

1. The benefits of a ryegrass legume pasture phase

The yield of a crop is greatly affected by the preceding crop or pasture¹. When fully utilised, a well-managed pasture phase can reduce the number of weeds, increase soil organic matter and improve soil structure, which could potentially increase crop yields and protein levels².

Weed management

Crop and pasture rotations are an effective integrated weed management technique. If pastures are well established and correctly grazed, they can provide effective competition and suppress weed growth. Pastures which have a sown grass component are usually more competitive than a pure legume pasture³. Decreasing weed population with pasture will decrease reliance on herbicides thus reducing the chance that weeds will develop herbicide resistance. An economic study on the value of pasture in integrated weed management by Monjardino⁴ found that an occasional pasture phase of 3 years may be more successful in the long term than a regular rotation involving more frequent pasture phases (1-2 years).

The duration of a “weed break” is vital to combating herbicide resistant ryegrass. The length of time required out of crop will be determined by a combination of the initial numbers of seed in the bank, together with the annual decay factor. It would take 4 years with no new seed input to decrease a population of 50–100 surviving ryegrass plants per square metre to a negligible level, assuming 80% germination (Table 1.1). Furthermore it could potentially take 5 years to reduce a ryegrass population of 350 plants per square metre to similar levels.

Table 1.1: Predicted ryegrass seed per square metre (m⁻²) likely to germinate in future years based on an annual germination of 80% at two levels of projected annual seed decay and with no new seed input⁵.

Surviving plants m ⁻²	50		100		350	
Potential seed m ⁻²	11100		22220		78750	
Decay factor	50%	80%	50%	80%	50%	80%
Yr 1 following seed set	4440	1780	8890	3560	31500	12600
Yr 2 following seed set	440	70	890	140	3150	500
Yr 3 following seed set	4	3	90	6	315	20
Yr 4 following seed set	0	0	9	0	30	1

Controlling weed populations for the following cropping phase will assist in increasing yields as competition for nutrients, water and sunlight is reduced. Including a pasture phase can also potentially increase the yield and quality of the following crop due to the soil health improvements.

Soil health

Good soil structure and organic matter retention depends on the presence of soil aggregates, which remain stable during cycles of wetting and drying. To increase retention of organic matter, aggregate stability needs to be increased. The stability of aggregates tends to increase more rapidly under grasses, such as ryegrass than legumes^{6,7}. This is because ryegrass has a root system that is highly branched and dense, with many fibrous, adventitious roots⁸. Including a leguminous plant however will help to increase soil fertility through nitrogen fixation.

Nitrogen (N) accumulates as both plant residue organic matter and as soil organic matter⁹. N fixed in pasture swards is proportional to the amount of legume dry matter and the number of years of the pasture phase⁹. The longer the pasture phase, the higher the total soil nitrogen available to the crops which promotes a higher yield (Figure 1.2).

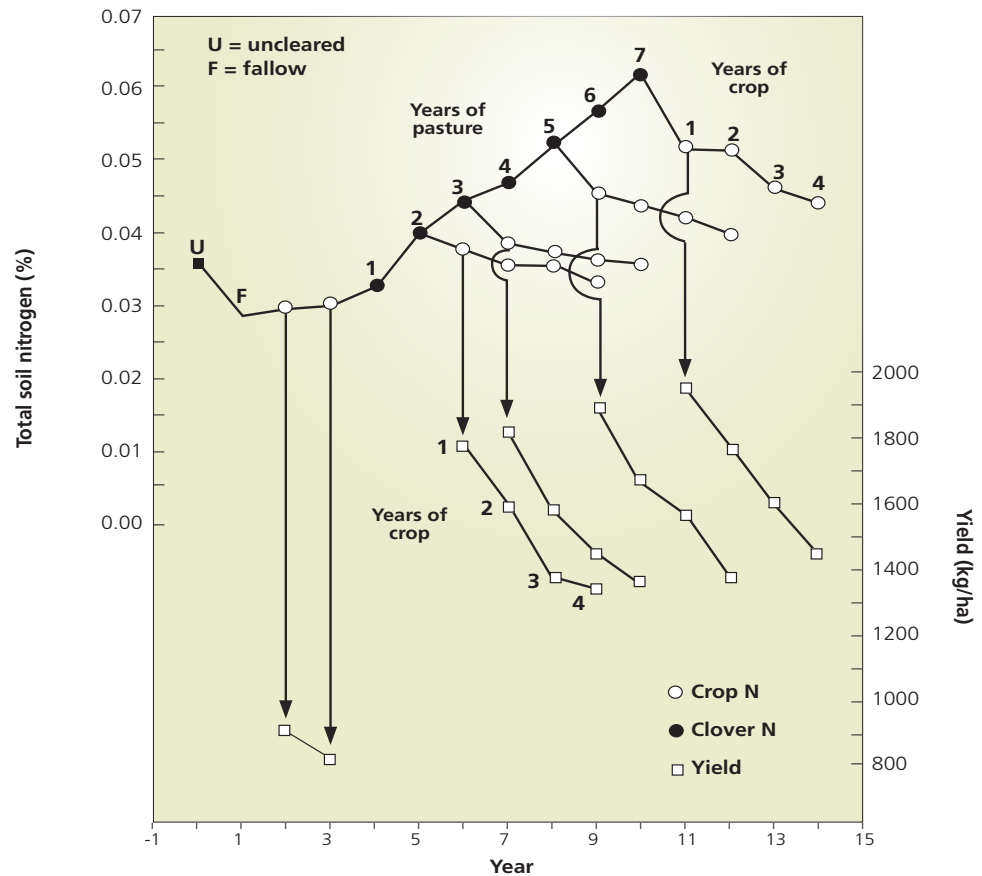


Figure 1.2: Nitrogen accumulates under pasture and declines under non-legume crops¹⁰.

In the past, crop nitrogen requirements were derived from legume and soil organic matter. This is released throughout the growing season ensuring a supply of nitrogen through flowering and grainfill if the surface soil remains moist⁹. In current farming systems, several non-legume crops are grown in succession, depleting the limited legume residue organic matter from the few legume years. Higher yields from adapted cereal varieties, earlier sowing and better weed and disease control contribute to the decline in protein levels unless nitrogen supply is maintained with increasing rates of fertiliser nitrogen⁹ and/or more frequent legume phase pastures.

Poor legume nitrogen fixation in recent years due to decreased rhizobial activity has also contributed to declining soil nitrogen levels. Adding new nitrogen fixing bacteria to the soil via peat or granulated inoculants such as ALOSCA and Nodulator will be a key to improved nitrogen supply for following crops²⁶.

As a pasture option, ryegrass/legume mixes can help improve the yield of the following cropping phase through weed control and improved soil health. Identifying how long the pasture phase should extend for will depend on initial weed populations and soil fertility. Results from local case studies found that a typical pasture phase is 3 years in a mixed enterprise (see Chapter 7). Ryegrass legume pastures can offer livestock a highly digestible, balanced and nutritious source of food and if managed correctly achieve high levels of pasture production and utilisation.