

GRASSLAND RENOVATION

Grassland renovation or resowing is necessary if the quality of the grassland leaves to be desired. This is the case when the production is not sufficient anymore or when the animals do not like the crop and leave large residues after grazing. A change in the botanical composition of the sward quite often is the main reason of this lower quality. Grasses of lower quality and maybe some unpalatable weeds are then the main components of the grassland. The actual reason of the deterioration of the botanical composition may be formed by poor drainage of the grassland, because good quality grasses do not like a wet soil and they will be replaced by species which like wet conditions, like bent (*Agrostis*) and foxtail (*Alopecurus*) species. Quite often incorrect management can also be the main reason of sward deterioration. Insufficient levels of fertilisers (or manure), too late cutting, grazing or driving with heavy machinery on the land under wet conditions a.o. can also lead to sward deterioration. On open or damaged spots in the sward rough-stalked meadow grass (*Poa trivialis*), annual meadow grass (*Poa annua*) and weeds may develop. Couch grass (*Elymus repens*), another low quality grass, may also form a problem in grassland. In some cases winter kill of e.g. perennial ryegrass can also cause changes in botanical composition.

Which species for good grassland?

Under temperate climatic conditions grassland should contain a high proportion of perennial ryegrass (*Lolium perenne*) because this is a highly productive grass, which also has a high nutritive value and is very palatable and very suitable for grazing. Some other grasses like timothy (*Phleum pratense*), meadow fescue (*Festuca pratensis*) and smooth stalked meadow grass (*Poa pratensis*) are also good and palatable grass species, but their productivity under grazing conditions is less than that of perennial ryegrass.

In a mixture with perennial ryegrass they can not compete with that grass as a rule, at least not under intensive management. Under mowing conditions they produce better and can be used for silage making e.g. a mixture of timothy and meadow fescue eventually in combination with red clover (*Trifolium pratense*). The grassland which is only used for silage making Italian ryegrass (*Lolium multiflorum*), tall fescue

(*Festuca arundinacea*) and also cocksfoot (*Dactylus glomerata*) can be grown as monocultures.

However, when grassland is used both for grazing and cutting, what is to be preferred, perennial ryegrass should be the main grass species, eventually combined with white clover (*Trifolium repens*). Under good management conditions perennial ryegrass proves to be a persistent species, even under more harsh conditions. Perennial ryegrass is susceptible to winter kill, but there are differences between varieties in the Baltic countries e.g. it shows a good winter hardiness, at least when it is well-managed in autumn and covered with snow in winter. Sometimes snow mold is a problem then. Under intensive management conditions (high N-levels and frequent grazing and/or cutting) it survives during warm and dry periods, e.g. in Slovenia and Croatia. In the second part of the summer some species may suffer from crown rust. Tetraploid variations are more resistant than diploid varieties.

In the Netherlands high quality perennial ryegrass fields can be maintained for long periods: 20 years or more is not an exception (**Picture 1**). However, quite often other, low quality grasses, like couch grass (*Elymus repens*) and annual meadow grass, may invade in a perennial ryegrass sward and impair the productivity and quality of it. Weeds, like dandelion (*Taraxacum officinale*), docks (*Rumex obtusifolius*) and chickweed (*Stellaria media*) may also be the reason that the quality of a grass field drops. However, these weeds can be controlled chemically.



Picture 1. High quality perennial ryegrass fields can be maintained for long periods

To avoid invasion of low quality grasses and weeds it is important to start with a close and

dense sward and to try to maintain that as long as possible. Dense sowing and good and intensive management are important conditions to achieve and sustain a dense sward., Perennial ryegrass is an intensively tillering grass species, at least before heading, and is therefore an ideal grass for realising a dense sward. Stems should be removed as soon as possible, through a cut for silage or a cleaning cut. After that forming of new tillers will start again.

A good perennial ryegrass pasture should be almost as dense as a lawn or a sporting field! Then it guarantees a good production and provides a sufficient carrying capacity for grazing animals and machinery.

When grassland renovation?

Grassland resowing is an expensive activity. It should therefore only be carried out if the botanical composition is insufficient or the land has to be levelled or drained.

Grassland improvement is only justified if the costs involved are repaid by higher yields, better forage quality and eventually by easier working. However, making a cost-benefit analysis is not easy in this case. Firming conditions, type of soil and requirements for grassland quality also play a role. In the Netherlands, grassland renovation is considered in the following situations:

- when the grass sward contains less than 50% good quality grasses and less than 35% perennial ryegrass;
- when the sward contains more than 15% couch grass or more than 25% annual meadow grass;
- when the land is very uneven and proper working, e.g. mowing, is not possible anymore;
- when the grass sward is seriously damaged by frost or heavy machinery;
- when drainage has to be improved.

Grassland with a medium quality botanical composition (50-75% good grasses and less than 25% couch grass) can also be improved through correct management (proper fertilisation, intensive cutting or grazing) if the lower quality grass species are well distributed over the field. However, this way of improvement takes a couple of years.

If the good grass species are only locally killed, e.g. perennial ryegrass during a severe winter, these spots can be repaired through sod-seeding in spring. This reparation is only necessary if there is less than 1 plant of perennial ryegrass per dm².

The best time for resowing

For germination of seed and further development of the young grass plants a certain temperature and moisture are needed. It therefore depends on the climate in a country or certain area what the best period is for resowing: early or later in the growing season. In the Netherlands August or the first half of September are recommended for resowing. On average the conditions are then somewhat better than in spring. August quite often is cloudy and humid, while the temperature is higher than in spring. The new grass can then develop rather quickly and competition of weeds is less. In other countries where August is dry and warm, resowing in spring may be preferred. Another advantage of resowing in August or September is that yield losses in that year are lower than with resowing in spring.

Ploughing better than minimum tillage

Resowing of grassland or sowing of grass after another crop can be carried out after complete tillage of the soil, but also through direct sowing into the old sward (sod-sowing), eventually without or combined with some minimum tillage. Undersowing of grass to a cereal crop is another possibility.

In general sowing after ploughing and proper seedbed preparation is preferred (Picture2).



Picture 2. Ploughing and cultivation for seedbed preparation

Ploughing is loosening the soil and buries the topsoil, which mostly contains much seed of unwanted species of grasses and weeds. Further it may bring up moist subsoil. After ploughing levelling of the land is also possible. If old grassland is ploughed up, it is strongly advised to destroy first the old sward with a rotary cultivator. This enhances the breakdown of the old vegetation after ploughing and prevents that the old sward is brought up again during cultivation. The grass should not be too long before this cultivation.

Only on soils where ploughing is difficult or impossible, such as heavy clay soils or peat soils, sod sowing may be applied. However, results in general are often poorer than after ploughing. Sod seeding can sometimes be used successfully to introduce clover into an existing grass sward of good quality. It can also be used to repair a grass sward that suffered from winter kill. In hilly areas where erosion may occur after ploughing sod seeding is sometimes also applied successfully.

Undersowing of grass to a cereal crop, in general, is not recommended, because either lower yields of the cereal crop have to be accepted or the grass is quite weak after the cereal harvest, which may lead to an open sward. Besides, ryegrass develops quickly after germination, so that loss of production is rather limited.

Resowing in practice

Ploughing breaks eventually undepth hard layers in the soil, but if disturbing and impermeable layers occur at larger depth in the subsoil, these have to be destroyed before ploughing with a special rigid tine cultivator or subsoiler.

If the grassland to be resown contains couch grass, this should be killed with a treatment with glyphosate, also before ploughing. For a good result the couch grass should be growing well and be 10-15 cm long when treated. After treatment with 3-4 liter glyphosate/ha the killed grass has to be cut or grazed after a waiting period of 5 days. Ploughing can occur about 10 days after that. In total the entire killing operation of the old sward takes about 1 month since the last grazing or cut.

Before ploughing it is also necessary to cut the old sward or sod into small pieces, which should not be bigger than 2-3 cm. For this operation different types of rotary cultivators can be used: with blades, tines, hooks or knives. If these rotary cultivators are not available or when the soil is quite stony it is also possible to use a disc harrow for destruction of the old sod. This first cultivation should be shallow: max. 5 cm. To bury the destroyed old sod completely, a well turning plough should be used. As a rule a ploughing depth of 25 cm is sufficient and a ploughing width of 40 cm. If the land needs to be levelled after ploughing, it is recommended to plough up to 30 cm, with a ploughing width of about 45 cm.

In W-Europe levelling is often carded out with special levelling machinery. For correct levelling laser controlled machines are often used, at least in the Netherlands. If such special equipment is not available it is also possible to use

a very heavy beam pulled by a tractor. A tractor with a heavy scorp is another possibility for levelling.

Correct seedbed preparation is important

A correct seedbed for grass sowing needs to be sufficiently compacted, well levelled and has a finely crumbled surface layer which is not more than 2-3 cm deep. The well compacted subsoil can provide moisture for germination and growth of the young grass plants. In combination with proper levelling this compacted soil also contributes to a good carrying capacity and prevents therefore poaching by cattle and excessive damage of the sward with heavy machinery later on. For correct mowing with a constant stubble length, well compacted and levelled land is important as well.

To realise a good and regular compaction, all operations after ploughing should be carded out with double wheeled tractors (Picture 3) or with tractors on broad tyres. In both cases pressure in these tyres should be low: not more than 1 Bar.



Picture 3. Cultivation with double wheeled tractor

On sandy soil some compaction and levelling can already be carded out during ploughing with so called packers behind the plough. These packers consist of cast iron rings with a diameter of 70 or 90 cm. With rings of 70 cm two packers are used and with rings of 90 cm only one. Quite often a crumbling roll is used behind the packers. Actually this way of seedbed preparation is not sufficient to achieve a good soil carrying capacity and to prevent the appearance of tracks later on, even already during sowing.

It is therefore better to prepare the seedbed with a spring-tine cultivator, combined with a crumbler. During this operation the whole field should be covered by the double wheels of the tractor! On heavy (clay) soils it is better to use a tractor powered rotary harrow or cultivator for

seedbed preparation, again in combination with a crumbler.

Special grass sowing machines should possibly be used

Once a seedbed has been prepared in the right way sowing of grass seed can take place. Of seed mixtures which contain mainly diploid ryegrass varieties, eventually mixed with some other grass species and /or white clover, minimum 30-35 kg of seed should be applied per ha.

If the mixture contains mainly tetraploid ryegrass varieties it is recommended to sow about 40 kg per ha, because tetraploid seed is larger and heavier than diploid seed. Sowing can best be carried out with special grass sowing machines which are equipped with sowing pipes and sowing coulters, with which the seed is sown in rows at a distance of about 8 cm. Depth of sowing should be 2-3 cm for grass seed and maximum 2 cm if the mixture also contains clover seed.

If a special grass sowing machine is not available the best alternative is a flax sowing machine, which can be found in some countries. Another possibility is to use a grain sowing machine and equip this with broad sowing coulters, which are about 6 cm wide. In that case the distance between the (wider) rows or strips is some 6-8 cm. Broad sowing coulters may have more problems with clods of the old sod when this is not chopped finely enough.

With a grain sowing machine the density of the new sward can also be improved somewhat by criss-cross sowing.

Sometimes good results can also be obtained with a grain sowing machine without pipes, which simply drops the seed on the surface (on top of the seedbed) and when the seed is worked into the seedbed with a fine weeding harrow after that.

Application of seed on top of the seedbed can also be done with a fertiliser broad caster, best one with a reciprocating spout. Be careful for wind. After fine harrowing the seedbed should be rolled (smooth roll) in order to improve germination. As a rule, rolling is not needed after sowing with (grass) sowing machine after proper seedbed preparation, when the seed is placed on the compacted subsoil and covered sufficiently. Only under dry conditions or when the seedbed is still quite coarse rolling may improve germination. Compaction after sowing may lead to crust forming on some soils under rainy conditions.

Sometimes seedbed preparation and sowing can be executed in one operation e.g. a heavy tractor provided with a powered rotary harrow and a sowing machine. These combinations are quite common in W-Europe (Picture 4), especially on light soils, and can actually only be applied if the soil has been compacted sufficiently before, e.g. during leveling. Ploughing in combination with a packer does not give sufficient compaction. Only when the new grassland is not used anymore in the same season a combined cultivation/sowing operation may be applied in that case.



Picture 4. Seedbed preparation and sowing executed in one operation

Sod seeding or direct sowing system

Sod seeding with minimum tillage is only possible if the land is already well levelled, well drained and does not contain disturbing layers. Otherwise ploughing is necessary. As already said before, ploughing is generally preferred to minimum tillage systems for resowing of grassland, because ploughing is loosening the soil and buries the top soil. Only when ploughing is difficult or impossible (very heavy clay soils and peat soils) direct sowing systems can be applied. For reparation of a damaged grass sward sod sowing is a good method as well. Because of costs, farmers sometimes still prefer minimum tillage systems. However, results are often worse than after ploughing. Different systems have been developed for direct sowing purposes:

- Direct sowing systems with minimum tillage often apply a combination of a rotary tiller and a grass sowing machine, sometimes followed by a packer or a Cambridge roll (one operation!). Soil cultivation is shallow (± 5 cm) and may lead to a dense layer in the topsoil. Residues of the old sod may cause problems for the sowing machine and distribution of seed in the top layer may be uneven. Seed of weeds also remain in the top layer, However, it has to be said that this system quite often leads to acceptable results in practice.
- With the systems just mentioned the complete old sward is destroyed, but in other cases only strips of a few cm. Between the strips the old sward is left untouched and will continue to grow, unless it was killed before. If the old sward has not been killed chemically the strips between the cultivated and resown ones will strongly compete with the newly sown grass. For grassland renovation these machines are therefore generally not recommended. Only for introduction of clover into an existing sward of a good quality these strip seeders can sometimes be used successfully.
- Finally machines exist which sow the seed directly in the existing sward without any cultivation. Sowing as a rule occurs with disc

coulters at a row distance varying from about 5-15 cm (Picture 5). Because the old sward between the rows will again compete with the young grass it is better to kill the old sward with glyphosate.

These machines are still popular in some countries where they are used for soils difficult to plough up, for resowing hilly areas and for reparation of swards after winter kill.



Picture 5. Sowing the seed directly in the existing sward

Management of new grassland

The young grass needs to be fertilised. After ploughing soil will be brought up with an unknown fertility status. To start with, about 100 kg P_2O_5 should be applied per ha and also about 100 kg of K_2O if the grass will be grazed. In case the first crop of the new grassland will be cut for silage or hay more K_2O should be applied: 160-200 kg/ha. On grass sown in August about 50 kg of N should be applied, on a grass/clover mixture less. In spring new grassland can be fertilised with N according to local recommendations.

In newly sown grassland weeds may also develop. It should be avoided that these weeds produce seed and they have therefore to be removed in time through grazing or a cleaning cut. Grazing should by preference be carded out with young stock and under dry conditions since the young sward is still susceptible to poaching. If some weeds still remain a problem chemical weed control may be necessary. Chickweed may form a problem in new grassland, especially if the resowing is done late in autumn and the grass sward is not yet well closed before winter.

After one or two cleaning cuts or grazings in a young stage of growth the grassland can be managed in a normal way.

Young grass should not be left too short when it enters winter: minimum + 7 cm. Too late grazing or cutting should therefore be avoided.