

Rice from the farm to the table



Rice cultivation

Rice is cultivated in paddy fields with good water retention under suitable sunlight conditions. Seedlings are transplanted in paddy fields or rice is seeded directly in the fields. Rice is harvested in the fall.

Threshing and hulling

In the harvested rice, the husks are removed from the ears by threshing and hulling to produce brown rice.



Polishing

The harvested brown rice is polished, which removes the rice bran. Depending on the proportion of the removed rice bran, 30% or 100% polished (white) rice is produced.

Cooking

Polished rice and brown rice are cooked by steaming or boiling in water. When the rice grains absorb the water and become sticky and fluffy, they are ready to eat.



NARO
National Agriculture and Food Research Organization
Tohoku Agricultural Research Center
Food Research Institute

Countermeasures against Radioactive Contamination of Food (in Japanese):
<http://www.naro.affrc.go.jp/disaster/higashinihon201103/index.html>



New approaches in food safety with respect to radiocesium

Research by NARO on countermeasures against radioactive materials

NARO is engaged in research on measures to reduce radioactive materials in food at each stage of production, starting from the farm, where radioactive materials are present in the environment, to breeding and cultivation, and consumption as food.



Studies to monitor and remove radioactive materials from the environment

Studies to curb the transfer of radiocesium to agricultural and livestock products



Studies to investigate the changes in content and concentration of radiocesium that occur during food processing and cooking

Unit of radiocesium concentration: **[Bq/kg]**

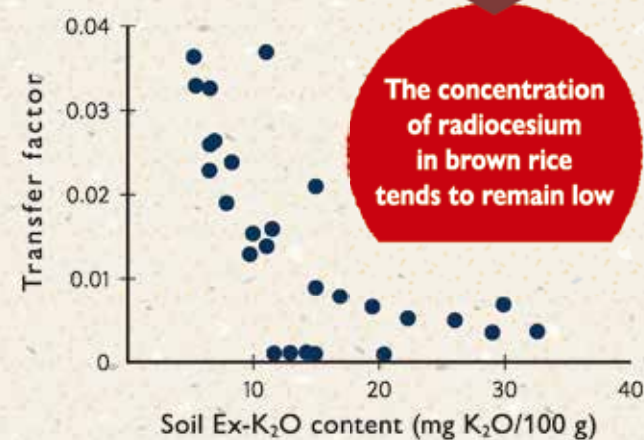
The unit that represents the measure of radioactivity is becquerel (Bq). "Bq/kg" (becquerels per kilogram) is used to indicate the concentration of radiocesium in food.

Cultivation Reducing radiocesium in cultivation

The concentration of radiocesium in brown rice is largely dependent on the content of exchangeable potassium (Ex-K₂O) in the soil that can be absorbed and used by crops. The concentration of radiocesium in brown rice is generally reduced when the Ex-K₂O content in the soil is high.



When the Ex-K₂O content in the soil is high



The concentration of radiocesium in brown rice tends to remain low

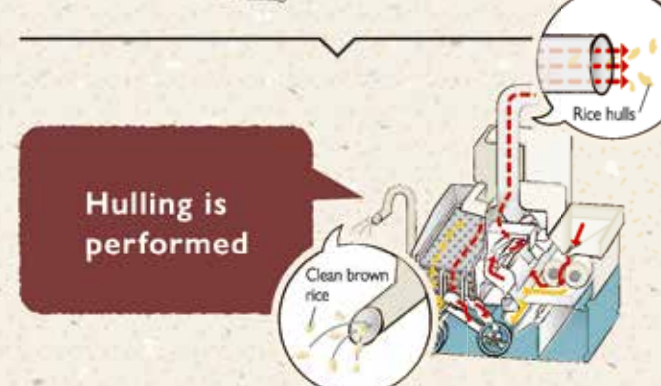
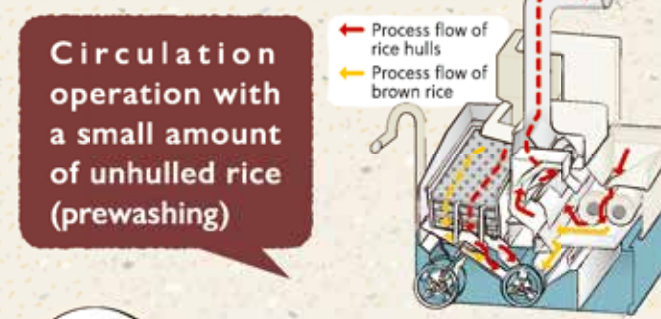
Fig. 1 Relationship between Ex-K₂O in the soil and the transfer factor of radiocesium to brown rice

$$\text{Transfer factor} = \frac{\text{radiocesium concentration in edible crop}}{\text{radiocesium concentration in soil}}$$

The radioactivity in brown rice has not exceeded the present limit for radiocesium of 100 Bq/kg since 2015.

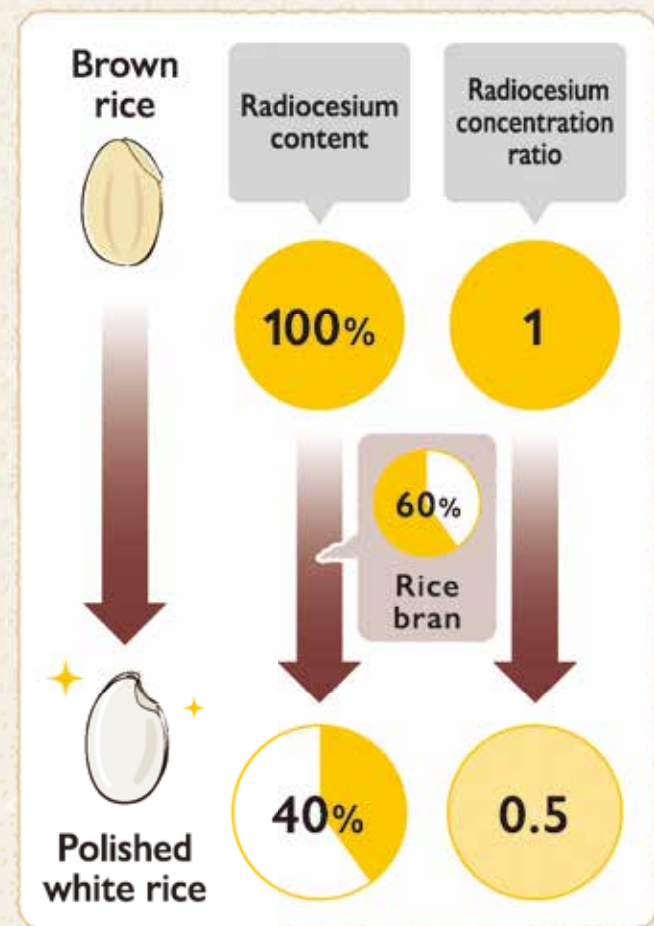
Preventing contamination in post-harvest processing

Brown rice can become contaminated if dust containing radiocesium settles on the rice huller or sorting/weighing machine used to process the rice without the husk. "Prewashing" can effectively prevent such contamination when a small amount of unhulled rice is placed into the rice huller and the resulting brown rice is discarded.



Polishing Reducing radiocesium by polishing

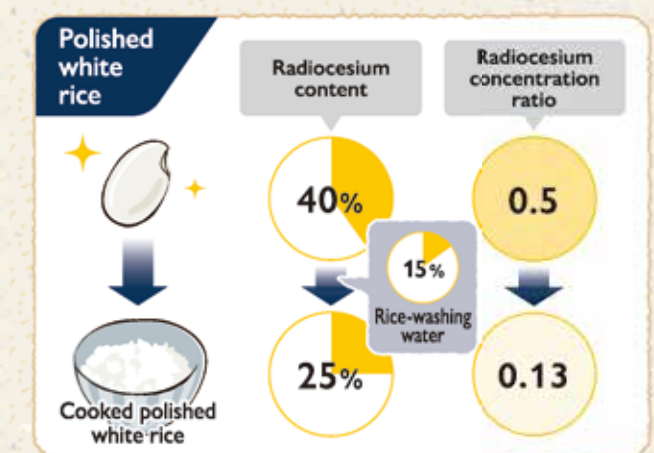
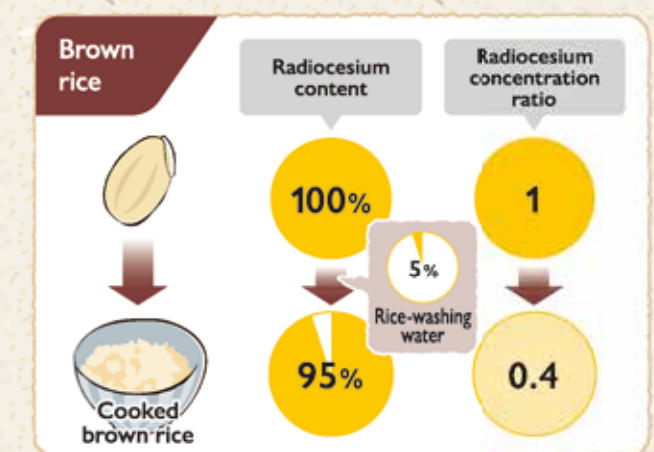
Radiocesium is also present in the rice bran. By polishing the rice bran during milling, up to 60% of radiocesium in brown rice is removed.



Only brown rice with radiocesium below the limit is processed and shipped. The radiocesium concentration in polished rice is less than half that in brown rice; thus, polishing ensures that the radiocesium concentration in white rice does not exceed the limit.

Cooking Reducing radiocesium by cooking

Radiocesium contained in food easily dissolves in water. Therefore, when brown rice and polished rice are washed, radiocesium is transferred into the rice-washing water and is removed from the cooked rice.



The total mass of rice increases upon cooking because of swelling caused by water absorption. Therefore, the radiocesium concentration in cooked rice is reduced to less than half that in uncooked brown and polished white rice.