NOTE N° 4

CORN

THE CORN

The corn is a plant of tropical origin. This plant, sowed in April, manages to produce 12-18 T of MS/ha in 6 months. Composed of fibers (recoverable by ruminants) and of starch (valued in ready-made meals as in design of industrial objects), its number one asset is to be rich in energy.

But the corn culture depends on the desired product: grain corn, corn used as fodder, sweet corn, grain used as seeding.

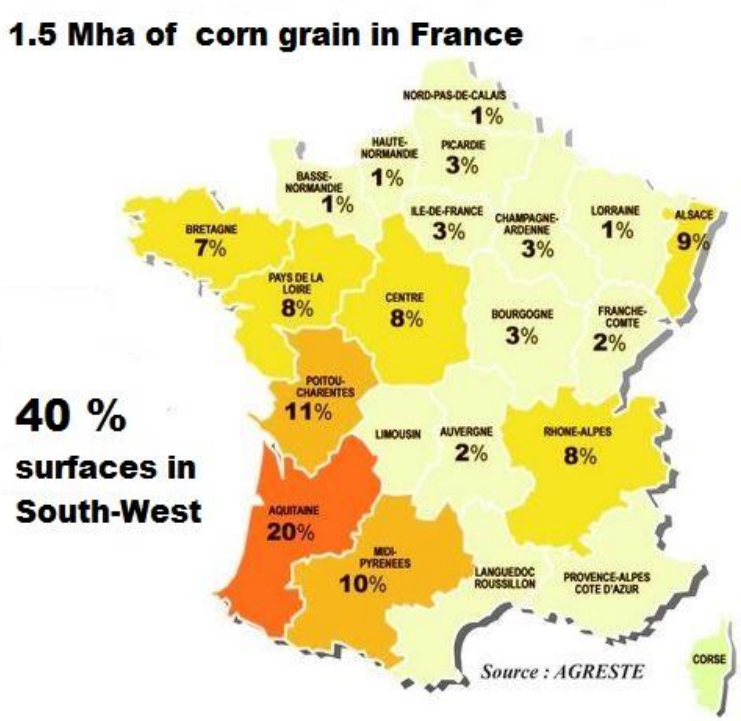
The cultural conduct is identical whatever the expected product, only the date of harvest and the castration differ.

I VARIOUS TYPES OF CORN PRODUCTION

1.1 Grain corn production

In France :

With 1.5 million hectares on average, the corn grain occupies the 2nd place in terms of surfaces behind the wheat (5 million hectares), and just in front of the barley. The volume of production oscillates between 15 and 16 million tons. Aquitaine, cradle of the corn, is the 1st French region, followed by Midi-Pyrénées and Poitou-Charentes. The Southwest covers approximately 600 000 hectares.



The stored grains serve to supply both the national internal market (manufacturers of cattle food of the, industrialists of the starch, semolina or ethanol manufactures), and the export market (essentially the EU).

The main outlet of the grain is used to feed animals (4 in 5 million tons), in particular poultry / pigs (contribution of energy). The harvested volumes are, in a small proportion, consumed by animals directly on the farm.

The branch of industry transforms every year around 3 million tons of corn on the French territory The starch manufacture is the main user branch of the corn industry with approximately 2 million tons, followed by the semolina manufactures with a little less than 0.4 million tons. Starch and maïze semolinas enter in the manufacturing of numerous foodstuffs and non food.

Since 2008, a factory of bioethanol has been using 0.5 million tons of corn at Lacq in the Pyrénées Atlantiques. 200 000 tons of ethanol are produced every year and serve as green fuel for French and European market. This factory also produces 160 000 tons of corn scrap which feeds the animal sectors with materials rich in proteins (in substitution of imports of American and South American soya).

First producing country of European corn, France is especially the first European exporting country and the 5th world exporter.

This corn presents an interest for certain industrial preparations: foodstuffs (thickening, unctuousness, resistance to the freezing-defrosting), textile, adhesive, linking (binding) in the industry of paper and some corrugated cardboard. Experiments show that feeding with fodder with waxy corn allows a faster fattening than the toothed corn allows it.

1.2 The production of corn used as fodder.

In France, it is the basic food to produce milk: easy to produce on the farm and a very good food value for dairy breedings. It is the fodder which has the best cost-quality ratio. This kind of corn represents 84 % of the total surface covered in annual feeds.

A production of the West of France. Therefore the repartition of the corn used as fodder on the national territory is the same as the national dairy production: three cattle-rearing areas Pays-de-Loire, Brittany and Basse-Normandie add up 60 % of the surface of this corn.

1.3 Sweet corn production.

Sweet corn is usually consumed as vegetable (boiled, steamed or roasted grains), consumed sometimes with some butter or some salt or as side dish of pizza.

Nutritional assets of the sweet corn. It supplies very few lipids; low in calories but richer in proteins than the rice, the corn is five times richer in fiber, essential to the smooth running of the digestive system.Besides, it contains a little part of each vitamin of the group B.

The sweet corn has been cultivated in France since 1973. The cob is picked when the grain contains more than 70 % of water. Then, the grain is very quickly conditioned for sterilization or deep-freezing to protect its freshness.France is situated in the fifth world rank but remains in the world front rank for the agronomic performances with an average yield on 20 T/ha in 2010.

89 % of the French production of sweet canned corn is exported. The sweet corn is mainly consumed in summer salads. Its consumers are young.

The consumption of sweet corn on the cob concerns only 11 % of the consumers among which 21 % in the Paris region.

Popcorn: a market rapidly expanding.

Popcorn, is a confidential production on the French territory. The surfaces of production keep to about 7 000 ha for an annual production of about 35 000 T. Today, France is leading the European market.

1.4 Seed corn production.

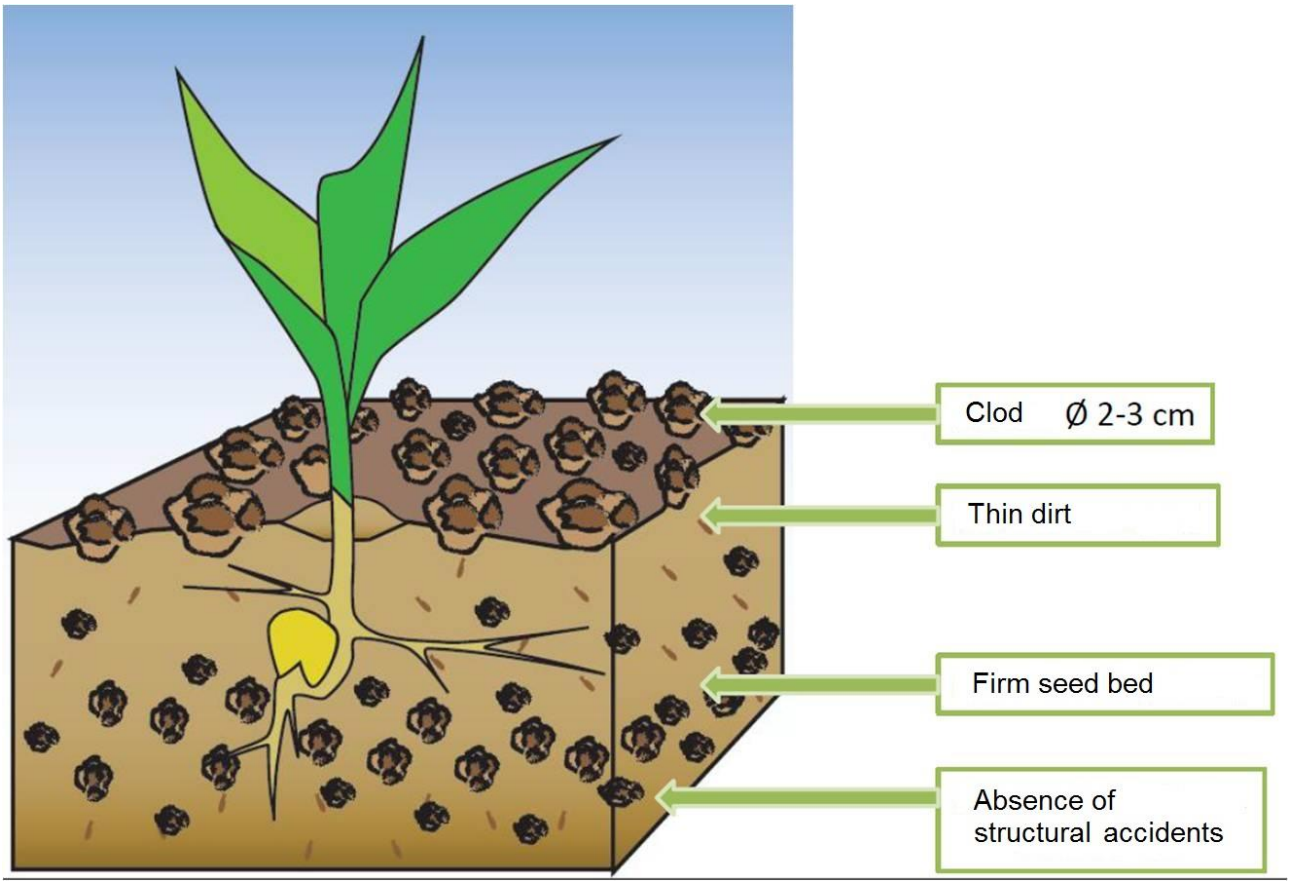
This production is a strategic activity for the agriculture and the French economy. It is assured by 3200 farms and 23 seed companies implanted in France. More than 1900 hybrid varieties, among which approximately 40 % of varieties with experimental character, are multiplied on 50 500 ha. Seeds thus produced are intended for 45 % for the French internal market and for 55 % for the overseas market and more particularly the European Union.

With 45 % of the surfaces of seed European production (27 countries), France is the leader of the second world production area. The first one is North America and mainly the United States (350 000 ha), followed by China (300 000 ha).

The positioning of the French seed production both in volume and quantity is the result of the works started 50 years ago by all the professional actors involved through their respective organizations and through their common interprofessional organizations.

II THE TECHNICAL GUIDELINES USED FOR THE CORN

Corn is very sensitive to the quality of the sowing and to the accidents of structure. A good setting-up is vital.



A depth of sowing from 3 to 4 cm is enough. For the sowing in dry conditions, we can increase the depth from 1 to 2 cms.

2.1 Date of sowing

It is the state of the drying up and the reheating of the soil that has to guide the starting up of the sowing. The years of drought, it is possible to anticipate the sowing on warmed soils.

2.2 Density of sowing

The density of sowing depends on the genetics, on the precocity of the variety, on the potential of the environment and the destination (feed or grain) : it varies between 75 000 and 100 000 grains / ha.

2.3 Varietal choices

The choice of the variety is made according to several criteria:

- The precocity adapted to the region and the date of sowing, to insure a good maturity for silage before September 20th

- The productivity (silage or grain), if the destination of the harvest is not known.

- The food value: PDI, UFL and starch.

- The seedling vigour is important to insure the quantity to harvest especially in early sowing, cold soils or direct sowing.

- The diseases are less important for silage: hollow stalks at the end of cycle for example.

2.4 Fertilization

→ Nitrogenous

The dose of manure is adjusted by taking into account the organic contributions. If grain corn objectives are to get a yield between 80 and 110 qx/ha, between 120 and 200 units/ha measures of nitrogen must be brought. (+ 20 units of nitrogen/10 quintals for different yields).

Corn silage

Objectives of yield : between 12 and 18 T MS / ha, between 135 and 185 units / ha measures of nitrogen must be brought.

If 35 T of manure are added every 3 year (that is 28 units supplied in the corn): between 60 and 105 units / ha could be harvested.

The division of the dose of nitrogen allows to bring the nitrogen by sticking on the evolution of the needs of the plant:

- First contribution: before the emergence of the corn, be careful not to exceed 50 units by hectare

- The balance will be brought in vegetation between 3 and 6 leaves in one or two times, even beyond 8 leaves

→ Phosphorus and Potash hydroxide

Corn silage is averagely requiring P205 and K20. The fertilization P K is to be reasoned according to the contents of the soil and the precedent. A contribution of 40 T of organic fertilizer of cattle allows to cover the needs in phosphorus and potash hydroxide of 25 T for MS of corn.

To sum up, a corn receiving 35 t of organic fertilizer of cattle does not require mineral complement P and K, but only a nitrogenous complement between 60 and 100 units brought in a contribution between 3 and 6 leaves for corn silage production of and 50 units / ha for the production of grain corn.

→Trace-elements.

The corn is a zinc demanding species. The liming and the fast ascents of pH can lead to temporary deficiencies.

2.5 Fight against weeds.

Weed-killers

The choice of the use of a pre emergence product is made according to the flora expected in grasses and in perennials, it can be necessary to resort to one even tw[illegible] post emergence.

In the rotations with only autumn cultures, the introduction of the c[illegible] cycle of autumnal weeds and the use of different weed-killers.

Several strategies of weeding are possible:

> Complete weeding for pre emergence: possible only for the little dirty [illegible]

> Classic weeding: pre emergence and catching up at post emergence (the most current formula and most regularly effective). The weeding is done twice :

Weeding of pre emergence on summer grasses, then catching up according to present weeds, most of the time broadleaved even perennial ones.

> Total Weeding at post emergence.

This technique offers several advantages: saving time at sowing, lower weeding cost, lesser dependence on the conditions of humidity of the soil and the lesser use of root products. It is necessary to adapt products and doses to the present flora.

2.6 Fight against pests

-Fight against soil pests :

At the beginning of the cycle, the corn can be attacked by several insects: slugs, click beetles and frit flies.

Treatments in the form of microgranules are to be applied in the line of sowing by means of a diffuser so that it is arranged around the seed and so that the active material spreads by action of steam.

The absence of treatments is possible if the risks of click beetles are low:

- Calcareous soils, clayey alluviums, easily flooded soils.

- Late sowing and fast starting up of the culture (variety with a good vigour and manure as a starter if necessary)

- Non hydromorph and low acidic soils.

- Plots of land in culture with few cereals for straw.

- Discing in summer to destroy larvaes and present eggs in the naked soils 5 cms deep. By bringing them up to the surface, the combined action of birds and sun destroys a large

number of them. The intermediate cultures with some mustard (rich in sulphurated compounds) would be unfavorable to click beetles.

- Favor the predatory auxiliaries (some carabes, birds).

- Shallow sowing.

- Years of drought.

-Fight against aerial pests.

-Fight against the corn borer (grey butterfly of 2-3 cms)

For the production of corn silage, the treatment is not justified.

-Fight against aphids Their multiplication is intense when the average temperatures reaches 15-20°C in the absence of rain.

-Fight against the Chrysomelid of the corn. its larvaes feed on the roots of the young plants from June to the middle of July.

Various means of fight exist:

The rotation over at least 1 year allows to break the cycle of the insects.

The chemical fight aims essentially at larvaes by sowing, seed or aerial treatments against the adults to reduce laying at the most.

GENETICALLY MODIFIED ORGANISMS resisting this parasite are not authorized in France.

Fight against diseases.

The corn is a species little affected by the diseases. The main diseases met are the smut, the inflorescences smut, the vascular and cob fusarium, the leaf stripe.

Sanitary quality: the risk of fungal toxins.

They can have toxic effects at very low dose and are thus dangerous for the human or animal health. A fine grinding of the residues of culture just after the harvest allows to limit these problems.

MIAS, FRENCH PASTRY MADE WITH CORN:

Ingredients for 6 people

· 100 g of cornstarch
· 40 g of wheat flour (T55)
· 125 g of caster sugar
· 25 g of butter
· 2 eggs
· 60 cl of whole milk
· 5 cl of Armagnac
· 1 bag of vanilla sugar
· the worn zest of an untreated orange
· 1 pinch of salt

Stages of preparation:

1

- Sieve both flours in a bowl, add the caster sugar, and then dilute with a third of the cold milk.
- Incorporate the rest of milk, and then overturn into a pan.
- Add the butter; carry in shivers by mixing regularly.
- Let cook 5 min, and then cut the fire. Let warm 30 min by mixing from time to time.

2

- Preheat the oven in 180 °C (th. 6). Incorporate Armagnac, beaten eggs, vanilla sugar, orange peel and salt.
- Deeply mix; it should not stay a lump.

3

- Overturn into a buttered and floured mold, put in the oven for 45 min approximately: the blade of a knife planted at the heart of the mias has to take out again sandbank.

Sources:

1. AGPM (General Association of the Producers of Corn): www.agpm.com
2. Farmers' association of Burgundy (Bourgogne) to www.bourgogne.chambagri.fr www.semencesdefrance.com