Grass-clover mixtures in practice: key-factors of success

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Abstract

For more than six decades, Swiss grassland farming has been successfully relying on a system of elite grass-clover mixtures, the so called 'standard mixtures'. Today, leys are almost exclusively seeded with grass-legume mixtures and about 80% of these mixtures are traded as standard mixtures. The four key-factors for this outstanding success are: (1) an unambiguous system offers forty-six mixtures in a broad range from intensive forage production to improvement of biodiversity. Grouping of individual mixtures to main types enables an easy choice of the appropriate mixture. (2) Scientific development of seed mixtures in multi-site, multi-annual field experiments taking into consideration the breeding progress by the exclusive use of recommended varieties enables optimised recipes. (3) Extensive practical testing of the most promising candidate mixtures on-farm ensures robustness and feasibility. (4) Collaboration with extension services, the seed industry and the Swiss Grassland Society anchors the system in practice manifested by a quality label awarded by the Swiss Grassland Society.

Keywords: grass-clover mixtures, standard mixture system, extension, collaborative model

Introduction

Forage production in the Swiss Plateau has been relying on grass-clover mixtures from as early as the 19th century (Stebler, 1881). Numerous small businesses produced their own mixtures. This resulted in an unmanageable situation on the Swiss seed market, which made it difficult to choose the appropriate mixture for a particular farm's specific needs. Thus, official registration of grass-clover mixtures was made mandatory (Frey, 1955). At the same time, the idea of a system of elite mixtures called standard mixtures was developed and implemented by the Swiss agricultural research stations, now Agroscope. The success of the standard mixtures is impressive. In Switzerland 80% of the grass-clover mixtures are traded as standard mixtures, which are awarded by the Swiss Grassland Society with a quality label guaranteeing their excellence. Furthermore, nearly all sown grasslands are based on grass-clover mixtures rather than pure grass swards. This paper aims at presenting the key-factors of this success.

Key-factors

Key-factor 1. Mixtures adapted to a broad range of needs, but easy to recognise

The first published set of forty-one standard mixture recipes was classified according to (1) planned duration of utilisation, (2) growth conditions and (3) utilisation of the forage (Frey, 1955). This classification has proven successful ever since. It is also the basis for the current product line of forty-six standard mixtures (Suter *et al.*, 2017). The use of a three-digit code instead of names for mixtures made it possible to map the system onto its nomenclature. The first digit of the code designates the main group 'duration' of utilisation. This main criterion is also made visible by a distinct colour of the label on the seed bag (Figure 1). The second digit provides information related to the mixture's requirements regarding water supply. Mixtures that contain cocksfoot are considered to be more robust in case of an occasional water shortage than mixtures without cocksfoot and are labelled with a '3' for the second digit. The third digit refers to whether the mixture is designed for highly productive growth conditions (annual mean temperature 6.5-9.0 °C, sunny, annual precipitation 900-1,200 mm, well drained fertile soils) which is

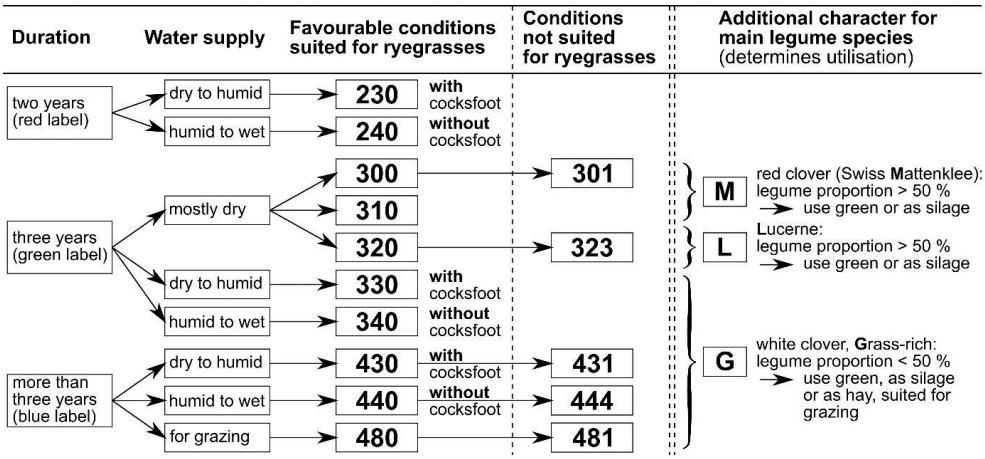

Figure 1. Main classification of important standard mixtures with their three-digit code and additional character.

indicated by a '0'. Other values for the third digit refer to mixtures for higher altitudes (e.g. 431 and 481) or for markedly wet (444) or dry (e.g. 323) conditions. An additional character adds information about the main legume species and the legume proportion of the forage. Mixtures with an 'M' (red clover of Swiss 'Mattenklee' type) or an 'L' (Lucerne) contain higher proportions of legumes (>50%) than mixtures with a 'G' (Grass rich, legume proportion <50%, main legume: white clover) and are restricted to the use as green forage or as silage. Mixtures with a 'G', however, are very versatile and can either be used green, as silage, as hay or be grazed. The three-digit code with an additional character enables the farmer to manoeuvre in the system, which makes it a lot easier to find the appropriate mixture compared to a scheme with long invented names.

Key-factor 2. Scientific development

Although some tools exist for at least a rough, conceptual design of a recipe (Caputa, 1948; Arens, 1973; Kirwan *et al.*, 2009), mixtures containing more than two species need to be developed, tested and optimised in a framework of multi-annual field experiments at several sites delivering detailed results on yield, botanical composition and forage quality. The exclusive use of recommended varieties makes it possible to benefit from the breeding progress already during mixture development. This also emphasises the importance of variety testing, which provides the basis for recommendations. For mixture development and variety testing eight experimental sites are available, located on the Swiss Plateau and at higher altitudes above 1000 m above sea level, covering a total of about 20 hectares.

Key-factor 3. Practical testing on farm

Controlled field experiments in small plots enable a valid evaluation of the agronomic potential of a mixture and a detailed comparison of different recipes. However, they provide rather limited information about how robust a seed mixture of a given recipe would be under very variable site conditions and utilisation. Thus, the recipes that have proven to be the most promising in small plots are subjected to on farm, upscaled strip-plot experiments under the respective farm's own utilisation practice. The different utilisation schemes, and even occasional mistakes regarding mowing, grazing or fertilising exert an important stress and contribute to the testing of the robustness and practical feasibility of a given seed mixture recipe. Only after passing these tests can a candidate recipe be selected and recommended as a new standard mixture.

Key-factor 4. Collaboration

The inclusion of extension services, the seed industry and the Swiss Grassland Society allows knowledge to be gained about trends in forage- and animal production and the required measures in grassland research and mixture development to be undertaken as a consequence. This collaboration further helps to anchor the system of standard mixtures in practice by supporting the on-farm testing programme and by a quality label awarded by the Swiss Grassland Society. The label emphasises the quality-based approach and guarantees for (1) scientifically developed seed mixture recipes, (2) composition of the seed mixture as published for the respective standard mixture, the use of (3) recommended varieties and (4) VESKOF® quality seed (Swiss-Seed, 2018) with a higher purity and a better germination ability than legally required. Regular examination of commercial seed samples ensures the label's acceptance. A small fee imposed on every seed bag carrying the quality label helps to finance the management and supervision of the label and to support research and development of mixtures.

Conclusion

The four factors – (1) a clear system of mixtures that accounts for duration of utilisation, growth conditions and utilisation of the forage, (2) scientific development of mixtures, (3) practical testing on farm and (4) tight collaboration among the stakeholders – all together form a package enabling the unparalleled success of the system of standard mixtures. This system undoubtedly is an important pillar of the broad use of multispecies mixtures in Swiss grasslands with their significant multifunctional advantages compared to pure grass swards.

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