# REPUBLIC OF INDONESIA

## MINISTRY OF COOPERATIVES, SMALL AND MEDIUM ENTERPRISES

### INTEGRATED RICE PROCESSING PLANT
### IN KARAWANG – WEST JAVA

# Post-harvest system - rice quality approach
# &
# Rice quality control in laboratory

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## Post-harvest system - rice quality approach
## &
## Rice quality control in laboratory

### Training and monitoring


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# &

# RICE QUALITY CONTROL IN LABORATORY

## INTRODUCTION

The study of the evolution of the grain quality during the different post-harvest sequences, is normally based on the analysis of samples taken before and after each specific operation which the grain undergoes from the field to the processing at the rice mill level.

Two first Cirad missions (Mrs Pons & Mr. Cruz) took place jointly in mars 2003 concerning "rice quality approach" and "Laboratory quality control". Then a final mission was realised en September 2003 (Mr Cruz) to complete the training at the laboratory level realising some measurements of the local rice quality.

**First missions – mars 2003**

In mars 2003, the first part of the training course given by the CIRAD (Mrs Pons & Mr Cruz) related to a general presentation of the various following topics:

- Structure of the rice grain
- Composition of the rice grain and its milling fractions
- Effect of various factors on milling quality of rice
- Preliminary steps for laboratory analysis
- Instructions for use the "Colombini" laboratory rice mill « G.150/R »

Then the local staff was separated in 2 groups:

- Post-harvest and rice quality approach (Mr. Dhanika & Mr. Varnan)
- Laboratory quality control (Mr. Makhum, Mr. Samiran & Mr. Suherwan)

*Post-harvest and rice Quality approach (Mr. Cruz)*

A field visit was done in the zone of Talagasari where producers were harvesting and threshing paddy and at the level of a KUD (village of Cilewo) to discuss the problems of drying and processing. These meetings with local actors of the rice channel make it possible to identify the rice post-harvest practices used in the area.

With this first approach, it is possible to understand that the grain circuit from the harvest to the market is relatively short and that, in the current system, the main critical point concerning technological quality is certainly the sun drying on flat concreted surfaces (possible problem of grain breakage). This first observation will have naturally to be confirmed or cancelled by the analyses of laboratory.

Then the discussion with the local staff related to:

* Grain preservation
  - Physical and biochemical composition of grains
  - Physical properties of grains (porosity, thermal conductivity: hygroscopicity.
  - Physical factors of grain deterioration (temperature, moisture content)
  - Biological factors of grain deterioration (insects , rodents)
* Grain quality and sampling methods
* Technological quality of grain (milling yield and head/broken ratio). A detailed attention was given to explain the possible origin of the grain breakage by too hard drying
* Post-harvest operations and quality
* Rice quality monitoring
  - Post-harvest system and rice milling unit diagram
  - Sampling campaign and laboratory analysis (see laboratory quality control)
  - Determination of the critical points
  - Increase of actors awareness concerning quality and proposals for possible alternative solutions
  - Analysis of the effectiveness of the corrective actions suggested
  - Capitalization of the gained experience

*Laboratory quality control (Mrs. Pons)*

During the following days, the activities continued of the specific topics:

- Methods of analysis for rice specifications :
  Presentation and explanation of :
- terms and definitions about the different states of rice,
- terms and definitions about the size of rice,
- terms and definitions about the defects of rice.
- Determination of the potential milling yield from paddy and from husked rice
- Elaboration of a specific procedure to analyse rices according to the Indonesian regulation (categories, minimum or maximum specifications for rice)
- Elaboration of the test report.

Many practical works were done on determination of the potential milling yield from paddy and from husked rice

The correct adjustment of the laboratory equipment were look at carefully. The complete disassembling of the cone whitener was taught with the trainees so that they can understand the interest of the directives given and that they can be able, in the future, to change the spares parts (rubber brakes) if necessary.

The interest of a correct adjustment of the equipment was discuss in relation to the evaluation of the quality of the rice sample, but also in relation to the composition of the grain and its milling fractions. A training book was delivered to the trainers about all the different aspects of the laboratory quality control of rice.

**Second mission – September 2003**

*Rice quality (Mr.Cruz)*

During the second mission in September 2003, the training given by the Cirad (Mr Cruz) to the local staff (Mr. Suherwan & Mr. Ujang) related to the measurement of the moisture content of grains (with portable moister testers) and general revision of the use of the laboratory micro rice mill and analyse quality of rice produced locally (rice stored in the silo, rice delivered to the silo and rice collected in the area)

A field visit was done in the zone of Wadas where producers were harvesting and threshing paddy and at the level of a private rice mill (village of Lemah Abang) to discuss the problems of drying and processing.

# I) RICE POST-HARVEST SYSTEM & GRAIN QUALITY APPROACH

Physical and biochemical characteristics of grains, their physical properties and ability, as living organisms, to react to environmental conditions must be borne in mind in approaching grain quality problems

## 1.1. GRAIN CHARACTERISTICS

### 1.1.1. Physical structure of grains

Grains are composed of three parts i.e. the covering, the endosperm and the germ.

**Covering**
Cereal grains are fruits (called caryopsis) with the outer covering, or pericarp, adhering to the seed. Some cereal grains still have floral coverings adhering to the grain even after threshing. Such is the case of paddy rice covered with husks (glumes).

**Endosperm**
It constitutes almost the whole inner part of the grain and represents the carbohydrate storage element (starch). It consists of starch granules aggregated in a peripheral aleurone layer. In rice, the arrangement of starch granules gives the endosperm a hard horny texture. In rice processing, white rice is obtained from the endosperm.

**Germ**
Germ consists of the embryo that is the rudiment of the future plant and of the scutellum (or cotyledon) In rice the germ is relatively small (2% of the husked rice grain). The germ is rich in proteins and fats

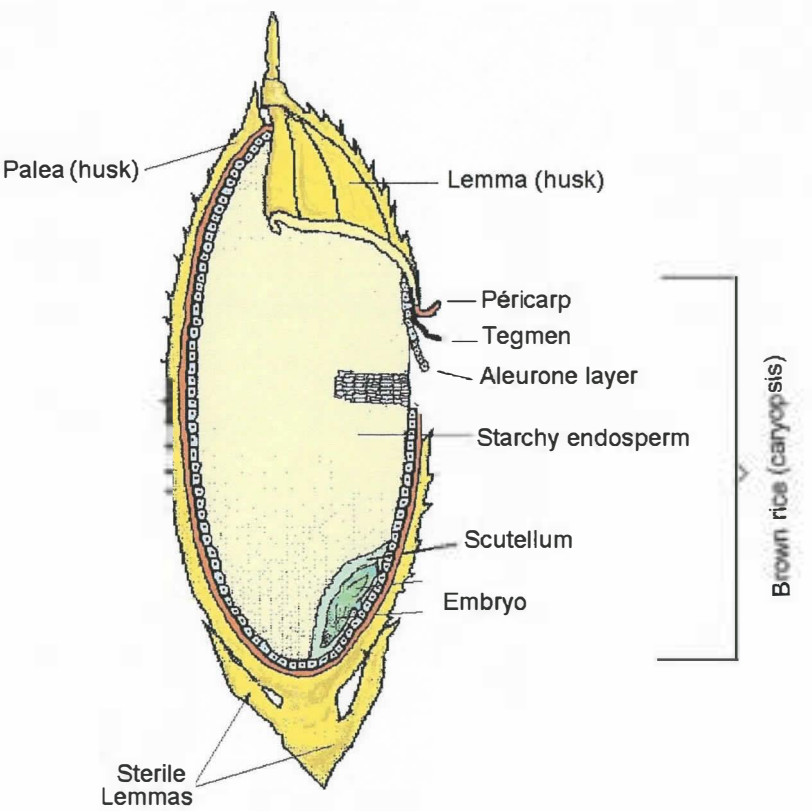



Fig. 1. Paddy rice structure

### 1.1.2. Biochemical composition of grains

Grains comprise dry matter and water

The **dry matter** consists of organic matter composed of carbohydrates, lipids and proteins and ash (mineral matter)

- Carbohydrates also called "sugars" are chiefly found in the endosperm as starch granules. From a nutritional standpoint, they mainly provide energy.

- Lipids, sometimes called "fats" are generally concentrated within the germ and also mainly constitute an energy source. When storage conditions are bad, lipids oxidize, developing a rancid odour and flavour in the grains

- Proteins are mainly found in the germ and the aleurone layer. Cereal grains are not rich in proteins.
- Vitamins are complex chemical elements found in minute amounts in grains but that are essential from a nutritional viewpoint because they act at the level of the fundamental functions of the human organism.

**Water** is present in grains in different forms:

- water of composition that is closely combined with the grain

- absorbed or "free" water, (obviously not closely combined with the grain). The presence or not of such free water, which is readily usable by developing micro organisms, will largely determine the "storability" of the grain.

The moisture content (wet basis) is the ratio in percent of the weight of moisture contained in a sample to the total weight of the sample.

$$\% \text{ moisture content} = \frac{\text{weight of water}}{\text{total weight}} \times 100$$

Example: if 1kg of grains contain 140 g of water, the moisture content of this sample is:

$$\% \text{ mc} = \frac{140}{1\,000} \times 100 = 14\%$$

### 1.1.3. Physical properties of grains

**Porosity**

Grain in mass constitutes a porous materiel in witch 30% to 40% of the volume consists of intergranular air. Such porosity allows air to enter through the grain mass (ventilation, drying).

**Thermal conductivity**

Thermal conductivity of grain is very low. When local heating occurs during storage, the heat so produced dissipates very slowly and results in high local temperature rise called "hot spot". This can be removed only by ventilation or unloading.

**Hygroscopicity**

Grains constitute a hygroscopic material losing or gaining moisture until equilibrium is reached with the surrounding air. So, dry grains in contact with humid air are going to absorb moisture whereas humid grains in contact with dry air are going to release moisture into air and so to dry

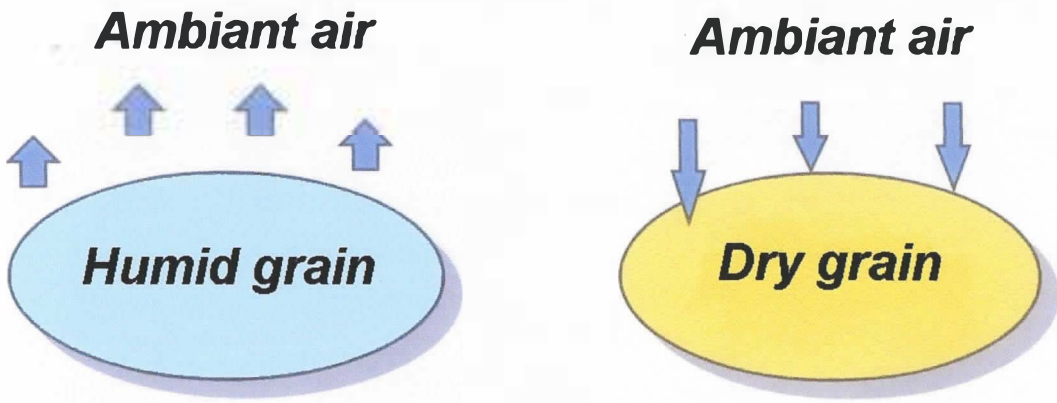



Fig. 2. Grain hygroscopicity

The equilibrium moisture content (EMC) is dependent on the relative humidity and temperature of the air. EMC for paddy is shown in the table below:

| | Air relative humidity (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| EMC Paddy | 7,9 | 9,4 | 10,8 | 12,2 | 13,4 | 14,8 | 16,7 |

Tab. 1. Equilibrium moisture content (% wb) at 25°C

## 1.2. FACTORS OF GRAIN DETERIORATION

### 1.2.1. Respiration: sign of grain activity

Grains are living organisms and as such they respire. The respiration mechanism can be roughly represented by the breakdown of starch that in contact with oxygen generates carbon dioxide, water vapour and heat.

$$C_6H_{12}O_6 + 6O_2 \Rightarrow 6\,CO_2 + 6\,H_2O + 674\ \text{Kcal}$$

Starch (grain) + oxygen (air) => carbon dioxide + water + heat

Such reaction is very frequent in stored masses of wet grain where it rapidly results in a high increase in temperature, mould development and aggregation of grains. To achieve safe storage conditions it is necessary to reduce the process to a minimum, by controlling the main physical factors of deterioration i.e. temperature and moisture.

### 1.2.2. Physical factors of grain deterioration

**Temperature**

Temperature greatly affects storage of grains because it increases the respiration rate and consequently the breakdown process in stored products. Temperature also influences the development of microorganisms (mould, for instance) and insect. It is therefore essential to store food grains at the lowest possible temperature.

**Moisture**

Moisture is certainly the major factor in grain deterioration. It increases respiration rate of grains and hastens their internal breakdown. The major effect of moisture, above a certain moisture content level, is to encourage moulds. This level is the critical limit for bad storage. For safe storage, grain moisture should be below the moisture corresponding to equilibrium with air at 65%-70% relative humidity. For example, maximum acceptable moisture content recommended for paddy grain storage is 14%. For long-term storage, the values can be reduced by 1 point (i.e. 13%)

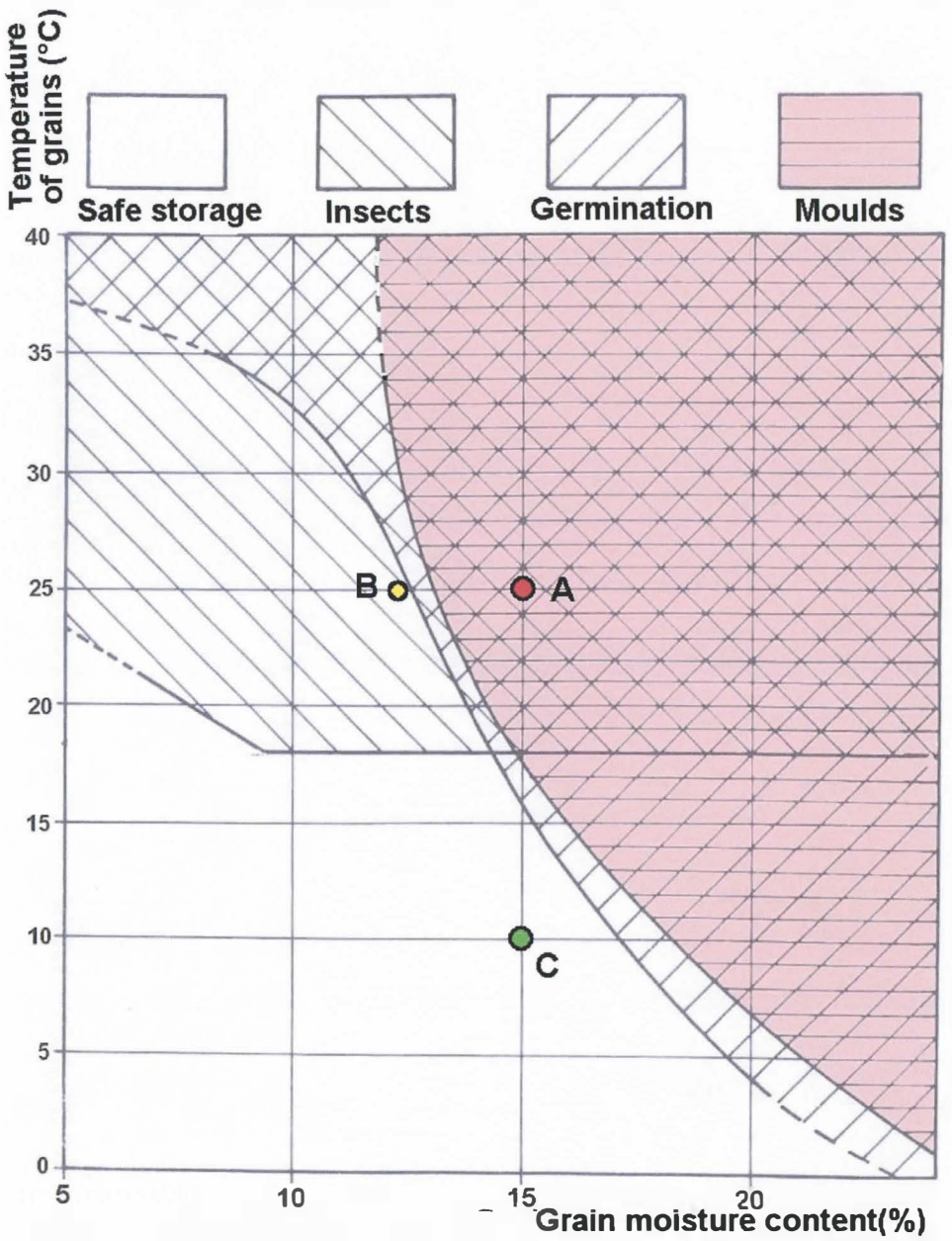



Fig. 3. Cereal storage diagramme (from Burgess and Burrel)

**Comments**

| Points | Characteristics | Possible problems |
|---|---|---|
| A | Temperature: 25°C<br>Moisture content: 15% | Moulds, Insects & germination |
| B | Temperature: 25°C<br>Moisture content: 12,5% | Insects |
| C | Temperature: 10°C<br>Moisture content: 15% | No problem |

### 1.2.3. Biological factors of grain deterioration

**Insects**

In hot areas, insects cause much damage in stored grain. The prevailing climate in these areas creates conditions favourable to insect multiplication. Insects cause high quantitative losses in stores grains as they eat the endosperm and even sometimes the embryo. For some species living within the grain, it is the larva that causes the highest damage. Depreciation (i.e. loss in market value) of infested grains also results from insect faeces and secretions.

Finally their biological activity produces waste, vapour and heat that create conditions favourable to mould development. In hot climates, *Sitophilus oryzae* and *Sitophilus zeamais* are mainly found. Insect females lay their eggs within the grain, larva develop eating out the interior of the grain.


Fig. 4. The weevil insect

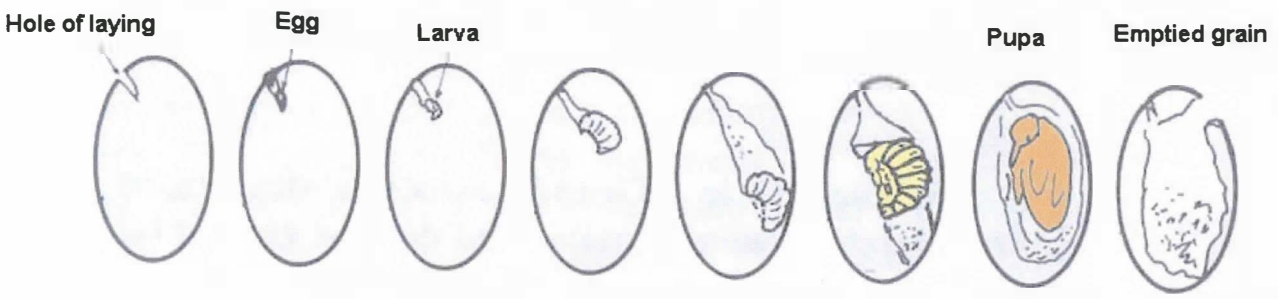



Fig. 5. Insect development within the grain

The development of the majority of the species is between 15°C and 35°C optimum at 25°C-30°C. Their multiplication is reduced for low moistures of the grain

For safe storage, grains must be clean. Foreign matter (dust, flour, straw...) and broken grains are particularly exposed to insect and mould and constitute centres of infestation in stored grains.

**Rodents**

Rodents can cause direct quantitative losses as they consume the store product and qualitative losses as they contaminate the stored product with urine and faeces. Finally, they also cause damage to storage structures and packing. The extent of such damage can vary according to the storage method applied; bag storage is typically more vulnerable than bulk storage.

The main destructive rodents damaging stored crops are:
*Rattus norvegicus* (grey rat), *Rattus rattus* (black rat) and *Mus musculus* (mouse).

The control of rodents is essential because of the losses involved in stores but also from a sanitary standpoint because rodents can act as vectors of various diseases. Such control must mainly be preventive, maintaining rigorous sanitary conditions in both the stocks and surroundings.

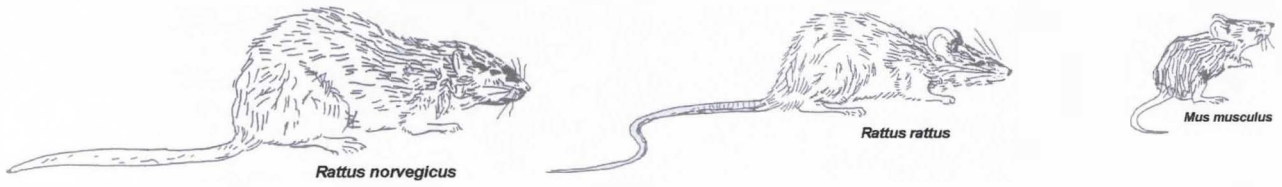



Fig. 6. Rodents

All the factors of conservation of the grains are closely dependent and interdependent.
- moisture of the grains and moisture of the ambience
- temperature of the grains and of the ambience
- insects
- rodents.

However, moisture is that on which it is most important to act quickly.

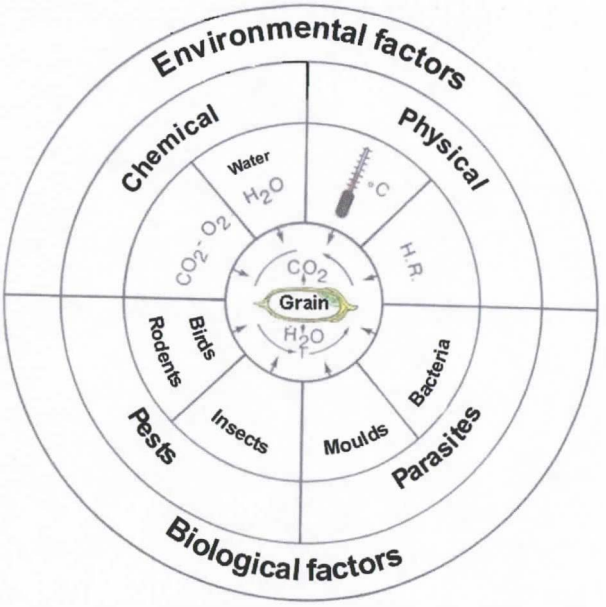



Fig. 7. Ecosystem of the stored grain

**MAIN STORAGE TECHNIQUES**

They consist in acting on the factors of degradation of the stored products.

* Moisture content------> Drying techniques
* Temperature -----> Aeration and ventilation techniques.
* Insects -------> Control insects techniques
* Rodents -------> Control of rodent pests

# 1.3. GRAINS QUALITY

## 1.3.1. General remarks

The concept of quality is complex. Quality standards can vary depending on the marketing level or subsequent use of the produce. Consumers are interested in aspect of milled grains (colour, cleanliness, size...) and cooking quality. Grain boards are interested in grain offering good storability and they consequently pay special attention to the moisture content, foreign matter content and degree of insect and mould infestation. Rice mills are usually interested in very homogeneous batches of grain with good technological quality (milled rice yield, broken ratio). Quality standards as defined by processing industries are rather precise but according to the quality of the raw material, it can be difficult to ensure compliance with them.

## 1.3.2. Quality standards

**Grain storability**

It is evident that storage is unable to improve intrinsic qualities of grains. Safe storage conditions can only reduce natural deterioration of stored produce. To prevent all risk of deterioration, storekeepers must initially verify that the grain received is free from damage and storable, by checking certain characteristics.

- Grain moisture content

It is essential to know this with accuracy is successful grain storage is to be expected. Some empirical methods that refer to grain hardness (i.e. crunch a grain), its flowability or its odour must systematically be excluded in storage centres because they are highly subjective. Oven drying is a very accurate method for determining moisture content but it is slow. Electronic moisture tester can measure directly the humidity of grains. Such instruments are often small portable battery-powered devices (i.e. SAMAP moisture tester).

- Foreign matter

The term covers a wide variety of elements subclassified as: mineral materials (stones, sand, dust, mud, metal fragments...), vegetable elements (straw, leaves, weeds, other seeds...) and animals' elements (insects, rodent droppings ...). Broken grains, mouldy grains, pest-damaged grains, immature grains, germinated grains can also be considered as foreign matter

**Quality standards according to the use of grain**

Such standards are mainly used after the storage stage, e.g. at the processing and consumption level. They can nevertheless indicate whether the post-harvest conditions were good. They concern food, nutritional and processing qualities of grain.

Food quality
Organoleptic characteristics (colour, odour, flavour), absence of pesticide residue, absence of toxins. As the process for determining the percentage of toxin and pesticide residue is complex it can only be carried out in specialized laboratories.

Nutritional quality
Tasting tests, biochemical analysis to determine nutritional elements

Technological quality
Milling yield and head/broken grain ratio. Processing industries are looking for products of constant and standard quality and also as homogeneous as possible.

### 1.3.3. Sampling of products

The sampling process consists of various operations that, from a mass of produce, allows one to obtain a small quantity (or sample) as representative as possible, that will be used far analyses to determine certain characteristics.

**Sampling methods**

Primary samples are taken and mixed so as to obtain a bulk sample. The less uniform the batch of produce, the higher must be the number of primary samples taken to obtain a bulk sample as representative as possible of the whole batch.

- Number of primary samples

This depends on the number of bags delivered

- 1 – 10 bags: every bag must be sampled
- 10-100 bags: 10 bags sampled drawn at random
- More than 100 bags: number of primary samples equal or immediately above the square root of the total number of bags, drawn at random.

When one or several bags delivered offer a very bad appearance, quite different from the general appearance of the consignment, they must be removed and separately considered.

- Sampling methods

Sampling can be made by emptying the bags or, more commonly by using sampling spears. Bag emptying is of interest because it allows a rapid visual examination of the quality of the grain delivered. Nevertheless, as it may seem rather slow and tedious, the spear sampling method is often preferred

Bag sampling with spears offers the advantage of being more rapid and not requiring the opening of bags. Samples are taken at random from different places in the bags selected because foreign matter or defective grain happens to be very irregularly disseminated in the bag. If 10 bags must be sampled, about 50 g must be taken per bag in order to obtain a sufficient representative working sample of 500 g.

Samples are taken using hollow metal spears called bag samplers. Tapered sampling spears penetrate bags easily but it is better to achieve sampling with cylindrical type in order to take equal portions of grain from along the line of penetration. In any case, one must keep in mind that the haphazard nature of spear sampling could lead to a distorted quality assessment.

Fig. 8. Sampling spears

**Subsampling**

The bulk sample obtained by mixing primary samples can often be quite large. This must be reduced to obtain more workable amounts of grain for analyses. There are several methods of reducing sample size and obtaining representative sub-samples.

- The coning method

The bulk sample is first piled up then thoroughly mixed, coned and divided into 2 or 4 equal parts, each of them constituting a sub-sample. The process can be repeated until the sub-sample size desired (e.g. 100g to 120g for technological quality analysis). This method is very simple and does not require any special instrumentation but only a very clean area of a reasonable size for implementing it.

- Dividers

Such equipment allows a sample to be divided into 2 equal halves e.g. "Boerner" divider composed of a cone into which is poured the sample to be divided. At the base of the cone, grains are trapped by vents grouped in 2 outlet chutes beneath the divider. This equipment is relatively expensive.

- Mix the sample with a hand turned seed mixer.
- Divide the sample in a sample divider. The grain from the hopper (1) flours through a throttle (2) over the surface of a cone where it is collected by pockets (3) and is channelled into two containers (4).

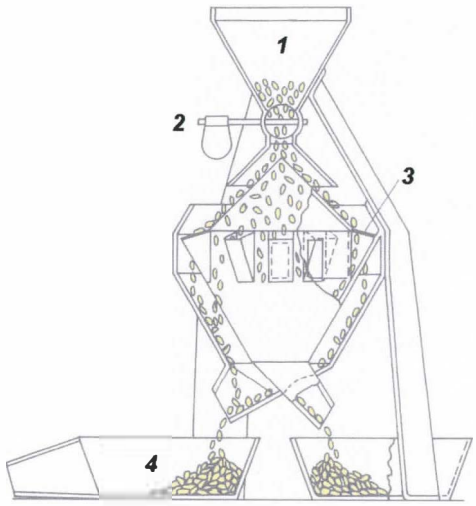



Fig. 9. Sample divider

**Equipment required for sample analysis**

For common analyses, the following equipment is needed.

Basic facilities and equipment

- A well-illuminated place for analyses separate or not from the storekeeper's office.
- Work tables with a smooth top perfectly clean and easily maintained
- Spears and grain scoops for taking and to mix the grain
- Balances
- Moisture testers
- Set of laboratory trays
- Other small equipment such as pans, bowls, small containers, brushes, small bags, scalpels

Specific equipment

- Laboratory rice mill
- Air-conditioned room to store the samples
- Indented metal sieves
- Trays with bottom in wire-mesh for the normal drying of the samples
- Chronometer
- Pocket calculator

# 1.4. TECHNOLOGICAL QUALITY OF GRAIN

## 1.4.1. Rice milling

Rice milling which consists in obtaining white rice from paddy is constituted of two main successive operations. The first one, which separates the husks from the grain, is called dehusking (or dehulling). The second one called whitening consists in eliminating the bran (pericarp and germ) to obtain white rice.

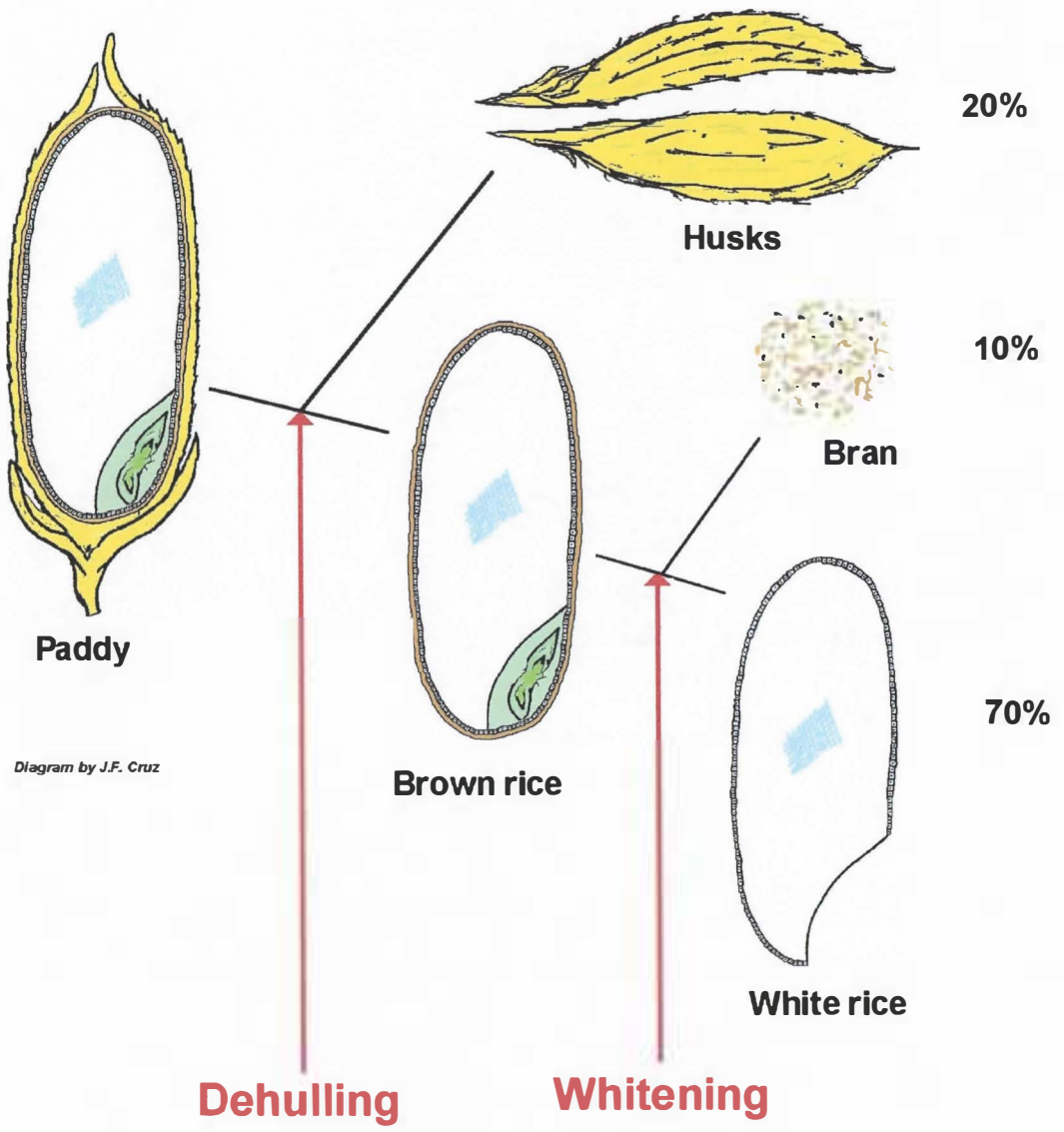



Fig. 10. Diagram of rice processing

The milling yield and the rate of broken (head/broken grain ratio) are the two main criteria characterizing technological quality.

The **milling yield**, which corresponds to the percentage of white rice obtained with a given quantity of paddy, is potentially close to 70%.

| |
|---|
| 100 kg paddy = > 70 kg white rice (head + broken) |
| 20 kg husks |
| 10 kg bran |

According to the international standard ISO 7301, the brokens are the portions of grain whose size is lower than 75% of the whole grain.

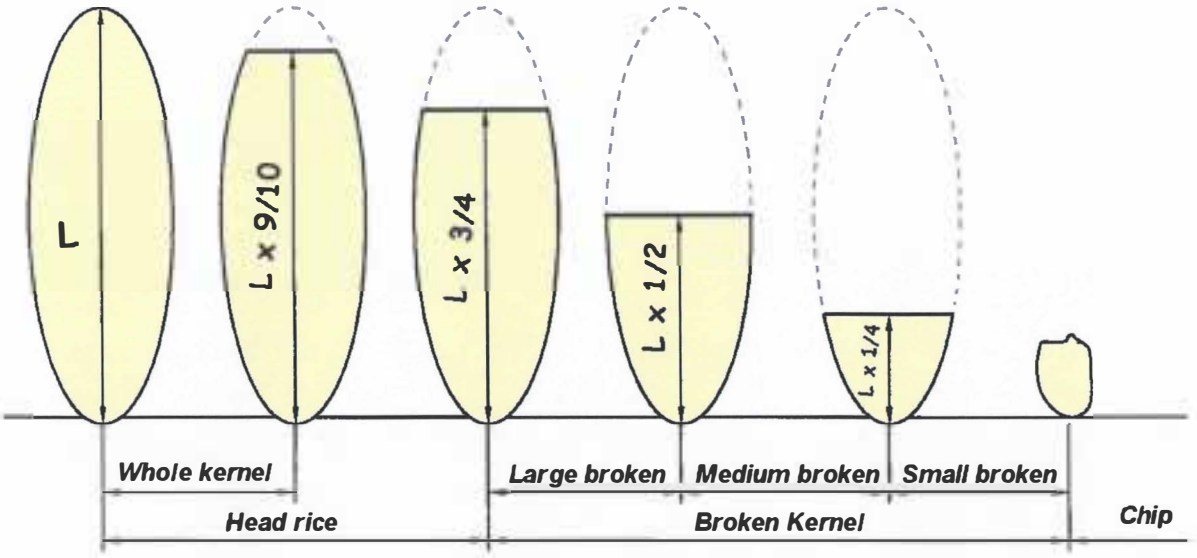



Fig. 11. Size of head rice and brokens

In Indonesia, national standards established by BULOG are different as following:

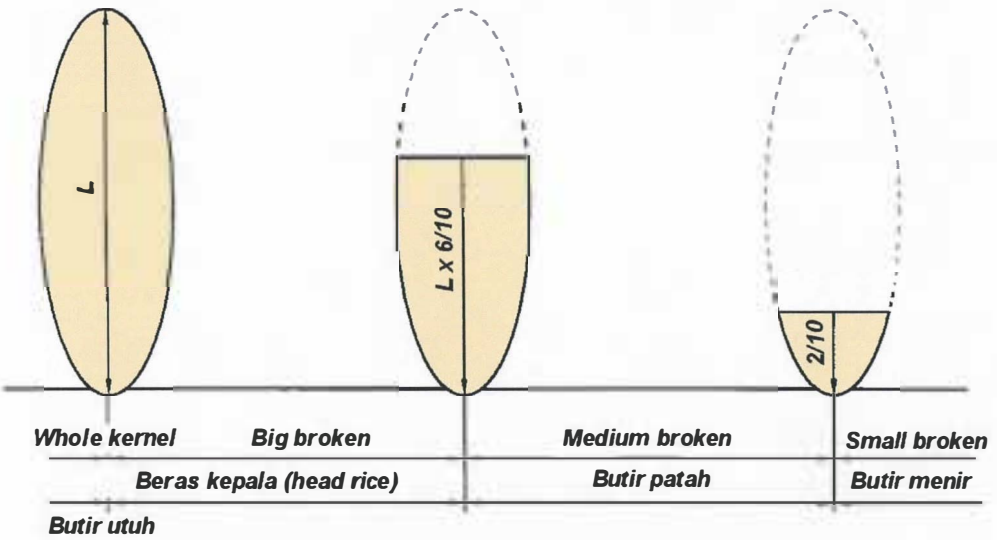



Fig. 12. Size of head rice and brokens in Indonesia

According to desired quality the minimum or maximum values are given in the table below

| Composition | | SNI (Indonesian National standard) Quality III | SNI (Indonesian National standard) Quality IV |
|---|---|---|---|
| Moisture content | | 14% | 14% |
| Head rice | (Min) | 84% | 78% |
| Whole kernel | (Min) | 40% | 35% |
| Medium broken | (Max) | 15% | 20% |
| Small broken | (Max) | 1% | 2% |

Tab. 2. Standards of quality (% broken)

The brokens often come from the mechanical action that the different machines exert on the grain during processing. But the formation of cracks in the grain before harvest or during drying also generates brokens.

### 1.4.2. Cracks generation in the grain

A too intense or too aggressive drying generates cracks of the endosperm. When the grain dries, the dry outer layer contracts around the core still wet of the grain. The core of the grain is then in compression while the external layer is in tension.

If the tension forces are too intense, the endosperm breaks and generates cracks.

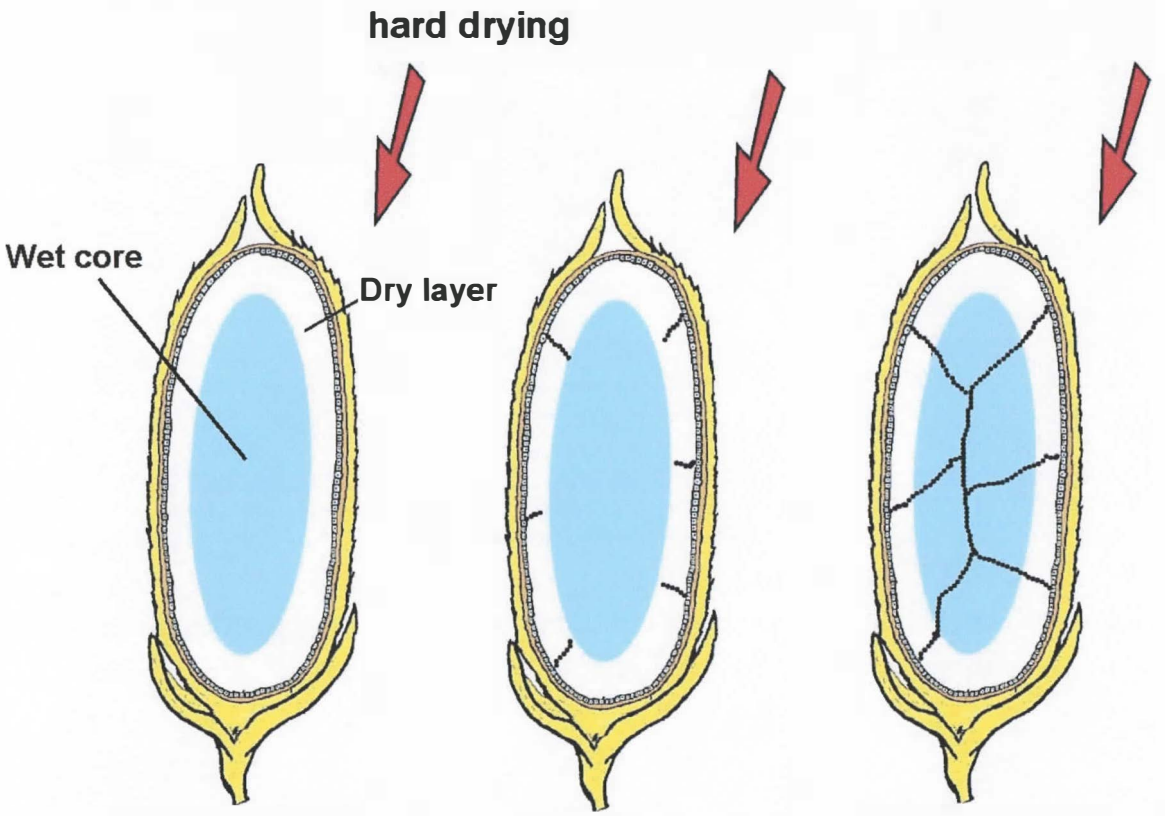



Fig. 13. Cracks generation in the kernel

Susceptibility to breakage depends on the type of grain: In short grain (bold varieties) the distance between the surface and the core of the grain is more important than in long grain. The gradient of moisture will be more significant and risks of breaks are thus higher. Bold grains are much more sensitive than long grains to hard drying or alternative drying and moistening periods specially during ripening. Other reasons as heterogeneous texture can also play a role in the fissuring susceptibility of grains.

Because of the envelopes (husks and pericarp) these cracks do not deteriorate the physical integrity of paddy and brown rice. But during whitening, once that the envelopes were removed, broken endosperm will separate in cracks.

The greater the proportion of paddy with cracks, the greater the amount of brokens obtained during whitening. Then the rice miller could think that these cracks are due to a bad adjustment of the processing machines whereas they can be due to a bad drying

Rice millers always seek to obtain an ideal milling yield with a minimum of brokens. This remains narrowly reliant with the raw material quality that depends on the good practices that will have been implemented during cultivation and post-harvest operations (threshing, drying and storage).

# 1.5. POST-HARVEST OPERATIONS

## 1.5.1. Cultivation and harvest conditions

The weather conditions during the ripening affect the technological quality. Near the harvest period the mature paddy risks to be exposed to alternate wetting and drying conditions. At less 20% moisture content, these daily cycles can produce breakage of grains. A good criterion for determination of harvest time is when moisture content is around 20-25%. A later harvest may increase the broken during milling. An early harvest is usually better for the milling quality but the probability of immature grains is increased.

Fig. 14. Stack of panicles before threshing

The harvest is usually done with a sickle and after harvest, the panicles are gathered in small stacks during 1 or 2 days in waiting of threshing. This "in-field storage" results in a pre-drying of the rice sheaves before threshing but a too long stacking of high moisture content panicles may also result in discoloration or yellowing.

## 1.5.2. Threshing

The traditional threshing of rice is generally made by hand: sheaves of panicles are beaten against a hard element e.g. a traditional bamboo table. The outputs are 10kg to 30kg of grain per man-hour according to the variety of rice. Grain losses generally increase when threshing is performed excessively late; some grains can also be lost around the threshing area, which is usually constituted by a single small tarpaulin. When the producer get 6 bags of threshed paddy, he gives 1 bag to the field owner for the rent of the land parcel.

Fig. 15. Traditional hand threshing near Karawang

To improve the outputs (up to 500kg/h) it should be possible to use mechanical thresher. In this case it is necessary to adjust correctly the machine (speed of the threshing cylinder) in order to avoid excessive breakage of grains. Long grains are less resistant to breakage for mechanical reasons during threshing

### 1.5.3. Drying

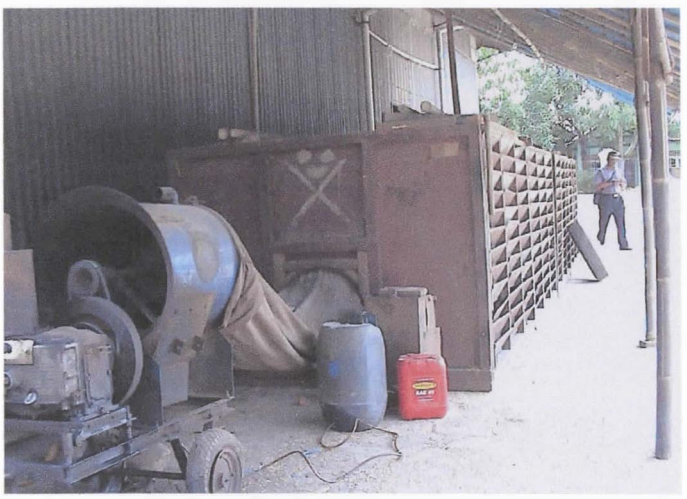
In the region, the start of the harvest in January coincides with the rainy season. Thus grains are harvested with relatively high moisture content (> 20%) and are prone to attack by microorganisms if they are not rapidly dried. In Indonesia, the most widespread drying technique involves exposing the grains to sunlight on drying areas. Natural sun drying is carried out on a simple tarpaulin by the farmers and involves relatively low unit quantities (several hundred kg) corresponding to a family-sized production.

This natural drying method is also used by numerous small, medium or even large storage or processing plants managing hundreds or thousands of tonnes per years. These centres have large concreted areas, surrounding the main buildings, on which grains collected from the farmers are spread out in thin layers and periodically mixed to improve the drying. The drying can last one or several days according to atmospheric conditions and the type of market concerned: 1 day for the local market (drying down to 15-16%) and 2 days or more for the sale to Bulog or Dolog (standard 14%).

The exposure of grains to direct sunlight is certainly not without incidence on the technological quality of rice (cracks generation as seen § 1.4.2)

Fig. 16 Natural sun drying on cemented area

Some years ago, static driers (flat bed dryers type IRRI BD2) were placed on the level of the KUD (co-operative) for the producers. These driers are not or little used today for reasons which are not very well explained but which must relate to problems of cost and difficulty of use by the rural operators.



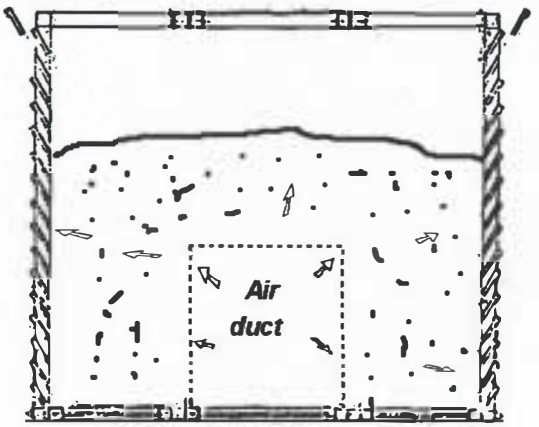
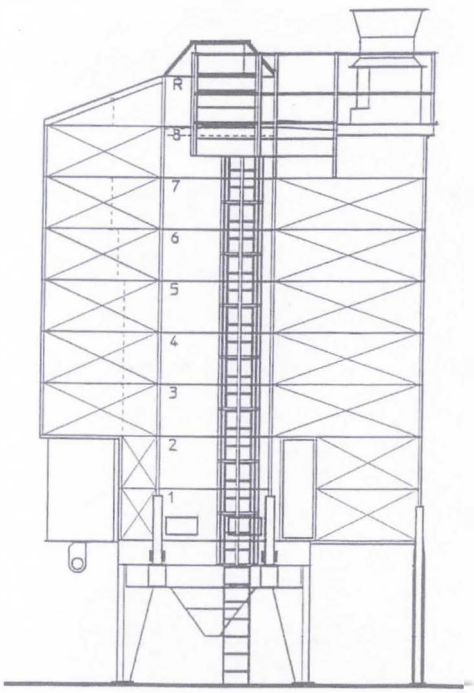



Fig. 17. Flat bed dryer at Cilewo KUD

The new installation built by the project at the Bayur Kidul village is equipped with 2 modern continuous flow dryers which will allow to fix and to control the temperatures of drying; what should make it possible to decrease the risks of grain breakage and thus to improve quality of the grains



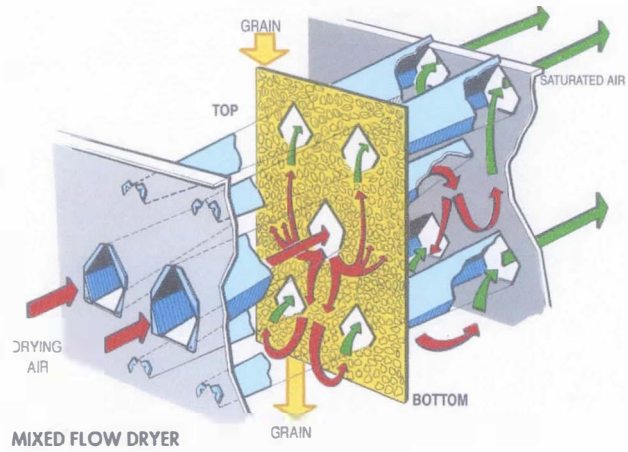




Fig. 18. Mixed flow artificial dryer (doc. Law)

### 1.5.4. Storage

Grain is stored at various points in the commodity chain: farmers, traders, retailers, cooperatives (KUD) and BULOG, private mills, .... Storage of grain is usually done with 50 or 100 kg sacks of jute or polypropylene and very rarely in bulk.

Farm storage is little developed. Here it is carried out mainly in bags for the temporary storage of paddy rice. Only some co-operatives (KUD), private traders and BULOG possess modern storage installation. Almost the whole of the existing buildings have been designed and constructed for bags storage. Storage capacities varies from user to user but it is generally hundreds tones at cooperatives level and over 1000 t in the centralised storage (DOLOG) or in the private sector

Fig 19. White rice stored in polypropylene bag before marketing

A difference must be made concerning the duration of storage between the BULOG which stores white rice for 6 months to 1 year on average and others storing paddy rice prior to processing and white rice prior to marketing. In the latter case, storage times are much shorter, with rapid stock rotation in order to make maximum use of the infrastructure and to reduce storage costs.

At the farm and the cooperatives levels, the main risks of deterioration of the quality of the grains during storage can then have for origin a bad drying (risk of development of moulds and risk of yellowing of rice). Finally the type of storage in bags does not facilitate the setting up of really well effective methods to control insects' infestations and to preserve the stocks from rodents' attacks.

The bulk storage system built by the project consist in 4 square steel bins equipped with ventilation air ducts on their flat floor. These air ducts can also be used to empty the bin. The control of grain temperature is ensured using probes installed in each cell. An air conditioning system make possible to reduce if necessary the temperature of the stored grains. In case of storage problem, the handling system by bucket elevators and conveyors allows the possibility of transferring the paddy rice from one cell to another. This modern plant equipped with cleaning devices must significantly improve quality of storage and also facilitate the fight against the insects and avoid the attack of the grain by the rodents.

Fig. 20. Integrated rice storage and processing plant in Bayur Kidul

## 1.5.5. Milling

### 1.5.5.1. Problematic and techniques

It is the process wherein paddy is transformed into white rice for human consumption, therefore, has to be done with utmost care to prevent breakage of the kernel and improve the milling recovery. Rice milling losses may be qualitative or quantitative. Quantitative losses are manifested by low milling recovery while low head rice recovery (high percentage of brokens) reflects the qualitative loss in rice grains.

The losses during rice milling could be attributed to machine factors such improper machine adjustment and selection, improper arrangement and combination of machine components, lack of maintenance and lack of proper training of mill operators. Losses could also be attributed to the inherent quality of paddy which the miller cannot really control (varietal characteristics such as length and thickness of grains, amount of chalky or immature,...)

In Indonesia, several tens of thousands of small rice milling units (most of them are 1 pass) are disseminated in the rice areas. In the district of Karawang, approximately 1700 mini rice mills were inventoried.

The simple processing modules constituted by a single machine (penggilingan padi) are generally held by small traders, by the farmers themselves or by the cooperatives. They often carry out work "to order" to meet the needs of local consumption. Then, the "mini" plants, principally run by the cooperatives (KUD) and by private traders. These semi- industrial units (1 000 - 2000 t / year) are present in the production zones and number several hundred (460) in the Karawang district.

Fig. 21. Private mini rice mill : dehuller (left) and whitener (right)

### 1.5.5.2. Processing quality

The quality obtained under these conditions is adapted to the needs of the local market but rather frequently below the standard quality required by the BULOG. There are several reasons for this: processing schema restricted or incomplete, worn machinery, poor management of materials, high cost of spares, etc.. In some parts of Indonesia, the white rice produced is therefore subject to a second whitening and grading to bring it up to standard quality. This double processing leads naturally to losses and, even though it represents an interesting market for the large private plants, it certainly represents a considerable loss of earnings to the farmers groups.

Quality control of paddy rice on reception in the KUDs or private small enterprises, relative to drying conditions, yields and levels of cracked grain during processing, is either not carried out or involves simply recording observations without analysis of the situation nor installation of essential improvement measures. Consequently, one sees large variations in grain quality from one factory or warehouse to another, and indeed from one day to another in the same unit.
It appears that the real conditions of quality control differ from those officially recommended by the BULOG and KUD

The industrial rice processing plant built by the project is equipped with high-performance processing equipment and is capable to produce good quality rice.

Fig. 22. Industrial rice mill built by the project

## 1.6. RICE CHANNEL IN INDONESIA

The following scheme gives an illustration of the rice channel in Indonesia can be

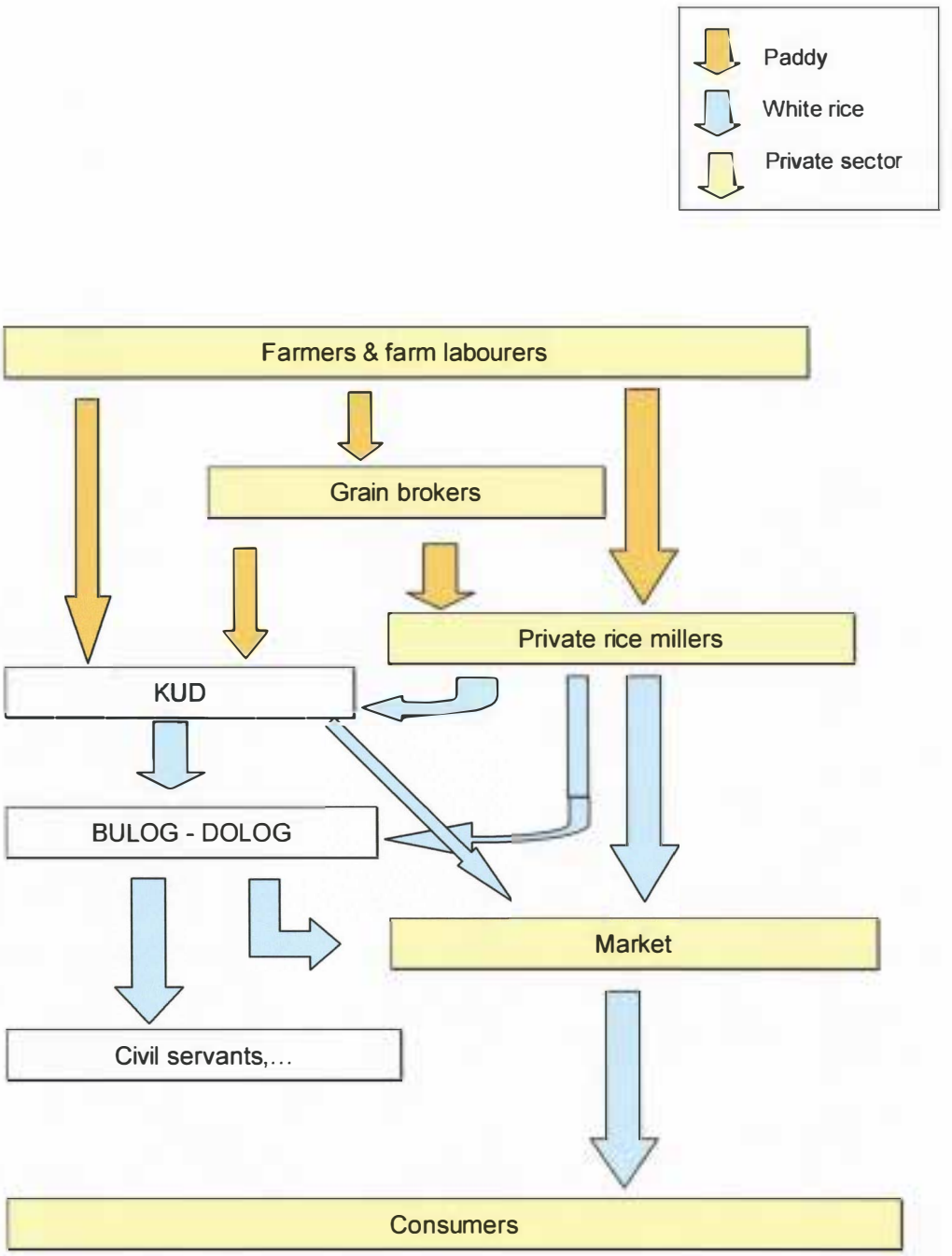



Fig. 23. Rice channel in Indonesia

# 1.7. RICE QUALITY MONITORING

In order to supply the rice mill with a raw material of good quality, it is necessary to have a better knowledge of the post-harvest operations in the zone of influence of the plant.

## 1.7.1. Post-harvest system

The first step consists in drawing up the diagram of the post-harvest system and identifying the different practices used by the different actors of the chain.

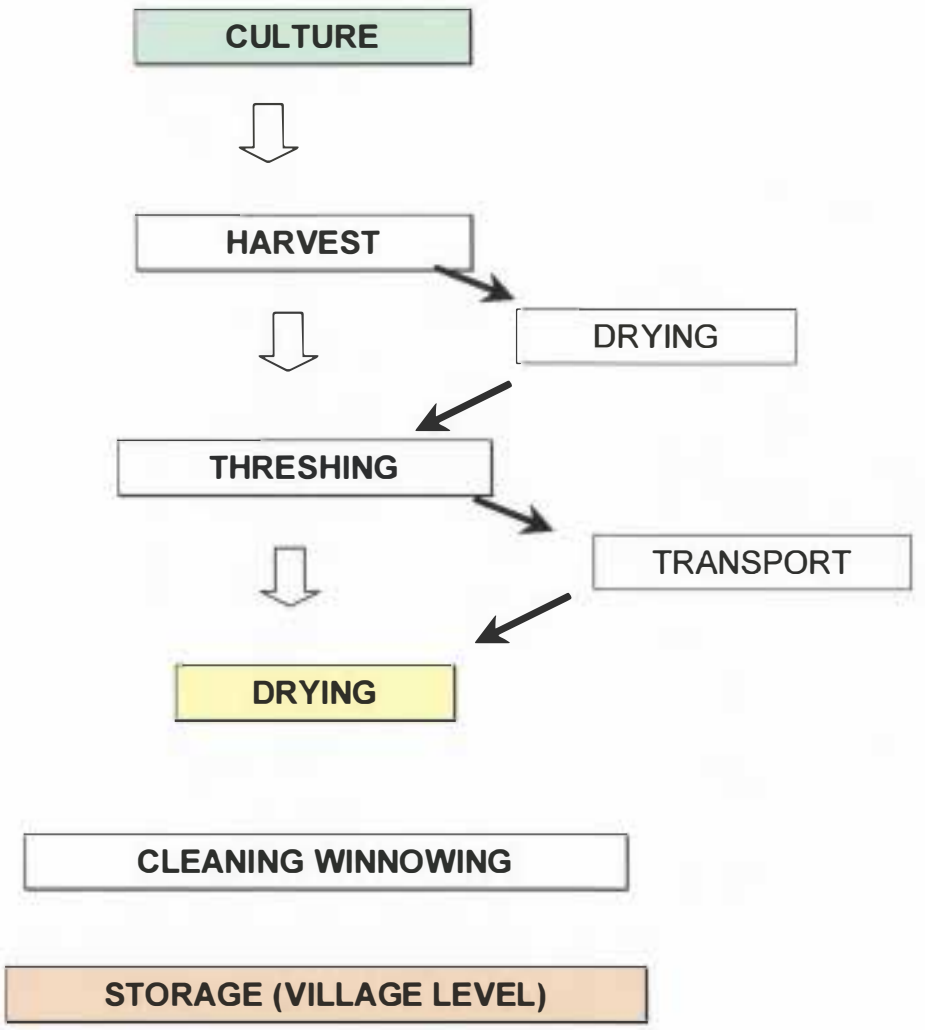



Fig. 24. Example of post-harvest flow sheet

## 1.7.2. Sampling campaign and laboratory analysis

To evaluate the influence of the post-harvest practices on the grain quality and to appreciate the incidence of the various techniques used, it is necessary to take samples at various stages i.e. after each operation.

The taken samples (of a size close to 500 G) will be brought back to the laboratory to be analysed. Before carrying out the analysis of the technological characteristics, the samples must be stabilized so that their moisture content is lowered to 14%

For each stage, the samples could be taken at a representative panel of actors

### 1.7.3. Determination of the critical points and proposal in the post-harvest sequences

The study of the results of the laboratory analyses will make it possible to identify the post-harvest operations which are likely to deteriorate the grain quality. These critical points will then be studied more in detail so as to detect precisely the origin of the phenomena observed. Then it is necessary to increase awareness of the actors (producers, traders,..) on the importance of these critical points with respect to the quality of the grain and to propose them possible alternative solutions to correct the identified defects. The effectiveness of the suggested corrective actions has to be tested with them.

### 1.7.4. Rice-mill system

Same presented procedure could be applied at the rice mill level i.e.

- Development of the diagram
- Sampling on the level of each principal operation and analyses in laboratory
- Determination of the critical sequences
- Identification of the origin of the phenomena observed
- Sensitising of the personnel and proposals for corrective actions
- Analyses of the effectiveness of the suggested corrective actions
- Capitalization of the gained experience

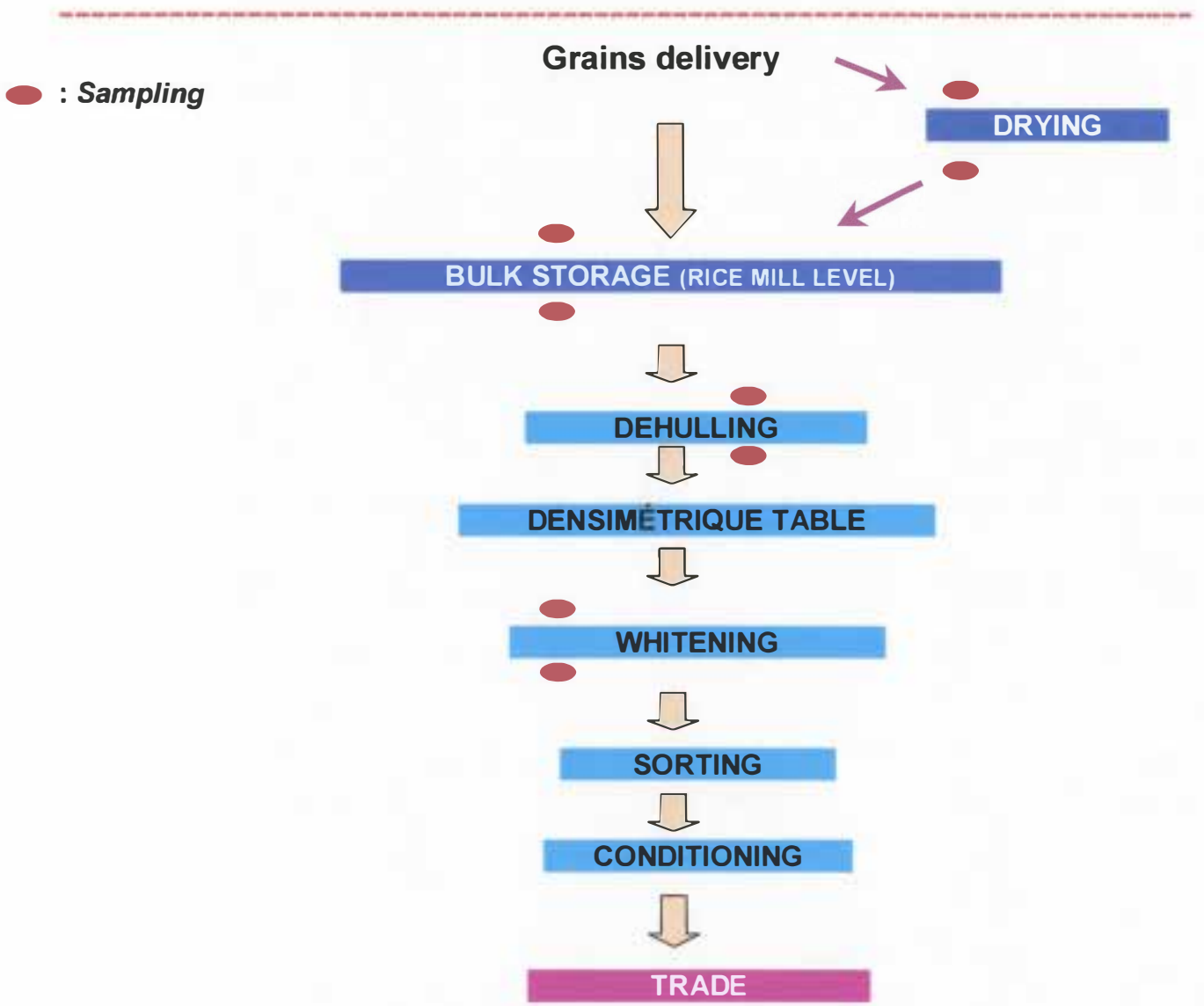



Fig. 25. Example of rice mill flow sheet

# II) QUALITY CONTROL OF RICE IN LABORATORY

## 2.1. PRELIMINARY STEPS FOR LABORATORY ANALYSES

### 2.1.1. Objective

To assess the milling quality of a rice sample.

The main characteristic is the head rice yield. However, a set of characteristics are measured : total milled yield which is the total quantity of whole and broken grains recovered from the sample, the head rice yield which is the quantity of whole grains recovered from the sample, the quantity of milled products, foreign matters, rices with defect, ....

To determine the quality of the whole bulk of rice, from which the sample has been taken, it is essential that the sample be truly representative and has not been damaged or changed during transport or storage.
It should :

- Contain the same elements present in the whole,
- Contain these elements in the right proportion,
- Maintain these elements in a stable condition.

The first two points involve proper sampling techniques ; the third is related to the preservation of the sample.

### 2.1.2. Different steps

- Reception and registry of the sample
- Mix and divide the sample
- Determination of the moisture content.
- Specifications of the rice sample (organoleptic and health specifications, foreign matters, defects, different yields, ...)
- Determination of the potential milling yield
- Elaboration of the test report

#### 2.1.2.1. Reception and registry

Each sample should be in a two pocket-bag :
One for analysis
One to be kept for reference

Once the sample enters the office, the responsible should :

- Stamp an identification number on the bags and on the relevant forms
- Record details of the sample and enter the date in a log book
- Keep one part of the sample (or reference or for an eventual second check in case of dispute)
- Send the second part of the sample to the laboratory to the analysis.

#### 2.1.2.2. Mix and divide the sample

The representative sample collected from the bulk grain is in excess of the quantity required for laboratory tests and reference purposes.

The "laboratory sample" is mixed and reduced to get "test sample". "Test sample" is divided to get "test portion". Normative references specify precisely the quantity of each part. However, in a number of countries, precise rules specify the number of laboratory samples to be taken according to weight.

Dividing methods are described in § 1.3.3.

#### 2.1.2.3. Determination of the moisture content

The acceptance range is a mass fraction of (13,0 +/- 1) %. If the moisture content is outside the acceptance range, the laboratory sample should be conditioned at ambient temperature (20°C +/- 1°C) and humidity around 68-70%) for a sufficient period to obtain a moisture content within the specified range.

Oven drying is a very accurate method for determining moisture content but it is slow. Electronic moisture tester can measure directly the humidity of grains. Such instruments are often small portable battery-powered devices i.e. SAMAP moisture tester (see § 1.3.2.)

## 2.2. THE LABORATORY MACHINERY

### 2.2.1. The rubber roller husker

The **objective** of a dehusker machine is to remove the husk from the paddy grain with a minimum of damage to the bran layer and, if possible, without breaking the brown rice grain[1].

**Principle of operation**

The grain of paddy is pressed between two rubber rolls which rotate in opposite directions and at different angular speeds. When the paddy is fed between the two rolls, the grains are caught under pressure by the rubber and because of the difference in speed, the husk is stripped off.

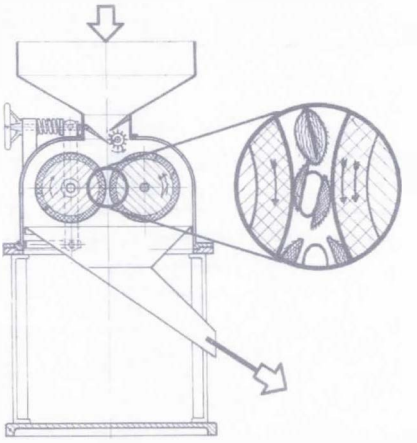


Fig. 26. Rubber roll husker

Fig. 27. Laboratory mini-rice mill in the Kud of Bayur Kidul

[1] In "Araullo, E.V., De Padua, D.B. and Graham, M. 1976. Rice post-harvest technology. IDRC. Ottawa. Canada.

## 2.2.2. The whitening cone

The **objective** of the whitening cone is to obtain milled rice from brown rice with a minimum of broken milled grains.

**Principle of operation**

Germ, pericarp and tegmen are removed from husked rice grains.

Two physical principles are used to mill rice :

- the abrasion : the whitening cone removed the outer layers and the germ by flaking
- the friction : kernels rubs against the others and against other part of the machine.

The cone removes the outer layers and the germ by flaking and skinning and by doing both together.

This machine basically consists of a cone-shaped cast iron cylinder with an abrasive coating. The cone is fixed on a vertical shaft that rotates either clockwise or counterclock-wise. A wire screen is fixed around the entire cone.

The rotating whitening cone is vertically adjustable so the clearance between the abrasive coating of the cone and the wire screen can be adjusted. This adjustment depends on the variety or rice, the conditions of the grain, the process method, and the wear of the coating. The rubber brakes in the wire-screen frame are adjustable and their clearance with the cone surface is only about 2-3 mn.[2]

The brown rice is fed into the centre of the machine through a small hopper. By centrifugal force the rice is fed between the cone and the wire screen. If no rubber brakes were installed, the rice would very quickly pass through the free space between the cone and wire screen and nothing would happen. However, the presence of the rubber brakes prevents the immediate discharge of the rice. The resistance built up by these brakes brings the grain under pressure and presses it against the abrasive coating of the cone and against the wire screen. This friction removes part of the bran layer. The bran passes through the wire screen and drops into the cone housing. The partly or fully whitened rice leaves the cone, falls into a self-unloading discharge spout, and is fed to a bin for further processing. The bran is scraped from the bottom of the cone housing by a rotating scraper and is unloaded into a spout for bran discharge.

Air is sucked through this machine to cool the grain and at the same time to remove part of the bran. This makes it necessary to blow the air to a cyclone for bran separation. Vertical adjustment of the rotating cone is done manually. The entire shaft-cone assembly is moved by moving the housing of the shaft end-bearing. A simple had wheel adjustment, which is mounted on the base of the cone frame, is used to lift or lower the steel bar that supports the bearing housing

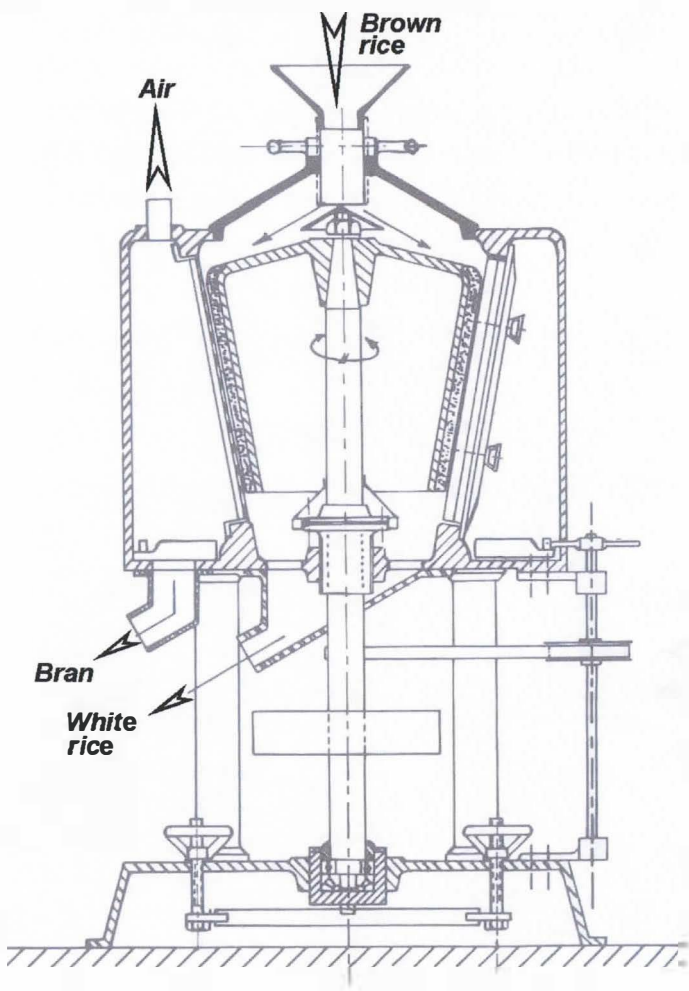



Fig. 28. Abrasive whitening cone

[2] In "Araullo, E.V., De Padua, D.B. and Graham, M. 1976. Rice post-harvest technology. IDRC. Ottawa. Canada.

## 2.2.3. The laboratory rice mill

2.2.3.1. The laboratory rice mill "COSTRUZIONI MECCANICHE COLOMBINI"

The laboratory rice mill Colombini type G.150/R, with pneumatic circulation of rice is equipped with a rubber roll husker and a cone whitener.

For a good working of the LAB. RICE-MILL, it is necessary to know thouroughly the several adjustment needed by the machines ; high efficiency can be obtained, if they are properly affected.

1 - Check the right tension of belts. If necessary, operate the special belt-tighteners on motor to obtained best results.
2 - Check the direction of rotation of machines, which is to follow the arrow thereon.


Fig. 29. The laboratory rice mill

2.2.3.2. Adjustment of the mini tester husker

The equipment, when viewed roller side, is equipped with three adjusting devices :

1 - Hopper opening or closing shutter. The shutter must be completely open during husking or completely closed when the equipment doesn't work.
2 - On the right side of the equipment a plastic handle operates the adjustment of the valve of the revolving feeder.
3 - Always, on the right side another flow adjusting handle adjusts the adjustment handle for roll clearance in order to get them near or away according to need. The rod locked to this adjustment handle has a two-position support. With the rod position on "UP", the rolls are near and the clearance may be adjusted by screwing or unscrewing the rod. With the rod on "DOWN" the rolls are completely separated for the equipment idling or stop.

Pressure regulation of roll automatic opening, when foreign matters (stones, etc) eventually come in operates the automatic resetting of rolls in their position during husking operation. Such an adjustment is executed through a spring locked on the rod end. According to necessity this spring is more or less compressed by a hexagon nut which must be locked in its turn by another nut.
This spring along with the hexagon nuts is mounted on the left, behind the rolls. The above automatic device prevents the equipment from being damaged by the mentioned foreign matters.

Should the husked paddy be whitened later on the whitening machine will carry out the husking of such grains without leaving any trace.
The rolls will be exactly positioned for work when the clearance between them equals the thickness of a postcard and such a postcard may slide in this clearance supporting a slight resistance.

2.2.3.3. Adjustment of the whitening cone

The whitening cone has six rubber brakes, placed on its circumference. Each of them is adjustable by 3 hexagon headed screw. The use of the central one is to lock the brake, while the use of the other screw, mounted on the brackets (upper and lower), is to adjust the brakes by pushing them outside or withdrawing them, as well as to secure parallelism by sight (photos 1 and 2).

In case you should push the rubbers forward, you have to slightly unscrew the screw of the central bracket, and screw up the other two.

Otherwise (re-entry of rubbers), unscrew the two screw (upper and lower) and screw up the central one.

Adjustment of rubbers is effected by taking off cap of the whitening cone, and taking the abrasive cone. Out of the conical seat of shaft. So you can have a complete view of the whole series of rubber. With a special small rod, 3 mm thick (which can also be wooden one) you determine the jut of the brake by setting the thickness rod on the rotating cone housing, by the side of the brake (photo 3).
Then adjust the rubber, so that it should be on a level with the control rod for its whole length. Put back the cone and the cap again, and tighten their screw.

Brakes can taken away from the cone and made to approach it, by a motion of vertical translation of the central shaft, on witch the cone is mounted. These movement are regulated by the lower bearing flywheel (photo 4), allowing, -through rotation in either direction- the cone to be lifted (disconnection from brakes) or lowered (approaching brakes).

The position of the cone as regards the brakes can be adjusted by getting some initial samples, starting form a distance of about 2 mm between cone and brakes. In case you should notice an excess of working in the product, you have to lift the done (a greater distance form brakes). In case of insufficient working of product, you have to lower the cone (a shorter distance form brakes).

Photo n°1: Abrasive cone and brakes

Photo n°2: screws to adjust brakes

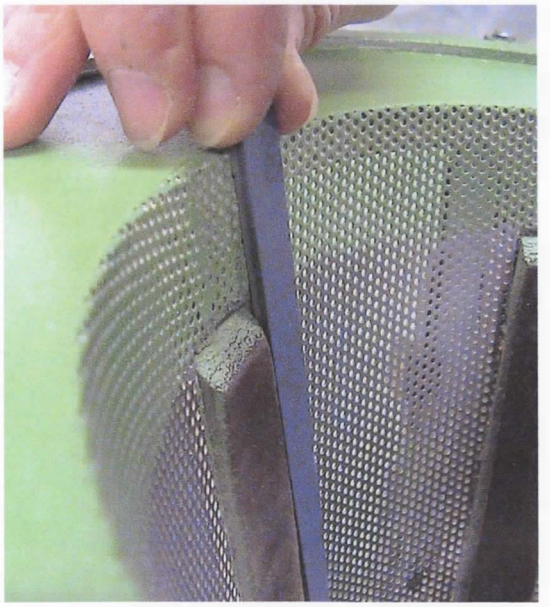


Photo n°3: small rod to adjust the brakes

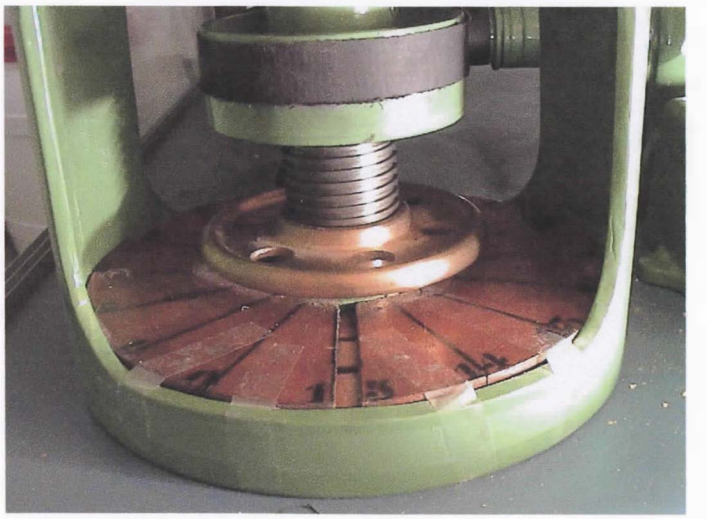


Photo n°4: the lower bearing flywheel

Fig. 30. Adjustment of the abrasive whitening cone

# 2.3. PROPOSITION OF SIMPLIFIED PROCEDURES

## 2.3.1. Proposition of a simplified procedure for the determination of milling yield and rice specifications (starting from paddy)

### 2.3.1.1. First step : preparation of test sample

Reception/registry

↓

Sampling

↙ ↘

Determination of moisture content

Determination of foreign matter (mf)
Remove insects

Conditioning
(up to 13+/- )

### 2.3.1.2. Second step : adjustment of equipment

- testing husker adjustment
- testing milling adjustment

### 2.3.1.3. Third step : determination of milling yield and rice specifications (two samples)

- Mix and sampling (up to 105-110g each sample) m0
- Remove foreign matter mf
- Weigh the clean samples m1
- Husk the paddy
- Weigh the total husked rice m2
- Mill the husked rice
- Weigh the milled rice m3
- Separate (with one of the milled sample):
  - head milled rice and whole kernel m4
  - whole milled rice m4'
  - medium broken kernel m5
  - small broken kernel m6

and

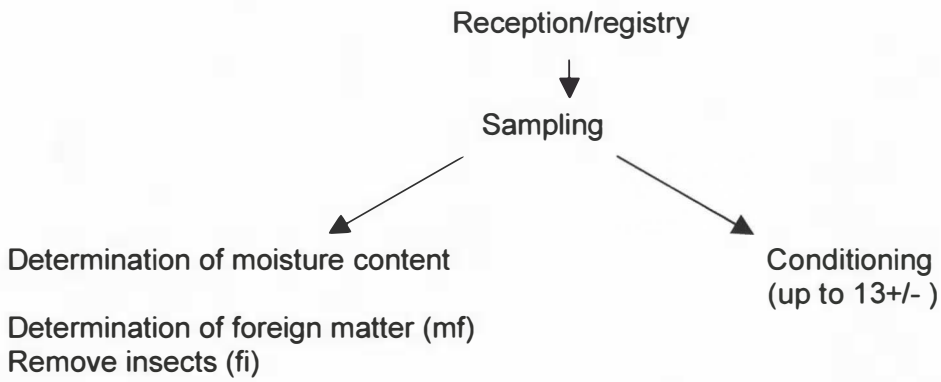
- Separate (with the other milled sample):
  - red kernel m7
  - heat damaged/damaged kernel m8
  - chalky kernel m9
  - paddy m10
  - others varieties m11

### 2.3.1.4. Fourth step : expression of results

| CATEGORIES | Expression (%) |
|---|---|
| Foreign matter | mf/m0 x 100 |
| Husked rice yield | m2/m1 x 100 |
| Milled rice yield | m3/m1 x 100 |
| Head milled rice and whole kernel | m4/m1 x 100 |
| Whole kernel | m4'/m1 x 100 |
| Medium broken kernel | M5/m1 x 100 |
| Small broken kernel and chip | m6/m1 x 100 |
| Red kernel | m7/m1 x 100 |
| Heat-damaged kernel/damaged kernel | m8/m1 x 100 |
| Chalky kernel | m9/m1 x 100 |
| Insect | |
| Paddy | m10/m1 x 100 |
| Others varieties | m11/m1 x 100 |

## 2.3.2. Proposition of a simplified procedure for the determination rice specifications for paddy

### 2.3.2.1. First step : preparation of test sample




### 2.3.2.2. Second step : adjustment of equipment

- testing husker adjustment
- testing milling adjustment

### 2.3.2.3. Third step : determination of rice specifications for paddy

- Mix and sampling (up to 105 - 110g ) — m0
- Remove foreign matter — mf
- Weigh the clean samples — m1
- Husk the paddy
- Weigh the total husked rice — m2
- Mill the husked rice
- Weigh the milled rice — m3
- Separate :
  - red kernel — m7
  - heat damaged/damaged kernel — m8
  - chalky kernel — m9

### 2.3.2.4. Fourth step : expression of results

| CATEGORIES | Expression (%) |
|---|---|
| Foreign matter | mf/m0 x 100 |
| Red kernel | m7/m1 x 100 |
| Heat-damaged kernel/damaged kernel | m8/m1 x 100 |
| Chalky kernel | m9/m1 x 100 |
| Insect | fi/m1 x 100 |

### 2.3.3. Proposition of a simplified procedure for the determination milled rice specifications

#### 2.3.3.1. First step : preparation of test sample

Reception/registry
Mix and sampling (up to 100 - 110g) m0
Determination of moisture content

#### 2.3.3.2. Second step : determination milled rice specifications

- Remove foreign matter (mf)
- Remove insects (fi)
- Weigh the clean samples m1
- Measurement of the whiteness
- Separate :
    - head milled rice and whole kernel m4
    - whole milled rice m4'
    - medium broken kernel m5
    - small broken kernel m6

and

- Separate :
    - red kernel m7
    - heat damaged/damaged kernel m8
    - chalky kernel m9
    - paddy m10
    - others varieties m11

#### 2.3.3.3. Third step : expression of results

| CATEGORIES | Expression (%) |
|---|---|
| Foreign matter | mf/m0 x 100 |
| Head milled rice and whole kernel | m4/m1 x 100 |
| Whole kernel | m4'/m1 x 100 |
| Medium broken kernel | M5/m1 x 100 |
| Small broken kernel and chip | m6/m1 x 100 |
| Red kernel | m7/m1 x 100 |
| Heat-damaged kernel/damaged kernel | m8/m1 x 100 |
| Chalky kernel | m9/m1 x 100 |
| Insect | fi/m0 x 100 |
| Paddy | m10/m1 x 100 |
| Others varieties | m11/m1 x 100 |

## 2.4. RECOMMENDATIONS/INSTRUCTIONS FOR THE INSTALLATION OF THE LABORATORY

### 2.4.1. Arrangement of the conditioned room at 20°C and 75 % HR.

This room will be fitted up with several shelves so that samples will be conditioned (and stored eventually) for a sufficient period to obtain a moisture content within the specified rang (13.0+/- 1%). Samples should be spread and conditioned in perforated plates.

Fig. 31. A perforated plate for natural sample drying

The relative humidity in this region is high during all the year and it could be interesting to install a dehumidifier as to get the recommended relative humidity (around 75%).

### 2.4.2. Arrangement of the laboratory

This room will be fitted up with larders to put all the all the small materiel of the lab (sieves, plates with small cavity cells, analytical balances, moisture testers, ...)

### 2.4.3. The laboratory equipment should be completed by :

- a plate with small cavity cells (4.2 mm) as recommended by the standard national Indonesian for the determination of "large broken kernel" after milling,
- a metal sieve with perforations minima 1.8 mm and maximum 2.0 mm as recommended by the standard national Indonesian for the determination of "small broken kernel" after milling.
- a vacuum cleaner for the cleaning of the laboratory rice mill to prevent an infestation by different insects.

### 2.4.4. Training book

Translate from English into Indonesian the training book, recommendations and propositions elaborated in this report.

# 2.5. INDONESIAN NATIONAL STANDARD (BULOG)

## 2.5.1. Terms and definitions

The following terms and definitions are applied in national Indonesian trade.

### 2.5.1.1. Terms and definitions about the different states of rice

**paddy,** paddy rice, rough rice, ***butir gabah***
rice retaining its husk after threshing

**husked rice,** brown rice, cargo rice, ***beras pecah kulit***
paddy from which the husk only has been removed

**milled rice,** white rice, ***beras berish***
husked rice from which all or part of the bran and embryo have been removed by milling

### 2.5.1.2. Terms and definitions about the size of milled rice, butir beras

**head milled rice,** ***beras kapela***
milled kernel or part of kernel with a length greater than or equal to 6/10 of the average length of the test sample kernels (including whole kernel and large broken kernel)

**whole kernel,** ***butir utuh***
milled kernel without any broken part

**large broken kernel,** ***butir patah besar***
part of kernel with a length greater than or equal to 6/10 of the average length of the test sample kernels. The use of a plate with small cavity cells of 4.2 mm is recommended.

**medium broken kernel,** ***butir patah***
part of kernel with a length less than 6/10 but greater than 2/10 of the average length of the test sample kernels.

**small broken kernel and chip,** ***butir menir***
part of kernel with a length less than or equal to 2/10 of the average length of the test sample kernels. The use of a metal sieve with perforations minimal 1.8 mm and maximal 2.0 mm is recommended.

**average length**
arithmetic mean of the length of the test sample kernels that are not immature or malformed and without any broken parts.

### 2.5.1.3. Terms and definitions about the defects of rice

**extraneous matter, foreign matter,** ***kotoran***
organic and inorganic components other than kernels of rice
*Organic extraneous matter* are: foreign seeds, husks, bran, parts of straw, etc.
*Inorganic extraneous matter* are: stones, sand, dust, etc.

**heat-damaged kernel and damaged kernel,** ***butir kuning and butir rusah***
head rice or broken kernel that has changed its normal colour as a result of a microbiological alteration.
head rice or broken kernel showing evident deterioration due to moisture, pests, disease or other causes

**chalky kernel,** ***butir mengapur***
head rice or broken kernel whose whole surface has an opaque and floury appearance

**red kernel,** ***butir merah***
head rice or broken kernel having a red bran covering more than one-quarter of its surface

**others varieties,** ***campuran varietas tain***

## 2.5.2. Quality conditions of paddy and milled rice bought and stored during 2003

(Norme : 01/SKB/BPPHP/TP.830/2003 January 2003
FEP-07/UP/01/2003)

### 2.5.2.1. General, organoleptic and health specifications

Note if an odour, particular or foreign to rice, is detected, as well as the presence of all anomalies.

Verify the presence of living or dead insects by visual examination and report the weight.

Paddy shall be sound, clean and free from foreign odours or odour which indicates deterioration. They shall also be free from toxic or any harmful matter.

Additives and pesticides and other contaminants which can affect the visual and organoleptic aspects are forbidden.

Milled rice shall be clean and free from husk and bran.

### 2.5.2.2. Specifications for paddy

| N° | Categories | Komponen Mutu | % max |
|---|---|---|---|
| 1 | Moisture content | Kadar air | 14 |
| 2 | Foreign matter | Butir Hampa/Kotoran | 3 |
| 3 | Damaged kernel | Butir Kuning/Rusak | 3 |
| 4 | Chalky kernel | Butir Hijau/Mengapur | 5 |
| 5 | Red kernel | Butir Merah | 3 |

### 2.5.2.3. Specifications for milled rice

| N° | Categories | Komponen Mutu | % max. Mutu III SNI | % Max. Mutu IV SNI |
|---|---|---|---|---|
| 1 | Whiteness | Derajat Sosoh (min) | 95 | 95 |
| 2 | Moisture content | Kadar air (max) | 14 | 14 |
| 3 | Head milled rice | Beras kepala (min) | 84 | 78 |
| | Whole kernel | Butir utuh (min) | 40 | 35 |
| 4 | Medium broken kernel | Butir patah (max) | 15 | 20 |
| 5 | Small broken kernel and chip | Butir menir (max) | 1 | 2 |
| 6 | Red kernel | Butir merah (max) | 1 | 3 |
| 7 | Heat-damaged kernel/damaged kernel | Butir kuning/rusak (max) | 1 | 3 |
| 8 | Chalky kernel | Butir mengapur (max) | 1 | 3 |
| 9 | Insect | Benda asing (max) | 0.02 | 0.02 |
| 10 | Paddy | Butir gabah (max) | 1 | 1 |
| 11 | Others varieties | Campuran varietas lain (max) | 5 | 5 |

# III) MEASUREMENTS OF RICE QUALITY

During the second mission in September 2003, the training given by the Cirad to the local staff related to the measurement of the moisture content of grains (with portable moister testers) and general revision of the use of the laboratory micro rice mill and analyse quality of rice produced locally (rice stored in the silo, rice delivered to the silo and rice collected in the area)

## 3.1. MEASUREMENT OF THE GRAINS MOISTURE CONTENT

### 3.1.1. Use of the "Samap O Test" moisture tester

A recall of the guiding principles of the use of the "Samap O Test" moisture tester was done

#### 3.1.1.1. Precautions and preliminary adjustments of the moisture tester

First make sure the battery is charged (a low battery is indicated by "lo b" on the digital display).
The moisture tester must be placed on a neutral support (wood table or plastic box for example) and should not never be posed on a metal, conducting or hot surface.
Before measurement, the display must indicate 500 or 501. In the contrary case, a button of adjustment placed on the front of the apparatus, must be turned to reach this ideal adjustment.
NEVER BLOW in the apparatus to evacuate possible dust because that will disturb measurement (steam sent in the apparatus).
Press on the gray key to select the code of the product to measure (range 24 for paddy rice and 23 for brown rice)


Fig. 32. The "Samap" moisture tester

#### 3.1.1.2. Grain moisture measurement

- Fill the hopper of the tester to the brim.
- Hold the right apparatus by the hopper
- Open the trap door
- Read the measurement data on the display.

#### 3.1.1.3. Correction of measurement according to the temperature

The moisture meter was regulated for an average temperature of 20 °C. Under the Indonesian conditions where the grain often reaches a temperature of 25°C, it is necessary to subtract 0,5 % from the result obtained (temperature compensation) . Thus if the apparatus indicates 14,5%, exact measurement is:

$$14,5 - 0,5 = 14\ \%$$

### 3.1.2. Comparison with other moisture testers

Other portable moisture testers are available on the site in particular at the silo level. It is a CROWN digital moisture meter, manufactured by OGA electric (Japan) and marketed by Pt Rutan (Surabaya).

Comparative measurements were made with the two apparatuses on a sample of short rice grain (Muncul) collected in the area and dried under shelter during one weekend. Measurement with CROWN moisture meter gave 14,3 % and measurement with Samap: 15 %. With the correction of grains temperature (25°C), measurement with Samap is 15 - 0,5 = 14,5 %. Taking into account the precision of the measurements provided by this type of portable apparatus (about 0,5%), we can conclude that the 2 apparatuses give equivalent measurements.

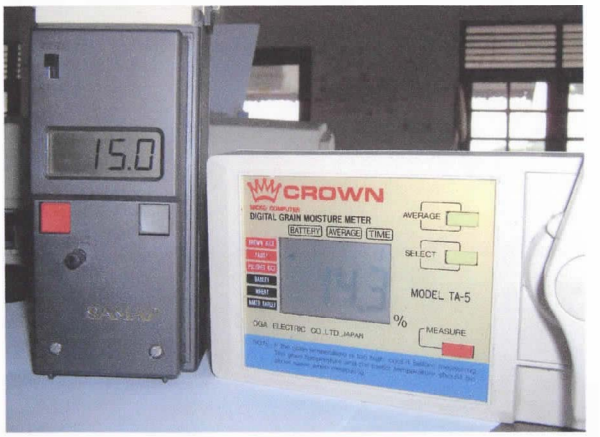



Fig. 33. Moisture testers

Other measurements were carried out on samples taken during a delivery of 17 tons of long rice from Solo (Java central). The data obtained with the 2 apparatuses were identical: 13,2 % i.e. 12,7% with Samap (temperature compensation). Taking into account the precision of the apparatuses, we can consider that these measurements are equivalent and deduce that the moisture of the sample is undoubtedly between 12,5 % and 13,5%.

With the Crown apparatus, the measurement is done with only 1g of paddy (42 grains) whereas the quantity of paddy which enters Samap is 120 g. So, measurement with Samap can be considered much more representative of the sample and thus presents less risks of error. It can be recommended to use "Samap" moisture tester at the laboratory level and "Crown" moisture tester, very practical and easily transportable, at the silo level to make quick control measurements.

### 3.1.3. Calculation of the loss in weight of the grains during drying

During the training, a question was asked concerning the loss in weight of a mass of grains during drying:

Question
"If 15 tons of wet grains (20% moisture content) are dried to 13% moisture content, what is the mass of the grains after drying? "

Answer
The quantity of water (Q) to remove to dry 1 kg of product from an initial moisture Mi % to a final moisture Mf % is given by the formula:

$$Q = \frac{Mi - Mf}{100 - Mf} \text{ (kg of water per kg of wet product)}$$

In our example, $Q = \frac{20-13}{100-13}$ = 0,08046 kg of water per wet kg of wet product

and for 15 tons of wet product: 15 000 x 0,08046 = 1 207 kg to be removed.

The mass of grains after drying is: 15 000 kg - 1 207 kg = 13 793 kg

One can also use the formula giving the dry weight (Wd) starting from the wet weight (Ww)

$$Wd = Ww\frac{100 - Mi}{100 - Mf}$$

for our example: $Wd = 15000\frac{100-20}{100-13}$ = $15000x\frac{80}{87}$ = 13 793 kg

## 3.2. SAMPLINGS

In order to carry out measurements of paddy quality at the laboratory level, several samplings were collected.

1°) sample from the paddy stored in the silo.

2°) sampling during the delivery of 17 tons (340 bags of 50 kg) of long rice Ciherang (IR 64) coming from Solo (Java central). According to rules' of sampling, it was decided to take grains in $\sqrt{340}$ = 18,4 i.e. 19 bags taken randomly. The elementary samples were collected during the emptying of the bags

Fig. 34. Delivery of paddy bags at the silo

3°) sampling during a field visit in the region of Wadas. The producers met were collecting and threshing short rice grains "Muncul" and long rice grains "Ciherang".

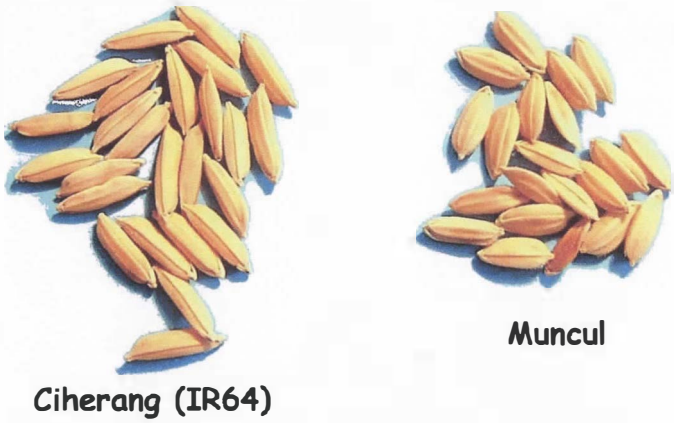



Fig. 35. Varieties of local rice

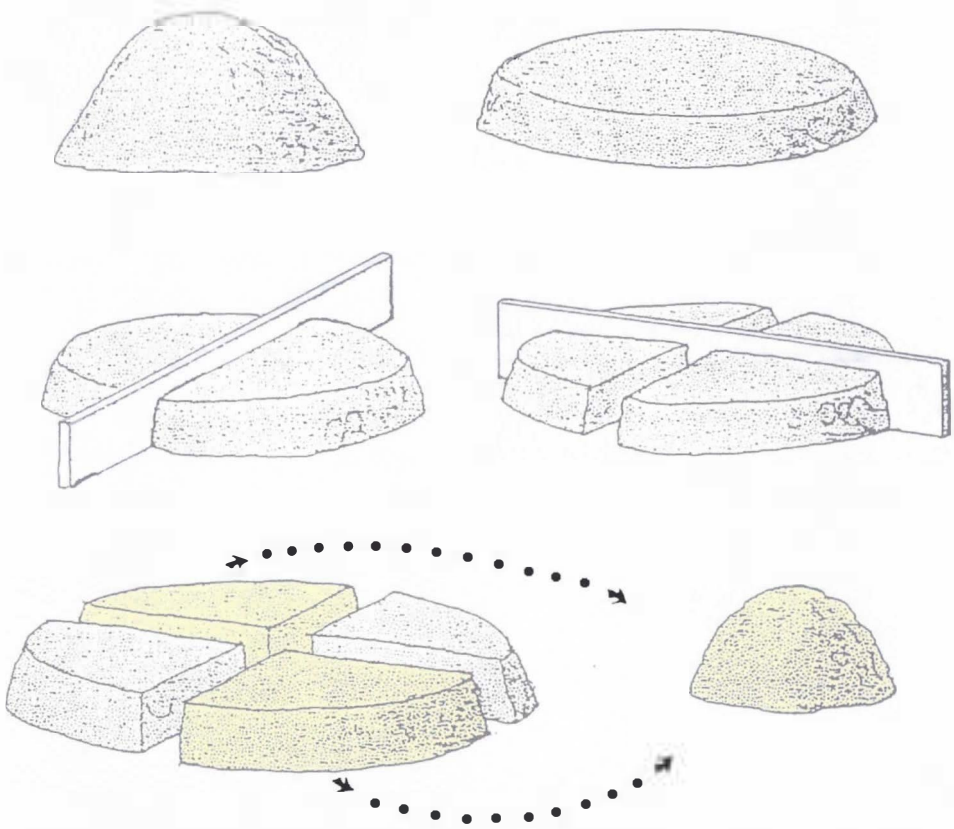
N.B. It was not possible to take samples at the plant level (before and after drying, before and after husking, before and after whitening) because the rice mill was not yet in production.

## 3.3. GRAINS QUALITY MEASUREMENTS IN THE LABORATORY

Grains quality measurements were carried out at the laboratory on the four types of taken samples. They related to the cleanliness of paddy, the moisture content, the analysis of the defects (immature, red grains red...) and the husked and milled rice yields according to rules' which had been taught during the first mission in March 2003.

### 3.3.1. Subsampling

The bulk sample obtained by mixing primary samples was quite large. It was necessary to reduce it to obtain more workable amounts of grains (100-120g). The method used to obtain sub-samples is the simple "cone" method. It is on these sub-samples that various measurements were done



**The coning method applied to divide a sample**

1. Bulk sample to be reduced: grains thoroughly mixed then coned
2. The cone has been flattened
3. The cone is being divided into two equal portions, using a small board
4. The sample is further divided resulting in four equal portions
5. Two opposite quarters are being put together and mixed to constitute a representative subsample (6)

Fig. 36. Subsampling by the coning method

### 3.3.2. Cleanliness of paddy

All foreign matters as mineral (stones, sands,..), vegetable (straws, other seeds...) or animal (insects..) were sorted so as to obtain a clean sample of paddy. The measurements made on the various samples showed that the rate of impurities varied from 1,3 % (paddy stored in the silo) to 3 % (delivered grains) to reach 5,5 % (long grains) to 6,7 % (short grains) for the samples taken during harvest (after threshing).

Fig. 37. Sorting of the samples at the laboratory


Fig. 38. Weighing of clean paddy sample

### 3.3.3. Moisture content

Measurements are realised on clean samples of paddy, because the presence of impurities (straws, stones...) can modify the result. In the laboratory, measurements of the grains moisture content were done with the "Samap" moisture tester. Some measurements were doubled by using the "Crown" moisture tester(see §). The results showed that the average paddy moisture content was 14 to 14,5 % for the grain stored in the silo and 13 % for the delivered grain. For the samples taken during harvest, moistures were particularly high and reached 30 % (the higher limit of work for the apparatus). After natural drying (in the shade) during one weekend, the moisture of these samples has dropped to 13,7 % (long rice) and to 14 % (round rice).

### 3.3.4. Husked rice yield and brown rice defects

After cleaning, the samples are husked in the rubber rolls husker of the laboratory rice mill of. The husked sample is then weighed on the precision balance.

If m1 = weight of clean paddy and m2 = weight of the brown rice,

the husked rice yield is: $Yh = \frac{m2}{m1} x100$

The samples of husked grains were then sorted to measure the percentage of immature grains, red grains, overheated grains and chalky grains. The defects most present are the immature grains (3 to 7%), then the overheated grains (0,2 to 5%) and the chalky grains (0,3 to 2,5%). The red grains are very rare (0,2 to 0,6 %). the values obtained are only indicative because the whole sample is then whitened to measure the milled rice yield.

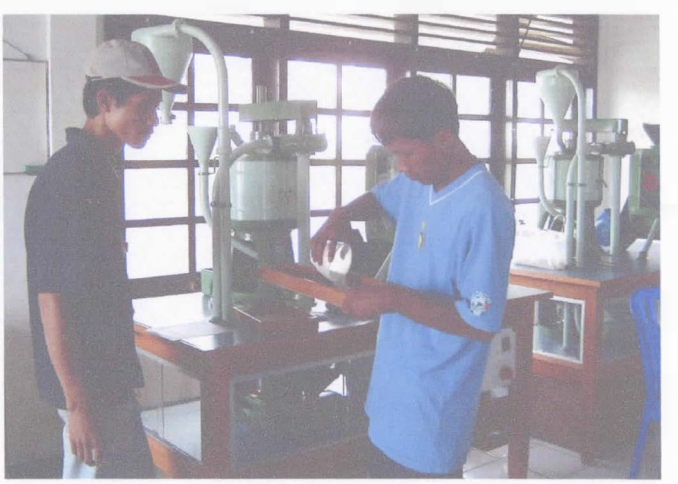


Fig. 39. Recovery of the sample after dehusking

## 3.3.5. Milled rice yield

### 3.3.5.1. Global milled rice yield

The husked samples are whitened during 1 minute with the cone whitener of the laboratory rice mill. The white grains are then weighed (m3) and the ratio with the weight of initial clean paddy (m1) gives the global milled rice yield.

The global milled rice yield is: $Ym = \frac{m3}{m1} x100$

### 3.3.5.2. Head milled rice yield

To measure the head milled rice yield, it is necessary to separate the broken from white the rice sample obtained. In Indonesia, brokens are grains whose size is lower than the 6/10 of the whole grain. For the long rice "Ciherang" whose average length is 7 mm, the broken were sorted with a indented plate with cells of 4 mm.

Fig. 40. Sorting of the brokens with the indented plate n°4

The head grains are then weighed (m4) and the ratio with the weight of initial clean paddy (m1) gives the head milled rice yield

The head milled rice yield is: $Ymh = \frac{m4}{m1} x100$

Brokens Head rice

Fig.41. Sample separated in brokens and whole grains

### 3.3.6. Expression of results

All the results are given in the following table

| n° | Sample réf. | Moisture content | Rough paddy | Foreign matters | Insects | | Clean paddy | Brown rice | Milled rice | Head milled rice | Yields | | | Defects | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | g | g (%) | dead | alive | g | g | g | g | Brown rice | Milled rice | Head milled rice | Immature kernels | Red kernels | Heat damaged kernels | Chalky kernels |
| 1 | 18/9/03/Silo | 14,3 | 107,1 | 1,4 (1,3%) | - | - | 105,7 | 81,7 | 67,4 | 58,0 | 77,3% | 63,7% | 54,8% | 6,17 (7,6%) | 0,13 (0,2%) | 4,1 (5%) | 2 (2,5%) |
| 2 | 19/9/03/Solo | 12,9 | 125,1 | 3,7 (3%) | - | - | 121,4 | 95,1 | 80,4 | 65,7 | 78,3% | 66,2% | 54,1% | 6,8 (7,1%) | 0,8 (0,8%) | 2,8 (3%) | 2,2 (2,3%) |
| 3 | 20/9/03/Long | 13,7 | 100,3 | 7,0 (7%) | - | - | 93,3 | 74,4 | 58,2 | 51,1 | 79,7% | 62,4% | 54,8% | 4,8 (6,5%) | 0,1 (0,1%) | 0,6 (0,8%) | 0,4 (0,5%) |
| 4 | 20/9/03/Short | 14,0 | 115,3 | 7,7 (6 ,7%) | - | - | 107,6 | 82,7 | 67,8 | 64,3 | 76,9% | 63,0% | 59,8% | 2,5 (3%) | - | 0,2 (0,2%) | 0,3 (0,4%) |

The results obtained shown that the foreign matters ratio vary from 1,3% - 3% (stored paddy) to 6,7% - 7% (harvested paddy) and the head milled rice yield fluctuate from 54,1% - 54,8% (long rice) to 59,8% (short rice). The professionals met (industrial rice millers) consider that these data are consistent with the data usually observed in the rice chain in Java.

## Conclusions

The implantation of various laboratory facilities i.e. two laboratory rice mills (with rubber roll husker and abrasive cone whitener, moisture testers, precision balances, indented sorting tray,...) give the opportunity to train technicians of the rice milling unit and to heighten local staff awareness of the rice quality monitoring. A total of 6 persons was trained during the first missions in march 2003 plus 2 persons during the final mission in September 2003.

The importance of the post-harvest system related to rice technological quality was particularly focused. Concerning post-harvest technology, it was recall that natural drying as direct exposure of the wet grains to the sun (method frequently used in Indonesia) may produce cracks in the grains, generate broken during processing and lower the head milled rice yield.

The losses during rice milling could be attributed to machine factors such improper machine adjustment and selection, improper arrangement and combination of machine components, lack of maintenance and lack of proper training of mill operators. Losses could also be attributed to the inherent quality of paddy which the miller cannot really control (varietal characteristics such as length and thickness of grains, amount of chalky or immature,...)

In order to accustom local staff to check rice quality, the consultants have organized a training programme including basic quality controls methods and many practical works were done on determination of the potential milling yield from paddy and from husked rice with elaboration of a specific procedure to analyse rice according to the Indonesian regulation (categories, minimum or maximum specifications for rice)

The sampling methods were recall and a correct adjustment of the laboratory equipment were look at carefully. The complete disassembling of the cone whitener was taught with the trainees so that they can understand the interest of the directives given and that they can be able, in the future, to change the spares parts (rubber brakes) if necessary.

Finally, different samples of rice (long and short) representative of the local productions were analysed in terms of moisture content, impurities, defects and milling yields. The main results shown that the foreign matters ratio vary from 1,3% - 3% (stored paddy) to 6,7% - 7% (harvested paddy) and the head milled rice yield fluctuate from 54,1% - 54,8% (long rice) to 59,8% (short rice).

# Appendix

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ISO 6646, Rice – Determination of the potential milling yield from paddy and from husked rice.

ISO 7301, Rice - Specification

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# Methods of analysis for rice specifications
## (husked and milled rice)

### 1 - Scope
This paper gives the minimum specifications for rice *(Oryza sativa* L.) which is the subject of international trade.
It is applicable to the following types : husked rice and milled rice, not parboiled, intended for direct human consumption.
It is not applicable to other products derived from rice, nor to waxy rice (glutinous rice).

### 2 - Normative references
ISO 7301, *Rice - Specification*
ISO 712, *Cereals and cereal products — Determination of moisture content — Routine reference method*
ISO 5223, *Test sieves for cereals*
ISO 13690:1999, *Cereals, pulses and milled products — Sampling of static batches*

### 3 - Terms and definitions
The following terms and definitions are applied in international trade.

***Terms and definitions about the different states of rice***

**3.1 paddy,** paddy rice, rough rice
rice retaining its husk after threshing

**3.2 husked rice,** brown rice, cargo rice
paddy from which the husk only has been removed
( NOTE : the processes of husking and handling may result in some loss of bran)

**3.3 milled rice,** white rice
husked rice from which all or part of the bran and embryo have been removed by milling
(NOTE : It should further be classified into the following degrees of milling)

**3.3.1 undermilled rice**
rice obtained by milling husked rice but not to the degree necessary to meet the requirements of well-milled rice

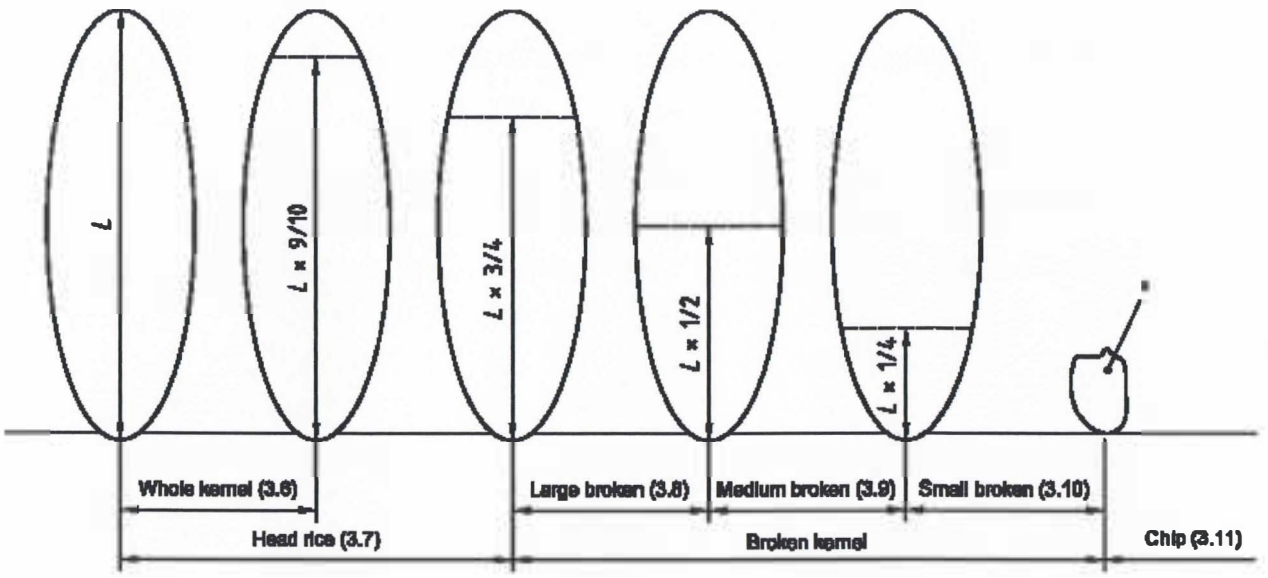
**3.3.2 well-milled rice**
rice obtained by milling husked rice in such a way that most of the bran and part of the embryo have been removed

**3.3.3 extra-well-milled rice**
rice obtained by milling husked rice in such a way that all of the bran and almost all of the embryo have been removed

**3.4 parboiled rice**
husked or milled rice processed from paddy or husked rice that has been soaked in water and subjected to a heat treatment so that the starch is fully gelatinised, followed by a drying process

**3.5 waxy rice,** glutinous rice
varieties of rice whose kernels have a white and opaque appearance
(The starch of waxy rice consists almost entirely of amylopectin)

***Terms and definitions about the size of rice***




[a] Not passing through a round perforation of 1,4 mm in diameter.

**Key**

$L$ is the average length (3.12)

**Figure 1 — Size of kernels, broken kernels and chips**

**3.6 whole kernel**
husked or milled kernel without any broken part, or part of kernel with a length greater than or equal to nine-tenths of the average length (3.12) of the test sample kernels

**3.7 head rice**
whole kernel (3.6) or part of kernel with a length greater than or equal to three-quarters of the average length (3.12) of the test sample kernels

**3.8 large broken kernel**
part of kernel with a length less than three-quarters but greater than one-half of the average length (3.12) of the test sample kernels

**3.9 medium broken kernel**
part of kernel with a length less than or equal to one-half but greater than one-quarter of the average length (3.12) of the test sample kernels

**3.10 small broken kernel**
part of kernel with a length less than or equal to one-quarter of the average length (3.12) of the test sample kernels but which does not pass through a metal sieve with round perforations in diameter

**3.11 chip**
part of kernel which passes through a metal sieve with round perforations in diameter 1,4 mm in diameter

**3.12 average length**
arithmetic mean of the length of the test sample kernels that are not immature or malformed (3.16) and without any broken parts

***Terms and definitions about the defects of rice***

**3.13 extraneous matter**
organic and inorganic components other than kernels of rice
*Note 1 : Organic extraneous matter* are: foreign seeds, husks, bran, parts of straw, etc.
*Note 2 : Inorganic extraneous matter* are: stones, sand, dust, etc.

**3.14 heat-damaged kernel**
head rice or broken kernel that has changed its normal colour as a result of a microbiological heating
This category includes kernel that is yellow/dark yellow in the case of non-parboiled rice and orange/dark orange in the case of parboiled rice, due to a microbiological alteration.

**3.15 damaged kernel**
head rice or broken kernel showing evident deterioration due to moisture, pests, disease or other causes, but excluding heat-damaged kernels (3.14)

**3.16 immature kernel, malformed kernel**
head rice or broken kernel which is unripe and/or badly developed

**3.17 chalky kernel**
head rice or broken kernel of non-parboiled rice, except waxy rice (3.5), whose whole surface has an opaque and floury appearance

**3.18 red kernel**
head rice or broken kernel having a red bran covering more than one-quarter of its surface

**3.19 red-streaked kernel**
head rice or broken kernel with red bran streaks of length greater than or equal to one-half of that of the whole kernel, but where the surface covered by these red streaks is less than one-quarter of the total surface

**3.20 partly gelatinised kernel**
head rice or broken kernel of parboiled rice which is not fully gelatinised and shows a distinct white opaque area

**3.21 peck**
head rice or broken kernel of parboiled rice of which more than one-quarter of the surface is dark brown or black in colour due to the parboiling process

## 4 - Methods of analysis for rice specifications

### 4.1 Principle
Manual separation and weighing of the broken kernels and of the categories in Table 1.

### 4.2 Apparatus
**4.2.1 Sample divider**, conical sampler or multiple-slot sampler
**4.2.2 Metal sieve**, with round perforation in diameter in accordance with ISO 5223.
**4.2.3 Tweezers, scalpel** and **paintbrush**
**4.2.4 Small bowls**
**4.2.5 Balance,** capable of weighing to the nearest .
**4.2.6 Tray,** or other means, coloured in contrast with the colour of the rice to be evaluated.
**4.2.7 Micrometer**, or other measuring device not deforming the kernels and capable of being read to the nearest.

### 4.3 Sampling
A recommended sampling method is given in ISO 13690.
It is important that the laboratory receive a sample which is truly representative of the lot and has not been damaged or changed during transport or storage.

Note: The packaging material shall not transmit any smell or taste, and shall not contain substances which may damage the product or constitute a health risk. If bags are used, they shall be clean, sufficiently strong and well stitched.

## 4.4 Procedure

### 4.4.1 General, organoleptic and health specifications

Note if an odour, particular or foreign to rice, is detected, as well as the presence of all anomalies.
Verify the presence of living or dead insects by visual examination and report their number.

**Note : Kernels of rice, husked or milled, broken or not, shall be sound, clean and free from foreign odours or odour which indicates deterioration. They shall also be free from toxic or any harmful matter.**
*The levels of additives and pesticides and other contaminants shall not exceed the maximum limits permitted by the national regulations of the country of destination or, in their absence, by the FAO/WHO Codex Alimentarius.*
*The presence of living insects which are visible to the naked eye is not allowed.*

### 4.4.2 Preparation of test sample

Weigh and carefully mix the laboratory sample to make it as uniform as possible. Then proceed to reduce it, if necessary, using a sample divider (4.2.1) to obtain a quantity of about.
Divide the test sample so obtained into two equal test portions of about 400g, using the sample divider (4.2.1).

### 4.4.3 Physical and chemical specifications

The mass fraction of moisture shall be not greater than 15.0% (m/m). The moisture content shall be determined in accordance with ISO 712.
The defect tolerance for the categories considered, and determined in accordance with the method described, shall not exceed the limits given in Table 1 (ISO 7301).

### 4.4.4 Determination

#### 4.4.4.1 General

When a kernel has several defects, it shall be classified in the category where the maximum permissible value is the lowest (see Table 1).
All parts of kernels which get stuck in the perforations of a sieve shall be considered to be retained by the sieve.

#### 4.4.4.2 Average length

On one of the two test portions (4.4.2):
a) separate two sets of 100 kernels without any broken part, by random sampling;
b) measure the length of the kernels using the micrometer (4.2.7) and calculate the arithmetic means of the length for both sets of kernels *( L1 and L2)*;
c) calculate the average length (3.12) of the two sets of kernels *((L1 + L2)/2)* ; if the value of *(100(L1 +L2)/L)* is higher than 2, return all the kernels to the tray and repeat from step a);
d) return all the kernels to the test portion.

#### 4.4.4.3 Husked rice (Figure A.1)

- Weigh one of the test portions (4.4.2) to the nearest 0.1g ($m_w$) and spread it on the tray (4.2.6).
- Separate the organic extraneous matter (3.13), the inorganic extraneous matter (3.13), the paddy (3.1), the milled rice, non-parboiled (3.3), the husked rice, parboiled (3.4), and the milled rice, parboiled (3.4), into small bowls (4.2.4), with the aid of tweezers, scalpel and paintbrush (4.2.3).
- Weigh the six fractions so obtained to the nearest ($m_1$, $m_2$, $m_3$, $m_4$, $m_5$ and $m_6$).

- Divide the second test portion with the divider (4.2.1) in order to obtain four different aliquot parts of about each.
- Weigh the first aliquot part to the nearest 0.01g ($m_x$).
- Spread it out and separate the damaged kernels (3.15), the immature and/or malformed kernels (3.16) and the red kernels (3.18) into small bowls. Weigh the three fractions so obtained to the nearest 0.01g ( $m_7$, $m_8$ and $m_9$).
- Weigh the second aliquot part to the nearest 0.01g ($m_y$).
- Separate the chips (3.11) by the metal sieve (4.2.2), then spread out the remainder and separate the broken kernels, classifying them into large broken kernels (3.8), medium broken kernels (3.9) and small broken kernels (3.10). Put the fractions so obtained into small bowls. Weigh the four fractions to the nearest 0.01g ( $m_{10}$, $m_{11}$, $m_{12}$ and $m_{13}$).
- Proceed with the laboratory milling of a third aliquot part. Weigh the obtained milled rice to the nearest 0.01g ($m_z$).
- Spread it out and separate the heat-damaged kernels (3.14), the chalky kernels (3.17) and waxy rice (3.5) into small bowls. Weigh the three fractions so obtained to the nearest 0.01g ($m_{14}$, $m_{15}$ and $m_{16}$).

**4.4.4.4 Milled white rice** (Figure A.2)

- Weigh one of the test portions (4.4.2) to the nearest 0.1g ($m_w$).
- Spread it on the tray (4.2.6). Separate the organic extraneous matter (3.13), the inorganic extraneous matter (3.13), the paddy (3.1), the husked rice, non-parboiled (3.2), the husked rice, parboiled (3.4), and the milled rice, parboiled (3.4) into small bowls (4.2.4), with the aid of tweezers, scalpel and paintbrush (4.2.3). Weigh the six fractions so obtained to the nearest 0.01g ($m_1$, $m_2$, $m_3$, $m_4$, $m_5$ and $m_6$).

- Divide the second test portion with the divider (4.2.1) in order to obtain four different aliquot parts of about 100g each.
- Weigh the first aliquot part to the nearest 0.01g ($m_x$). Spread it out and separate the heat-damaged kernels (3.14), the damaged kernels (3.15), the immature and/or malformed kernels (3.16), the chalky kernels (3.17), the red kernels (3.18), together with the red-streaked kernels (3.19), and the waxy rice (3.5) into small bowls. Weigh the six fractions so obtained to the nearest 0.01g ($m_7$, $m_8$, $m_9$, $m_{10}$, $m_{11}$ and $m_{16}$).
- Weigh the second aliquot part to the nearest 0.01g ($m_y$).
- Separate the chips (3.11) by the metal sieve (4.2.2), then spread out the remainder and separate the broken kernels, classifying them into large broken kernels (3.8), medium broken kernels (3.9) and small broken kernels (3.10). Put the fractions so obtained into small bowls. Weigh the four fractions to the nearest 0.01g ($m_{12}$, $m_{13}$, $m_{14}$ and $m_{15}$).

## 4.5 Expression of results

Express the result obtained for the categories given in Table 2 as mass fraction, in percentage, of the product as received.

Report the result for each category to one decimal place by rounding it to the nearest integral multiple.

## 4.6 Test report

The test report shall specify:

- all information necessary for the complete identification of the sample;
- the sampling method used, if known;
- the sample mass;
- the test method used, with reference to the International Standard;
- the date of analysis;
- any operating details not specified here, or regarded as optional, together with details of any incidents likely to have influenced the results;
- the test results obtained.

**Note : Contract specifications**

All commercial contracts shall show clearly the following:

a) the total percentage of broken kernels permitted, classified according to the agreed categories, and the relative proportion of each category.

b) the total percentage permitted of all the categories and the method to use for the determination.

Table 1 – Specification of rice

| Categories | Reference to the definition | Husked rice non-parboiled max. % (mass fraction) | Milled rice non-parboiled max. % (mass fraction) |
|---|---|---|---|
| Extraneous matter: | | | |
| organic | 3.13, Note 1 | 1,0 | 0,5 |
| inorganic | 3.13, Note 2 | 0,5 | 0,5 |
| Paddy | 3.1 | 2,5 | 0,3 |
| Husked rice, non-parboiled | 3.2 | Not applicable | 1,0 |
| Milled rice, non-parboiled | 3.3 | 1,0 | Not applicable |
| Husked rice, parboiled | 3.2 and 3.4 | 1,0 | 1,0 |
| Milled rice, parboiled | 3.3 and 3.4 | 1,0 | 1,0 |
| Chips | 3.11 | 0,1 | 0,1 |
| Heat-damaged kernels | 3.14 | 2,0[a] | 2,0 |
| Damaged kernels | 3.15 | 4,0 | 3,0 |
| Immature and/or malformed kernels | 3.16 | 8,0 | 2,0 |
| Chalky kernels | 3.17 | 5,0[a] | 5,0 |
| Red kernels and red-streaked kernels | 3.18 and 3.19 | 12,0[b] | 12,0 |
| Partly gelatinized kernels | 3.20 | Not applicable | Not applicable |
| Pecks | 3.21 | Not applicable | Not applicable |
| Waxy rice | 3.5 | 1,0[a] | 1,0 |

[a] After milling.

[b] Only full red husked (cargo) rice is considered here.

**Table 2 – Expression of results**

| Categories | Husked rice non-parboiled[a] | Milled rice non-parboiled[b] |
|---|---|---|
| Organic extraneous matter (3.13, Note 1) | $\frac{m_1 \times 100}{m_w}$ | $\frac{m_1 \times 100}{m_w}$ |
| Inorganic extraneous matter (3.13, Note 2) | $\frac{m_2 \times 100}{m_w}$ | $\frac{m_2 \times 100}{m_w}$ |
| Paddy (3.1) | $\frac{m_3 \times 100}{m_w}$ | $\frac{m_3 \times 100}{m_w}$ |
| Husked rice, non-parboiled (3.2) | Not applicable | $\frac{m_4 \times 100}{m_w}$ |
| Milled rice, non-parboiled (3.3) | $\frac{m_4 \times 100}{m_w}$ | Not applicable |
| Husked rice, parboiled (3.4) | $\frac{m_5 \times 100}{m_w}$ | $\frac{m_5 \times 100}{m_w}$ |
| Milled rice, parboiled (3.4) | $\frac{m_6 \times 100}{m_w}$ | $\frac{m_6 \times 100}{m_w}$ |
| Heat-damaged kernels (3.14) | $\frac{m_{14} \times 100}{m_x}$ | $\frac{m_7 \times 100}{m_x}$ |
| Damaged kernels (3.15) | $\frac{m_7 \times 100}{m_x}$ | $\frac{m_8 \times 100}{m_x}$ |
| Immature and/or malformed kernels (3.16) | $\frac{m_8 \times 100}{m_x}$ | $\frac{m_9 \times 100}{m_x}$ |
| Chalky kernels (3.17) | $\frac{m_{15} \times 100}{m_x}$ | $\frac{m_{10} \times 100}{m_x}$ |
| Partly gelatinized kernels (3.20) | Not applicable | Not applicable |
| Pecks (3.21) | Not applicable | Not applicable |
| Red and red-streaked kernels (3.18) and (3.19) | $\frac{m_9 \times 100}{m_x}$ | $\frac{m_{11} \times 100}{m_x}$ |
| Waxy rice (3.5) | $\frac{m_{16} \times 100}{m_x}$ | $\frac{m_{16} \times 100}{m_x}$ |
| Large broken kernels (3.8) | $\frac{m_{10} \times 100}{m_y}$ | $\frac{m_{12} \times 100}{m_y}$ |
| Medium broken kernels (3.9) | $\frac{m_{11} \times 100}{m_y}$ | $\frac{m_{13} \times 100}{m_y}$ |
| Small broken kernels (3.10) | $\frac{m_{12} \times 100}{m_y}$ | $\frac{m_{14} \times 100}{m_y}$ |
| Chips (3.11) | $\frac{m_{13} \times 100}{m_y}$ | $\frac{m_{15} \times 100}{m_y}$ |

[a] For the meaning of the symbols, refer to Figure A.1.

[b] For the meaning of the symbols, refer to Figure A.2.

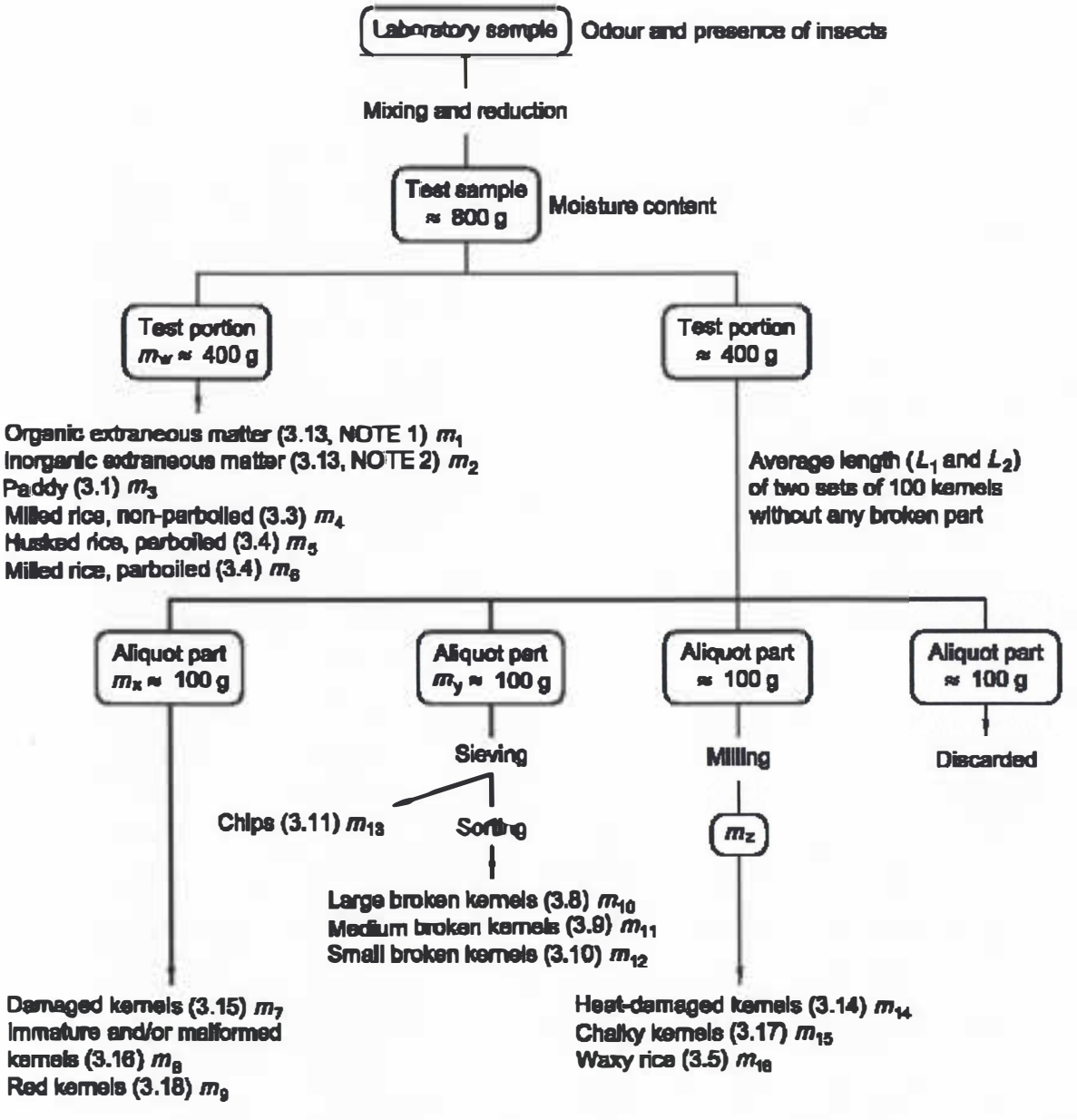



Figure A.1 — Scheme of procedure for husked rice, non-parboiled

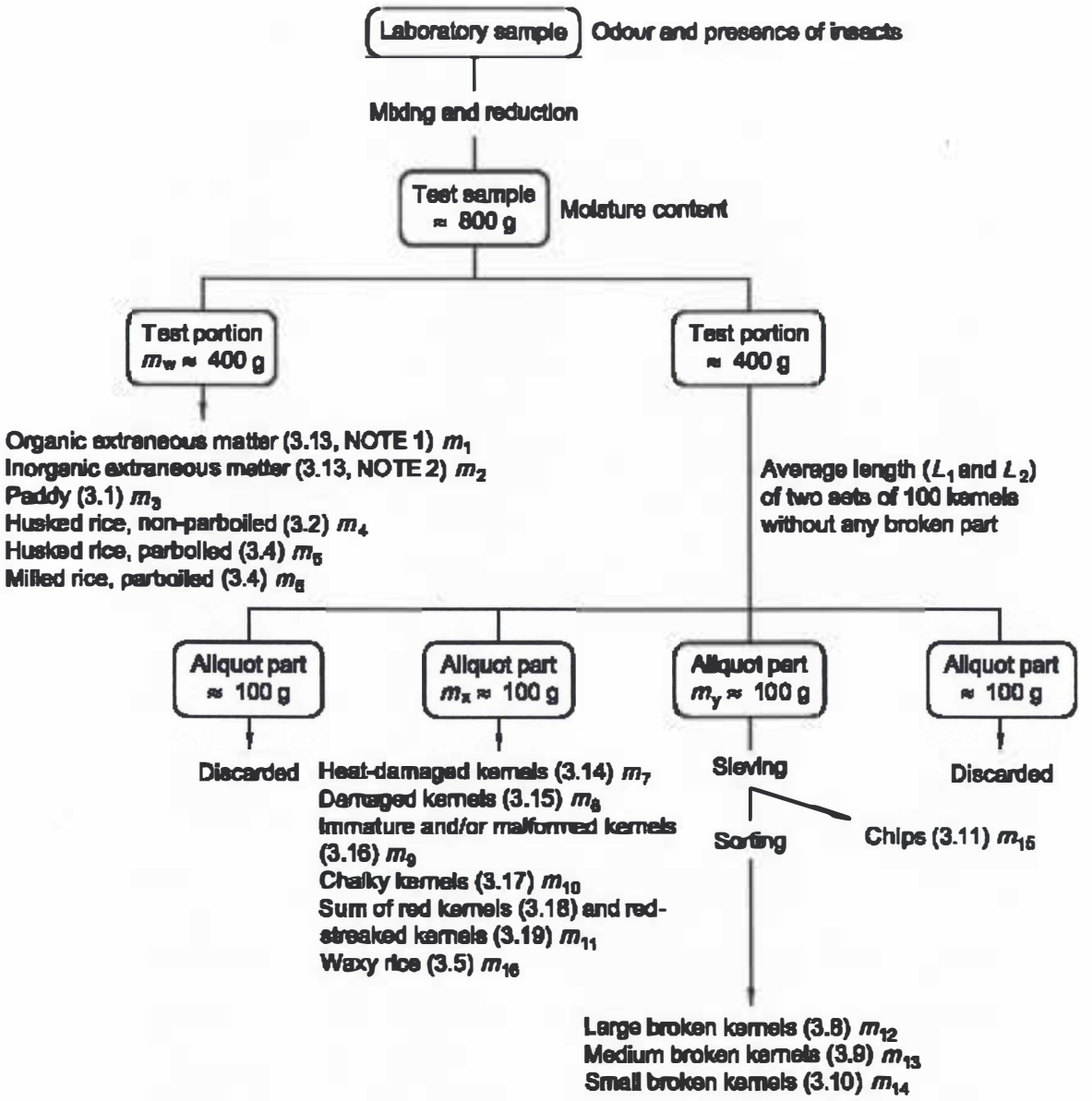



Figure A.2 — Scheme of procedure for milled rice, non-parboiled

# Determination of the potential milling yield from paddy and from husked rice

## 1 - Principle

The husk is mechanically removed from paddy. The resultant husked rice is then weighed. Next, the pericarp and germ are mechanically removed from the husked rice to a fixed reduction in mass and the resulting milled head rice is weighed.

## 2 - Normative references

ISO 6646, Rice – Determination of the potential milling yield from paddy and from husked rice.
ISO 712, Cereals and cereal products — Determination of moisture content — Routine reference method.
ISO 7301, Rice — Specification.

## 3 - Terms and definitions

All the following terms and definitions are given in ISO 7301.

**3.1 husked rice yield :** amount of husked rice obtained from paddy
**3.2 milled rice yield :** amount of milled rice (head rice, broken kernels and chips) obtained from paddy or husked rice
**3.3 milled head rice yield :** amount of milled head rice obtained from paddy or husked rice

## 4 - Apparatus

Usual laboratory apparatus and, in particular, the following :

**4.1 Sample divider**, conical sampler or multiple-slot sampler with distribution system.

**4.2 Testing husker**, suitable for removal of the husk from paddy without damaging the kernels.

**4.3 Abrasive testing mill**, suitable for removal of the pericarp and germ from husked rice.

**4.4 Small bowls.**

**4.5 Balance**, capable of weighing to the nearest 0,01 g.

## 5 - Preparation of test sample

It is important the laboratory receive a sample which is truly representative and has not been damaged or changed during transport or storage.

The laboratory sample shall have a mass of not less than 1,5 kg.
Carefully mix the laboratory sample to make it as homogeneous as possible, then reduce it through a sample divider to obtain the test sample.
Determine the moisture content of the test sample according to ISO 712. The acceptance range is a mass fraction of (13,0 _ 1,0) %.
If the moisture content is outside the acceptance range, the laboratory sample should be conditioned at ambient temperature and humidity for a sufficient period to obtain a moisture content within the specified range.

# 6 - Procedure

## 6 - 1 - Adjustment of equipment

**Testing husker adjustment**
Adjustment of the test equipment shall be carried out prior to the determination.
The testing husker shall be considered correctly adjusted when, subsequent to dehusking of rice samples with grain dimensions similar to those of the laboratory sample, the following are not present :

- husked rice with damage to the pericarp,
- grains of paddy or husked rice in the separated husk,
- a lot of husk particles in the husked rice.

**Testing mill adjustment**
Adjustment of the test equipment shall be carried out prior to the determination.
Adjust the testing mill by milling rice samples of grain dimensions similar to those of the laboratory sample in order to remove a mass fraction of ($f$ ±0,5) % of the husked rice so that the mass of milled head rice minus the mass of milled whole kernels is ≤ 3,0 % (head rice includes whole kernels). The value of $f$ shall be agreed by the parties involved.

## 6 - 2 - Determination of husked rice yield (Figure A.1)

a - Take the test sample and divide it to give a portion suitable for the equipment. Weigh it to the nearest 0,01 g.
b - Spread the paddy and remove any extraneous matter.
c - Dehusk the paddy in the testing husker. If a lot of grains of paddy are not dehusked, they shall be separated from the husked rice and passed through the testing husker again.
d - Weigh the total yield of husked rice to the nearest 0,01 g.

## 6 - 3 - Determination of milled head rice yield

### 6 – 3 – 1 - Starting from paddy or parboiled paddy (Figure A.2)

a - Operate according to 6.2 to obtain the husked rice.
b - Divide the husked rice to give a portion suitable for the equipment. Weigh and record the mass to nearest 0,01 g. A minimum of 100 g is recommended.
c - Thoroughly clean the testing mill. Introduce the husked rice sample and mill it for the time necessary to remove the mass fraction ($f$ _ 0,5) % of its total mass. The milling time has to be predetermined by trials on each test sample.
d - Weigh the obtained milled rice and record the mass to the nearest 0,01 g.
e - Separate the head rice from the broken kernels and place the two fractions in separate bowls.
f - Weigh the head rice and record the mass to the nearest 0,01 g.

### 6 – 3 – 2 - Starting from husked rice or from husked parboiled rice (Figure A.3)

a - Take the test sample and divide it to give a portion suitable for the equipment. Weigh it to the nearest 0,01 g. A minimum of 100 g is recommended.
b - Spread the husked rice and remove any extraneous matter.
c - Continue as given in 6.3.1.c

## 7 - Expression of results

Calculate the results as quotients to four decimal places according to Table 1.

**Table 1 — Calculation of milling yields**

| Yield | Mass (m) of test portion starting from paddy | Mass (m) of test portion starting from husked rice [a] |
|---|---|---|
| $Y_0$ (husked rice) | $m_v/m_x$ | $m_z/m_y$ |
| $Y_1$ (milled rice) | $m_1/m_w$ | $m_1/m_z$ |
| $Y_2$ (milled head rice) | $m_2/m_w$ | $m_2/m_z$ |
| [a] Including extraneous matter | | |

Refer to the scheme of the procedure given in Figure A.1 or A.2 for paddy; Figure A.3 for husked rice.

Express the results of yields as percentages, referred to the starting material, as follows:

- potential yield of husked rice ($Y_h$), $Y_h = Y_0 \times 100\ \%$
- potential yield of milled rice ($Y_m$), $Y_m = Y_0\ (100-f)\ \%$
- potential yield of milled head rice ($Y_{mh}$), $Y_{mh} = Y_0 Y_2\ (100-f)/Y_1\ \%$

**Calculate the results for each category to two decimal places, and report them to the nearest 0,1 %.**

## 8 – Precision

**Repeatability**
The absolute difference between two independent single test results, obtained using the same method on identical test material in the same laboratory by the same operator using the same equipment within a short interval of time, will in not more than 5 % of cases :

- for husked rice, 1 %
- for milled head rice, 2 %.

**Reproducibility**
The absolute differences between two single test results, obtained using the same method on identical test material in different laboratories with different operators using different equipment, will in not more than 5 % of cases :

- for husked rice, 3 %
- for milled head rice, 5 %.

## 9 - Test report

The test report shall specify :

- all information necessary for the complete identification of the sample,
- the sampling method used, if known
- the test method used, (with reference to the test method used),
- all operating details not specified in the test method used, or regarded as optional, together with details of any incidents which may have influenced the test result(s),
- the test result(s) obtained; or if the repeatability has been checked, the final quoted result obtained.

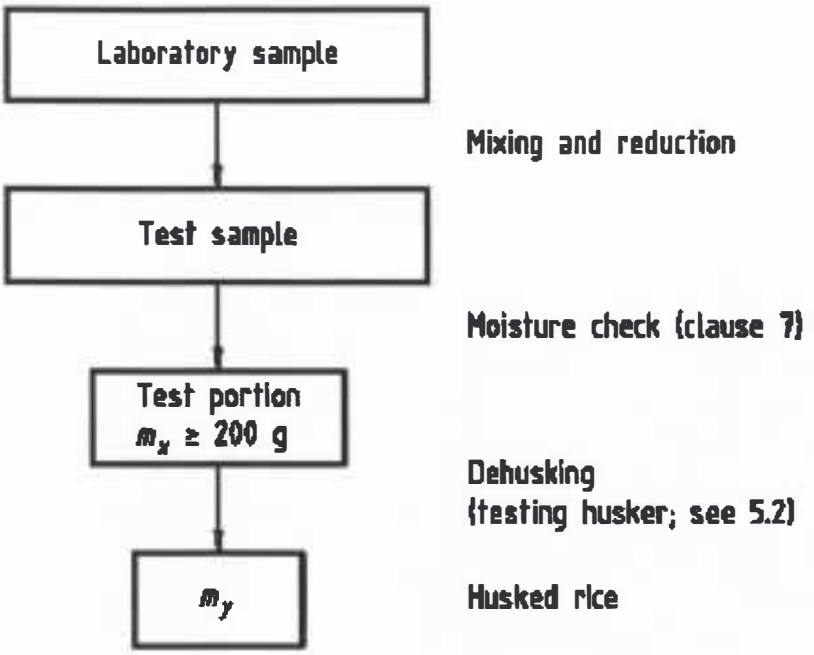



Figure A.1 — Starting from paddy or parboiled paddy: yield of husked rice

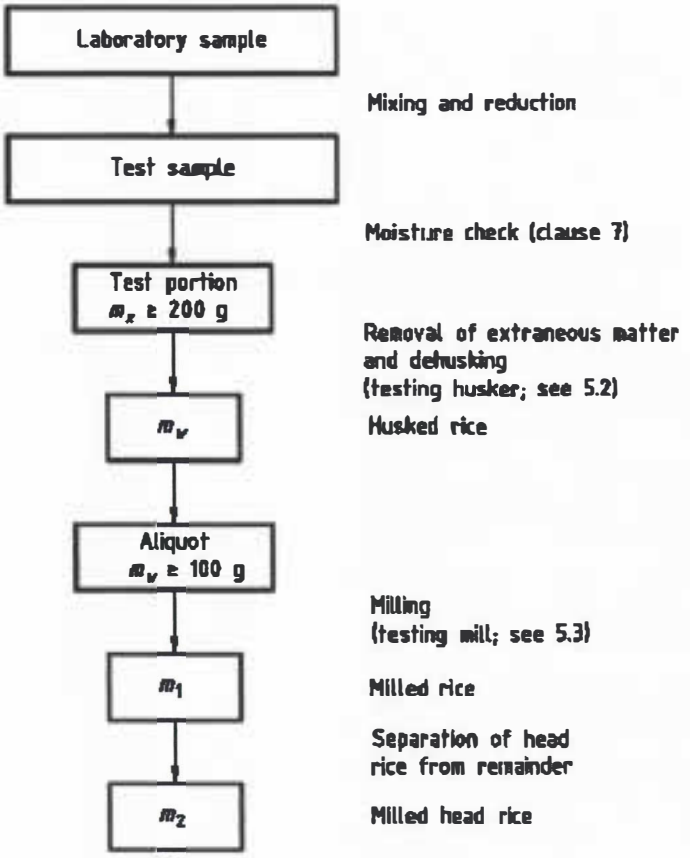



Figure A.2 — Starting from paddy or parboiled paddy: yield of husked rice, milled rice and milled head rice

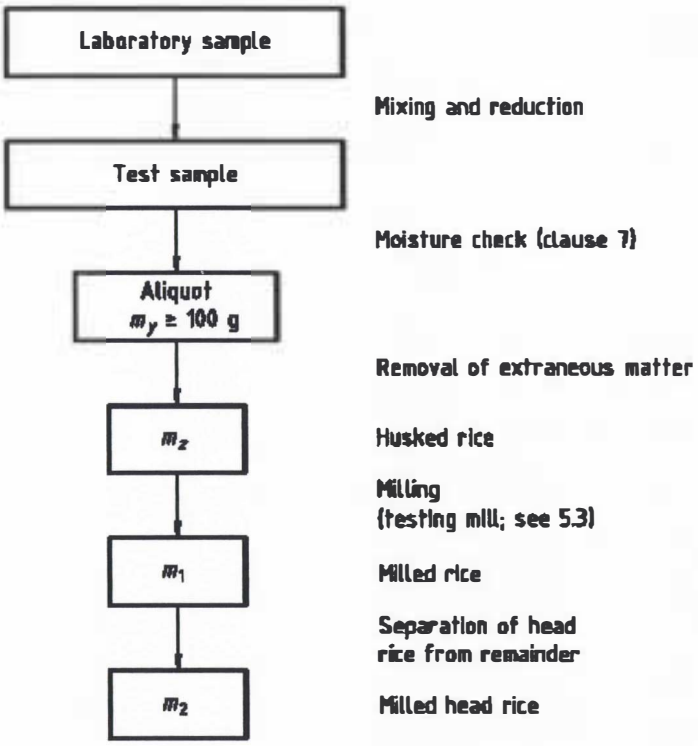



Figure A.3 —Starting from husked rice or husked parboiled rice: yield of milled rice and milled head rice

# Rice quality standards in Indonesia (BULOG)

**KEPUTUSAN KEPALA BADAN URUSAN LOGISTIK**
**NOMOR : KEP-04/KA/01/2003**

**TENTANG**

**PEDOMAN UMUM PENGADAAN DALAM NEGERI MELALUI POLA KEMITRAAN DENGAN PUSAT PENGOLAHAN PADI TERPADU (P3T)**

**KEPALA BADAN URUSAN LOGISTIK**

**Menimbang :** a. bahwa permasalahan yang dihadapi petani adalah masih kurangnya jaminan harga terhadap hasil produksi terutama pada saat puncak panen yang bersamaan dengan musim hujan;

b. bahwa Perusahaan Pengolahan Padi sebagai mediator BULOG dengan petani umumnya memiliki keterbatasan peralatan pasca panen khususnya alat/mesin pengering dan penyimpanan. Kondisi ini menyebabkan terbatasnya penyerapan produksi yang selanjutnya menekan harga jual oleh petani;

c. bahwa dengan kondisi alat/mesin pasca panen yang dimiliki Perusahaan Pengolahan Padi saat ini, kualitas gabah/beras yang dihasilkan masih kurang memuaskan;

d. bahwa dengan adanya tuntutan konsumen BULOG (Golongan anggaran, TNI/POLRI, RASKIN) terhadap beras yang berkualitas baik, perlu dilakukan pengadaan melalui pola kemitraan dengan Pusat Pengolahan Padi Terpadu (P3T);

e. bahwa untuk memenuhi sebagaimana huruf a sampai dengan d diatas perlu ditetapkan dalam Surat Keputusan KABULOG.

**Mengingat :** 1. Keputusan Presiden Republik Indonesia Nomor: 67/M Tahun 2001 tanggal 19 Pebruari 2001 tentang Pengangkatan Kepala Badan Urusan Logistik;

2. Keputusan Presiden Republik Indonesia Nomor: 103 Tahun 2001 tanggal 19 September 2001 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi dan Tata Kerja Lembaga Pemerintah Non Departemen (LPND) sebagaimana

telah diubah dengan Keppres RI Nomor 3 tahun 2002 tanggal 7 Januari 2002;

3. Keputusan Presiden Republik Indonesia Nomor: 110 Tahun 2001 tanggal 10 Oktober 2001 tentang Unit Organisasi dan Tugas Eselon I Lembaga Pemerintahan Non Departemen;
4. Keputusan Kepala Badan Urusan Logistik Nomor : Kep-20/KA/01/2002 tanggal 30 Januari 2002 tentang Organisasi dan Tata Kerja Badan Urusan Logistik;
5. Keputusan Kepala Badan Urusan Logistik Nomor : Kep-180/KA/07/2000 tanggal 14 Agustus 2000 tentang Organisasi dan Tata Kerja Depot Logistik, yang telah dirubah dengan Keputusan KABULOG Nomor: KEP-134/KA/06/2002 tanggal 27 Juni 2002.

**Memperhatikan :** Saran dan pendapat staf Badan Urusan Logistik

**M E M U T U S K A N :**

**Menetapkan : KEPUTUSAN KEPALA BADAN URUSAN LOGISTIK TENTANG PEDOMAN UMUM PENGADAAN DALAM NEGERI MELALUI POLA KEMITRAAN DENGAN PUSAT PENGOLAHAN PADI TERPADU (P3T).**

**Pasal 1**
**PENGERTIAN**

Yang dimaksud dengan:

1. Kemitraan adalah hubungan pembeli dengan pemasok dalam suatu derajat kerja sama yang saling percaya mempercayai serta memanfaatkan keahlian/kelebihan setiap mitra usaha, untuk terciptanya keterpaduan. Dengan kata lain kemitraan adalah kerja sama yang saling menguntungkan satu sama lain.
2. Pusat Pengolahan Padi Terpadu (P3T) adalah suatu unit usaha baik berupa Koperasi atau Perusahaan yang memiliki sarana pasca panen padi secara terpadu, antara lain : alat/mesin Pembersihan, Pengeringan, Penggilingan, Penyimpanan, Pengepakan dan Transportasi dalam satu lokasi atau minimal berdekatan.
3. Mitra Kerja adalah suatu unit usaha baik berupa koperasi atau perusahaan yang berbadan hukum serta memenuhi syarat sebagai Pusat Pengolahan Padi Terpadu yang bersedia melakukan kerja sama dengan BULOG di dalam pengadaan gabah petani dan selanjutnya diolah menjadi beras berkualitas.

   Pengadaan Dalam Negeri pola kemitraan dengan Pusat Pengolahan Padi Terpadu (P3T) adalah pemberian kontrak pengadaan gabah dalam jumlah

tertentu kepada mitra kerja BULOG, untuk menjamin kelangsungan kerja mitra tersebut dalam jangka waktu tertentu.

## Pasal 2
## TUJUAN UTAMA KERJA SAMA

1. Meningkatkan daya serap kontraktor pengadaan dalam negeri melalui pola kemitraan sehingga menjamin pemasaran hasil produksi petani pada tingkat Harga Dasar Pembelian Pemerintah (HDPP), khususnya pada saat puncak panen yang bersamaan dengan musim hujan.
2. Meningkatkan kualitas dan kuantitas gabah/beras hasil olah P3T sehingga secara tidak langsung menunjang peningkatan produksi nasional.
3. Memberikan nilai tambah dari hasil samping pengolahan padi berupa peningkatan kualitas dedak dan katul.
4. Mengoptimalkan kinerja Perusahaan Penggilingan Padi milik Koperasi dan Swasta yang memenuhi persyaratan P3T sehingga efisiensi di bidang pasca panen dapat ditingkatkan.
5. Dengan adanya P3T secara tidak langsung merangsang petani untuk menggunakan benih unggul berlabel khususnya yang diproduksi oleh Lembaga Benih Nasional sehingga pada gilirannya meningkatkan produktivitas dan kualitas padi nasional.

## Pasal 3
## PERSYARATAN STANDAR PERUSAHAAN PENGOLAHAN PADI (P3T)

1. Memiliki alat/mesin pembersih gabah (paddy cleaner/winnower) dengan kapasitas tertentu yang digunakan untuk membersihkan gabah hasil pembelian produksi petani dan gabah hasil pengeringan.
2. Memiliki alat/mesin pengering (dryer) dan atau lantai jemur yang digunakan untuk mengeringkan gabah hasil pembelian produksi petani. Kapasitas dryer minimal 15 ton/hari dan lantai jemur minimal 25 ton/hari.
3. Memiliki alat/mesin pengolahan padi (dan operatornya) yang dapat menghasilkan beras berkualitas dengan peralatan minimal sebagai berikut : Pembersih awal (Pre Cleaner), Pemisah batu (Destoner), Pemecah Kulit (Husker), Pemisah Gabah dengan Beras Pecah Kulit (Separator), Penyosoh bertingkat (Multi Polisher), Pemutih (Whitener), Pemisah Kualitas (Grader), Timbangan (Weighing), Pengepakan (Packaging). Kapasitas Penggilingan Padi 2 ton/jam sampai dengan 5 ton/jam GKG.
4. Memiliki sarana gudang penyimpanan baik untuk gabah hasil pembelian maupun untuk gabah yang telah dikeringkan dan beras hasil olah. Gudang tersebut harus terpisah bangunannya sehingga memudahkan kontrol barang milik BULOG. Kapasitas gudang minimal yang harus dimiliki adalah 1.000 ton, sedangkan bagi P3T yang kapasitas gudangnya masih dibawah persyaratan dapat menyimpan di gudang DOLOG.

5. Memiliki dan atau menguasai sarana transportasi untuk menunjang kegiatan operasional Pusat Pengolahan Padi Terpadu (P3T).

**Pasal 4**
**PERSYARATAN MITRA KERJA**

1. Mempunyai Badan Hukum dan Nomor Pokok Wajib Pajak (NPWP) serta memiliki Surat Izin Tempat Usaha (SITU), Surat Izin Usaha Perdagangan (SIUP), Surat Izin Pendirian Penggilingan Padi (SIPPP) serta surat keterangan tidak mengganggu lingkungan (HO).
2. Memiliki sarana pasca panen seperti yang disyaratkan sebagai Pusat Pengolahan Padi Terpadu (P3T) sebagaimana Pasal 3.
3. Bersedia mengikuti seluruh peraturan dan ketentuan Pengadaan Gabah dan Beras Dalam Negeri BULOG yang berlaku, yaitu : Penetapan Kebijakan Perberasan, Persyaratan Kualitas Gabah/Beras Untuk Pengadaan Dalam Negeri, Harga Pembelian Gabah Oleh Kontraktor Pengadaan Gabah/Beras Dalam Negeri Dari Petani/Kelompok Tani dan Pengolahan/Giling Gabah Dalam Negeri.
4. Melaksanakan pembelian gabah kering panen langsung kepada petani dengan harga dasar pembelian yang ditetapkan oleh Pemerintah. Pembayaran diupayakan dengan menggunakan fasilitas Bank sehingga keamanan terjamin dan kontrol pembelian dapat dilakukan.
5. Memprioritaskan membeli gabah petani yang berasal dari benih yang berlabel sesuai ketentuan yang dikeluarkan oleh BULOG kecuali pada kondisi tertentu. Hasil pembelian gabah dari petani di kelompokkan berdasarkan varietas.
6. Bersedia memberikan jaminan berupa aset bergerak/tidak bergerak (akte notariat dengan biaya mitra) pada kegiatan pengadaan dan giling gabah dalam negeri.
7. Memiliki rekening di salah satu Bank yang ditunjuk oleh BULOG untuk memudahkan pembayaran dan mutasi keuangan.
8. Bersedia melakukan kerja sama hanya dengan BULOG untuk menghindari kemungkinan tertukarnya barang milik BULOG dengan barang milik pihak lain.

**Pasal 5**
**KOMPENSASI BAGI MITRA KERJA**

1. Mitra kerja diberikan kontrak pengadaan gabah dengan kuantum antara **4.000** ton sampai dengan **15.000** ton GKG per tahun dengan mengacu pada kapasitas gilingnya, dan mengolah GKG hasil pengadaan tersebut sampai menjadi beras sesuai kualitas yang ditentukan.
2. Gabah Kering Giling hasil produksi P3T sebelum diolah menjadi beras disimpan di gudang P3T tanpa sewa, dengan syarat kondisi dan pengelolaan gudang tersebut sesuai peraturan pergudangan BULOG.

3. Bagi Koperasi atau Perusahaan Pengolahan Padi yang memenuhi persyaratan sebagai P3T dan dapat menghasilkan beras kualitas diatas SNI mutu III akan diberikan premi mutu dengan nilai sesuai kesepakatan bersama untuk merangsang P3T milik Koperasi atau Perusahaan Pengolahan Padi menghasilkan beras kualitas tersebut.
4. Pada kesempatan tertentu dapat diikutkan dalam program pelatihan peningkatan kualitas pengolahan padi yang dilaksanakan oleh BULOG atau instansi lain pada bidang yang sama, dan secara periodik dilakukan pertemuan untuk membahas usaha dan teknologi yang dapat meningkatkan kualitas dan kuantitas pengadaan dalam negeri.
5. Pengawasan terhadap kemungkinan terjadinya penyimpangan peraturan dan ketentuan disediakan saluran pengaduan di SUBDOLOG, DOLOG maupun BULOG.

**Pasal 7**
**PEMILIHAN MITRA KERJA**

1. Koperasi dan atau Perusahaan Pengolahan Padi yang telah beroperasi pada bidang ini minimal 3 (tiga) tahun dan memenuhi persyaratan sebagaimana pasal 4 dapat menjadi calon mitra kerja BULOG.
2. Mengajukan permohonan kerjasama secara tertulis ke DOLOG dengan rekomendasi dari SUBDOLOG dengan melampirkan seluruh persyaratan yang dibutuhkan sebagai calon mitra kerja BULOG.
3. Pihak DOLOG menginventarisasi keseluruhan para calon mitra kerja di wilayahnya serta selanjutnya mengusulkan ke BULOG untuk diadakan verifikasi sesuai dengan persyaratan yang telah ditetapkan.
4. Berdasarkan usulan tersebut ayat 3 Tim BULOG melakukan verifikasi kebenaran permohonan dari calon mitra kerja dengan cara peninjauan langsung ke lapangan dan selanjutnya mengusulkan ke pimpinan BULOG untuk disahkan (akreditasi) sebagai mitra kerja BULOG di bidang pengadaan dalam negeri.
5. Pengesahan mitra kerja pengadaan dalam negeri yang berlaku selama 1 (satu) tahun ditetapkan dengan Surat Keputusan Kepala Badan Urusan Logistik atau pejabat lain yang diberi wewenang untuk itu.

**Pasal 8**
**JAMINAN**

1. Pada dasarnya setiap Kontraktor Pengadaan DN harus mempunyai jaminan sesuai dengan yang ditetapkan (pada SK KaBULOG tentang Juklak ADA gabah dan beras DN dan SK Pengolahan/Giling Gabah DN).

   Khusus Kontraktor Mitra Kerja BULOG yang memperlihatkan etiket baik dalam kemitraan, jaminan yang dipersyaratkan (pada SK KaBULOG tentang Juklak ADA gabah dan beras DN dan SK Pengolahan/Giling Gabah DN) dapat berupa

asset perusahaan baik yang bergerak maupun yang tidak bergerak yang dilegalisir oleh notaris yang disepakati antara BULOG dengan mitra kerja.

**Pasal 9**
**TATACARA PEMERIKSAAN KUALITAS BARANG**

1. Pada dasamya tatacara pemeriksaan kualitas gabah/beras juga berlaku pada Kontraktor Pengadaan Dalam Negeri Pola Kemitraan sesuai SK KaBULOG tentang Tatacara Teknis Pemeriksaan Kualitas Gabah, Beras dan Karung Plastik Dalam Rangka Pengadaan Dalam Negeri.
2. Dengan pertimbangan bahwasanya personil surveyor kualitas mengikuti seluruh proses, baik pengeringan, pembersihan dan giling gabah yang dilakukan oleh Kontraktor Pola Kemitraan, maka pengambilan contoh cukup dengan contoh analisa (250 gram untuk gabah dan 100 gram untuk beras) yang dilakukan setiap jam secara acak (tidak ditetapkan waktunya).
3. Selanjutnya contoh analisa tersebut diadakan pemeriksaan kualitas sesuai ketentuan SK KaBULOG tentang Tatacara Teknis Pemeriksaan Kualitas Gabah, Beras dan Karung Plastik Dalam Rangka Pengadaan Dalam Negeri untuk menentukan diterima tidaknya gabah/beras milik Kontraktor Mitra Kerja.
4. Khusus gabah/beras produksi Kontraktor Mitra Kerja pe-label-an dilakukan dengan cara mencetak pada kemasan (karung plastik) bagian belakang. Ukuran label yaitu panjang 24 cm dan lebar 16 cm agar lebih jelas dan dapat dilacak kembali bilamana diperlukan.

**Pasal 10**
**PENGAWASAN, MONITORING DAN PELAPORAN**

1. Untuk mengawasi arus barang (gabah/beras) khususnya yang telah menjadi milik BULOG dan di simpan atau di olah di P3T, DOLOG/SUBDOLOG/Gudang dapat menempatkan satu atau lebih personil sebagai wakil pemilik barang.
2. Berdasarkan laporan perkembangan usaha P3T dari SUBDOLOG, DOLOG melakukan evaluasi kinerja dari mitra kerja. Apabila dari evaluasi tersebut dinyatakan kegiatan P3T cendrung merugikan pihak BULOG, maka DOLOG segera mengajukan ke BULOG untuk meminta pembatalan kerja sama.
3. Evaluasi perkembangan P3T dilakukan setiap tahun oleh BULOG dan dapat melibatkan Perguruan Tinggi setempat.

**Pasal 11**
**PROYEK PERCONTOHAN**

1. BULOG belum pernah melaksanakan proyek sejenis, dan untuk menerapkan konsep ini secara Nasional perlu dilakukan secara bertahap. Oleh karena itu pada tahap awal kerja sama sejenis akan di kategorikan sebagai Proyek Percontohan.
2. Untuk tahun 2003 program kerja sama sejenis dengan kategori Proyek Percontohan dapat dilakukan di berbagai sentra produksi sesuai dengan

kemampuan manajemen BULOG untuk mencermati dan mensukseskan pelaksanaannya.

3. Apabila pola kerja sama sebagaimana butir 2 diatas (Proyek Percontohan) berhasil dengan berbagai perbaikan operasional yang diperlukan, maka model kerja sama ini akan di berlakukan secara nasional.
4. Untuk tahap awal proyek percontohan akan dilakukan di lokasi Jawa Timur, Jawa Tengah, Jawa Barat, Jakarta dan Sulawesi Selatan.

**Pasal 12**
**ORGANISASI PROYEK**

1. Pelaksanaan proyek percontohan ini di bawah binaan Deputi Operasi (Deops) beserta jajarannya baik di pusat maupun di daerah.
2. Penentuan pemilihan Mitra Kerja dilakukan oleh Deputi Operasi atas nama Kepala Badan Urusan Logistik atas rekomendasi Kepala Depot Logistik.
3. Perjanjian Kerja Sama dilakukan di tingkat Kabupaten antara Kepala Sub Depot Logistik dengan Pimpinan Mitra Kerja. Secara periodik diadakan pertemuan untuk melakukan evaluasi perkembangan pelaksanaan proyek percontohan.
4. SUBDOLOG sebagai aparat pelaksana lapangan setiap saat memonitor perkembangan usaha proyek percontohan dan melaporkan perkembangannya.

**Pasal 13**
**PENUTUP**

Keputusan ini berlaku sejak tanggal ditetapkan dengan ketentuan apabila di kemudian hari ternyata terdapat kekeliruan dan atau kesalahan dalam keputusan ini, maka akan diadakan perubahan sebagaimana mestinya.

**Ditetapkan di : Jakarta**
**Pada tanggal :** 15 Januari 2003

**BADAN URUSAN LOGISTIK**
**KEPALA,**

BADAN URUSAN LOGISTIK KEPALA

**WIDJANARKO PUSPOYO, MA**

**KEPUTUSAN BERSAMA**
**KEPALA BADAN BIMAS KETAHANAN PANGAN**
**DEPARTEMEN PERTANIAN REPUBLIK INDONESIA DAN**
**KEPALA BADAN URUSAN LOGISTIK**

**Nomor : 02/SKB/BBKP/I/2003 Tanggal 16 Januari 2003**
**KEP-08/UP/01/2003**

**TENTANG**

**HARGA PEMBELIAN GABAH OLEH KONTRAKTOR PENGADAAN GABAH/BERAS DALAM NEGERI DARI PETANI/KELOMPOK TANI**

**BADAN BIMAS KETAHANAN PANGAN**
**DEPARTEMEN PERTANIAN REPUBLIK INDONESIA DAN**
**BADAN URUSAN LOGISTIK**

**Menimbang** : bahwa dalam rangka memberikan dukungan bagi peningkatan produktivitas petani padi dan produksi beras nasional, dipandang perlu menetapkan pedoman harga pembelian gabah dari petani/ kelompok tani oleh Kontraktor Pengadaan Gabah/Beras Dalam Negeri di tingkat Penggilingan. Pedoman tersebut disusun dengan memperhatikan harga dasar pembelian yang berlaku dan ditetapkan dengan Keputusan Bersama antara Kepala Badan Bimas Ketahanan Pangan Departemen Pertanian Republik Indonesia dan Kepala Badan Urusan Logistik.

**Mengingat** :

1. Keputusan Presiden Republik Indonesia Nomor 102 Tahun 2001 tanggal 13 September 2001 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi, dan Tata Kerja Departemen;
2. Keputusan Presiden Republik Indonesia Nomor 110 Tahun 2001 tentang Unit Organisasi dan Tugas Eselon I Lembaga Pemerintah Non Departemen Sebagaimana telah diubah dengan Keppres RI Nomor 5 tahun 2002 tanggal 7 Januari 2002;
3. Keputusan Presiden Republik Indonesia Nomor 103 Tahun 2001 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi dan Tata Kerja Lembaga Pemerintah Non Departemen sebagaimana telah diubah dengan Keppres Nomor 3 tahun 2002 tanggal 7 Januari 2002;
4. Instruksi Presiden Republik Indonesia Nomor 9 Tahun 2002 tanggal 31 Desember 2002 tentang Penetapan Kebijakan Perberasan;
5. Keputusan Menteri Pertanian Nomor: 01/Kpts/OT.210/I/2001 tentang Organisasi dan Tata Kerja Departemen Pertanian;

6. Keputusan KABULOG Nomor: KEP-20/KA/01/2002 tanggal 30 Januari 2002 tentang Organisasi dan Tata Kerja Badan Urusan Logistik;
7. Keputusan KABULOG Nomor: KEP-180/KA/08/2000 tanggal 14 Agustus 2000 tentang Organisasi dan Tata Kerja Depot Logistik, yang telah dirubah dengan Keputusan KABULOG Nomor: KEP-134/KA/06/2002 tanggal 27 Juni 2002.

**Memperhatikan:** Saran-saran dan pendapat staf Badan Bimas Ketahanan Pangan Departemen Pertanian Republik Indonesia dan Badan Urusan Logistik (BULOG).

**MEMUTUSKAN :**

**Menetapkan :** **KEPUTUSAN BERSAMA KEPALA BADAN BIMAS KETAHANAN PANGAN DEPARTEMEN PERTANIAN REPUBLIK INDONESIA DAN KEPALA BADAN URUSAN LOGISTIK TENTANG HARGA PEMBELIAN GABAH OLEH KONTRAKTOR PENGADAAN GABAH/BERAS DALAM NEGERI DARI PETANI/KELOMPOK TANI.**

**Pasal - 1**
**Pengertian-Pengertian**

Dalam Keputusan ini yang dimaksud dengan :

1. Gabah adalah hasil tanaman padi yang telah dilepaskan dari tangkainya dengan cara perontokan.
2. Gabah Kering Panen (GKP) adalah gabah yang mengandung kadar air lebih besar dari 18% tetapi lebih kecil atau sama dengan 25% (18%<KA≤25%), hampa/kotoran lebih besar dari 6% tetapi lebih kecil atau sama dengan 10% (6%<HK≤10%), butir hijau/mengapur lebih besar dari 7% tetapi lebih kecil atau sama dengan 10% (7%<HKp≤10%), butir kuning/rusak maksimal 3% dan butir merah maksimal 3%.

   Gabah Kering Simpan (GKS) adalah gabah yang mengandung kadar air lebih besar dari 14% tetapi lebih kecil atau sama dengan 18% (14%<KA≤18%), hampa/kotoran lebih besar dari 3% tetapi lebih kecil atau sama dengan 6% (3%<HK≤6%), butir hijau/mengapur lebih besar dari 5% tetapi lebih besar atau sama dengan 7% (5%<HKp≤7%), butir kuning/rusak maksimal 3% dan butir merah maksimal 3%.

   Gabah Kering Giling (GKG) adalah gabah yang mengandung kadar air maksimal 14%, hampa/kotoran maksimal 3%, butir hijau/mengapur maksimal 5%, butir kuning/rusak maksimal 3% dan butir merah maksimal 3%.

   Harga di tingkat gudang Bulog adalah harga di depan pintu gudang Bulog sesuai dengan Harga Dasar Pembelian yang ditetapkan dalam diktum ketiga Inpres Nomor 9 tahun 2002 tentang Penetapan Kebijakan Perberasan.

   Harga di tingkat Penggilingan adalah harga di lokasi gudang-gudang penampungan/pengolahan yang dikuasai oleh Kontraktor Pengadaan Dalam Negeri baik Koperasi maupun Non Koperasi yang selanjutnya disebut dengan "Kontraktor

ADA DN", dimana Kontraktor tersebut dapat membeli gabah/beras dari petani/kelompok tani dan dapat mengolahnya sampai memenuhi persyaratan kualitas yang ditetapkan.

7. Harga di tingkat petani adalah harga di tempat terjadinya transaksi jual beli antara Kontraktor ADA DN dan petani/kelompok tani di luar tempat-tempat penampungan sebagaimana disebut dalam ayat 6.

**Pasal – 2**
**Harga Pembelian**

1. Harga pembelian gabah oleh Kontraktor ADA DN kepada petani/kelompok tani di tingkat petani/kelompok tani pada berbagai tingkat kualitas (GKP, GKS dan GKG) ditetapkan minimal sesuai dengan pedoman harga dasar pembelian pemerintah (HDPP) dikurangi ongkos angkut dan biaya pengolahannya.
2. Harga pembelian Gabah Kering Giling (GKG) di depan pintu gudang BULOG dari Kontraktor Pengadaan Dalam Negeri ditetapkan sebesar Rp.**1.725**,-/kg (seribu tujuh ratus dua puluh lima rupiah per kilogram).
3. Harga pembelian Gabah Kering Giling (GKG) di tingkat penggilingan oleh Kontraktor Pengadaan Dalam Negeri kepada petani/kelompok tani ditetapkan sebesar Rp.**1.700**,-/kg.
4. Harga pembelian Gabah Kering Simpan (GKS) di tingkat penggilingan oleh Kontraktor Pengadaan Dalam Negeri kepada petani/kelompok tani ditetapkan sebesar Rp.**1.500**,-/kg.
5. Harga pembelian Gabah Kering Panen (GKP) di tingkat penggilingan oleh Kontraktor Pengadaan Dalam Negeri kepada petani/kelompok tani ditetapkan sebesar Rp.**1.230**,-/kg.
6. Kontraktor ADA DN harus membeli gabah dari petani/kelompok tani sesuai harga dasar pembelian gabah pada berbagai tingkat kualitas (GKP, GKS dan GKG) yang dalam pelaksanaannya dapat bekerja sama dengan Kelompok Tani/Koperasi dan UKM.
7. BULOG dapat menurunkan Satuan Tugas Operasional Pengadaan Dalam Negeri (SATGAS ADA) dan atau Unit Pengolahan Gabah & Beras (UPGB) DOLOG/SUBDOLOG untuk melakukan pembelian langsung kepada petani, yang dalam pelaksanaannya dapat bekerja sama dengan Kelompok Tani/Koperasi dan UKM.
8. Untuk kelancaran tugasnya, SATGAS ADA DN dan atau UPGB dapat dibantu oleh aparat pertanian setempat.

**Pasal – 3**
**Analisa Kualitas**

1. Untuk melakukan pembelian Gabah dari petani/kelompok tani, Kontraktor ADA DN melakukan analisa kualitas meliputi :
   a) Analisa kadar air yang diperiksa dengan menggunakan Moisture Tester yang telah ditera/telah disesuaikan dengan standar oven.

b) Kadar hampa/kotoran gabah diperiksa dengan menggunakan ayakan slot untuk gabah.

c) Untuk mengukur komponen mutu lainnya diperiksa dengan cara visual dan manual.

2. Analisa Kualitas terhadap Gabah GKG pada kegiatan Pengadaan Gabah Dalam Negeri ditingkat Gudang Bulog dilakukan oleh Surveyor Independen yang terdiri dari Surveyor Swasta dan atau Petugas Survey Dolog (PSD).

**Pasal – 4**
**Penutup**

1. Dengan ditetapkannya Keputusan Bersama ini, maka Surat Keputusan Bersama Kepala Badan Urusan Ketahanan Pangan, Departemen Pertanian Republik Indonesia, dan Kepala Badan Urusan Logistik :

Nomor : 04/SKB/BBKP/II/2002
KEP-58/UP/02/2002

tanggal 26 Pebruari 2002 tentang Harga Pembelian Gabah oleh Kontraktor Pengadaan Gabah/beras Dalam Negeri dari Petani/Kelompok Tani, dinyatakan tidak berlaku lagi.

2. Hal-hal yang belum diatur dalam Keputusan Bersama ini akan ditetapkan kemudian.

3. Keputusan bersama ini berlaku sejak tanggal ditetapkan dan apabila dikemudian hari terdapat kekeliruan dan atau kesalahan, maka akan diadakan perubahan seperlunya.

**Ditetapkan di Jakarta**
**pada tanggal 16 Januari 2003**

**DEPARTEMEN PERTANIAN R.I**
**BADAN BIMAS KETAHANAN PANGAN**
**KEPALA,**

BADAN BIMAS KETAHANAN PANGAN

**DR. Ir. Achmad Suryana**
**NIP. 080.034.254**

**a.n. KEPALA**
**BADAN URUSAN LOGISTIK**
**DEPUTI OPERASI,**

**Ir. Andi Chaeruddin**
**NIP. 780.000.046**

LAMPIRAN KEPUTUSAN BERSAMA

Nomor : 02 /SKB/BBKP/I/2003
KEP- 08 /UP/01/2003

**PERSYARATAN KUALITAS DAN HARGA PEMBELIAN GABAH (GKG, GKS DAN GKP) OLEH KONTRAKTOR ADA DN DAN SATGAS ADA DN DARI PETANI/KELOMPOK TANI DI TINGKAT PENGGILINGAN**

| HARGA PEMBELIAN DAN PERSYARATAN KUALITAS | | GKG | GKS | GKP |
|---|---|---|---|---|
| Rp/Kg | | 1.700 | 1.500 | 1.230 |
| PERSYARATAN | KUALITAS | GKG | GKS | GKP |
| Kadar Air | Maksimum | 14% | 18% | 25% |
| Butir Hampa/Kotoran | Maksimum | 3% | 6% | 10% |
| Butir Kuning/Rusak | Maksimum | 3% | 3% | 3% |
| Butir Hijau/Mengapur | Maksimum | 5% | 7% | 10% |
| Butir Merah | Maksimum | 3% | 3% | 3% |

**Keterangan :**
- **GKG** : Gabah Kering Giling.
- **GKS** : Gabah Kering Simpan.
- **GKP** : Gabah Kering Panen.

Harga pembelian Bulog untuk GKG di depan pintu gudang Bulog sebesar Rp.1.725/kg sesuai Inpres RI Nomor 9 tahun 2002 tanggal 31 Desember 2002.

Ditetapkan di Jakarta
pada tanggal 16 Januari 2003

DEPARTEMEN PERTANIAN R.I
BADAN BIMAS KETAHANAN PANGAN
KEPALA,

DR. Ir. Achmad Suryana
NIP. 080.034.254

a.n. KEPALA
BADAN URUSAN LOGISTIK
DEPUTI OPERASI,

Ir. Andi Chaeruddin
NIP.780.000.046

**KEPUTUSAN BERSAMA**
**DIREKTUR JENDERAL BINA PENGOLAHAN**
**DAN PEMASARAN HASIL PERTANIAN**
**DEPARTEMEN PERTANIAN REPUBLIK INDONESIA**
**DAN KEPALA BADAN URUSAN LOGISTIK**

**Nomor : 01/SKB/BPPHP/TP.830/2003 Tanggal 16 Januari 2003**
**KEP– 07/UP/01/2003**

**TENTANG**

**PERSYARATAN KUALITAS GABAH/BERAS**
**UNTUK PENGADAAN DALAM NEGERI TAHUN 2003**

**DIREKTUR JENDERAL BINA PENGOLAHAN**
**DAN PEMASARAN HASIL PERTANIAN**
**DEPARTEMEN PERTANIAN REPUBLIK INDONESIA**
**DAN KEPALA BADAN URUSAN LOGISTIK**

**Menimbang** :

a. bahwa dalam rangka meningkatkan pendapatan petani dan pengembangan ekonomi pedesaan, dipandang perlu untuk menetapkan Kebijaksanaan Perberasan Nasional. Pemerintah melakukan pengadaan pangan berupa Gabah/Beras, pada tingkat harga sesuai dengan Harga Dasar Pembelian yang ditetapkan.

b. bahwa hasil pengadaan tersebut dipergunakan/disimpan sebagai Cadangan Pangan Nasional yang akan disalurkan bagi kelompok masyarakat miskin (RASKIN) dan rawan pangan, Golongan Anggaran, Operasi Pasar Murni dan Bahan Baku Industri.

c. bahwa dalam rangka pengadaan gabah dan beras dalam negeri, serta guna menjamin agar cadangan gabah dan beras tersebut dalam masa penyimpanannya di gudang tidak cepat rusak, sehingga pada waktu penyalurannya dapat diterima oleh konsumen.

d. bahwa atas dasar hal tersebut diatas perlu menetapkan persyaratan kualitas dengan Keputusan Bersama antara Direktur Jenderal Bina Pengolahan dan Pemasaran Hasil Pertanian Departemen Pertanian Republik Indonesia dan Kepala Badan Urusan Logistik;

**Mengingat** :

1. Keputusan Presiden Republik Indonesia Nomor 102 Tahun 2001 tanggal 13 September 2001 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi, dan Tata Kerja Departemen;

2. Keputusan Presiden Republik Indonesia Nomor 110 Tahun 2001 tanggal 7 Januari 2001 tentang Unit Organisasi dan Tugas Eselon I Lembaga Pemerintah Non Departemen Sebagaimana telah diubah dengan Keppres RI Nomor 5 tahun 2002 tanggal 7 Januari 2002;

3. Keputusan Presiden Republik Indonesia Nomor 103 Tahun 2001 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi dan Tata Kerja Lembaga Pemerintah Non Departemen sebagaimana telah diubah dengan Keppres Nomor 3 tanggal 7 Januari 2002;
4. Instruksi Presiden Republik Indonesia Nomor 9 Tahun 2002 tanggal 31 Desember 2002 tentang Penetapan Kebijakan Perberasan;
5. Keputusan Menteri Pertanian Nomor: 01/kpts/OT.210/1/2001 tentang Organisasi dan Tata Kerja Departemen Pertanian;
6. Keputusan KABULOG Nomor: KEP-20/KA/01/2002 tanggal 30 Januari 2002 tentang Organisasi dan Tata Kerja Badan Urusan Logistik;
7. Keputusan KABULOG Nomor: KEP-180/KA/08/2000 tanggal 14 Agustus 2000 tentang Organisasi dan Tata Kerja Depot Logistik, yang telah dirubah dengan Keputusan KABULOG Nomor: KEP-134/KA/06/2002 tanggal 27 Juni 2002.

**Memperhatikan:** Saran-saran dan pendapat staf Direktorat Jenderal (DITJEN) Bina Pengolahan dan Pemasaran Hasil Pertanian (BPPHP) Departemen Pertanian Republik Indonesia dan Badan Urusan Logistik (BULOG).

## M E M U T U S K A N :

**Menetapkan :** **KEPUTUSAN BERSAMA DIREKTUR JENDERAL BINA PENGOLAHAN DAN PEMASARAN HASIL PERTANIAN DEPARTEMEN PERTANIAN REPUBLIK INDONESIA DAN KEPALA BADAN URUSAN LOGISTIK TENTANG PERSYARATAN KUALITAS GABAH/BERAS UNTUK PENGADAAN DALAM NEGERI TAHUN 2003.**

### Pasal – 1
### Pengertian-Pengertian

Dalam keputusan ini yang dimaksud dengan :

a. Gabah hasil pengadaan dalam negeri adalah gabah yang dibeli oleh Pemerintah berupa Gabah Kering Giling produksi dalam negeri yang telah memenuhi persyaratan sebagaimana yang ditentukan dalam Pasal 2 ayat 1.

b. Beras hasil pengadaan dalam negeri adalah beras yang dibeli oleh Pemerintah, berupa beras giling produksi dalam negeri yang telah memenuhi persyaratan sebagaimana yang ditentukan dalam Pasal 2 ayat 2.

## Pasal – 2
## Persyaratan Kualitas

1. Komponen persyaratan kualitas untuk gabah pengadaan dalam negeri meliputi persyaratan umum dan khusus seperti yang tercantum dalam Lampiran I Keputusan Bersama ini.
2. Komponen persyaratan kualitas untuk beras pengadaan dalam negeri meliputi persyaratan umum dan khusus seperti yang tercantum dalam Lampiran II Keputusan Bersama ini.

## Pasal – 3
## Pembelian Oleh Kontraktor Pengadaan Dalam Negeri

1. Kontraktor Pengadaan Dalam Negeri (Kontraktor ADA DN) akan membeli gabah/beras dari petani disekitar lokasi Usaha Penggilingan Padi yang lokasinya ditentukan oleh DOLOG bersama Dinas Pertanian setempat pada berbagai tingkat kualitas dengan harga sesuai ketentuan yang berlaku.
2. Kontraktor ADA DN diutamakan perusahaan penggilingan padi yang mempunyai kerjasama kemitraan dengan petani padi.
3. Kontraktor ADA DN akan mengolah gabah/beras hasil pembelian dari petani/kelompok tani, sehingga gabah/beras tersebut memenuhi persyaratan kualitas.
4. Harga yang berlaku pada tiap tingkat kualitas pembelian gabah oleh Kontraktor ADA DN ditetapkan bersama antara Badan Bimas Ketahanan Pangan (BBKP) Departemen Pertanian RI dan Badan Urusan Logistik (BULOG).

## Pasal – 4
## Pembelian Oleh Bulog

1. BULOG akan melakukan pembelian Gabah Kering Giling seperti tersebut dalam Pasal 1 huruf a dari Kontraktor ADA DN sesuai dengan kebutuhan dengan harga pembelian yang ditetapkan dalam diktum ketiga INPRES RI Nomor 9 Tahun 2002.
2. BULOG akan melakukan pembelian beras seperti tersebut dalam Pasal 1 huruf b dari Kontraktor ADA DN sesuai dengan kebutuhan dengan harga pembelian yang ditetapkan dalam diktum ketiga INPRES RI Nomor 9 Tahun 2002.
3. Pembelian Gabah Kering Giling dan Beras diluar ketentuan diktum ketiga INPRES RI Nomor 9 Tahun 2002 (termasuk beras pecah kulit) untuk keperluan pemupukan persediaan/cadangan pangan nasional, akan ditetapkan tersendiri oleh Kepala Badan Urusan Logistik (KABULOG) sesuai dengan harga pasar yang berlaku.
4. Tata Cara Pelaksanaan Pengadaan Gabah/Beras serta Tata Cara Pemeriksaan Kualitas Gabah/Beras ditetapkan oleh KABULOG.

## Pasal – 5
## Pembinaan Pra dan Pasca Panen

1. Program peningkatan produksi pangan serta penanganan pra dan pasca panen diarahkan melalui berbagai upaya terpadu untuk dapat mencapai kualitas yang ditetapkan dalam Keputusan Bersama ini.
2. Pembinaan pra dan pasca panen ditingkat petani/kelompok tani dan penggilingan padi dilaksanakan oleh Dinas Pertanian setempat, DOLOG/SUBDOLOG dan instansi lainnya yang terkait.

## Pasal – 6
## Penutup

1. Dengan ditetapkannya Keputusan Bersama ini, maka Surat Keputusan Bersama Direktur Jenderal Bina Pengolahan dan Pemasaran Hasil Pertanian Departemen Pertanian Republik Indonesia dan Kepala Badan Urusan Logistik :

   Nomor : 17/SKB/BPPHP/II/2002
   KEP-57/UP/02/2002

   tanggal 26 Pebruari 2002, tentang Persyaratan Kualitas Gabah/Beras untuk Pengadaan Dalam Negeri Tahun 2002, dinyatakan tidak berlaku lagi.
2. Hal-hal yang belum diatur dalam Keputusan Bersama ini akan ditetapkan kemudian.
3. Keputusan Bersama Ini mulai berlaku sejak tanggal ditetapkan, dan apabila dikemudian hari terdapat kekeliruan dan atau kesalahan akan diadakan perbaikan seperlunya.

**Ditetapkan di Jakarta**
**pada tanggal 16 Januari 2003**

**DEPARTEMEN PERTANIAN R.I**
**DIREKTUR JENDERAL**
**BINA PENGOLAHAN DAN PEMASARAN**
**HASIL PERTANIAN,**

**DR. Ir. Iskandar Andi Nuhung, MS**
**NIP: 080.034.535**

**a.n. KEPALA**
**BADAN URUSAN LOGISTIK**
**DEPUTI OPERASI,**

**Ir. Andi Chaeruddin**
**NIP: 780.000.046**

LAMPIRAN – I

KEPUTUSAN BERSAMA
Nomor : 01/SKB/BPPHP/TP.830/2003 Tanggal 16 Januari 2003
KEP-07/UP/01/2003

## PERSYARATAN KUALITAS GABAH PENGADAAN DALAM NEGERI TAHUN 2003

### I. Persyaratan Umum :

1. Bebas hama dan penyakit yang hidup;
2. Bebas bau busuk, asam atau bau-bau asing lainnya;
3. Bebas dari tanda-tanda adanya bahan kimia yang membahayakan baik secara visual maupun secara organoleptik;

### II. Persyaratan Khusus :

| No. | Komponen Mutu | | Satuan | Mutu GKG |
|---|---|---|---|---|
| 1. | Kadar air | Maksimum | (%) | 14 |
| 2. | Butir Hampa/Kotoran | Maksimum | (%) | 3 |
| 3. | Butir Kuning/Rusak | Maksimum | (%) | 3 |
| 4. | Butir Hijau/Mengapur | Maksimum | (%) | 5 |
| 5. | Butir Merah | Maksimum | (%) | 3 |

## A. PENGERTIAN KOMPONEN KUALITAS GABAH UNTUK PENGADAAN DALAM NEGERI TAHUN 2003

### I. Persyaratan Umum :

1. Hama dan Penyakit.
   Ada/tidaknya kehadiran hama (serangga hama, ulat dsb) dan/atau penyakit (cendawan dsb) yang hidup dan terdapat pada contoh gabah yang diperiksa. Bebas hama/penyakit berarti secara visual tidak ditemui hama/penyakit yang hidup dalam contoh gabah yang diperiksa (contoh primer). Bangkai serangga hama dikategorikan sebagai kotoran (lihat butir B.II.3.b. pengertian ini).

2. B a u.
   Menyangkut bau yang dapat ditangkap oleh indra penciuman (hidung) pada contoh gabah yang diperiksa. Bau yang ditolak adalah bau busuk, asam atau bau-bau asing lainnya yang jelas berbeda dengan bau gabah yang sehat.

3. Bahan Kimia.
   Sisa-sisa bahan kimia seperti pupuk, insektisida, fungisida dan bahan-bahan kimia lainnya yang membahayakan kesehatan/keselamatan manusia.

## II. Persyaratan Khusus :

1. Gabah Kering Giling (GKG).
   Hasil tanaman padi *(Oryzae sativa L)* yang telah dilepas dari tangkainya dengan cara perontokan, dikeringkan dan dibersihkan sampai memenuhi persyaratan kualitas seperti tercantum dalam persyaratan kualitas gabah kering giling pengadaan dalam negeri.

2. Kadar Air.
   Jumlah kandungan air didalam butir gabah yang dinyatakan dalam satuan persen dari berat basah (wet basis).

3. Butir Hampa/Kotoran

   a) Butir hampa.
   Butir gabah yang tidak berkembang sempurna atau akibat serangan hama, penyakit atau sebab lain sehingga tidak berisi butir beras walaupun kedua tangkup sekamnya tertutup maupun terbuka. Butir gabah setengah hampa tergolong kedalam butir hampa.

   b) Kotoran.
   Segala benda asing lainnya yang tidak tergolong gabah, misalnya: debu, butir-butir tanah, butir-butir pasir, batu-batu kerikil, potongan kayu, potongan logam, tangkai padi, biji-biji lain, bangkai serangga hama, dsb. Termasuk dalam kategori kotoran adalah butir-butir gabah yang telah terkelupas (beras pecah kulit) dan gabah patah.

4. Butir kuning/rusak

   a) Butir kuning.
   Butir beras pecah kulit (setelah gabah dikupas) yang berwarna kuning, coklat atau kekuning-kuningan dan kuning rusak akibat proses perubahan warna yang terjadi selama perawatan

   b) Butir rusak
   Butir rusak adalah beras pecah kulit (gabah yang telah dikupas) dengan kondisi rusak, termasuk dalam kategori butir rusak adalah butir-butir gabah yang isinya:

   - berwarna putih/bening, putih mengapur dan berwarna merah yang mempunyai bintik-bintik warna lain. Biji dengan bintik yang bernoktah termasuk butir rusak.

   - sedangkan biji dengan bintik kecil tunggal yang tidak potensial tergolong butir baik.

5. Butir hijau/mengapur.

a) Butir hijau.
Butir beras pecah kulit (setelah gabah dikupas) yang berwarna kehijauan dan bertekstur lunak seperti kapur akibat dipanen terlalu muda (sebelum proses pemasakan buah sempurna), hal ini ditandai dengan patahnya butir-butir hijau tadi. Butir berwarna hijau yang utuh dan keras dikategorikan sebagai butir sehat (bukan butir hijau).

b) Butir mengapur.
Butir beras pecah kulit (setelah gabah dikupas) yang berwarna putih seperti kapur (chalky) dan bertekstur lunak yang disebabkan oleh faktor fisiologis. Butir berwarna seperti kapur yang utuh dan keras dimasukan sebagai butir sehat (bukan butir kapur).

6. Butir merah.

Butir beras pecah kulit (setelah gabah dikupas) yang 25% atau lebih permukaannya diselaputi oleh kulit ari yang berwarna merah atau seluruh endospermnya berwarna merah.

**Ditetapkan di Jakarta**
**pada tanggal 16 Januari 2003**

**DEPARTEMEN PERTANIAN R.I**
**DIREKTUR JENDERAL**
**BINA PENGOLAHAN DAN PEMASARAN**
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**BADAN URUSAN LOGISTIK**
**DEPUTI OPERASI,**

**Ir. Andi Chaeruddin**
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LAMPIRAN – II

KEPUTUSAN BERSAMA
Nomor : 01/SKB/BPPHP/TP.830/2003 Tanggal 16 Januari 2003
KEP-07/UP/01/2003

## PERSYARATAN KUALITAS BERAS PENGADAAN DALAM NEGERI TAHUN 2003

### I. Persyaratan Umum :

1. Bebas hama dan penyakit yang hidup;
2. Bebas bau apek, asam atau bau-bau asing lainnya;
3. Bersih dari campuran dedak dan katul;
4. Bebas dari tanda-tanda adanya bahan kimia yang membahayakan baik secara visual maupun secara organoleptik;

### II. Persyaratan Khusus :

| No. | Komponen Mutu | | Satuan | Mutu III SNI*) | Mutu IV SNI**) |
|---|---|---|---|---|---|
| 1. | Derajat Sosoh | (Min) | (%) | 95 | 95 |
| 2. | Kadar Air | (Max) | (%) | 14 | 14 |
| 3. | Beras Kepala | (Min) | (%) | 84 | 78 |
| | Butir Utuh | (Min) | (%) | 40 | 35 |
| 4. | Butir Patah | (Max) | (%) | 15 | 20 |
| 5. | Butir Menir | (Max) | (%) | 1 | 2 |
| 6. | Butir Merah | (Max) | (%) | 1 | 3 |
| 7. | Butir Kuning/Rusak | (Max) | (%) | 1 | 3 |
| 8. | Butir Mengapur | (Max) | (%) | 1 | 3 |
| 9. | Benda Asing | (Max) | (%) | 0.02 | 0.02 |
| 10. | Butir Gabah | (Max) | Butir/100 g | 1 | 1 |
| 11. | Campuran varietas lain | (Max) | (%) | 5 | 5 |

*) Modifikasi SNI No.01-6128-1999 pada Derajat Sosoh dari 100% menjadi 95%.
**) Modifikasi SNI No.01-6128-1999 pada Butir Patah dari 15% menjadi 20%, penambahan komponen Beras Kepala 78%.

### III. Harga Pembelian Beras oleh BULOG :

1. **Mutu III SNI :**

   Harga pembelian beras oleh BULOG : Rp.2.790,-/Kg (dua ribu tujuh ratus sembilan puluh rupiah per kilogram) untuk wilayah Jawa, Nusa Tenggara Barat, Sulawesi Selatan, Lampung dan Sumatera Selatan.

2. **Mutu IV SNI :**

   Harga pembelian beras oleh BULOG : Rp.2.790,-/Kg (dua ribu tujuh ratus sembilan puluh rupiah per kilogram) untuk wilayah Bali, Sulawesi Tenggara, Sulawesi Tengah, Sulawesi Utara, Gorontalo, N. Aceh D., Sumatera Utara, Riau, Sumatera Barat, Jambi, Bengkulu, wilayah Kalimantan, Nusa Tenggara Timur, wilayah Maluku dan Papua.

## A. PENGERTIAN KOMPONEN KUALITAS BERAS PENGADAAN DALAM NEGERI TAHUN 2003

### I. Persyaratan Umum :

1. Hama dan Penyakit.

   Ada/tidaknya kehadiran hama (serangga, ulat dsb) dan/atau penyakit (cendawan dsb) yang hidup dan terdapat dalam contoh beras yang diperiksa (contoh primer). Bebas hama dan penyakit berarti secara visual tidak ditemui hama/penyakit yang hidup dalam contoh beras. Bangkai serangga dikategorikan sebagai benda asing (lihat butir B.II.9 pengertian ini).

2. B a u.

   Menyangkut bau yang dapat ditangkap dengan indra pencium (hidung) pada contoh beras yang diperiksa. Bau yang ditolak adalah bau busuk, asam, apek atau bau-bau asing lainnya yang jelas berbeda dengan bau beras yang sehat.

3. Dedak dan katul.

   Ada/tidaknya dedak/katul yang terlepas (bebas). Bersih dari campuran dedak dan katul

4. Bahan Kimia.

   Sisa-sisa bahan kimia seperti pupuk, pestisida dan bahan-bahan kimia lainnya yang membahayakan bagi kesehatan/keselamatan manusia.

### II. Persyaratan Khusus :

1. Beras Giling.

   Beras utuh atau patah yang diperoleh dari proses penggilingan gabah hasil tanaman padi *(Oryzae sativa L)* yang seluruh lapisan sekamnya terkelupas atau sebagian lembaga dan katul telah dipisahkan serta memenuhi persyaratan kuantitatif dan kualitatif seperti tercantum dalam persyaratan kualitas beras giling pengadaan dalam negeri.

2. Derajat Sosoh.

   Tingkat terlepasnya lapisan katul (pericarp, testa dan aleuron) dan lembaga dari butir beras.

   a) Derajat Sosoh 100% (Full Slyp).
      Tingkat terlepasnya seluruh lapisan katul, lembaga, dan sedikit endosperm dari butir beras.

   b) Derajat Sosoh 95%.
      Tingkat terlepasnya sebagian besar lapisan katul, lembaga dan sedikit endosperm dari butir beras sehingga sisa yang belum terlepas sebesar 5%.

Penilaian dilakukan secara visual dengan atau tanpa zatpewarna yang kemudian dibandingkan dengan contoh baku dari varietas yang bersangkutan.

3. Kadar Air.

Jumlah kandungan air didalam butir beras yang dinyatakan dalam satuan persen dari berat basah (wet basis).

4. Ukuran butir beras.

a) Beras Kepala (Head Rice)
Beras Kepala merupakan penjumlahan Butir Utuh dan Butir Patah Besar (Big Broken).

b) Butir Utuh (Whole Kernel)
Butir beras baik, sehat maupun cacat, yang utuh (10/10) tanpa ada bagian yang patah.

c) Butir Patah Besar (Big Broken)
Butir Patah baik sehat maupun cacat yang mempunyai ukuran lebih besar atau sama dengan 6/10 ( BPB $\geq$ 6/10) bagian dari ukuran panjang rata-rata butir beras utuh yang dapat melewati permukaan cekungan indented plate dengan persyaratan ukuran lubang 4,2 mm.

d) Butir Patah.
Butir beras patah, baik sehat maupun cacat yang mempunyai ukuran lebih kecil dari 6/10 bagian tetapi lebih besar dari 2/10 bagian (2/10<BP<6/10) panjang rata-rata butir beras utuh

e) Butir Menir.
Butir beras patah, baik sehat maupun cacat yang mempunyai ukuran lebih kecil atau sama dengan 2/10 bagian butir utuh (BM $\leq$ 2/10). Penggunaan ayakan menir standar dengan lubang berukuran garis tengah minimal 1,8 mm dan maksimal 2,0 mm.

5. Butir Merah.

Butir beras utuh, kepala, patah dan menir yang 25 % atau lebih permukaannya diselaputi oleh kulit ari yang berwarna merah atau seluruh endospermnya berwarna merah.

6. Butir Kuning/Rusak.

a) Butir Kuning.
Butir beras utuh, kepala, patah dan menir yang berwarna kuning, kuning kecoklat-coklatan atau kekuning-kuningan (kuning semu).

b) Butir Rusak.
Butir beras utuh, kepala, patah dan menir yang rusak dan berubah warna karena air, hama/penyakit, panas dan sebab-sebab lain. Beras yang berbintik kecil tunggal yang tidak potensial (kemungkinan tidak menjadi rusak) tidak termasuk butir rusak.

7. Butir hijau/mengapur.

a) Butir hijau.
Butir beras yang berwarna kehijauan dan bertekstur lunak seperti kapur akibat dipanen terlalu muda (sebelum proses pemasakan buah sempurna), hal ini ditandai dengan patahnya butir-butir hijau tadi. Butir berwarna hijau yang utuh dan keras dikategorikan sebagal butlr sehat (bukan butir hljau).

b) Butir mengapur.
Butir beras yang separoh bagiannya atau lebih berwarna putih seperti kapur (chalky) dan bertekstur lunak.

8. Butir Ketan.
Butir beras yang berasal dari varietas Oryzae Sativa L glutinosa. Butir ketan yang berwarna putih, utuh yang tercampur dalam beras dikatagorikan sebagai butir beras baik, sedangkan butir beras ketan putih yang tidak utuh dikategorikan sebagai butir kapur. Untuk butir beras ketan hitam dikategorikan sebagal benda asing.

9. Campuran varietas lain
Varietas yang bukan merupakan varietas dominan dari gabah/beras tersebut termasuk beras ketan (*Oryzae sativa L glutinosa*)

10. Benda Asing.
Benda-benda asing yang tidak tergolong beras, misalnya butir-butir tanah, butir-butir pasir, batu-batu kerikil, jerami, malai, potongan logam, potongan kayu, tangkai padi, biji-bijian lain, bangkai serangga hama dan lain sebagainya.

11. Butir Gabah.
Butir beras yang sekamnya belum terkupas atau hanya terkupas sebagian, termasuk dalam kategori butir beras patah yang masih bersekam.

**Ditetapkan di Jakarta**
**pada tanggal 16 Januari 2003**

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