

BIODIVERSITY IN GRASSLAND

MUMBO JUMBO OR A VALID OPTION?

The general public and lawmakers increasingly require arable and forage farmers to include biodiversity and environmental protection measures in their farming practices which are additionally affected by climate challenges. The viability of forage farming hinges on profitable production schemes which in the past few years emphasised on species-poor stands, especially in grasslands. However, biodiversity offers a great chance to meet the above demands – provided the individual species are combined intelligently.

Forage farmers find it difficult to reconcile the three aspects biodiversity, intensive crop management and forage quality in their practices, especially as these are all inter-dependent. Extensively farmed land may

indeed score on greater biodiversity but usually it falls short in terms of forage quality.

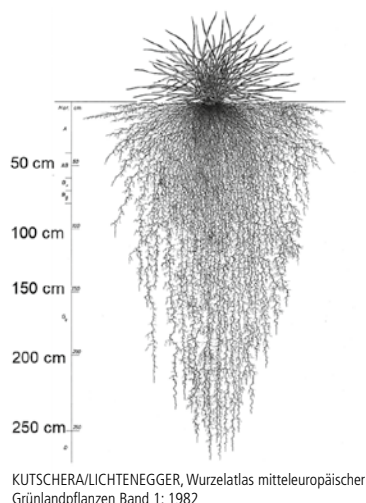
By comparison, intensively managed grasslands tend to be less diverse and usually

consist of perennial Perennial ryegrass which is the guarantee for high-quality forage.

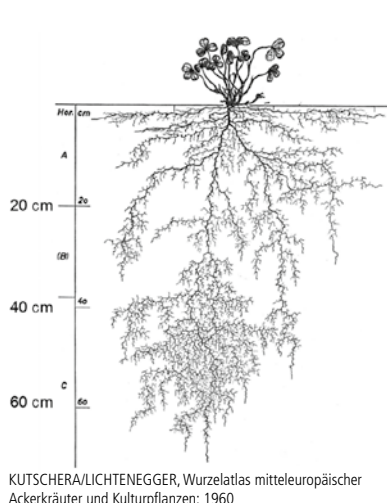
Another important factor for high- quality forage is the weather during the vegetation

FIG. 1: DIFFERENT ROOT ARCHITECTURES PROMOTE A DIVERSE SOIL LIFE

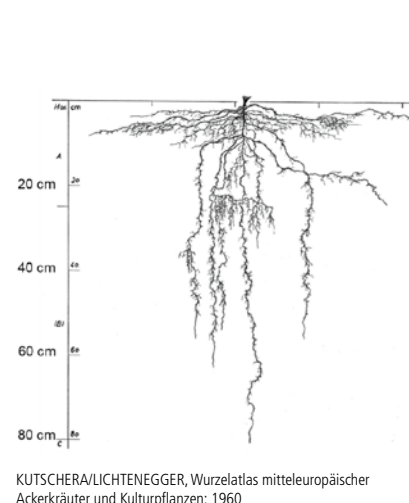
Tall fescue (*Festuca arundinacea*)



White clover (*Trifolium repens*)



Red clover (*Trifolium pratense*)



period and harvest. In 2021, yields were high thanks to generous rainfall, but the quality of the forage was poor.

In the years before 2021, yields were lower due to lack of rain. One strategy for coping with drought could be growing species-rich mixes, because these increase the biodiversity on and in the ground as well as the stress tolerance of the grassland stand. At the same time, they offer high yield levels and good forage qualities at reduced fertiliser inputs.

Species-rich grass mixes
are “multitasking”

It takes some expertise in all the many forage crop species in order to create a performing multi-species mix that meets multiple requirements. How do plant communities interact both on and in the ground? How do they survive drought? How can we assess the quality of the forage which is after all the ultimate factor for the farm’s productivity?

By intelligently combining a wide range of plant species, species-rich grass stands can be the solution to many issues of the past. This is because different species have dif-



Using the Nutrient
Requirement
Calculator

Only a balanced input of fertiliser leads to high yields and high-forage quality. This calculator at www.dsv-saaten.de helps calculating the nutrient deficiencies in your grassland and applying fertiliser to actual requirements and at consistent rates.

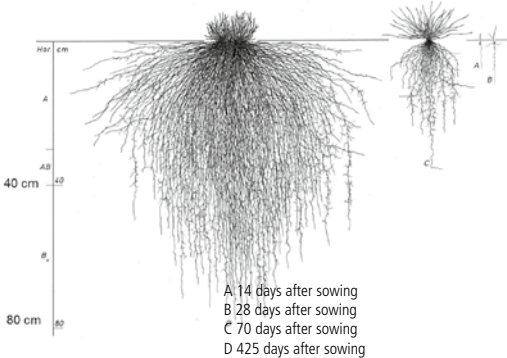
TABLE 1: COMPARING PREDOMINANTLY GRASS AND BIODIVERSE MIXES

	Total crude protein (%)		Total yields (dt/ha)	
	relative	absolute	relative	absolute
COUNTRY Energy MultiLife 2031	105.7	18.8	123.8	18.2
biodiverse mix 2	104	18.5	118.4	17.4
biodiverse mix 3	102.7	18.3	116.3	17.1
biodiverse mix 4	102.4	18.2	117.7	17.3
biodiverse mix 5	105.9	18.9	123.1	18.1
Standard G I	104.4	18.6	95.9	14.1
Standard G II	97	17.3	88.4	13
Standard G IV	84.3	15.0	95.2	14
Grand Mean	100	17,8	100	14,7

Quelle: Gräserzuchtstation Ven Zelderheide, eigene Versuche

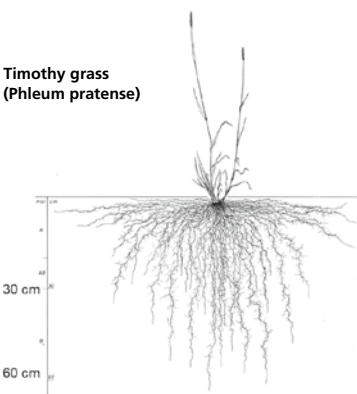
ferent growth patterns, which leads to high yields during the entire vegetation period. Especially in periods of drought species-rich stands demonstrate a better drought tolerance and resilience than species-poor stands. This is mainly attributed to the fact that the various species in the stand form different root architectures (fig. 1). Consequently, combining grasses, legumes and herbs means combining shallow-rooted and

German Ryegrass (*Lolium perenne*)



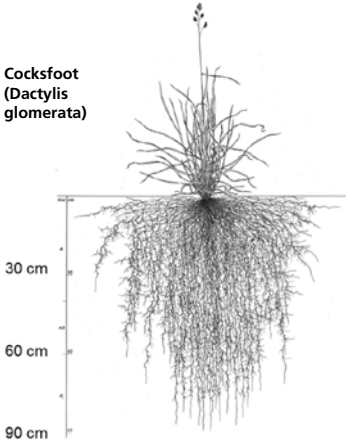
KUTSCHERA/LICHTENEGGER, Wurzelatlas mitteleuropäischer Grünlandpflanzen Band 1; 1982

Timothy grass (*Phleum pratense*)



KUTSCHERA/LICHTENEGGER, Wurzelatlas mitteleuropäischer Grünlandpflanzen Band 1; 1982

Cocksfoot (*Dactylis glomerata*)



KUTSCHERA/LICHTENEGGER, Wurzelatlas mitteleuropäischer Grünlandpflanzen Band 1; 1982

MODEL CALCULATION: REDUCING NITROGEN LEVELS IN GRASSLAND BY GROWING CLOVER GRASS

No legumes in the mix	312 kg N/ha total N requirement*
–	170 kg N/ha from organic fertilisers
=	142 kg N/ha N deficit/ha
	525 kg additional calcium ammonium nitrate***
Legumes in the mix	312 kg N/ha total N requirement*
–	120 kg N/ha due to N fixed by legumes**
–	170 kg N/ha from organic fertilisers
=	22 kg N/ha N deficit/ha
	81 kg additional calcium ammonium nitrate***

N deficiencies are reduced by 120kg thanks to the ability of legumes to fix N in the stand.
→ Reduced fertiliser costs and application rates

* N requirement for anticipated yields of 12,000kg DM per ha and year ** N-fixation by a mix containing 20% legumes and an N-fixation of 6kg per ha and year
*** Calcium ammonium nitrate contains 27% N (used for illustration purposes)

SAVING POTENTIALS BY ADDING LEGUMES TO THE STAND (AT VARIOUS FERTILISER PRICES)

Prices of calcium ammonium nitrate per 100 kg	No legumes in the mix: N costs per ha	Legumes in the mix: N costs per ha	Cost savings for N per ha
€15.00	€78.89	€12.22	€66.67
€30.00	€157.78	€24.44	€133.34
€45.00	€236.67	€36.67	€200.00
€60.00	€315.56	€48.89	€266.67

deep-rooted species and offers the opportunity of generating nutrients in the deeper layers of the soil and promoting soil life.

Robust stands can therefore establish even in adverse conditions. Stress tolerance and high performance are the key qualities.

Species-rich grass mixes have recently been introduced to the market. Deutsche Saatveredelung AG (DSV)) offers these under the brand name COUNTRY Energy MultiLife.

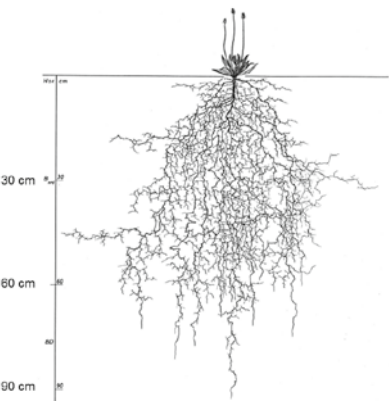
The targeted combination of various forage plant families and species in COUNTRY Energy MultiLife is the result of years of experience by the company in biodiverse mixtures from the cover crop segment (TerraLife®).

The COUNTRY Energy MultiLife forage crop programme also combines five or more species from three different plant families in one mix. In appropriate tests it was explored which species would make good mixes and which would be the best relative percentages to avoid dominations and repressions. After all, the solution lies in the right mix.

Forage grasses and legumes supply the nutritional value and energy

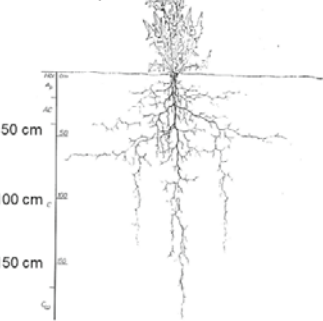
The nutritional and energy values are supplied by high-quality forage grasses and also legumes in the species-rich grass mixes. Legumes are very easy to digest, because their lignin, which is the indigestible part of the cell wall, is distributed uniformly in the leaves. This makes them easier to digest and pass faster through the rumen which in turn leads to a higher feed intake. High yields can be achieved from biodiverse stands. Legumes are valuable sources of protein for animals and equally valuable suppliers of nitrogen for the soil both in forage and arable farming. 1% legumes in the crop can fix 3-6kg of nitrogen per hectare and year. Stands in

Spitzwegerich (Plantago lanceolata)



KUTSCHERA/LICHTENEGGER, Wurzelatlas mitteleuropäischer Grünlandpflanzen Band 1; 1982

Chicorée (Cichorium intybus var. Foliosum)



KUTSCHERA/LICHTENEGGER, Wurzelatlas der Kulturpflanzen gemäßigter Gebiete mit Arten des Feldgemüsebaues, 2009



Advantages of species-rich stands:

- + Stress Tolerant
- + Diverse
- + Nutrient efficient
- + Protein supplier
- + Palatability
- + Profitable

which legumes make up 20% of the plants can absorb up to 120kg of N per ha and year. Especially in view of increasing fertiliser costs and new regulations regarding nitrate-polluted groundwaters and N applications, legumes present a good option for reducing N levels and N-fertiliser costs while making up for N deficiencies caused by reduced fertiliser applications (see model calculation).

Palatable herbs

The herbs are the icing on the cake of species-rich mixes. Herbs are palatable ingredients in the ration and lead to a higher feed intake and at the same time are rich in minerals.

There is a clear answer to the question raised at the beginning of this article: How can farmers reconcile stress tolerance, biodiversity, forage production and forage

quality? The answer is: Species-rich and biodiverse mixes are excellent options for livestock farmers to increase biodiversity and produce high-quality forage at the same time.

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Grass seed crops – an intriguing element in the crop rotation

Arable farming revolves around crop diversity, expanded rotations and the promotion of soil health and soil fertility. Can grass seed crops make a contribution here? Grass seed producers grow grass seed crops not only for economic but also for agronomic reasons, i.e. expanding narrow rotations. Studies carried out at the University of Applied Sciences of South Westphalia and elsewhere have shown that diversified crop rotations in combination with conservation tillage improve the general productivity of the farm by reducing input costs and labour costs while at the same time being beneficial to the environment.

What are the requirements for arable farmers who wish to expand their crop rotation and take up grass seed production?

Integrating grass seed crops in the rotation increases the health status of all crops in the

rotation, because grass seed crops improve the soil properties and growth conditions for the following crops and provide specific phytosanitary benefits. Integrating grass seed production in narrow rotations consisting mainly of winter cereals increases the health status, especially in terms of cereal foot diseases, which in turn reduces the spraying costs in the following crops. An expanded rotation that includes grass seed crops promotes biodiversity in rural landscapes and hence a balanced ecosystem.

Grass seed crops in the rotation supply organic root material to the soil to the amount of 3,500-4,500kg/ha (annual crops) or 5,000-6,000kg/ha (biennial and perennial crops). This biomass is relatively low in nitrogen. In the first phase of rotting in the soil (in the autumn months), it fixes the soil-borne nitrogen and prevents it from being displaced into the

deeper layers and, under certain circumstances, into the groundwater. This nitrogen will then slowly become available to the following crops. How to get started with grass seed production?

Farmers who wish to explore this option for themselves are invited to contact DSV for guidance and get advice on choosing the grass species that best suits their fields and farming schemes. At the same time, machine requirements and fresh matter drying and storage capacities should be discussed to ensure all requirements for successful grass seed production are met beforehand.