

Extruded fortified kernels

Our solution to make rice more nutritious



More than 3 billion people across the globe rely on rice as a staple food, many of which live in developing countries where rice contributes as much as 75% of daily energy intake and where deficiencies in essential vitamins and minerals are known to be high.

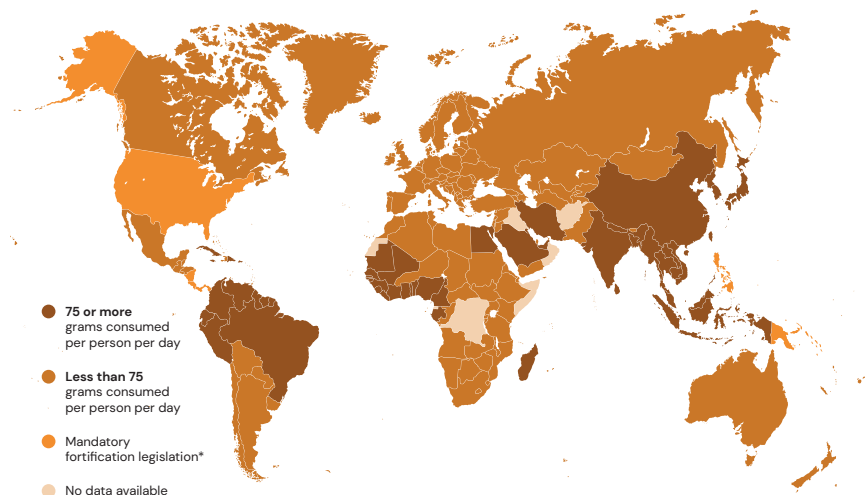
Rice is a good source of energy, protein and a natural source of vitamins and minerals, but neither milled white nor brown rice provide a significant quantity of micronutrients compared to the daily recommended intakes. In addition, the milling process removes both the fat and nutrient-rich bran layers, which produces the commonly consumed and starch-rich white rice.

Following the harvesting and milling process, fortifying rice with vital, micronutrients is an effective solution for addressing deficiencies and improving the micronutrient status of the millions of people for whom rice is the main staple food. It also offers a huge opportunity to differentiate rice brands by addressing specific needs of consumers.

Success story: Fortified rice brands

Increasing numbers of fortified rice products have been launched in Asia, West Africa and South America including our extruded fortified kernels in response to specific consumer demands. In addition to boosting nutrition in general, these products offer specific health benefits such as improved energy, immunity or strength and more.

World map of rice consumption¹



¹ Legislation has the effect of mandating grain fortification with at least iron or folic acid. This does not reflect how much grain is available in that country.

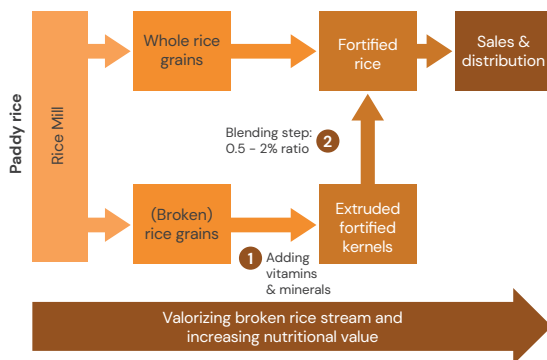
Success story: Fortified rice in Costa Rica^{2,3,4,5,6}

In Costa Rica, per capita rice consumption is approximately 150 g per day on average, providing around 30% of caloric intake. All rice for human consumption in Costa Rica is fortified with folic acid, vitamins B₁, B₃, B₁₂, E, selenium and zinc. Since the introduction of the food fortification program, which includes rice, the number of neural tube defects (NTD) has decreased significantly.

How do we improve the nutritional value of rice?

dsm-firmenich has been a pioneer in the development of hot extrusion fortification technology for rice fortification. This robust and cost-effective method of adding vitamins and minerals to rice also allows for other nutrients to be included, such as fibers or amino acids, to enhance the overall nutritional value of the product. Nutrients can be added to rice in a straightforward two-step process:

1. Broken rice grains are ground into rice flour and mixed with water and vitamins, minerals and/or other nutrients to produce a rice dough.
2. This fortified rice dough is passed through an extruder to produce the fortified kernels, which are then blended with rice, typically in a ratio of 0.5–2%, to produce the final product.



Benefits of extruded fortified kernels⁷

dsm-firmenich's fortified kernels produced by hot extrusion provide a multitude of benefits:

Robustness

The added high-quality micronutrients are embedded in the rice matrix and remain so when the rice is washed before cooking, steamed, or cooked in excess water.

At dsm-firmenich, we know that creating brighter lives for people worldwide takes solid experience, technical expertise, and passion at every stage of the development process. That's why we constantly innovate affordable, aspirational, and accessible nutritional solutions, empowering our customers' products to change lives anywhere in the world. This takes more than ingredients.

It takes a partner.

References available on request.

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Acceptance

As the appearance and taste of fortified rice, with blended fortified kernels, are similar to that of nonfortified rice, consumers can increase their nutritional intake without their dietary or food preparation habits being affected.

Flexibility

Any variety of rice can be fortified. The shape, size and color of fortified kernels can be customized to create food products with widespread appeal. Additionally, the blend of micronutrients can be modified to meet the specific needs of target populations, such as the elderly or vulnerable groups, or to address specific health concerns, such as immunity or brain health.

Scientific backing

The use of hot extrusion technology to produce fortified kernels is supported globally by a wide range of evidence on acceptability and effectiveness in improving micronutrient status.

Market opportunities

Fortified kernels offer a wealth of commercial opportunities. Over 30% of industrially milled wheat flour and almost half of industrially milled maize flour is fortified globally, compared to 4% of rice, where efforts to fortify at scale have increased substantially over the last years. This percentage has been rising consistently, passing from 1% to 4% in the past 3 years, and this for a number of reasons, including:

- Advancements in the technology that enable cost-effective rice fortification
- A growing evidence base of the benefits of fortifying rice
- An increase in the support from governments and non-governmental organizations (NGOs), including UN agencies

Rice fortification is mandatory in eight countries including the US with 6 states. Moreover, many governments in Latin America, West Africa and Asia are implementing mandatory rice fortification legislation or are setting rice fortification standards to encourage voluntary fortification of rice.⁸

dsm-firmenich is working with many partners including millers, governments, research institutes, UN agencies and NGOs to unlock the potential of rice as a vehicle to improve public health and make the most nutritious rice for consumers around the world.

Rice brand owners are also using fortification as a method of differentiating their products by providing healthier, more nutritious rice that meets consumer needs. The rice market is constantly evolving and the popularity of rice makes it effective in bringing crucial micronutrients to consumers that can address specific demands. This offers brands the opportunity to strengthen their position in the market with unique, targeted products through cost-effective fortification.

Contact us to find out more:

www.nutritionimprovement.com

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