

PRODUCT DATA SHEET

Undersowing with maize

Many of our native grasses can be used for undersowing with maize. This undersowing process aims to resolve the known problems of intensive pure maize cultivation in a targeted manner. Regardless of whether conventional, ecological or regenerative agricultural practices are followed, undersowing with maize represents an important element of consistent and sustainable crop cultivation strategies that have become essential for operators. The increased application and integration of undersowing in commercial operations are largely thanks to the agricultural, economic and ecological advantages of undersowing in maize. Numerous experiments have shown that undersown crops grown with maize generally do not affect revenues with respect to maize yields.



Benefits at a glance

▸ Quick soil cover and row closure

- Protection from erosion due to extensive ground coverage by the undersown crop, both during the growing phase and after harvest of the cover crop
- Effective suppression of weeds and weed grass through soil shading

▸ Soil protection

- Improved soil tilth → Improved bearing capacity of the soil
- Improved soil structure → Crumbly texture

▸ Groundwater protection

- Nutrient fixation → Additional ground coverage protects against nutrient loss via leaching

▸ Humus formation in line with carbon farming

▸ Promotes crop diversity and biodiversity

▸ Boosts forage production

▸ Economic advantages

- Cost reduction by reducing tractor runs or preparatory operations
- Seed savings due to a lower seeding rate for the cover crop and the undersown crop
- Avoids labour peaks

Act as boundary for overseeding crops

- Fields with extremely high weed pressure, particularly due to root-propagating weeds

Climate & soil requirements

- No limitations per se
- It is important for the undersown crop to be compatible with the cover crops so that both can easily cope with local conditions

Soil preparation

- Soil preparation depends on the cultivation aim and stand density: The denser the intended crop establishment, the earlier the need for ploughing in order to prepare a clean soil bed before sowing

Sowing

▸ Selecting undersown varieties

- Grasses (for instance, perennial ryegrass, Italian ryegrass, hybrid ryegrass, meadow fescue, smooth-stalked meadow grass, cocksfoot, red fescue, etc.) are ideal crops for undersowing with maize due to the height and shade generated by maize
- If undersowing is planned in years with a dry spring or early summer, then red fescue/sheep's fescue mixtures sown at 5-7 kg/ha are ideal, sown just before or after maize
- Annual ryegrass is usually not recommended due to its very fast establishment and high mass formation during early development

▸ Cover crop variety selection

- In terms of growth habit and leaf arrangement, a maize variety should be chosen that allows the maximum possible sunlight to reach the soil
- Varieties with erectophile leaf angle distribution and lower ground shading
 - Undersown crops perform better with silage maize than with grain maize (since the plant's maturity and intended use also influence the duration of shading); selecting a (medium-) early maize variety allows for a longer autumn growth period for the undersown crop. Numerous variety tests have shown that early/medium-early maize varieties have no yield benefits relative to medium-late varieties.

Weighting of 0.3 for ecologically sensitive areas (OVF)

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▸ Sowing period and seeding rate

• Sowing period

- The sowing period is determined by the species of grass selected for undersowing

• Seeding rate

- In contrast to undersowing with cereals, the seeding rate of the cover crop (maize) need not be reduced for undersowing with maize

• Recommended seeding rates (kg/ha) and sowing periods for undersowing with maize:

Species/mixture	Seeding rate (kg/ha)	Undersowing after maize development	Sowing technology**
Spring undersowing			
Perennial ryegrass, dip.*	20	3rd-6th leaf	FS, RH, SM
Red fescue	8-10	As early as possible	SD
Italian ryegrass, dip.*	20-25	Once a height of 30 cm is reached	FS, RH, SM
Hybrid ryegrass, dip.*	20-25	Once a height of 30 cm is reached	FS, RH, SM
MehrGras BG 50*	25-30	Once a height of 30 cm is reached	FS, RH, SM
MehrGras BG 55*	20-25	Once a height of 30 cm is reached	FS, RH, SM
MehrGras BG 500*	20	3rd-6th Leaf	FS, RH, SM
* for tetraploid varieties: 25% higher sowing quantity			
** SD = seed drill, FS = pneumatic fertiliser spreader, RH = reseeding harrow, SM = seed with liquid manure			

▸ Sowing technology

- Sowing management depends on the available sowing technology to a greater extent than other processes

Sowing technologies	Overseeding performed by seed broadcasting	Seed with liquid manure	Interseeding
Notes	<p>Pneumatic fertiliser spreader, slug pellet spreader or reseeding harrow</p> <ul style="list-style-type: none"> ▸ Well suited for highly competitive undersowing varieties with strong mass formation in early development (e.g., perennial ryegrass, Italian ryegrass or hybrid ryegrass) ▸ Problem: Centrifugal shakers, in particular, often have insufficient distribution accuracy and poor spreading pattern. 	<p>Best performance when spread using a trailing shoe while maize is no higher than 30 to 40 cm</p> <ul style="list-style-type: none"> ▸ Well suited for highly competitive undersowing varieties with strong mass formation in early development (e.g., perennial ryegrass, Italian ryegrass or hybrid ryegrass) ▸ Liquid manure or digestate quantities of 15 m³/ha should not be exceeded so as to ensure that the 2-3 cm wide slurry trench can reliably carry the organic fertiliser with the added grass seeds 	<p>Mechanical or pneumatic seed drill, mounted on the maize planter if necessary or combined with a hoeing mechanism (here a sowing rate of 8-10 kg/ha in mid June is sufficient), can be used in the space between seed rows</p> <ul style="list-style-type: none"> ▸ A good option for planned long-term or multi-year usage of the undersown crop as fodder ▸ Well suited even for sensitive, slowly developing undersowing species such as red fescue, sheep's fescue or hard fescue

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▸ **Side note: Undersowing red fescue with maize**

- Particularly widespread in mid-range mountain regions with abundant rainfall
- Undersowing is carried out using a pneumatic grass seeding machine mounted on the maize drill, which sows the seeds between maize rows via hoses
- Avoids competition pressure by maintaining a 20 cm distance from the maize row



Undersowing maize with red fescue

▸ **Sowing depth**

- Depending on available sowing technology
 - Especially if the undersown crops is intended for long-term or multi-year fodder usage and for less-competitive undersown crops with slower early development, crop-specific seed sowing depth should be followed both for the cover crop and the undersown crop; sowing should ideally be carried out using a seed drill

Apart from single-crop sowing, grass or legume-herb mixtures can also be considered for undersowing

Strong mixtures for strong undersowing:

- MehrGras BG 50 Biogasexpress Undersowing Coated Seed
- MehrGras BG 55 Biogasexpress Undersowing Coated Seed
- ProGreen® 11 Herb Mixture for Pastures and Meadows



MehrGras BG 50 Biogasexpress Undersowing Coated Seed



ProGreen® 11 Herb Mixture for Pastures and Meadows

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Crop protection

Weed control

- Maize undersowing should only be carried out on fields with relatively low weed pressure
- Soil herbicides can be applied at 30 to 50% of their application rate over at an interval of at least 6 weeks to ensure establishment of the undersown crop
- Foliar herbicide application can be carried out at intervals of at least 2 weeks from undersowing, even at a 100% application rate
- Overall, herbicide tolerance depends to a considerable degree on the soil humus content
 - The greater the humus content, the greater the tolerance of higher application rates
 - In case of a humus content > 2.5% and undersowing using trailing shoe: 50% application rate is tolerable
 - For humus content <2% and undersowing using overseeding/seed broadcasting: max. 30% application rate is tolerable
- Mechanical weed control instead of second herbicide application is a tried and tested standard
- Undersowing with red fescue considerably limits the choice of herbicides
 - Because it is planted early, red fescue has already sprouted by the time a herbicide is applied
 - Soil herbicides and sulfonylureas affecting grasses are to be strictly avoided in this case
 - Tank mixes by Stomp Aqua and Callisto can be applied during early post-emergence to manage easy-to-control seed weeds

Pest control

- Undersown crops are preferentially attacked by snails and slugs under the moist, shaded conditions created by a cover crop
 - Regular monitoring of damage by slugs and snails is advisable
 - Slug pellets can only be used for undersown crops outside ecologically sensitive areas

Fertilisation

- Basic fertilisation based on soil testing
- Site-specific N fertilisation strategy that accounts for all relevant fertilisation regulations
- N fertilisation is to be avoided on sites where a leguminous plant forms more than 50% of the stand
- Undersown plants as an indicator of the current nutrient status
- Tests on undersown crop emergence in the spring showed three-year average (2017-2019) nutrient uptakes of 55 kg/ha N, 71 kg/ha K₂O and 16 kg/ha P₂O₅

Cutting, harvesting and treatment

- After the maize harvest, another grass cut can be harvested in autumn in temperate locations if conditions are suitable
- Undersowing helps in the winter greening of the maize field; if the undersown crop has grown well, it may be possible to harvest another fodder cut before sowing the summer crop



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European corn borer - stubble crushing should be aligned with undersowing

Maize stubble should be destroyed so that the European corn borer does not get a chance to pupate in intact stubble. How can this be done without also destroying the undersown crop in the process? The following systems are possible:

Crushing maize stubble in the autumn using a flail mower and roller: If undersown crops are normal or well-developed, these mechanical measures stimulate tillering in the grasses so that they become even more lush afterwards. In weakly developed stands, stubble crushing should be done only in spring. As an alternative measure in spring, soil levelling facilitates the further incorporation and subsequent decomposition of crushed maize stubble and introduces liquid manure or digestate into the top soil. If you prefer a clear soil bed, a combination of flail mowing/rolling followed by ploughing is an option. From the phytosanitary point of view, strip-tilling, and particularly direct seeding, is considered problematic in areas infested with the European corn borer.

Summary

Undersowing with maize is possible...

- ... for all forage production operations in water protection areas
- ... in extensive arable feed crop production operations seeking additional forage sources, particularly during dry years
- ... in organic or regenerative farming operations, particularly those that do not have any organic farm manure from animal husbandry
- ... in conventional farming operations with maize fields in conservation areas that wish to reduce the application of chemical plant protection agents in maize cultivation and to reduce or eliminate mineral fertilisers

Do you have any questions? Please feel free to contact us!

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