PRIFYSGOL ABERYSTWYTH UNIVERSITY

IGER

IBERS

Sefydliad y Gwyddorau Biolegol, Amgylcheddol a Gwledig

Institute of Biological, Environmental and Rural Sciences

Breeding of forage varieties for improved agronomic performance and reduced environmental impact

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Breeding programmes

- Perennial, Italian and hybrid ryegrasses
- White and red clover
- Winter and spring oats
- Lupins, Lotus
- Energy crops

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White and red clover : high quality feed for the beef, sheep and dairy sectors

- White clover
  - Most important temperate forage legume
  - Major source of home grown traceable protein
  - High intake
  - Good digestibility and mineral content
  - Quality maintained through season
  - Stoloniferous
- Red clover
  - High Yields: 15- 20 t/ha/annum DM without N
  - Traceable home grown protein
  - Mainly used for silage
  - Particularly important in organic rotations
  - Not stoloniferous

IBERS bred white clover varieties

- More balanced contribution to sward
- Enhanced persistency and reliability
- Flexibility

White clover **varieties are grouped into four categories according to their leaf size**

Small	Medium	Large	V. Large
			
Suitable for hill land or intensive sheep grazing	**Suitable for sheep and cattle grazing**	**Suitable for rotational sheep, cattle grazing and silage**	**Suitable for lax cattle grazing and silage**

Red clover breeding targets

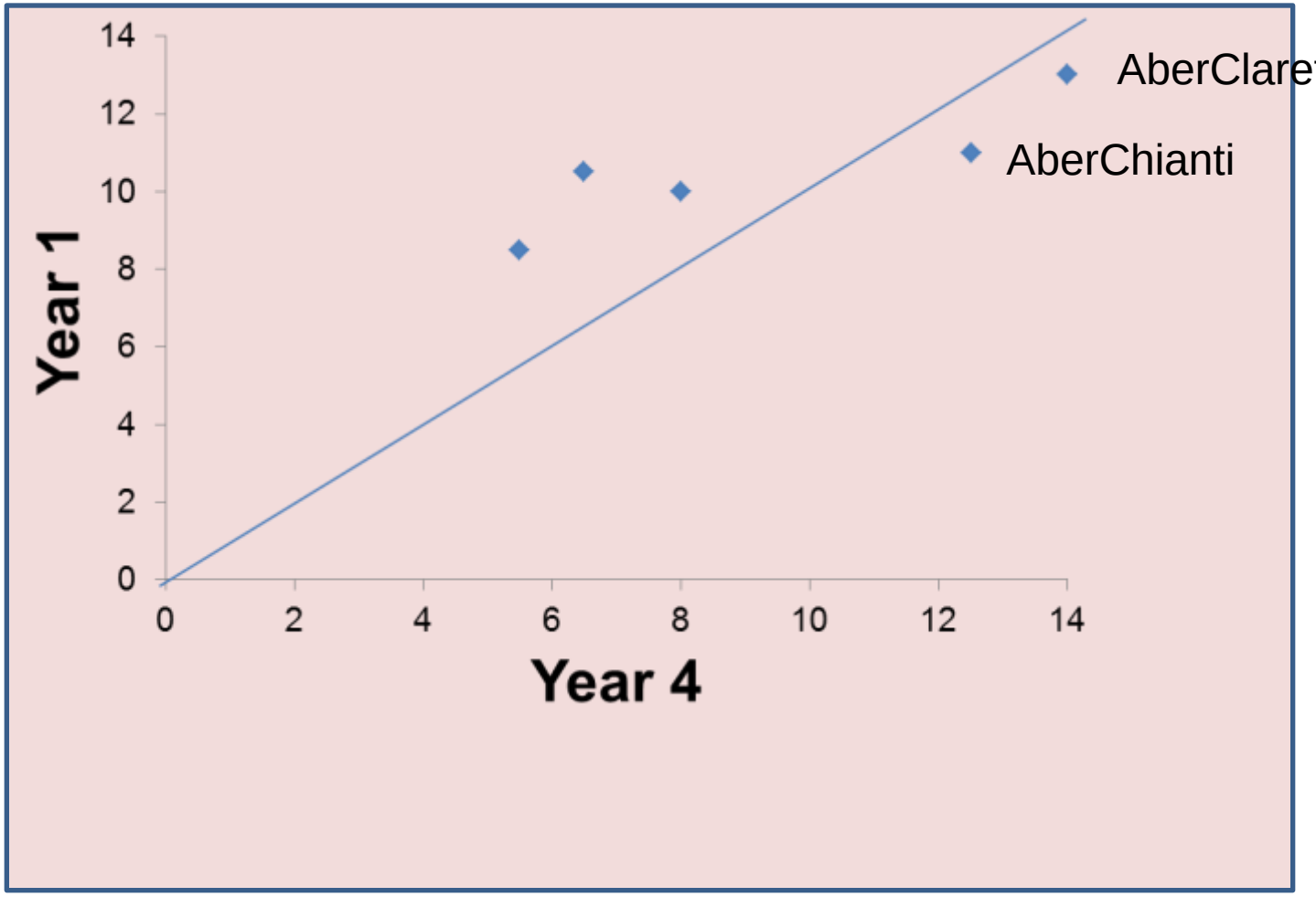
- High yields in third year and beyond
- Tolerance of grazing
- Pest and disease resistance - Sclerotinia,
- Stem nematode
- Improved crown survival
- Improved quality

Plant persistence

Poor

Good

Red clover DM yields (t/ha)



How High Sugar Grass improves the efficiency of nitrogen utilisation

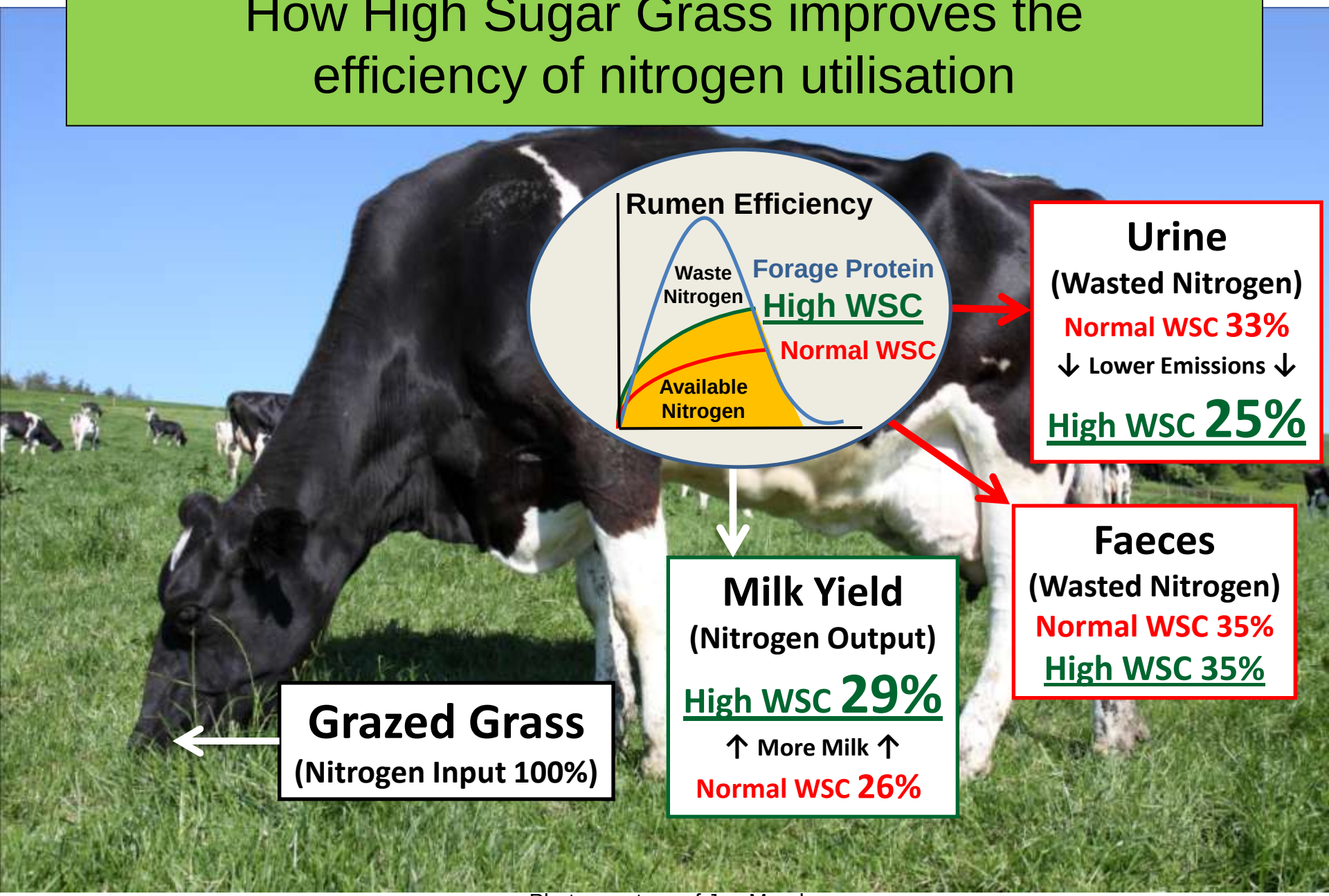
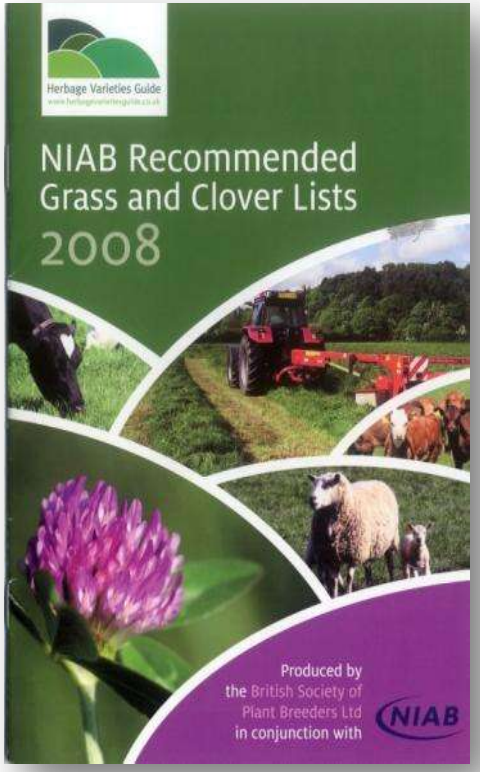


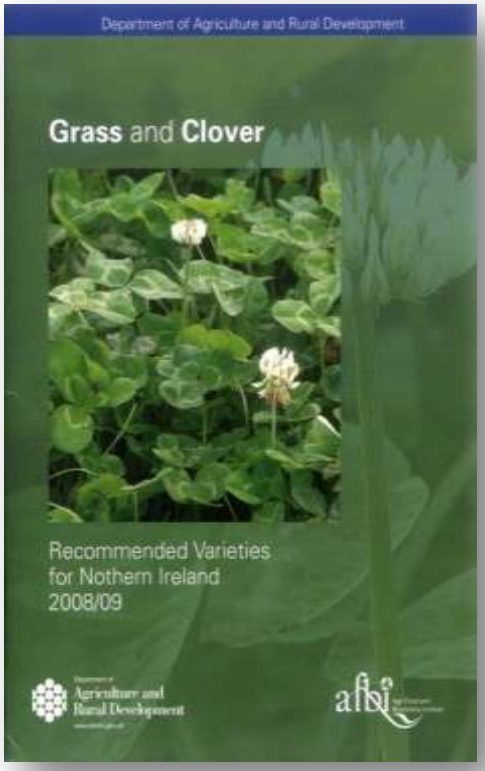
Photo courtesy of Jon Moorby

UK National List and Recommended Lists

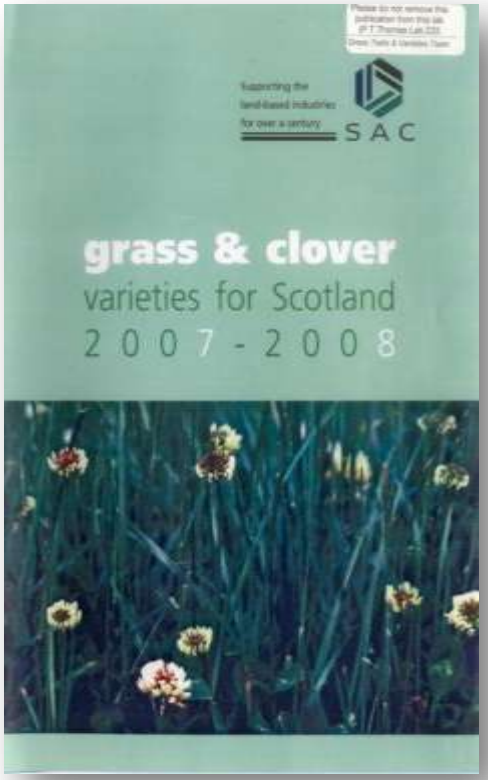
England and Wales



Northern Ireland



Scotland



Grass varieties - recent

Forage Perennial ryegrass

AberStar	***diploid, intermediate***	***NL UK; RL E&W, SAC, DARD, Eire, France***
AberGlyn	***tetraploid, intermediate***	***NL UK; RL E&W, SAC, DARD***
AberAvon	***diploid, late***	***NL UK; RL E&W, SAC, DARD, France, Austria, Germany***
AberCraigs	***tetraploid, late***	***NL UK, France; RL E&W, SAC, DARD, Eire, France***
AberDart	***diploid, intermediate***	***NL UK; RL E&W, SAC, DARD, France, Neth'lands, Austria***
AberElan	***diploid, intermediate***	***NL UK, Czech***
AberGold	***diploid, intermediate***	***NL UK; RL Netherlands***
AberMara	***diploid, intermediate***	***NL Czech***
AberMont	***diploid, intermediate***	***RL France***
AberSilo	***diploid, intermediate***	***NL UK; RL E&W, SAC, Germany, Austria***
AberTorch	***tetraploid, early***	***NL UK; RL E&W, SAC, DARD, Luxembourg***
AberZest	***diploid, late***	***NL UK; RL E&W, SAC***
AberMagic	***diploid, intermediate***	***NL UK; RL E&W, SAC, DARD***
AberChoice	***diploid, late***	***NL UK ; RL E&W, SAC, DARD***
AberFarrell	***diploid, intermediate***	***NL UK ; RL E&W, SAC***
AberBite	***tetraploid, late***	***NL UK ; RL E&W, SAC, DARD***
AberSweet	***diploid, intermediate***	***NL UK ; RL E&W***
AberGreen	***diploid, intermediate***	***NL UK ; RL E&W***

Grass varieties - recent

Hybrid ryegrass and Italian ryegrass

AberEve	*tetraploid, intermediate heading*	*NL UK; RL E&W SAC Eire*
AberEcho	*tetraploid, intermediate heading*	*NL UK; RL E&W SAC DARD, Austria*
AberElite	*tetraploid, intermediate heading*	*NL France*
AberExcel	*tetraploid, intermediate heading*	*NL UK, France; RL E&W, SAC, DARD*
AberLinnet	*tetraploid, intermediate heading*	*NL UK; RL E&W, SAC, DARD*
AberAnvil	*tetraploid, intermediate heading*	*NL Germany*
AberOscar	*tetraploid, early heading*	*NL UK, Chile*
AberStorm	*tetraploid, early heading*	*NL UK; RL SAC, DANI*
AberVision	*tetraploid, early heading*	*NL UK*
AberComo	*diploid, Italian Ryegrass*	*NL UK, Austria*
AberEpic	*diploid, Italian Ryegrass*	*NL UK; RL E&W, SAC, Austria*
AberMario	*diploid, Italian Ryegrass*	*NL UK; RL E&W, SAC*
AberTop	*Cocksfoot*	*NL UK; RL E&W, SAC*

“New” Breeding Objectives

- Improved use of resources
  - Nitrogen use efficiency
  - Efficient use of protein by the animal
  - Increasing phosphorous use efficiency
- Adaptation to climate change
  - Improved drought tolerance

Incorporated into good agronomic background

Breeding LINK projects

- White and red clover, ryegrasses and hybrids
- N use efficiency (soil, plant, rumen)
- P use efficiency (soil & plant, and livestock)
- Water use efficiency (uptake & within plant)

DairyCo

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EBLEX
THE BEEF & LAMB SECTOR COMPANY

LMC Livestock & Meat Commission

defra
Department for Environment Food and Rural Affairs

GERMINAL HOLDINGS

QMS QUALITY MEAT SCOTLAND

HYBU CIG CYMRU
MEAT PROMOTION WALES

BGS

Improving nitrogen use efficiency (NUE) in perennial ryegrass and red clover

Why?

Water Framework Directive –reduce N use to protect water courses and ground water

Cost and availability of nitrogen fertiliser

Poor conversion of forage nitrogen into milk and meat



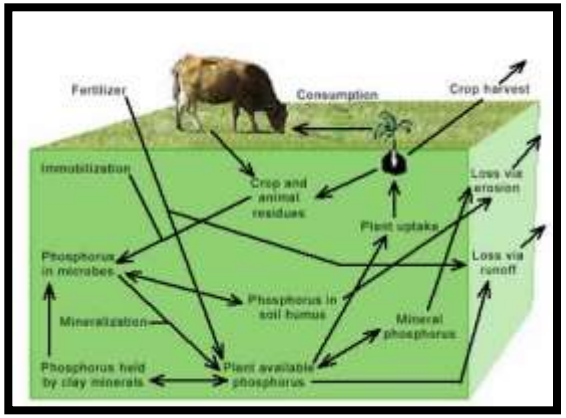



Improving perennial ryegrass and white clover to increase phosphorus use efficiency (PUE)

Phosphorus- vital to yield and environmental quality in agriculture

Crops recover less than 10% of applied fertiliser P

Phosphorus -key to modern farming & has no synthetic alternative



Livestock sector must maintain production, profit and protect the environment

Drought resistant grasses and clovers that make better use of water

Why?

- Drier summers (rainfall now lower than ’61-’90 av)
- Less soil water means lower yields (typically 2-4t/ha in UK)
- DEFRA: need to conserve water and adapt to climate change

Organic seed – breeders perspective

- Ensure organic producers have access to best varieties
- Seed of best varieties available to organic producers
- Welsh Government funding
  - Organic seed problems
  - Develop organic seed production techniques?

Organically produced forage seed

Farmer concerns-

- Availability of organic seed
- Cost of organic seed
- Is organic seed of *suitable* varieties available?
  - Constraint?
  - Who will produce organic seed and how?
  - Existing seed growers or organic producers

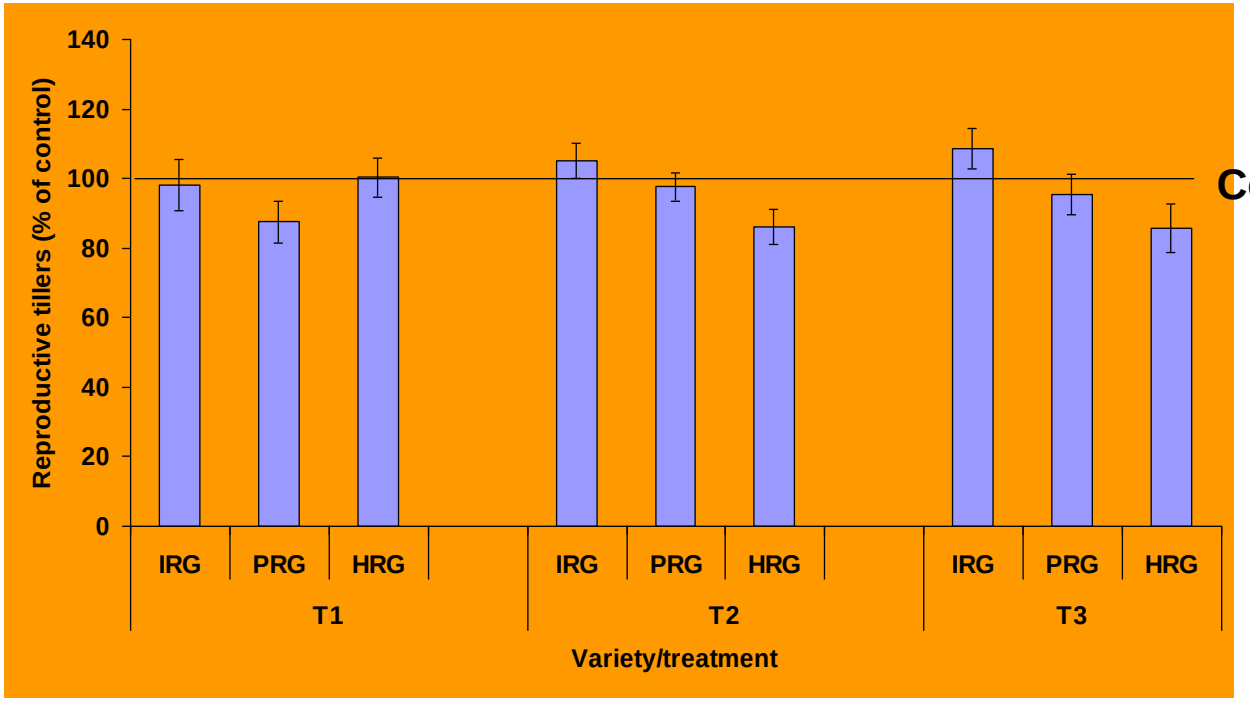
Challenges for organic forage seed production

- Establishment and weed control
  - necessary for crops to meet official standards
  - reduce cleaning costs
- Supply of nutrients
  - Nitrogen for grasses
- Maximising seed yields

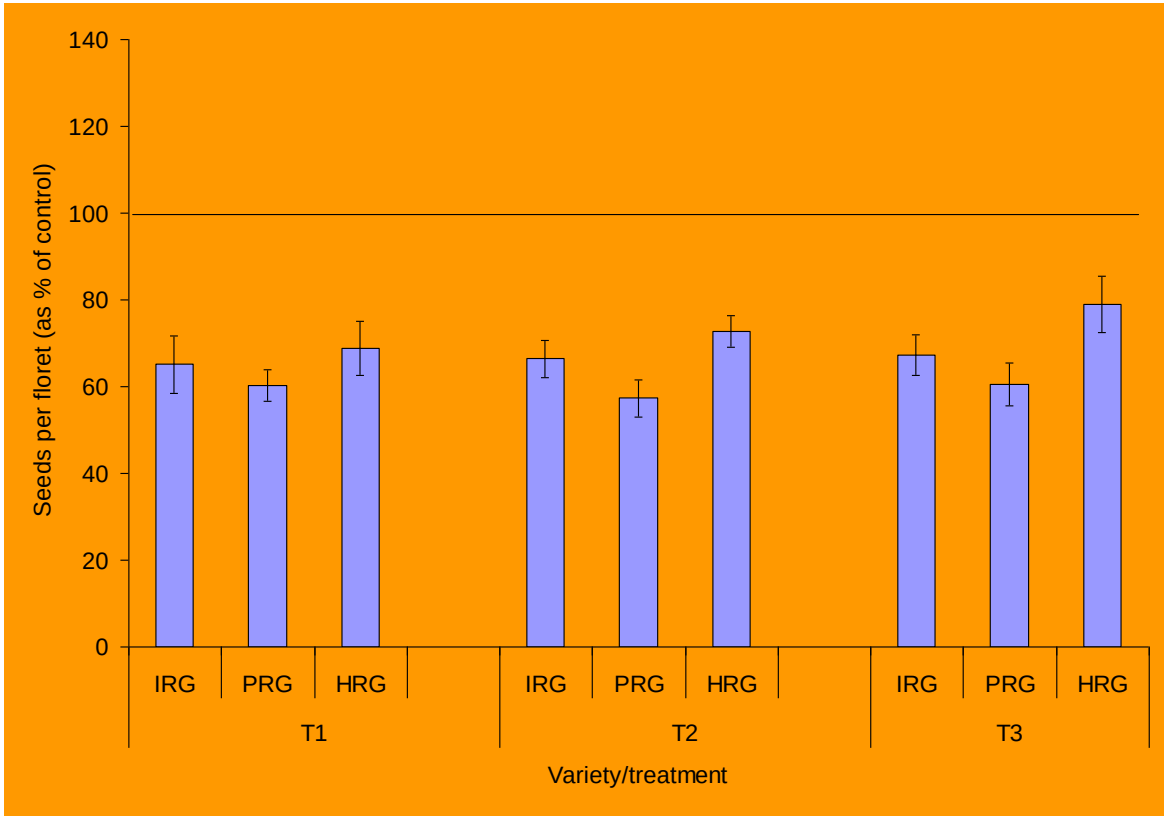
Nitrogen supply is a major issue

- Replace inorganic N used in conventional systems
- Options
  - Mixed farms
    - animal manure
  - Arable farms
    - sow into previous fertility building crop
    - sow with N producing companion legume

Reproductive tillers

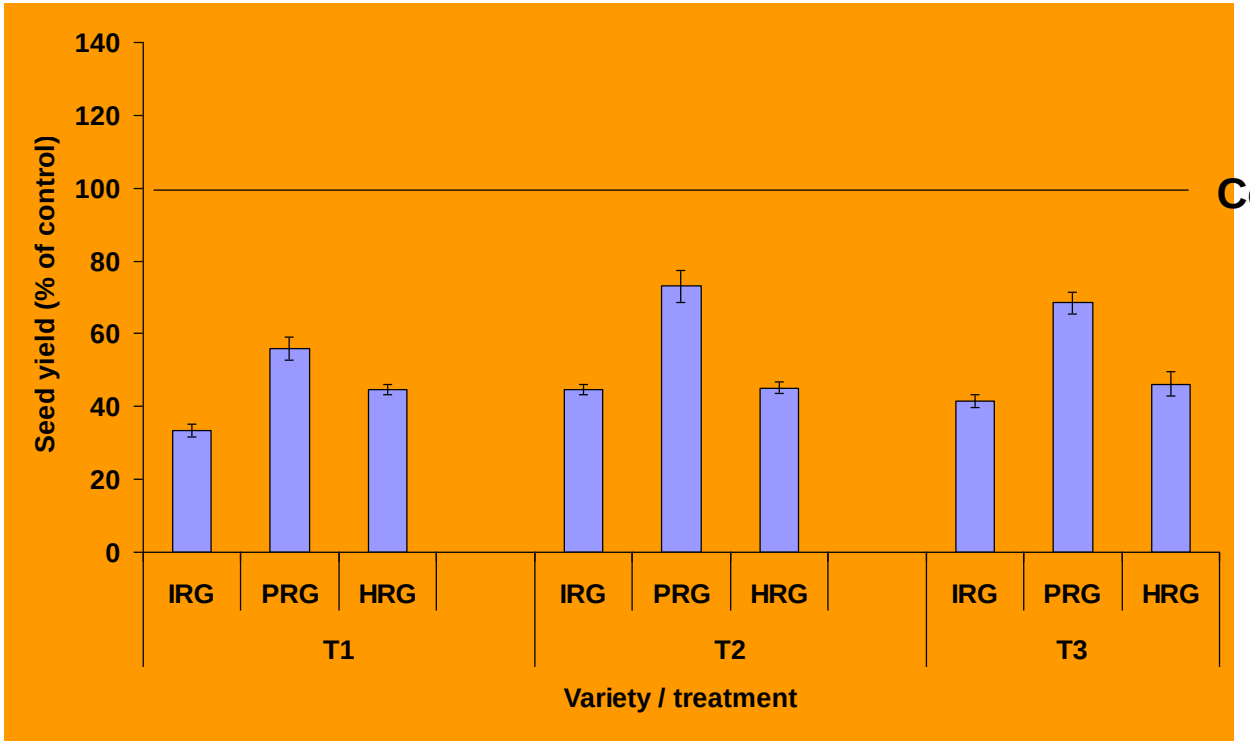


Seeds per spikelet

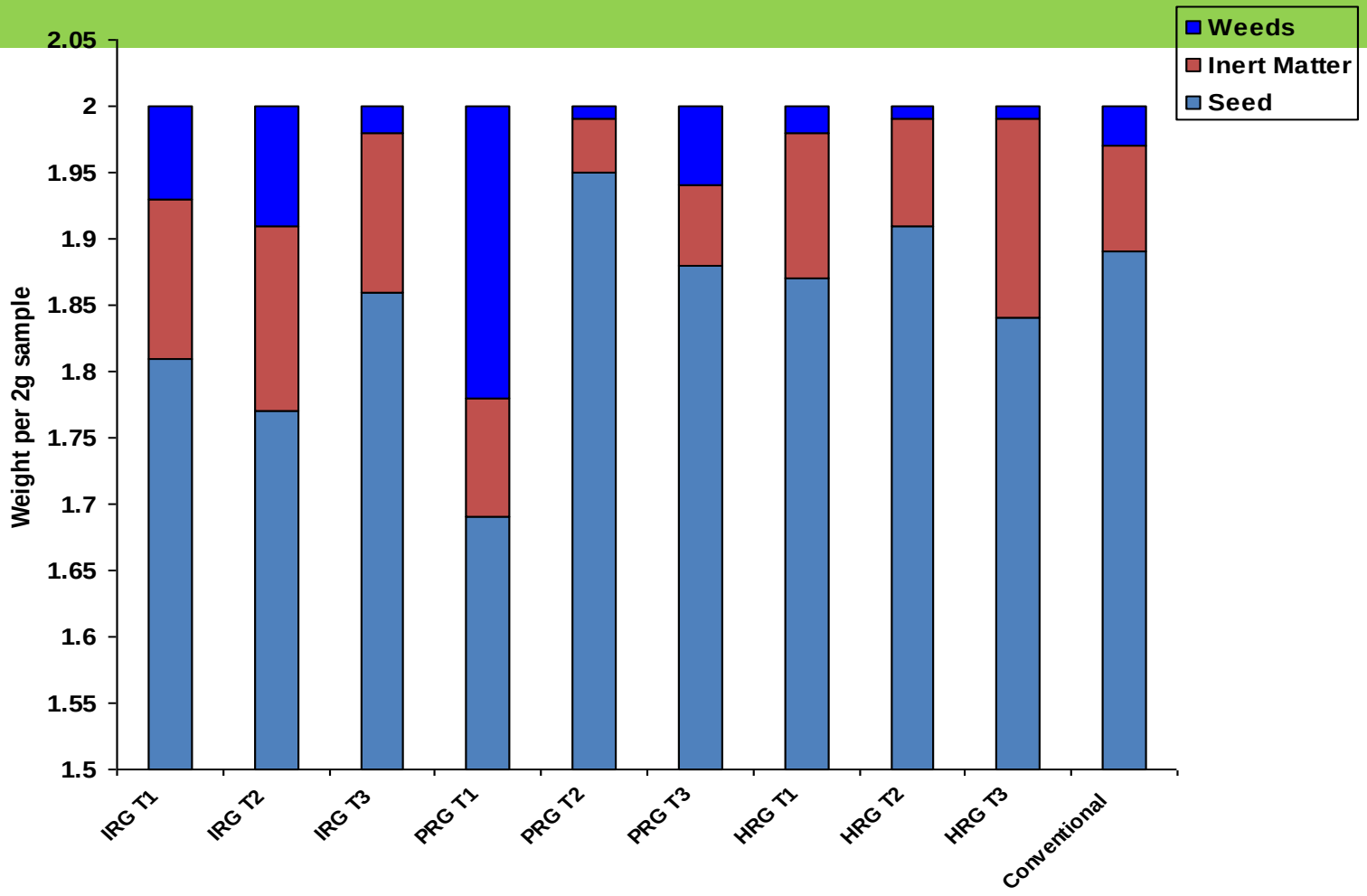


Conventional

Seed yield


140
120
100
80
60
40
20
0
Seed yield (% of control)
Conventional
IRG
PRG
HRG
IRG
PRG
HRG
IRG
PRG
HRG
T1
T2
T3
Variety / treatment

Weed content



Summary

- New varieties build on agronomic platform of yield and forage quality
- “New traits”
  - Increased resource use efficiency
  - Environmental benefits
- Organic producers must have access to best varieties
- Organic seed availability can be a constraint
- Techniques required to maximise yield in organic systems