

SOIL HEALTH

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The benefits of pasture diversity

As you'll read in many of Outgro's Farm Results series, increasing pasture diversity is a very simple and valuable tool for any farmer. Recently, on a farm walk with a founding farmer of the Outgro programme, he commented that he felt reluctant to bring the cows into these paddocks as the pasture looked "just too good to eat!" And it's not just a feast for the eyes here – there's a whole lot more going on underneath his pastures.



Diversity Benefits

- Increase in annual herbage yield – 10-40% more annual production depending on year and site (*Daly, 1996*)
- 40% more annual production from an 11 species mix (*Sanderson et al 2004*)
- Greater root biomass and rooting depth
- Diverse pastures are less prone to insect attack, grass staggers and animal health problems than are ryegrass-based pastures
- Improved soil structure, aeration and porosity
- Increase in soil organic matter, carbon and humus
- Improved overall feed value of available forage
- Legumes fix nitrogen
- Diverse pastures filter water, build more resilience into soils and extend grazing seasons.

Lately there has been an increased focus on the central role that farmers have in enhancing biodiversity. A well-managed pasture system is one method which can significantly contribute to the sustainability of a farm.

Balancing the soil's chemistry helps to enhance the physical soil structure which supports soil life; by also encouraging plant diversity there is a dramatic multiplier effect to the soil foodweb. Forage diversity has a vital

role in this overall biodiversity increase, adding depth, dimension and range into the habitat and food supply, both in its canopy and around its root system. Forage diversity turns a farming operation from a single-dimensional affair into something much more three-dimensional.

Forage diversity creates more diversity in microbes, minerals, enzymes, vitamins and other secondary compounds invaluable for plant and animal health –



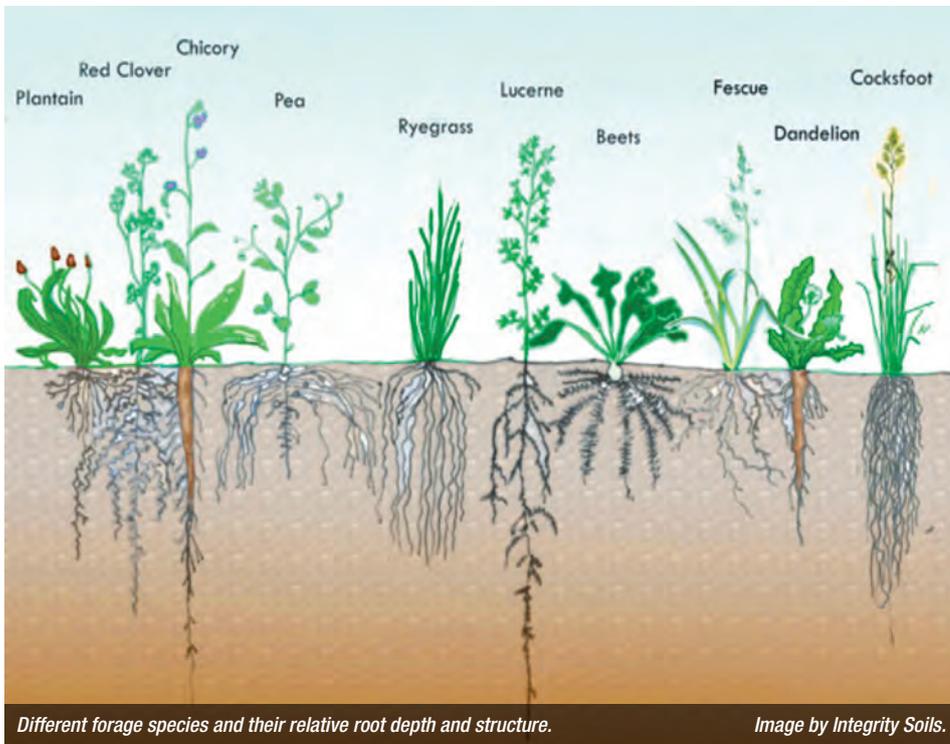
Diversity in plant rooting depths allows the pasture to hold on longer in dry conditions.

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and ultimately, for human health. Diverse pastures are less prone to insect attack, grass staggers and animal health problems than are ryegrass-based pastures. Biodiversity also provides vital services which are commonly overlooked, such as food for bees and beneficial predators.

Encouraging a wide range of plant guilds – legumes, herbs, forbs (broad-leaved herbs) and grasses – builds far more resilience into the pasture system. As you can see in the root diagram different species occupy different soil zones or niches; this means they can exploit different nutrients and resources. Biodiversity also buffers pastures from the greatest leveller of all in agricultural income: the climate.

New Zealand and international studies have shown a 10-50% increase in production, a 30% increase in root

sickness in the first place; clearly the most preferential and satisfying route to herd health.

When researching plant varieties, it is useful to assess what are your particular goals; do you want to increase production, or nutrient density, or overcome current gaps in your growing season? Specific species can be introduced to address soil issues; cocksfoot is a great choice if you want to improve soil crumb structure, while species such as lucerne, chicory and sweet clover have a strong tap root to break open hardpans.

It is essential to source varieties that will perform well in your local conditions. Not all varieties will flourish on your patch; Timothy, for example, prefers summer wet areas and heavier soils for persistence, while Yorkshire Fog loves more acid, low-fertility conditions. Also different species may require different grazing management to optimise their growth, so it's important to talk to your Outgro consultant about which species will suit.

As soil health improves, the nutritional component of the forage species also increases. Many Outgro clients notice a change in the palatability and evenness in grazing, with 'weeds' now becoming an important part in the animals' diet. 'Weed' species like dock and dandelion are high in tannins and have important health properties. Interestingly, compared to lucerne, dandelion has more digestible nutrients, protein, and a higher relative feed value!

Many forage species are important contributors to organic matter levels, which can be maximised by lengthening grazing rotations, increasing trampling and the root biomass which is shed following grazing. Increasing soil organic matter and ultimately humus is one of the best ways to add value to the land over time. Fields high in humus act like sponges, absorbing water and reducing the leaching of nutrients.

Author Peter Andrews found that old-school English horse breeders consider that good horse breeding pastures should contain at least 80 species. If the pasture had less than 40 species, it was considered to be in decline. These pastures would not produce a Group One winner for 10 years if the soils were cultivated and resown. Fascinating stuff.

With the advent of industrial agriculture we have lost much of the art and husbandry skills associated with diverse pastures, but fortunately we are seeing a revival of interest in building the resilience back into pastures.

References:

Daly et al. 1996. A comparison of multi-species pasture with ryegrass-white clover pasture under dryland conditions, Proc. New Zealand Grassland Assoc. 58 (1996), pp. 53–58.
Sanderson et al. 2005. Forage mixture productivity and botanical composition in pastures grazed by dairy cattle. USDA, ARS Source: Agronomy journal. v. 97, no. 5, p. 1465-1471.



biomass and rooting depths, when diverse mixes were sown (11-17 species).

There has been a lot of research into the benefits of different pasture species, and while it can be tempting to sow a limited number of species, farms can miss out on benefits which not only contribute to production, but enhance the quality of the food produced. Forages are able to produce quality protein, energy, medicinal compounds, vitamins, minerals, enzymes and many other growth factors. Using as examples chicory and plantain, which are highly relished and preferentially grazed by livestock (in spite of the slight bitterness of chicory), each herb comes up with over 80 recorded phytochemical compounds and minerals, including salicylic acid, ascorbic acid, tryptophan, betacarotene, and alpha-linolenic acids in significant quantities. These plant chemicals not only boost milk production and growth, and provide cures for animal illnesses, but they also play an important role in the prevention of animal

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