

MGA Trials 2015

Neil Groom Technical Director Grainseed Ltd

Sulphur for Maize

Maize under plastic variety trial

Why sulphur?

Combinable crops and grassland show good response to additional Sulphur – WHY NOT MAIZE?

Historically 20-40kg S deposited, now 1-4kg/ha

Sulphur used for protein, deficiency results in smaller leaves and reduced chlorophyll (photosynthesis)


Application of S on grass in deficient sites increases dry matter by 10-30%

NIABTAG recommendations
Sulphur recommendations: summary
 Winter OSR – 75 - 100 kg/ha SO₃ (30-40 kg/ha S)
 Spring OSR – 50 - 60 kg/ha SO₃ (approx. 15-25 kg/ha S) **MAIZE 2016**
 Cereals – 25 - 38 kg/ha SO₃ (10-15 kg/ha S)

MGA SULPHUR TRIAL 2012 Harper Adams University


2 Replicated Trials

- Four gates FYM, no bagged N
- Flatt nook no FYM history, 150kg AN split dose



4 different rates applied as elemental sulphur – Brimstone 90

- 0%
- + 10%
- + 20%
- + 40%



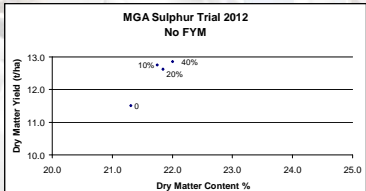
MGA Sulphur Trial 2012 – No FYM

Sulphur level	% Dry Matter	Fresh Yield (t/ha)	Dry Matter Yield (t/ha)	% no Sulphur
0	21.3	54.0	11.5	0.16
10%	21.8	58.8	12.8	0.15
20%	21.8	57.7	12.5	0.18
40%	22.0	58.3	12.9	0.18

Applied as elemental sulphur – Brimstone 90

Ammonium nitrate applied at 150kg/ha as 2 splits

Sulphur tissue analysis % 22 Aug



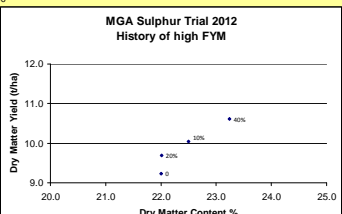
MGA Sulphur Trial 2012 – FYM

Sulphur level	% Dry Matter	Fresh Yield (t/ha)	Dry Matter Yield (t/ha)	% no Sulphur
0	22.0	41.9	9.2	0.11
10%	22.5	44.6	10.0	0.11
20%	22.0	44.0	9.7	0.11
40%	23.2	45.7	10.6	0.11

Lower overall yield + 2t/ha

Applied as elemental sulphur – Brimstone 90

Sulphur tissue analysis % 22 Aug



2012 Conclusions

Statistically no benefit, but systematically increased yields

Visually greener, larger leaf in August

Cost of sulphur paid for by increased yield

Nutrient budgeting essential

MGA Maize Sulphur Trial 2015 - Treatments

Ammonium N (17.5kg N/ha bagged fert)
 Ammonium Sulphate to supply 20kg S
 Ammonium N (35kg N/ha bagged fert)
 Ammonium Sulphate to supply 40kg S
 Ammonium N (52.5kg N/ha bagged fert)
 Ammonium Sulphate to supply 60kg S
 None
 Sulphur applied as Ammonium sulphate = 40% S

All plots drilled as Ballade and thinned to standard pop

MGA Maize Sulphur Trial 2015 - Treatments

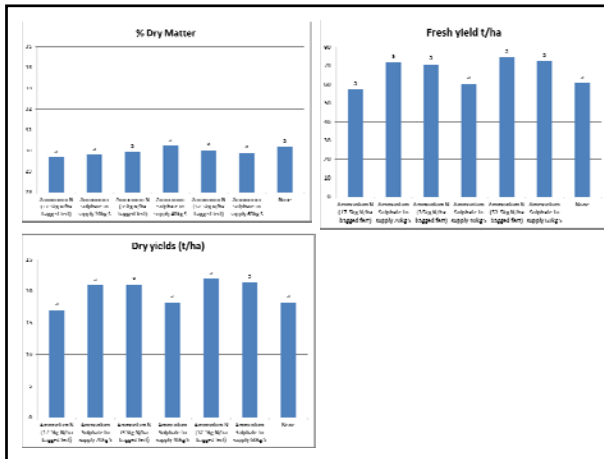
Ammonium N (17.5kg N/ha bagged fert)
 Ammonium Sulphate to supply 20kg S = 50kg/ha AS
 Ammonium N (35kg N/ha bagged fert)
 Ammonium Sulphate to supply 40kg S = 100kg/ha AS
 Ammonium N (52.5kg N/ha bagged fert)
 Ammonium Sulphate to supply 60kg S = 150kg/ha AS
 None
 Sulphur applied as Ammonium sulphate = 40% S

SOIL ANALYSIS REPORT

Laboratory Sample Reference		Field Details		Index			mg/l (Available)		
No	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg	
33476/15	1 BROXTON 8.0 Hectares Fodder Beet into Spring Barley	7.6	5	3	2	95.4	332	94	

Reference: 07126/33476/15	Field Name: BROXTON	Result (*)	Deficient	Marginal	Target	Marginal	Excessive
EDTA Extractable Copper mg/l		5.31					
Hot Water Soluble Boron mg/l		0.9					
Ammonium Nitrate Extractable Sodium mg/l		12.6					
EDTA Extractable Zinc mg/l		10.8					
Ammonium Nitrate Extractable Calcium mg/l		996					
DTPA Extractable Iron mg/l		79.7					
Organic matter (LOI) %		3.8					
Phosphate Buffer Extractable Sulphate mg/l		19.5					
DTPA Extractable Manganese mg/l		4.1					
Estimated Cation Exchange Capacity meq/100g		10.8					

Plants absorb sulphates, not sulphur
 Sulphates water soluble and leach like Nitrogen
 Stored within organic matter in the soil
 Plant tissue tests showed no differences in S level



Treat	N (kg/ha)	D.M.	Dry yield (t/ha)	Fresh yield (t/ha)	Har ch %	Har ch Yld (t/ha)	ME	D.V. Value	ME YLD	SNPD
1 Ammonium N (17.5kg N/ha bagged fert)	29.68	17.04	57.09	26.47	4.51	11.34	70.85	193	58.91	
2 Ammonium Sulphate to supply 20kg S	29.81	20.95	71.68	30.33	6.35	11.29	70.57	237	57.33	
3 Ammonium N (35kg N/ha bagged fert)	29.94	21.05	70.81	28.92	6.09	11.47	71.66	241	58.97	
4 Ammonium Sulphate to supply 40kg S	30.24	18.26	60.33	27.89	5.06	11.45	71.56	209	58.89	
5 Ammonium N (52.5kg N/ha bagged fert)	30.02	21.96	74.34	28.42	6.24	11.62	72.61	255	59.95	
6 Ammonium Sulphate to supply 60kg S	29.90	21.39	72.34	26.76	5.72	11.31	70.67	242	58.01	
7 None	30.19	18.25	60.53	29.56	5.39	11.52	72.03	210	59.74	

Additional Sulphur is important for maize when:
 Light and sandy soils
 Low organic matter soils
 Where deficiency known in other crops



Previous advice to members was from trials in Northern and Southern Ireland.


Crop performance 'with' and 'without' Plastic Mulch

	Silking date	Total yield t/ha	DM Content %	Starch Yield t/ha	Starch Content %	ME Yield GJ/ha	ME Content MJ/kg
Plastic mulch	30 Jul	15.5	35	5.7	37	171	11.0
Open Establish	15 Aug	12.7	30	3.6	28	135	10.6
Plastic Gain	16 days	2.8	5.0	2.1	9	36	0.4

Climate and growing conditions in UK could be different (drier) so in 2014 the first replicated trials were conducted by MGA.


The three trials were undertaken by SAMCO and overseen by MGA members.

Varieties identified by the breeders




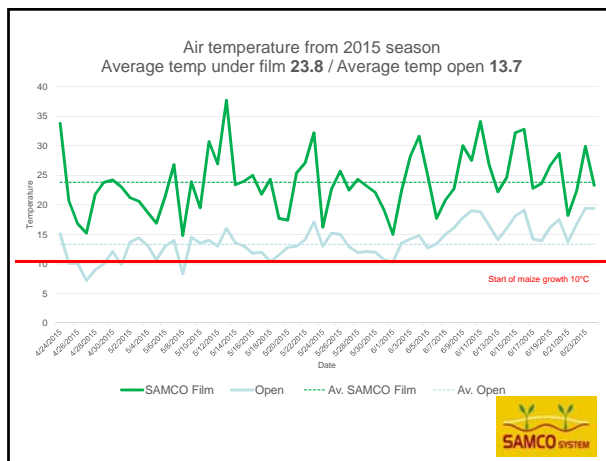
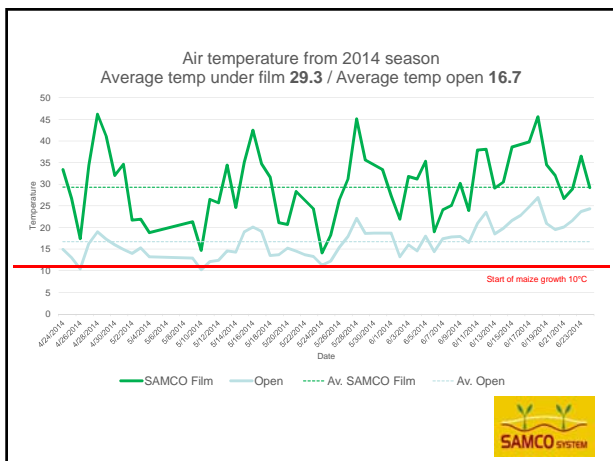
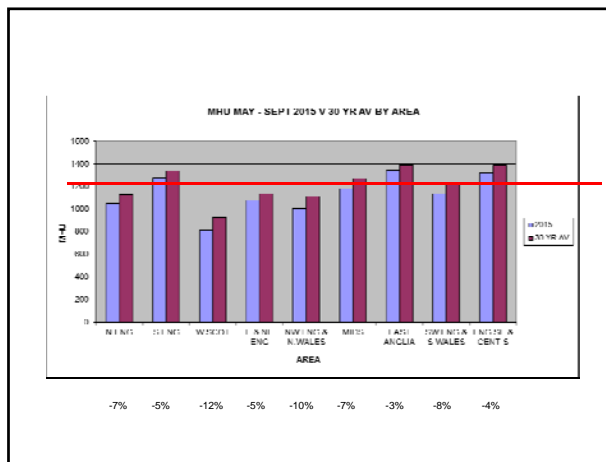
	DM%	Yield TDM/ha	ME (MJ/kg DM)	ME Yield (MJ/ha) (1000's)	Starch %	Starch Yield T/ha
Glory	38.8	13.4	11.8	159	44.50	5.96
Ambition	37.5	13.9	11.9	165	43.71	6.08
Exxtens	35.9	12.0	11.7	140	44.02	5.27
Marco	33.5	16.9	12.1	205	45.25	7.63
Ambrosini	32.7	13.8	11.3	156	38.64	5.33
Award	31.4	15.4	11.4	175	39.74	6.12
SY Feeditop	31.2	14.7	11.7	171	36.88	5.42
P7905	30.8	16.4	11.7	191	40.62	6.64
Average	34.0	14.6	11.7	170	41.67	6.06

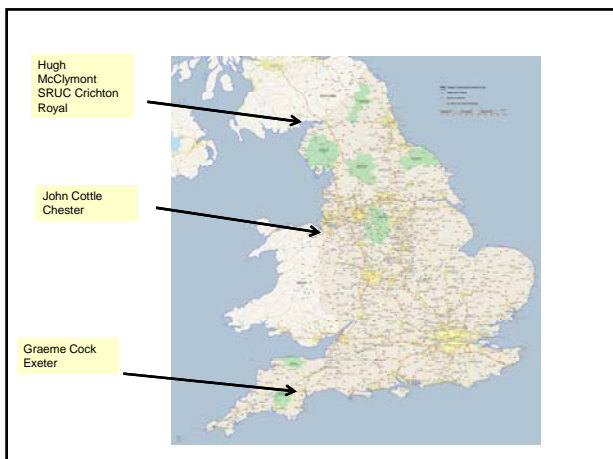
*Data is average of all three sites. Exxtens, SY Feeditop, and Award were tested on two sites only.



Drilled 24 April
Harvested 29 September






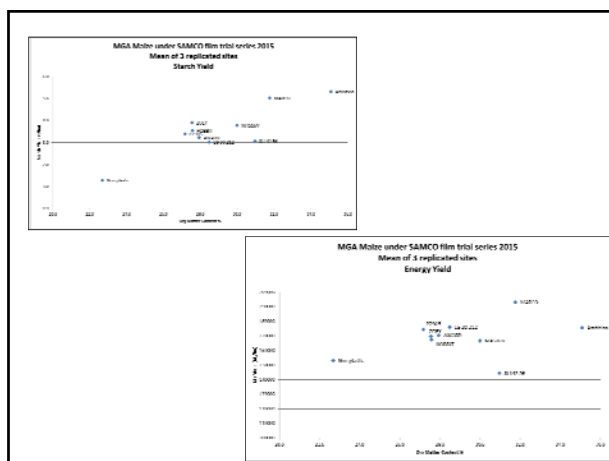
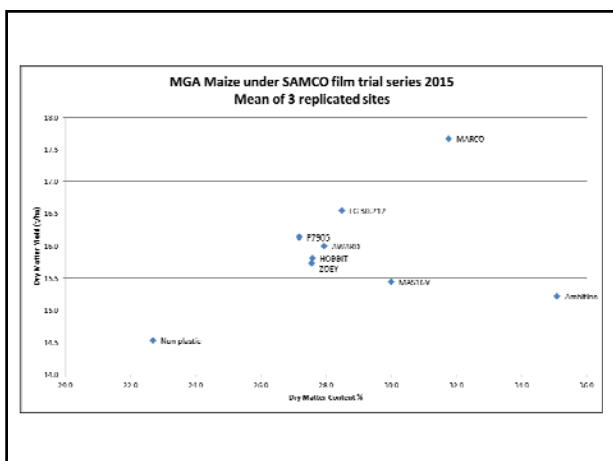


Agronomy of sites

SAMCO drill applied Green 28 Pinhole plastic + pre-em herbicides:
Pendimethalin (Stomp Aqua) @ 1 l/ha + Dimethenamid-p + pendimethalin (Wing-P) @ 4 l/ha.

SRUC Dumfries – Drilled 22 April. Harvested 20 November. 28m Ht above sea level
Exeter – Drilled 17 April, Harvested 20 September. 138m Ht above sea level
Chester – Drilled 19 April, Harvested 20 September. 25m Ht above sea level

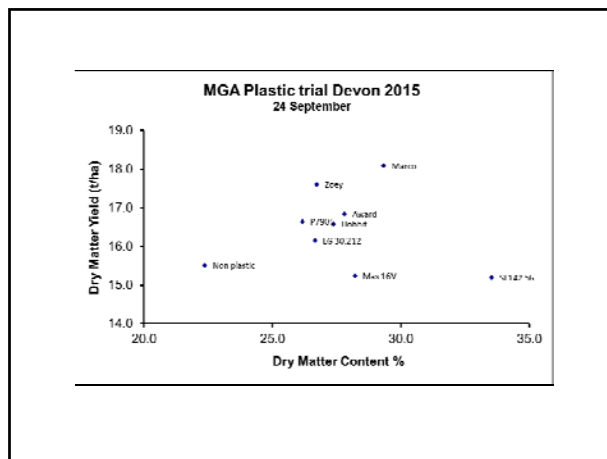
3 replicates drilled and harvested separately to enable statistical analysis



Graeme and Patrick Cock
Ashburton, Exeter

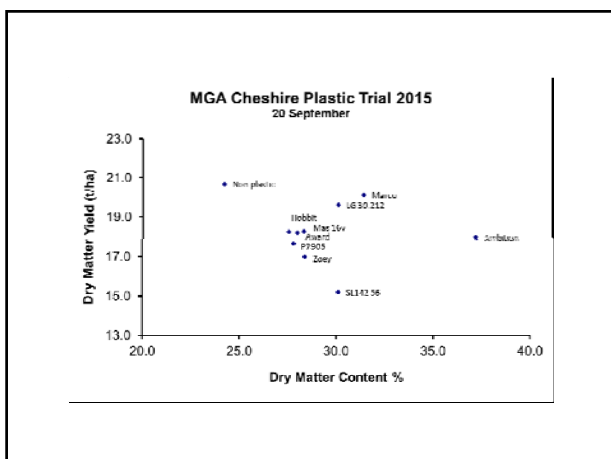
- Steep slopes
- High genetic cows



MGA Plastic trial – Devon 24 Sept 2015

	DM (%)	Dry Yield (t/ha)	Starch (%)	ME Mj/ha	Starch Yield	ME Yield
SL142 56	33.5	15.2	16.7	10.1	2.5	153575
Marco	29.3	18.1	27.7	10.8	5.0	195506
Mas 16V	28.2	15.2	21.3	10.3	3.2	156808
Award	27.8	16.8	27.5	11.0	4.6	185033
Hobbit	27.4	16.6	25.8	11.2	4.3	185055
Zoey	26.7	17.6	28.2	11.2	5.0	196773
LG 30.212	26.7	16.2	19.0	10.9	3.1	175767
P7905	26.2	16.6	29.6	11.4	4.9	189150
Non plastic	22.4	15.5	6.0	10.5	0.9	163172

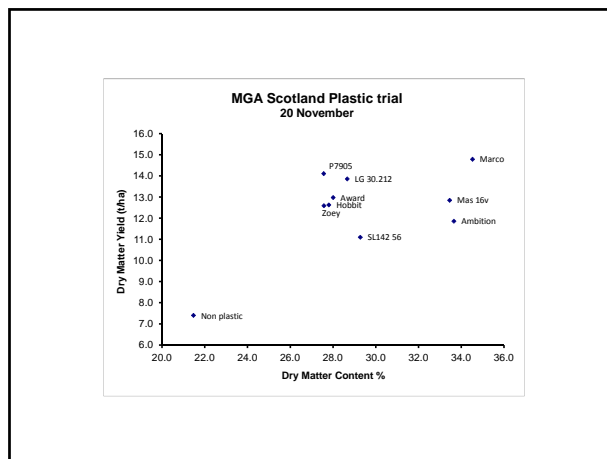
Best plastic varieties approaching 30% starch, non plastic 6%



MGA Plastic trial – Cheshire 20 Sept 2015

	DM (%)	Dry Yield (t/ha)	Starch (%)	ME Mj/ha	Starch Yield	ME Yield
Ambition	37.2	17.9	36.1	11.8	6.5	212581
Marco	31.5	20.1	28.3	11.3	5.7	227948
LG 30.212	30.1	19.6	21.1	10.7	4.1	210579
SL142 56	30.1	15.2	30.4	10.9	4.6	166110
Zoey	28.4	17.0	24.0	10.6	4.1	180376
Mas 16v	28.3	18.2	23.0	11.0	4.2	200990
Award	28.0	18.2	14.7	10.8	2.7	196335
P7905	27.8	17.7	18.0	10.5	3.2	185602
Hobbit	27.6	18.2	21.4	10.3	3.9	187703
Non plastic	24.2	20.7	13.9	10.5	2.9	216582

No plastic used on farm crop, earlier and more quality from the plastic plots



MGA Plastic trial – Dumfries 20 November 2015

	DM (%)	Dry Yield (t/ha)	Starch (%)	ME Mj/ha	Starch Yield	ME Yield
Marco	34.5	14.8	29.5	10.5	4.4	155631
Ambition	33.7	11.9	31.9	10.9	3.8	129118
Mas 16v	33.5	12.9	30.3	11.1	3.9	142330
SL142 56	29.3	11.1	18.1	10.2	2.0	113481
LG 30.212	28.7	13.9	13.3	10.2	1.8	141725
Award	28.0	13.0	18.1	10.0	2.3	129779
Hobbit	27.8	12.6	19.2	10.2	2.4	129375
Zoey	27.6	12.6	21.2	10.5	2.7	131812
P7905	27.6	14.1	14.5	10.5	2.0	148331
Non plastic	21.5	7.4	0.0	10.7	0.0	79267

No colour in grains of non plastic plots, plastic always used in Scotland now

Challenges with plastic:

- Local contractor kitted up for plastic
- High level of care and attention by drill operator
- Requires deep stone free soil
- Excellent weed control essential

Extra investment paid for?

Maize – Still an economic feed for 2016

	Grazed Grass (10 year ley)	Grass Silage (5 cuts 7 year ley)	Maize Silage (Plastic)	Maize (Plastic)	Wholecrop	Fodder Beet	Kale	Italian ryegrass (3 cuts 2 year ley)
Yield of Fresh Matter (t/ha)	58	50	42	52	28	70	50	53
Typical Dry Matter Content of crop	18.00%	25%	30%	30%	45%	18%	14.50%	25%
Yield of Dry Matter (t/ha)	10.44	12.5	12.6	15.6	12.6	12.6	7.25	13.25
Establishment Costs (£/ha)								
Ploughing	54	54	54	54	54	54	54	54
Cultivations	60	60	75	60	60	60	60	60
Sowing	30	30	45	40	45	30	30	30
Seed	175	175	160	60	130	55	100	100
Lime	60	60	60	60	60	60	60	60
Fertiliser	70	70	265	272	265	262	70	70
Sprays	26	26	50	170	154	48	26	26
Fertiliser applications	12	12	24				12	12
Spraying	12	12	24				12	12
Additional Cost of Plastic				250				
Total	50	71	753	1093	800	848	593	212
Variable Costs (£/ha)								
Fertiliser	322	496	0	0	0	0	0	496
Sprays	10	10	0	0	0	0	0	10
Total	332	506	0	0	0	0	0	506
Contractor Costs (£/ha)								
Fertiliser Applications	60	60	0	0	0	0	0	60
Spray applications	12	12	0	0	0	0	0	12
Harvest + Sheets etc	0	410	170	170	150	225	0	410
Total	72	482	170	170	150	225	0	410
Total Annual Cost (£/ha)	454	1059	923	1173				
Total Annual Cost (£/acre)	184	429	373	475				
Feed Out Costs (£/t)	3.5	10	10	10				
Total Cost (£/t utilised DM)	47	95	83	85	85	95	85	100
Total Cost (£/t utilised fresh weight)	8	24	25	26	38	17	12	25

£250/ha = £100/acre

Plastic cost = £1173/ha
Av DM yield 15.8t/ha = £74/t DM

Thanks to:

Matt Shine and the team at SAMCO
NIAB for harvesting Devon
Harper for quality and stats analysis

Host growers:
Graeme and Patrick Cock
John and Kath Cottle
Hugh McClymont at SRUC Dumfries