

DAIRY MANAGEMENT

COLOPHON:

Veepro Dairy Management is a supplement to the Veepro Magazine. It contains articles, tips and advice aimed at the management of dairy farms worldwide.

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GROWING AND FEEDING AN IDEAL CROP



World-wide advancement of corn

Corn is popular in the dairy farming industry. It is a fodder crop with unique qualities. It provides abundant yield with high nutritional value. It is rich in energy and contains a lot of starch. In combination with grass, for example, corn is an ideal feed. The cultivation, but also the storage of corn, is relatively simple. No wonder, then, that there is an increasing interest in corn around the world.

The cultivation of corn is not possible anywhere. However, in many countries where there is no corn or where it is present in small amounts, it can develop into a crop with good yield. It can yield up to 40,000 kg of fresh product per hectare, and in

some cases, even more. This corresponds to yield on a dry matter basis of 10,000 - 15,000 kg per hectare. In some countries the lack of moisture is the limiting factor in growing corn. In these cases, irrigation is a possible solution.

Although corn can also be fed fresh, most cattle farms feed the crop as corn silage. The corn is chopped and conserved as silage, and later in the year can be added to the ration as an excellent forage.

Besides being a source of fresh feed or silage, in various countries, corn is also grown as a source of concentrate.

Although the yield of this crop is high, there are a number of potential problem areas. Harvest-

ing, conservation, storage, and feeding are important points of attention.

Excellent yield and quality

When cultivating corn, an excellent yield and quality is the ultimate goal. What is first required is a suitable climate and good soil. Is it not too dry or too cold? The parcel must contain sufficient nutrients and moisture and the soil must also be tillable.

Further, proper preparation, adequate fertilization, correct planting depth of sowing, and sowing distance are important for the success of the crop. The distance between the drills is normally 75 cm. The more plants the farmer wants, the closer they are spaced in the drill (see Table 1, next page).

Table 1: Number of plants per hectare

The following table provides information about the number of seeds and planting distance for a specific number of plants per hectare with a 75 cm row distance.

Plants per hectare	modest sowing conditions		good sowing conditions	
	number of seeds per hectare	seed distance in the row	number of seeds per hectare	seed distance in the row
80,000	92,000	14.5	88,000	15.2
90,000	103,500	12.9	99,000	13.5
100,000	115,000	11.6	110,000	12.1
110,000	126,500	10.5	121,000	11.0
120,000	138,000	9.7	132,000	10.1



Number of plants per hectare between 80 and 120,000

Variety selection

Variety selection is very dependant upon the continent, but also upon the objective (to be fed fresh, as a silage or as a concentrate). Among the many varieties available, there are large differences. Each continent has a group of suitable varieties. This is especially due to the difference in the length of the growing season. When selecting a variety, it is important if the corn is used as a forage or a concentrate. For forage, the farmer looks at the cob and the rest of the plant. What is the yield and the quality? In the case of concentrate, the cob is the most important part. What is the yield, quality, and time of maturity of the cob?

In order to determine the most suitable variety for homegrown crops, the following characteristics are important:

- plant height
- early development
- strength of the stalk
- time of flowering
- time of maturity
- nutritional value
- yield

Besides using corn as a forage, the cultivation of corn as a concentrate is possible. In this case, variety selection must be geared to a well-developed cob. At the time of harvesting, the cob especially needs to be completely ripe.

Harvesting

It makes a difference as to what the corn is intended for: fresh feed, as a concentrate, or as a forage.

Fresh: Harvesting and feeding of fresh corn can be done in various stages, even at an early stage of growth. At this stage already, corn has a fairly good nutritional value. However, it is wise not to feed large quantities of fresh, young corn to animals at once since it contains components that digest rapidly. Feeding no more than 10 kg of fresh corn at one time is recommended. If the fresh corn is fed throughout the day, more than 10 kg per day is not a problem. "Spread it over the day" is the device here.

Concentrate: Harvesting corn as a concentrate should occur when the cob is fully ripe. There are three ways of harvesting corn as a concentrate. The first method involves harvesting the entire cob, which is directly chopped and made into silage. The second method is harvesting the entire cob by threshing. The resulting product includes the kernel and a portion of the cob which is processed and ensiled. This product is called high-moisture corn. The third method involves the

Dry matter content of the corn cob for silage must be 50 – 55%



combining of the entire cob when it is fully ripe. The resulting product is only the kernel. This is dried afterwards and stored under dry conditions.

Silage: In order to make corn silage, the corn has to be sufficiently ripe (hard dough ripe). This is a prerequisite for an optimum conservation and thus optimum quality. Table 2 explains the different stages of maturity.

Harvesting at an early stage - when the corn is not yet ripe - results in a lot of conservation losses. In addition, this method results in feed that is less palatable and has lower nutritional value.

The ideal chop length for corn silage is 0.8 cm



Chopping for Silage

Harvesting of corn that is meant for silage is done with a chopper. The height of cut is usually around a stubble length of 15 cm. When cutting shorter, there is a danger that the ash content of the feed will increase.

In addition, it is important that the chopper has sharp knives. The machine has to be able to chop the corn short and to process all of the kernels.

The optimum chopping length for forage is 0.8 cm. This length is very suitable for making silage and allows for sufficient pressing of the silage in the pit. With chopped shorter, the crop loses effective fibre and comes closer to being a concentrate. When the corn is chopped more coarsely than 0.8 cm, it becomes more difficult to press the silage. It may result in air remaining in the silage. This may cause the silage to heat up and mould may develop.

It is critical that during the chopping process, all kernels are processed well. This is important for utilization during digestion. Unprocessed kernels are indigestible and end up in the manure.

Table 2: Different stages of maturity and influence of ripeness on the feeding value of fresh corn and corn silage

stage of riping (cob) + Characteristics	% dry matter in		in dry matter	Quality / kg dry matter				Ensiling losses in %	
	Plant	cob	% cob	Fresh corn		Corn silage		dm	Energy
				MJ * FUM *	CD GDCP	MJ * FUM *	CD GDCP		
Milk ripe - Colour yellow - Much pressure in grain - The content is like milk	18-21	30	30-35	6,0 875	94 61	5,9 850	96 55	10-15	15-20
Soft dough ripe - Colour more dark yellow - Content partly dough - When pressed with nail, moisture seeps out	21-25	40	35-45	6,1 885	94 58	5,95 860	96 53	8-12	11-15
Dough ripe - Colour dark yellow - Still moist by point of grain - Rest of content already rather solid	25-29	50	45-50	6,3 910	84 55	6,25 905	84 50	6-10	8-12
Hard dough ripe - Colour dark yellow - Content solid - Difficult to press in with nail - No moisture coming out - Dry matter content of cob is	29-34	55	50-55	6,4 925	82 50	6,35 920	80 50	4-8	6-10
Fully ripe - Colour dark yellow - Hard grain - Unable to press in by nail - Dry matter content of cob is	>34	>55	>55	6,45 935	80 45	6,5 940	79 50	<4	<6

*1 Fum = 1,65 kcal = 6,9 kj - 1000 Fum = 1,65 Mcal = 6,9 Mj - 145 Fum = 1,0 Mj

Conservation

Conserving corn is rarely a problem. This is especially because the crop contains only small amounts of protein and sufficient sugar. A prerequisite is that the corn is hard dough ripe at the time of harvest. In this case, the crop contains a sufficient amount of sugar and the amount of moisture is limited.

Storage

For conservation, the corn is ensilaged after chopping and covered with plastic and a canvas tarp for protection against birds etc. Preferably this takes place in a silo. It then becomes possible to press all

The corn is cut to leave a stubble length of about 15 cm.



of the corn well, also the side parts. If no silo is available, putting the silage in a clamp is an option. In this case, the setup of the sides requires extra attention as well as the pressing of the sides. Corn that is not pressed well contains too much air and is susceptible to heating up. Heating up and moulding frequently occur first on the sides. Heating and moulding affect the palatability of the feed. They lower the dry matter intake and in this way, the milk production as well. In addition, mould in the feed has a negative effect on the growth of bacteria in the rumen. This may disturb the proper functioning of the rumen.

Size of Storage

When making silage, the size of the pit is

important. With a large herd, a large pit is necessary, and with a small herd, a small pit. When making a pit we must keep in mind that 1.5 - 2 m should be fed each week. Feeding less increases the likelihood of heating up and moulding. It takes some advance calculations to determine not only the width but also the height of the pit. For example:

- A dairy farmer has 30 milking cows. He would like his milking cows to receive 5 kg of dry matter per cow per day. From the feed nutrient analysis, it appears that the corn silage contains an average of 180 kg dry matter / cubic metre. The dairy farmer wants to feed two metres of silage per week.
- What size of pit is necessary?
- The dry matter intake for 30 cows per day is 30 cows x 5 kg DM = 150 kg DM. Per week, this is 7 x 150 = 1050 kg dry matter. Each cubic metre of the silage contains 180 kg DM. For a weekly amount of 1050 DM (1050 / 180 kg DM =) approximately 6 m³ is necessary. With a desired feeding speed of 2 metres per week, approximately 3 cubic metres over a distance of 1 m is necessary.
- The recommendation thus includes the following dimensions:
 - * 5 m wide / 0.6 m high
 - * 6 m wide / 0.5 m high
 - * 7 m wide / 0.45 m high

Tips for harvesting corn silage

- Harvest during the hard dough ripe stage. This gives a dry matter content of 30 - 35%.
- Don't cut too short. A stubble length of 15 cm is the best. This also prevents dirt from ending up in the silage.
- Chop with sharp knives. The ideal chop length is approximately 0.8 cm.
- Pay attention to the kernels. All kernels should be processed.
- When making silage, every wagon load of corn silage should be distributed over the entire pit and be pressed very tightly.
- Adapt the size of the pit to the size of the herd.



Never take out the corn silage in this way à it becomes warm à negative impact on palatability and feed intake



Always cut the pile straight to prevent heat up and mould development

Tips for storage

- Press the corn silage well.
- Seal the corn silage with plastic and a canvas tarp.
- Cover the pit with a layer of soil on top of the plastic or with a layer of potato bran under the plastic.
- The product should be cold and not contain mould.
- Pay special attention to the sides. They heat up first, and after that mould develops.

Tips for feeding

- Feed approximately 2 m / week.
- Always cut the pit straight when feeding.
- Do not leave loose corn silage lying around, since it will begin to heat up.
- Feed the corn silage cold and fresh.

Quality

Proper harvesting and conservation of the corn silage ensures good quality. This is important for the highest possible dry matter intake and thus an optimum nutritional intake. In the end, the cow will reward us with outstanding milk production. And after all, that's what we are striving for.

Good quality corn silage meets the following standards:

- dry matter 30-35%
- kernels hard dough ripe
- chop length approx. 0.8 cm
- all kernels are processed
- good smell and palatability
- colour yellow

Feeding corn

Corn is a crop with unique qualities. It possesses a high nutritional value, it has a lot of energy, and also contains a high amount of starch. This is also a disadvantage, because as a result of the starch, cows may quickly become overweight (fat). Cows that are too fat may have a lot of problems with feed intake, especially after calving. They are highly susceptible

to ketosis. Another potential problem with corn is its fairly low amount of crude protein content. Therefore in a ration with corn silage, even in combination with a protein-rich forage, the supplementing a protein-rich feed is often necessary. Further, corn silage has a low mineral content. So it is necessary to add additional minerals to a ration with corn silage.

Fresh corn

Fresh corn has excellent nutritional value and high palatability. As it has a high sugar content care must be taken when feeding large amounts. This may cause acidosis.

Corn silage

Corn is most commonly fed as corn silage. When feeding, the greatest danger is that the rate of feeding is insufficient. The corn silage then becomes warm. This has a negative impact on palatability, feed intake, and nutritional value. Corn silage should always be taken out and fed while it is cold. If soil has been put on top of the plastic, it will help to keep the corn cool.

Corn as a concentrate

When corn is fed as a concentrate, the kernel is ground and fed as meal or in combination with another single ingredient concentrate. Corn is then added to provide additional energy or starch to the livestock.

Supplementing of corn silage is often necessary during the pasture period to have balance in the ration

