RICE MILLING IN JAPAN (AND OVERSEAS)

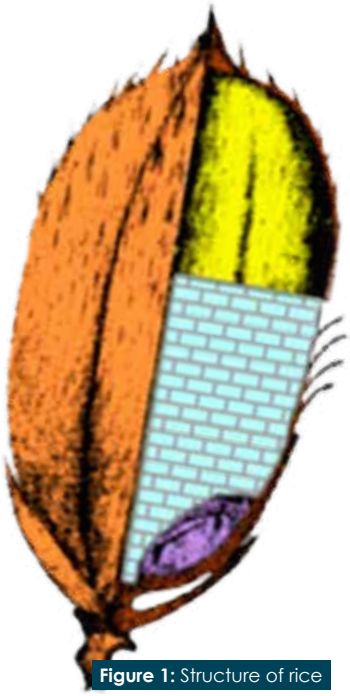

Figure 1: Structure of rice

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As one may already be aware, rice just after being harvested is referred to as paddy. Paddy consists of four parts: husk (the brown part as seen in Figure 1), bran (the yellow part), germ (the purple part), and endosperm (the blue part). Rice conditioning/milling is a series of processes to extract the endosperm (the blue part), that people normally eat, by removing the other components without damage. The process generally refers to the following five stages.

Drying is a stage necessary for the stable long-term storage of rice. Rice harvested in the field contains more than 20 percent moisture by weight. If left in high temperature and humid environments, it will deteriorate in less than 24 hours. To prevent this, the rice is quickly dried after harvesting and the moisture level is lowered to around 15 percent. Hot/warm air is used for drying with careful temperature control, since the rice will be cracked or burnt if hot air is applied for too long.

Figure 2: Rice grinding

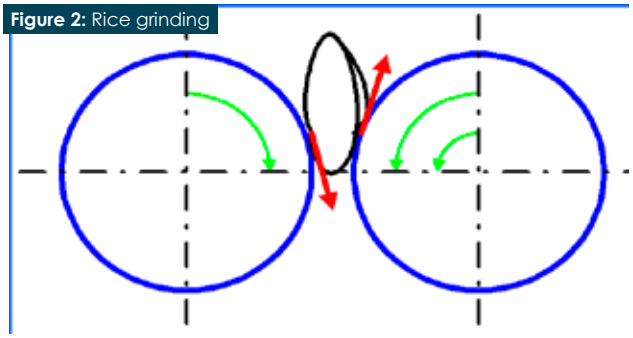


Figure 3: Japanese rice processing

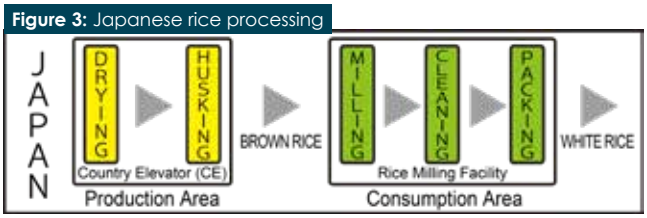
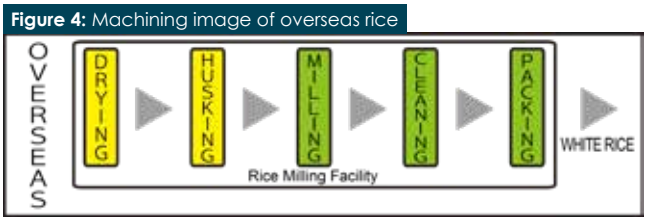


Figure 4: Machining image of overseas rice



Husking is a stage of removing husk (the brown part in Figure 1) from the dried paddy. Husk is a hard shell that protects both the germ and endosperm of the paddy. It is rich in fibre and silica, therefore making it unsuitable for people to eat.

In order to carry out the subsequent milling of rice with regard to high quality and high yield, first we remove the outer husk. A pair of rubber rolls rotating at high speed is used for rice husking. The two rubber rolls are rotating inwardly at differing speeds so that the husk is removed as the paddy passes between them. If the rubber roll spacing is too small, the rice may crack or the bran may scrape off, adversely affecting the subsequent rice milling. Rice after husking is referred to as brown rice.

Milling is a stage of removing the bran and germ which cover the brown rice, leaving only the endosperm. Several types of milling machinery are used to remove the bran gently to avoid damaging and/or breaking the endosperm. On a side note, a rinse-free rice is considered as an extension of rice milling. It is a rice processed to remove nearly all the bran on the surface of the grain, utilising tapioca.

Cleaning is the stage of removing impurities and defective products from the rice to improve its appearance and increase food safety. The term "impurities" refers to foreign materials and/or non-rice grains mixed in, and the term "defective" refers to rice that is broken (cracked) or has been subject to insect damage. Cleaning, physically and optically, sorts these impurities and defective products.

Packing is a stage of weighing and packaging the rice from which impurities and defective products have been removed in the previous cleaning stage.

Typically, in Japan, the above steps (drying and husking) are carried out at drying facilities such as country elevators and rice centres located near the rice growing area, and milling and packing are carried out at the rice milling plants nearer the consumption areas such as larger cities.

This is to provide stable quality rice to consumers throughout the year in Japan, where there are four seasons. The rice is stored in paddy at the silo of the country elevator until just before it is ready to be sold as white rice in the retail store.

Overseas rice milling situation

Outside Japan, although most of the population also eat the endosperm of the rice, the processing and distribution methods differ vastly. The biggest difference is that overseas rice millers often carry out the milling processes mentioned above all at once. In other words, the overseas rice industry often does not separate processing into country elevators and rice milling plants. The paddy received from the farm is processed into white rice and shipped immediately.

The capacity/size of rice milling plants varies as well. In the United States, Thailand, Australia, and other countries who export rice, gigantic processing plants with throughputs of more than 100 tonnes-per-hour operating for 24 consecutive hours are used.

In developing countries, however, where the rice milling industry is not so highly geographically concentrated, there are numerous smaller plants with capacities of 100 to 200kg per day. In general, large-scale factories engaged in exports are similarly as modernised as those in Japan, and are actively introducing the latest technology to their facilities. On the other hand, small and medium-sized factories often use older equipment.

As many of you know, there are generally three types of rice: short-grain, medium-grain, and long-grain. Short-grain is the most commonly grown rice in Japan, but overseas the production of long-grain rice is extremely high. Whether this is caused by the consumers' preference or the climate, short grain rice is currently grown only in Japan and a few other places.

On a side note, a study conducted on short-grained rice in Southeast Asia cultivated by Japanese immigrants, illustrated that the grain had gradually become thinner in shape as generations went by.

Figure 5: Definition of long, medium and short species

		Grain Length	Length ÷ Width
LONG GRAIN		6.7 mm ≦	3.1 ≦
MEDIUM GRAIN		< 6.7 mm 5.6 mm ≦	< 3.1 2.1 ≦
SHORT GRAIN		< 5.6 mm	< 2.1

As one may predict from its shape shown in Figure 5, long-grain rice is easier to break unless the rice is milled gently. Milling long-grain rice with a Japanese-standard short-grain rice milling machine produces high levels of broken rice. In order to mill long grain rice without breaking, it is necessary to utilise a specially designed model.

In the next article, we will further explore long-grain rice processing in detail.

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