Maize undersowing review – ADAS 2022

Some scientific findings, some more anecdotal advice:

Establishment

- ❑ Drilling much more effective than broadcasting
- ❑ 4-5 leaf stage ideal (MGA)
- ❑ Can also drill at same time as maize with Pottinger drill, but should then reduce grass seed rate or apply pre-em herbicide to knock it back a bit (Agrovista)
- ❑ MUST tailor the mix, seed rate and timing to site conditions (Agrovista)
- ❑ Note: if poor soil structure hinders maize growth, grass growth can be more vigorous (Wye and Usk)
- ❑ On dry sandy soils, important to get the grass away quickly (Severn Trent)
- ❑ Control weeds when small, but no need to alter herbicide regime (MGA)
- ❑ Although, possible sensitivity to sulfonylurea observed by Hutchinsons

Species choice

Early sowing (early June)	Later sowing (mid June, or 4-6 leaf stage)
• **Fescue** – or other slower growing (MGA) • **Tall Fescue** (Oestergaard 2015 MGA conference - Danish data) • Mix of **Perennial Ryegrass and Tall Fescue** (Agrovista)	• **Perennial Ryegrass / Italian Ryegrass** for mid June (MGA) • **Italian Ryegrass** or other faster growing @ 6 leaf [Agrovista] • **Perennial Ryegrass/ Italian Ryegrass** (Oestergaard 2015 MGA conference - Danish data) • **Fescue** had the best combination of vigour and persistence @ 4-6 leaf stage, though not clear what they were compared with (Reaseheath College, Cheshire) • **Westerwolds** in Norfolk droughty light soil @ 4-5 leaf; i.e. even faster growing?! (Jon Myhill, MGA/ contractor)

Westerwolds Ryegrass – mixed opinions?

Agrovista (trials in Cheshire, Norfolk, Somerset)	CMG Agronomy (Norfolk)	Severn Trent (Notts, light soil?)	Jon Myhill (MGA and Norfolk contractor)
Can die back under the maize canopy due to **poor stress tolerance**. Can also be more susceptible to **bolting** and setting seed which then can create a weed problem in the rotation	Concluded that Westerwolds grass was not effective for undersowing, as it **died off** when the maize canopy closed	Agrovista Tetraploid late Perennial Ryegrass / Tall Fescue PLUS mix better suited than Westerwolds to **later sowing** and persisted better through wet autumn and winter	Gets away quickly, **persists well** in bottom of a **droughty** canopy till the autumn. CHEAP!

Maize yield effects?

*statistically proven

Yield benefit	No yield impact	Yield reduction
South Staffs (heavy soil, Tall Fescue @ maize drilling, 10 kg/ha seed rate)	Oestergaard Danish data: undersowing at any time didn't reduce maize yields on high fertility soils	Oestergaard Danish data*: tendency for small reduction in yield in soils of low or medium fertility
2021 Wessex/MGA* (medium loam, Italian Ryegrass @ 4-6 leaf, 10 kg/ha seed rate)	2014-2016 Wye and Usk: no impact seen	2018 Anglian Water (sandy silt loam, **dry growing season**, Perennial Ryegrass or Tall Fescue @6-8 leaf)
	2019 CMG (sandy loam, sandy clay loams, Norfolk)	2020 CMG (sandy loam, sandy clay loams, Norfolk)
	2019 Anglian Water* (sandy silt loam, **wet growing season**, Perennial Ryegrass or Tall Fescue @6-8 leaf)	
	2020 Wessex/MGA* (medium loam, Italian Ryegrass 5 or 10 kg/ha seed rates)	
	2021 UU/Kings (Westerwolds/Italian Ryegrass @ 6 leaf)	
	2021 Wessex/MGA* (medium loam, Italian Ryegrass 20 kg/ha seed rate)	

Leaching reductions

(compared to bare fallow)

- **26 kg/ha** and **42 kg/ha** Wessex, sandy loam
- **17 kg/ha** (25%) and **30 kg/ha*** (23%) Anglian Water, Tall Fescue, loamy sand
- **0** and **35 kg/ha** (50%) Anglian Water, Perennial Ryegrass, loamy sand
- **40 kg/ha** (50%) DEFRA WQ0140, Norfolk, Perennial Ryegrass
- 50% * Wachendorf et al. (2006), sandy soil, Germany, Perennial Ryegrass, 3-4 leaf
- 58% Portsmouth
- **82 kg/ha** Wessex, silty clay loam

Runoff reductions

- **40 – 60%** runoff reduction u/s ryegrass broadcast 1 month after maize (North Wyke); **70%** sediment reduction in this trial, **85%** in another when ryegrass broadcast at 6-8 leaf
- **60 – 90%** runoff reduction for clover broadcast @ drilling (Long Ashton); **85%** sediment reduction
- **70%** lower sediment losses in ryegrass broadcast @ 6-8 leaf (Norfolk) *
- Biodiverse mix performed less well due to lower ground cover (Devon and Norfolk DEFRA project)

Other options?

- **Drilling cover after maize harvest**: Wessex data found Italian Ryegrass reduced leaching by 8 kg/ha and 22 kg/ha
- **Post harvest ryecorn:** for **5 out of 6 years** in a Dutch study, this took up as much N as undersown ryegrass, but in the last (late/wet) harvest year, it failed totally
- **Non grasses?** More expensive, and *(DEFRA WQ0140)* biodiverse mix **less effective** at reducing N leaching and sediment loss
- **Chicory** reported to be very good at N uptake though (Oestergaard at MGA annual conference, Peterborough 2015)

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Knowledge Gaps

- ❑ Understanding of subsequent effects on **pests and diseases**
- ❑ Understanding of subsequent **nutrient release from green cover**
- ❑ Balance points between environmental benefits and **maize yield penalties** with different degrees of ground cover

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