Maize technical memo for Georgia

Preamble

Corn is a tropical plant of the grass family. It is cultivated as a cereal for its grains rich in starch, but also as a fodder plant. It is the most widely cultivated cereal in the world.

Sum of temperature.

Corn is very temperature dependent. It is considered that it does not grow below 6 ° nor above 30 °

The different stages of development are reached when the plants have received a certain amount of temperature.

The sum of the daily temperatures is calculated by adding the average daily temperature, subtracting 6 ° and below 30 °. We speak of sum of temperature in base 6 or base 6/30

$$\frac{T° \text{ Min} + T° \text{ Maxi}}{2} \quad -6$$

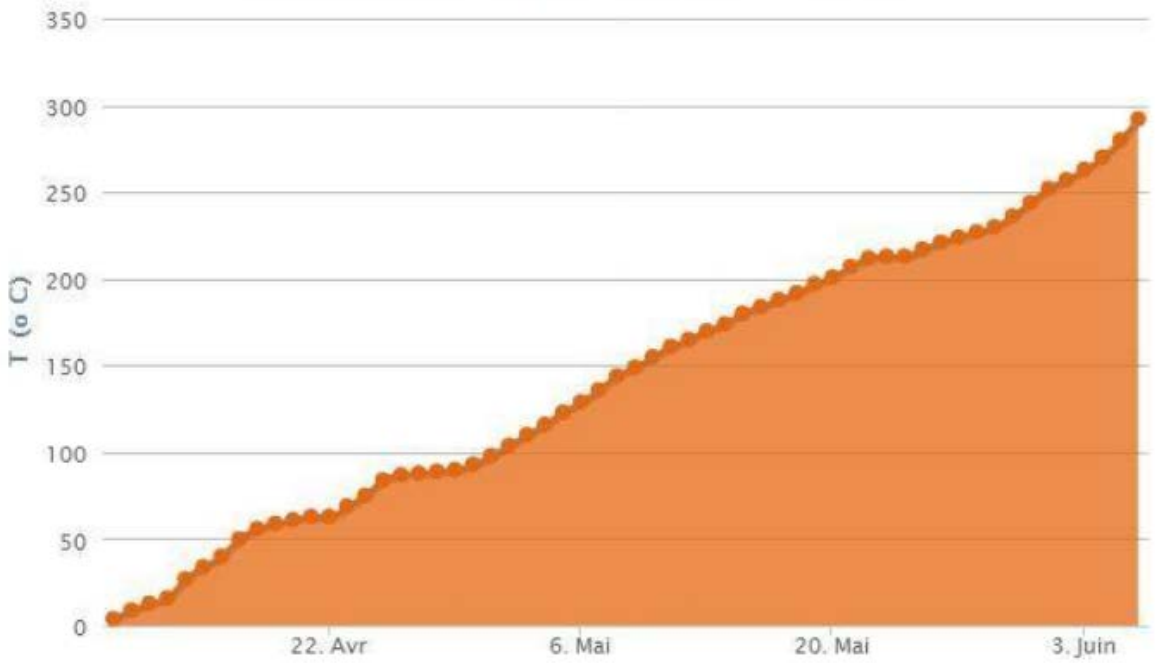
T° mini = minimum daily temperature.

T° maxi = maximum daily temperature.

If the average temperature is less than 6 °, then the day counts as zero.

If the maximum temperature is above 30 °, then 30 is taken as the maximum.

Example of calculation of sum of temperatures



Variety Choice

According to the variety precocity, the sum of temperature to reach a stage of development is different.

Here is a summary table of the sums of temperatures to be reached according to the level of precocity of the varieties of corn from the date of sowing:

Precocity groups	**FAO indices**	**Sum of temperature to reach the stage**		
		Flowering stage	**Silage 32% dry matter**	**Grain 35% grain moisture**
Very early	150-240	790 à 835	>1.410	*> 1.700*
Early	240-280	825 à 870	1.415 à 1.500	*1.680 à 1.760*
½ early	260-330	850 à 930	1.470 à 1.570	*1.740 à 1.820*
½ early to ½ late	310-400	920 à 975	1.560 à 1.600	*1.800 à 1.880*
½ late	400-480	975 à 1.020	1.600 à 1.670	*1.870 à 1.950*
Late	470-560	1.020 à 1.070	1.690 à 1.760	*1.940 à 2.020*
Very late	550-620 +		< 1.780	*< 2.000*

It is necessary to choose the varieties in the group of precocity corresponding to the climate of the region of production. Generally, in grain production, varieties preferred require less

temperature to ensure harvesting at a low grain moisture level. In silage, due to a harvest with higher moisture content, a later group can be chosen.

Soil preparation

The tillage, preparatory to sowing, aims to create a structure allowing good rooting and homogeneous emergence. It is therefore necessary to avoid too much compacting the soil while maintaining humidity conducive to germination.
Corn is very sensitive to competition from weeds. It is better to work the soil shortly before sowing to eliminate weeds or to carry out weeding just after sowing and before emergence.

Sowing

A crucial step for the success of the crop, sowing influences the speed and uniformity of emergence, the establishment of plants and their future tolerance to stress.
The sowing date is determined according to the temperature of the soil.
The corn kernel germinates from 8-10 ° in warmed and dried soil to guarantee rapid emergence and to avoid compaction. The soil temperature should be at least 8 °.
Statistics show that sowing early is often synonymous with more yields because the crop benefits from the light contributions of long days; and the quality of fertilization is protected by early flowering.
Obviously, you have to take into account the weather forecast. You can sow in cold soil if the days ahead are warm. Conversely, avoid sowing if severe cooling is expected.
The sowing density is determined according to the type of soil, the earliness of the variety and the grain or silage destination.
We sow clear in light and drying soil, thicker in rich and irrigated soil.
The later the variety, the clearer you sow
A higher density is sown for silage (+ 5,000 gr / ha) than for grain.

Precocity groups	FAO indices	Density to be obtained upon emergence In grains / ha
Very early	150/240	100 000 – 110 000
Early	240/280	95 000 – 105 000
½ early	260/330	85 000 – 100 000
½ early to ½ late	310/400	80 000 – 90 000
½ late	400/480	75 000 – 85 000
Late	470/560	72 000 – 85 000
Very late	550/620	68 000 – 78 000

The **spacing between the rows** must be adapted according to the harvesting equipment and possibly the cultivator.
The optimum **sowing depth is 3-4 cm**.
A homogeneous depth allows a homogeneous lift. We can reason the depth of sowing according to the humidity of the different layers of the soil and its preparation.
The seeds must be in the moist part of the soil to ensure germination.
• If depth> 6 cm: lifting will be slower and less regular
• If depth <3 cm: the seeds will be more exposed to birds and to dry conditions which may prevent them from germinating.
The **sowing speed** must be adapted to the material available to have good regularity.
Generally we advance between 4 to 6 km/h.

Density table

Density for spacing of			Seed interval
70 cm	75 cm	80 cm	cm
71 429	71 429	62 500	20
73 260	68 376	64 103	19,5
75 188	70 175	65 789	19
77 220	72 072	67 568	18,5
79 365	74 074	69 444	18
81 633	76 190	71 429	17,5
84 034	78 431	73 529	17
89 286	83 333	78 125	16
95 238	88 889	83 333	15
102 041	95 238	89 286	14

Calculation of interval between grains

Space between grains = 1 000 000 / spacing of row (in meters) / number of grains/ha

Example:
1 000 000 / 0.80 / 62 500 = **20**

Calculation of density

Density = 1 000 000 / Spacing of row (m) / seeds interval (cm)

Example:
1 000 000 / 0.80 / 20 = **62 500**

Fertilization

Exports of elements by harvest in Kg / ha.

Fertilizers		**Grain harvest 10 tonnes/ha**	**Silage 16 tonnes MS/ha**
Nitrogen	N	143	184
Potash	K	46	158
Suffer	S	9	14
Magnesium	Mg	8	18

A maximum of 10-20% of phosphorus and potash is considered to be used in the same year as the intake. It is therefore necessary to reflect the contributions according to the richness of the soil and exports. In Georgia most soils are well to very well supplied with P and K.
Plant requirements are generally largely covered by the available elements.
For nitrogen, the needs of the plants must be assessed against the yield potential.
The need is estimated at 2.1 to 2.3 kg of nitrogen per tonne of grain, or 12 to 14 kg per tonne of dry matter ensiled.
Nitrogen releases from the soil must also be taken into account.
To put it simply, I propose to provide enough to cover the exports of the crop, i.e. 150 to 170 Kg of N/ha
Additions can be made before or after sowing, but before the maize has 4-5 leaves.
If the farmer (or the cooperative) is used to producing maize and has a different practice, such as adding manure, consider the way they work.

Weed control

Maize is a short-cycle crop, sown with wide inter-rows and very sensitive to weed competition.

Weed control can be done chemically or mechanically, most often by combining the two methods. In all cases it is necessary to treat early.

The application of weed killer can be done before or after emergence, in one pass or with a catch-up. The first treatment should be made early enough, before the 3-4 leaf stage and on young weeds.

Hoeing is sometimes necessary to supplement weed control. Hoeing can be done between 3-4 leaves and up 7 leaf-stage, depending on when the weed killer was applied. It is a shallow work of the soil (4 to 6 cm); too deep it can cause new emergence of weeds and destroy the roots of the corn.

Examples of chemical herbicides allowed in Georgia

STELLAR® STAR (BASF)

Component : 160 g/l Dicamba, 50 g/l Topramezone

Dose : **1 l/ha**

Wider window of application for post-emergence weed control - More flexible application timing.

The broad-spectrum, post-emergence maize herbicide with the widest flexibility of application.

- Stellar® Star is a highly effective herbicide for post-emergence.
- application to control annual and perennial.
- broadleaf weeds and annual grasses in maize.
- has an adjuvant present in the formulation for optimal efficiency.

Vaslatop Ek (AgroIQC) **ou Pandigan EC** (ADAMA)

Component: pendiméthaline 330 g / l

Dose : **3 to 6 l/ha**

It may be used either Preemergence or Postemergence in corn to control weeds as they germinate and before they emerge from the soil.

Preemergence

Apply after planting but before weeds and crop emerge

Planting depth must be at least 1.5" deep and seed must be completely covered with soil

It can be mixed with Sharpen® herbicide for enhanced burn down and residual broadleaf control.

Postemergence

Apply from spike to 30" tall corn (60 cm).

Elumis (Syngenta)
Component: 30 g/l Nicosulfuron + 75 g/l mésotrione
Dose **1.5 l/ha**
Stage of use: From 2 leafs to no later than 8 leafs
ELUMIS is a co-formulation of mesotrione and nicosulfuron for the moderate control of perennial grass weeds, and the control of annual grass and broad-leaved weeds in maize

Varieties

Limagrain is the partner of FINEXCOOP.
The varieties offered by Limagrain in Georgia are LG Justeen, LG Agrister, LG Aveline, LG 30.500 and LG 31.695

LG JUSTEEN
FAO 300 - ½ early - silage
Characteristics:

- Sum of T ° for 32% of dry matter 1540 à 1580
- Good vigour at the start
- Good energy value
- High digestibility

LG AGRISTER
FAO 500 - Late - Grain
Characteristics:

- High stability and highly adaptable hybrid.
- Excellent yield potential.

Experience from past seasons shows that Agrister is absolutely able of forgiving small failures, as well as richly rewarding growers who work without error. It is adaptable to most types of soil and tolerates stress. Its stem is of medium height, firm, elastic with a slightly more modest leaf mass. The ears are fairly uniform in size, with 16-18 rows of kernels. It dries very well for its precocity group.

LG AVELINE
FAO 500 - late - Silage
FOR THE CHAMPIONS: Corn silage is the essential feed base for almost all dairy cattle producers, the choice of hybrid is one of the fundamental aspects to obtain a great product.
Characteristics:
The high digestibility of LG Aveline fibbers speeds up rumen transit, allowing you to use large amounts / day in the ration and ensure high energy levels.

LG 30.500

FAO 530-540 - Late - Grain

Characteristics:

- Very good starting vigour.
- Developed plant.
- Erect leaf habit.
- Insertion of medium ears.
- Excellent rod hold.
- Good health profile.
- Good behaviour against helminthosporium

LG 31.695

FAO 670 - Very late - Grain

Excellent potential and high tolerance to disease

Characteristics:

Plant with high production potential.

Excellent behaviour in all kinds of conditions, especially under water stress.

Plant with very good architecture, medium height and low ear insertion, which in addition to its good stem, offers excellent lodging tolerance.

High tolerance to diseases such as Cephalosporium, Helminthosporium.

Good vegetal structure, with large homogeneous leaves.

Harvest

Silage

Harvest forecast

The optimum harvest period for forage maize is 32-33% dry matter (DM) of the whole plant. Harvesting at less than 30% means limiting the yield and risking loss of sugars in the silo through the flow of juice. Harvesting at more than 35% DM risks altering the preservation quality of the silage and reducing the digestibility of the 2 parts of the plant (starch from the grains and stems + leaf).

Silage requires site organization that involves several equipments at the same time. Therefore it needs a collective organization. In order to be ready at the right time, it is necessary to have a good forecast of the harvest period

From the flowering stage, it takes between 550 and 700 degree-days (base 6-30 ° C), depending on the precocity of the variety, to reach the optimal stage of whole plant harvest. This represents 45 to 70 days depending on the region and the climate.

When we talk about the "flowering stage" for corn, this is the female flowering. It corresponds to the emergence of silks at the tips of the ears. Tip for spotting it: it occurs 8-10 days after the panicles emerge at the top of the plants.

The flowering date of corn is the day when half of the plants have visible bristles in the leaf axils. This is the first indicator of the earliness of the crop.

Knowing the exact date of flowering improves predicting the harvest date

Why do you need to accurately record the flowering date? Because to miss 3 days at flowering is to miss a week at harvest, and take the risk of increasing the dry matter content of the silage by 2 points.

Three weeks after flowering

Three to four weeks after the silks emerge (the landmark flowering stage), observing the grains further helps to refine the optimum harvest date.

At this date, it is easy to spot the glassy lens that appears at the tips of the grains. The glassy lens, golden yellow and difficult to scratch with the fingernail, corresponds to the deposit of vitreous starch. When you see the glassy lens at the top of most kernels, you are around 25-26% DM. On varieties with dentate kernels, this corresponds to the appearance of a depression at the top of most kernels.

For medium-sized corn, with leaves that are starting to dry out, at this stage, we will already be around 28-29% DM.

From the “glassy lens visible on the majority of the grains” stage, there are 6 to 8 points of dry matter to be acquired in order to reach the optimal harvest stage, 32% DM whole plant. In need of temperatures, this represents about 150 degree days (base 6-30). It's been 10 to 20 days depending on the region, the harvest period and the weather scenario of late summer and fall...

Grain harvest

Seek the quantity / quality compromise
Maximum yield is reached at physiological maturity, i.e. around 30-32% grain moisture, when the black point appears at the base of the grain. Leaving the corn in the field allows the loss of moisture by desiccation but involves risks: development of mold on the ear, lodging of plants.

Drying on stand
The choice of standing drying, often constrained for reasons of insufficient drying capacity, has advantages and disadvantages. It removes an economic burden and improves the ecological balance of the crop, but it forces the choice of earlier varieties for the climatic possibilities of the region, thereby depriving itself of a significant yield potential (count 5 to 7 quintals per 100 FAO units).
This choice implies choosing varieties that are especially renowned for their mechanical robustness and their drying speed

Artificial drying
The use of artificial drying secures the harvest in terms of quality and quantity ; it makes it possible to harvest in the event of degradation of the growing crop: storm, frost, health degradation due to fusarium.
Although the relationship between grain quality and moisture content is not systematic, the moisture in the ears has a direct impact on breakage and / or ginning and therefore on the final quantity of whole grains.

The best indicator: **observe in the field to decide**
To visually determine the stage of plants, one should rely as much on the grain as on the appearance of the vegetative system.
To properly assess the stage of plants:
• rely on the general condition of the vegetative system to assess the leeway available to harvest beyond physiological maturity;
• follow the grain filling line to the black point (and / or the sums of temperatures) to know the stage of the plants.

Conclusion :

Quality is being prepared in the field

The technical choices made during cultivation have a direct influence on the quality:
• ripening (yield / humidity) is optimal by adapting the precocity of the hybrids to the environment
• The health of the plants and grains is promoted by correctly reasoning the cultivation techniques from sowing to harvest.
• The maturity and sanitary quality of the ears should be monitored during field visits. This makes it possible to better predict the harvest date.
• The grain filling and its technological and sanitary quality are preserved when the water requirements of the plants, particularly around and after flowering, have been met.