

A. FARMING SECTOR BY SECTOR OBSERVATIONS

A.1 GRASSLAND MANAGEMENT REVIEW

A conventional grassland management approach involves the frequent low-residual grazing and cutting of shallow-rooting, near-monoculture, typically-ryegrass swards that are 'plant-fed' with artificial nitrogen and untreated liquid animal wastes and which need to be regularly reseeded due to their poor persistence.

ARE PASTURES CURRENTLY LACKING DIVERSITY?

- ♣ is the use of limited plant diversity now being seen as a major weakness in agricultural systems?
- ♣ are near-monocultures more productive or more profitable than deeper-rooting diverse swards?
- ♣ does a lack of deep-rooting plants in a sward mean it can't naturally access deep-level minerals?
- ♣ does the poor access to deep-soil minerals mean that more *mined* fertilizers have to be bought?
- ♣ if ryegrass monocultures contain few nitrogen-fixing legumes do they have higher fertilizer costs?
- ♣ do shallow-rooting swards increase yield-vulnerability to drought and have poorer trafficability?
- ♣ do plant monocultures impact on farmed-soil-based food chains for insects, birds and mammals?
- ♣ what is the impact of providing a narrow-plant-species diet on rumen and general animal health?
- ♣ if animals are able to self-medicate by naturally selecting plants, is a broader diversity called for?

IS THERE TOO MUCH RELIANCE ON ARTIFICIAL NITROGEN?

- ♣ is grass production too reliant on the heavy usage of fossil-fuel-based artificial nitrogen fertilizer?
- ♣ how profitable will the current system be when the nitrogen derogation finally comes to its end?
- ♣ do nitrogen fertilizers inhibit the soil microbe/plant relationship and create nitrogen *dependency*?
- ♣ how inefficient are nitrogen fertilizers when it comes to the plant's actual utilization of applied N?
- ♣ how significant are grassland-used nitrogen fertilizers as a pollutant of rivers, lakes and aquifers?
- ♣ just how inefficient are nitrogen fertilizers from a climate-change, greenhouse gases perspective?
- ♣ how efficient is a heavily-N-fertilized and shallow-rooting ryegrass-sward at sequestering carbon?
- ♣ what is the impact of high artificial-N use on soil organism health and biodiversity's food chains?

IS THERE A GRASSLAND SYSTEM AND ANTHELMINTIC CONNECTION?

- ♣ is there a connection between near-to-the-soil grazing practices and internal parasite circulation?
- ♣ can grazing to 4 cm and short-rotations create a system dependent on parasite-control products?
- ♣ does the common-place use of untreated slurry aid the life-cycle circulation of internal parasites?
- ♣ will parasites' growing resistance to anthelmintics force a grassland management system rethink?
- ♣ what is the impact of anthelmintics on the health of soil organisms and biodiversity's food chains?
- ♣ is the nitrogen / anthelmintics / sward-desiccation fusion leading to grassland's biodiversity loss?

IS IT TIME THAT 'PERMANENT' PASTURE MEANT PERMANENT?

- ♣ is short rotation grazing to 4 cm destroying roots and plants and giving rise to regular reseeding?
- ♣ is frequent reseeding using glyphosate and tillage damaging to the soil health and soil structure?
- ♣ is the nitrogen / anthelmintics / sward-desiccation fusion leading to grassland's biodiversity loss?
- ♣ does regular reseeding nullify '*permanent pasture*' status and also reduce carbon sequestration?



DESIRABLE GRASSLAND MANAGEMENT PRINCIPLES

- ♣ use management practices to improve soil-health first and utilize Nature's productivity
- ♣ decrease applications of artificial nitrogen fertiliser by 7% each year from 2020 to 2030
- ♣ adopt sward compositions and management approaches that will minimize nitrate loss
- ♣ use deep-rooting plant species able to improve the soil structure to far greater depths
- ♣ establish deep-rooting plants that can naturally extract minerals from deep soil strata
- ♣ improve drought resilience by using species mixtures that include deep-rooting plants
- ♣ select mixtures that improve soil structure, water retention, drainage and trafficability
- ♣ focus on extending sward persistency to minimize the use of tillage-needing reseeding
- ♣ attain a situation where 'permanent pasture' actually does mean **permanent** pastures
- ♣ provide diverse-species pastures containing medicinal herbs to improve animal health
- ♣ implement practices to integrate biodiversity and pastures rather than separate them
- ♣ recognize that hedgerows may also provide species-diversity for grazing farm animals

THE FUTURE FOCUS FOR GRASSLANDS RESEARCH

- ♣ review the literature on the symbiotic relationship between plants and soil microbes
- ♣ research the potential for maintaining productivity without imported agro-fertilizers
- ♣ investigate the potential for deep-rooting plants to source a pasture's mineral needs
- ♣ see how adaptive multi-paddock grazing can be best employed in a maritime climate
- ♣ evaluate parasite infestation when long-grass grazing and when long-rotation grazing
- ♣ establish what impact the routine usage of animal health products has on soil health
- ♣ find plants that may have anti-parasitic properties as per sainfoin or birds-foot trefoil
- ♣ classify the pasture and hedgerow species that enable farm animals to self-medicate
- ♣ identify alternatives to cattle housing that leads to the spreading of untreated slurry
- ♣ evaluate the cost-saving and marketing-benefit of lower-input multi-species pastures
- ♣ determine the pasture-management approach most effective at sequestering carbon
- ♣ assess ruminant methane output when grazing multi-species versus ryegrass pastures
- ♣ compare results from the above grazing systems with those from grain-fed ruminants