Alternative nitrogen sources for grassland nutrition

www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences

Henn Raave

Alternative N sources for grassland nutrition

- Legumes (red clover, white clover, alfalfa, galega etc.
- Organic manures (cattle and pig slurry)

The method for the N replaced by legume accounting (accounting on the basis of DM yield)

- Grasses yield in unfertilized treatment or control treatment or N0
- Grasses yield on fertilizer backgrounds (N100; N200; N300)
- Grasses - legume mixture yield

Yield obtained due to fertilizer N =

Grasses yield on N fertilizer backgrounds (N100; N200; N300) – Grasses yield in control treatment

Yield obtained due to legume N =

Grasses + legume yield – Grasses yield in control treatment

Example

Yield obtained due to legume N - 4,3 t ha^{-1}

Yield obtained due to fertilizer N - N100= 4,0 ; N200= 7,2 ; N300= 9,0 t ha^{-1}

Replaced mineral nitrogen amount, kg ha^{-1} = 100 X 4,3/4,0 =107,5 kg N

Mineral nitrogen amounts replaced by legumes (*Sau, 1983; Laidna et al., 1994*)

Legume	Year	Content in the yield, %	DM yield, t ha^{-1} (Grass + legume)	Replaced mineral nitrogen amount, kg ha^{-1} y^{-1}
Red clover *Trifolium pratense*	1…2	87	10,4	320
	3…4*	2	7,7	17
	5**	64	5,8	123
Alsike clover *Trifolium hybridum*	1…2	81	9,0	170
	3…4*	4	7,0	6
	5**	59	4,9	94
White clover *Trifolium repens*	1-5	30…40	5,5	135
Alfalfa *Medicago sativa*	1…2	84	8,5	194
	3…4	66	7,4	132
	5	68	7,6	189
Galega *Galega orientalis*	1…5 6…10	56 80	7,4 14,0	107 363

*Fertilized with mineral N. Applied N rates 100 kg ha-1 and 150 kg ha-1 on 3 and 4 year respectively. **Reseeded

Table 2. Chemical composition of cattle slurry

Factor	Sampling time			
	16.04.08	28.04.09	8.05.09	30.07.09
pH	Nd*	6,56	6,7	6,6
DM, %	8,3	8,54	7,84	8,05
total N, kg t^{-1}	3,65	3,83	3,78	3,95
NH_4-N, kg t^{-1},	1,6	1,51	2,02	2,3
NO_3-N, kg t^{-1}	0	0	0,001	0,002
NH_4-N % from total N,%	43,9	39,5	53,4	58,2
total P, kg t^{-1}	0,73	0,81	0,82	0,79
total K, kg t^{-1}	2,28	2,87	2,72	2,7
N:P:K ratio	1:0,20:0,62	1:0,21:0,75	1:0,22:0,72	1:0,20:0,68

nd* not determined

Optimal N:P:K ratio for grasses fertilization 1:0,22:0,62

Table 2. Chemical composition of sewage sludge

Factor	Content
pH	nd
DM, %	19,9
total N, kg t^{-1}	6,78
total P, kg t^{-1}	1,06
total K, kg t^{-1}	0,58
N:P:K ratio	1 : 0,16 : 0,08

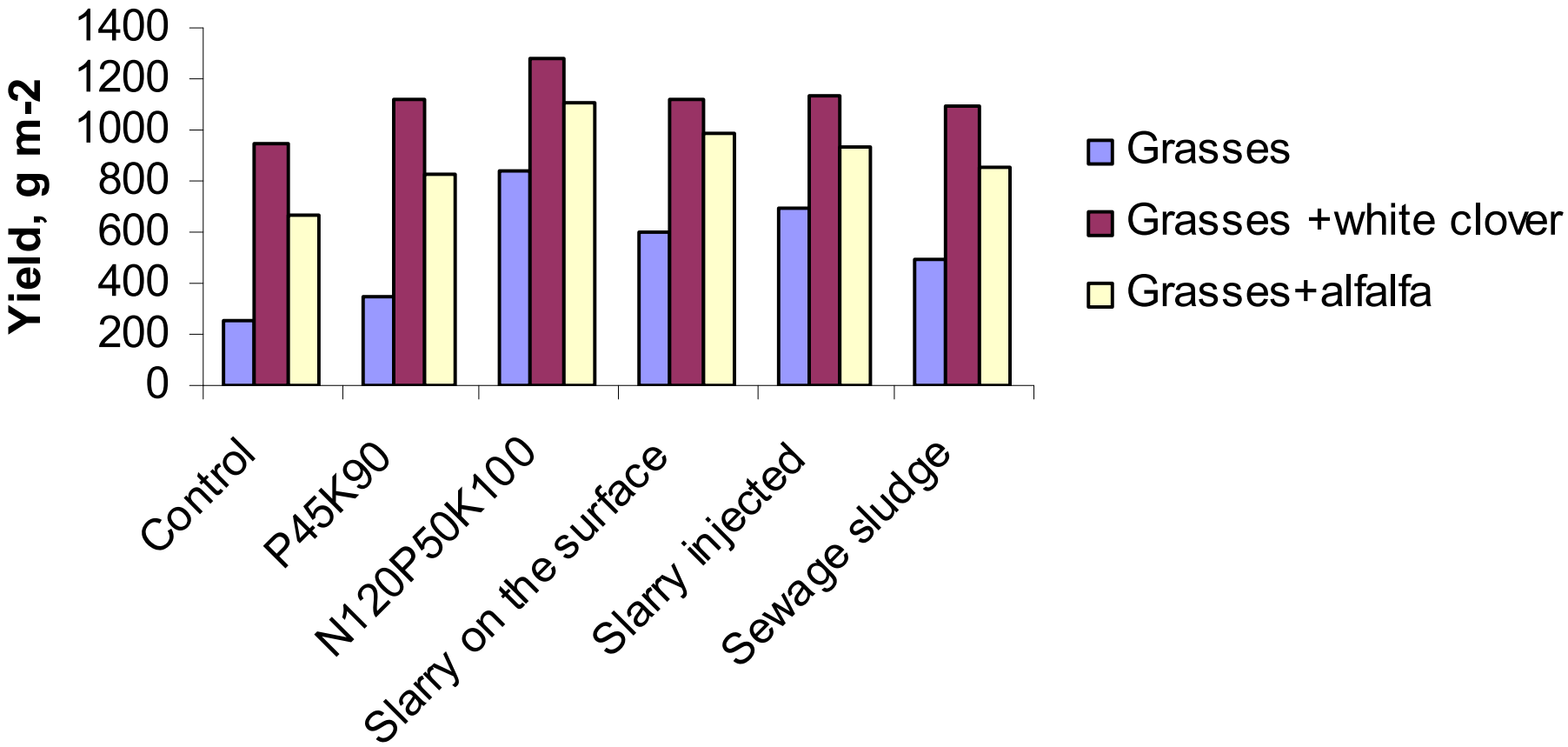

Figure 1.Swards yields on mineral fertilizers and organic manures background

Conclusion

- Legumes ability to replace mineral nitrogen is high but problem is legumes short time persistence in grassland sward.
- Organic manures application effect depended on sward type and it was highest in case of grasses sward.
- It seems the highest energetic effect in grassland could give grass + legume swards utilization in case to fertilize it with organic manure.

Thank you for your attention

www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences

Henn Raave

This material has been produced in ENPOS project. ENPOS is acronym for ***Energy Positive Farm***.

The project partners are
• University of Helsinki, department of Agricultural Sciences – Agrotechnology
• MTT Agrifood Research Finland - Agricultural Engineering
• Estonian University of Life Sciences

Project home page is at http://enpos.weebly.com/

The project is financed by the EU Central Baltic IV A Programme 2007-2013

ENPOS Energy Positive Farm

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007–2013