

PROTEINS

to secure markets



The protein yield in the Picardy region (north-eastern France) is similar to those of Belgium and Germany's North Rhineland.

In France, markets for bread wheat are well established: animal feed, milling, starch manufacturing and biofuels. Protein content is used as one of the reference criteria, but what does this really mean? Here are some answers and an overview of the situation

Albeit in varying degrees, bread wheat markets (animal feed, the milling industry and starch manufacturing) require a good protein content. In the case of animal feed, the protein content has to fulfil the livestock's nutritional needs. Rations contain between 13% and 40% of protein, depending on species and development stage. Wheat is a major ingredient in feed, making up around 25% of the ration.

Although wheat is not classed as a high protein product (unlike soya and oilseed rape), it is an important source of protein because of the amount that is incorporated into feed. French wheat with a good enough protein content will help minimise the need for complementary feed products, and therefore will help achieve protein self-sufficiency and reduce feed costs.

« In animal feed, wheat with a good enough protein content will help minimise the need for complementary feed products. »

Specific requirements

The primary market for French wheat produced for human consumption is bread-making, which utilises 65% of the flour produced. It is followed by industrial markets that utilise 29% of production (brioches, buns, sandwich loaves, pastry, and biscuits). Retail bags of flour account for 6% of the market.

In 2010, traditional "boulangerie-pâtisserie" (bread and pastry making) made up 60% of the bread-making market, despite a steady decline against the industrial sector, which represented nearly a third of the market. In bread-making, protein essentially serves a technological purpose (*insert*). However, with increased mechanisation of certain steps in the bread-making process, as well as the use of positive and negative refrigeration and changes in fermentation times, dough must be more resistant than before, and this in turn calls for higher protein content.

An exceptional protein for a unique product

Bread wheat grain has processing characteristics like no other species in the plant world. It is one of the main constituents of bread products and contains special proteins with exceptional properties, capable of clustering together in a moist environment. When they interact with starch, they produce a three-dimensional network which is both elastic and stretchy, and can be handled by a machine. This network makes up gluten.

Those proteins have different properties depending on the type of molecular interaction they are having with their environment (other molecules, pH, temperature...): hydration power (wettability, swelling, adherence...), aggregation properties (precipitation, coagulation, gelatination...), and emulsifying power (emulsifying and foaming properties...). Those multiple and specific properties mean that proteins are able to withstand the different pressures resulting from the bread-making processes, including kneading the dough, controlled rising under positive refrigeration, freezing and the thermal shock induced by the cooking process.

Main raw material

Nowadays, wheat is the main raw material used by the starch manufacturing sector. In the last 15 years, the amount of wheat incorporated into starch has increased four-fold, to reach 2.8 Mt. Bread wheat accounts for 55% of this tonnage, in front of maize and potato. Starch manufacturing aims to extract two main constituents, starch and gluten, as easily as possible, in order to utilise them in the milling sector, as part of animal feed or for non-nutritional purposes. Good utilisation of gluten requires the presence of around 11-11.5% of good quality protein, mainly insoluble ones.

Variations between production areas

Between 1996 and 2013, the average protein content of French wheat fluctuated between below 11% and 12.5%; it is now around 11.6%. During this period, the national average was in 50% of cases below the 11.5% target. As farmers and other players in that market well know, protein content and yield are connected: if a season produces high protein contents, yields are lower, or at best within the pluriannual average range.

In Germany, protein content is higher than in France, but usually follows a similar variation curve, with differences never greater than 1 point and levels always between 12.5 and 13.5%. In the United Kingdom, protein content is also usually higher than in France, with similar differences. In Belgium, content and fluctuations are very similar to French figures. Finally, in Spain, there are significant variations, going from 11 to 14%.

There are therefore differences in protein content levels from one country to another. Protein content fluctuates everywhere, but it seems less variable in a continental climate. France's neighbours

also experience the negative correlation between yield and protein content.

Climate has a major impact

In order to combat the negative correlation between those two parameters, it is possible to calculate a protein yield indicator combining yield per hectare and protein content. It shows that in the Picardy region (north-eastern France), protein yield is quite similar to those of Belgium and Germany's North Rhineland. Likewise, the situation observed in south-western France is very close to the situation in Spain.

This indicator reveals a South-North gradient showing that climate plays a major part in the correlated building of protein content and yield.

The protein content of bread wheat can be improved by activating agronomic and genetic



The French average does not always reach the protein content target of 11.5%; this has led to the signing of an interprofessional agreement in December 2013, which came into force in July 2014, putting protein content at the forefront of contracts. The aim of this agreement is to better meet the needs of French wheat users and help French wheat compete on export markets. In order to reach targets while taking into account the effect of climate, which is a determining factor for protein content and yield building, producers will have to activate agronomic and genetic levers.

Benoit Meleard - b.meleard@arvalisinstitutduvegetal.fr

Perrine Moris

ARVALIS - Institut du vegetal

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Changes in the bread and patisserie sector require greater levels of protein in wheat.

