

Nutrice Process.

A breakthrough in rice fortification.



Unlimited. **DSM**

BÜHLER

Hidden hunger – Invisible malnutrition. Impact of vitamin and mineral deficiencies.



“Vitamin and mineral deficiencies affect a third of the world’s people – Food fortification is an effective way to ensure that large numbers of those at risk receive the nutrients they need.” (Source: GAIN)

What is hidden hunger?

Malnutrition caused by deficiencies of vitamins and minerals is also known as “hidden hunger”, because most of the people affected by it do not show the physical symptoms usually associated with hunger and malnutrition. The lack of key vitamins and minerals has been known for a long time to cause anemia, cretinism and blindness. Only during the last years it has been realized that these visible forms of deficiencies are but the tip of an enormous iceberg. A large percentage of malnutrition is not directly related to extreme hunger but to a shortage of the nutritionally correct forms of food in particular during the early years of childhood. Levels of mineral and vitamin deficiencies that have no clinical symptoms can have large impacts causing many people to live below their physical and mental potential.

This hidden form of malnutrition impairs the mental and physical development of infants and young children, undermines productivity in adults and affects the economic progress of nations.

What causes hidden hunger?

When daily meals are based on the same starchy foods such as rice, wheat flour or corn the diet may provide enough calories but does not provide the vitamins and minerals needed for good health.

A balanced diet, containing adequate amounts of all essential vitamins and minerals, includes a variety of fruits, vegetables, pulses, dairy, eggs and possibly other foods from animal sources. People who do not consume such foods for any reason (cost, availability, traditions, ignorance, etc.) will sooner or later develop hidden hunger.



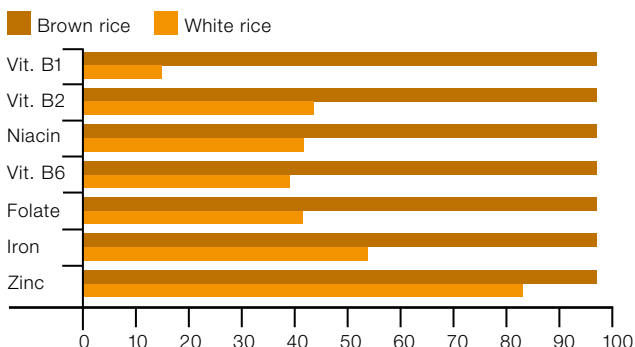
The role of rice in nutrition

Hidden hunger exists in many countries, where rice is the major staple food and provides a high percentage of the daily caloric intake. Rice has a low vitamin and mineral content and a significant part of micronutrients in rice is lost during rice whitening and polishing processes. Making rice more nutritious by fortifying it with essential vitamins and minerals will help to improve the health status of people.

Staple food fortification – safe and effective

Food fortification – the addition of small amounts of essential vitamins and minerals to the foods that people regularly eat – is a demonstrated and effective way to ensure that large numbers of those at risk of vitamin and mineral deficiencies receive the nutrients they need. This approach has been used successfully for decades in many countries. The fortification of commercially produced staple foods allows populations at risk to benefit without needing to make major changes to their eating habits.

Milling losses of vitamins and minerals in rice

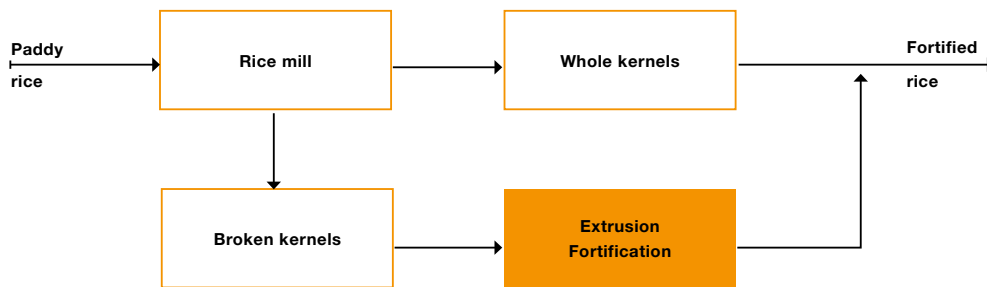


The Nutrice solution

Nutrice process overcomes the difficulties in rice fortification and enables to use low cost broken rice as raw material: Nutrice – reconstituted, vitamin and mineral enriched rice kernels formed by extrusion of rice flour, thereby protecting the incorporated vitamins and minerals.

Nutririce Process.

An efficient way to fortify rice.



The Nutririce concept

The value of rice fortification for a balanced nutrition has been undisputed for many years but implementation has been a critical issue. The size of rice kernels does not allow simple mixing with vitamin powders or beadlets since vitamins and rice would segregate immediately. In particular, the rinsing of rice challenges rice fortification, washing off greater parts of the added vitamins and minerals. Cooking additionally impacts sensitive micro-nutrients such as vitamins.

Nutririce process uses broken rice kernels from the rice mill for production of rice flour and mixing with vitamins and minerals. To resolve the problems of segregation and washing off vitamins and minerals the mixture is formed by extrusion into reconstituted rice kernels. The fortified reconstituted kernels are then added to the natural whole rice kernels.

A secured intake of the right vitamins and minerals

Fortified rice kernels are added to natural rice in a ratio of e.g. 1:100 or 2:100 guaranteeing a controlled intake of the right levels of vitamins and minerals.

Nutririce process – high flexibility in product properties

The production of reconstituted rice offers the unique possibility to efficiently fortify rice with multiple micro-nutrients. Vitamins and minerals, such as vitamin A and the B-complex vitamins, as well as iron and zinc, can be chosen for inclusion.

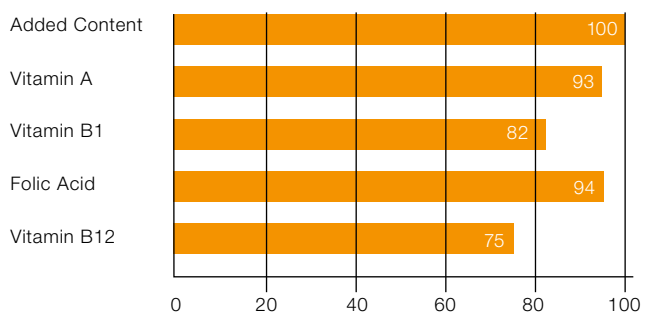
In the cooking extrusion process, rice flour and micro-nutrients are transformed into a product resembling

natural rice in terms of visual appearance. Thereby, vitamins and minerals are embedded and protected from segregation as well as from being removed through rinsing or leaching out during cooking.

Rice varieties are diverse and the individual need for specific vitamins and minerals among different population groups varies. The Nutririce process allows flexible adaptation of shape, micronutrient formulation and colour to suit a variety of local needs. Hence fortified rice (fortified rice kernels admixed to normal rice) can be produced without impacting appearance, mouth feel and taste of rice easing the acceptance of the fortified rice product by consumers.

Excellent stability results

The fortified rice kernels show good physical stability with excellent retention of vitamins and minerals during storage, washing and cooking.



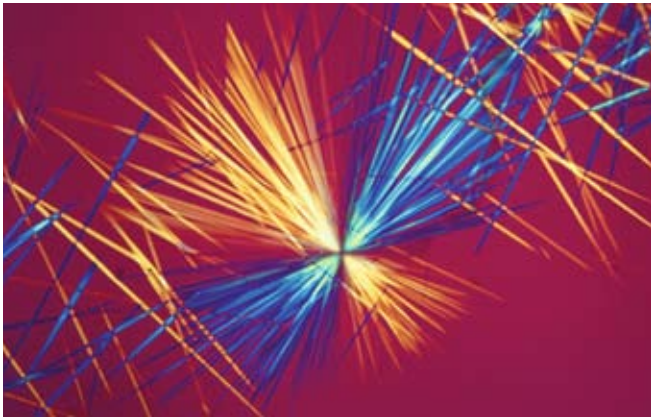
Vitamin losses from processing to table are minimal.



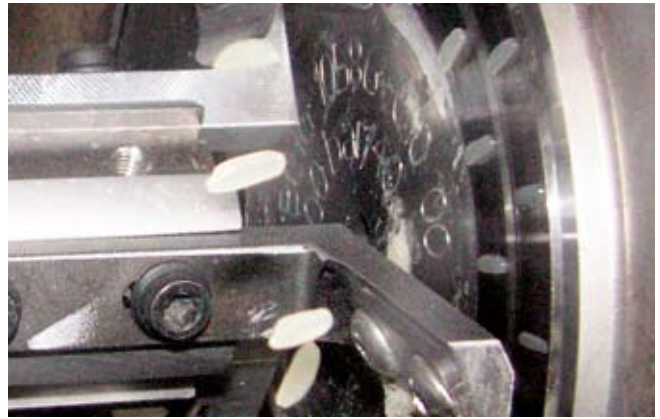
White rice mixed with coloured fortified rice kernels and with uncoloured fortified rice kernels.



An innovative alliance. Combining extrusion and vitamin know-how.



Vitamin crystal.



Extrusion die for forming of reconstituted rice kernels.

Collaborative development

Nutrice process has been developed in collaboration between Bühler and DSM Nutritional Products. With the combined extensive know-how of Bühler on extrusion processing and of DSM on vitamins and food

fortification a reliable process was elaborated overcoming the challenges of efficiently fortifying rice. A careful selection of vitamins and minerals along with well adjusted process parameters is the key to ensure quality of the fortified rice kernels.

From the rice field through processing in the rice mill to Nutrice



Equipment supply Bühler AG

Know-how supply (IP, product, quality)



Business model.

Through investments in development of tailor-made product forms and production process parameters, Buhler and DSM can offer a safe and effective solution for the large-scale fortification of rice with vitamins and minerals.

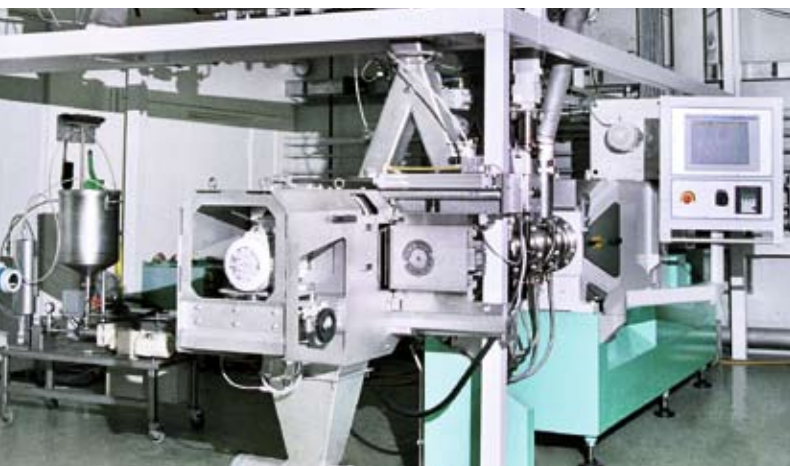
This proprietary knowledge is offered by Buhler and DSM to customers. Via licensing customers get the opportunity to profit from this solution to manufacture a highly value added product.

With Nutrice Process customers benefit from

- An outstanding product performance differing from other products currently available in the markets.
- Generation of a profitable product from a low cost raw material.
- A superior, already proven process technology minimizing technological risks.
- The know-how and experience gained from our jointly owned fortified rice kernel production plant in China: Wuxi Nutrice Co. Ltd.
- The local presence worldwide with service centres as it only can be provided by market leaders.

Premix supply DSM Nutritional Products

Production license



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