

# THE ESSENTIAL ABOUT SILAGE MAIZE



Technical guide for  
succeed in your culture



A BRAND OF  
**MAÏSADOUR**

**masseeds**  
UNITED TO GROW

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## GENERAL INFORMATION ABOUT SILAGE MAIZE



Why is corn silage a staple cereal?

And a concentrate of energy?

Why use hybrids?



# THE ADVANTAGES OF SILAGE MAIZE

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Maize is a basic winter forage or a complement to pasture, and is an essential part of milk cow feed all year round.

It is richer than hay, easier to conserve than grass silage, and quickly convinced the breeders who tried it.

## Forage maize is grown like grain maize

Only the harvesting stage and method change. For forage maize the whole plant is harvested, shredded and used for silage. Harvesting takes place when the plant contains around 32% of dry matter. It is a good compromise between yield, conservation and feed value.

Silage maize is easy to conserve, the fermentation process is fast and efficient. Once stabilised, the silage can be kept for 12 to 18 months.



## Silage maize can be given to animals in two forms:

### Whole plant

It is rich in starch and has a high and stable energy value, around 0.91 UFL (milk feed unit) and 0.81 UFV (meat feed unit) per kg of DM.

A good ration consists of 70 - 75% forage maize and contains 22 to 28% starch for milk cows and 10 points more for feeder cattle.

In the ration the forage maize is always associated with other feeds and mineral and nitrogen additives which enable the production targets to be reached.

### Grain harvested humid

Grain maize harvested humid (28 - 35% humidity) has long been used for pig feed, and is also suitable for milk cow rations or for feeder cattle. Its ease of use, high nutritional value and drying savings make humid grain maize an ideal feed choice for cattle and pigs.



# WHY USE HYBRIDS?

## Yield Potential

In most cases, sowing hybrids multiplies yields by 6.

## Stability and reliability

Advantages of hybrids:

- More regular yield
- Greater tolerance to diseases
- Better tolerance to stresses

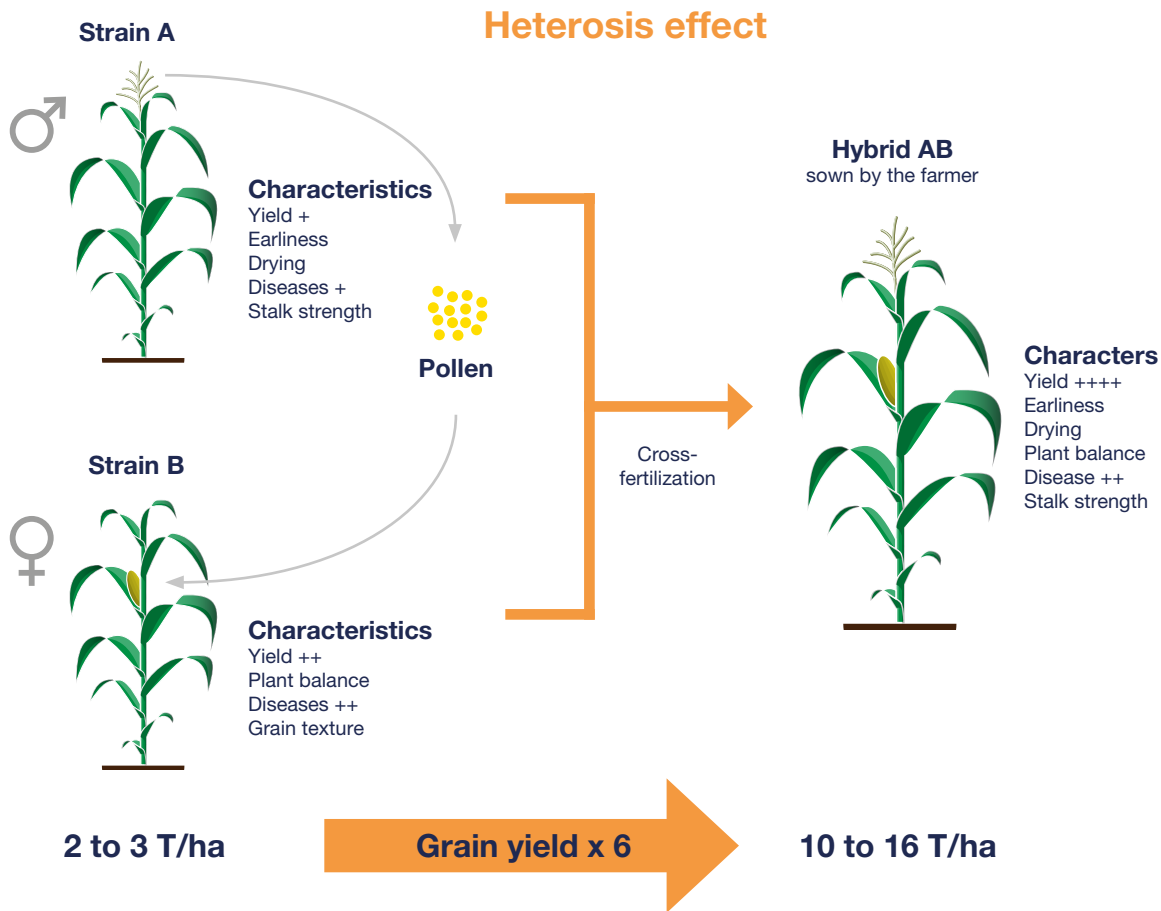
The heterosis effect, also called hybrid vigour, gives a performance gain. The hybrid exhibits the best of both parents and a bonus with respect to many agronomic characteristics.

The more genetically distant the initial populations, the greater the heterosis effect.



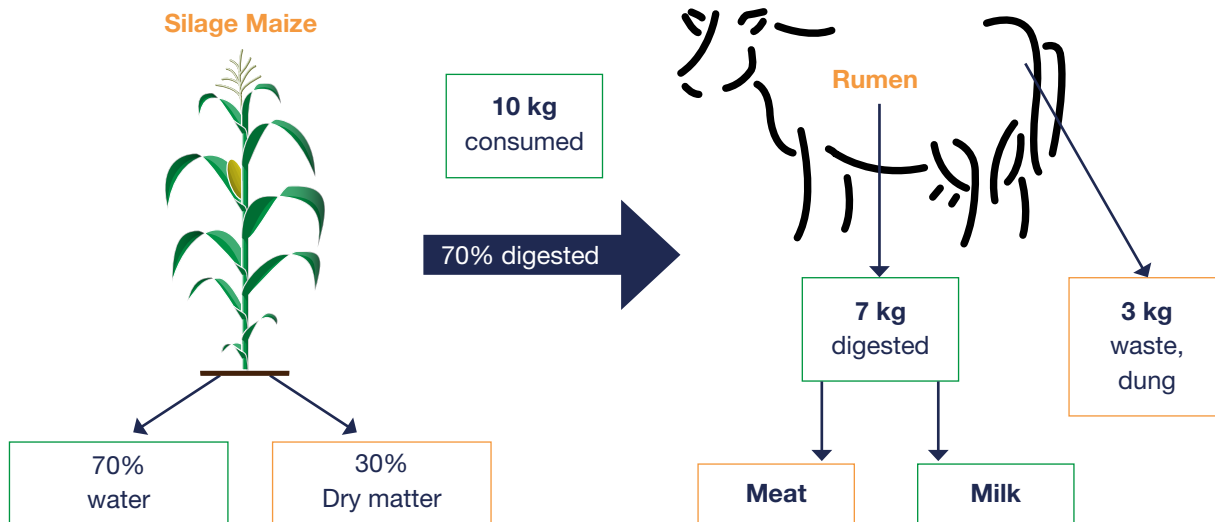
Self-fertilization of elite lines



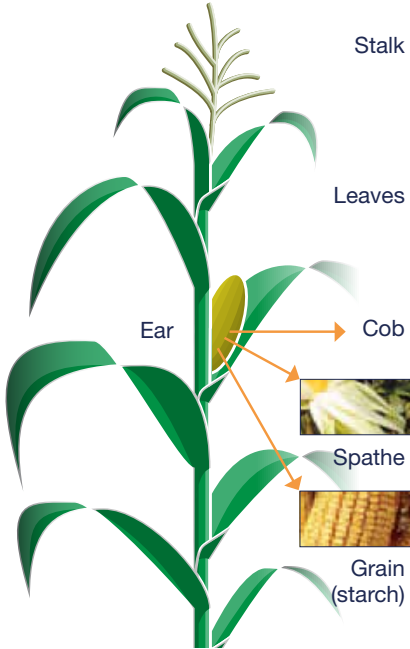


# SILAGE MAIZE: AN ENERGY CONCENTRATE

Silage maize is the basic feed in cattle fodder rations for producing milk and meat.



Corn silage is an excellent energy concentrate with a very good compromise between starch and fibre.

The plant		DM distribution	DM distribution	% DM digestibility
	Stalk	20 %	Mineral Matter 4 % Lignin 4 %	Indigestible
	Leaves	20 %	Cellulose 20 %	Partly digestible (55 à 60%)
		5 %	Hemicellulose 23 %	
		9 %		
		46 %	Starch 28 % Soluble sugars 10 % MAT 8 % Matte Fat 3 %	Totally digestible (90 à 100%)

The aim of research is to improve stalk and leaf digestibility.

# Notes

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## PHYSIOLOGY OF SILAGE MAIZE



What are the temperature requirements of maize?

What are the yield components?

What are the key stages of the crop?



# MAIZE TEMPERATURE REQUIREMENTS

**Maize is a plant of tropical origin and has been selected for northern regions but requires a specific temperature range.**

- Germination zero is around 6 °C.
- Emergence requires a soil temperature over 10°C.
- 80°C (base 6) is necessary from sowing to emergence.
- 44°C (base 6) is needed to produce a leaf.

## Calculation of effective temperatures (degrees/day) base 6°C

Calculation of effective temperatures/day =  
 $((T^{\circ}\text{max} + T^{\circ}\text{min})/2) - 6$

NB: If  $T^{\circ}\text{max} > 30^{\circ}\text{C}$ , use the value 30  
for calculation

$$\begin{aligned} \text{E.g.: } T^{\circ}\text{max} &= 24^{\circ}\text{C} \quad T^{\circ}\text{min} = 10^{\circ}\text{C} \\ \text{RMS } T^{\circ} &= ((24+10)/2) - 6 \\ &= 17 - 6 = 11^{\circ}\text{C} \end{aligned}$$

## Requirement for a base 6 Temperature according to the FAO earliness figures (international earliness index)

	FAO 180-220	FAO 220-280	FAO 280-380	FAO 380-480	FAO 480-560	FAO 560-700
Requirements in degree days (dd) (base 6°) from sowing to harvest (32% of the grain's water content)	<1415	1 415 - 1 480	1 480 - 1 555	1 555 - 1 650	1655 - 1 750	1 750 - 1 950
Total number of leaves	15-16 f	16-17 f	17-18 f	18-20 f	19-21 f	20-22 f



Temperature requirement to gain one dry matter (DM) point in fodder: 24°C (base 6°C)

# MAIZE GRAIN TEXTURE

- The maize grain mainly contains starch which can be glassy or floury.
- The grain texture has, of course, an effect on the type of starch.

Type of grain	Dent	Flint (origin: Europe)	Flinted - Dented
Type of hybrids	FAO 280 to 700	Early	FAO 180 to 300 hybrids from 2 other families
Grain visual aspect	Flat and rather long, retracts when mature giving the grain a toothed shape at the top	Round and often orangey, does not retract when mature	Wide variety of textures with grains rather dented to rather flinted
Starch	Floury	Glassy	Intermediate vitreousness and starch digestibility slower during silage
Advantage of genetics	Yield potential and drydown qualities	Early maturity and tolerance to cold	Early slots to mix tolerance to cold with yield potential
Usage	Animal Feed		
	Starch industry	Semolina and cornflake industry	Semolina industry





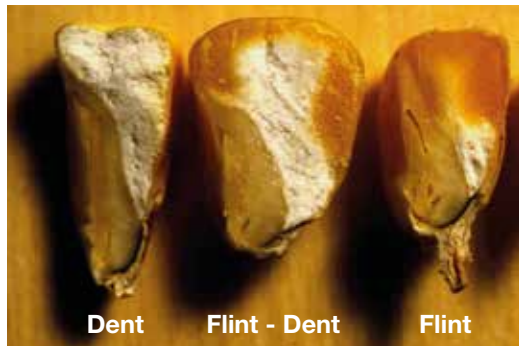
## Cross-sections of different types of maize grains

Floury albumen

Glassy albumen

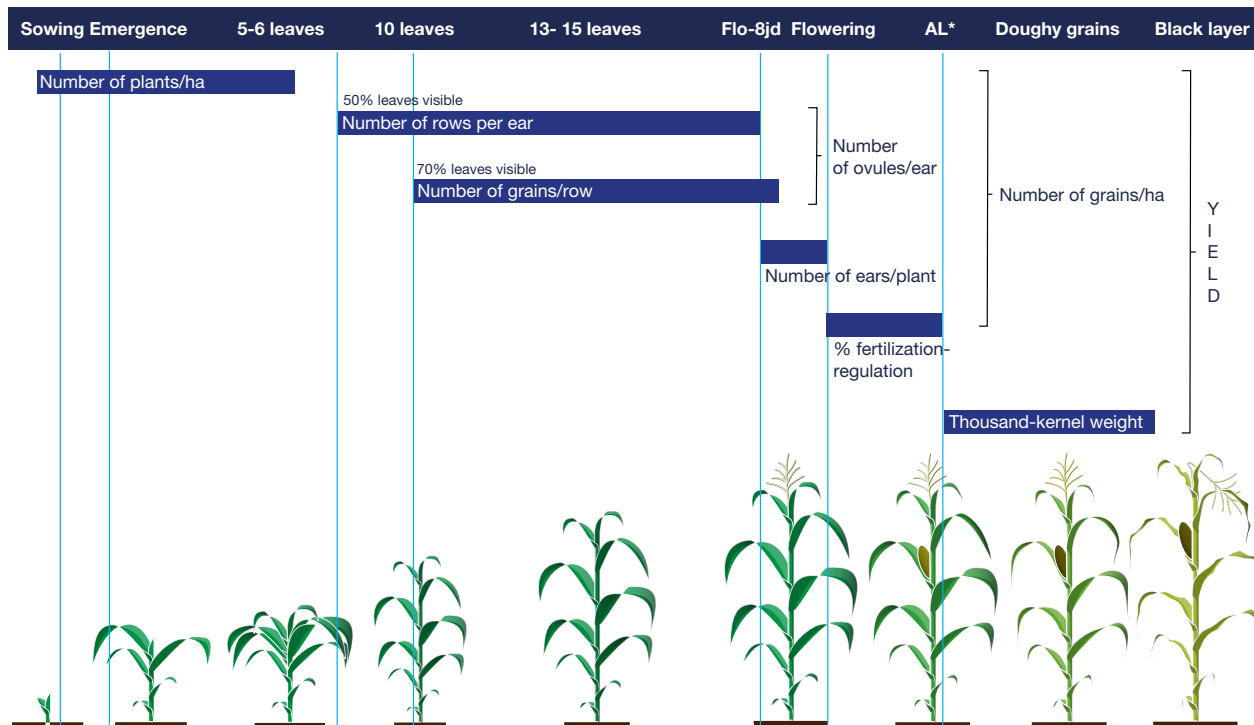
Dented grain

Flinted Grain



# DEVELOPMENT OF MAIZE YIELD COMPONENTS

**Yield components of grain maize build step by step from sowing till black layer.**



\*AL: Grain abortion limit stage

# THE 8 KEY STAGES OF MAIZE

## 1. Emergence

- **10°C required in the soil for germination**
- Need for sufficiently fine and moist soil around the seed
- 12-17 days required to reach emergence



## 2. 4-5 leaf stage: Weaning

- Appearance of new roots (crown roots)
- The plant is no longer dependent of the seed's reserves: it is weaned
- Sensitivity to deficiencies (phosphorous)
- **Reaches final density**



### 3. 8-10 leaf stage: Initiation of ears (ovule)

- **Initiation of the ears (number of rows)**
- 10 leaves: Elongation stage = need for water and nutrients
- Sensitivity to cold  $T^{\circ}$  ( $<8^{\circ}\text{C}$ ), to low sunlight and to the application of weedkillers



### 4. Tassel visible

- **Stage which determines the number of ears per plant, the number of ovules is 90% determined**
- Stage of great sensitivity to lack of water and nitrogen





## 5. Female flowering

- **Fertilization of ovules by the pollen**
- High sensitivity to water deficit and high temperatures:
  - grain development disrupted
  - fertilization problem
  - sensitivity of pollens and silks to high  $T^{\circ}$  ( $>40^{\circ}\text{C}$ )



## Grain abortion limit stage

- 3 weeks after fertilization, i.e. 250 dd after flowering. Beyond this stage, grain abortions are no longer possible.
- Final number of grains.
- Stage marking the end of maximum sensitivity to water stress



### 7. 50% H<sub>2</sub>O stage = doughy grain stage

- Last irrigation stage
  - **Silage maize harvesting stage**
- = 32% MS whole plant stage



### 8. Black layer , 32% grain moisture

- **Grain physiological maturity: end of grain fill**
- Formation of black layer: closing of vessels between grains and cob



## GROWING OF SILAGE MAIZE



Cultural interventions :  
When and how?



# WHAT MAKES GOOD SOWING?

Maize is a short-cycle plant. Emergence and rooting problems are very difficult to overcome. From germination to the 4-leaf stage, the maize limiting factors are cold, excess water and parasites (wireworms, slugs, cutworms, etc.). They can have a significant effect on population and yield.

Early maturity	Densities
FAO 180-280	95 - 115 000 gr/ha
FAO 280-480	85 - 100 000 gr/ha
FAO 480-700	75 - 90 000 gr/ha



## To maximize your yields:

- Plant early. It often gives better yields
- Monitor the sowing speed  
The slower the sowing, the more is precise
- Sow in a dried soil at a minimum of 10°C
- Plant the seed in cool soil at a depth of 4 cm approx.
- Adapt the density to the type of early seed and soil





### A regular sowing depth

- Plant the seeds at the same depth, 4 cm, in cool soil.
- Seed bed with fine soil (be careful of the risk of surface sealing in silty soil)
- Some small surface clods
- A good moisture level around the seed

### A seed drill in very good condition

- Tyre pressures: 2 kg/cm<sup>2</sup>
- Blades in very good condition for a V furrow
- Perfect pickup of sowing elements
- Perfect coulter pressure and clod clearer setting



### For good sowing

- Regularly check the settings and distribution
- Respect the sowing densities and depths adapted to the soil

### Controlled distribution of seeds on the line

- Verified and controlled density: adjust the sowing rate to adapt it to each field. Take into account each field's yield potential in the criteria used to determine the appropriate sowing rate
- No doubles or misses

## TWO ADVANTAGES OF EARLY PLANTING

The best yields are regularly to be obtained with early planting. Anticipate manuring and working the soil to be ready for end March-early April.

Early crops also have the advantage of dryer harvesting and therefore bring savings in drying. But planting too early can also reduce yields. The maize germinates and develops when the soil temperature reaches 10°C. At lower temperatures than those indicated above, the seed remains dormant and will become more vulnerable to disease, insects and animal predators. It is therefore recommended to take the soil temperature, check the 5-day or 7-day weather forecasts to see if they are favourable.

Soil T°	Effective T°/day	Number of days needed for emergence
10°C	4	20 - 22 j
11°C	5	16 - 18 j
12°C	6	13 - 15 j
13°C	7	12 - 13 j
16°C	10	8 - 10 j
21°C	15	5 - 7 j

Maize germination dynamics in relation with soil temperature

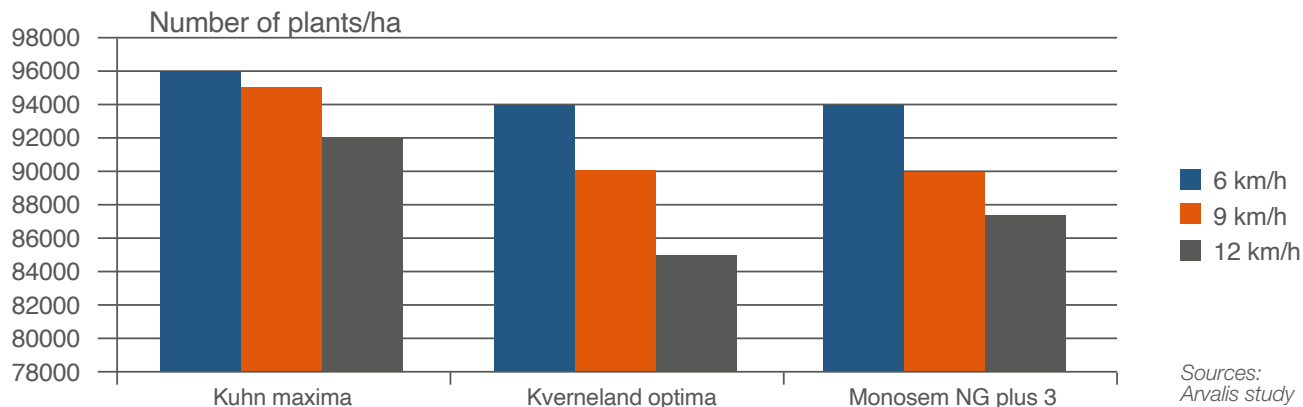
# THE SOWING SPEED AND AN INCORRECTLY SET SEED DRILL DISRUPT DENSITY

The ideal sowing speed is normally between 5 and 7 km/h. Sowing at excessively high speeds causes misses, more doubles and an unequal sowing depth.

The following graph shows the loss of density at different speeds and with different seed drills.

New seed drills are arriving on the market which claim to sow at over 12 km/h (Verderstad tempo, Amazone EDX, etc.)

## Plant losses as a function of sowing speed linked to sowing heterogeneity



# WEED CONTROL STRATEGIES

**The farmer has different weed control strategies available to him according to the plot**

**A plot to weed:** use a pre-emergence control product and a post-emergence control product

**For relatively difficult to weed plots:** (or land with a long rotation): use a pre-emergence control product

**Visual weed control:** use one or two post-emergence control products

## Weed control strategies

	Pre-emergence	Post-emergence
Product type	Broad spectrum germination inhibitor	General application of products up to 7-8 maize leaves then used for directed spray application after this stage
Soil type	Moist, slow drying soil or difficulty to enter the land	Use on soil rich in organic matter → Problem of persistence of pre-emergent plants
Usage/ Advantages	Use in priority if high presence of grasses	Can be a totally «post» strategy for visual treatment of grasses. Combats perennial weeds
Remark	Avoid weed control on spiking maize (phyto), and after maize 7-leaf stage with certain products (sulfonylurea). A treatment at this stage can cause stress and ear and tassel sterility	



All the mineral elements have a role to play when cultivating maize and an optimum supply of these will contribute to achieving the highest yields.

## NITROGEN FERTILIZATION

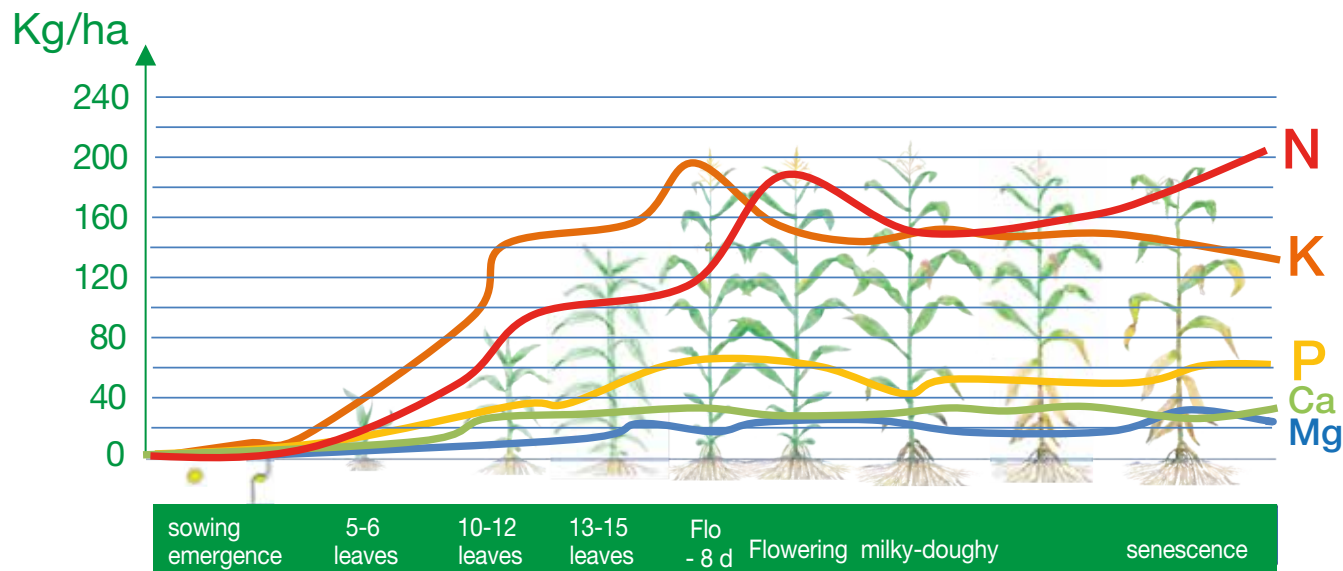
The maize growth period coincides with the time when organic matter mineralization is optimum, particularly if water is not a limiting factor.

**Quantity of nitrogen to be supplied =**  
needs according to the yield objective

$\ominus$   
nitrogen from the soil



## The main mineral needs of maize and their change during development



## Nitrogen needs according to the potential

Forage maize	Nitrogen needs (kg/t DM)
< 14 T DM/ha	14
> 14 T DM/ha	13

Some benchmarks: estimation of nitrogen doses to be applied to forage maize (in situations not receiving an organic input)	Yield objective Forage maize	
	12 T DM/ha	15 T DM/ha
Topsoil poor in OM (< 1,5%)	110 - 130 U	150 - 170 U
Soil moderately fertile (> 2% and < 5%)	85 - 105 U	125 - 145 U
Fertile soil rich in OM (> 5%)	60 - 80 U	70 - 100 U



It is strongly recommended that the nitrogen supply should be staged because maize absorbs practically no nitrogen during the 1st month of growth. From 8 leaves, the maize must have a sufficient quantity of nitrogen. Between 20 and 50 units should be given at the sowing stage and completed at the 7-8 leaf stage.



## Standard recommendations for the different forms of nitrogen

Fertilizer type	Nitrogen units in 100 kg	Use after maize emergence		
		General application	Local application	Burial
Ammonitrate	27 or 33,5% N • 50% nitrates • 50% ammonia	Not recommended after 5 leaves (burns)	Recommended	Recommended particularly if ground is dry
Urea	46% N • 100% urea	Possible on dry leaves and incorporation recommended	Possible	Recommended to prevent volatilization
Anhydrous ammonia	82 Units of which 100% of ammonia	No	Mandatory: Avoid excessively dry soils (volatilization) and excessively damp soils (soil smoothing and evaporation of ammonia)	
Solution of urea and ammonium nitrate (UAN)	39 Units of N per 100 l • 25% nitrates • 25% ammonia • 50% urea	No	Mandatory: Use down tubes	Recommended

# PHOSPHO-POTASSIC FERTILIZATION

The crops use a small part of the phosphorous and potassic fertilizers applied the same year.

Phosphorous exports are 0.6 kg P205/q of grain and the potash exports are 0.5 kg K20/q of grain.



## Oligo-elements

Monitor the manganese, magnesium or zinc deficiencies in excessively acid or excessively basic soils

### Some benchmarks: estimation of phospho-potassic fertilization

Forage maize	Phosphoric (P) fertilization		Potassic (K) fertilization	
Yield objective	12 T DM/ha	15 T DM/ha	12 T DM/ha	15 T DM/ha
Well-supplied soil	20 - 55 U	40 - 85 U	80 - 150 U	90 - 180 U
Normally supplied soil without input of manure	45 - 55 U	80 - 90 U	130 - 150 U	160 - 180 U



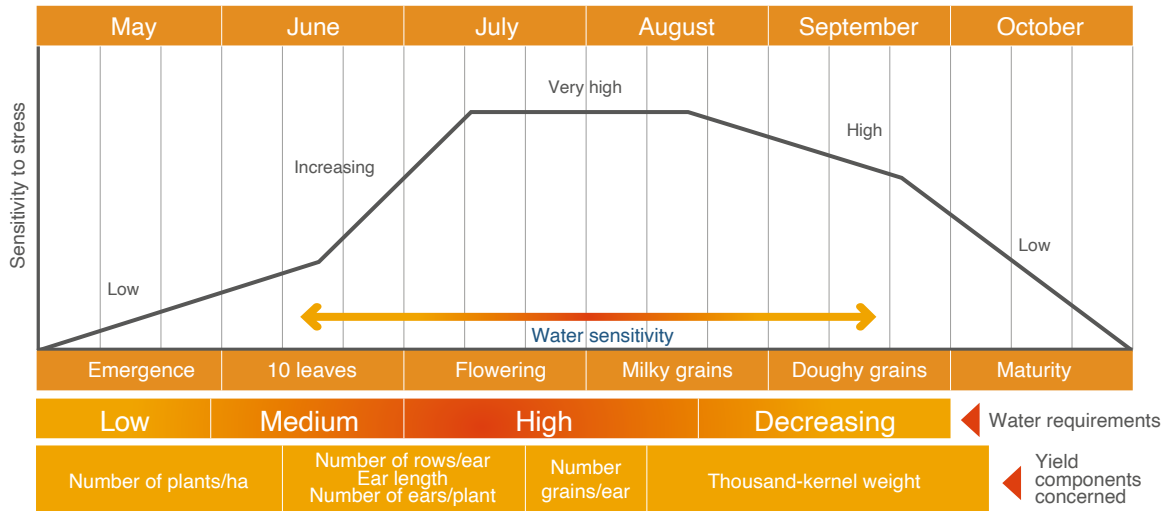
# IRRIGATION

## Maize crops are mostly rainfed

25% of the maize surfaces in Europe are irrigated. Maize is highly sensitive to a water deficit over the period from 20 to 30 days before flowering (8-10 leaf stage) to 10-15 days after and even during the grain fill phase (from end June to mid August). For irrigated situations, and depending on the soil and the year's climatology, the following must be provided:

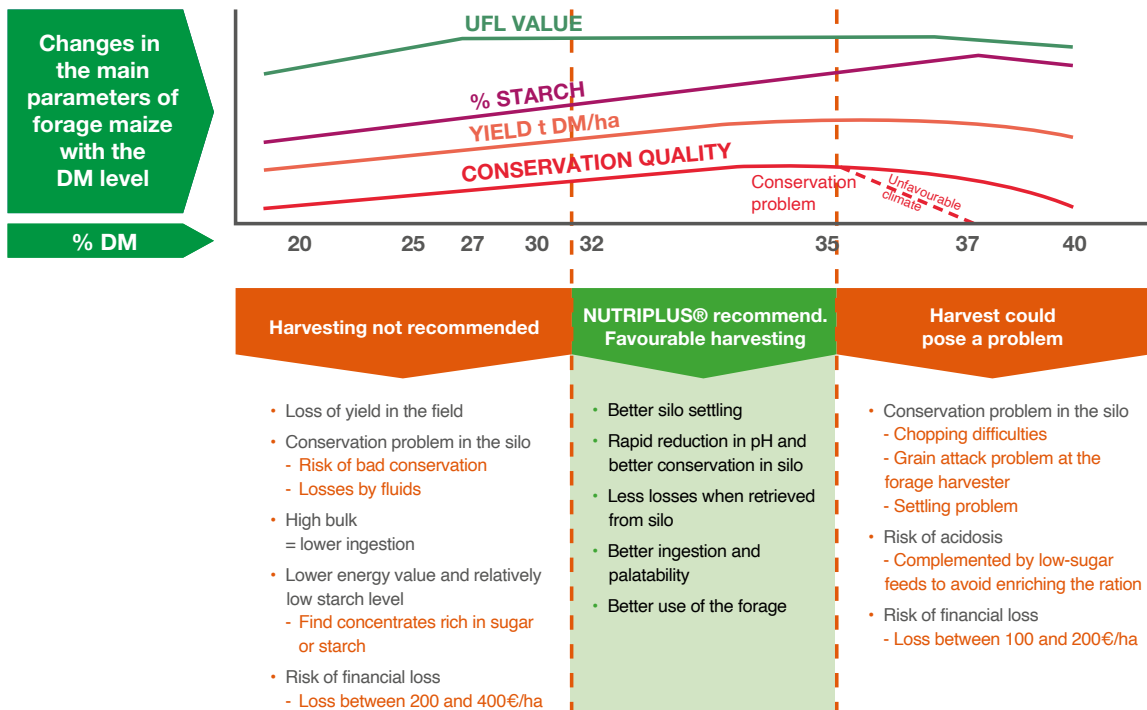
	Before Flowering	Flowering	After Flowering
Number of water towers	2	1	2 o 3
mm	25 to 30	25 to 30	25 to 30

## Maize water requirement throughout its cycle



# DETERMINING THE SILAGE HARVESTING STAGE

The best stage to harvest silage maize is between 32 and 35% dry matter. It is a compromise between yield, plant composition, ease of silage production, silage conservation ability and desired ingestion level by the animal.





## Determining the silage harvesting stage

Observing the grain fill level is a good way of determining the plant stage in the field

- Observe the grain filling line after having cut a cob in two pieces
- Find out, depending on the type of plant (dent or flint), your dry matter content



FLINTED GRAIN	Top of the grain							
	Grain profile							
DENTED GRAIN	Top of the grain							
	Grain profile							
STATE OF THE PLANT		<ul style="list-style-type: none"><li>• Green husks</li><li>• 5 to 6 green leaves under the ear</li></ul>	<ul style="list-style-type: none"><li>• Green husks</li><li>• Apparition of the lens</li></ul>	<ul style="list-style-type: none"><li>• Green husks</li><li>• Lens clearly visible</li><li>• 4 to 5 green leaves under the ear</li></ul>	<ul style="list-style-type: none"><li>• The husks beginning to dry</li><li>• 3 to 4 green leaves under ear</li></ul>	<ul style="list-style-type: none"><li>• Dried husks</li><li>• 2 to 3 green leaves under the ear</li></ul>	<ul style="list-style-type: none"><li>• Dried husks</li><li>• 0 to 1 green leaves under the ear</li></ul>	<ul style="list-style-type: none"><li>• Dried husks</li><li>• No more milk in the grain</li></ul>
DRY MATTER CONTENT		20-22%	25-26%	27-28%	29-30%	32-33%	35%	-
SILO ADVICE		Risk of bad conservation Liquid/juice losses				Favorable		Difficult to hash. Difficult to crush the grain. Problems of compaction.
FEEDING ADVICE		Look for high levels of sugar and starch				Balanced feeding bases		To complete with low energy food not to enrich feeding program. Risk of acidosis.



## For forage, number of days to lose 1 pt (22°C base 6)

In fodder, number of days allowing to win 1 pt (22 ° C base 6)	Number of days to gain one point of silage DM												
	France	Germany	Poland	Belgium	Austria	Czech Republic	Hungary	Romania	Italy	Spain	Bulgaria	Ukraine	Russia
	Paris	Munich	Poznan	Brussels	Vienna	Prague	Budapest	Bucharest	Milan	Madrid	Pleven	Kiev	Krasnodar
From 15 to 30 August	1,8	2,2	3,0	2,0	1,8	2,1	1,7	1,5	1,5	1,3	1,5	1,9	1,4
From 1 to 15 September	2,0	2,5	4,8	2,4	2,2	2,7	2,0	1,8	1,7	1,5	1,9	2,7	1,9
From 16 to 30 September	2,5	3,4	8,0	3,0	2,8	3,4	2,5	2,1	2,0	1,8	2,4	3,3	2,2
From 1 to 15 October	4,0	7,0	8,0	4,8	5,3	8,0	4,4	4,0	3,4	2,7	3,6	10,0	4,7

# PART OF A SILO

## At harvest:

- Survey grain maturity and water content as harvest time approaches (ideal: 32 -35% dry matter)
- Adapt production rate to silo settling, necessary for good forage conservation
- Clean harvesting equipment and storage location
- Adjust chopping size
- Fill silo rapidly (limit the aerobic phase)
- If weed control problem, raise the cut to limit incorporating of solanums, mercuries, amaranths and datura in the silo
- Lay a utility sheet along the walls to prevent entry of water and air





## At storage

- Ensure that there is a rapid and stable anaerobiosis (no air entry): good sealing and good settling
- For difficult to settle forage (over 35 % dry matter), take the time to assist the settling (particularly at the edges) and sufficiently fill the silo
- For good settling overinflate the tractor wheels
- Avoid wide tyres and low pressures
- Avoid incorporating earth or dust into the forage, which favours the development of butyric spores
- Evacuate the silage fluid
- The silage conservation conditions, anaerobiosis and low pH do not favour the development of moulds



## When the silo is opened

Adapt the width of the front opening to the herd's consumption to allow a sufficient advance at the opening:

- 10 cm/day in autumn and winter
- 20 cm/day in spring and summer

Do not give visibly mouldy silage to cattle

# CONTROLLING CHOPPING SIZE FOR CONSERVATION AND CONSUMPTION

## Two apparently contradictory objectives

- finely chop to improve silo settling
- leave the strands long enough for cows to chew

## Silage unloaders and mixers reduce the particle size

The maize silage production process can lose a third of its medium-size particles in 5 minutes (mixing cutter).





### Aim in the silo

- 80 % of particles less than 10 mm
- 10 to 15 % of particles between 10 and 20 mm
- Large pieces (>20 mm) are not recommended because they prevent settling and animals refuse to eat them: therefore the large pieces should not exceed 1 %
- Grain shredding size should be adapted to maturity. The glassy starch in maize with over 35% dry matter needs to be broken up to optimise its digestion: this is the job of the grain crushers available on most silage harvesters.



**These objectives produce a maximum of particles between 8 and 10 mm at the trough.**

Silage extraction with blade mixer		Silage extraction with knife mixer	
Dry matter	Average length	Dry matter	Average length
28%	12 mm	28%	12 mm
32%	10 mm	32%	12 mm
> 35%	8 mm	> 35%	10 mm

# INTERPRETING A SILAGE MAIZE ANALYSIS

From one year to the next, maize silage is completely different because the growing conditions are different. To better adjust the ration of the animals, a sample should be taken at harvesting on the silage maize to analyse the silage quality.

These analysis sheets give the chemical composition of silage maize and the calculated criteria, to assess the quality of the maize to be harvested and give the breeder an indication of the ration to be given to his animals.

Criteria	Gives an indication of	Lower values	Target	Higher values
% Dry matter	<ul style="list-style-type: none"> <li>• Harvest storage stage</li> <li>• Conservation</li> <li>• Ingestion</li> </ul>	Ingestion adversely affected	30 - 37%	Conservation more difficult
% Crude Fibre	<ul style="list-style-type: none"> <li>• Ear/plant ratio</li> <li>• Ruminant fermentation stability</li> <li>• Energy value (-)</li> </ul>	Digestibility improved but risk of acidosis	18 - 21%	Digestibility adversely affected
Mineral matter	<ul style="list-style-type: none"> <li>• Pollution by earth</li> <li>• Butyric risk</li> </ul>	Vigilance for mineral additives	3 - 4%	Probable contamination by the soil, beware of butyric risk
% Starch	<ul style="list-style-type: none"> <li>• Ingestion palatability</li> <li>• Energy value (+)</li> <li>• Risk of acidosis</li> </ul>	Due to bad growing conditions early harvest	27 - 35%	Risk of acidosis
Cell Wall Digestibility	<ul style="list-style-type: none"> <li>• Digestibility of the nonstarch part</li> </ul>	Digestibility and bulk adversely affected	50 - 54	Increased digestibility
Total nitrogenous matter %	<ul style="list-style-type: none"> <li>• Energy value (PDI)</li> <li>• Digestibility</li> </ul>	PDIN value low, complemented with other sources of proteins	7 - 7,5%	High PDIN value
Digestibility of organic matter	<ul style="list-style-type: none"> <li>• Digestibility of whole plant</li> <li>• Energy value</li> </ul>	Energy value suffers	70 - 72%	Energy value increased
Milk forage unit/Kg	<ul style="list-style-type: none"> <li>• Energy value of whole plant</li> </ul>	Energy value low, find sugar-rich concentrates to complement the ration	0,88 - 0,92%	Energy value high to very high Above 0.98, be careful of the complements

## PESTS AND DISEASES



What are the pests and  
the most common diseases of maize?



# MAIZE INSECT CALENDAR



sowing	emer- gence	3-4 leaves	5-6 l.	10-12 l.	flowering	milky-doughy		senescence	
March	April	May	June	July	August	September	October	November	
Seedcorn maggot			Corn rootworm						
Wireworm									
Symphylan			Aphids						
Cutworms									
Oscinella frit				Budworm					
Leafhopper									
1 <sup>st</sup> gen. Mediterranean corn borer					2 <sup>nd</sup> gen. Mediterranean corn borer				
Thread worms				1 <sup>st</sup> gen. European corn borers		2 <sup>nd</sup> gen. European corn borer			

**SEEDCORN MAGGOTS**

Germination



Larvae on grains

**OSCINELLA FRITS**

Sowing to 4-5 leaf stage



Fly and plants damaged

**MEDITERRANEAN CORN BORERS**

1st generation: 3 to 10 leaves

2nd generation: flowering to harvest



Larvae and plants damaged

**WIREWORMS**

Sowing to 8-10 leaf stage



Larvae and plants damaged



## LEAFHOPPERS

May to July



MRDV virus caused by the leafhopper

## APHIDS

June to September



Aphid on leaves

## SYMPHYLANS

March to May



Insects on roots

## CORN ROOTWORM - LEAF BEETLE

10 leaves to end of flowering



Larva and adult



**EUROPEAN CORN BORERS**

1st generation: 10-12 leaves to end of flowering

2nd generation: Flowering to harvest



Eggs and larvae

**THREAD WORMS**

Roots atrophied on the right

**CUTWORMS**

Sowing to 8-10 leaf stage



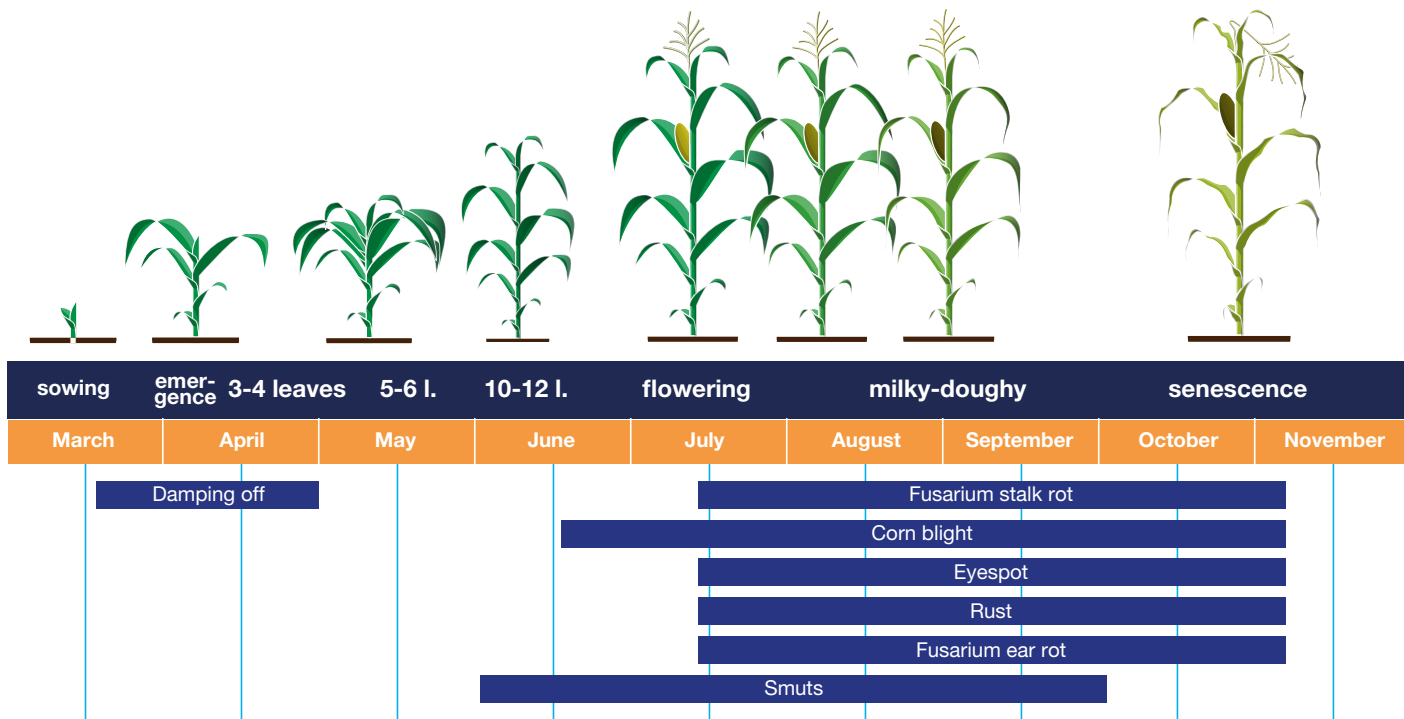
Larvae and plants damaged

**BUDWORM**

Flowering to harvest



# MAIZE DISEASE CALENDAR



### DAMPING OFF

Germination



Pythium, Fusarium stalk rot, etc.

### FUSARIUM STALK ROT

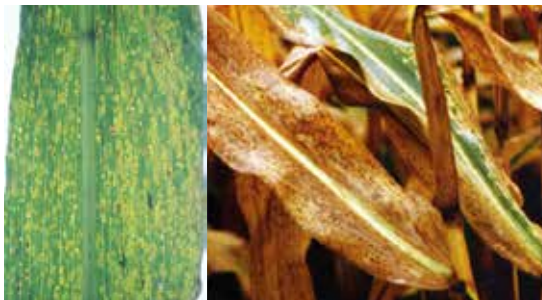
Sowing to flowering stage to maturity



Damaged stem and plants

### EYESPOT

June to September



Damaged leaves and plants

### COMMON SMUT (Corn smut)



### INFLORESCENCE (Sphacelotheca)



### DEFICIENCY SYMPTOMS



Phosphorous deficiency



Potash deficiency



Nitrogen deficiency



Magnesia deficiency



Ammonia or weed  
control product burn

### CORN BLIGHT

10 leaves to maturity



### FUSARIUM EAR ROT

Moniliforms



European corn borer attacks or grain cracking

### RUST

Flowering to maturity



### GRAMINEARUM

Infestation at flowering

Attacks top of ear

Rotten cob



## Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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