (parts)	Size of broken (parts)	Rice and matter that may be present, not exceeding (%)							Milling degree
	Whole kernels	Head rice	Broken & Small broken C1					Red and/or Under milled kenels	Yellow kernels	Chalky kernels	Damaged kernels	White glutinous rice	Undeveloped, Immature kernels, Other seeds and foreign mater	Paddy (grains /kg.)	
			Total	Broken Not reaching the min. specified part & not passing through sieve No.7	Small broken C1										
100%	≥ 60.0	-	≤ 4.5	≤ 0.5	≤ 0.1	≥ 8.0	≥ 5.0 to < 8.0	0	0.2	6.0	0.25	1.5	0.2	7	Extra well milled
5%	≥ 60.0	-	≤ 7.0	≤ 0.5	≤ 0.1	≥ 7.5	≥ 3.5 to < 7.5	2.0	0.5	6.0	0.25	1.5	0.3	10	Well milled
10%	≥ 55.0	-	≤ 12.0	≤ 0.7	≤ 0.3	≥ 7.0	≥ 3.5 to < 7.0	2.0	1.0	7.0	0.5	1.5	0.4	15	Well milled
15%	≥ 55.0	-	≤ 17.0	≤ 2.0	≤ 0.5	≥ 6.5	≥ 3.0 to < 6.5	5.0	1.0	7.0	1.0	2.0	0.4	15	Reasonably well milled

Table B.2 White Broken rice

Grades	Grain Composition (%)						Defect, not exceeding (%)		
	Whole kernels	Whole kernels & > 6.5 parts of broken	>5.0 parts of broken	< 6.5 parts of broken & not passing through sieve No.7	< 5.0 parts of broken & not pass through sieve No. 7	Small broken C1	White glutinous rice		Foreign matter
							Total (including C1)	Small broken C1	
A1 Extra Super	≤ 15	-	≥ 74.0	-	≤ 10	≤ 1.0	1.5	0.5	0.5
A1 Super	-	≤ 15.0	-	≥ 80.0	-	≤ 5.0	1.5	0.5	0.5

Table B.3 Brown rice

Grades	Grain composition (%)			Size of head rice (parts)	Size of brokens (parts)	Rice and matter that may be present, not exceeding (%)						
	Whole kernels	Head rice	Brokens			Red kernels	Yellow kernels	Chalky kernels	Damaged kernels	White glutinous rice	Undeveloped, Immature kernel, other seed and foreign matter	Paddy
100%	≥ 80.0	-	≤ 4.5	≥ 8.0	≥ 5.0 to < 8.0	1.5	0.75	6.0	0.75	1.5	5.0	1.0
5%	≥ 75.0	-	≤ 7.0	≥ 7.5	≥ 3.5 to < 7.5	2.0	1.0	6.0	1.0	1.5	6.0	1.0
10%	≥ 70.0	-	≤ 12.0	≥ 7.0	≥ 3.5 to < 7.0	2.0	1.0	7.0	1.0	1.5	7.0	2.0
15%	≥ 65.0	-	≤ 17.0	≥ 6.5	≥ 3.0 to < 6.5	5.0	1.0	7.0	1.5	2.5	8.0	2.0

Table B.4 White glutinous rice

Grades	Grain composition (%)					Size of head rice (parts)	Size of brokens (parts)	Rice and matter that may be present, not exceeding (%)						Milling degree
	Whole kernels	Head rice	Brokens & Small broken C1					White rice	Red and/or Under milled kenels	Yellow kernels	Damaged kernels	Undeveloped, Immature kernels, Other seeds and foreign mater	Paddy (grains /kg.)	
Total			Not reaching the min. specified part & not passing through sieve No.7	Small broken C1										
10%	≥ 55.0	-	≤ 12.0	≤ 0.7	≤ 0.3	≥ 7.0	≥ 3.5 to < 7.0	15.0	2.0	1.5	0.5	0.5	10	Well milled
25%	≥ 40.0	-	≤ 28.0	-	≤ 2.0	≥ 5.0	≤ 5.0	15.0	6.0	4.0	2.0	3.0	20	Ordinary milled

ANNEX C
METHOD OF SAMPLING
 (Section 10)

C.1 DEFINITION

Lot means commodity in each consignment, and the sampling officer knows or assumes that the commodity is consistent in terms of origin, producer, type, packer, packaging material, mark and transporter.

C.2 PROCEDURES

Sampling procedures for paddy aromatic rice, brown aromatic rice and white aromatic rice shall be carried out in such a way to obtain the best representative samples of the lot. Sampling shall be done at random increments distributed throughout the lot to collect primary samples. The collected primary samples shall be mixed thoroughly, and then its quantity is reduced until getting a suitable sample size for analysis. Numbers of primary samples from various increments of the lot in different forms of transportation shall not be less than those requirements as prescribed in Table C.1 to C.3.

Table C.1 Numbers of primary samples for rice packed in sack or bag

No. of sacks / bags in lot	No. of sacks / bags sampling
1 to 10	every sack / bag
11 to 100	10
> 100	calculated from taking square root of quantity of sacks / bags in a lot

Table C.2 Numbers of primary samples for rice transported in vehicle (such as truck, boat)

Quantity (tons)	No. of increments for primary samples
< 15	5
15 to 30	8
> 30 to 500	11
> 500	see Table C.3

Table C.3 Numbers of primary samples for rice in bulk or silo

Quantity (tons)	No. of increments for primary samples
500	12
1,000	16
2,000	23
4,000	32
6,000	39
8,000	45
10,000	50

Remark: In case of bulk consignment other than prescribed in Table C 3, the numbers of increments to get primary samples are calculated from a half of the square root of the quantity in tons of rice. The decimal number is allowed upward to make a round figure.

$$\text{Numbers of increment primary samples} = \frac{\sqrt{\text{Rice quantity (tons)}}}{2}$$

Recommendations on the using of sampling devices, methods of sampling and sample size reduction for analysis can be seen in ISO 13690: 1999 Cereal, Pulses and Milled Product Sampling of Static Batches.

ANNEX D
METHOD OF ANALYSIS
(Section 11)

D.1 AMYLOSE CONTENT**D.1.1 Apparatus**

D.1.1.1 Spectrophotometer

D.1.1.2 Balance, capable of weighing to the nearest 0.0001 g.

D.1.1.3 Magnetic stirrer

D.1.1.4 Grinder, capable to grind white rice to flour up to 80-100 mesh fineness

D.1.1.5 Volumetric flask, 100 ml.

D.1.1.6 Volumetric pipette; 1 ml., 2 ml., 3 ml., 4 ml. and 5 ml.

D.1.1.7 Measuring pipette; 1-10 ml.

D.1.2 Reagents

D.1.2.1 Ethyl alcohol, 95%

D.1.2.2 Sodium Hydroxide (NaOH), 2 N solution

D.1.2.3 Glacial acetic acid, 1 N solution

D.1.2.4 Iodine solution, containing 0.2 g. iodine and potassium iodide 2.0 g in 100 ml. solution.

D.1.2.5 Pure amylose

D.1.3 Methods

D.1.3.1 Grind white rice to be flour in a grinder. Weigh 0.1000 g. flour and put into a 100 ml. dry volumetric flask.

D.1.3.2 Add 1 ml. 95% ethyl alcohol, shake gently.

D.1.3.3 Add 9 ml. Sodium hydroxide solution.

D.1.3.4 Stir the test solution on a magnetic stirrer for 10 min. add distilled water until reaching total volume 100 ml.

D.1.3.5 Add 70 ml. distilled water into another 100 ml. volumetric flask, and add 2 ml. of glacial acetic solution and 2 ml. of iodine solution.

D.1.3.6 Pipette 5 ml aliquot of the test solution and put into the prepared volumetric flask, add distilled water until reaching total volume 100 ml., let stand for 10 min.

D.1.3.7 Measure the absorbance of the solution at the wavelength of 620 nm by spectrophotometer, setting the absorbance of the blank solution at zero.

D.1.3.8 Prepare the blank by adding 2 ml glacial acetic acid solution and 2 ml iodine solution, add distilled water until reaching total volume 100 ml.

D.1.3.9 Evaluate the quantity (percentage) of amylose by absorbance in accordance with the standard curve as mentioned in clause D.1.4

D.1.4 Determination of standard curve

D.1.4.1 Weigh 0.0400 g. of amylose and put into a dry volumetric flask and proceed the same procedure as in D.1.3.2 to D.1.3.4 to obtain a standard solution.

D.1.4.2 Prepare a set of 5 volumetric flasks with 100 ml. capacity. Add 70 ml. distilled water. Transfer 0.4, 0.8, 1.2, 1.6 and 2.0 ml aliquot of glacial acetic acid solution into the series of the flasks respectively. Add 2 ml aliquot of iodine solution into each flask.

D.1.4.3 Transfer 1, 2, 3, 4 and 5 ml. aliquot of standard solution into the series of the flasks respectively, which are corresponding to 8%, 16%, 24%, 32% and 40% of amylose content respectively. Add distilled water until reaching volume 100 ml. Measure the absorbance of the solution at the wavelength of 620 nm by spectrophotometer, setting the blank at zero absorbance, as mentioned in D.1.3.7

D.1.4.4 Plot the standard curve with absorbance of the standard solutions against amylose content.

D.1.4.5 Convert the absorbance of the sample solution to amylose content percentage according to the standard curve.

D.2 MOISTURE CONTENT

D.2.1 Apparatus

D.2.1.1 Hot air oven

D.2.1.2 Balance, capable to weigh to the nearest 0.0001 g.

D.2.1.3 Desiccator

D.2.1.4 Grinder, capable to grind white rice to flour up to 80-100 mesh fineness.

D.2.1.5 Aluminium can with lid.

Remark: In case of other method of moisture content analysis is available such as moisture meter; such tool shall comply with relevant standard by passing calibration or certification of the ministry of commerce or relevant authority.

D.2.2 Method

D.2.2.1 Grind white rice kernels to flour with the grinder.

D.2.2.2 Dry an aluminium can with the lid underneath it in an oven at 130°C for 1 hour. Cool to room temperature in a desiccator. Weigh the can with lid and record the actual weight.

D.2.2.3 Puts an approximately 1 g. flour in the aluminium can. Weigh and record the actual weight.

D.2.2.4 Dry the can with flour in the oven with the lid underneath at 130°C for 1 hour. Cool the can and lid to room temperature in the desiccator. Weigh and record the actual weight.

D.2.2.5 Calculate the percentage of the moisture content (MC) from the following formula:

$$MC (\%) = \frac{(B-C)}{(B-A)} \times 100$$

If A = weight of aluminium can with lid.
 B = weight of aluminium can with lid and flour before drying.
 C = weight of aluminium can with lid and flour after drying.

D.3 FOREIGN MATTER IN PADDY

D.3.1 Apparatus

D.3.1.1 Seed blower

D.3.1.2 Sieve

D.3.2 Method

D.3.2.1 Random paddy from a composite sample to get an approximately 100 g. of working sample and record the weight.

D.3.2.2 Sieve the working sample to separate heavy matter, such as, soil particle, sand, pebble and broken seed.

D.3.2.3 Clean the sieved sample in a seed blower to separate light matter, such as, straw, pedicel and undeveloped kernel.

D.3.2.4 Any remaining foreign matter shall be sorted by visual examination. Then record the weigh of cleaned paddy. The percentage of foreign matter shall be calculated by the following formula:

$$\text{Foreign matter (\%)} = \frac{\text{Weight of paddy before cleaning} - \text{Weight of cleaned paddy}}{\text{Weight of paddy before cleaning}} \times 100$$

D.4 AROMA TEST**D.4.1 Apparatus**

D.4.1.1 Test tube, size 16 mm x 100 mm

D.4.1.2 Stainless bath with gas stove

D.4.1.3 Rubber cork

D.4.1.4 Thin plastic sheet, size 5.08 cm (2 inch) x 5.08 cm (2 inch)

D.4.1.5 Balance, capable to weigh in gram.

D.4.1.6 Measuring pipette; 1-10 ml.

D.4.2 Method

D.4.2.1 Weigh 5 g. of rice, put into test tube.

D.4.2.2 Add 4 ml 10% salt solution.

D.4.2.3 Close test tube by placing plastic sheet under rubber cork before closing.

D.4.2.4 Boil test tube in boiling water for three minutes.

D.4.2.5 Leave test tube for cooling, then smell and report “aroma” or “non aroma”

Remark: Paddy can be tested by grinding paddy before test.

D.5 MILLING QUALITY**D.5.1 Apparatus**

D.5.1.1 Aspirator

D.5.1.2 Shelling machine, Satake

D.5.1.3 Whitener, Mc. Gill Miller No.2

D.5.1.4 Sizing Divider

D.5.2 Method

D.5.2.1 Clean paddy in an aspirator, to sort out undeveloped kernel, pedicel and foreign matter (heavy material should be separate by hand picking).

D.5.2.2 Determine moisture content, if it exceeds to 14%, the paddy must be dried to reduce the moisture.

D.5.2.3 Weigh a portion of 125 g. cleaned paddy.

D.5.2.4 Dehull the paddy with a shelling machine, record brown rice weight.

D.5.2.5 Mill the brown rice in a whitener (directions as mentioned for each model). Cool at room temperature and record the white rice weight.

D.5.2.6 Separate white rice or milled rice into whole kernels, head rice and broken kernels in sizing divider.

D.5.2.7 Repeat separation the whole kernels, head rice and brokens by hand to get an accurate result.

D.5.2.8 Record the weight of whole kernels and head rice.

D.5.2.9 Calculate the percentage of hull, bran, whole kernels and head rice by the following formula:

$$\text{Hull (\%)} = \frac{\text{Wt. of paddy} - \text{Wt. of brown rice}}{\text{Wt. of paddy}} \times 100$$

$$\text{Bran (\%)} = \frac{\text{Wt. of brown} - \text{Wt. of milled rice}}{\text{Wt. of paddy}} \times 100$$

$$\text{Whole kernels and head rice (\%)} = \frac{\text{Wt. of head rice}}{\text{Wt. of paddy}} \times 100$$

Remark: Continue operating a shelling machine and a whitener for a long time may introduce heating. It is recommended to stop operating at 10 samples interval.

D.6 ALKALINE OF SPREADING VALUE

D.6.1 Apparatus

D.6.1.1 Balance, capable of weighing to the nearest 0.0001 g.

D.6.1.2 Oven

D.6.1.3 Volumetric flask, 1,000 ml.

D.6.1.4 Petri dish with cover, 14.5 cm. diameter

D.6.1.5 Beaker, 1 l. – 2 l.

D.6.1.6 Desiccator

D.6.2 Reagents

D.6.2.1 Potassium hydroxide pellet (KOH) 87%

D.6.2.2 Potassium hydrogen phthalate

D.6.2.3 Phenolphthalein

D.6.3 Preparation of 1.7% ± 0.05% Potassium hydroxide solution

D.6.3.1 There are two methods to prepare Potassium hydroxide solution.

D.6.3.1.1 Directly prepare working solution. Dissolve 19.54 g. of potassium hydroxide pellet in cooled-boiled distilled water, and let cool down to room temperature; add distilled water to 1,000 ml. in a 1,000 ml. volumetric flask.

D.6.3.1.2 Prepare working solution from stock solution.

(1) Dissolve 588.2 g. potassium hydroxide pellet in cooled-boiled distilled water, and let cool down to room temperature; add distilled water to 1,000 ml. volume flask. This solution is used as Stock solution.

(2) Dilute 33.0 ml. of the stock solution to 1,000 ml. with distilled water. This solution is used as working solution.

D.6.3.2 Determine the concentration of working solution.

D.6.3.2.1 Dry potassium hydrogen phthalate at 130°C for 1 hour and let cool down in desiccator.

D.6.3.2.2 Weigh approximately 0.5000 g. of Potassium hydrogen phthalate and record the exact weight.

D.6.3.2.3 Dissolve Potassium hydrogen phthalate in 50 ml. of distilled water. Add three drops of 1% Phenolphthalein solution and titrate the solution with the working solution to reach the end point, which the solution turns to pink color. Record the volume of working solution.

D.6.3.2.4 Prepare blank solution by the same way as D.6.3.2.3, but without Potassium hydrogen phthalate.

D.6.3.2.5 Calculate the concentration of working solution, as following formula:

$$\% \text{ Potassium hydroxide} = \frac{P}{204.23} \times \frac{56.109}{V-B} \times 100$$

When V = Volume in ml. of working solution used for potassium hydrogen phthalate titration

B = Volume in ml. of working solution used for blank titration

P = Weight of Potassium hydrogen phthalate in gram

D.6.4 Method

D.6.4.1 Sampling exactly 100 white rice kernels and put into a set of four petri dishes (25 kernels each). Place the dishes above a black board.

D.6.4.2 Add 100 ml. Potassium hydroxide solution into each Petri dishes (D.6.4.1). Ensure that the kernels completely submerge in the solution and spread independently. Cover and let stand undisturbed at room temperature for 23 hours.

D.6.4.3 Rate the disintegration of the kernels in D.6.4.2, according to the scale of alkali spreading value in Table D.1.

Table D.1 Alkali spreading value of white rice kernel

Scale of alkali spreading value	Spreading of the rice kernel
1	Rice kernel not affected
2	Rice kernel swollen
3	Rice kernel swollen, collar incomplete and narrow
4	Rice kernel swollen, collar complete and wide
5	Rice kernel split or segmented, collar complete and wide
6	Rice kernel dispersed, merging with collar
7	Rice kernel completely dispersed and intermingled

D.7 MIXING OF LOOSE RICE AND HARD RICE IN SOFT RICE

Staining test is applied for testing of paddy and brown rice or white rice containing some brokens.

D.7.2.1 Apparatus

D.7.2.1.1 Beaker or Plastic cups 100 ml.

D.7.2.1.2 Plastic dropper, 1 ml.

D.7.2.1.3 Volumetric flask, 100 and 2,000 ml.

D.7.2.1.4 Pipette, 1-10 ml.

D.7.2.1.5 Brown bottle, 100 ml.

D.7.2.1.6 Cylinder, 50 ml.

D.7.2.1.7 Forceps

D.7.2.1.8 Tissue paper

D.7.2.1.9 Balance, capable of weighing to the nearest 0.01 g.

D.7.2.2 Reagents

D.7.2.2.1 Sodium hydroxide pellet (NaOH)

D.7.2.2.2 Glacial acetic acid

D.7.2.2.3 Potassium Iodide (KI)

D.7.2.2.4 Iodine (I₂)

D.7.2.2.5 Thymol blue

D.7.2.2.6 Ethyl alcohol 95%

D.7.2.2.7 Isopropyl alcohol 70%

D.7.2.2.8 Distilled water or deionized water

D.7.2.3 Preparation of working solution

D.7.2.3.1 Sodium hydroxide solution 1 N (NaOH): Dissolve 4.00 g. of NaOH in approximately 80 ml. distilled or deionized water, transfer to 100 ml. volumetric flask, left cool and adjust to 100 ml.

D.7.2.3.2 Acetic acid solution 1 N: Dilute 6 ml. Glacial acetic acid in distilled or deionized water, let it cool down to room temperature and fill up to 100 ml. in a volumetric flask.

D.7.2.3.3 Sodium hydroxide solution 0.05 N: Dilute 5 ml. 1 N of NaOH in distilled water and fill up to 100 ml. in a volumetric flask.

D.7.2.3.4 Acetic acid solution 0.05 N: Dilute 5 ml. of 1 N Acetic acid solution in distilled water and fill up to 100 ml. in a volumetric flask.

D.7.2.3.5 Working solution: Mix 10 ml. of 1 N NaOH and 10 ml. 1 N of Acetic acid, and fill up to 100 ml. in a volumetric flask.

D.7.2.3.6 Indicator solution: Weigh 0.10 g. Thymol blue and dissolve in 53 ml. of 95% Ethyl alcohol. Add distilled or deionized water to 100 ml. in a volumetric flask.

D.7.2.3.7 Iodine solution: Weigh 0.20 g. Iodine and 2.00 g. Potassium Iodide dissolve in 80 ml. distilled water. Let stand in dark room over night. Add distilled or deionized water to 100 ml. in a volumetric flask. Keep this solution in brown bottle.

Remark: This solution should not be kept over two months.

D.7.2.3.8 Isopropyl alcohol 70%

D.7.2.4 Method

D.7.2.4.1 Preparation for staining solution

- (1) Transfer an aliquot of 30 ml. working solution into a beaker.
- (2) Add 3 drops of indicator solution
- (3) Put in drop by drop of 0.05 N NaOH to get the end point (titration). The color of the solution changes from yellow to blue.
- (4) Put in drop by drop of 0.05 N Acetic acid until the color change from blue to yellow again (back titration).
- (5) Add 1.5 ml. of Iodine solution (clause D.7.2.3.7) into the staining solution. This solution shall be used for staining white rice kernels. (immediate staining).

D.7.2.4.2 Staining method

- (1) Sampling 3.0 g. newly milled white rice and put in a 100 ml. beaker or plastic cup.
- (2) Add 15 ml. 70% Isopropyl alcohol into the beaker or plastic cup. Swirl the liquid to wash the kernels surface for 45 seconds and decant the alcohol.
- (3) Add 15 ml. distilled water, swirl for 30 seconds and decant all the excess water.
- (4) Add 15 ml. staining solution, swirl for 45 seconds and decant the solution.
- (5) Wash the excess staining solution with water.
- (6) Place rice kernels on tissue paper and remove the excess waters with tissue paper. Let dry for five minutes.
- (7) Sort the stained rice kernels with forceps into two parts as:

Part 1 Light to pink color to no color indicates low amylose rice or soft non-glutinous rice such as Pathum Thani 1 Rice.

Part 2 Blue or dark purple color indicates intermediate or high amylose rice or loose hard non-glutinous rice.

- (8) Weigh each part of rice kernels.
- (9) Calculate percentage of admixture of other varieties in a soft non-glutinous rice.

$$\text{Admixture of other rice (\%)} = \frac{\text{Wt. of part 2 rice kernels}}{\text{Wt. of part 1 and part 2 rice kernels}} \times 100$$

ANNEX E

UNIT

The unit and symbol used in this standard the unit SI (International System of Units or *Le Système International d' Unités*) recognized to be used are as follows:

Measurement	Unit	Symbol
Mass	gram	g
Volume	liter	l
Length	mililiter	ml
	centimeter	cm
	nanometer	nm
Time	second	s
Temperature	degree celcius	°C
Concentration	normality	N