

# Exploring wheat milling by-products: an overview of 8 ways of valorisation for wheat bran

Wheat bran is a byproduct of wheat milling, which in Europe is a significant sector within the food processing industry.

Europe is the second most important producer of wheat worldwide, behind China. Indeed, the climate in the European Union is favourable to the development of cereal crops, in particular wheat, thanks to moderate temperatures (between -6 and 20 degrees Celsius), warm weather before growth and sunny conditions during the final stages before wheat harvest.

Two main wheat families exist: the soft wheat, which is used for example to produce flour, and the durum wheat, transformed for example into pasta or semolina. European cereal production is largely dominated by soft wheat (around 95 % of European production in 2023). However, wheat crops are very different from country to country: 55% of the total soft wheat production is concentrated in France, Germany and Poland, whilst nearly 75 % of the European durum wheat production is based in Italy, France and Spain. The vagaries of the weather (notably, drought in the last 3 years) and in politics (e.g. the war in Ukraine) have created tensions in the European wheat production and trade. The European Union is a historical importer of wheat from non-EU countries. Historically, soft wheat is imported to Ukraine, though the current political context has changed these Ukrainian imports. Durum wheat is imported from Turkey and Russia.

Wheat holds significant economic value in 2 main markets: the food industry and the animal feed industry. In the food market, wheat is often milled into flour. Milling generates a large quantity of wheat by-products, including wheat bran, which accounts for roughly 15-25% of the initial weight (depending on the final application). Considering its rich elements, indeed wheat bran is considered as the most important by-product of the wheat milling industry.

Wheat bran comprises the outer layers of the grain including the pericarp, testa, and aleurone layer. Wheat bran is rich in dietary fibre, consisting of protein (13-18 %), starch (14-25 %), fat (3-4 %), minerals (3-8 %) and non-starch carbohydrates (55-60%) based on dry matter.

The B-Resilient partners made the decision to explore the valorisation of wheat by-products in 6 European regions covered by the partnership where the wheat production and milling sectors are important at regional level : Flanders and Wallonia in Belgium, Emilia-Romagna in Italy, and Pays de Loire, Brittany and Normandy in France. Here, large amounts of wheat bran are available, and the valorisation of this biomass is a priority.

The partners conducted a market analysis aimed at exploring new business opportunities in the valorisation of wheat bran. The study included a review of scientific literature available,

data gathered through Mintel, an international database of product releases as well as interviews with seven organizations, including different types of companies (SMEs and large companies, flour mills, industrial bakeries), a research centre and one university. This work allowed to identify numerous ways of valorisation of wheat bran: animal feed, human food, cosmetics, nutraceuticals, bioactive surfactants, substrate for enzyme production, pigments industry, bioenergy.

**Animal feed** represents the oldest process of valorisation, but it has poor economic added value. Animal feed is a complementary activity for cereal producers. However, the use of wheat bran for animal feed is limited due to its high fibre content, because of issues concerning digestibility, nutrient dilution, bulkiness, and nutritional balance. Another limit lies in the presence of pesticides, which is a major health issue for animals. An interesting valorisation of wheat bran emerged during the study is in entomoculture (also known as insect farming or insect rearing). Indeed, wheat bran is useful for feeding insects which will then be crushed to be transformed into insect meal or consumable insects. Wheat bran helps to stabilize humidity in the insect environment and improves the habitation of insects, including locusts and crickets. A research line identified during the interviews carried out in France involves the treatment of wheat bran with ozone, to enhancement its nutritional value for insects.

Wheat bran is a versatile ingredient that can be integrated into various **food** preparations to enhance both nutrition and texture. Wheat bran is indeed rich in dietary fibre, which offers various benefits for digestive health. Moreover, its hydrophilic properties stabilize wheat flours. However, excessive consumption of wheat bran can cause gastrointestinal discomfort or irritation in some individuals. One current research axe emerged from the interviews carried out in Emilia Romagna region focuses on valorising the use of wholegrains more than separating the bran from the refined flour. Wholegrain products are offered by the food industry because they are perceived as healthier than refined products by the consumers due to their dietary fibre content and bioactive substances (phenolics, carotenoids, lignans, etc.). The International Association for Cereal Science and Technology (ICC) (which gathers members from all over the world) has set up a working group on a global definition of a whole grain (raw materials) and on the definition of a whole grain food within the Whole Grain Initiative aimed at promoting the consumption of wholegrains.

Wheat bran is rich in fibres and ferulic acid which can be used in **cosmetics, pharmaceuticals, and nutraceuticals**. Extracts from wheat bran are well known for their antioxidant and skin-nourishing properties. However, the extraction of molecules is very expensive for industrials. Moreover, in the cosmetics industry, synthetic molecules have historically been more commonly used compared to bio-sourced or natural ingredients.

Wheat bran is rich in **nutrients and bioactive components** and more specifically alkyl polyglycosides, which are used in many economic sectors (household detergent, cosmetics, agrochemical, etc.). Biosurfactants (also known as biobased surface-active agents) extracted from wheat bran are synthesised by enzymes under mild reaction conditions (moderate temperature, absence of chemical analysis). They hold promise as natural alternatives to

synthetic surfactants, catering to the growing demand for sustainable and eco-friendly ingredients in various industries. The [Interreg ValBran project](#), for instance, has sought to exploit the carbohydrates that make up the bulk of wheat bran to produce bio sourced surface-active molecules. The project aimed to produce non-ionic surfactants of plant origin such as APGs (alkyl polyglycosides) and sugar esters, which would replace molecules of fossil origin. The project developed joint approach to biotechnologies to develop a synthesis path of alkyl glycosides and ester sugar. Though biosurfactants extracted from wheat bran are certainly an interesting valorisation, the B-Resilient market study nevertheless illustrated that their production requires important investments and product reformulation, which are costly for industrials. Moreover, consumers awareness and sensitivity to the use of these biomolecules is still poor.

The scientific literature carried out by the partners has also allowed to identify 3 additional ways of valorisation of wheat bran: as a **substrate for enzyme production**, in the **pigments** industry and **bioenergy** production. Though the latter did not emerge from the interviews conducted at regional level, the use of wheat as a source of bioenergy production is well-known. Indeed, 3 % of European wheat consumed as biofuel wheat is also used as a substrate for methanisation, especially in France, thanks to its high methanogenic potential. Valorisation in the pigments industry and as a substrate for enzyme production seem to be newer lines of research, and these subjects also did not emerge from the interviews.

Would you like to receive more information about wheat bran recovery in the regions targeted by the B-Resilient partners?

Please do not hesitate to contact with your local partner!



**Author:** Sara BOTTI, European projects manager, [sara.botti@pole-innovalliance.com](mailto:sara.botti@pole-innovalliance.com)  
Innov'Alliance (France)