



**THAI AGRICULTURAL STANDARD**

**TAS 4401-2008**

# **GOOD AGRICULTURAL PRACTICES FOR RICE**

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

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**UNOFFICAL TRANSLATION**



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**Ministry of Agriculture and Cooperatives**

**50 Phaholyothin Road, Ladyao, Chatuchak, Bangkok 10900**

**Telephone (662) 561 2277 [www.acfs.go.th](http://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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16. Representative of the Thai Rice Mills Association

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Mr. Surat Chokprajakchad (alternate)

Mr. Vinai Nguenkuakul (alternate)

17. Experts

Mr. Parkpian Arunyanart

Technical Expert

Ms. Kunnika Naklang

Technical Expert

Ms. Wannakorn Intarasatit

Technical Expert

Mr. Prasert Markprasert

Farmer Representative

Mr. Pramote Wanichanont

Private Enterprise Representative

18. Representative of the Office of Commodity and System Standards,  
National Bureau of Agricultural Commodity and Food Standards

Secretary

Ms. Namaporn Attaviroj

19. Representative of the Office of Commodity and System Standards,  
National Bureau of Agricultural Commodity and Food Standards

Assistant Secretary

Ms. Saowapan Palasuwan

Thailand is the world major producer and exporter of rice. The establishment of this standard is important to significantly promote and encourage the quality and safety development of the rice production in order to be accepted for both domestic and international trade. Therefore, it is deemed necessary for the Ministry of Agriculture and Cooperatives to establish a standard on Good Agricultural Practice for Rice. This standard should be used as a guideline to farmers in their rice cultivation and postharvest practices and also applied as criteria to certify the production process at farm level for food safety of the consumers and promoting rice exportation.

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

Rice Department B.E. 2551 (2008). Quality Management System Manual: GAP of rice. Rice Department , Ministry of Agriculture and Cooperatives.

Ministry of Agriculture and Cooperatives. B.E. 2546 (2003). Thai Agricultural Commodity, Good Agricultural Practice for Food Crops. (TAS.9001-2546). National Bureau of Agricultural Commodity and Food Standards.

Ministry of Agriculture and Cooperatives. B.E. 2546 (2003). Thai Agricultural Commodity, Good Agricultural Practice for Thai Hom Mali Rice (TAS.4400-2546). National Bureau of Agricultural Commodity and Food Standards.

***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:  
GOOD AGRICULTURAL PRACTICES FOR RICE  
B.E. 2551 (2008)**

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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 Good Agricultural Practices for Rice for the benefit of development of agricultural commodity and food which is safe and in accordance with the standard.

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 Good Agricultural Practices for 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**  
**GOOD AGRICULTURAL PRACTICES FOR RICE**

**1 SCOPE**

1.1 This Thai Agricultural Standard applies to the Good Agricultural Practices for Rice, which has the scientific name of *Oryza sativa L.* in the genus of Gramineae or Poaceae. It includes every production steps practiced by farmer to produce rice that is safe for consumption with good quality. This standard does not apply to good agricultural practices for Thai Hom Mali Rice which is established according to TAS 4400: Thai Agricultural Standard entitled Good Agricultural Practices for Thai Hom Mali Rice.

1.2 This standard is implemented in conjunction with related Thai agricultural standards on rice such as Thai Agricultural Standard entitled Thai Aromatic Rice (TAS 4001).

**2 DEFINITIONS**

For the purpose of this standard:

2.1 **Wet paddy rice** means paddy which is harvested and immediately threshed without exposing to moisture reducing process. Normally the moisture of this paddy is not less than 18% by weight.

2.2 **Dry paddy rice** means paddy rice with the moisture of less than 15% for trade rice.

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

2.4 **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.

2.5 **Broken** 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.

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

2.7 **Volunteer rice plant** means rice plant that germinated from those seeds remained in the field from the previous season.

2.8 **Off type rice** means rice plant of other varieties grown in the rice field, but excluding weedy rice.

2.9 **Weedy rice** means the weed which has its plant and kernel similar to rice. The grain is normally shattered from its panicle before the harvest of rice.

2.10 **Mature grain** means rice kernel that developed completely to ripening stage and is ready to be harvested. At least three quarters of the grain of the panicle turn yellow.

2.11 **Pest** means any type of plant, animal or microorganism that causes damages to plants, plant produces and plant products.

2.12 **Milling quality of paddy** means the amount of whole kernels and head rice obtained from a milling test calculated as percentage by weight of paddy.

2.13 **Flowering date or blooming date** means the day that not less than 80% of rice plants in the field are blooming.

2.14 **Hazardous substances** (refers to the Hazardous Substance Act, B.E. 2535 (1992) mean the following substances:

- explosive substances;
- flammable substances;
- oxidizing agents and peroxides;
- toxic substances;
- substances causing diseases;
- radioactive substances;
- mutagenic substances;
- corrosive substances;
- irritant substances; and
- other substances, either chemicals or anything which may cause harmful to humans, animals, plants, properties or environments.

2.15 **Pesticide** means any hazardous substance used in agriculture regulated by the Department of Agriculture in accordance with the list of hazardous substances issued under Hazardous Substance Act, B.E. 2535 (1992).

2.16 **Wet Season crop** means the period of rice growing during rainy season.

2.17 **Dry Season crop** means the period of rice growing off rainy season.

2.18 **Hygiene** means good practices indicate conditions and measures for the production processes necessary to achieve a produce that is safe and suitable for consumption.

### 3. REQUIREMENTS AND INSPECTIONS

Provisions concerning requirements and inspections for Good Agricultural Practices for Rice are defined in Table 1.

**Table 1 Requirements and Inspections for Good Agricultural Practices for Rice**  
(Section 3)

ITEMS	REQUIREMENTS	INSPECTIONS
1. Water sources	Water for growing rice shall be from source that environment is safe from hazardous substance contamination.	Inspect the surroundings. If there is any risk, verify the water quality.(see Annex B. 1)
2. Plantation area	The land is safe from hazardous substance which can cause contamination on the produce.	Inspect the surroundings. If there is any risk, verify the soil quality.(see Annex B. 2)
3.Application of pesticides	<p>-If application of pesticide is required, use according to the recommendations of the Rice Department or the Department of Agriculture, and follow the recommendations on the registered label authorized by the Department of Agriculture, Ministry of Agriculture and Cooperatives.</p> <p>- Do not use the hazardous substances which are prohibited for agricultural use.</p> <p>- In case of rice produced for export, do not use pesticides which are prohibited by the importing country.</p>	<p>- Check the record of pesticide application.(see Annex A. 9.2)</p> <p>- Inspect the storage of the pesticides.(see Annex B.3)</p> <p>- If evidence or situation is in doubt of misapplication of pesticide, the produce shall be analyzed for pesticide residues.</p>
4.Quality management in pre-harvest production		
4.1 The production for the right variety of paddy.	The paddy that has been harvested and threshed is allowed to contain admixture of other varieties grain not exceeding 5%. In this amount the admixture of red kernel shall not be over 2%. This can be achieved by:	

ITEMS	REQUIREMENTS	INSPECTIONS
	<ul style="list-style-type: none"> <li>- Select of qualified seeds from reliable seed production source;</li> <li>- Rice cultivation management is applied to minimize the quantity of volunteer rice plant and off type rice. The practices shall be recorded; and</li> <li>- The quantity of off type rice plants shall not exceed 3%. In this amount, the admixture of red kernel variety shall not exceed 1%.</li> </ul>	<ul style="list-style-type: none"> <li>- Review the certified document or the record of seed source in Annex A.4.</li> <li>- Review the record of soil preparation and off type plant elimination in Annex A. 6 and 7.</li> <li>- Random sampling for off type rice plant in rice field.</li> <li>- In case of any doubts, analyze the paddy for admixing grain.</li> </ul>
4.2 Pest control and the prevention of damage from pest.	<ul style="list-style-type: none"> <li>- Examine the plant damage by pest across rice field.</li> <li>- Control pest and weedy rice effectively by a suitable method, following the instruction of Rice Department. If pesticide is used, follow the Requirement No.3.</li> <li>- Produce shall not have any plant disease and damages by insect greater than 10%.</li> </ul>	<ul style="list-style-type: none"> <li>- Review the record for plant damages by pest survey and control. (see Annex A .8)</li> <li>- Review the record of pesticide application. (see Annex A .9.2)</li> <li>- Visual examination of for weedy rice plant in rice field.</li> <li>- Visual examination of produce for defected grain by disease and insect.</li> </ul>
5. Harvesting and post-harvest practices		
5.1 Management for good milling quality of paddy (harvesting time) <sup>1/</sup>	<p>Rice shall be harvested at appropriate time resulting in a good milling quality that obtain the whole kernel and head rice according to Thai Agricultural Standard for each rice type. The appropriate harvesting time shall be observed by :</p> <ul style="list-style-type: none"> <li>- 25 to 35 days after flowering date; or</li> <li>- Rice panicle is at mature stage.</li> </ul> <p>At least three quarters of the kernels in the rice panicle have a full yellow colour.</p>	<ul style="list-style-type: none"> <li>- Review data record for harvesting and threshing practices. (see Annex A .10)</li> <li>- If necessary, inspect the practices during harvesting and threshing or visual examination of the harvested produce.</li> <li>- If any doubt occurring, take a random sampling of the paddy to test for milling quality.</li> </ul>

<sup>1/</sup>depend on rice variety and growing season.

ITEMS	REQUIREMENTS	INSPECTIONS
5.2 Harvesting and threshing	<p>-Harvesting equipments, containers and harvest practices shall not cause any effect on quality and introduce any admixing grain to the produce.</p> <p>-If threshing and/or harvesting is applied, equipments shall be properly cleaned and threshing process shall be handled carefully in such a way that it does not introduce any admixing grain to the produce. If the machine has been previously used to harvest or thresh other rice variety, it shall be cleaned to get rid of all remaining grains.</p>	<p>- Review record for harvesting and threshing practices.(Annex A.10)</p>
5.3 Moisture content of paddy and drying practice <sup>2/</sup>	<p>- If produce is not sold as wet paddy, it must be dried to reduce moisture within 24 hours after harvested.</p> <p>- Drying practice shall not introduce any breakage to grain in such a way that the result of milling quality test of paddy is lower than the criteria required in Thai Agricultural Standard for each type of rice.</p> <p>- The moisture of paddy shall not exceed 15% for traded rice and 14% for stored rice.</p>	<p>- Review record of drying.(see Annex A .11)</p> <p>- If any doubt, take a random sampling of paddy to test for moisture and/or milling quality.</p>
6. Transportation, storage and produce collection.	<p>- Equipments, containers and carriages for transportation and storage shall be cleaned and able to prevent quality deterioration of produce and prevent from contamination of substances that may be harmful to consumers, and also from inducing of admixing grain.</p> <p>- Grain collecting and storage room shall be managed in such a way that</p>	<p>- Review record of packing, transportation and storage. (see Annex A. 12)</p> <p>- Inspect equipments, containers, storage and rice collecting room.</p> <p>- Inspect practices for grain storage and collecting handling.</p> <p>- Inspect labeling in storage.</p>

<sup>2/</sup> The difference of cultivation in wet season crop and dry season crop shall be taken into account.

ITEMS	REQUIREMENTS	INSPECTIONS
	<p>the condition is hygienical clean and well ventilated. They are able to prevent contaminations and inducing of admixing grain.</p> <p>- Practices in grain storage and collecting rooms shall not cause any damage and inducing of admixing grain.</p> <p>- If more than one variety of rice is handled or stored, management in storage shall be in such a way that admixture of grain between different varieties is prevented.</p>	
7. Recording and record keeping	<p>- Recording of the followings are required:</p> <p>(1) seed sources;</p> <p>(2) water sources;</p> <p>(3) soil preparation;</p> <p>(4) the off type rice elimination;</p> <p>(5) the survey of plant damages by pest and pest management;</p> <p>(6) application of pesticides;</p> <p>(7) harvesting and threshing practices;</p> <p>(8) paddy moisture reduction;</p> <p>(9) paddy packaging and storage; and</p> <p>(10) the produce sources.</p> <p>- Produce during transportation and storage shall be identified in order to be able to trace the produce.</p>	<p>Review the records. (see Annex A .4 to 13)</p> <p>- Review code or sign or mark or record of produce source as in Annex A .13.</p>

#### 4. RECOMMENDATIONS ON GOOD AGRICULTURAL PRACTICES FOR RICE

These recommendations on good agricultural practices for rice advise farmer to produce safe and suitable rice for human consumption. The detail is prescribed in Annex B.

**ANNEX A**  
**SAMPLE OF RECORDS**  
 (Section 3)

**Field No.** ..... **Production year** ..... **Area** ..... **rai**

**Farmer Identification No.** ..... **Plot No.** .....

**1. General information of farm owner**

Name and family name of farmer .....

Address.....

.....

Telephone ..... E-mail address.....

Name and family of farm manager (if any).....

Address.....

.....

Telephone ..... E-mail address.....

**2. Farm location** address .....

.....

**3. Farm map**, showing the routes and distinguishable place nearby for convenience to reach the farm. Indicate the adjacent plots and also farm water sources.

N  


**The history of land used within the past three years: Indicate the type of crop/variety grown**

**1<sup>st</sup> Year**..... **2<sup>nd</sup> Year**..... **3<sup>rd</sup> Year**.....

**4. Rice seed source**

Varietal name	Area (rai)	Seed source	Broadcasting Date/Seeding date*	Transplanting Date	Seed used (Kg)	Seed rate (Kg/rai)

**Remark :** \* Cross out the unused item.

**Cultivation practice**     transplanting     wet seeded     dry seeded

**5. Water resource**     rain     irrigation water     pond/pool  
 underground water     canal/river/stream

**6. Soil preparation**

Soil type     clay     loamy soil     sandy loam soil     sandy soil

Soil preparation practice

- machine     animal     plough, sow and harrow within one day  
 without soil preparation and applied chemical to control weed

Practice	Date/Month /Year	Practice
1. First ploughing		
2. Second ploughing		
Repeat Second ploughing		
3.Harrow/puddling/laveling/ furrowing for water drainage *		
4. Apply herbicide to control weed		
5. Rotary puddling/ submerge puddled soil*		
6. Others practices		

**Remark**    \* Cross out the unused item.

**7. Off type rice elimination**

Practice	Date /Month /Year	Off type rice (plant/Rai)	Off type rice character	Off type rice elimination (uproot/cut)
1. Tillering stage				
2. Flowering/Blooming stage				
3. Dough stage				
4. Ripening stage				

**8. Survey and control of plants damage by pests(if pest is not found, omit this section)**

**8.1 Diseases**

- Rice blast disease**      Severity level     Low     Medium     High  
 Control practice.....Date.....
- Brown spot disease**      Severity level     Low     Medium     High  
 Control practice.....Date.....
- Bacterial bright disease**      Severity level     Low     Medium     High  
 Control practice .....Date.....
- Rugged stunt disease**      Severity level     Low     Medium     High  
 Control practice .....Date.....
- Dirty seed disease**      Severity level     Low     Medium     High  
 Control practice .....Date.....
- False smut disease**      Severity level     Low     Medium     High  
 Control practice .....Date.....

.....disease      Severity level     Low     Medium     High  
 Control practice .....Date.....

.....disease      Severity level     Low     Medium     High  
 Control practice .....Date.....

.....disease      Severity level     Low     Medium     High  
 Control practice .....Date.....

**8.2 Insects**

**Green leaf hopper**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Black beetle**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Brown plant hopper**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Whitebacked plant hopper**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice case worm**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice leaf folder**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice stem borer**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice gall midge**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice back bug or  
 Malayan black bug**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Rice bug or  
 Slender Rice bug**      Severity level     Low     Medium     High  
 Control practice .....Date.....

**Others.....**      Severity level     Low     Medium     High

Control practice .....Date.....  
**Others.....** Severity level  Low  Medium  High

Control practice .....Date.....  
**Others.....** Severity level  Low  Medium  High  
 Control practice .....Date.....

**8.3 Weeds**

**First inspection**

**General weeds** Severity level  Low  Medium  High  
 Control practice .....Date.....

**Weedy rice** Severity level  Low  Medium  High  
 Control practice .....Date.....

**Second inspection**

**General weeds** Severity level  Low  Medium  High  
 Control practice .....Date.....

**Weedy rice** Severity level  Low  Medium  High  
 Control practice .....Date.....

**..... inspection**

**General weeds** Severity level  Low  Medium  High  
 Control practice .....Date.....

**Weedy rice** Severity level  Low  Medium  High  
 Control practice .....Date.....

**..... inspection**

**General weeds** Severity level  Low  Medium  High  
 Control practice .....Date.....

**Weedy rice** Severity level  Low  Medium  High  
 Control practice .....Date.....

**8.4 Animals pests**

<b>Golden apple snail</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Rice field crab</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Birds</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Rats</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Others.....</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Others.....</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Others.....</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		
<b>Others.....</b>	Severity level	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
	Control practice	.....Date.....		

**9. Fertilizer and agricultural hazardous substance application****9.1 Application of chemical fertilizer/organic fertilizer/plant growth regulator and others**

<b>Application</b>	<b>Type/formular/ chemical name</b>	<b>Buying Date month year</b>	<b>Buying source</b>	<b>Application rate (Kg/rai)</b>	<b>Operator</b>
<b>1. Chemical fertilizer</b>					
First d/m/y.....					
Second d/m/y.....					
Third d/m/y.....					
<b>2. Organic fertilizer</b>					
First d/m/y.....					
Second d/m/y.....					
Third d/m/y.....					
<b>3. Plant growth regulator *</b>					
First d/m/y.....					
Second d/m/y.....					
Third d/m/y.....					
<b>4. Others (indicate)</b>					
First d/m/y.....					
Second d/m/y.....					
Third d/m/y.....					

**Remark** \* growth control chemical such as hormone

## 9.2 Application of pesticide

Pests	Commercial name*	Common name*	Registration No. *	Manufacturing Date/ Expiring date*,**	Buying source	Application date	Rate of application per 20 liters water or per rai	Total amount (liters)	Remarks
<b>1. Rice disease</b>									
<b>- Blast disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- Brown spot</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- Bacterial bright disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- Rugged stunt disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- Dirty panicle disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									

**Remarks:** \* See the label on container. If no agricultural hazardous substance is applied, indicate “not apply”.

\*\* Cross out non used item.

Pests	Commercial name*	Common name*	Registration No. *	Manufacturing Date/ Expiring date*,**	Buying source	Application date	Rate of application per 20 liters water or per rai	Total amount (liters)	Remarks
<b>1. Rice disease (cont.)</b>									
<b>- False smut disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- .....disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- .....disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- .....disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									
<b>- .....disease</b>									
1 <sup>st</sup>									
2 <sup>nd</sup>									
3 <sup>rd</sup>									

Remarks: \* See the label on container. If no agricultural hazardous substance is applied, indicate "not apply".

\*\* Cross out non used item.











**10. Harvesting and threshing practices****Case 1 Harvest by labor / Harvesting machine in line** (cross out non use item)**Thresh by labor/ Threshing machine** (cross out non use item)

Performance	Notice	Date Month Year
1. Blooming 80%	<input type="checkbox"/> Blooming consistently throughout rice field. <input type="checkbox"/> Blooming inconsistently throughout rice field. <input type="checkbox"/> .....	
2. Water drainage	<input type="checkbox"/> Water draining seven days before harvest. <input type="checkbox"/> Water draining longer than 10 days before harvest. <input type="checkbox"/> No water draining.	
3. Panicle performance	<input type="checkbox"/> Turn yellow completely. <input type="checkbox"/> three quarters of panicle turn yellow. <input type="checkbox"/> Whole panicle remain green. <input type="checkbox"/> Panicle over dried.	
4. Harvest by <input type="checkbox"/> labor <input type="checkbox"/> machine	Field condition <input type="checkbox"/> Dried <input type="checkbox"/> Wet	
5. Drying <input type="checkbox"/> Drying on a court for ... days  <input type="checkbox"/> Drying in rice field for .....days <input type="checkbox"/> Drying rice panicle in bundle for .....days <input type="checkbox"/> Drying rice panicle field laying in line on top of straw for....days	<input type="checkbox"/> On a cement court <input type="checkbox"/> On ground lay under with ..... <input type="checkbox"/> Clean the court by..... Sunlight <input type="checkbox"/> Strong <input type="checkbox"/> Medium <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> others..... Sunlight <input type="checkbox"/> Strong <input type="checkbox"/> Medium <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> others..... Sunlight <input type="checkbox"/> Strong <input type="checkbox"/> Medium <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> others.....	
6. Rice pile up in stack.	Amount.....stacks	
7. Threshing <input type="checkbox"/> Labor <input type="checkbox"/> Threshing machine <input type="checkbox"/> Animal	<input type="checkbox"/> Same variety of rice was harvested from last crop. <input type="checkbox"/> Different variety of rice was harvested from last crop. Explain cleaning practice. <input type="checkbox"/> Others.....	

**Case 2 Harvest and thresh rice by machine**

Performance	Criteria	Date/ Month /Year
1. Blooming 80%	<input type="checkbox"/> Blooming consistently throughout rice field. <input type="checkbox"/> Blooming inconsistently throughout rice field. <input type="checkbox"/> ..... .....	
2. Water drainage	<input type="checkbox"/> Water draining seven days before harvest. <input type="checkbox"/> Water draining longer than 10 days before harvest. <input type="checkbox"/> No Water draining.	
3. Panicle performance	<input type="checkbox"/> Panicle turn yellow completely. <input type="checkbox"/> three quarters of panicle turn yellow. <input type="checkbox"/> Panicle remain green. <input type="checkbox"/> Panicle over dried.	
4. Harvesting date	Field condition <input type="checkbox"/> Dried <input type="checkbox"/> Wet	
5. Harvesting machine	<input type="checkbox"/> Last harvest was the same variety. <input type="checkbox"/> Last harvest was different variety Indicate name ..... (If known) Indicate cleaning method to eliminate remaining grain. ..... <input type="checkbox"/> Others.....	
6. Total Produce <input type="checkbox"/> Sale paddy in form of wet grain .....ton. <input type="checkbox"/> Safe for seeding / self consumption .....ton.		
Yield of paddy .....ton / Rai. Selling price*.....Bath/ton.		

**Remark** \* Selling price is in option.

**11. Drying practice** (If produce is sold in form of wet paddy, omit this clause).**Dry date: Starting date** ..... **Finish date** .....

Performance	Criteria
1. Performance of drying court. <input type="checkbox"/> Ground courty. <input type="checkbox"/> Cement courty. <input type="checkbox"/> Asphalt court.	<input type="checkbox"/> Thickness of paddy layer is less than 5 cm. <input type="checkbox"/> Thickness of paddy layer is 5-10 cm. <input type="checkbox"/> Thickness of paddy layer is greater 10cm.
2. The last drying on this courty was on ..... (date).	<input type="checkbox"/> Other produce ..... <input type="checkbox"/> Rice (variety name)..... <input type="checkbox"/> Other activity .....
3. Material lay under produce during drying.	<input type="checkbox"/> None <input type="checkbox"/> Canvas/plastic <input type="checkbox"/> Net <input type="checkbox"/> Others .....
4. Cleaning drying court.	<input type="checkbox"/> None <input type="checkbox"/> Sweeping <input type="checkbox"/> Others (indicate).....
5. The sun shine condition (in general).	<input type="checkbox"/> Strong sunlight <input type="checkbox"/> Medium sunlight <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> Others.....
6. Turn over paddy during drying.	Frequency of turning over paddy ..... time/day
7. Drying period.	Number drying day .....days
8. Material used for covering paddy during drying period.	<input type="checkbox"/> none <input type="checkbox"/> cover paddy with.....
9. Dryer.	<input type="checkbox"/> Last drying was ..... (indicate variety) <input type="checkbox"/> Cleaning to eliminate grain remaining in the machine ..... Drying time: Starting at .....o'clock am or pm until ..... o'clock am or pm. Drying duration .....hours.

**12. Packaging and storage practice** (Omit this clause if sell wet paddy)

Plot number	Weight (Kg)	Type of Containers	Cleaning container and storage practice	Location of storage

**13. Source of produce**

Plot number	Variety of rice	Weight (kg)	Harvesting date	Farm owner	Address

Name.....  
 (.....)  
 Recorder

**ANNEX B****RECOMMENDATIONS ON GOOD AGRICULTURAL PRACTICES FOR RICE**  
(Section 4)**B.1 WATER SOURCES**

B.1.1 Water applied to rice cultivation should not be obtained from sources where the environment is risk to contamination with any harmful substance and its quality is suitable for cultivation. It shall not be waste water from industrial activities or others that may cause hazardous contamination. If necessary to use, it shall be clarified that the water has been treated to improve the quality suitable for rice production.

B.1.2 If it is doubted that water may be contaminated with hazardous substances, it should be collected at random at least once before rice cultivation. The sample should be submitted to an official laboratory or an officially accredited laboratory for any contamination. The sampling practice and the results must be kept as the evidence.

B.1.3 Water resources and farm environment should be conserved for rice cultivation.

**B.2 PLANTATION AREA**

B.2.1 The production plots must be noted in the records. The details consist of farmer's name, contact address, plot keeper (if any) with contact address, farm layout, crop type and variety name, history of the farm land utilization at least in the past three years, and other details.

B.2.2 If any risk to hazardous substance contamination, the soil should be collected at random and analyzed at least once before rice cultivation by an official laboratory or officially accredited laboratory. The results must be kept as the evidence.

**B.3 APPLICATION OF PESTICIDES**

B.3.1 Application of hazardous substances shall be complied with the relevant laws. The label shall indicate the registration number and the application instruction to rice cultivation. It is prohibited to apply any substance that is banned to produce, import, export, or to have in possession in accordance with the Hazardous Substances Act B.E. 2535 (1992). Application of the substances shall be ceased before harvesting and complied with the duration indicated in the label or the official recommendations.

B.3.2 Rice for export, the hazardous substance applied shall not be those indicated in the prohibited list of the trading countries.

B.3.3 Application of hazardous substances shall follow the instruction on the official label authorized by Department of Agriculture, Ministry of Agriculture and Cooperatives. Application of pesticides must comply with the identified pests found in the rice field and the official recommendations of the Rice Department or Department of Agriculture. The applications shall be recorded in the form as shown in Annex A. 8 and 9.2

B.3.4 The farmer and labors who work in the plant pest protection sector should understand the nature of pests, select the appropriate pesticides and application rate, and select suitable sprayers and nozzles with the correct application. It is recommended that, the equipment should be in good condition and be ready all the time by consistent checking. To prevent contamination from pesticides, the applicants must put on protective clothing covering the body and some protective accessories, such as face masks or nasal masks, rubber gloves, hats or caps and rubber boots.

B.3.5 All the prepared solution should be completed at one application. Do not leave any excess solution in the tank of the equipment.

B.3.6 Hazardous substance must be prepared at the recommended concentration. The substance should be diluted by adding water to the specified volume and stirred to get a homogeneous dilution.

B.3.7 Application of hazardous substance should be done in morning or evening at still wind. Avoid to apply the substance under strong sunny or windy. The applicants must be at windward position during working.

B.3.8 After spraying hazardous substance, the applicant must bathe and shampoo, change clothing at once. The used clothing must be cleanly washed.

B.3.9 When the pesticide is applied completely, the equipment must be well rinsed two to three times with water.

B.3.10 If the hazardous substance is not depleted at one application, the remaining chemical in the container shall be tightly closed and kept in the agricultural hazardous substance storage.

B.3.11 The empty container of hazardous substance must be to prevent reusing. destroyed to prevent reusing. The damaged containers should be collected at a particular place for elimination later or buried under ground. It must be ensured that, the hazardous substance should not cause any contamination to water resource and the dept is enough to prevent unearthing from animals. It is prohibited to burn the hazardous substance container.

B.3.12 Agricultural hazardous substance storage

B.3.12.1 Containers of agricultural hazardous substances used in production practice must be kept in a particular room with properly closed for safety and prevent the exposure to sunlight and rainfall with good ventilation. The store room should be well assigned and partitioned to

prevent any contamination to food and environment. There should be a set of first aid for an emergency need, such as, eye cleaner, clean water, sand and fire extinguisher.

B.3.12.2 Each hazardous substance must be kept in a sealed container with clear label and stored in categorized group. They should be kept separately from fertilizers, plant growth regulator, and other plant supplements. Once a container of hazardous substance is opened, the remaining chemical shall be kept in its own container, do not transfer to another one.

B.3.12.3 Hazardous substance that is prohibited to be produced, imported, exported, or in possession according to Hazardous Substance Act 1992 should not be kept in the storage or in cultivating field.

## **B.4 QUALITY MANAGEMENT IN PRE-HARVEST PRODUCTION**

### **B.4.1 The Production for the right variety of paddy.**

The following practice is recommended for controlling off type rice in paddy after being harvested and threshed. This admixture is allowed not exceeded 5 % in the standard. This amount includes red rice.

#### **B.4.1.1 Seed source and preparation**

B.4.1.1.1 Use qualified rice seed from an official agency or other seed source certified by the Rice Department or competent authorities.

B.4.1.1.2 Qualified seed should contain at least 98% purity, not less than 80% germination, admixture of other rice variety shall not exceed 0.5%. It can be obtained or purchased from the following sources:

- (1) The official agencies such as Rice Seed Centers, Rice Research Centers under the Rice Department; or
- (2) Agricultural Cooperatives, Agricultural Promotion and Rice Seed Production Community and other competent authorities certified by the Rice Department or other assigned agencies; or
- (3) Farmer produces his own seed. The seed shall be produced from an isolated area from paddy commodity production field, or the seeds produced from the selected area in paddy field that showed a uniform plant performance and any off type plants have been eliminated during growing.

B.4.1.1.3 Seed preparing for wet seeded practice or transplanting seedling should be put in a gunnysack, a cotton bag or a bag made from any material providing good water drainage. The bag is steeped in water for 12 to 24 hours then take it out from water to drain and cover the wetted bag with thick sailcloth to incubate the seeds for 36 to 48 hours. Sprinkle the bag occasionally. After incubation period, a small shoot and a small root will grow from the germinated seed. The seeds are ready for wet seeded or seedling preparation. For dry seeded practice rough rice seed can be applied directly on rice field.

B.4.1.1.4 The detail of seed source must be recorded according to appendix A.4 for verification.

#### **B.4.1.2 Planting and Cultivation**

The practice is applied to control off type rice plants not exceeding to 3%, in this amount including red rice not more than 1%. This level of adulteration can be anticipated the admixture of other rice variety not exceeding to 5% with 2% red rice in the commodity.

#### **B.4.1.2.1 Planting season**

B.4.1.2.1.1 Rice should be planted at an appropriate time depending on the variety. It is suggested to avoid unfavorable weather during plant development, for example, too warm or too cold weather during blooming stage, and heavy rain at harvesting.

B.4.1.2.1.2 Appropriate time for rice planting in main crop and off season crop in irrigated area are as follow;

<b>Region</b>	<b>Main crop</b>	<b>Off season crop</b>
North	May to July	December to January
Northeast	May to July	December to February
Central	June to August	November to April
Southeast	August to September	March to May
Southwest	June to August	January to April

#### **B.4.1.2.2 Improve soil fertility**

B.4.1.2.2.1 Improving soil fertility should be done according to the following;

- Rice stubbles and straws should not be burnt after harvest. It is suggested to left them decompose naturally or plough and turn over them in to muddy soil or apply a bio-extract during land preparation for wet seeded practice to accelerate decomposition of the bio-mass.
- To improve low fertile soil, application organic fertilizer is suggested, such as compost, manure, rice husk, humus, green manure etc. Spread 500 to 1000 kilogram of organic fertilizer per rai throughout the field and plough over. Leave it to decompose for two to three weeks to complete gasification process that will be harmful and toxic to rice plant.
- Two months before rice cultivation, seeds of legume may be applied as green manure such as *Sesbania rostrata*, Mung bean, cowpea, or *Crotalaria juncea*. These seeds should be sow at the rate of five kilograms per rai or Jackbean seed 10 kilograms per rai. When the plants grow for 50 days or blooming, they are ploughed.

#### **B.4.1.2.3 Rice seed rate**

B.4.1.2.2.1 Seed rate for transplanting, wet seeded and dry seeded practices should be as following:

- 5 to 7 kilograms per rai for transplanting.
- 10 to 20 kilograms per rai for wet seeded.
- 10 to 20 kilograms per rai for dry seeded.

B.4.1.2.2.2 Seed rate for wet seeded and dry seeded practices may be adjusted depending on soil condition and pests infection. If the soil surface is plane without any interference from rats, birds and weed, seed rate can be reduced to 10 kilograms per rai. If the soil surface is uneven or bumpy and contains serious pest infection, therefore it is necessary to increase seed rate.

#### **B.4.1.2.4 Soil Preparation and Planting Method**

B.4.1.2.4.1 Transplanting practice should be done as follow;

(1) Seedling nursery

- The seedbed should be prepared by starting from first plowing in lengthwise of the field. The second plowing in crosswise should be done 7-10 days after. Water should be applied into the field subsequently after plowing to flood the muddy soil, then harrowing and paddling processes.
- The prepared land should be partitioned into small seedbeds, 1-2 m. wide with the length along the field. A small furrow of 30 cm. wide is set between seedbeds for water drainage.
- Rice seeds are sown uniformly on the seedbeds at the rate of 50-70 gm. per sq. m.
- The seedbeds re maintained at saturated moisture for seed germination by draining out the flooding water. After the emergence of seedling, gradually increase the water level of the seedbeds according to the height of the seedling, but not exceeds 5 cm. from the soil surface.

(2) Transplanting

- Planting field should be started from first plowing in lengthwise of the field. The second plowing in crosswise should be done 7-10 days after. Water should be applied into the field subsequently after plowing to flood the muddy soil, then harrowing and paddling processes. The water level should be maintained at approximately 5 cm. from the soil surface.
- Transplanting is made by using approximately 25 day-old seedlings.
- Spacing between rows is recommended at 20 cm and between hills at 20 cm with the number of 3 to 5 seedlings/hill.
- Water level in the field should be maintained at 5-10 cm. that appropriate to the plants growth.
- Water should be maintained all the plant growth duration, especially the period of panicle initiation to blooming
- 15 to 20 days after 80% of plants bloomed; remaining water should be drained depending on soil type.

B.4.1.2.4.2 Wet seeded Practice should be done as follow;

- Planting field should be started from first plowing in lengthwise of the field. The second plowing in crosswise should be done 7-10 days after. Water should be applied into the field subsequently after plowing to flood the muddy soil, then harrowing and puddling processes, then leveling the muddy surface.
- Prepared field should be partitioned into small plots of 5-10 m. wide with the length along the field. A small furrow of 30 cm. wide should be set between the plots for water drainage.
- Rice seeds should be sown or broadcasted uniformly on the plots at the rate of 10 to 20 kg./rai. (According to b.4.1.1.3)
- Drain off flooding water after sowing and keep the soil saturated with moisture for seed germination, then gradually increase the water level according to the height of the plants, but not exceed 10 cm. from the soil surface.

- Water should be maintained all the plant growth duration, especially the period of panicle initiation to blooming
- 15 to 20 days after 80% of plants bloomed; remaining water should be drained depending on soil type.

B.4.1.2.4.3 Dry seeded practice should be done as follow;

- Planting field should be started from first plowing in lengthwise of the field. The second plowing in crosswise should be done 15-30 days after with hand weeding at the same time.
- Rice seeds should be sown or broadcasted uniformly on the plots at the rate of 10 to 20 kg./rai.
- Soil should be plowed to incorporate rice seed under it. The moisture will accelerate seed germination. If the seeds incorporated too deep under the soil, at heavy rain, the seed would not evenly germinate and rot.
- After sowing, keep the field from being flooded but containing moisture sufficient for seed germination. Slowly increase water level according to plant height. Be careful that the plants are not submerged under water and not exceed to 10 cm. from soil surface.
- Be sure that rice plants have sufficient water to grow , especially at the stage of panicle initiation and blooming.
- 15 to 20 days after 80% of plants bloomed; remaining water should be drained depending on soil type.

#### **B.4.1.2.5 Fertilizer application**

B.4.1.2.5.1 Fertilizer application should comply with good cultural practice for rice as follow;

- Plot size should be known for accurate fertilizer application
- Dike around rice plot must not have any water leakage before fertilizer application. After applying fertilizer for three to five days, water can be flow normally.
- Before fertilizer application, water level should be maintained at 5cm.
- Eliminate any weed in rice before fertilizer application, especially when rice plants develop at early stage.
- Apply fertilizer, its rate and time of application appropriate to rice variety and soil type.
- Calculate amount of fertilize use correctly or apply fertilizer sufficient for the plant requirement.
- Clay soil: the recommended basal application is 20-25 kg./rai of either of the following compound fertilizers, 16-20-0 or 18-22-0 or 20-20-0. Top dressing application is 5-10 kg./rai of urea or 10-20 kg./rai of ammonium sulfate or ammonium chloride.
- Loam, sand and sandy loam soils: the recommended basal application is 20-25 kg./rai of either of the following compound fertilizers, 16-16-8 or 18-12-6. Top dressing application is 5-10 kg./rai of urea or 10-20 kg./rai of ammonium sulfate or ammonium chloride.

B.4.1.2.5.2 Use of organic fertilizer in rice cultivation must be decomposed completely. Method of producing and applying should not introduce any contamination that is harmful to consumers.

B.4.1.2.5.3 Use of chemical fertilizers incorporated with organic fertilizers in rice cultivation, the organic fertilizer enhances an improvement in physical and biological properties of soil. It increase micro organism and contains more supplemental elements than chemical fertilizer. It also absorbs nutrients and slow down leaching of chemical fertilizer. Application of chemical incorporated with organic fertilizers depends on soil type as follow;

- Clay soil: organic fertilizers such as manure, composts of rice straw, rice husk, or husk ash, at the rate of 500 to 1,000 kg./rai., as well as Azola at the rate of 50 to 100 kg./rai are recommended to apply to the rice field before planting. Green manure, such as legumes should be planted at the seed rates of 5-10 kg./rai are also recommended. The green manure plants should be plowed to incorporate them with soil before planting rice. The chemical fertilizer is recommended for basal application at the rate 20-25 kg./rai of 16-20-0 or 18-22-0 or 20-20-0 formulated fertilizers.
- Loam, sand, and sandy loam soils: before planting rice, organic fertilizers such as manure, composts of rice straw, rice husk, or husk ash, are recommended at the rate of 500 to 1,000 kg./rai. Azola is also advised to apply at the rate of 50 to 100 kg./rai. Green manure, such as *Sesbania* spp. or kenaf (*Hibisens cannabinus*) planted at the seed rates of 5 to 10 kg./rai are also recommended. The green manure plants should be plowed to incorporate them with soil before planting rice. The chemical fertilizer is recommended for basal application at the rate 20-25 kg./rai of 16-16-8 or 18-12-6 formulated fertilizers.

B.4.1.2.5.4 Consideration for fertilizer application

- Use only one formula of fertilizer in each application.
- The first figure of the above recommended compound fertilizer indicates the general rate while the later figure is the rate to get a higher yield.
- For basal application, the recommended rate of fertilizer may be split into twice, on the planting date and rice tillering stage.
- Top dress fertilizer means the fertilizer applies at panicle initiation stage of rice plant
- Application of organic fertilizer every year induces the accumulation in the soil and reduce the requirement of chemical fertilizer in the following year. So heavy application of organic fertilizer accelerate the reduction of chemical use.

#### **B.4.1.2.6 Water management**

B.4.1.2.6.1 Water is necessary for rice plantation and affect the yield. During seedling stage, rice plant need less water so it is not necessary to flood the field. At Tillering stage (about 20 to 30 days after seed germination in wet or dry seeded rice or 30 days after transplanting). Dry soil surface always enhance weed growth and becomes competitors of rice plants. It is advised to maintain water level at 5 to 10 cm. from the soil surface to control weeds. At maximum tillering stage, water level should be maintained at higher level to prevent emerging of new nonproductive tillers. In order to get an uniform ripening grain, it is suggested to drain off the water from the field 20 days after flowering date or 10 days before harvesting.

**B.4.1.2.7 Elimination of off type rice plant**

B.4.1.2.7.1 During seed germination and plant development, Inspect for admixture of off type rice plant at 3 stages of growth:

- (1) At tillering stage, inspect the performance of rice tillers, leaves erectness, color of stems and leaves, size of leaves and plant height. Any diverse plants should be pull out immediately.
- (2) At blooming stage, inspect time of flowering (early or late), flower performance, color of flower and stamens. Any diverse plants should be pull out immediately.
- (3) At dough stage, inspect performance and bending of panicles. Any diverse plants should be pulling out immediately.
- (4) Maturing stage, inspect size and color of paddy, maturing characteristic. Any diverse plants should be pull out immediately.

B.4.1.2.7.2 uprooting and cutting off type rice plant should be done as follow;

- (1) Uprooting. Pull out all stems, roots and tillers of off type rice plants at Tillering stage.
- (2) Cutting. Cut all stems and tillers at soil surface level at stages of flowering, dough and maturing .

B.4.1.2.7.3 In case of farmer produces his own seed, it is suggested to pay more attention to inspect

**B.4.2 Control of pests and plant damage from pests.**

The following management is aimed to prevent and control pests that cause disease or pest damages on paddy commodity not exceed to 10%.

B.4.2.1 Farmers should learn to know about types, life cycles and controlling, as well as the environment and the ecosystem of the important rice pests. Details of these pests are described in Annex C.

B.4.2.2 Regularly inspect pest damage in rice field and follow its epidemic at every stage of rice growth. If the damage reach the economic threshold, an appropriate controlling management must be applied according to the recommendation of the Rice Department and record the practice according to Annex A.8 and 9.

B.4.2.3 If an agricultural hazardous substance is used, the application should comply with clause b.3

B.4.2.4 Infected part of rice plant should be destroyed according to Annex C.

**B.4.3 Agricultural input management**

B.4.3.1 Provision of inventory report of the input resources, their source of origins and specified the details of important resources, such as, rice varieties, fertilizers, hazardous substance use in production. The details should also be indicated the items, volume, date, and source of supply.

B.4.3.2 The application of manure, organic and other natural fertilizers should be managed appropriately to prevent any microbial, chemical and physical contamination to the commodity that may be harmful to consumers.

#### **B.4.4 Agricultural equipment and tools management**

B.4.4.1 Arrange a list of agricultural equipments, tools and their storage.

B.4.4.2 Provision of appropriate agricultural equipments and tools which are sufficient for operation.

B.4.4.3 Provision of shelter/store room for keeping agriculture equipments and tools in proper order, safety and convenience for usage.

B.4.4.4 Set up a maintenance schedule for agricultural equipments and tools. The maintenance must be operated according to the schedule and recorded for verification.

B.4.4.5 Agricultural equipment and tools, such as chemical sprayers or harvesting machines should be inspected before operation. Any accessory that requires high accuracy, for example, the nozzles of sprayer, should be calibrated regularly. If any error is found, it is necessary to repair or replace, in order to obtain efficient output in line with its standard.

B.4.4.6 Agricultural equipments and tools including containers for loading and transporting produce should be cleaned before and after being used or prior to storage.

#### **B.4.5 Disposal of waste and plant residues**

B.4.5.1 Sound or disease-free rice straw and plant residues can be used for preparing compost or green manure fertilizers.

B.4.5.2 Noticeably separated garbage types such as papers, paper boxes, plastic, glass, oil, chemical substances and plant parts, etc. Garbage bin should be well arranged or the disposal area should be clearly identified.

### **B.5 HARVESTING AND POST-HARVEST PRACTICE**

#### **B.5.1 Management for good paddy quality.**

The following practice is to anticipate getting a good milling quality paddy to yield at least 34% of head rice and whole grains that complied with the Rice Standard.

B.5.1.1 When the rice plants begin to bloom, the field should be inspected more frequently to notify flowering date which 80% of rice plants bloom. This date can be applied to estimate harvesting date. The optimum harvesting date is between 25 to 35 days after flowering date.

#### **B.5.2 Harvesting and threshing**

B.5.2.1 Plan to harvest rice at an appropriate time. Set a schedule for harvesting and record the practice according to appendix A. 10. Contact the owner of a combine harvester or labors to make an appointment to harvest rice on the scheduled date.

B.5.2.2 To have an uniformly ripening rice, water in the field must be drained off 7-10 days before harvest.

B.5.2.3 Harvesting by a combine harvester, it is necessary to know the variety of rice at previous harvest. If the machine has been harvested other varieties before, it requires cleaning up the system or do harvesting around the border area for 100 kg of paddy to purge any remaining. This portion of paddy should not be combined to the certified commodity.

B.5.2.4 Threshing by a thresher, it is necessary to know the variety of rice at previous threshing. If the machine has been threshed other varieties before, it requires cleaning up the system or do threshing some bundles of rice panicles to purge any remaining. This portion of paddy should not be combined to the certified commodity.

B.5.2.5 In case of using tractors, labors, or animals for threshing, the threshing place must be cleaned and free from panicles or paddy of the other varieties.

### **B.5.3 Drying practice.**

The following practice is to reduce moisture in paddy to 15% for trading, and 14% for storing

#### **B.5.3.1 Sun-drying.**

B.5.3.1.1 Drying rice bundles before threshing, the rice bundles should be exposed to sunshine for two to three consecutive sunny days. The dried rice bundles should be kept in shading area and covered with a clean blanket to prevent them from rain and dew, or pile up on dry land. The dried rice bundles are threshed to get paddy. The paddy is then exposed to sunshine for another one to two consecutive sunny days or until appropriately dried before storing.

B.5.3.1.2 Drying paddy after be threshed is suggested as follows: Dry paddy on a dry and clean supporting blanket, such as, a canvas or a plastic sheet. It is not recommended to dry paddy directly on a concrete floor because it may cause cracking inside the grain or introduce adulteration of foreign matters.

- Spread the paddy on a clean supporting blanket with the thickness of 5 cm. Thicker paddy layer results a slow moisture loss due to bad ventilation. On the other hand, if the layer of paddy is too thin, it will expose too high temperature and causes cracking inside the grain. This will bring to a poor milling quality. To increase drying efficiency, paddy should be turn over at every two hours interval.
- Period of drying depends on the initial moisture content, thickness of paddy layer and turning over frequency. Continue drying to get 12-14% moisture. If drying process cannot be completed within 1 day, pile up the paddy and cover with a dry and clean blanket to prevent rain and dew at night.

#### **B.5.3.2 Drying paddy in a dryer.**

B.5.3.2.1 Temperature of dryer should not be over 50° C at 60% relative humidity. Drying rate should not be too speedy, otherwise grain crack will occur.

B.5.3.2.2 Drying paddy in a fluidized dryer at very high temperature. It may be as high as 100 °C or more. Paddy moisture may be reduced from 28% to 19% within five minutes. The drying process should be ceased when the paddy contains 19% moisture; otherwise all rice grains will turn cracked. piled up the paddy and leave it cool down. Continue slow drying process according to b.5.3.2.1 to until appropriate moisture is achieved.

### **B.5.4 Packaging management**

B.5.4.1 Rice sack for paddy should be cleaned to get rid of all remaining paddy. Record type of paddy container and cleaning practice according to in Annex A. 12.

## **B.6 TRANSPORTATION, STORAGE AND PRODUCE COLLECTION PRACTICES**

### **B.6.1 Transportation**

B.6.1.1 Vehicle used for Transportation should be clean with property concealing properly to prevent external wetting. It should not cause any contamination of hazardous substance.

B.6.1.2 It is not recommended to use any vehicle that has been carried soil, animals, manure, fertilizers, or chemicals, except that, the vehicle has been properly cleaned before application.

### **B.6.2 Storage and collection**

B.6.2.1 Paddy commodity and containers should be stored in a room separated from that for containers of hazardous substance, fertilizer, or chemical that may be harmful to consumers. If it is necessary to store all items in the same room, prevention any contamination to the commodity must be sufficient.

B.6.2.2 Store room or barn must be clean and always in readiness for operation. It must be able to be locked properly to prevent leakage or throwing in of rain. It must be managed in such a way that damages cause by animal pests, such as birds, rodents and insects are prevented.

B.6.2.3 After being threshed and dried, paddy should be cleaned by winnowing process. The cleaned paddy is kept in clean gunny bags or sacks and properly sealed. The sacks are laid in arrangement on a wooden platform, at least 5 cm above the floor in a proper ventilated store room and separated from other varieties.

B.6.2.4 Small labeling plastic tags or bamboo sticks are attached to the sacks. The labels indicate the details of quantity, date and time of being stored.

B.6.2.5 To prevent and reduce the loss causes by storage pests, the recommendations are as follows:

B.6.2.5.1 Control the temperature of paddy storage. High temperature causes rapid loss of fragrant smell from aromatic rice. On the other hand, low temperature delays the loss but it need a high investment. In addition, low temperature provide an advantage in inactivate insect feeding and may cause mortality. At temperature below 10° C, insects are not active, while that below 5° C inhibit their egg laying and growths. Temperature between -2 to -50° C causes the dead of insects.

## **B.7 RECORDING AND RECORD KEEPING**

B.7.1 Document or record forms: Forms of documents and records of production management must be updated to present season. The details must cover all the practices including the signatures of the responsible personals.

B.7.2 If the farming is conducted in more than one plot, the documentation and record should correspond to each plot.

B.7.3 Filing and/or documents should be arranged in groups in accordance with the cropping seasons for verification convenience and implementation.

B.7.4 Data records and significant documents related to the practices should be well kept for at least three consecutive years of production or in accordance with the requirement of the administrator or trade partner for verification.

B.7.5 Records and list of document that should be kept are as follow;

- (1) Recording of application of pesticides;
- (2) Recording of rice seed source;
- (3) Recording of soil preparation and off type rice elimination;
- (4) Recording of survey of plant damage by pests and pest management;
- (5) Recording of fertilizers application;
- (6) Recording of harvesting and threshing practices;
- (7) Recording of drying practice;
- (8) Recording of paddy packaging and storage practice;
- (9) Recording the list of instruments and tools including the details of place and storage arrangement. In case of documentation has not been done, the storage must be managed in such a way that the instruments and tools are clean and safety, and convenience to use. They must be arranged in groups with distinguishable description of items list; and
- (10) Document or evidence of the analytical results of soil, water and other production necessities.

B.7.6 Produce in the storage or in the transportation vehicle should be clearly stated its lot number, code, sign or any information to indicate source of cultivation or harvesting date, attached to the container for convenience in verifying source of origin.

## ANNEX C

**RECOMMENDATION TO WATCH FOR, INSPECT AND PREVENT PESTS**  
(B.4.2.6.1)

Potential pests, their inspection, and prevention are as follow;

<b>Epidemic Period</b>	<b>Symptom</b>	<b>Control practice</b>
<b>1. Diseases</b>		
Cold weather with heavy dews on leaves and mist are favor to blast disease epidemics.	<b>Rice blast</b> Causal agent is a fungus <i>Pyricularia grisea</i> Sacc. <b>Damage at economical threshold:</b> Defected rice leaves exceeding to 10% l or more	- Eradicate the alternate hosts around the surrounding of rice field, such as grasses, panicum grass, paragrass, southern cutgrass etc.
Seedling stage	The symptoms on the leaves are elliptical or eye-shaped brown spots. Size of lesion is about 2-5 mm wide and 10-15 mm long. In case of severe infection, the seedling are often completely killed	-Fertilizer application should be followed the recommendation of the Rice Department. - The rice field should be frequently inspected. If the symptoms of the disease are found, an appropriate fungicides should be applied in accordance with the direction on the label or the recommendation of the Rice Department, or other corresponding official agency.
Tillering stage	The symptoms are found on leaves, nodes and collars of the infected rice plants. The lesions on leaves are larger than that on seedling. It may expand to adjoin the adjacent lesions. The infected collars become blackish and cause falling down of the leaves.	- Rice seeds are mixed or steeped in a solution of a fungicide according to the recommendation of Rice Department.
Blooming stage	If the infection occurs at the beginning of flowering, it causes production of unfilled grain. If it attack rice plants when the flowering is completed, the necks of the panicles show brown lesions and causes falling down of the panicles. This symptoms are known as neck rot.I	
High humidity and high temperature weather at	<b>Sheath blight</b> Causal agent is fungus <i>Rhizoctonia solani</i>	- Burn rice stump from the severe infected plot to

Epidemic Period	Symptom	Control practice
tillering to harvesting stages of rice growth favor to sheath blight disease epidemic.	<p>(<i>Thanatephorus cucumeris</i> (Frank) Donk) (<i>Corticium sasakii</i> (Shirai) Mats.)</p> <p>The symptoms on the sheath close to water level is greenish gray lesions with brown edge. Size of lesion is about 1 to 4 mm wide and 2 to 10 mm long. Lesions may expand along the sheath of leaf and flag leaf, causing wilting and death. If one rice plant produces excessive tillers that causes a compression among them. This enhance the severity of infection.</p> <p><b>Damage at economical threshold:</b> Lesion on rice stem is 1/3 of its height or more.</p>	<p>inhibit epidemic of the fungi.</p> <ul style="list-style-type: none"> <li>- Eradicate alternate hosts surrounding the rice field and water reservoir to reduce accumulation of causal agent.</li> <li>- Grow rice according to the recommended spacing and seed rate.</li> <li>- Apply nitrogen fertilizer according to the recommenddation.</li> <li>- If the 5<sup>th</sup> leaf sheath from flag leaf is infected, apply an appropriate fungicide according to the direction on label or the recommendation of the Rice Department, or other corresponding official agency.</li> </ul>
Every rice cultivation season, rainy season, high humidity and consecutive foggy days.	<p><b>Dirty panicle disease</b></p> <p>Causal agent are fungi  <i>Curvularia lunata</i> (Wakk) Boed., <i>Cercospora oryzae</i> I.Miyake, <i>Helminthosporium oryzae</i> Breda de Haan., <i>Fusarium semitectum</i> Berk &amp; Rav., <i>Trichoconis padwickii</i> ganguly, and <i>Sarocladium oryzae</i>. Symptom show speck rice panicle. Lesion on paddy grain surface is dark brown spot, brown or gray strips. Infected grain is covered with pink mycelium. Some grains are unfilled with dark brown color. The symptom causes great loss of grain quality.</p> <p><b>Damage at economical threshold:</b> Lesion on rice grain exceed 5% at flowering stage</p>	<ul style="list-style-type: none"> <li>- In the field that regularly find this disease, weak rice breed should not be cultivated in.</li> <li>- Use seed from disease-free source. If necessary, seeds must be prepared against diseases as recommended by Rice Department or Department of Agriculture.</li> <li>- At flowering stage, rainy and high humidity raise the infection of the disease. If Lesions are found on leaves, apply insecticide according to the label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
Consecutive showering,	<b>Bacterial leaf blight or bacterial blight</b>	- Rice stubble in infected

Epidemic Period	Symptom	Control practice
high water level in paddy field or flooding	Causal agent is bacteria <i>Xanthomonas oryzae</i> pv. <i>Oryzae</i> (ex Ishiyama) Swings et al	field should be plowed immediately after harvesting.
Seedling stage	The symptoms started at water saturated spots on the edge of lower leaves. After 7 to 10 days of infection, Lesion changes to yellow stripes and then dry up. The green parts of leaves turn to grayish. Severe infection causes the plants to dead. If the infected seedlings are transplanted, they will turn wilt and die in a short time.	- Alternate hosts, such as, wild rice and southern cutgrass must be exterminated. - Nitrogen fertilizer application should follow the recommendation. - Water from infected plot should not be drained to the adjacent plots.
Transplanting stage	In general, the infected plants will show the symptoms 4 to 6 weeks after transplanted. The lesions start with the water-saturated stripe at leaf edge, and then develop to yellow. Sometimes, bacterial bead can be observed on the lesion. The lesions expand rapidly along the infected leaf. If it expands crosswise of the leaf, the internal edge of lesion becomes uneven. The color turns to gray and wilt.	
After severe epidemic of brown planthopper	<b>Ragged Stunt Disease</b> Causal agent is Ragged Stunt Virus. Brown planthopper is the carrier of the virus and causing the Infected plant to stunt, color changes to dark green. Its leaves become more narrow and shorter than normal plant with twisted tip. Sometimes with incisive leaf edge and swollen vein at the back side of leaf and leaf sheath. Flowering of plant is delayed and	- Rice stubble in infected field should be plowed immediately after harvesting. - Grow rice variety that resistant to brown planthopper - Do not grow single rice variety in large area consecutively for a long time. - Alternate hosts, such as, wild rice pickerel weed, barnyard grass, swollen

Epidemic Period	Symptom	Control practice
	<p>produces unsound panicle and grain with high proportion of unfilled kernels and low quality</p> <p><b>Alternate host plants are;</b> wild rice, pickerel weed, barnyard grass, swollen finger grass, and sprangle top grass.</p>	<p>finger grass, and <i>Leptochloa chinensis</i> L. must be exterminated.</p> <ul style="list-style-type: none"> <li>- Exterminate infected rice plant and destroy outside the paddy field.</li> <li>- If epidemic of ragged stunt disease is severe, do rotation cropping to disrupt the life cycle of carrier insect.</li> <li>- Inspect rice field, if one brown planthopper per hill is found, apply appropriate insecticide according to the direction on label or recommendation the of Rice Department or other corresponding official agency.</li> </ul>
<b>2. Insect</b>		
<p>Seedling stage in drought condition and long breaking period of raining season.</p>	<p><b>Rice thrips</b> <i>Stenchaetohrips biformis</i> (Bagnall) in Thripidae family.</p> <p>Size of insect is 1 to 2mm long. Adult is black.</p> <p>Damage rice by sucking nutrient from rice leaf and causing it to wilt and rolling leaf edge. In severe case, all rice plants died</p> <p><b>Damage at economical threshold:</b> 20% of rice plants have rolled leaves when inspected at random.</p>	<ul style="list-style-type: none"> <li>- Maintain water sufficiently for seedling growth.</li> <li>- When rice thrips epidemic occurs, submerge rice plants under water for 1 to 2 days, then stimulate the plant growth by applying fertilizer.</li> <li>- When epidemic becomes severe, apply insecticide according to the label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
<p>Tillering to Flowering stages</p>	<p><b>Brown planthopper: BPH</b> <i>Nilaparvata lugens</i> (Stal) <b>and White backed planthopper: WBPH</b></p> <p>The adults of BPH and WBPH are different in morphology. BPH are about 5 mm. long with the brown color at either short or long wings. WBPH is similar to BPH in its size but the wings are more translucent</p>	<ul style="list-style-type: none"> <li>- Grow several rice varieties resistant to BPH and WBPH alternately. .</li> <li>- At outbreak period, apply light trap to collect insects and kill them mechanically.</li> <li>- To cut the life cycle of the insects, it is suggested to skip over rice plantation for a period of time or cultivated alternate crops in</li> </ul>

Epidemic Period	Symptom	Control practice
	<p>with black spots at the center and margin. From the top view, it is seen as white strip on the back. Both BPH and WBPH are attracted to light at night. Nymphs and adults of both insects suck plant sap at the extreme base of rice hills. Heavy infection may cause burn symptom and dead to rice plants. In addition, BPH transmit ragged stunt virus. The damage cause s from BPH is more widely spread and severe than that from WBPH. Now a day, BPH is considered the most important insect pest of Thailand.</p> <p><b>Damage at economical threshold:</b> Inspected 10 or more adults or larvae per hill of rice plant. And one adult or larva per hill of <i>Cyrtorhinus lividipennis</i> (Reuter)</p>	<p>the rice field, such as legumes or corn.</p> <ul style="list-style-type: none"> <li>- If the outbreak built up during the period between two to three weeks after transplanting or broadcasting until booting stage of rice plant, drain off flooding water and keep the soil saturated with water or maintain the water at soil surface to reduce epidemic of BPH</li> <li>- When 1 BPH/plant by averaged is found, apply insecticide in accordance with the direction on the label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
Maturity or rice plant less than 45 days	<p><b>Green rice leafhopper</b> <i>Nephotettix cirescens</i> (Distant). Adult of <b>Green rice leafhopper</b> is about 5 mm. long with green color and black spots at the margin of the wings. It is attracted to light at night. Nymphs and adults of insects suck plant sap from rice leaf that causes direct damaged. The Indirect damage is transferring virus that causes yellow orange leaf disease to rice plant. This insect is found more often in wet season crop than in dry season.</p>	<ul style="list-style-type: none"> <li>- Grow rice variety resistant to Green rice leafhopper.</li> <li>- At outbreak period, apply light trap to collect insects and kill them mechanically.</li> <li>- Grow rice at the same time as neighbor field. To cut the life cycle of the insects, it is suggested to skip over rice plantation for a period of time.</li> <li>- When epidemic becomes severe, apply insecticide according to the label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
At the beginning of	<p><b>Rice leaf folder: LF</b> <i>Canphalocrocis medinalis</i></p>	<ul style="list-style-type: none"> <li>- Alternate hosts grown in</li> </ul>

Epidemic Period	Symptom	Control practice
transplanting to flowering	<p>(Guenee)            Adult is a kind of moth.            Worm is green and yellow with brown head. The worm produce web to hold both edges of rice leaf in lengthwise to wrap it inside. It eats all the green part of leaf and remains the white web along rice leaf. Damage is more severe if high nitrogen fertilizer is applied or rice plant is grown under shading. If damage occurs at booting stage, it will development unfilled grains. Control epidemic of insect at tillering stage can minimize the loss in booting stage.  <b>Damage at economical threshold:</b> More than 15% of folded leaves or four to five moths per square meter are found at random.</p>	<p>rice field and near by, such as, barnyard grass, junkle rice, Leersia hexandra Sw., Panicum repense, and wild rice must be exterminated.            - When epidemic becomes severe, apply insecticide according to the direction label or the recommendation of Rice Department or other corresponding official agency.</p>
From seedling, panicle initiation and flowering stages.	<p><b>Rice stem borers: SB</b>            There are 4 types of SB in Thailand; yellow rice stem borer; <i>Scirpophaga incertulas</i> (Walker), dark-striped stem borer; <i>Chilo polychrysus</i> (Meyrick), dark-headed rice borer borer; <i>Chilo suppressalis</i> (Walker), and pink rice stem borer; <i>Sessamia inferens</i> (Walker). Damage results from the larvae of the insects feeding within the rice stems. At the seedling and tillering stage, the infection causes the tiller dead. At flowering stage, it causes the white unfilled spikelets panicles and called white head. The white panicle can be pulled out easily.</p>	<p>- After harvesting, the remaining rice stubble must be burnt and flooded. The land must be plowed to kill the larvae and pupa.            - Crop rotation is recommended in order to break the life cycle of stem borers.            - Apply light trap to collect insects and kill them mechanically.            - When epidemic becomes severe, apply insecticide according to the direction on label or the recommendation of Rice Department or other corresponding official agency.</p>

Epidemic Period	Symptom	Control practice
	<p><b>Damage at economical threshold:</b> The epidemic of insects or 10 to 15% white headed rice plant is found at random.</p>	
<p>Seedling stage to maximum tillering stage. Heavy showering and high relative humidity (80-90%) enhance RGM epidemic.</p>	<p><b>Rice gall midge: RGM</b> <i>Orseolia oryzae</i> (Wood-Mason) Adult RGM looks similar to Mosquito, except that Rice gall midge has pinky orange color. Damage causes by gall midge larvae get into the space between rice stem and leaf sheath and injures the growth tissue of a new tiller. Rice plant will create membrane to wrap the larvae and develops a tube like similar to union leaf. The tubular tiller is unable to produce a panicle. If the epidemic becomes severe, rice plant will create numerous tillers with stunted height. <b>Damage at economical threshold:three to five gall midge</b> tubular tillers per 10 rice plant are Inspected at random.</p>	<ul style="list-style-type: none"> <li>- Alternate hosts, such as, barnyard grass, southern cutgrass, corngrass, panicum grass, and wild rice shall be removed from the surroundings of rice field.</li> <li>- Consecutive planting rice is not recommended.</li> <li>- Apply light trap to collect the adult and kill them.</li> <li>- When epidemic becomes severe, apply insecticide according to the direction on label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
<p>Maximum tillering to harvesting stages.</p>	<p><b>Rice black bug or Malayan black bug</b> <i>Scotinophara coarctata</i> (Fabricius) A round shield like sucking insect with brown or black color. Size of insect is 7 to 8 mm long and 4 to 5 mm wide. Head and upper thorax is triangular. Female lays clustered eggs in a line along rice leaf close to basal of rice hill near water level or sometime on the ground. At day time, a group of insects live in cluster at the base of rice hill or in the soil</p>	<ul style="list-style-type: none"> <li>- Apply light trap to collect the adult and kill them.</li> <li>- When epidemic becomes severe, apply insecticide according to the direction on label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>

Epidemic Period	Symptom	Control practice
	<p>cracks. At night, they migrate to stem. Adult can survive along cold or dry season in soil cracks having some grasses. When weather is appropriate, the insects move to rice field and increase the population. Adult is attracted to light at night. Larvae and adult damage rice plant by sucking sap from leaf sheath at the basal of rice hill and alter leaf color to dark brown similar to rice blast disease symptom. The plant wilt like Hopper burn symptom causes by BHP. Epidemic is localized, not spread widely as BHP.</p> <p><b>Damage at economical threshold:</b> more than 5 rice black bugs per 10 rice plant are Inspected at random.</p>	
Flowering and milky stages	<p><b>Rice bug, stink bug</b>  <i>Leptocorisa acuta</i> (Thunberg) and <i>Leptocorisa oratorius</i> (Fabricius)</p> <p>Long slender insect with strong acrid smell. Adult is 15mm long with brown color at dorsal and green at ventral. Its antennae and body have identical length. Adult and larvae rice bugs suck sap from rice grain at milky stage, and bring to unfilled or deformed grain development. Severe epidemic causes yield loss and a strong acrid smell can be detected from the rice field.</p> <p><b>Damage at economical threshold:</b> 4 adults per 1 square meter are detected at random.</p>	<ul style="list-style-type: none"> <li>- Apply a net to capture larvae and adult in the infected field and kill them.</li> <li>- Apply a spoiled meat as bait for the adults by hanging it along rice field and kill them.</li> <li>- Consecutive planting rice is not recommended.</li> <li>- When epidemic becomes severe, apply insecticide according to the direction on label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>

Epidemic Period	Symptom	Control practice
3. Weeds		
3.1 Weeds		
All cultivation seasons Sometimes	<p><b>Barnyard grass</b>  <i>Echinochloa crusgalli</i> (L.)            P. Beauv            It is an annual grass with small stem very similar to rice plant, but without ligule located between leaf and leaf sheath. It can germinate in wet soil and survive under 6 cm of water dept. This weed is commonly found in wet seeded and transplanted rice fields.</p>	<ul style="list-style-type: none"> <li>- Apply certified rice seed having high in purity, germination rate and seeding vigor to compete against weeds.</li> <li>- Clean rice seeds with winnowing instrument to remove seeds of weeds.</li> <li>- Land preparation with first Ploughing lengthwise and allow weed's seeds to germinate before ploughing for a second time in crosswise to bury the seedlings of weeds.</li> <li>- Appropriate water management for wet seeded practice. After broadcasting rice seeds drain off all water and left the field to dry until soil cracking occurs. Irrigate water into the field rapidly. This practice should be completed within 7 days after seed sowing.</li> <li>- Apply herbicide according to the direction on the label or the recommendation of Rice Department or other corresponding official agency.</li> </ul>
	<p><b>Jungle rice</b>  <i>Echinochloa colana</i> (L.)            Link.            It is an annual grass with pink color stem, leaf and flower. There is no ligule and auricle between leaf and leaf sheath. It can grow appropriately in moist and semi dry soil. This weed is commonly found in dry and wet seeded rice fields.</p>	
	<p><b>Wrinkle duck-beak</b>  <i>Ischaemum rugosum</i> Salisb.            It is an annual grass. Its stems climb along the ground with standing top. Inflorescences is compose of several tightly packed flowers look like a joss stick. It grows appropriately in damp soil and commonly found in dry seeded and wet seeded rice fields.</p>	
	<p><b>Sprangle top</b>  <i>Leptochloa chinensis</i> (L.)            Nees            It is an annual grass. There is a ligule with two serrations between leaf and leaf sheath. It grows appropriately in damp soil and commonly found in dry seeded and wet</p>	

Epidemic Period	Symptom	Control practice
	<p>seeded rice fields.</p> <p><b>Crowfoot grass</b> <i>Dactyloctenium aegyptium</i> (L.) P. Beauv. It is an annual grass. There is a ligule with four serrations. It grows appropriately in upland condition and dry loamy soil. This weed is commonly found in dry seeded rice fields.</p> <p><b>Knotroot foxtail</b> <i>Setaria geniculata</i> Beauv. It is an annual bush, with 50 to 150 cm plant height. It grows appropriately on damp soil. The seed always germinate at the same period of rice. This weed is commonly found in upland rice field.</p> <p><b>Finger grass</b> <i>Digitaria ciliaris</i> (Retz.) Koel It is an annual grass with inflorescences compose of several high panicles . It grows appropriately on upland and dry loamy soil. This weed is commonly found in dry seeded rice field.</p> <p><b>Panicum grass or Torpedo grass</b> <i>Panicum repens</i> L. It is an annual grass that tolerant to drought, flooding and acid sulfate soil. It grows appropriately on upland, dry and flooded soil. This weed is commonly found in dry seeded rice field.</p>	
All seasons	<p><b>Gooseweed</b> <i>Sphenoclea zeylanica</i> Gaertn. It is a broad leaf annual plant. The base of plant</p>	- Use clean seed that does not contaminated with other seeds, high germination rate, and fast growing, strong and

Epidemic Period	Symptom	Control practice
	stem under water is wrapped with a white sponge. It has a cone shape inflorescence. It grows appropriately on damp or flooded soil. This weed is commonly found in dry and wet seeded rice field.	able to compete with weeds. - Clean rice seeds with thresher to blow weeds out from rice seeds. - Plowing preparation. First plough then wait till the weeds grow then plough again to bury the weeds.
	<p><b>Pickrel weed</b> <i>Monochoria vaginalis</i> (Burm.f.) Presl. It is a broad leaf annual plant. Leafstalk and leaves look like a leg of a small frog. The plant is similar to water hyacinth. It grows appropriately on damp or flooded soil. This weed is commonly found dry and wet seeded rice fields.</p>	- Apply weed killer according to the label or Rice Department recommendation or other methods recommended by the government.
	<p><b>Spreading Dayflower</b> <i>Cyanotis axillaries</i> Roem. &amp; Schult. This weed is a broad leaf annual plant with long and sharp leaves. It is a succulent plant with creeping stem. It can grow on upland condition or on damp soil it grows appropriately on flooded area.</p>	
	<p><b>Water primrose</b> <i>Jussiaea linifolia</i> Vahl This weed has a straight stem with branching of 25 to 70cm height. It grows appropriately on flooded area.</p>	
	<p><b>Horse purslane</b> <i>Trianthema portulacastrum</i> L. This weed is a broad leaf annual plant with succulent leaves. Stem and leaves spread over the ground. Commonly found on dry seeded rice field.</p>	

Epidemic Period	Symptom	Control practice
All seasons	<p><b>Water clover</b>  <i>Marsilea crenata</i> Presl.            A fern-type weed with lifespan longer than one year. Leaf has four serrations. It grows appropriately on damp and flooded soil. Commonly found on dry and wet seeded rice fields.</p>	<ul style="list-style-type: none"> <li>- Plowing preparation for burying the weeds.</li> <li>- Apply weed killer according to the label or Rice Department recommendation or other methods recommended by the government.</li> </ul>
All seasons	<p><b>Small flower umbrella sedge</b>  <i>Cyperus difformis</i> L.            This weed is an annual plant with a dented triangle stem. Green serrated flower has a circular shape. It grows appropriately on damp and wet soil. Commonly found on transplanted, dry and wet seeded rice fields.</p>	<ul style="list-style-type: none"> <li>- Use clean seed that does not contaminated with other seeds, high germination rate, and fast growing, strong and able to compete with weeds.</li> <li>- Clean rice seeds with thresher to blow weeds out from rice seeds.</li> <li>- Plowing preparation. First plough then wait till the weeds grow then plough again to bury the weeds.</li> <li>- Apply weed killer according to the label or Rice Department recommendation or other methods recommended by the government.</li> </ul>
	<p><b>Umbrella sedge or rice flatsedge</b>  <i>Cyperus iria</i> L.            This weed is an annual plant. Its seedling has a sharp-tip spear like shape. Small flowers line in two rows with brown and yellow color. It grows appropriately on damp clayey sandy soil. Commonly found on transplanted, dry and wet seeded rice fields.</p>	
	<p><b>Tall Fringe rush</b>  <i>Fimbristylis miliacea</i> (L.) Vahl.            This weed is an annual sedge. The tillers of seedling spread out like a fan. The flowers in its inflorescence form a brown cluster. It grows appropriately on moist soil. Commonly found on dry and wet seeded and transplanted rice fields.</p>	
<b>3.2 Weedy rice</b>		
	<b>Weedy rice</b>	

Epidemic Period	Symptom	Control practice
All seasons	<p>At the beginning of epidemic, a few weedy rice plants are found in rice field. If these plants are not eliminated, the epidemic will be increased to several millions and overcomes all rice plants in two to three cropping. Weedy rice may be called different name depending on its appearance as follow;</p> <p>- Barnyard grass, a plant that survive annually or many years. The plant performance is similar to rice with branching stem lying along the ground. Straight up plant is 50 to 100cm tall which is 30 to 50cm taller than rice plant. It has long slender leaves with 15 to 80cm length and 1 to 2.5 cm width. There are leaf teeth at the base of the leaves and stipule is 1.5 to 4cm long with hairs. Inflorescence is about 20cm long and branching with just one flower on each branch which is 7 to 9 mm long and 2 to 2.5 mm wide. Its seed has a tail that is 5 to 8 cm long which will fall when older hence they would all fall before harvesting. There are both red and white grains.</p> <p>- Bouncing rice usually will flower before cultivated rice. Seed has no or with very short tail which would fall before cultivated rice would ripe. It is taller or of the same height as cultivated rice.</p>	<p>- Inspect and control the weedy rice by look for rice plant that is taller or flower before cultivated rice. In the case of small spread, the weedy rice should be uprooted. In the case of severe epidemic, should skip one cultivating season. If it cultivation cannot be skipped, plough the field to allow the weedy rice to grow and be destroyed once before sowing.</p> <p>- cut out the ears of weedy rice which should be done in the booting and florescence stage. It should be cut close to the base to prevent new stem from germinate and at the beginning of seed maturity stage and brought to be destroyed outside the cultivated field.</p> <p>- Apply weed killer with care according to Rice Department recommendation because the substance that can kill weedy rice can also kill cultivated rice.</p> <p>- Apply weed killer according to the label or Rice Department recommendation or other methods recommended by the government.</p>
<b>4. Animal</b>		
	<b>Golden apple snail</b>	

Epidemic Period	Symptom	Control practice
All seasons	<p><i>Pomacea canaliculata</i> <i>Lamarck</i></p> <p><b>Destruction characteristic:</b> Looks similar to Pila scutata with yellow mix with brown shell or dark green mix with black shell. Spawn all year round with 400 to 3,000 eggs each time along plants that grow close to water source. Eggs are small pinkish which will hatch within 7 to 12 days and will start eating rice seedling until tillering stage.</p>	<ul style="list-style-type: none"> <li>- Collecting them out of the cultivated field.</li> <li>- Use blocking equipment across the water way into cultivated field.</li> <li>- Sticking wooden sticks around levee every 10m to lure snail to lay eggs.</li> <li>Collect snails and eggs to be destroyed.</li> <li>- Drain out water from cultivated field after indirect seeding to disrupt snail habitat until rice plant become strong enough to withstand snail damage then let the water back in.</li> <li>- Promote natural enemy such as open-billed stork.</li> <li>- Select and apply any particular snail control substance according to Rice Department recommendation or other methods recommended by the government.</li> </ul>
All seasons	<p><b>Ricefield crab</b> <i>Esanthelephusa spp.</i>, <i>Sayamia spp.</i></p> <p><b>Destruction characteristic:</b> Ricefield crab likes to dig a hole along the levee. Its body is dark brown with 3 to 8cm shell. Start destroying rice plant in the seedling stage until indirect seeding stage by eating the base of the plant about 3-5 cm above ground. Patches of damage areas found.</p>	<ul style="list-style-type: none"> <li>- Use bamboo trap along the water way or dig a hole and bury a bucket with rotten fish as bait. Collect them out of the rice field.</li> <li>- Drain out water from cultivated field after indirect seeding to disrupt ricefield crab habitat.</li> <li>- Select and apply any particular crab control substance according to Rice Department recommendation or other methods recommended by the government.</li> </ul>
All seasons	<p><b>Bird</b></p> <p><b>Destruction characteristic</b> Bird is avian. It is an important pest to rice crop such as spotted munia,</p>	<ul style="list-style-type: none"> <li>- Should time rice cultivation for it to reach booting and heading stages at a similar time with the</li> </ul>

Epidemic Period	Symptom	Control practice
	scientific name is <i>Lochura punctulata</i> . It would peck on rice grains in milk stage until harvesting stage.	majority of the cultivation to reduce damage cause by birds. <ul style="list-style-type: none"> <li>- Destroy weeds to destroy birds' habitat and food source which is the seed of weeds.</li> <li>- Build scarecrow or use human to scare off birds.</li> <li>- Use reflecting material such as mirror etc.</li> <li>- Apply bird control substance according to Rice Department recommendation or other methods recommended by the government.</li> </ul>
All seasons	<p><b>Rat</b>  <b>Destruction characteristic</b>  Rat is an animal that uses its teeth which is an important pest to rice crop such as great bandicoot, lesser bandicoot, ricefield rate, lesser ricefield rate, ryukyu mouse, and fawn-colored mouse. Generally found in all stages of rice cultivation and after harvest.</p>	<ul style="list-style-type: none"> <li>- Use ratsbane before, during rice cultivation until harvesting in highly rat populated area to reduce rat population and minimize damage.</li> <li>- Destroy weed around rice field and nearby area to destroy rat habitat.</li> <li>- Set up rat traps and other methods.</li> <li>- Use natural method by promoting natural enemies such as owl, barn owl, hawk, mongoose and snakes.</li> <li>- If traces of rats are found or in the case of an epidemic, rat control method with the mixture of various methods should be used such as rat cage trap or trap with ratsbane.</li> </ul>

## ANNEX D

## 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
length	millimeter	mm
	centimeter	cm
	meter	m
Area	square meter	m <sup>2</sup>
Quantity	kilogram	kg
	gram per square meter	g/ m <sup>2</sup>
Capacity	cubic meter	m <sup>3</sup>
	liter	<i>l</i>
Temperature	degree Celsius	°C