

Industry players
and professionals
of animal feed,
**INSIST ON
STAR-SORGHUM**



Sorghum is a crop IN TUNE WITH THE TIMES

SORGHUM

IS A RUSTIC and STRONG CEREAL, shoulders broad enough to resist predators of all kinds, sober like a camel, low on inputs and above all, generous. It has everything to seduce our times and meet its expectations. Based on this observation, European breeders have created new varieties that are even more resistant, even more sober, even more generous and even more economical. Varieties, whose yields have been increasing steadily for 30 years, and which amply deserve their stars.

“*Sorghum represents 5 to 10% of the total of my production surface depending on the year. It's an economic and ecological culture which can achieve great results.*”

Hervé Clamens, farmer in France
Learn more at: www.sorghum-id.com



SORGHUM,

SINCE TIME IMMEMORIAL, THE CEREAL OF THE FUTURE

Among the major cereals, Sorghum is the one with the greatest development potential. Sorghum has been a staple food for centuries in Africa and Asia, now it is being warmly welcomed in the USA and has also seduced the agricultural world of the old European continent, which is thirsty for productive, profitable and sustainable crops. And sorghum can boast of being an ecologically virtuous plant:

Low-water-need crop

Thanks to its CO₂ absorption mechanism which gives it better photosynthetic yield even in dry conditions and to its dense and deep root system capable of extracting and using water and nutrients from the soil more efficiently, sorghum has little need in water.

Low in input

Sorghum is able to use efficiently fertilizers from the soil so it does not need further fertilization. In addition, it is little exposed to diseases and pests so requires little phytosanitary treatment. The icing on the cake: it plays the role of an antiparasitic in rotations because its presence in a succession of cultures breaks the cycle of parasites.

Insist on Star-sorghum It is productive, profitable and sustainable.

A big thank you to European breeders who, for thirty years, have been producing high quality sorghum whose yields are progressing steadily.

Why?

Because this sorghum-star has the double merit of meeting all the criteria of the animal feed manufacturers and of being productive, which encourages producers to cultivate it and secures supplies.

+1%/ yr* since 1990. That is the increase in yield generated by early- and semi-early hybrid genetics produced in Europe.

*example from France,
source: Arvalis 2015



PORTRAIT OF A SORGHUM GRAIN

The sorghum variety intended for the production of animal feed is the sorghum grain: a small sorghum selected for grain production. This species is known for its high yield potential and excellent resistance to lodging-related diseases.

Colours and sizes

The sorghum grain of sorghum is round and pointed. It presents a great diversity of hue and size (diameter from 4 to 8 mm). Its TKW (Thousand-kernel-weight) varies from 6 to 70 g.



Nota bene

There are also other varieties like the single-cut sorghum silage and the multi-cut sorghum for silage, pasture or green feeding.

“ I have been growing sorghum every year since 2014. It is a crop that requires less water.

Cristian Spiridon, farmer in Romania. Learn more at: www.sorghum-id.com



A CULTURE GROWING, GROWING AND GROWING

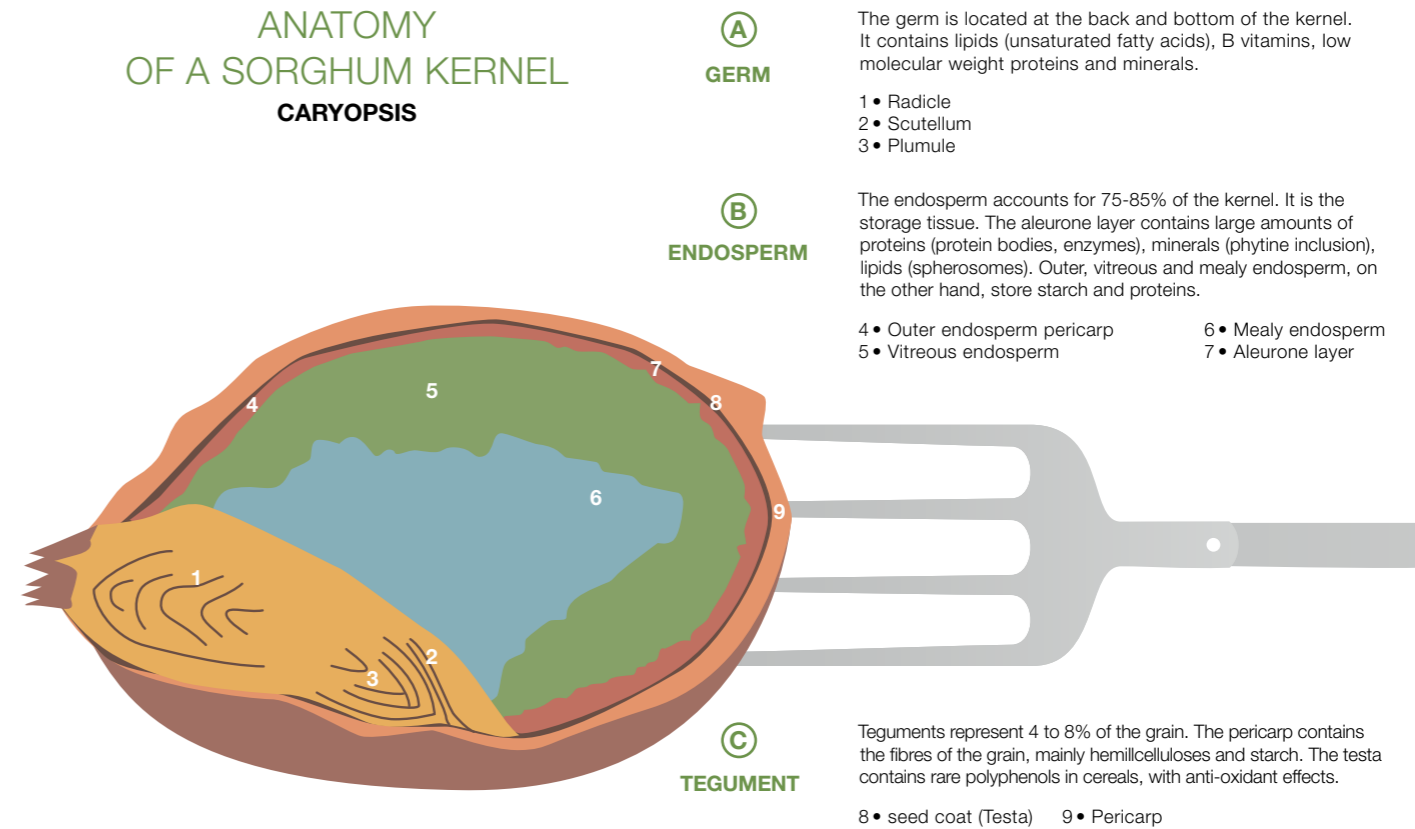
More and more farmers in Europe grow sorghum. Sorghum is a crop which gives them both an opportunity for diversification and an agronomic response to global warming (let's not forget that 85% of agricultural land is not irrigated!). Another convincing argument: thanks to star-sorghum genetics, yields are increasing. Surfaces are growing which reinforces supply security.

In 2019, for the 2nd consecutive year, the surface cultivated in sorghum increased very significantly in Europe. In the EU28, the average increase compared to the previous year is +10%, with variations depending on the country (+ 9% in Italy, + 14% in France, + 18% in Romania, + 30% in Austria, + 50% in Hungary...). In Ukraine, the cultivated surface increased by 25%. This surface increase, as well as good yield levels, especially in Central and Eastern Europe, made it possible to reach an overall

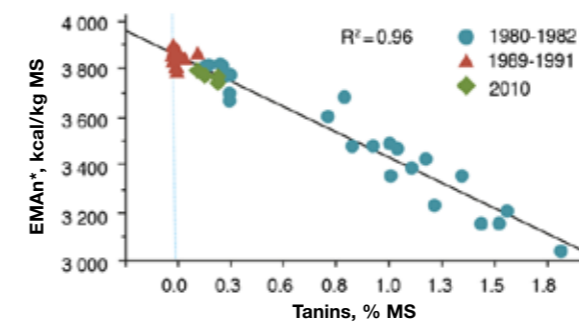
production (EU28 + Ukraine and Russia) of 1.3MT, which constitutes a good level of production, superior to previous harvest results.

This trend should continue because (among other things) sorghum benefits from Community funds intended for its promotion across Europe. It's Sorghum ID that is piloting this project. The success of the 2nd European Congress, held in Milan in 2018 on its initiative, confirmed the interest that producers and industrialists took in this cereal.

ANATOMY OF A SORGHUM KERNEL CARYOPSIS



For the past 30 years, European sorghum has been tannin-free, as shown in the graph here under:



*EMAn: Metabolizable energy measured in poultry
Source: News@lim n°29 ARVALIS-Institut du végétal

On this graph, each dot represents a European variety (in blue from 1980-1982, in red from 1989-1991 and in green, from 2010).

Two lessons can be learnt from the data above:

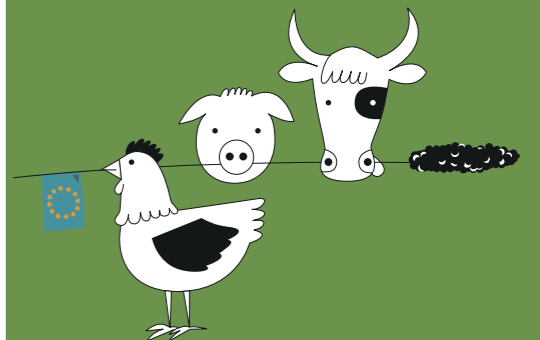
- There is a significant correlation between tannin-content and the energy value of the finished product
- Since the end of the 1980s, European varieties are tanning-free

What are tannins?

Tannins (condensed) are polyphenols of vegetal origin. They precipitate proteins, forming enzyme-resistant complexes, that plant use as a chemical defence solution against pathogen germs and herbivores.

Insist on star-sorghum. It is tannin-free!

Sorghum has a reputation of having high tannin levels. This is an image handicap, as the presence of tannin in animal feed is a significant anti-nutritional factor in monogastrics. Thanks to the efforts of European breeders, for the past 30 years European sorghum has been devoid of tannins. And that whatever its colour. The « Tannin contents <0.3 » criterion is required to register any new variety. In practice, it means “tannin-free” as the presence of tannin acid is so weak that it has no impact on the animal feed quality.



Sorghum is a food IN TUNE WITH THE TIMES

Today's consumer is hungry for healthy, perfectly traced products, produced locally within environmentally friendly conditions. Today's consumer wants to know how animals have been fed. Sorghum is one of the virtuous crops that animal feed professionals can trust.

SORGHUM

HAS SERIOUS ADVANTAGES FOR LIVESTOCK

Sorghum offers chemical composition similar to that of maize, though with a slightly higher protein level and energy value, and it is tannin free. It can thus be woven into the rations of most livestock sectors.

Poultry: The average energy value is 3,730 kcal / kg DM, with variable incorporation into the ration: from 15% on average (all species and growth stages combined) and up to 40%.

Grazing animals: Sorghum grains can be used to produce the energy concentrates that supplement fodder and nitrogen enriched sources.

Pigs: The digestible energy of sorghum is relatively high. This is the reason why sorghum is a raw material very suitable for feeding pigs and its proportion can reach up to 25 to 30% in pig feed.

“ 80%
of the sorghum
volumes
produced in
Europe are
intended for
animal feed

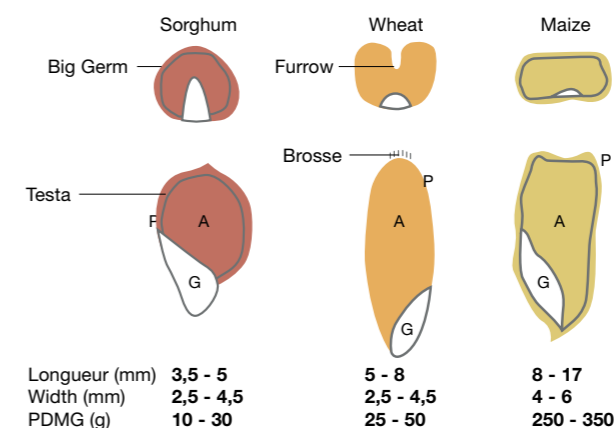
Charles-Antoine Courtois
Development Manager
Sorghum ID
Learn more at:
www.sorghum-id.com

Insist on star-sorghum! It is the result of rigorous seed production standards

THE EUROPEAN SELECTION'S 8 PILLARS.

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- 1 Yield and stability
 - 2 Early growth, as well as tolerance of low temperature during emergence and flowering
 - 3 Drought tolerance
 - 4 Lodging resistance, as well as its "stay green" character
 - 5 Disease resistance
 - 6 Predator resistance
 - 7 Grain quality: very low tannin content, grain colour and texture, starch content, grain health quality, etc.
 - 8 Forage quality: digestibility and food value, BmR character, sugar content, etc.

COMPARATIVE MORPHOLOGY OF CEREAL GRAINS



SORGHUM CHEMICAL COMPOSITION AND ENERGY VALUE

Sorghum offers a nutritional composition similar to that of maize, but with slightly higher levels in protein and energy value.

The starch and fat contents (main sources of energy) of sorghum are identical to those of maize, while its protein content is a little bit higher. Sorghum also has a low proportion of fibre. The amino acid profile of sorghum is a little bit different from that of maize (less lysine and sulphur-containing amino acids, more threonine and double tryptophan content). Grain sorghum is a source of water-soluble vitamins of group B. Its concentrations of thiamine, riboflavin and niacin are comparable to those of maize.

Composition (g/kg MS)	Sorghum	Maize
Amidon*	747	747
Proteins*	109	90
Fat*	42	42
Cell walls*	98	105
Total sugar**	13	19
Calcium**	0.4	0.5
Phosphor**	3.2	3.0
Lysine**	2.5	2.8
Threonine**	3.6	3.5
Met + Cys**	3.8	4.3
Tryptophan**	1.2	0.6

Source: Qualit@lim sorghum, Arvalis - Plant Institute - France Agrimer ** source tables INRA



TO THE HEALTH OF MONOGASTRIC ANIMALS

Thanks to its chemical composition, its energy value, its richness in proteins and its low exposure to mycotoxins, sorghum integrates perfectly in the rations of monogastrics.

Favourable chemical composition

ARVALIS - Plant Institute, in collaboration with FranceAgriMer, analyses grain sorghum every year. It appears that its chemical composition is similar to that of other cereals, such as wheat and maize (see table below).

- Its starch content, which is a source of energy, represents 74% of the dry matter. It is superior to that of wheat and equivalent to that of maize.
- The protein level of sorghum, on average 11%, which can fluctuate between 10 and 12 in the best cases, is also very interesting and higher than that of grain maize.

Chemical composition of sorghum, wheat and maize.

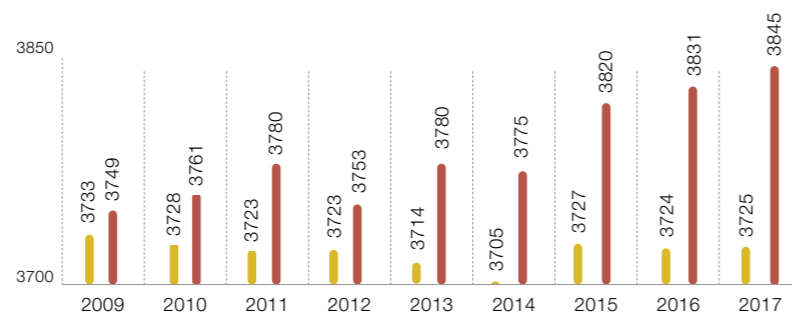
% DM	Sorghum	Wheat	Maize
Amidon	74	69	74
Protein	11	12	9
Fat	3.5	1.8	4.2
Cell walls	8	11.5	9.5
Total Sugar	1.3	2.9	1.9



Very high energy value in poultry.

Sorghum not only has a favourable chemical composition, but it is also the most energetic cereal for poultry. It can be incorporated up to 40% in formulations; while taking care to adapt this incorporation rate according to the growth or production stage. For example, during start-up phases, it is preferable to limit the incorporation rate to a maximum of 30%.

Energy value of sorghum (red) for rooster compared to maize (yellow) expressed in kcal/kg DM



Source: Qualit@lim maize and Qualit@lim sorghum

IMPACT ON MEAT QUALITY

The presence of sorghum in the diet of the poultry has little effect on the organoleptic quality of the meat.

- Compared to maize, sorghum contains less xanthophyll, a pigment which induces the yellow colouring of the final product. Poultry having a sorghum-rich diet will produce less yellow meat than corn-fed poultry.
- However, some markets prefer white meat and, although the colour of the meat can be changed, there is no effect on its taste!

AND WHAT ABOUT PIGS?

The nutritional qualities of sorghum in pork production are also very interesting.

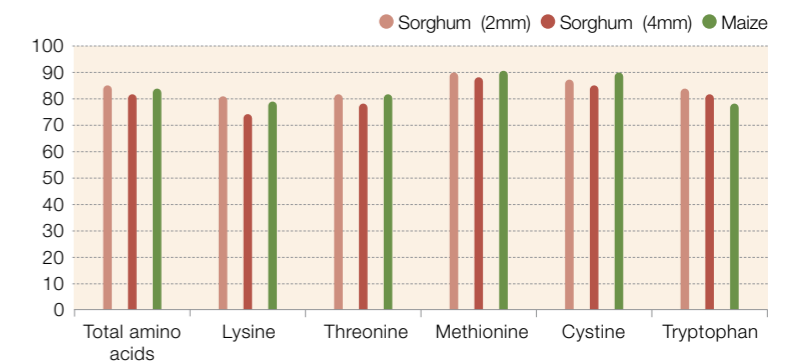
- The nutritional value of sorghum has been proven. In the growth phase and when fattening pigs, the daily gain generated by sorghum is almost identical to that of maize. Sorghum can be introduced into the feed formulations with maize, wheat and barley. Compared with maize, sorghum nutrient levels are slightly higher in amino acids, with a little less energy.
- Sorghum can be used at every stage of pork production: during breeding, growth and fattening.
- Containing essential amino acids, sorghum offers interesting amounts of threonine and tryptophan. On the performance side, average daily gains range from 98% to 106% of the value of maize.



MILLING: A STEP THAT SHOULD NOT BE NEGLECTED.

Sorghum grains need to be processed properly so that its full potential is released. As it is smaller and harder than the grain maize, it needs to be broken down into fine particles in order to improve its digestibility. Milling is then an important step. The digestibility of sorghum in food, as well as a better availability of starch (ie energy) is the result of milling the grain. The finer the seed, the better it is used by animals. 2 mm is a good compromise. This increases the level of digestibility of most important amino acids compared to 4mm milling.

Digestibility of amino acids according to the size of the milling of sorghum seeds (in%)



Source: News@lim n°23 ARVALIS - Institut du végétal

Since all animals do not have the same sensitivity, the quality of milling acts differently according to the species and stage of development.

- For pigs, there should be no ungrounded grains left as they will not be digested.
- For poultry, which are grain-eating, the opposite is true. However, for fast-growing poultry, grinding seeds is useful because it allows faster absorption of nutrients and increases their performance.

**TO THE HEALTH
OF GRAZING ANIMALS**

Grain sorghum can enter the composition of energy concentrates complementing fodder and nitrogen sources (see table below): the vitreous nature of the endosperm slows down the degradation of starch and proteins in the rumen, which limits the risk of acidosis and optimizes the delivery of PDIA. Unlike wheat it must be finely ground in order to be well digested.

**Energy and protein values
in ruminants**

	Sorghum	Maize
UFL (by Kg DM)	1.22	1.22
UFV (by Kg DM)	1.22	1.23
PDIN (g/Kg DM)	78	74
PDIE (g/Kg DM)	100	97

**Insist on
star-sorghum!
It is not very
sensitive to
mycotoxins and
GMO-free.**

Sorghum is not attacked by borer insects, which are the gateway for fungi such as fusarium. In addition, the panicle and the grains being in the open air, the grain dries quickly which strongly limits the installation of Fungi. Thanks to these characteristics, sorghum is safe from mycotoxins. In addition, it is GMO-free.

** Be careful, however, to harvest sorghum as soon as the grain is mature because if the harvest comes too late after the maturity of the grain, the development of mycotoxins can be significant.*





SORGHUM THE SAFE BET FOR THE FUTURE

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