> PUBLICATION
October 2017

HARVEST 2017

Quality of French wheat

AT DELIVERY TO INLAND COLLECTION SILOS

FranceAgriMer

ARVALIS Institut du végétal

EDITORIAL

37.8

million tonnes of wheat harvested in 2017 including

26

million tonnes of wheat from the "Superior" and "Premium" categories

HARVEST 2017: AMPLE VOLUME AND QUALITY

Following an atypical 2016 harvest, French wheat production has returned to a satisfactory level in 2017, at 37.8 million tonnes (+6% compared to the 2012-2016 average). However, the climatic conditions of the 2016-2017 cultivation campaign have sparked concern. French wheat was subject to a widespread and persistent water deficit throughout its cycle, late spring frost of varying severity, persistent high temperatures around the crop flowering period and rainy episodes around the time of the harvest. Although these conditions inhibited the yield potential of the crops as a whole, they also led to reduced pest pressure.
In terms of quality, French wheat will therefore be able to satisfy the full range of the traditional markets, with a good - or even very good - quality for certain characteristics, particularly protein content. Almost 69% of wheat falls under the "Superior" and "Premium" milling quality categories.

High protein content and very good bread-making quality

At national level, the average protein content is high, even for plots with high yield levels, due to optimal use of nitrogen inputs. Over 91% of wheat has a protein rate above 11.5%.
The variability in the intensity and frequency of rain occurring at the end of the cycle resulted in varying specific weights. Nonetheless, owing to very high starting potentials linked to genetics and favourable climatic conditions, they remain at the levels expected by the markets. As such, the national average is 77.2kg/hl, 74% of wheat exceeding 76kg/hl.
Furthermore, the Hagberg falling numbers will meet user specifications, despite localised end of cycle rains.
In terms of technological quality, the baking strength is 196 on average. The dough has average P/Ls of 0.7 and 95% of wheat is under 1. Lastly, the bread-making quality is very good with good dough and bread results and satisfactory volumes.

The French cereals sector has, for many years, strived to offer a high quality production. 96% of our wheat areas are seeded with bread-making varieties which have complementary characteristics. In 2017, 26 million tonnes are milling wheat belonging to the "Superior" and "Premium" categories, with a protein rate of over 11%, a specific weight of over 76kg/hl, and a Hagberg falling numbers exceeding 220 seconds. This harvest will be able to satisfy the requirements of all customers in France, on both the internal and external markets.

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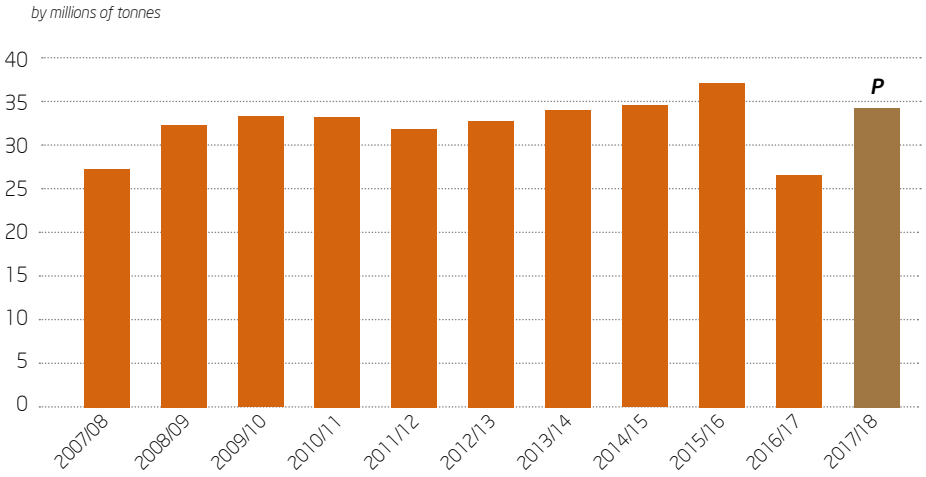
COLLECTION LEVEL

NATIONAL WHEAT COLLECTION TRENDS

> The collection, strictly speaking, represents the share of the harvest that is not used for on-farm consumption and consequently is marketed by the producers. Over the last five campaigns, the national harvest stayed at a high level, except for the exceptionally low 2016/2017 campaign. Estimated at 34.5 million tonnes, the 2017/18 collection should be higher than the average of these last 5 years.



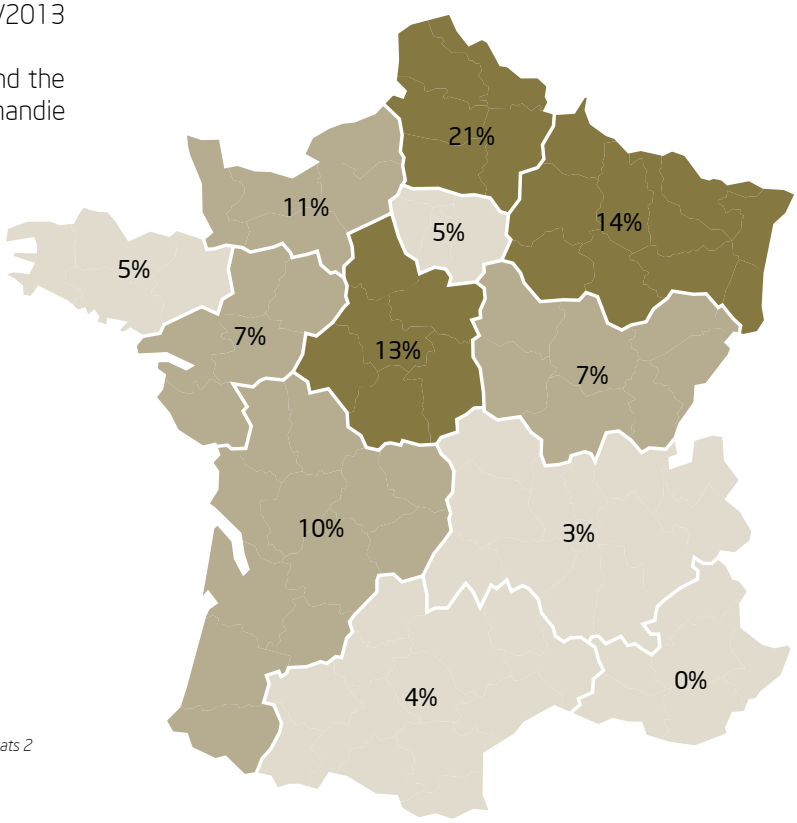
Source: FranceAgriMer, estimations as at 13 September 2017

P: provisional collection

AVERAGED COLLECTION OVER THE PAST FIVE CAMPAIGNS

> The map shows the contribution of each region to the national collection averaged over the last five marketing years (2012/2013 to 2016/2017).
The Northern half of France is the main collection area, and the regions of Hauts-de-France, Centre, Grand-Est and Normandie account for almost 60% of the total collection.

32.8 million tonnes
on average collected over
the last 5 campaigns



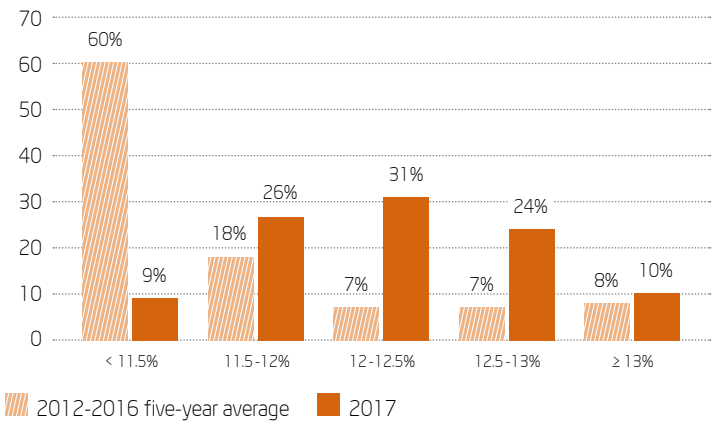
Source: FranceAgriMer/États 2

PROTEINS AND SPECIFIC WEIGHTS

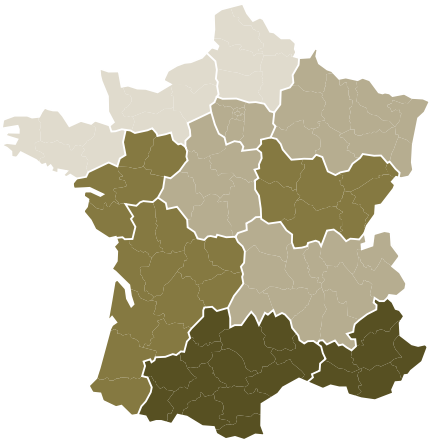
HIGH TO VERY HIGH PROTEIN CONTENTS

> The high amounts of nitrogen available in the soil at the end of winter and the good plant rooting in most areas resulted in high protein content nationwide - 12.3% on average. The regional averages range from 11.6% to 13.4%. In total, 91% of wheat exceeds 11.5% of protein and 65% is above 12%.

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017



Regional averages
- < 12%
- 12% to 12.4%
- 12.5% to 12.9%
- ≥ 13%

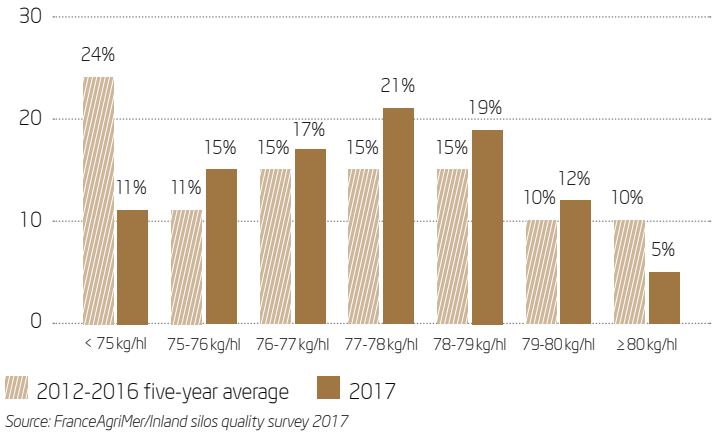
Source: FranceAgriMer/ Inland silos quality survey 2017

91% of wheat has a protein content over **11.5%**

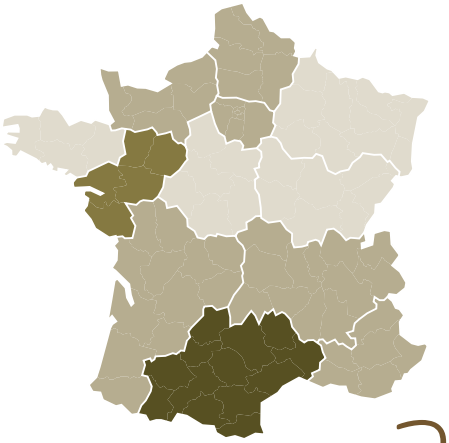
SPECIFIC WEIGHTS: 77.2 KG/HL ON AVERAGE

> The dry and sunny weather during the grain filling period led to a high specific weight potential. The varied rainfall at the end of the cycle throughout France degraded this potential at local level. Nonetheless, the harvest will satisfy the needs of the markets, with an average national specific weight of 77.2 kg/hl. In total, 74% of wheat exceeds 76 kg/hl. Specific weights are measured from samples taken at the time of delivery to inland collection silos, before grain cleaning and processing.

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017



Regional averages
- < 77 kg/hl
- 77 to 77.9 kg/hl
- 78 to 78.9 kg/hl
- ≥ 79 kg/hl

Source: FranceAgriMer/ Inland silos quality survey 2017

3/4 of wheat above **76 kg/hl**

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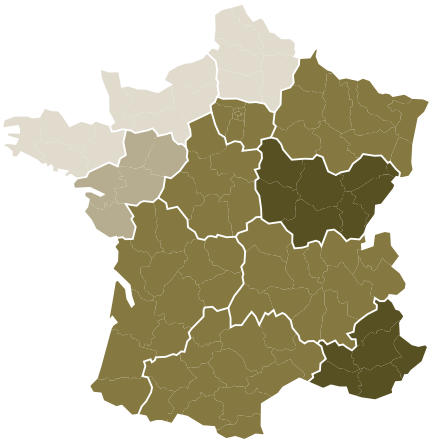
WATER CONTENT AND HAGBERG

WATER CONTENT CONDUCIVE TO GOOD STORAGE

> The harvest mainly took place in good conditions. The water contents of the grain at the time of delivery to collection silos are 13.1% on average at national level. The regional values are lower than 13% for two thirds of them. The regions bordering the Channel show higher values, without, however, exceeding 14.3% humidity on average. At national level, 73% of the harvest has a water content of under 14%.

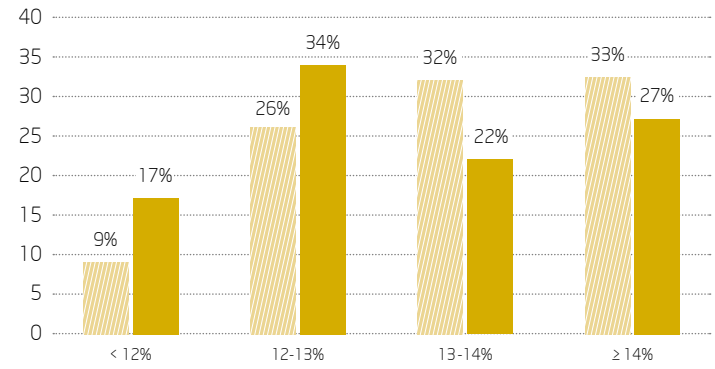


Regional averages

- < 12%
- 12% to 13%
- 13% to 14%
- ≥ 14%

Source: FranceAgriMer/ Inland silos quality survey 2017

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

Water content of

13.1%

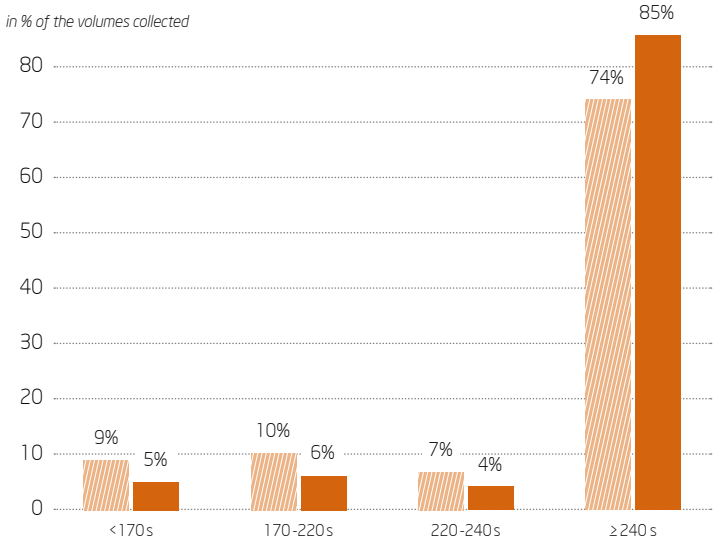
on average at delivery to inland collection silos

HIGH HAGBERG FALLING NUMBERS

> Despite concerns caused by the conditions at the end of the cycle, the Hagberg falling numbers show very good levels across most of the country. Overall, 85% of the wheat exceeds 240 seconds, and only 5% of the harvest scores below 170 seconds.

89% of wheat over **220 s**

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

HARDNESS AND GLU TEN

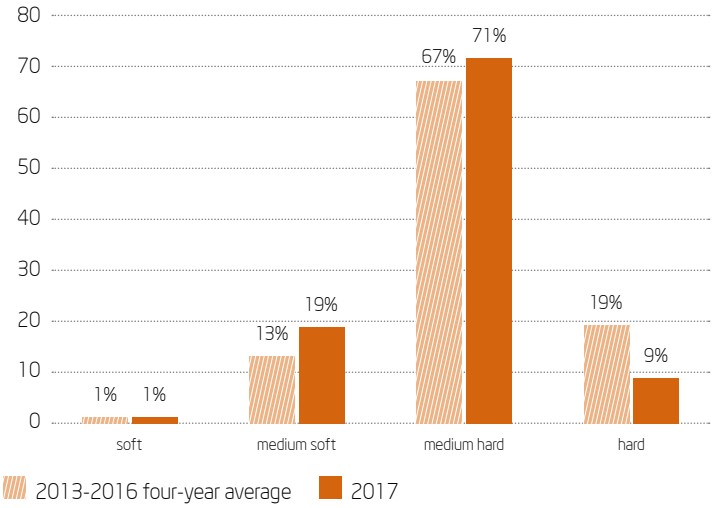
HARDNESS: A MEDIUM-HARD WHEAT

> French wheat ranked medium-hard and hard for over twenty years. The average hardness, of 59.7 in 2017, is consistent with values of the previous years. 80% of the harvest is higher than 50.

80%
of wheat
over 50

Hardness

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

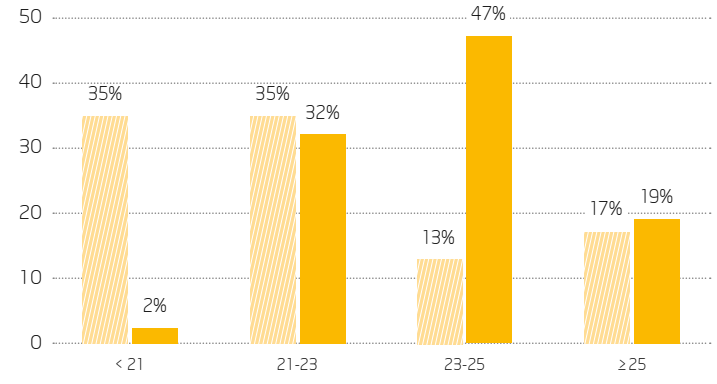
A GOOD QUALITY GLUTEN

> In line with the protein contents, the wet gluten content is high this year. The national average is 23.7%. 66% of wheat has a wet gluten content over 23%.

> The gluten index, an indicator of the protein quality, is 91 on average. 73% of the harvest has a gluten index greater than 90, demonstrating a good gluten viscoelasticity.

Wet gluten

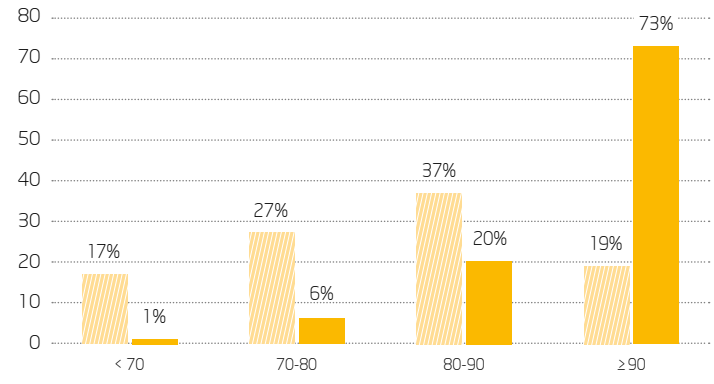
in % of the volumes collected



Source: FranceAgriMer/ARVALIS - Institut du végétal/Inland silos quality survey 2017

Gluten index

in % of the volumes collected



Source: FranceAgriMer/ARVALIS - Institut du végétal/Inland silos quality survey 2017

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Analyses of the wet gluten content and the gluten index, conducted by the Pôle Analytique d'ARVALIS, are covered by Cofrac accreditation no. 1-0741.

ALVEOGRAPHIC CRITERIA

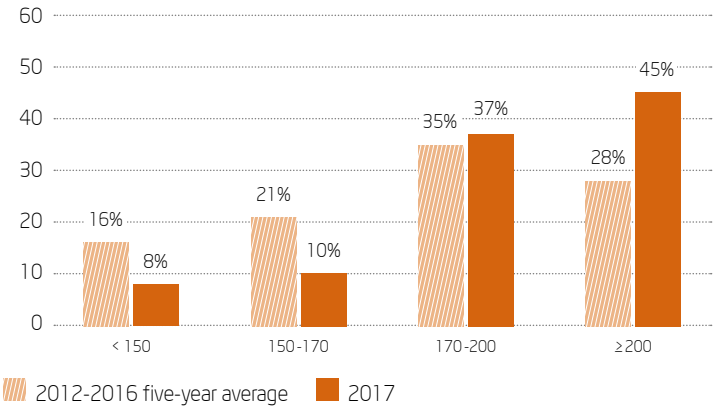
A BAKING STRENGTH OF 196 ON AVERAGE

› The baking strength (W) is good - 196 on average with both nicely extensible and elastic doughs. 82% of the wheat is above 170 W, therefore satisfying the needs of French and foreign millers.

82%
of wheat over
170 W

Baking strength (W)

in % of the volumes collected



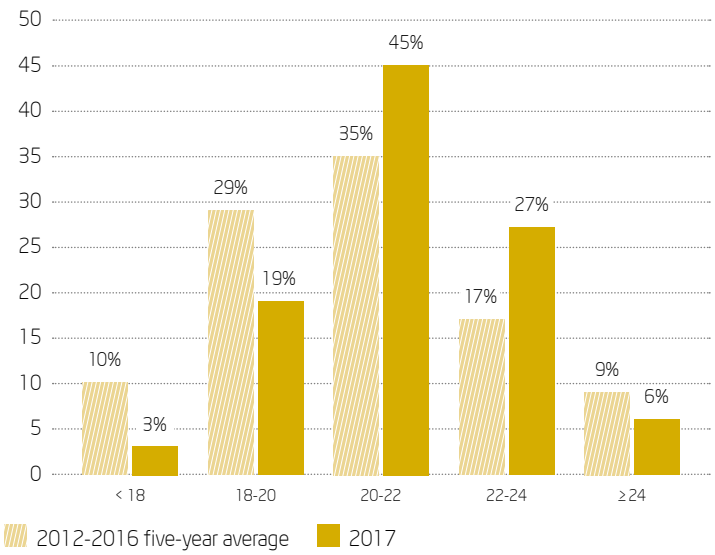
Source: FranceAgriMer/Inland silos quality survey 2017

G AND P COEFFICIENTS: A WIDE RANGE OF EXTENSIBILITY AND TENACITY

› The rising index (G) and the tenacity parameter (P) are spread over a large range of values capable of responding to the various requirements of the milling industry. On average, the G coefficient is 21.4 and the P coefficient is 62.8.

G

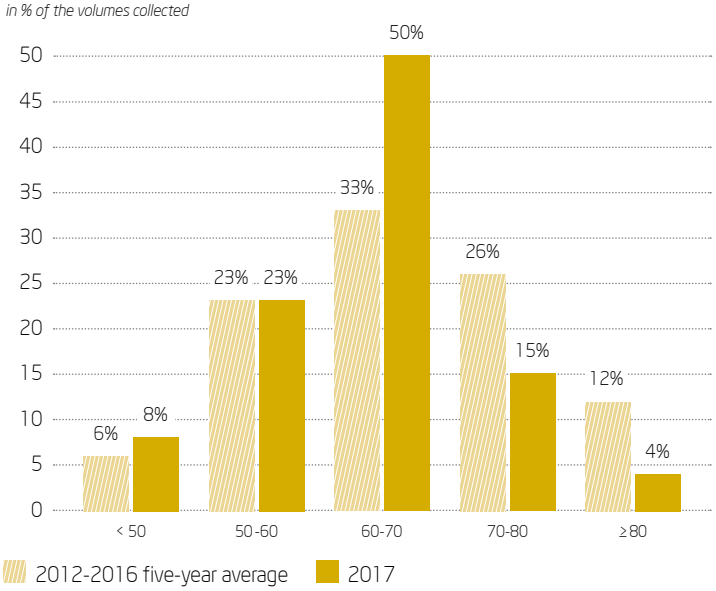
in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

P

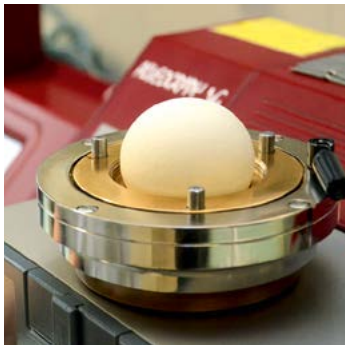
in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

Alveograph tests were performed on wheat whose protein content is above 10.3% and the Hagberg falling number is higher than 170 seconds, classified as fodder or under 100 tonnes.

ALVEOGRAPHIC CRITERIA



WELL BALANCED P/LS

> The P/Ls are very balanced with an average of 0.7. Almost all of the wheat has a P/L of less than 1 and nearly 77% of the harvest is between 0.4 and 0.8. These values will satisfy a broad range of requirements.

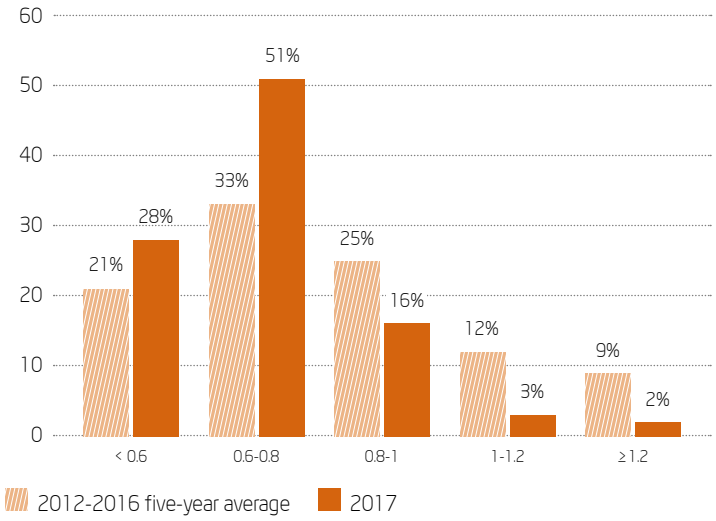
P/L:

95%

of wheat less than 1

P/L

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

HIGH ELASTICITY INDEXES

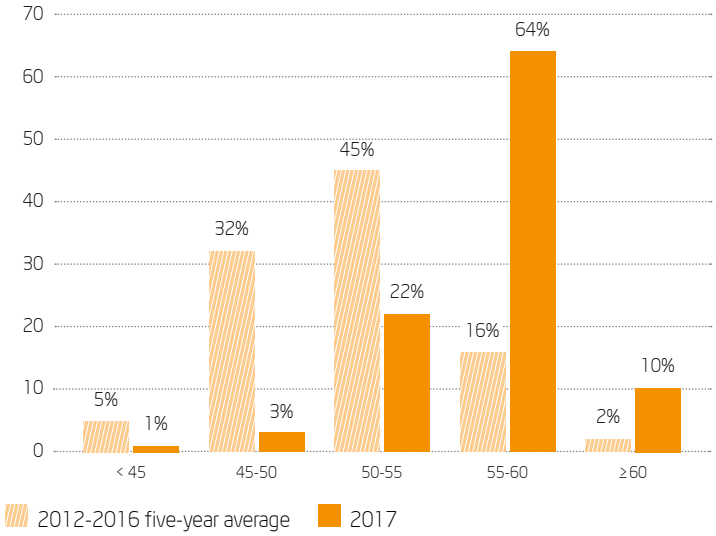
> The elasticity index (Ie) of the wheat reached 57 on average. The majority of the collected harvest stands at over 55, corresponding to a pronounced elasticity. A very little proportion of the wheat has a low elasticity index, under 50.

3/4

of the harvest with a high elasticity index

Elasticity index

in % of the volumes collected



Source: FranceAgriMer/Inland silos quality survey 2017

Alveograph tests were performed on wheat whose protein content is above 10.3% and the Hagberg falling number is higher than 170 seconds, classified as fodder or under 100 tonnes.

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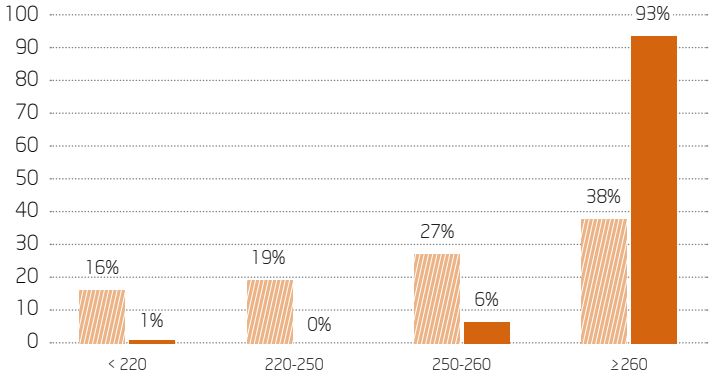
BAKING VALUE

A CONSISTENT AND RECORD LEVEL BAKING QUALITY

> The baking quality of the wheat was graded according to the standard French bread-making test. The overall behaviour, seen through the total scores, is very good and consistent. In total, 99% of wheat scored over 250 out of 300, and 54% is above 270. The national average stands at 268/300.

Total bread-making grade out of 300

in % of the volumes collected

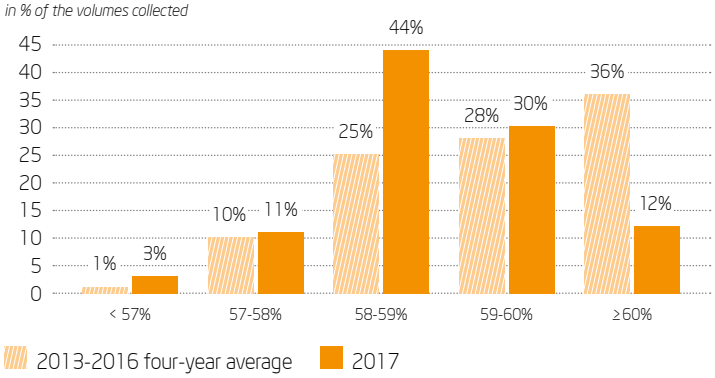


Source: FranceAgriMer/ARVALIS - Institut du végétal/Inland silos quality survey 2017

BREAD-MAKING CHARACTERISTICS

Water absorption

in % of the volumes collected



Source: FranceAgriMer/ARVALIS - Institut du végétal/Inland silos quality survey 2017

> Water absorption during kneading is good, with an average of 58.7%. Over 86% of the wheat has a water absorption higher than 58% and 42% of wheat has a water absorption higher than 59%.

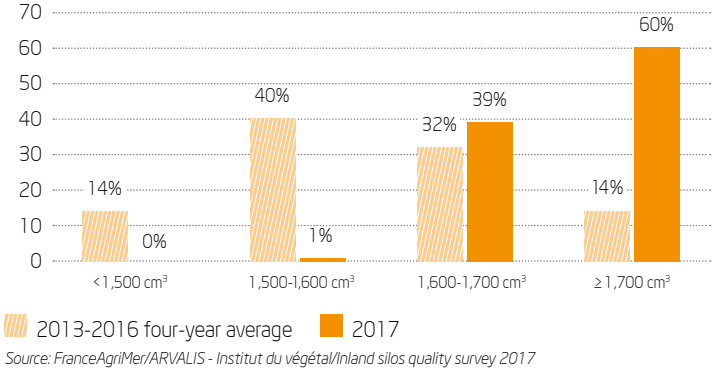
During shaping, the doughs are balanced to slightly short. The shape preservation during baking is also very good. These two elements result in good dough notes.

The bread results are also of a good level, with well-developed blade marks. The average volume is high - 1,750 cm^3. 99% of the wheat analysed has a volume higher than 1,600 cm^3 including 60% with a volume higher than 1,700 cm^3.

This demanding test, reflecting the main stages of the bread-making process, can be transposed to many applications. The characteristics show that French wheat is, in most situations, able to satisfy the needs of users.

Volumes

in % of the volumes collected



Source: FranceAgriMer/ARVALIS - Institut du végétal/Inland silos quality survey 2017

The standard French bread-making test, conducted by the Pôle Analytique d'ARVALIS – Institut du végétal, is covered by Cofrac accreditation no. 1-0741.

ACCREDITATION NO. 1-0741 CAN BE ACCESSED AT WWW.COFRAC.FR

CLASSIFICATION OF WHEAT

THE MAJORITY OF FRENCH WHEAT IS CLASSIFIED IN THE "SUPERIOR" OR "PREMIUM" CATEGORIES

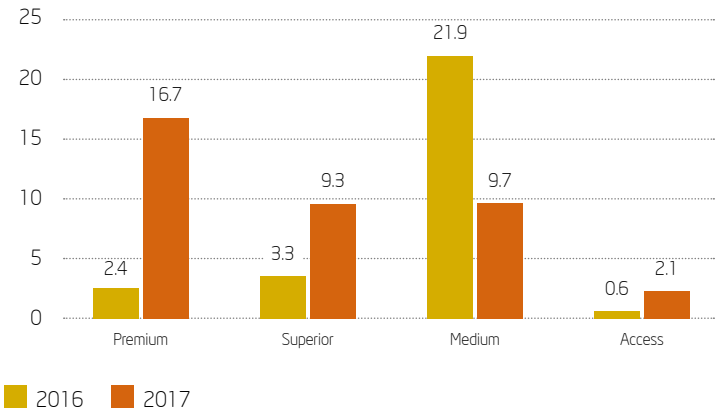
› The protein rate, baking strength (W), mass per hectolitre and Hagberg falling number value allow the collected wheat to be positioned within four quality categories.

This overview of the harvest depicts the French "average resource". On top of that, the diversity in the hinterland leaves the room for the segregation and blending ability of the various operators, which allows a better matching to customers' expectations.

In 2017, 35.7 million tonnes are Premium, Superior and Medium category wheat. 26 million tonnes are in the "Superior" and "Premium" categories, with a protein rate of over 11 %, a specific weight of over 76 kg/hl, and a Hagberg falling number exceeding 220 seconds.

26 million tonnes fall into the **Premium and Superior categories**

by millions of tonnes (Mt)



Source: FranceAgriMer, estimation of the harvest as at 9 September 2015/Inlandsilos quality survey 2017

CLASSIFICATION TABLE

Categories	Protein rates	Baking strength W	Specific weight	Hagberg falling number	National breakdown 2017	National breakdown 2012-2016
Premium	≥ 11.5%	≥ 170	≥ 77	≥ 240	**44%**	**10%**
Superior	≥ 11%	not specified	≥ 76	≥ 220*	**25%**	**26%**
Medium	≥ 10.5%	not specified	not specified	≥ 170*	**26%**	**47%**
Access	specified in the contract	not specified	not specified	not specified	**5%**	**17%**

Proteins: (N x 5.7) % M.S.
W: 10^{-4} joules/g
Hagberg: seconds
Specific weight: kg/hl

* The Superior and Medium categories can be used without a Hagberg specification and in this case, the labels are "Superior" and "Medium"

Source: FranceAgriMer/Inland silos quality survey 2017

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A SURVEY PERFORMED AT INLAND COLLECTION SILOS

The *Quality of French Wheat* survey is conducted by FranceAgriMer and ARVALIS - Institut du végétal, with the support of Intercéréales, the Association Nationale de la Meunerie Française (ANMF) and the Groupement National Interprofessionnel des Semences et Plants (GNIS).

The aim of the survey is to provide information on the quality of the wheat harvested in 263 silos belonging to storage organisations, cooperatives and private merchants. At the time of the harvest, 508 samples were taken by FranceAgriMer agents during delivery from farms to inland collection silos on the categories put in place by the harvesters. These samples were then sent to the laboratories of FranceAgriMer and ARVALIS- Institut du végétal for analysis. Depending on the type of analysis, either all the samples, or a subset of them (nevertheless representing the vast majority of the collected wheat of that site) were analysed.

ANALYTICAL METHODS

› Protein content - *508 samples*

The protein content is measured on whole grains by near infra-red spectroscopy.
The protein content is calculated using coefficient 5.7 and refers to dry matter (DM).

› Mass per hectolitre or specific weight (NF EN ISO 7971-3) - *508 samples*

It is obtained with a Niléma-litre and expressed in kg/hl on the sample as is.
Since 1st July 2012, the results obtained have been corrected using the following equation: (0.9078 x mass per hectolitre) +6.6025.

› Water content - *508 samples*

The protein content is measured on whole grains by near infra-red spectroscopy.

› Hagberg-Perten falling number value (NF EN ISO 3093) - *508 samples*

This indirectly measures the level of alpha-amylase activity, which can become excessive due to the presence of grain which has germinated or is in the process of germinating. The falling number is expressed in seconds and corresponds to the time it takes a stylet to reach the bottom of a tube containing a mixture of milled wheat and water, immersed in a bath of boiling water. A short duration means high amylase activity and therefore a potentially degraded quality.

› Hardness index (AACC 3970.A) - *508 samples*

The hardness, or state of cohesion of the grain, is measured by near infra-red reflectance spectroscopy. The different classes of hardness (extra-soft, soft, medium-soft, medium-hard, hard and extra-hard) are expressed by an index on a continuous scale graduated from 0 to 100.

By general standards, index 25 corresponds to the average value of "soft" wheat and index 75 corresponds to "hard" wheat.

› Wet gluten content and gluten index (NF EN ISO 21415-2) - *206 samples*

These values are used to assess:
- the quantity of gluten extracted by mechanically kneading and washing a mixture of milled wheat and salted water,
- and the viscoelastic quality of gluten by centrifugation through a sieve. The higher the index, the more tenacious the gluten.

› The CHOPIN alveograph test (NF EN ISO 27971) - *460 samples*

The alveograph test is performed on flour taken from a milled wheat sample, for samples whose protein content is above 10.3% and the Hagberg falling number is higher than 170 s.

The CHOPIN alveograph tests weren't carried out on wheat classed as "fodder" by the harvesters. The measure is based on the recording of rheological behaviour of a disc of dough undergoing deformation in the form of a bubble. Five parameters are assessed: W, G, P, P/L and Ie. W represents the deformation of the dough. It gives a good indication of the baking strength. G, or rising index, represents the extensibility of the dough. P relates to the tenacity of the dough. The P/L ratio provides a measurement of the balance between tenacity and extensibility. Finally, the 'Ie' parameter expresses the elasticity of the dough.

› Standard French bread-making test (NF V03-716) - *54 samples*

The bread-making test is conducted on the flour from a milled wheat sample and on 54 representative samples of the collection. It is conducted in five stages: kneading, first fermentation, shaping, second fermentation and finally baking of the breads. Baking quality is assessed at each stage of the bread-making process and leads to a grade out of 300. It summarises 30 intermediary grades established by the baker for evaluating the characteristics of the dough, the bread as a whole and its soft centre. A bread-making grade which is lower than 200 indicates that the wheat is poorly adapted to French bread-making. On the other hand, a grade higher than 250 testifies to the dough's good bread-making quality.

NB: the previous results are shown as the five-year average (2012-2016) or the four-year average (2013-2016) depending on the date when the analyses were carried out on the current methodological basis.

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groupement national interprofessionnel des semences et plants

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