



SORGHUM,
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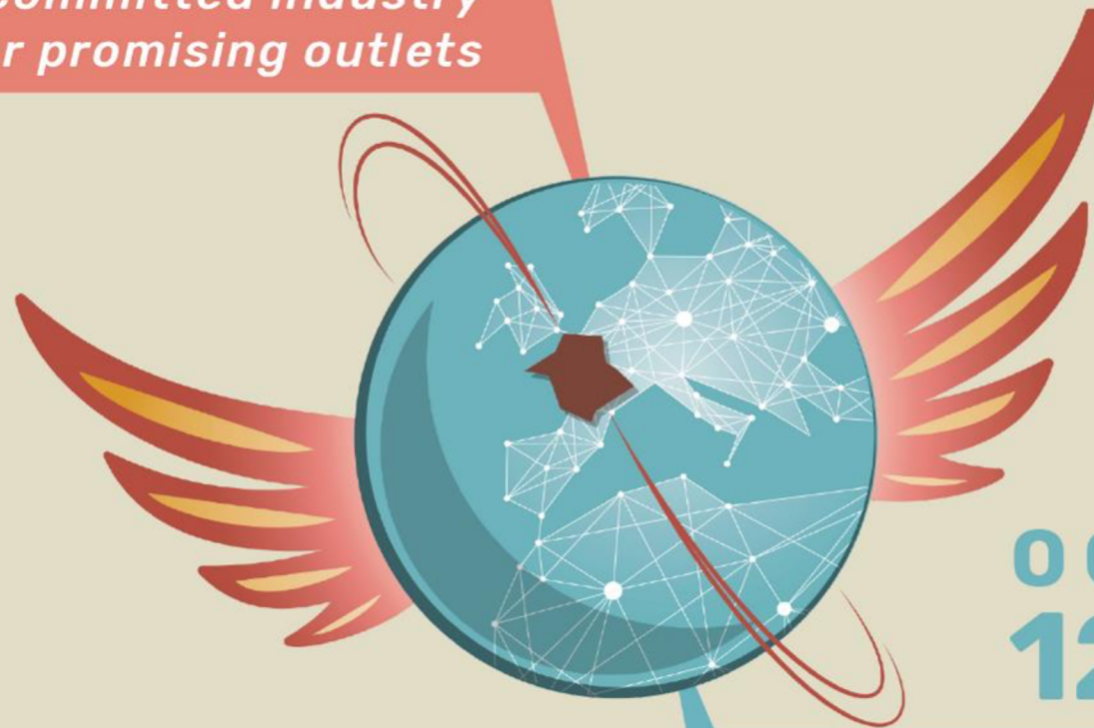


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THE SORGHUM

*A committed industry
for promising outlets*



OCTOBER
12TH & 13TH

TOULOUSE

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ENJOY
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EUROPE



Main axis of research for EU market

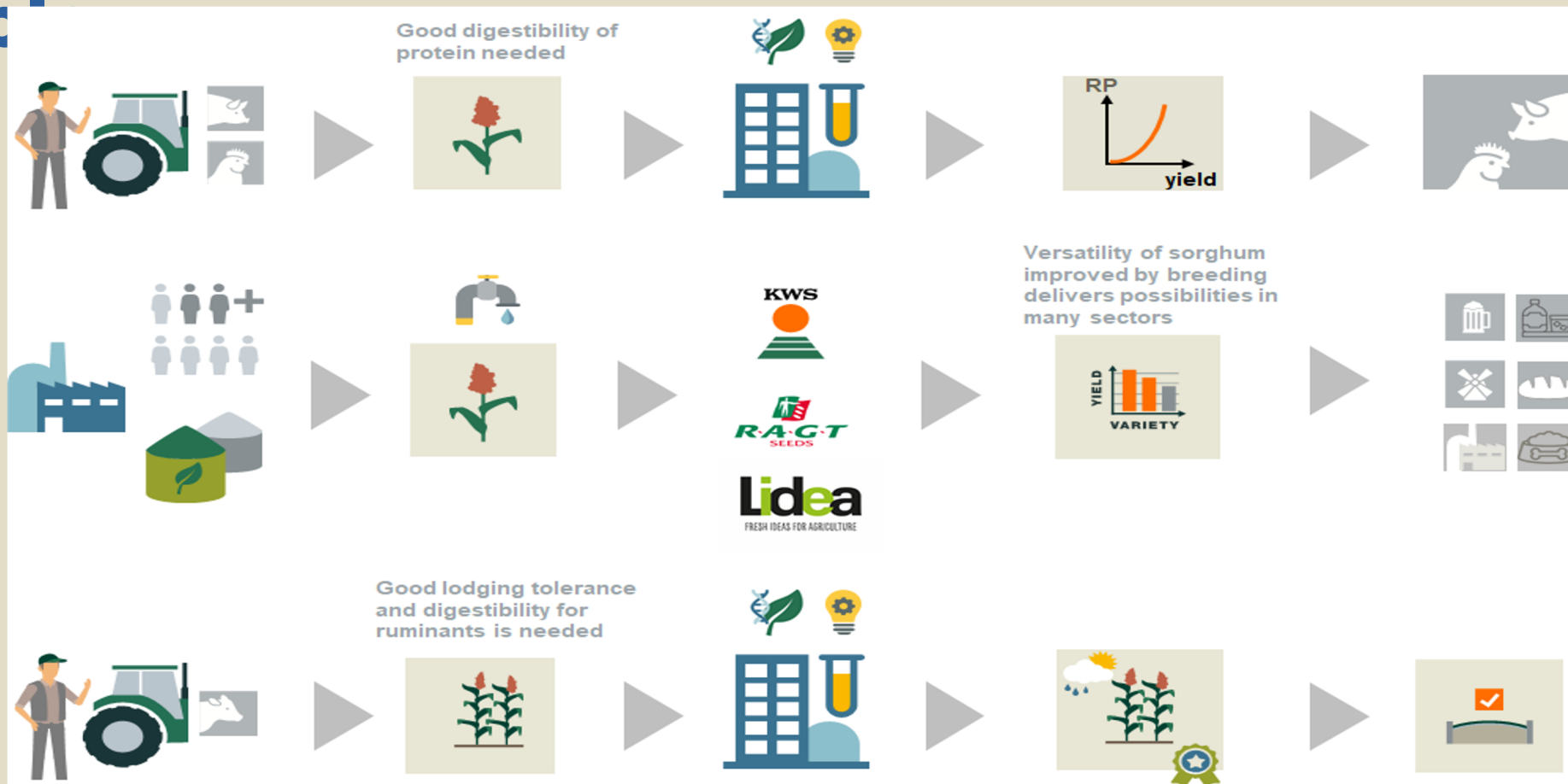
Patrice Jeanson, LIDEA
Magdalena Buschmann, KWS
Joel Alcouffe, RAGT



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Sorghum Value chains: varietal solutions are available



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source: Eurosorgho

Sorghum Research

In Western Europe, sorghum breeding programs are mainly oriented on grain and silage.

Breeding for grain:

In addition to the traditional targets (yield and earliness), we have to consider the following characters to develop sorghum acreage in response to the market's requirements and to fight against climate change

- Quality of the grain
- Higher digestibility of the dry matter
- Nitrogen efficiency
- Drought and heat tolerance
- Diseases tolerance
- Insects tolerance
- Others (growth at low temperature, heading fertility.....)



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GRAIN

Improve the quality of the grain

No tannin

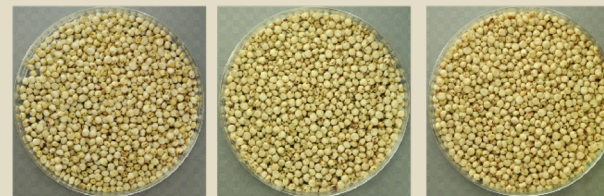
First “poor tannin” sorghum varieties have been registered in France in 1981

To be registered, all the varieties have to be lower than 0,4% for the tannin content in the grain

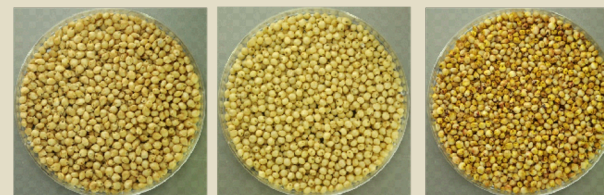
All the varieties commercialized in western Europe are “poor tannin” whatever the color of the pericarp.

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whites



creams



oranges



light brown



dark brow



Treated S3



source: Eurosorgho



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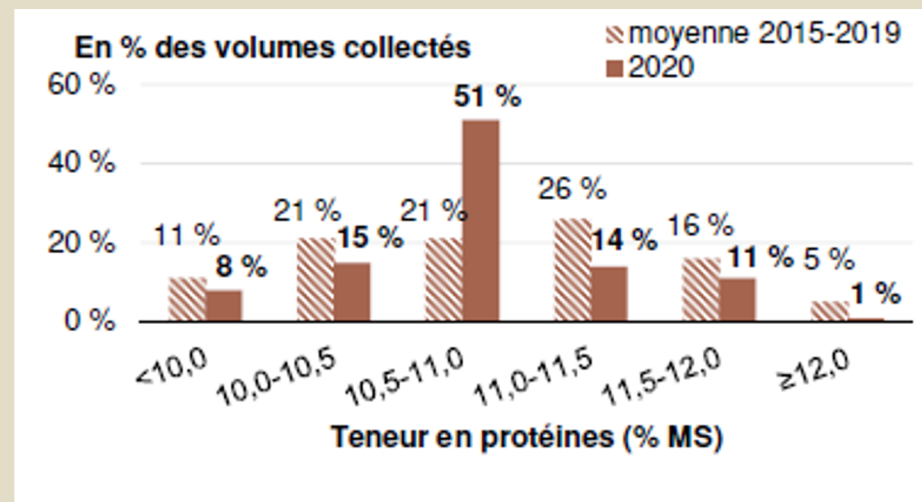
GRAIN

Improving the quality of the grain

Protein content

The EU calls for increasing the protein independence.

Sorghum protein content is higher than corn (up to +3 points). Add 1 point and more could give to this crop a real advantage for near the feed industry.



➤ Composition chimique

	Sorgho	Maïs	Orge 2R	Blé
MAT(% MS)	10.9	9.4	11.6	12.1
Amidon (% MS)	74	74	60	70
Cellulose (%)	2,6	2,2	4,0	2,3

source: Arvalis



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GRAIN

Improving the quality of the grain

Protein digestibility

Sorghum protein digestibility is not optimal
(kafirins, protein encapsulation)

Increasing the protein digestibility is essential to
promote the use of sorghum, have more accessible
energy and improve the value chain.

Collaborative project: **NITROSORG**

A research program dedicated to develop tools
for improving grain quality (protein content
and digestibility) and adapted to poultry
feeding

Partners Network:

- CIRAD UMR AGAP
- CIRAD UMR SELMET
- INRAE UMR IATE
- INRAE UE PEAT
- INRAE Tours University
- ITAVI
- EUROSORGHO
- RAGT





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FORAGE

Increasing the energy value of the dry matter

Forage for ruminants – methane potential

3 main types of forage sorghum, depending on their digestibility index (UF)

- **Biomass:** characterizes by high productivity but lower digestibility, only for biogas production
- **Dual uses:** good production and medium digestibility, use for industry and feed
- **Silage:** with high digestibility, well adapted for feed



Source: KWS



Source: RAGT



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FORAGE

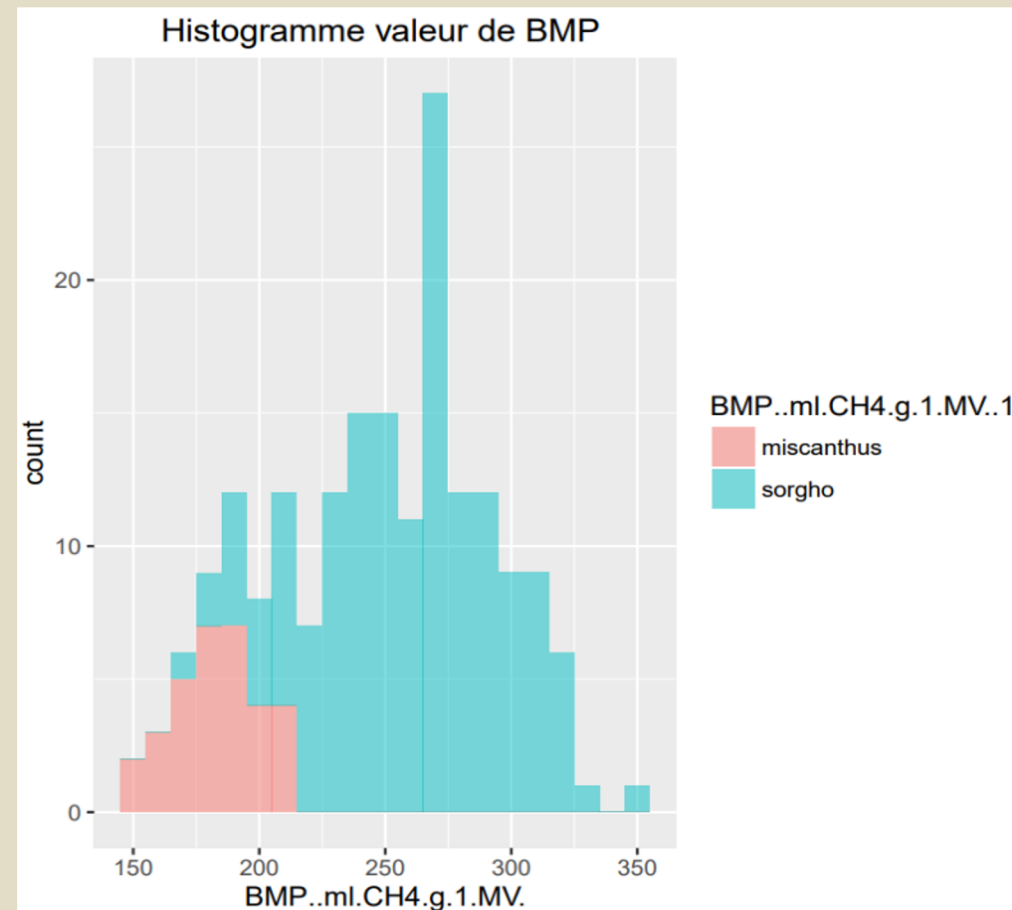
Methane potential

Prediction equation for methane production, is output of the **BFF (Biomass For the Future)** project, developed by LBE in Narbonne.

Allows to characterize all sorghum diversity for the potential of methane with NIRS technology.

A good tool to screen the best varieties adapted to methane production in the research programs

Big genotype effect, less methane production per G of DM for the industrials, and higher for the silage.



Source: LBE



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FORAGE

Silage for ruminants

Due to climatic evolution, the use of forage sorghum increases.

Increasing the digestibility of these sorghum is indispensable to be more attractive for the farmers. Evaluate variability for lignin content is one of the key points to address this subject. So introducing BMR trait is a way to work.

Then, resulting from the works of BFF, an approach is to screen all the traits involved in the digestibility



Source: KWS



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Agronomic

Root efficiency

Due to climatic evolution the water availability will decrease while the evaporation will increase with the higher temperatures

Work on root efficiency is a major topic to select the genotype best suited to extract a maximum of water and nutrients from the soil. This will confer to these genotypes a better adaptation for growing in constrained environments.

The EU project **ORHIZON** has been submitted.

Some of the goals are to give to the breeders tools to phenotype roots, to correlate root architecture and plant behavior, nitrogen and water efficiency.



Source: KWS



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Agronomic

Lodging tolerance

In last year, climate change was more visible like storms. Hundreds mm of precipitation in one hour. Such climatic event impacts the standability of any crops. Especially forage types could be more under lodging stress.

Two main traits are in the focus - lodging tolerance before flowering and before harvest and green snapping.



Source: KWS



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Agronomic

Diseases tolerance

Fusarium and macrophomina

These are the two main diseases for grain sorghum in Europe.

The post flowering stage, during the grain filling phase is highly sensitive to these disease specifically under conditions of high temperatures and water stress.



source: Eurosorgho



source:
RAGT



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Agronomic

Diseases tolerance

Fusarium could attack also panicles, leading to grain maturation problems, quality and yield decrease.

The right selection is eliminating the problem.



Source: KWS



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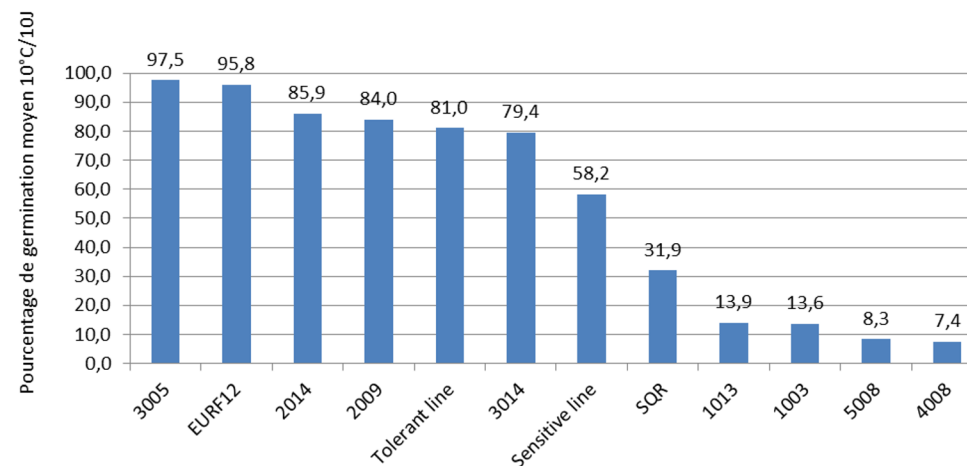
Agronomic

Cold tolerance

Capacity to growth at lower temperature:

- Stress after emergence -> slow down whole development
- Could negatively impact the heading fertility
- For planting earlier than usual
- To have a better and faster emergence
- To adapt the crop in the organic farms, without seed treatment
- Genetic diversity exists

Percent of mean germination at 10°C versus 20°C
after 10 days



Source:EUROSORGHO

source: RAGT



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Agronomic

High temperature tolerance

Heading fertility at high temperature could be disturbed.

Pollen viability is affected by temperature. Usually in Europe the risk is limited but with the heatwaves higher than 40 degrees that are being observed, increased impacts are expected and fecondation does not achieve the optimum.

Heading fertility: to maintain the level of production even in case of low or high temperature before and during the flowering stage. Crucial periods are floral initiation and flowering time



source: Eurosorgho RAGT



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Agronomic

Stay green and drought tolerance

Stay green helps Sorghum to ensure stable yield.
The interest of this trait is growing in EU in
accordance with the higher frequency of
heatwaves and drought events after flowering



Source: KWS
Eurosorgho
RAGT



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Agronomic

Green bug and Aphids tolerance

Green bug and aphids, Aphids are getting around the world still more and more stress for Sorghum, mainly the sugarcane aphids. The aphid sucks juices from and injects toxin into plants.

The tolerance to aphids is key success in the future to assure stable high yields. Resistant hybrids will not be completely free of greenbugs, but there are less bugs than on susceptible hybrids, so the damage is lower.



Source: KWS



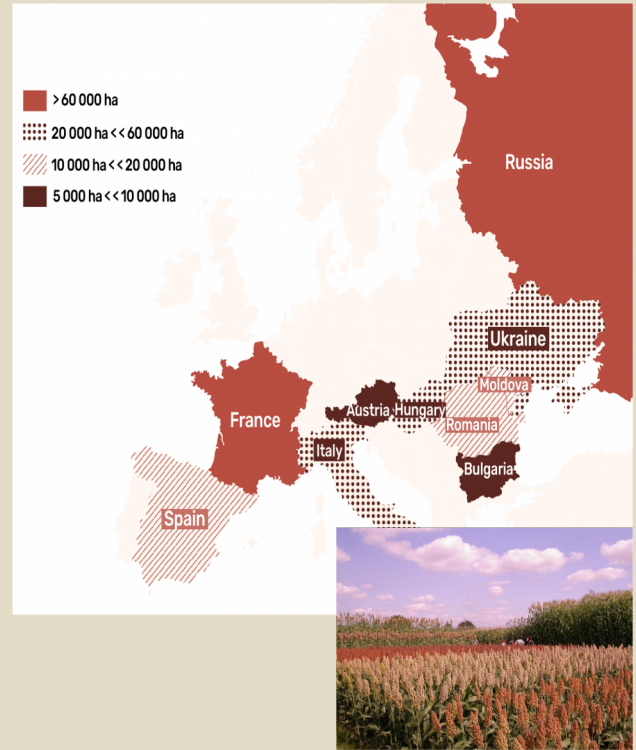
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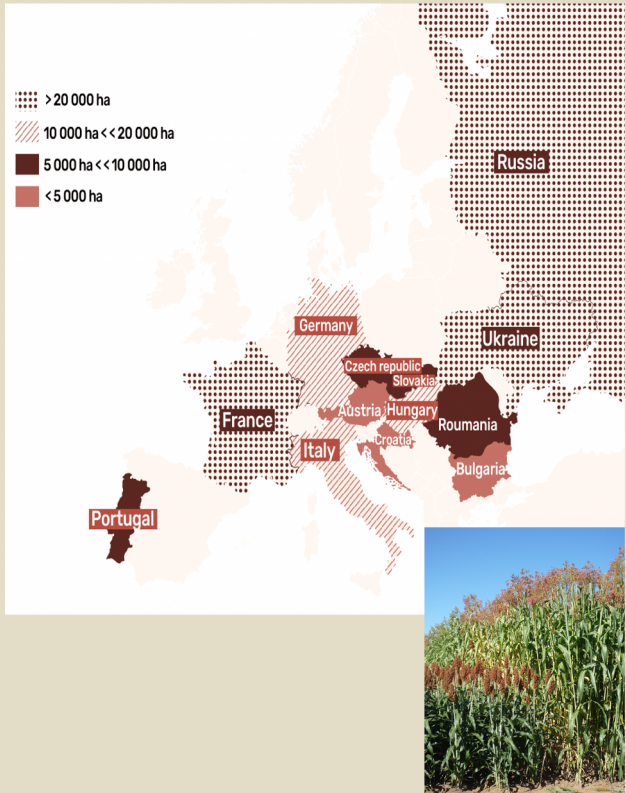


Some challenges to tackle but varietal solutions for the main value chains are already available

For grain



For silage



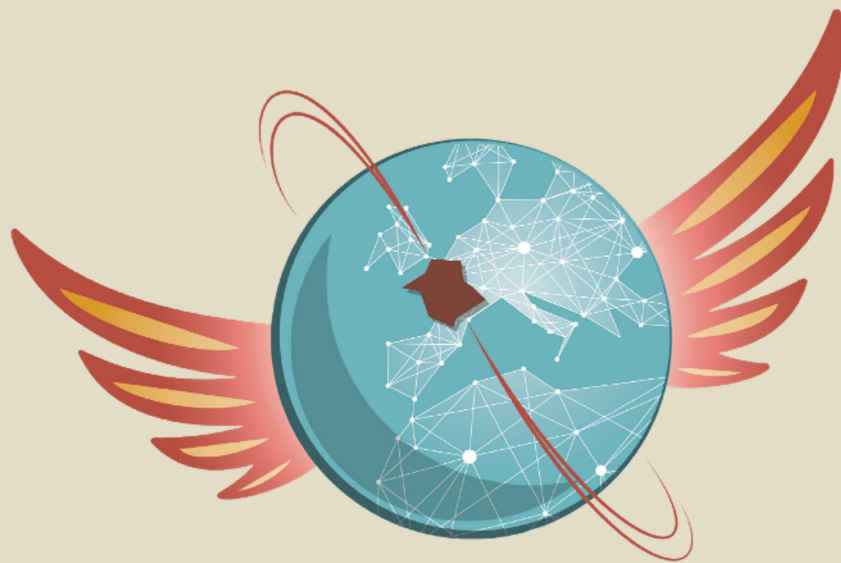
Varieties adapted to the different EU pedo-climatic and management conditions

=> Fitting the expectations of the value chains



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Thank you

Partners



FNPSMS
maiz'EUROP'



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