



## MANUAL OF FODDERS ENSILAGE IN ROLLS

### WHY BETTER TO CHOOSE SILAGE IN BIG ROLLS?

#### PRODUCTION RULES OF THE SILAGE

Manufacturing the silage is aimed at protecting and storing nutrients in green fodder thanks to lactic bacteria which cause the fast fermentation in an aerobic conditions and are minimizing losses, from harvests to distributing. Independent of the used technology ensilage and main functions of the system of the storage consist in cutting off air supply while pickling and at storing the silage. To the fermentation and losses at storing a speed of the set, a content of the damp, a height of mowing and a condensation have a large impact. Thanks to the effective fermentation fodder is usually tastier and more easily digestible. This getting maximum eating a dry matter by farmed animals, what usually results in higher milkiness or gain in weight.

#### ADVANTAGES

- lower dependence on weather conditions
- the quality of the silage in big rolls can equal the silage in the pile and it can be better, if they are actually acting
- lower losses as a result of the spoilage caused by aerobic bacteria compared with pickling in the pile
- the simple economy and distributing (it is possible to give corner kicks to the amount of the silage depending on the demand)
- fitted diet: in rolls it is easy to mix the silage with other fodders in accordance with the requirements nutritional of different farmed animals in the household
- surpluses perfect for conserving of grass and the grass collected in autumn
- lower losses of a dry matter while the production and storing (< 5-10 %) compared with pickling in the pile
- flexible system of storing: it is possible to store rolls on field or it is easy to transport households to every point
- reduced investments, lower costs of the transport and storing
- low threat of the impurity, lack of the leak of liquids, if rolls were actually wrapped up in the foil, in the case about the content of the roll about the high dry matter content
- it is possible to sell the surplus - source of income in the household

#### DEFECTS

- high unit costs
- about the big contents damps aren't suitable for silages
- labour intensity / time at distributing
- susceptibility to damaging at improper acting
- costs of the recycling of plastics and the dignity with regulations concerning waste

### HOW TO MAXIMIZE USING OF SILAGE IN BIG ROLLS - POINTERS

#### HARVEST

- to conduct mowing after drying of the dew, in the period head or of creating the bunch of the dominating kind
- to avoid contaminating of the soil, not to place knives or niddy-noddy too low
- height mowing with 5-10 cm, depending on the risk of contaminated soil
- fast drying to the dry matter content 35-55 %, not longer than 24 hr in case of the grass and 48 hr in the case leguminous, so as lucerne and a red clover
- to scatter the set on possibly of the greatest area within 1 hr from reaping
- to apply the addition in the audit purpose of the fermentation and reducing losses after pickling

#### FORMING OF ROLLS

- grind down silage in the aim of getting the greater condensation and the better availability of substrates - ultimately 200 - 220 kg of a dry matter on m<sup>3</sup>
- to apply silage additives, if necessary and appropriately of fodder
- as much as possible to wrap rolls up in the place of storage applying the high quality foil with the preliminary tension 55-70 %
- to apply the minimum of 6 layers (silage for cows) in the destination of the better security against damage and the protection against the access of air
- so that reduce heating the surface of the roll and lower the risk of the corruption, best to apply the green or white foil

#### PROCEEDINGS AND STORAGE

- with rolls one should conduct all operations very cautiously and to limit them in order not to damage the foil what could supply for spoiling the silage
- in case of wet silage (<25% dry matter content) place carefully rolls on the ground in one layer; in case the dry matter content is over 35% it is possible to arrange in three layers
- to store rolls in the distance of the minimum of 10 m from watercourses
- to cover rolls from above in order to protect against damage by birds and rodents
- to control the place of storage of the roll in order to reduce the possibility of damaging them, and therefore of access of air

## SOIL HOLDING FOR MANUFACTURING SILAGE

Two main factors, which have the influence on the fermentation of the silage, this contaminating of the soil and applying fertilizers. Improper holding the soil and fertilizing can lead green fodder to lowering the amount of forage and the inferior quality at ensilage. Contaminating of green fodder with the exaggerated amount soil and unused nitrogen of fertilizers can result in the increase in the risk of the fermentation of bacteria Clostridium in the silage what is leading to the considerable nitrogen content ammonium and of butyric acid in the silage, and therefore - to low eating by farmed animals and the insufficient increase in mass.

### HOW TO AVOID IMPURITY SOIL?

A high content of ash in analysis of silage is a good indicator of exaggerated contaminated soil (> 100 g/kg of a dry matter).

In order to avoid and to limit contaminating of the silage with the soil to the minimum it is possible to take the sequence of operations:

- to roll field late in autumn and/or in early spring and to remove stones - to avoid collecting the grass, if is humid
- not to cut at the too low height, if it is threatening with contaminated soil (e.g. < 70 mm)
- in the winter to limit the proliferation of moles applying recommended and humanitarian methods.

### FUNDAMENTALS

- the held soil in good condition should have an opened, brittle structure, should be deep surpassed with the root system, not to have discolourations and to have a healthy population of earthworms
- if they are planning to manufacture the silage, a spring belongs to commence preparing the soil and to distribute with grass animals before the beginning of her height in the end winters
- one should smoothe the area of ground, in it to remove all molehills and to limit the proliferation of moles so that during the vegetative season they don't form molehills
- if before mowing a substantial amount of molehills is on a meadow, one should if necessary not mow and not produce big rolls in order not to expose oneself for contaminating of the pile
- the soil contains million of the bacterium which are calling the acetic fermentation and butyric. They cause the decomposition of proteins and sugars in fodder, because of which the silage has a little sustenance and unwillingly is being taken
- contaminating of the soil can moreover cause health problems for animals, if cattle get the contaminated silage.

### APPLYING FERTILIZERS

Every year applying fertilizers on fields from which grass will be acquired to the silage is one of fundamental decisions made by farmers. This decision can have a significant effect of the winter feed to the amount and the quality get.

### NITROGEN (N)

- two-time mowing the grass to the silage means you will remove from field up to 10 ton of a dry matter. It is answering 200 - 400 N/ha kg; one should supplement this amount
- the required N amount for the replenishment depends on the sequence of factors:
  - : of, how many N comes from the soil
  - : of vegetative period from closing field for mowing
  - : seasons
  - : of, whether field was grazed in front of the lock
- one should conduct analysis of the soil so that ensure the appropriate dose of fertilizer and always take implemented nutrients into account from slurry
- fundamentally the N dose amounts from 100 up to 150 N/ha kg
- one should check, whether at mowing remains of nitrogen aren't in green fodder of fertilizer so that the silage doesn't contain significant concentration of the butyric acid and ammonium nitrogen what results in low eating by farmed animals
- fundamentally one should not apply more than 2.5 N/ha kg for every day from closing field for mowing - best however to apply less.

### PHOSPHORUS (P)

- at mowing green fodder less phosphates than potassium are being removed, however in order to get a good crop it is recommended to keep the content of P in soil of 3
- depending on analysis one should apply by 100 P/ha kg (indicator 0) up to 30 P/ha kg (indicator 3) after the first mowing green fodder and 30 P/ha kg after every next mowing

### POTASSIUM (K<sub>2</sub>O)

- as similarly as in case of nitrogen, considerable quantities of potassium are being removed along with cut grass, it should be supplemented. In this case analysis of the soil will also allow to describe crops requirements
- fundamentally the indicator of potassium contents in the soil should amount 3; for every mowing the appropriate amount potassium should be ca 150 kg/ha
- one should not apply potassium before grazing, but only after closing field
- if the indicator in the soil amounts to potassium contents is lower than 3, it should be corrected in autumn. Above the value 3 require applying of the paucity potassium in the vegetative period.

## MOWING FOR MANUFACTURING SILAGE IN ROLLS

The choice of the moment of mowing is one of the most important decisions which one should entertain. A time of mowing the silage and getting the optimum yield of a dry matter at keeping the nutritious best quality are basic factors of the good production of the silage in rolls which in the direct way influence the increase in mass and a milkiness.

Below we are giving information which will help with the optimum selection of the time and the method of mowing and drying, what green fodder best will be used thanks to and will be transformed into a high quality efficient silage in rolls.

#### WHEN SHOULD MOWING STARTS?

- in case of a lot of the silage in rolls the time of mowing depends on the growth of plants. Best if mowing is being conducted while heading began no more than a 50% of plants, since then value of the D indicator (digestibility) is high - similarly to the protein and sugar content.
- mowing at that time will reduce the total potential yield in the comparison to the more late crop, however a balance of the baulk is perfect with the sustenance and the crop
- mowing at that time also guarantees the fast shoot of grass moreover it allows increase the annual crop
- if grass grew too long and becoming woody of stalks is starting, a content of fibre is increasing, because of which a digestibility, an energy value and the protein content are reducing; moreover it is hard to press green fodder into fodder and is more susceptible to the development of the mould
- this way so too late mowing is leading fodder for reducing the energy value and has a direct effect to parameters of dairy cows and porker cattle (Table 1)

TABLE 1 - DELAYING MOWING AND HIS INFLUENCE ON THE MILK PRODUCTION

Delaying of the optimum time mowing	Loss of the energy MJ NEL/kg density of a dry matter	Lowering the potential milkiness in kg/ha/year
4 days	-0.3	-850
7 days	-0.5	-1420
10 days	-0.8	-2271

J m - NEL mega joules - net energy of the lactation

#### POINTERS IN RELATION TO MOWING

- to adapt the height of mowing potential fieldlutants for soil conditions and the participation
- to mow in dry conditions: wet grass reaped in the morning, for which the crop forms deposits, isn't drying effectively itself. To mow always belongs dry grass - without the dew drop or the rain on stalks
- to mow on the adequate height: height after mowing should take out 5 - 10 cm, depending on soil conditions in the objective of lowering of the risk of fieldlutant. Mowers exactly following the profile of ground are best. If the machine is mowing the existence low, one should set her in order to get the optimum height of mowing. A speed of mowing and a more late shoot of grass will increase it to grazing or the next harvest of grass to the silage.

#### DRYING

The pretended production of the silage requires fast drying, what provides the optimum dry mass content (30-55 %). It is improving the course ensilage and limiting the decomposition of proteins as well as increasing the content of liquid after fermentation.

- time of drying should be limit to the minimum in order to avoid losses of the yield as a result of decomposition of sugars and proteins in green fodder
- in case of the grass to green fodder is recommending drying not longer than 24 h
- applied method of drying has an impact on the time of drying essential to get the appropriate dry matter content (DM). The method of wide scattering green fodder on field often requires the shorter time of drying (Table 2)

TABLE 2 - TIME OF DRYING ESSENTIAL TO GET APPROPRIATE DRY MATTER CONTENT

Date of mowing average temperature	Method of drying	DM at ensilage	Time of drying (in hours)
3 - 5 May 28 C Sr. / 83 F Sr.	Widely	44.6	29
	Narrowly	43.5	55
12 - 14 June 28 C Sr. / 83 F Sr.	Widely	45.0	28
	Narrowly	44.7	40
17 - 18 July 35 C Sr. / 96 F Sr.	Widely	48.5	6
	Narrowly	46.9	25

#### POINTERS IN RELATION TO DRYING

- immediately after mowing to scatter green fodder. Drying is faster, if times of plants are open (100 litres of water to the ton for the hour); by closed leeks is falling to 20 lt/h. Times remain open only for two hours for reaping, therefore scattering green fodder parrying water is facilitating from undone still of leeks
- additions are precipitating drying, since are opening the surface of leaves and are increasing the volatilization
- green fodder without additions should be, as soon as possible, widely scatter green after mowing with the tedder in order to facilitate drying
- in case of great yields peculiarly applying the tedder is significant so that enable regular drying green fodder and avoid the presence of wet and not-dried plants by the earth
- the weather should be controlled - in hot and windy days drying and getting the appropriate dry matter content takes place quickly and it is possible to overlook the optimum moment
- against dry matter contents above the 45% it is hard to press green fodder, whereas by the dry matter content of the 65% a productivity of the lactic acid fermentation is lowering

- directly before the press winding should be used windrower. The width of the crop should be almost so wide as the width of collecting the press - some more green fodder should be in part outside than in the centre of the crop.

#### **FORMING OF ROLLS AND WRAPPING SILAGE UP**

At manufacturing the silage in rolls creating anaerobic conditions in the roll after wrapping up which they are supporting is a purpose simple to achieve and at the same time essential oneself for fattening up. Two factors are contributing to it: the structure and the density of the roll and the effectiveness impervious air of the barrier.

In the modern farming practice rolls are being wrapped up with many layers of the foil of material in the destination of getting long-lasting, impervious air of the barrier. At pickling a sustenance of green fodder is being kept and a threat of decaying which has often appeared in case of applied earlier sacks is reducing.

Foils are being tightened with the con man on the wire-wrap tool of rolls, and then is wrapping up her rolls. Memory of plastics - property thanks to which the foil is returning to primitive dimensions - causes the contraction of the foil around the roll which is creating very much tight and reliable barrier. High quality layers of the foil more easily are sticking together with themselves what the airtightness of the barrier is increasing and a process of wrapping rolls up is facilitating.

#### **FILM TO THE SILAGE**

The silage film should fulfil three essential conditions: it must have good mechanical properties, well to adjoin (to be sticky) and to contain stabilizers protecting before damaging by the sunlight - mainly radiating UV rays. A best quality of the foil is essential what is being combined with stresses appearing while wrapping the transport up and storing, thanks to what:

- the process of wrapping up is proceeding without problems - less breaks because of the tear, the heterogeneous tension or blocking devices
- a density of the roll continues and prevents damage - for a long stretch in a wide range of climatic conditions and at typical operations with rolls
- the sunlight is being reflected - it prevents a rise of temperature which could support the development of undesirable micro-organisms and increase the permeation of gasses through the stretchy foil
- the foil constitutes the barrier for water and oxygen - is keeping the right concentration of the gas carbon dioxide inside the roll which is acting as preservative

#### **IS THE COLOUR OF THE FILM SIGNIFICANT?**

It was showed in research, that foils about the light colour - white or green - are reflecting more warmth in the comparison from foil black, what provide the best possible conditions for the fermentation thanks to. Exaggerated heating is leading for loss of the sustenance and the potentially spoilage SILAGE green fodder.

#### **WHAT ARE APPROPRIATE CONDITIONS, IN WHICH SHOULD BE WRAPED ROLLS UP**

Rolls should be wrapped up in dry

conditions. At the weather without falls the film is keeping glutinous properties, moreover ensilaged green fodder has the highest possible dry matter content. Of the humid silage more juices are freeing, what also negatively influences the air tightness of layers.

#### **HOW MANY LAYERS OF THE FILM?**

Fundamentally for due wrapping up the roll with the silage should be applied at least 4 layers of the applied traditionally stretchy foil.

Producing the roll about the high density and dry matter contents from very easily of digestible green fodder (over 200 kg of a dry matter to the roll) applying 6 layers of the foil is justifying. The height about 25 kg of a dry matter to the roll is covering two additional layers of the foil expenses, since a number of rolls which it is necessary to form, is reducing to wrap up, to transport and to store.

Built recently by the Welsh Institute of Grassy Areas and environment tests (IGER) the research is showing that increasing the number of strata of the foil, with which rolls are being wrapped up with green fodder, is reducing the penetrability of air, loss of a dry matter of the silage and is reducing the height of the mould what provides the high performance for the fermentation. It means that increasing the number of losses of the foil lets the quality get more nutritious silage intended to fatten up and better for her.

#### **TIGHTENING THE FILM**

Tightening the film allows to get a tight connection of layers, however exaggerated tightening causes loss of the elasticity of the foil what for its the effectiveness is making lower. Measuring reducing the width is a good solution of foil after tightening. Although is making advances so that after stretching the width of the foil is 70 up to the 80% of primal width, they usually assume that it is possible to tighten the foil 750 mm wide so that the width is an about 600 mm. Such a value is being get, if the foil lightly is tightened, and then is wrapping rolls up.

#### **INDICATORS CONCERNING THE FORMING AND WRAPPING ROLLS UP**

- it should be aspired to producing rolls about the high density and the appropriate shape. Thanks to that rolls will be heavier and their number will reduce to the hectare, and therefore costs of the forming and wrapping rolls up will reduce
- to grind green fodder down in order to get the greater condensation and the better availability of the sugar, thanks to that the fermentation is coming quickly - ultimately 200 - 220 kg of a dry matter on m<sup>3</sup>
- to apply silage additions according to recommendations of the producer
- to set the highest density of the roll on the press
- as much as possible to wrap rolls up (within at most 12 hours in the place of storage) applying the high quality foil with the preliminary tension 55-70 %. One should wrap rolls up in dry conditions
- regularly to clean rollers so that on them remains don't gather
- to apply the minimum of 6 layers to the purpose of the better security against damage and the protection against the access of air
- in order heating the surface of the roll will reduce and to lower the risk of the corruption, best to apply the green or white foil
- wrapping up should be conducted according to the instruction for use of the wire-wrap tool and recommendations of producer of the foil

- wire-wrap tools should be used with whip-round platforms on which the roll is falling gently, in order to minimize damaging the foil at knocking off
- all operations with rolls should be conducted very carefully to limit, in order not to damage the film what could supply for spoiling the silage
- in case of wet SILAGE (<25% dry matter content) carefully put down rolls on ground – one layer; if dry matter content is over 35% it is possible to arrange that in three layers
- to cover rolls from above in order to protect before damaging by birds and rodents.

#### MANUFACTURING SILAGE FROM THE SECOND CROP

As similarly as in other fields, from the second crop it is possible to get good results of the production of the silage following a few main practical advices.

First advice is following: the preparation for the second crop is starting right away after the first mowing.

##### PREPARING OF THE SOIL AND FODDER

In order to produce the select silage at the minimal losses, for optimal use by animals and high production potential, farmers should commence preparing the soil and fodder right after mowing.

These activities are covering three stages.

##### STAGE I

- if exactly collecting all over the first crop wasn't possible and on field a grass stayed, it is worthwhile dismissing it before commencing growing again
- it results from it, that such grass will probably rot away, what the concentration of undesirable bacteria and mushrooms will increase by, and because of that a risk of the faint fermentation of the silage will intensify or a susceptibility of the silage to the development of the mould will increase. Grazing cattle or sheep on field by the day is the simplest method of removing remaining fodder or two after collecting the first crop.

##### STAGE II

- it should be checked whether the area of ground is even and didn't remain for the inequality as well as all moles and molehills were removed. Thanks to that a risk of contaminating of the soil the second crop will reduce.

##### STAGE III

- to apply the appropriate dose of fertilizer to the purpose of the improvement in the growth of plants – it's necessary to avoid over fertilizing, since if this is the case at mowing a considerable quantity of soluble nonprotein nitrogen will be in green fodder, what the productivity of the fermentation of the silage will make lower, and therefore - a quality of the silage will deteriorate
- it is worthwhile to use a right dose, not exceed the dose 2.5 N/ha kg for every day from the first crop to the perfect date made plans of mowing, since it is the maximum dose which plants can exploit in perfect conditions. More information regarding the application of fertilizers was given earlier in this textbook.

It is possible already only to rest after these treatments and to watch, how grass grows.

Since into preparing field and plants for the second crop we put our time and the work, a similar care is essential at the harvest.

#### HARVEST

*Mowing in the opportune moment is a consecutive fundamental stage in order to ensure the highest nutritional value at the harvest:*

- 4 to 5 week after the first mowing one should control plants, in order to state, what part blooming started at. Depending on kinds and plant varieties and of weather conditions between the first but second crop, a date of heading of plants is changing in the crop
- in case of a lot of the silage in rolls the time of mowing depends on the growth of plants. Best, if mowing is being conducted while heading began no more than a 50% of plants, since then the value of the D indicator is high - similarly to the protein content and of sugars. This moment is usually coming after 6 weeks of growing again, it is worthwhile however controlling plants within 2 preceding weeks, since plants can head earlier than usual. More information concerning mowing was given in the manual No. 3 mowing for manufacturing the silage in rolls in this textbook.

When a time of the set approaches, the following matters are substantial:

- mowing should start when plants are dry (after drying of the dew, best for the end of the day at the sunny weather)
- the height of mowing should take out 5 - 10 cm. If the surface of the soil lets it height of mowing should be lower, if not - increasing the height should be considered. Too low height is increasing the risk of contaminating of the soil, but also is increasing the time of the regeneration of plants and the resurgence, what reduce the size of harvest
- to decompose the crop on possibly of the greatest area right after mowing so that drying takes place more quickly
- to dry grass through maximum 30 hours, whereas leguminous plants for two days. Exaggerated drying is increasing losses of a dry matter on field and is reducing the nutritional value of fodder
- best he is to form rolls with the press with the chaff-cutter which is increasing the density of the roll, but thanks to that a content in them is reducing oxygen and is precipitating the fermentation
- to apply silage additions
- after forming the roll best to transport them to the place of storage, and then to wrap up with 6 high quality layers of the foil; to store ensuring appropriate conditions
- in the end to cover rolls with the net so that prevent for damaging by birds and destroy vermin.

Thanks to all these action it is possible to get the high quality silage, so is a last point as the best use of fodder through examining qualities of the silage and mixing up corner appropriate fodders and concentrates, in accordance with the requirements of farmed animals: in this way maximum increasing the potential of the animal production is possible thanks to the own silage in rolls.

#### DEALING WITH SILAGE IN BIG ROLLS AND STORAGE

At manufacturing the silage in rolls creating anaerobic conditions in the roll after wrapping up which they are supporting is a basic aim oneself for fattening up. Appropriate treatment with rolls and storing them has a key importance so that ensure such conditions and keep the quality and the sustenance SILAGE green fodder.

Even if select foils are applicable, improper proceedings and storing rolls can lead for piercing or damaging the hermetic barrier from classes of foil what is leading to decaying and going mouldy.

#### POINTERS CONCERNING DEALING WITH ROLLS AND STORAGE

- rolls should be removed from the wire-wrap tool very carefully
- wire-wrap tools with whip-round platforms should be used, on which the roll is falling gently, in order to minimize damage to the foil at knocking off
- to perform manipulations of rolls with special loaders in order to reduce the possibility of damage. - - bars of the loader must be smooth in order to prevent to damage
- directly after wrapping the foil up to check, whether rolls aren't damaged. As much as possible infusion trick of damaging with the help of the appropriate adhesive tape immune to UV radiating
- all operations with rolls must be conducted very carefully cautiously to limit it in order not to damage the foil
- to transport 24 hours within from wrapping up by the foil to the place of storage.
- to choose the place of storage a long way from trees and watercourses - best overshadowed and revealed from the wind
- to store rolls on the flat, stable surface without keen edges which they could damage
- wet silage about the low dry matter content (< 25% of a dry matter) to arrange in one layer
- silage about the high dry matter content (> 35% of a dry matter) it is possible to arrange to a maximum in 3 layers
- to cover rolls with densely woven mesh in order to protect against damage by birds and rodents. If necessary to secure rolls with the appropriate fence
- to control the place of storage of the roll in order to reduce the possibility of damaging them, and therefore of access of air
- to inspect rolls within the winter and to control, whether the foil wasn't damaged in the place of connecting the roll to ground. If necessary to repair damages.

#### ELEVEN RECOMMENDATIOIS FOR PRODUCERES OF SILAGE

A few principles are existing to get the high-quality silage. Irrespective of whether we care about the high productivity of dairy cattle, whether we want to achieve good results in the cattle raising slaughter, a maximization of the participation of the silage in fodder is the key to success.

1. Fodder should be based on good qualitatively elements (grass or leguminous plants). The old pasture strongly is often surpassed with weeds. The participation of weeds in the crop is lowering his quality. Fodder is then less digestible and contains less saccharine. It is worthwhile considering using leguminous plants which are characterized very much high with sustenance.
2. Fertilizing in accordance with the demand of the crop and the class of the soil. The dark-green colour means the excess of nitrogen, i.e. the lower content of sugars. It is also slowing the fermentation down what is threatening the underdogs with pickling and the participation in the end increased of indigestible elements of fodder like ammonia and butyric acid. The maximum level of nitrogen in the silage should take out from 180 to 250 individuals on the ha, depending on the type of the meadow and the class of the soil.
3. Applying manure in fertilizing meadows. Manure is a valuable source of nitrogen, phosphorus and potassium (NPK). Manure should be applied the cautiously and it is necessary to include it in comprehensive balance of fertilizing. One should avoid scattering manure later than 7 weeks before harvests, since it can lead for contaminating of the silage.
4. We are setting about to mowing in the right stage of the development of green fodder. High-assailable silage (70 +) should be mown in the early period of soaring into the stalk. One should and so select the moment, in which the stalk is starting expanding - it is good time for mowing. Every consecutive week of delaying crops of May devotions to Our Lady is indicating the fall in the sustenance of the silage against 1.8 individual.
5. We are cutting silage on the adequate height and when is dry. We are cutting silage at height 5 - 20 cm, in wet from the risk of contamination of the soil. In this way we are making sure that matter will remain dead on field. To mow he belongs, when the crop is dry, otherwise water is stopped in the crop and heavily of it will be to drain.
6. Drying the crop. For them more quickly a crop will be dried (desired participation of a dry matter for bale silages are 35-55 % volumes) energy losses and a lower risk of contamination will be all the lower with mould and fodder yeast.

#### THE INFLUENCE OF THE DEVELOPMENT PHASE OF THE CROP ON THE ENERGY EFFECTIVENESS AND THE CONTENT OF PROTEINS

Stage of the development of stalks and leaves in the crop	Energy value (MJ/kg of a dry matter)	Content of proteins (%)
Crop strongly leafed, stalks are missing	12	18

Crop leafed, sparsely visible stalks	11	16
Crop leafed with blooming stalks	10	14
Crop on average leafed with the substantial amount of blooming stalks	9	12
Mature stalks, crop is entering the blossoming period	8	10

7. Applying of incisal baler. At applying incisal baler a thickness of the silage is increasing in the roll what is facilitating fermentations through the limited access of air. Compacter SILAGE is indicating less roll on the ha of the crop what much influences the reduction of costs. Arranging compact about the same size much wrapping up and storing the silage is facilitating the roll.
8. Applying additions to the silage. Applying additions makes easy the fermentation and stopping nutrients in the silage.
9. Applying the foil about the best quality. The high quality foil is characterized by a better endurance and a viscosity what is lowering the risk of the access of oxygen after baling. At baling of the silage about the high share of a dry matter (45% and more) and of silage acquired from reaping plants about fatter stalks, so as the red clover and the lucerne, is recommending to the foil at least 6 layers being applicable.
10. Thorough preparing the roll for the storage. Arranging the roll in stacks higher than 3 rolls is reviving, and in the case more one should arrange wet surfaces of the roll is eating one by one or after two. Differently rolls are exposed for unsealing or even splitting the protective foil up.
11. Correct storing the roll and repair of all damage to the foil. It is necessary to store rolls a long way from watercourses in order to avoid potential contaminating. Rows of the roll should be wrapped up with special ring for the protection against birds and vermin. All damage to foils should as soon as possible be repaired with the help of appropriate patches, and patched rolls should be used as first for the feeding.

#### WHY IS IT WORTHWHILE TO APPLY ADDITIONS TO SILAGE?

The following guide constitutes the independent source of knowledge about types of additions and of applying them in order to achieve the better quality bale silages.

#### CONSERVING SILAGE - VITAL STATISTICS

Bacteria of the lactic acid being found in green fodder are exchanging saccharides for the lactic acid, what the crop is staying thanks to preserved as the silage. Unfortunately the majority of bacteria being found in a silage is hindering the fermentation or causes the transformation of saccharides into an undesirable end products. We often observe the following coincidences:

- the large portion of saccharides is being consumed and processed into undesirable chemical primordiums, so as: acetates, salts of the butyric acid or the ethanol
- proteins are staying spread up to time offs of amino acids, amines, amides and of ammonia
- the reduced nutritional value and the assimilability of fodder

#### HOW DOES WORK ADDITIONS TO THE SILAGE?

Additions to the silage are composed so that dominate the bacterial flora of green fodder or straight out entirely stunt for her. Thanks to that:

- we are obtaining well preserved silage, immune to different weather conditions. It can cause the lack of allowances, that silage will be undigested for cattle
- at the weather best possible conditions we are obtaining the silage about higher than standard of sustenance.

#### WHAT RESULTS FROM RESEARCH?

Researchers conducted by the Aberystwyth University in Great Britain are showing, that applying proper additions we are obtaining the silage about the best quality:

- 6 trials for dairy cows showed, that after applying additions, the assimilability of the silage rose on average by the 7% but the increase in living masses of the livestock as far as by the 24%
- similar results were achieved at attempts with the headage.

#### WHEN TO APPLY ADDITIONS TO THE SILAGE?

- when weather conditions are favourable, the crop is of better quality and distributed cattle are highly efficient cattle milk, quickly assuming slaughter cattle on mass or pregnant sheep
- at the rainy weather, when the risk of contamination of the soil is high
- always at ensilage of leguminous plants, so as: the lucerne or the red clover.

#### WHEN ISN'T IT WORTHWHILE APPLYING ADDITIONS TO THE SILAGE?

When weather conditions are good but the crop is of weak quality. In this case green fodder well will be fermenting and it will be well digested but because of the weak sustenance, the cost of applying additions won't be returned in the form of the increased productivity to fodder.

#### TYPES OF ACCESSORIES OF SILAGE AVAILABLE ON THE MARKET

- inoculants home-fermented containing strains of bacteria from kinds: *Lactobacillus Plantarum*, *Pediococcus* and *Lactococcus*. Those inoculants strongly are heightening the fermentation through the production of the lactic acid. In the end we receive the fast drop of the reaction pH of the silage to 4 what prevents unfolding of proteins and saccharines to undesirable matters
- inoculants hetero-fermented containing strains of bacteria from kinds: *Lactobacillus Buchneri* and *Brevi Lactobacillus*. They produce the blend of lactic acid and acetic acid. They are characterized by a fainter fermentation than inoculants home-fermented but are useful for blocking the development of the mould and fodder yeast

- mixed products make up from inoculants home-fermented with the addition sorbents and/or is salting benzoates. Included in them inoculants violently he is heightening the fermentation and salts are blocking the development of mould and fodder yeast

- acids and salts of acids (firebrands formic acid and propionates and their salts). These matters directly are souring green fodder at dosage 3 - of 4 litres to the ton. Entirely they are blocking the development of any microbiological flora. They are expensive in the use and caustic, of May however applying at poor weather conditions, when contaminating of the soil is high.

#### SUMMARY

1. At weak weather conditions, for producing the silage from grass or the clover one should deliver the million to the bacterium to gram of the crop in order to dominate the bacterial flora. One should remember, that not everyone inoculants allows for achieving such results.
2. At the proper management of the silage, among others applying 6 layers of the foil for wrapping the roll up and the proper storage, additions against mould generally speaking aren't required.
3. Additions aren't exchanging the weak crop in good, will help however from the good crop to produce the first-class silage. It shouldn't be treated as the substitute of good practices at the manufacture of feed.

#### WRAPPING UP ROLLS – HOW MANY LAYERS?

An amount of layers of the foil applied for wrapping pallets up is one of the most important factors by production. Using many layers of the foil is creating better protective layer. And so a question how many classes of the foil should be applied is arising in order to stop the access of oxygen to the silage at simultaneous holding of lower costs the output.

#### TWO, FOUR OR SIX LAYERS OF THE FOIL? WHAT ARE RESEARCHES SAYING ABOUT THIS SUBJECT?

Generally for baling of the silage it is recommended to the high-quality foil four layers being applicable, however there are cases, when it is necessary to apply six layers: densely broken rolls with a large stake of a dry matter, baling of thick plants and baling of the silage to foddors of horses.

#### RESEARCH 1

They conducted research at the Institute of Meadow Crops and environment tests (IGER) in Wales. Tests were held in a standard agricultural farm, green fodder was bale directly on field and next transported to the place of storage. Results (table 1) are portraying the difference in airtightness and covering the silage with the mould at 4 and 6 layers of the foil.

TABLE 1 - THE INFLUENCE OF THE AMOUNT OF LAYERS OF THE FOIL ON THE AIRTIGHTNESS OF THE ROLL AND THE QUALITY OF THE SILAGE

Amount of layers of the foil	4	6
Bell* airtightness (seconds)	73	150
% of coverage with the mould	1.8	0.8
Energy value (Mj/kg of a dry matter)	9.9	10.1

\* Airtightness of the roll calculated based on the time in which air about the normal atmospheric pressure returned to the roll after creating a vacuum in it. For them higher result, all the more tight roll.

#### FOIL FOR BALING OF THE SILAGE

The assortment of the appropriate foil for baling has first-rate meaning at the production of the silage. The foil should fulfil three essential conditions:

- good mechanical strength
- the top stair of the viscosity
- she should be immune to the influence of the UV radiation provided by the sunlight

#### RESEARCH 2

In next conducted test by IGER, 16 standard turns of the wire-wrap tool which so far were being used for wrapping up 4 layers of foil was reduced to 14 trades but next compared to 16 and 17 turnovers. At 14 trades rolls obtained 2 layers of the foil, however at a lot of turnovers a recommended amount of 4 layers was get.

TABLE 2 - INFLUENCE OF THE NUMBER OF TRADES OF THE WIRE-WRAP TOOL ON THE QUALITY OF THE SILAGE

Number of trades baler	14	16	17
Listeria (number/g of the silage)	61.000	2.250	688
Airtightness of the foil (seconds)	68	124	130
Energy value (Mj/kg of a dry matter)	9.8	10.0	9.8

#### WRAPINNG UP ROLLS – PREAPRATION AND TESTS

It results from examinations, around four layers of the foil constitute optimum safeguard against the access of oxide to the silage. However using six layers is giving the maximum airtightness and the mechanical protection, particularly if bale the silage has more than standard participation of a dry matter.

Wrapping up with less than 4 layers is increasing losses of a dry matter, risk of the riot of the mould and is reducing the nutritional value of the silage. A risk of contamination of fodder is also appearing through the Listeria Bacterium.

#### PREAPARATIONS

Everything is beginning by correctly wrapped up of roll.



In order to provide tight wrapping up the roll, one should well prepare rolls for wrapping up. Rolls should firmly be nailed together and have an identical shape and a size. The net should reach the at least edge of the round area of the roll in order to limit coming off of the excess of green fodder. An amount of oxygen trapped in the roll is making it lower as well as is facilitating very procedure of wrapping up.

#### PREPARING FOIL FOR USE

The foil should properly be prepared for wrapping up. Rolls with the foil should be stored vertically, in the environmental temperature. In the destination of avoiding damage, rolls should be taken out directly before wrapping up.

#### MAINTENANCE OF THE WIRE-WRAP TOOL

With time glue from the foil is accumulating on rolls of the wire-wrap tool, peculiarly of the ones made of rubber or plastic. It is leading dust to sticking to rolls and in the end is preventing the foil from the appropriate tension. Rolls of the wire-wrap tool should regularly be cleaned with spirit (with not a petrol, since she is destroying the surface of the roll).

A need of new carving the sophisticated tread of the roll can also occur with the help of the angle grinder

BEFORE WRAPPING UP ONE SHOULD CAREFULLY READ MANUALS OF THE FOIL AND THE WIRE-WRAP TOOL.

#### TESTS BEFORE WRAPPING UP

Before setting about to works it is worthwhile testing the wire-wrap tool in order to make sure that the silage will be wrapped up in appropriately tight rolls.

#### CHECK THE 50% OF THE TUCK

Put rolls on to the wire-wrap tool and roll it up with two turnovers of the device.

Next to measure the distance from the edge of the base coat to the place, in which the foil is starting being covered through the second layer. This distance should amount to the half of the height of the foil stretched over the roll.

#### CHECKING THE AMOUNT OF LAYERS

- we are putting first rolls on the wire-wrap tool
- we are slowly wrapping rolls up to the moment when green fodder isn't sticking out from under the foil and how many turnovers we are counting passed up to this moment
- we are still adding one turnover in order to get the 50% of the bookmark
- in order to get 4 layers of the foil, it should be repeated above points twice, however by 6 layers - three times.

#### CHECKING STRENGTH OF THE TENSION OF THE FOIL

- we are putting the roll on to the wire-wrap tool
- we are wrapping the roll up for the half of the turn of the turntable
- in the vicinity of rolls we are drawing two lines with the marker on the foil in the distance of 10 cm from oneself
- we are doing the next trade in the wire-wrap tool
- we are finding lines and we are measuring the distance between them. They should be distant from oneself for 17 cm what is marking perfect, 70% tension of the foil
- in the end we are wrapping the rest of turnovers up and we are finding the free end of the foil cut to size. We are measuring the height of layer after stretching. By foil 75 cm is should be from 58 up to 61 cm what getting the 70% of the tension means.

If we can see that the roll badly is wrapping itself, one should set the wire-wrap tool based on instructions of the producer. A few minutes spent on preparations for wrapping the roll up save months of worries, whether fodder will be well ensilaged.

#### INCORRECT WRAPPING UP THE ROLL CAUSES A NUMBER OF PROBLEMS

- sliding of foil: poorly the tightened foil loosely is wrapping rolls up
- incomplete coverage with the foil: insufficient amount of layers
- excessive stretching the foil: tuck of layers under the 50%
- holes and slits in the foil: caused by dust stuck to rolls.

All above mistakes cause the weaker protection before the access of oxygen and in the end weaker quality of the silage.

#### PAPILIONACEOUS PLANTS AS CROP FOR SILAGE

Fodder ensilaged in rolls can rise from many species of plants. It is important in order to remember that different kinds of the silage demand other processes of preparation. Papilionaceous plants are unusually valuable under the angle of the silage, farmers can however come across certain problems choosing them as the base of fodder. Below set of advices which can help the farmer to maximize results of ensilage papilionaceous plants.

Fodders based on papilionaceous plants are a base of feeding cattle in the majority of countries in the world. He is happening this way firebrands thanks to their ability to bind free nitrogen from the soil by current bacteria in root nodules.

In spite of these unusually beneficial properties, the crop of papilionaceous plants in North Europe is undergoing the great fall, firebrands on account of the access to cheap nitrogen fertilizers. But, farmers are searching in current economic conditions savings in using fertilizers, therefore papilionaceous plants again are making a profit on the popularity. Their crop is lightening budget of the household at the same time improving his productivity.

#### BENEFITS FROM CROPS OF PAPILIONACEOUS PLANTS IN HOUSEHOLDS OF THE MILK AND MEAT PRODUCTION

- independence from artificial fertilizers (table 1)
- increased participation of the white in fodder

- increased consumption of fodder by cattle
- increased productivity of the household

TABLE 1 - COMPARING COSTS OF CROPS OF THE CLOVER AND GRASS

	Cost/ha/year
300 kg of less nitrogen fertilizers	260 PLN
500 kg of more calcium fertilizers	450 PLN
80 kg of more potassium fertilizers (K <sub>2</sub> O)	120 PLN
Additional herbicides	98 PLN
Extra cost of the seed	74 PLN
<b>Annual potential savings ha/annually</b>	<b>1002 PLN</b>

## THE MOST BENEFICIAL SPECIES OF PAPILIONACEOUS PLANTS

- red clover (*Trifolium Pratense*)
- lucerne (*Medicago Sativa*)
- rutwica medical (*Galega Orientalis*)
- lotus (*Lotus Corniculatus*)
- white clover (*Trifolium Repenny*)

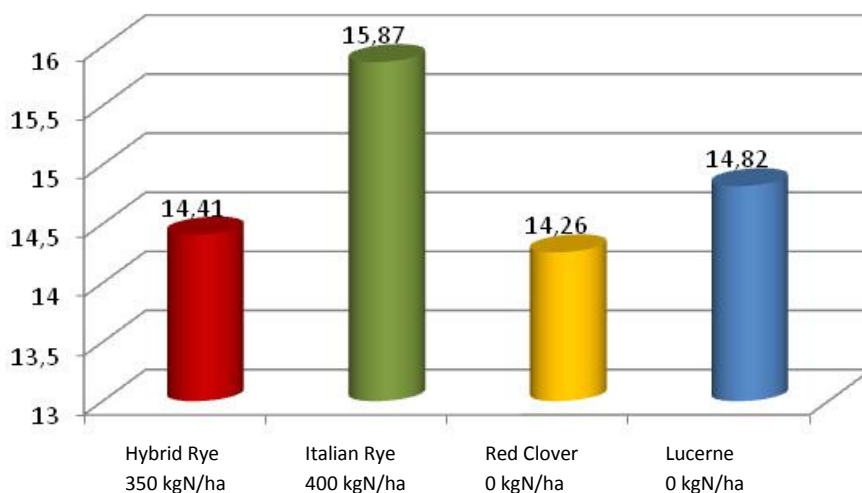
Before making a decision, which kind will be most beneficial it is worthwhile taking local soil conditioning into consideration. A red clover and a lucerne are popular brands of papilionaceous plants worldwide.

## WHY IS IT WORTHWHILE APPLYING THE RED CLOVER AND THE LUCERNE?

- they are these are kinds having a high yield (about 13 ton of a DM/ha/year dry matter comparable for crops of the Italian rye grass fertilized 350 kg of N/ha nitrogen) (graph 1)
- increased assimilability of fodder (on average by the 20% bigger than in case of grass)
- limited edition production of the white (16 22% of the dry matter content)
- easy digest
- the lucerne is much more immune to droughts than grass
- correcting of the milk and meat productivity cows
- of improving quality through the increase in the fertility and airing the soil
- reducing the demand for the purchase of fodder concentrates
- longer time of the mow than at grass
- it can be applied alternately with the rye grass.

GRAPH 1 - DRY MATTER CONTENT. GRASS AND PAPILIONACEOUS PLANTS

Tons DM/ha



## POSSIBILITIES OF THE SOWING

- the direct sowing and rolling
- the scattering and rolling
- to harrow field all over the first crop and to scatter seeds
- there is no need of deep ploughing, maximum 1.5 cm
- pH of the soil 6.0
- rate of P phosphorus and K potassium on the level 7.3 kg/ha red clover + 21.6 kg/ha Italian or hybrid rye grass

## PASTURAGE

- plan pasturage cautiously in order to avoid coming into existence of bare squares on field

- fodders based on papilionaceous plants it is worthwhile leading gradually, no, when cattle are hungry. The exaggerated and too fast consumption can threaten with flatulence
- don't feed pregnant sheep for 6 weeks before and after childbirths
- use autumn crops to fatten sheep.

#### ENSILAGE OF PAPILIONACEOUS PLANTS IN ROLLS

Papilionaceous plants are a Group of fodder plants which the much larger per cent of the white than other plants in a popular way used have as the silage - grass or cereal crops. It causes that they are very attractive under the angle of preparing fodders ensilaged in rolls. But in order to exploit their potential fully, the farmer must observe a few simple rules. This manual contains the row of simple advice thanks to which fodder ensilaged into rolls will still be arising from papilionaceous plants of better quality.

TWO REASONS EXIST, FOR WHICH IN THE PAST PAPILIONACEOUS PLANTS WERE REGARDED PROBLEMATIC IN THE ENSILAGE PROCESS:

- they have the high protein content - this feature is beneficial at feeding, however causes the big grad of the fodder buffering, that with difficulty reagent is changing pH in the roll what is hindering the fermentation
- little content of water-soluble carbohydrates and sugars. Sugars are being processed by bacteria of the lactic acid in the manufacturing process of stable, well preserved silage.

Table 1 - Typical Values: Easiness of the Buffering of the Reaction of the pH, the protein content, the Content of Carbohydrates (source: Halling ah Ave. 2001)

Crop	Easiness of buffering (g acid DM lactic/g)	The protein content (DM g/kg)	Carbohydrates (DM g/kg)
Red clover	0.71	194	92
Lucerne	0.68	181	72
White clover	0.67	225	84
Goat's rue medical	0.61	203	65
Lotus	0.68	198	74
Grass without N nitrogen fertilizers	0.43	113	124
Grass of 200 N/ha kg	0.52	133	112

Therefore, in order to produce of better quality Silage from papilionaceous plants more Acid is Needed in order to lead the pH inside the Roll to 4, at lower ZAWAROŚCI of Sugars.

However when the silage process is conducted according to a few simple rules, produced fodder from leguminous plants can be excellent sources of nutrients while winter feeding the livestock.

#### METHODS OF THE HARVEST AND ENSILAGED TECHNIQUES

##### MOWING AND DRYING

- in the year of sowings crop should bloom before swathe. It is heightening the development of warts on roots what the process of binding nitrogen is heightening N. Next crops are committing harvest between budding and early blooming
- 6 - 8 week's break between crops should be kept
- annually it is possible to conduct a few crops, in addition the quantity of harvest influences the amount and the quality of the silage
- in order to avoid contaminating of the fodder with the earth, the silage should be mowed at height 12 - 15 cm above the earth
- reaped arrange the silage in rows possibly like widest in order to facilitate drying
- green fodder shouldn't be damaged through mechanical processing
- the silage should be dried at least through 48 hours, getting the rate of a dry matter into this way between 28 and 35%
- if in the process of mechanical processing the foliage of plants is damaged, a dry matter content is endangered and proteins in the silage.

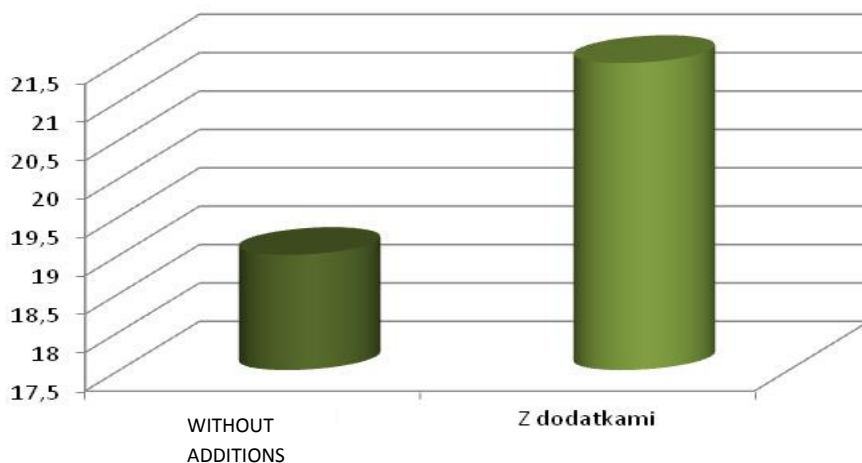
##### ENSILAGE

At least will be papilionaceous will be ensilaged just as well in rolls as well as silos, it is worthwhile considering the first option on account of the possibility of simpler producing fodder from low acreage. The climb of this type will provide the full application for the paucity of the produced silage from papilionaceous plants which it is possible to apply e.g. in feeding cows in the early period of the lactation, when demand on high protein fodders is bigger.

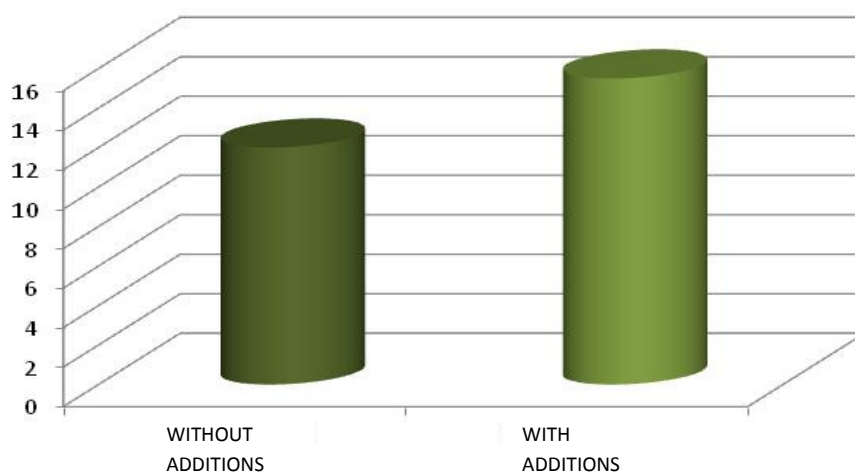
- the addition to the silage containing the tribe home-fermented of bacterium of the lactic acid should be applied. Such proceedings will cause that the low amount of sugars in the silage will be exploited to the maximum. Examinations showed that with the help of additions the larger protein content was appearing in the produced silage and of nitrogen, in comparing to the silage produced without additions (graph 1 and 2)
  - bale with the helped baler grinding down what will increase the density inside the roll and will free sugars, which "will urge" fermentation. Such action will streamline the fermentation, will remove oxygen from the roll as well as will reduce the number of produced rolls, in the process production costs will be lower
  - one should wrap rolls up in the foil should be paced in the place of storing. Optimum rolls should be wrapped up in 6 layers of the foil.
- Papilionaceous plants have fatter stalks what is causing, that the risk of damage to an insulating layer is much greater.

Graph 1 - Red Clover PROTEIN - N

**PROTEIN - N DM g/kg**



GRAPH 2 - TESTS ON SHEEP, RED CLOVER  
CONTENT of NITROGEN (g/d)



#### DISTRIBUTING

- papilionaceous plants are exposed to the lower risk of the spoilage because of the access of oxygen, than grass or cereal crops  
 - implementing SILAGE from papilionaceous plants as the component of expenses, gradually maximizing the participation in fodder for her for:

1. of total number of the headage in the household, in the objective of lowering of the demand for fodder concentrates
2. of cattle having an increased demand to the white, as cows in the early stage of the lactation.

Fodder from ensilaged papilionaceous plants in rolls is an excellent protein source for cattle requiring an extra portion.

#### MINIMIZATION LOSSES IN SILAGE PRODUCTION

Losses of a DM dry matter between crops and winter distributing is the main problem to which farmers using ensilaged fodders in rolls must face up. A few losses are sure, however by applying a few straight steps it is possible much to minimize the spoilage of fodder. This manual contains unusually effective signs, thanks to which it is easy to reduce losses in a dry matter of fodder.

There are many causes of loss of a dry matter in the silage. During tests conducted in Germany (Zimmer) 504 households, in which losses reached level of 25 - 70% of the value of a dry matter. Similar tests conducted in Great Britain (ADAS) showed losses of class 25 - 40%.

Other tests showed losses in:

- of ensilaged fodder in rolls: 0.2 - 8%
- for silage of the corncob: 15 - 30%
- for silage from the red clover: 4 - 14%

#### LOSSES OF THE DRY MATTER CONTENT ARE A WASTE OF MONEY

Many causes of losses of the dry matter content exist in ensilaged fodder in rolls. This phenomenon has also direct transferring into financial losses farmers. If we accept the loss of the 20% of the dry matter content in the silage, which DM produced from 1000 ton of green fodder about the contents of the 25% will stay, then losses in ensilaged fodder will reach 50 ton.

In a dry matter so minimizing losses directly is connected with the minimization of financial losses.

Losses in the DM dry matter content can happen at every stage of ensilage and of distributing. Pie chart (graph 1) is pointing out to typical causes of losses at every stage of preparing silage. Some of DM losses are not to avoid, but can be minimized. Other can completely be eliminated by applying good practices in ensilage (table 1).

GRAPH 1 - TYPICAL CAUSES OF LOSS OF DRY MATTER - DM

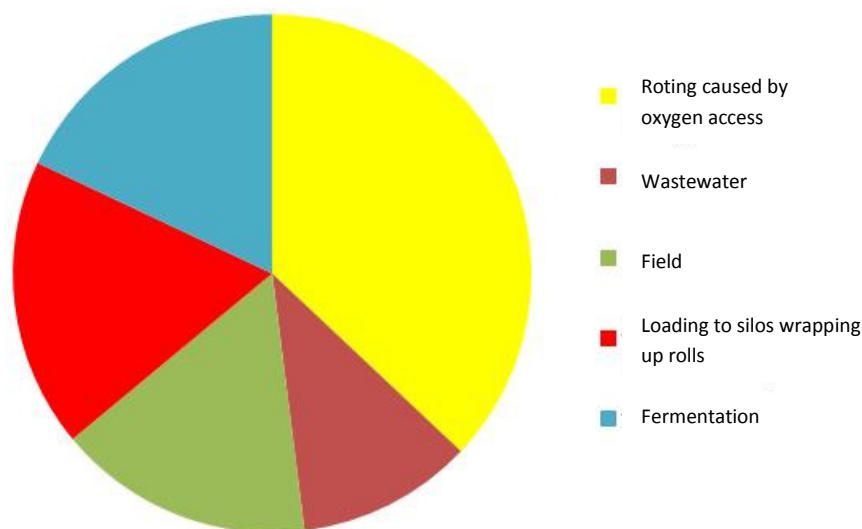


TABLE 1 - THE PROCESS AND REASONS OF LOSSES IN A DRY MATTER

Process	Classification	Cause
Respiration of plants	inevitable	Plant enzymes
Fermentation	inevitable	Useful micro-organisms
Floods or exaggerated drying the crop	inevitable	Low DM content, evil methods ensilage
Secondary fermentation	for avoiding	Plant undesirable micro-organisms contaminating of the soil, the quality
Permeation of air to the silo	for avoiding	Pressing, degree of the grinding, speed of wrapping up, putting in the silos
Oxygen spoilage of fodder while distributing	for avoiding	Like above, the important airtightness of the foil or silos, the speed of distributing

#### PRACTICAL POARDY HOW TO REDUCE THE LOSS

##### LOSSES ON FIELD

- it is important in order to mow how the weather is rainless. It is ensuring the low content of water in the crop. Water must be removed before pickling.
- to avoid contaminating of the fodder with the earth (to cut at height 5 - 10 cm), of searching and raking up
- to avoid mechanical damages. Papilionaceous plants should not have damaged leaves
- rows of the drying silage should be wide and flat what drying is heightening
- dry to a beneficial dry matter in possibly the time the shortest most possible. For grass of 24 h, and for papilionaceous 48 h.

##### LOSSES IN SILOS

- if it is possible crops should be ensilaged about the DM dry matter content larger than the 27% what will allow on you will remove unnecessary liquids
- grind green fodder down depending on guidelines for the given kind. At the rolls production use grinding down baler. Grinding the silage down influences increasing the thickness of fodder in the roll and reducing contents of oxygen
- use additions to ensilage. They are heightening the content of bacteria contributing to the fermentation, are lowering the pH inside the roll, of silo
- fill up exactly the silo, well pressed with silage
- seal the silo as soon as possible after filling up. Rolls should be sealed within of two hours from wrapping up. It is important so that the foil is of better quality
- rolls should be wrapped up in the place of the more late storage what allows to avoid losses caused by mechanical damaging the foil.

##### LOSSES AT DISTRIBUTING

- select the capacity of the silo to the amount of cows in the household. The silo cannot be opened longer than 5 days

- use sharp selectors what will reduce the access of oxygen to the silo
- it is worthwhile thinking over replacing the silage in silos with ensilaged fodder in rolls. Particularly in periods when feeding on the silage is less intensive.

The losses caused by the access of oxygen to the silage in silos reach the 25% while losses of the same kind in ensilaged fodder in rolls practically aren't appearing.

#### **ELIMINATING MOULD FROM ENSILAGED FODDER IN ROLLS**

There are many factors which influence the quality of the silage. Farmers most often assess fodder after: smell, colour, degree of the grinding. A possible presence of the mould on the surface of the roll is a next important sign.

Appearing of the mould means not only losses in the content of nutrients in fodder. Moreover the silage contaminated with the mould can cause illnesses of cattle caused by toxins produced through mushrooms and very often with *Listeria* bacteria co-occurring with them. This manual contains good advice which will help to eliminate the mould in the production of ensilaged fodder in rolls.

##### **MOST FREQUENT REASONS OF GOING MOULDY OF THE SILAGE**

- planted plants up to the silage are infested of mould. Fungal spores are universal in every environment, therefore their total eliminating is impossible. However a number of ways to minimize their content in crops exists.
- oxygen must be removed. The extirpate of oxygen and keeping the anaerobic atmosphere are recommended and possible to achieve.

##### **SPECIES OF THE MOULD**

There are over 200 000 kinds of mould. The ones most often responsible for losses in fodder and of poisoning cattle it: *Aspergillus*, *Fusarium*, *Penicillium*. These kinds are current in the soil and unfolding plants. This knowledge is helpful by effective controlling their number.

##### **PRACTICAL METHODS OF THE REDUCTION IN THE MOULD ON SILAGE BEFORE PICKLING**

###### **REMOVE DEAD REMAINS OF PLANTS FROM FIELD**

- before the beginning of the season make sure that field was low reaped for previous autumn/winter, in the destination of removing dead plant substance
- all over crops the part of plants often remains uncut. They are usually places, into which the mower didn't reach or, which grass lay down in. It is important in order to remove such remains. If we leave plants on field, rot away, what will supply to harmful bacteria multiplying, yeast fungi and the mould in the period of next crops.

###### **MINIMIZE CONTEMINATING FODDER WITH THE SOIL**

- every gram of the earth contains million of fungal spores
- control molehills in the winter and harrow field in order to level all irregularities
- mow the crop on the adequate height, between 6 and 9 cm
- make sure that harrows and the rake are placed "on stiffly".

###### **MOW THE CROP IN THE OPTIMUM GROWTH STAGE**

- when aren't on still dead parts
- avoid mowing in conditions when is probable that the crop is wet
- dead parts of plants are excellent food for the mould and causes fast quintessence of mould

###### **DRY SILAGE QUICKLY**

Grass should dry 24 h, but 48h papilionaceous plants. Tests showed that the quantity of fungal spores was increasing 1000 times in the drying silage. It is possible to prevent this situation, scattering the silage directly after the cut, since the crop is drying then much more quickly. Leaving green fodder in narrow, thick rows is a mistake.

##### **PRACTICAL METHODS OF MINIMIZING APPEARING OF THE MOULD WHILE BALING AND STORING THE SILAGE**

###### **REMOVING OXYGEN FROM THE ROLL**

- use grinding down baler so that increase the thickness of the silage and reduce the amount of oxygen in the roll
- make sure that no stalks are sticking out of the roll, particularly on edges of the roll
- quickly roll up rolls, perfectly in 24 hrs, it is shortening the time, in which fermentation of boozing oxygen. Delays in wrapping up are facilitating the growth of mushrooms and are increasing the risk of breaking down of fodder.

TABLE 1 - INFLUENCE OF THE LAYERS QUANTITY OF THE FOIL ON PERCENTAGE COVERING THE ROLL WITH THE MOULD

Amount of layers of the foil	2	4	6	8
% of covering the roll with the mould	50.0	21.2	9.5	1.5

##### **KEEPING ANAEROBIC CONDITIONS INSIDE THE ROLL WHILE STORING**

- make sure that base, on which the stored silage is supposed to be is flat and has a foil in the vicinity of no sharp objects which they could damage
- wrap rolls up in the place of storing them and cautiously transfer to piles

- wrap rolls up in minimum 4 layers of the foil, guard is to consider using 6 layers in order to ensure the maximum protection before oxygen. Table 1 is demonstrating results of conducted examining by IMUZ in Poland. Then a relation was tested between the amount of layers of the foil and appearing of the mould
- immediately fix damaged rolls
- cover piles of rolls with mesh in order to avoid the damage caused by birds and insects.

FOLLOWING A FEW SIMPLE RULES FACILITATE THE PRODUCTION OF HIGH QUALITY SILAGE WHICH IS FREE FROM THE MOULD.