### NLSD/BASE 2010







### Location of Mill Farm, Malvern





### Farm information:

### Malvern Worcestershire



- Size 320 ha
- Three units
  12 km apart
- Average field size6.8 ha
- Soil Type Heavy Silty/clay
- Average Rainfall
  700mm (1050 2008!)

# Reduced tillage over the last 40 years



#### Eco-Intensive Agriculture Jig-Saw – you need all the pieces



### Conservation Agriculture Our results after 12 years



# Why reduced Tillage ?

- Differing goals economically and environmentally
- Better understanding of soils and techniques
- New technologies







### SD Worldwide

#### Spring sown crops –

Northern Hemisphere Canada, US, Finland, Eastern Europe.

# Continuous Growing season -

Southern Hemisphere – New Zealand, Australia, South America

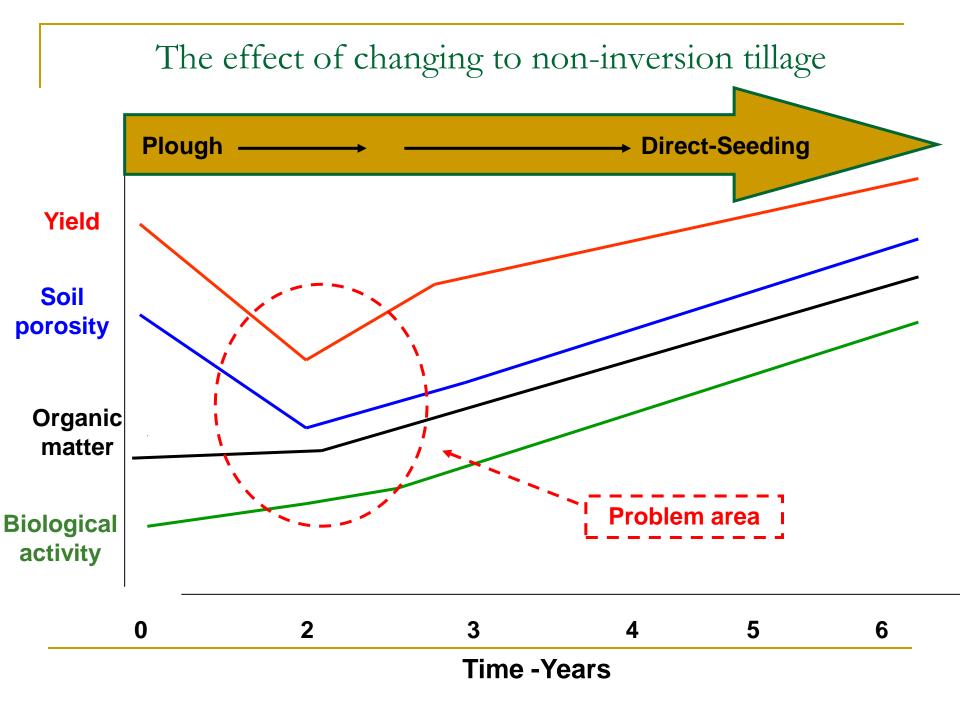
"Crops do not stop growth for Winter"

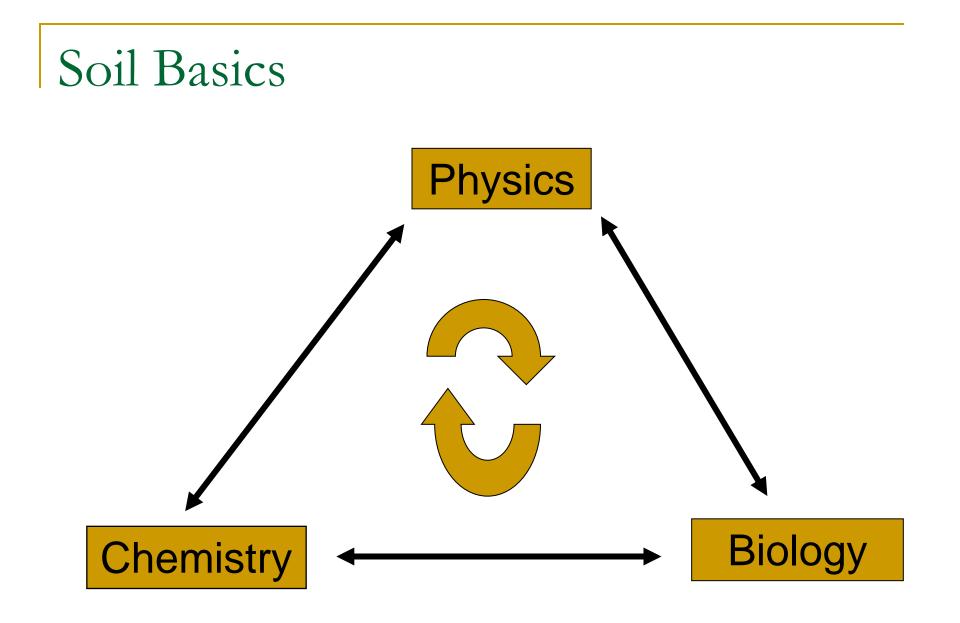




# Direct-Drill or "One -Pass seeding







# Direct drilled Wheat



# Direct drilled Spring Beans





### Direct drilled Oats







### Soil Structure – compaction depth

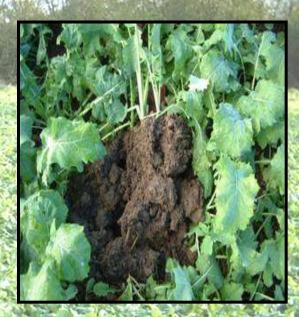






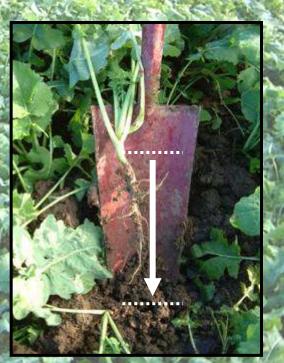


#### Soil structure & its effect on crop rooting









#### What is happening under the surface?

SUBLIFT

### Boulet draineur





### Residue or Trash?

#### Residue –

- Improves soil workability
- Maintains soil fertility
- Reduces erosion
- Encourages earthworms

### Trash –

- Creates establishment and weed control problems
- Encourages slugs
- Reduces crop yields





### Harrowing to spread straw



### Action of Harrow

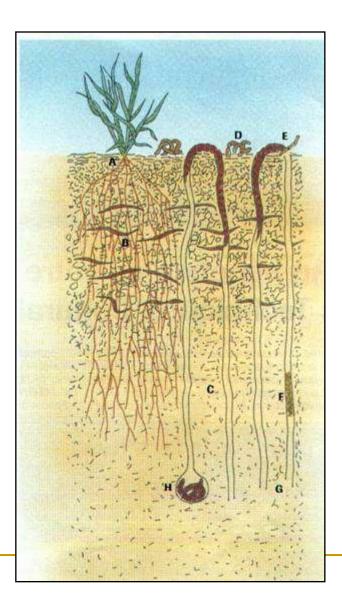


 Harrow tines disrupt slugs (and slug eggs)

 Micro-tilth promotes germination of weed seeds

 Spreads straw and chaff



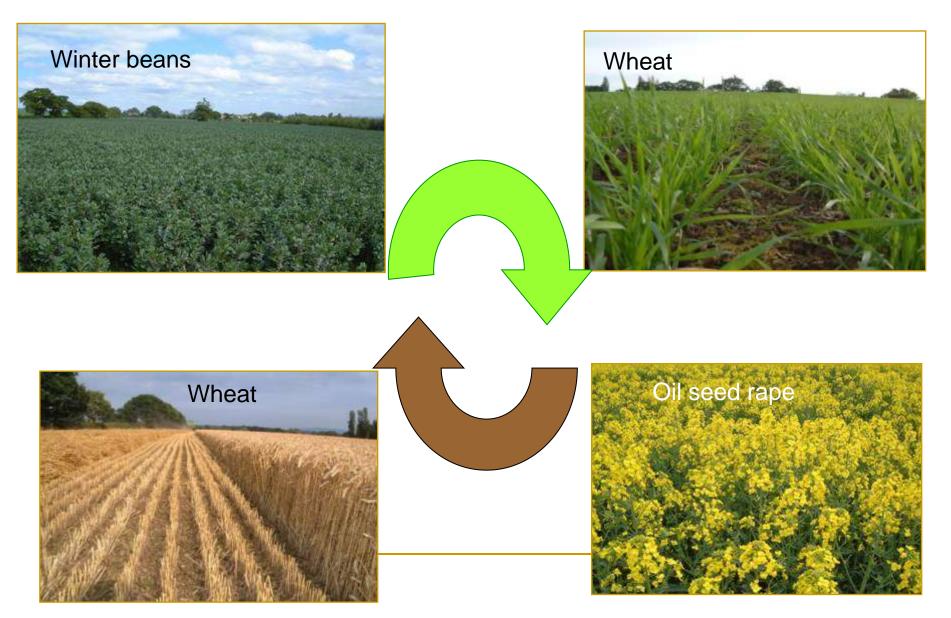




### Evidence of worm activity



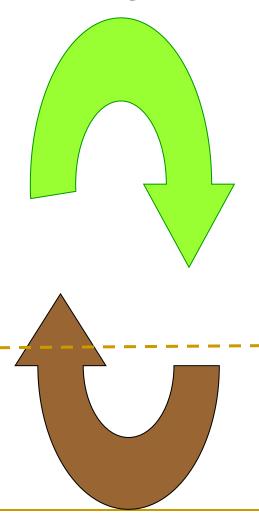
### **ROTATION TCS/SD**





#### ROTATION

#### Controllable grass weeds





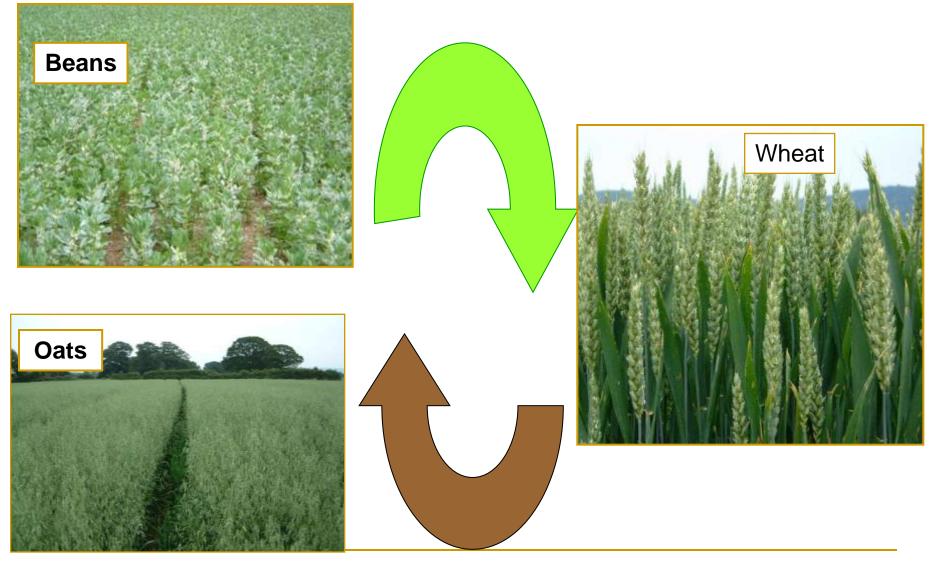




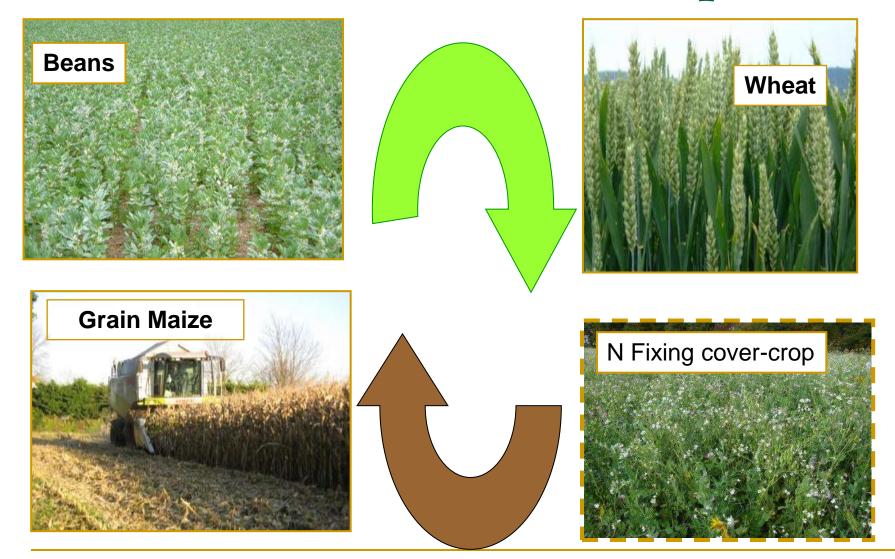




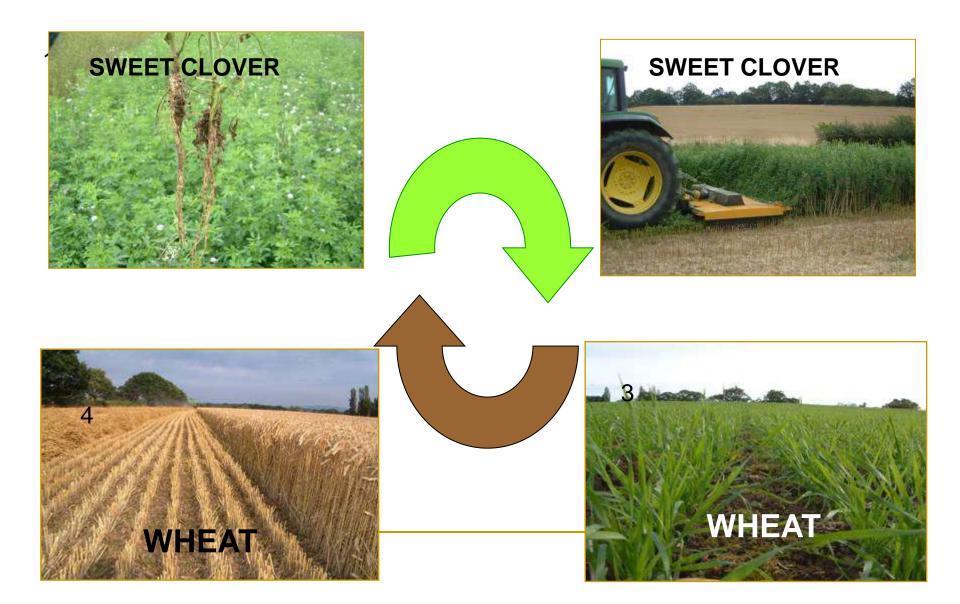
### **ROTATION** Poor soils (low pH & P+K)

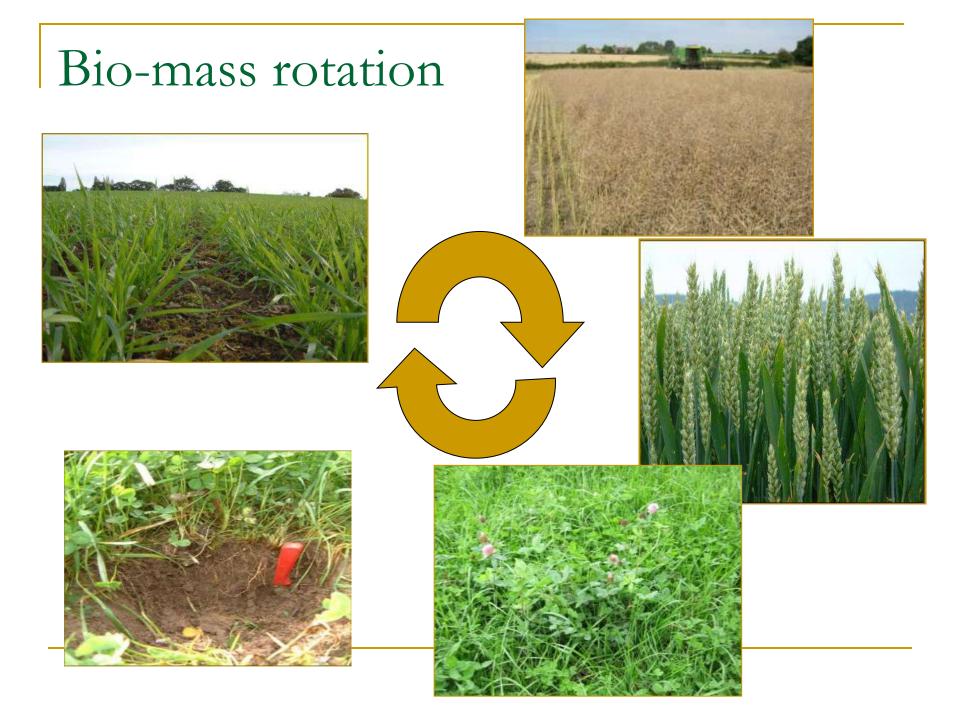


### **ROTATION Low N input**



# **ROTATION : Bio-mass (bio-gas)**





### Choice of varieties



- Long strawed cereals tend to have more vigorous root systems
- Hybrid rape varieties are worth considering where drilling is late..

#### 12/9/07 Excalibur/Astrid

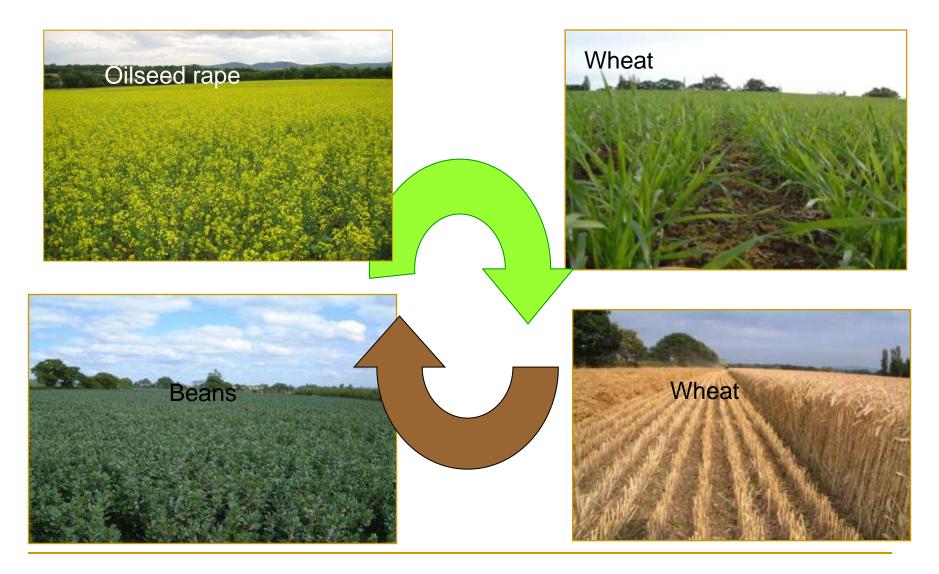
### Grass weeds







### **ROTATION - Double-break**



### Challenge conventional systems

Oilseed rape after wheat

Oilseed rape after spring beans

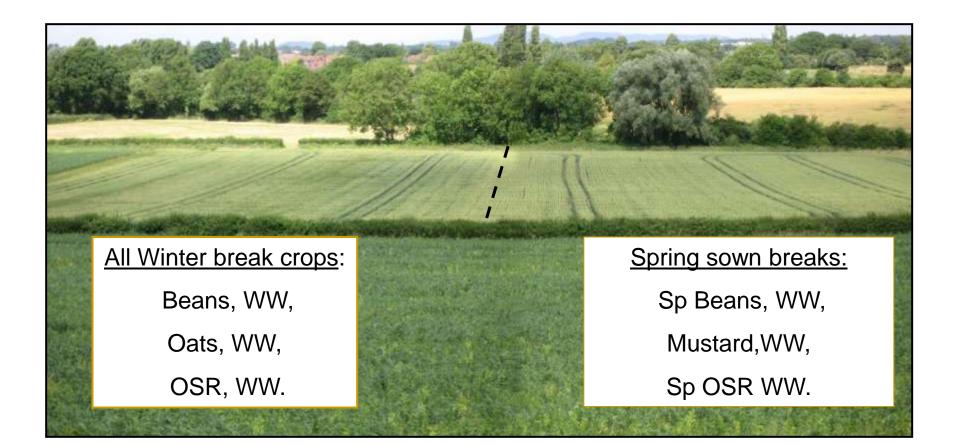


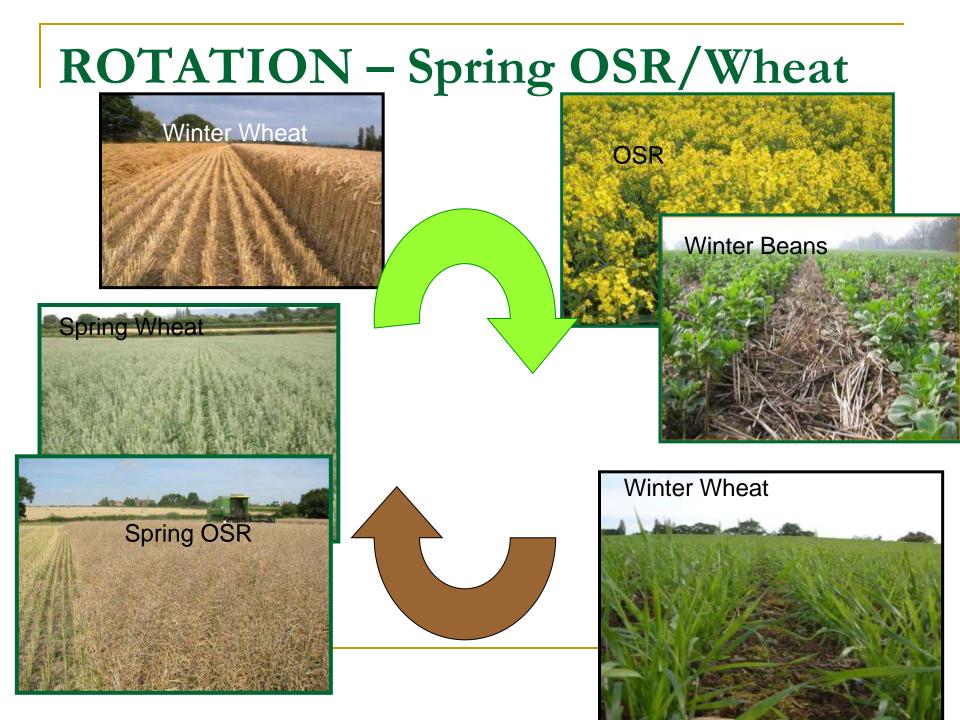
### Value of double break

- Wheat yield increased by 1 ton/ha for -:
   Beans/OSR/Wheat/Wheat
   compared to
   Beans/Wheat/OSR/Wheat
- Improved grass weed control



# Benefit of Spring break crops.





# Winter v Spring sown break crops.



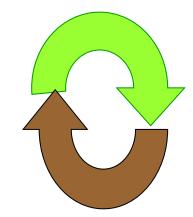
## Establishment Rotation (direct drill/till-seed)









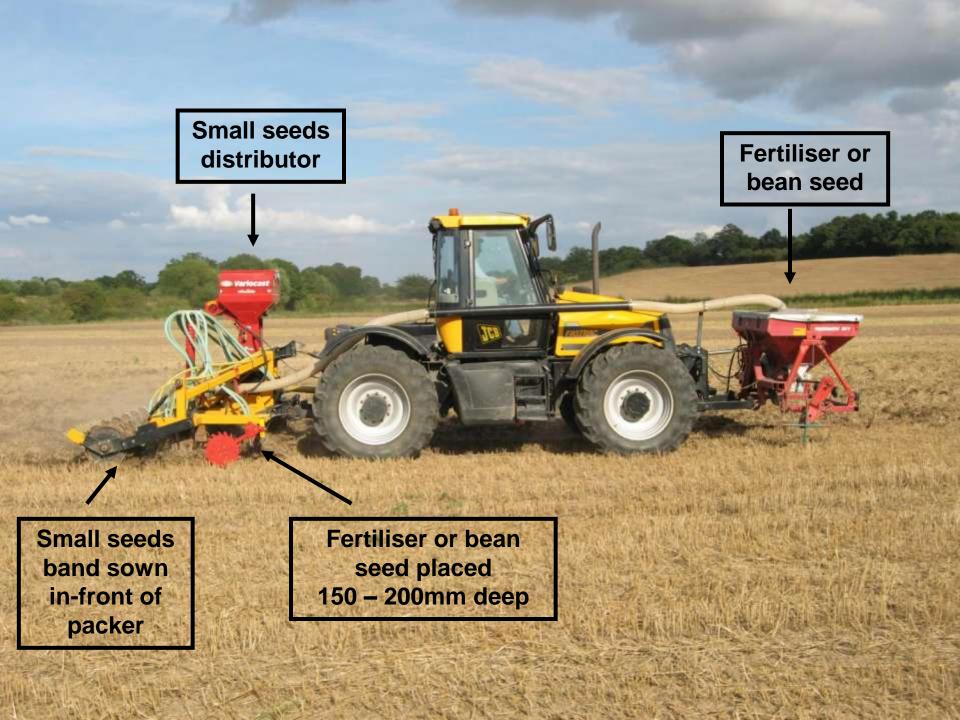












## Roots – stabilise soil structure



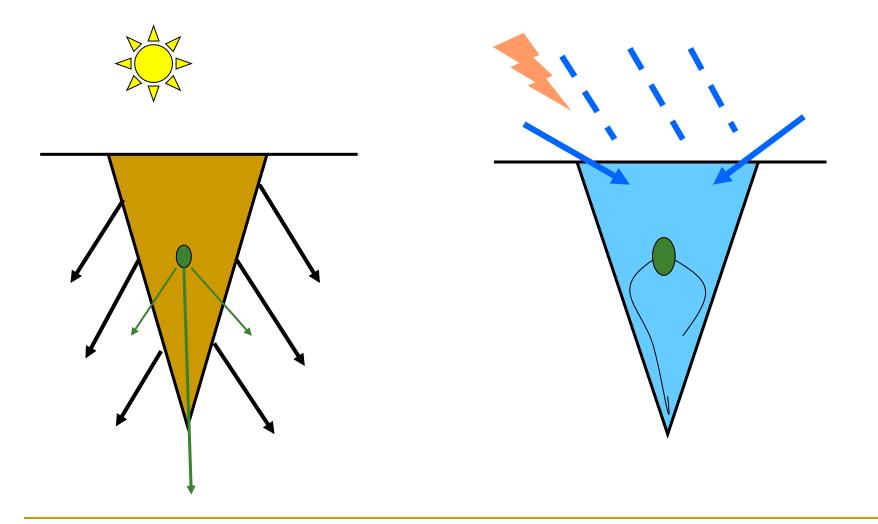


## Till-seeded beans





## Problem with strip-till



Direct drilling wheat into winter bean residue and volunteers

50 4000



## Three very wet summers



- 135mm rain July 20<sup>th</sup>
  2007 170mm total for month
- July/August/September 2008 – 300min rainfall

July **2009** – 23 wet days over 125 mm!

## Wet straw – severe wheelings

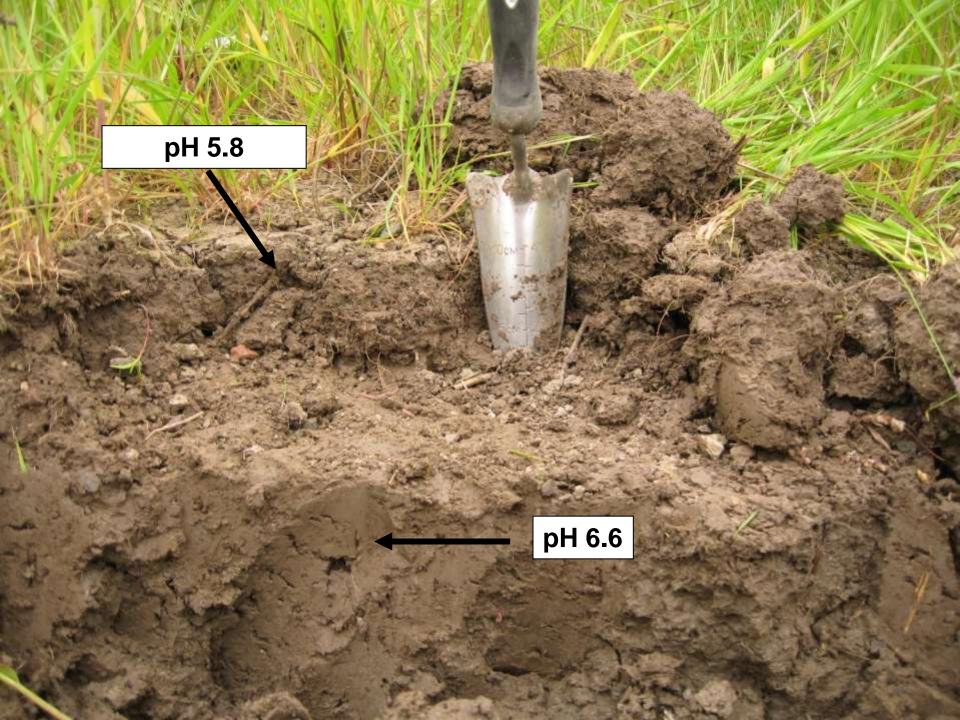






## Uneven soil moisture







### **Problem Soil**

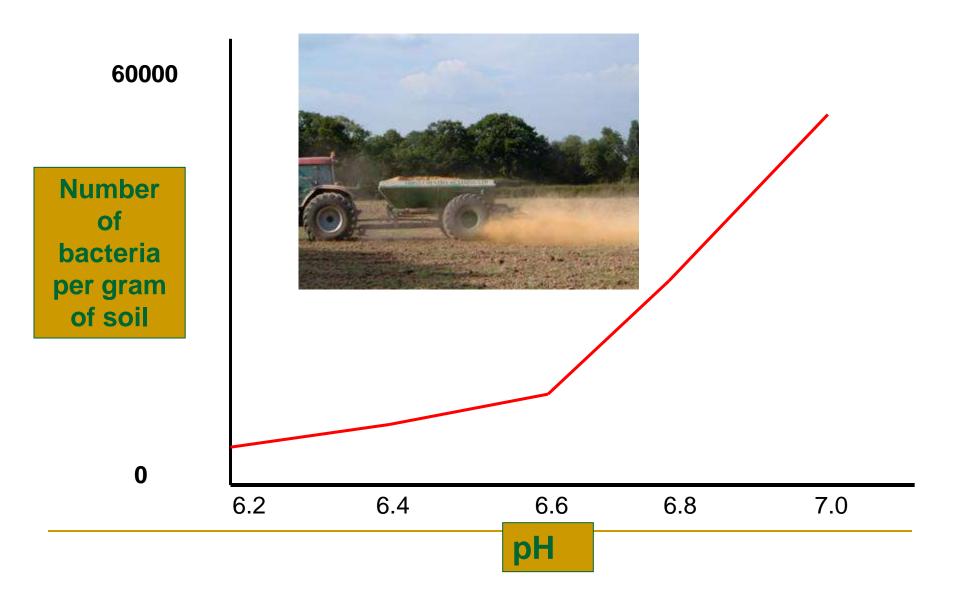


# Well Balanced Hi Magnesium





## The influence of pH on soil biological activity





#### e-mail soilsolutions@msn.com

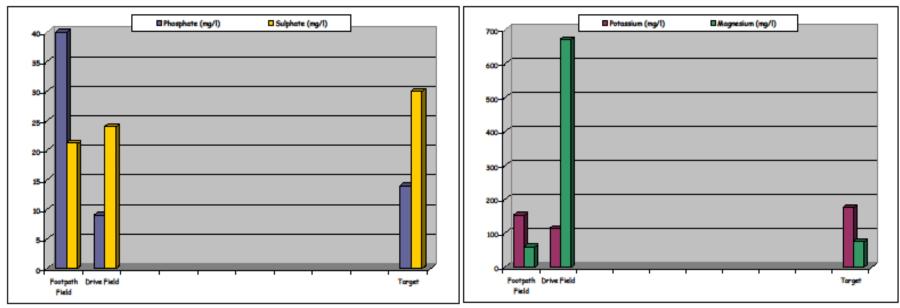
### W Bullock & Partners

### The Mill Farm, Malvern

### Soil Health Check - Primary Data for Soil & Nutrient Management Plans

Sampl	e reference	Seil	Phosphate	Potassium	Magnesium	Nitrogen	Sulphate	Seil	Soil F	article Dist	ribution	Stone	CEC	Soil Classification	Erosion Risk
Field	crop	pН	P <sub>2</sub> O <sub>5</sub>	K₂O	NgO	(SNS)	50,	O.M.	Sand	Silt	Clay	content	cmoi/kg	class texture	based on texture
Footpath Fiel	d arable	7.7	40.0 3+	152.0 2-	59.0 2-	41.2 2	21.2	3.2%	22.0%	44.0%	34.0%		21.2	3 mineral Clay loam	v low to low
Drive Field	arable	6.4	9.0 0	114.0 1+	672.0 7	41.4 2	24.0	3.3%	12.0%	42.0%	46.0%		31.3	3 mineral Clay	v low to low
	Suggested Range	6.0 - 6.8	14 - 18	175 - 225	75 - 100	30 - 60	30 - 45	5.0%							

### Major Nutrient Sufficiency Levels (802(9)



Analysis conducted to ISO 17025. Pully compliant with UE Ministry ref 423<sub>00</sub> & 80 (Good Agricultural Practice) Soli & Water Framework Directives. Developed in Association with the Albrecht Poundation use in throughout the 8C All rights reserved @ 1985-2009

Nov '09

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### **Prescription Nutrition**®

The Mill Farm, Malvern

#### Dedicated Analysis for Integrated Soil, Plant & Animal Nutrient Management

e-mail : soilsolutions@msn.com

Advisor Steve Townsend

### Sample Ref Footpath Field

arable

arable

Soil class 3 Mineral

texture

Stones <5%

Agrimax Soil pH (water) 7.7

Clay loam Major Nutrients (mg/l) Deficit Good High Elemental (mg/l) Low Excess Kar 40.0 3+ Phosphate, P2O5 2.35 17.4 P 152.0 2-Potassium, K<sub>2</sub>O 126.2 K 0.82 35.6 Mg Magnesium, MgO 59.0<sup>2</sup>-0.71 Calcium, CaO 3808.9 3 1.04 2722.2 Ca 11.4 Na Sodium, Na<sub>2</sub>O 15.3 1 0.40 Sulphate, SO3 21.2 1 0.53 8.5 S Nitrogen, NH4-ma 21.8 2 103.2 N 0.41 Nitrate, NO<sub>3</sub>\* K:Mg ratio 2.6 :1 Mg:P ratio 1.5 :1

Micro-Nutrier	nts (mg/l)	De	fic	it	I	.0₩	6	00	d	F	lgł	۱.	E	xce	:55	Kar	
Iron, Fo	<b>69.9</b>		1						/				,			2.15	DPTA
Manganese, Mn	11.2															0.43	DPTA
Boron, B	1.4					/	,									0.80	Water
Zinc, Zn	16.0		/					/						1		2.58	EDTA
Copper, Cu	28.0															5.43	<b>EDTA</b>
Molybdonum, Mo	-																
Cobalt, Co	-																
Iodine, I	-																
Selenium, Se	-																
Chlorids, Cl	-																

Cation Exchang	s (cmol <sub>e</sub> /kg)	Defi	cit	Low	, ,	Good	I	High	1	Exc	ess	mg/l	K <sub>rmag(kg)</sub>	BCSR	[	Soil Parent A	Aatorial	Deficit	Low	6	Good	I	ligh	E	xces	ş	
Total CEC	21.20						1	Π	Τ	Γ					[	Soil pH	7.7									Τ	
Calcium, Ca <sup>2+</sup>	18.60					-				7		3707.7	1450.0	87.26	[	Conductivity	2117.0 uS					/		Π		Ι	
Magnesium, Mg <sup>2+</sup>	0.54		Π					Π	Ι			64.8	-281.7	2.55	[	Bulk Density	1.102 s/mt					/		Π		Ι	
Potassium, K*	0.35			7				$\square$				136.5	-179.4	1.65	[	Infiltration ratio	0.011 est/s										
Sodium, Na <sup>*</sup>	0.09						Ι	Π	Τ	Γ		23.9	-30.7	0.42		Sand	22.0 %			Ι	Π	Π		Π		Τ	
Iron, Fe <sup>2*</sup>	0.21											67.6	64.2	1.01		Silt	44.0 %					,		Π			
Aluminium, Al <sup>3+</sup>	1.33							Π	Τ	Γ		127.5	1.7	6.26	[	Clay	34.0 %					,		Π		Τ	0.908 Kx
Hydrogen, H	0.00		Π					Π	Τ			0.0	-24.2	0.00		Organic Carbon	1.84 %			Ι	Π	Π		Π		Ι	0.092 Kx
Other cations	0.18						1	Π	Ι				31.0	0.84	[	Microbial assay	246.0 vg				Π	Π		Π		Ι	FDA extract
Ca:Mg ratio	34.3 :1														[	C:N ratio	-			Γ	Π	Γ					
Mg:K ratio	1.5 :1							Π	Ι						[	N:5 ratio	-										

Results relate solely to sample provided. Analysis conducted to ISO 17025, DEFRA ref 427 200 & EC Soil & Water Framework Directives. Developed in association with the Albrecht Foundation for use throughout the EC. All rights reserved @ 1985-2009

Soil OM 3.2%

Soil pH (salt) 7.1

he	Mill Farm, Malvern Footpath Field		Clay loam 7.7	and.	roup L(%)		Mine	sna/			SNS index Mg index (MgO)	2		mg/l mg/l		P index K index	1. 1. 1.		40 mg/l 152 mg/l
	W Wheat feed		Fertiliser selection			co	nposit	ion			Application rate			Nutri	ent app	lied			Comment
				N	P <sub>2</sub> O <sub>0</sub>	8,0	MgO	60	50,	Ne <sub>2</sub> O	(per hectore)	N	P2O5	K <sub>2</sub> O	MgO	CaO	503	Na <sub>2</sub> O	
2	This sail requires organic matter & routine (	1.000 000 000 000 000	Nutri-Bio	0.1	1,2	0	0.2	5	0.8	1.3	12000 kg/ha	12	144	4.8	24	600	96	156	
-	to maintain structure. Consider using an	2011									units/ac	10	115	4	19	490	77	125	
	fortiliser to condition soil. Cover cropping wi	th rys or oats	25 % avail								available in yr 1	3	36	1	6	160	24	39	
	would be beneficial.		DALWARD AND A						- 48			2	29	1	5	120	19	31	
	Starter fert - placement N with P. Consider foliar P as an alternative. Microbial or Manganese seed treatment	65 12/14	Phosphorous																
	NI - feeding active growth. Use an NKS	65 24-30	NK5	23		25	1997 - 19 19	0-21	30	-	200 kg/ha	46	арана С	60	<u>e i</u>		60	<u>, , , , , , , , , , , , , , , , , , , </u>	
	compound or a Urea-Potassium blend										units/ac	37	1	40	1		48		
	N2 - canopy development	65 31-32	NK5	23	:==:+	25	5=	10	30	-	250 kg/ha	67.5	<u> </u>	62.5	<u> </u>	2	75	5=0-	9
											units/ac	46		50			60		
	N3 - grain building	65 37-39	Urea + S	38	- 57		3		19	<u></u>	200 kg/ha	76				-	38		
											units/ac	61	( )		5 3		30		
	4			5		83	TOT		UTRI	ENT	APPLIED (kg/ha)	183	36	114	6	150	197	39	-
								RB2	09 N	com	mendation (kg/ha)	180	20	45	85 V				÷

### W/ Bullack & Pantnan

CATTS Soil Solutions - Provisional Fertiliser Recommendation

Commonts Action Stage Requirement Agronomist : Neil Douglas Fuller NUTRITION Nutritional inputs for optimising plant 65 24 Phosphorous, Magnesium, Manganese, Zinc office tel: (+44) 08453 704706 growth, environemtnal tolerance & disease Phosphorous, Magnosium, Zinc, Sulphur 65 32 mobile : (+44) 07887 743035 resistance 65 39 Magnesium, Sulphur e-mail: soilsolutions@msn.com Foliar Nitrogen with Magnesium & Sulphur Nitrogen, Sulphur, Magnesium FOLIAR 65 69 BASIS R/IE/1964/H AMTRA ANT to maintain grain protein FACTS FE/1684 ICM/646 SWM090 **BETA** 

ALL RECOMMENDATIONS TO BE CONFIDMED BY SOIL ANALYSIS & CROP INSPECTION. Whilst every core is taken in the preparation of these recommendations, no lability can be accepted for unautisfactory results, as no guarantee can be given for product quality. someline accuracy, method of application, disclosure of field history or third-party interpretation. Many factors can affect the efficacy of the recommandation, either before, at or after application, which are beyond our direct cantrol. If in doubt that conditions have changed since these recommendations were made, please contact your agronomist. Always read manufacturers instructions prior to application, collimate equipment & follow product label advice, Responsibility can not be accepted for off-label or unspecified applications. Check the statutory information on product labels for details of environmental, operator sofety, application & other requirements, directors, local authority or National government.

Nov '09

### CATTS Soil Solutions - Provisional Fertiliser Recommendation

Nov '09

W Bui	lock	& F	artners
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nc	Mill Farm, Malvern Footpath Field		Clay loam 7.7	and the	roup L(%)		Min	enar			SNS index Mg index (MgO)	2-		mg/l mg/l		P index K index	1. 1. 1.		40 mg/l 162 mg/l
	Oilseed rape		Fertiliser selection			co	mposi	tion			Application rate			Nutri	ent app	blied			Commonts
				N	P <sub>2</sub> O <sub>0</sub>	140	MgO	600	50,	Ne <sub>2</sub> O	(per hectore)	N	P2Os	K <sub>2</sub> O	MgO	CaO	503	Na <sub>2</sub> O	
2	This soil requires organic matter & routine	1.6.8.9.9.6.	Nutri-Bio	0.1	1.2	0	0.2	5	0.8	1.3	12000 kg/ha	12	144	4.8	24	600	96	156	1
INTO	to maintain structure. Consider using an	20 <b>2</b> -1 - 201									units/ac	10	115	4	19	490	77	125	
	fertiliser to condition soil. Cover cropping wi would be beneficial.	th rys or oats	25 % avail			L					available in yr 1	3	36	1	6	160	24	39	
	would be beneficial.		in company of the	:			-					2	29	1	5	120	19	31	te .
	Seedbed nutrition - Nitrogen &	drilling	Urea	46							85 kg/ha	39.1							
	Phaspharous. DAP or Urea with foliar P as an alternative. Manganese on seed.			120							units/ac	31			3				
	NI - feeding active growth. Use an NK5	4-6 leaf	NK5	23		25			30	с. Т	175 kg/ha	40.26	÷	43.76	<u> </u>		62.6		
BUILDING	compound or a Urea-Potassium blend										units/ac	32	Î.	35			42		
71	N2 - canopy development	stom ext	NK5	23	æ.	25	5=3	:==0	30	<u> </u>	275 kg/ha	63.25		68.75	<del>.</del>	-	82.5	5-C	0
3											units/ac	51		55			66		
	N3 - pod building	pre flower	Urea + 5	38		$\vdash$		4	19	<u>.</u>	200 kg/ha	76	M	8 12 	54	-	38		6
	1947 - 1947 - 19		- and shares the second se								units/ac	61			5	-	30	2	
4				<u>s</u> _1		- 8	TOT	AL N	UTR	ENT	APPLIED (kg/ha)	222	36	114	6	150	197	39	2 2
								RB	209 r	ecom	mendation (kg/ha)	220	×5 2	20	25. V		с. С		с. С

220	Action	Stage	Requirement	Commonts	Agronomist : Neil Douglas F	<sup>p</sup> uller
ION	Nutritional inputs for optimising plant	2 loaf	Phosphorous, Magnesium, Manganese, Zinc		office tel: (+44) 08453 7	704706
e	growth, environemtnal tolerance & disease	stam axt	Phasphorous, Magnesium, Zinc, Boron, Sulphur		mobile : (+44) 07887 7	743035
ş	resistance	pre flower	Magnesium, Boron, Sulphur		e-mail: soilsolutions@	man.com
ą	Foliar Nitrogen with Magnesium & Sulphur	pod	Nitrogen, Sulphur, Magnesium		BASIS R/IE/1964/H	AN TRA ACCO
IIO	to maintain oil & sood production			1	FACTS PE/1684	ICM/646
	-				SWM090	IETA

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The Mill Farm, Malvern

### Dedicated Analysis for Integrated Soil, Plant & Animal Nutrient Management

e-mail : soilsolutions@msn.com

Advisor Steve Townsend

### Sample Ref Drive Field

arable

arable

Soil class 3 Mineral

Stones <5%

Agrimax Soil pH (water) 6.4

Clay texture

Soil OM 3.3%

Soil pH (salt) 5.8

Kar

4.55

0.87 0.82

0.36

1.75

OPTA OPTA

Water

EDTA

EDTA

Major Nutrien	ts (mg/l)	Defici	t	ما	5	60	od	H	igh	۱.	Ex	cess	s	Kar	Elemental (mg/l)	Micro-Nutrie	nts (mg/l)	Def	ficit	L	×	6	ood	н	igh	Ð	xce	\$
Phosphate, P <sub>2</sub> O <sub>5</sub>	9.0 0			1	Γ	Τ	Τ	Π	Τ	T	Т	Т	T	0.50	3.9 P	Iron, Fe	141.0											1
Potassium, K <sub>2</sub> O	114.0 1+						T	Π		T	T	T	T	0.58	94.6 K	Manganese, Mn	25.1			/			1	Π	Τ	Π	Π	
Magnasium, MgO	672.0 7												1	6.85	405.2 Mg	Boron, B	1.6					•	Τ	Π			Π	_
Calcium, CaO	4054.1 3					7		Π		Τ	Τ	Ι	Ι	0.86	2897.5 Ca	Zinc, Zn	2.5				Γ	Π		Π			Π	
Sodium, Na <sub>2</sub> O	27.1 2							Π		Ι	Τ	Ι	Ι	0.71	20.1 Na	Coppor, Cu	10.5							<b>_</b>			Π	
Sulphate, SO3	24.0 1							Π		Ι	Τ	Ι	Ι	0.55	9.6 S	Molybdenum, Mo	-				Π	Π		Π			Π	
Nitrogon, NH <sub>4-ENR</sub>	20.6 2		7	Ι				Π		Ι	Τ	Ι	Ι	0.33	103.6 N	Cobalt, Co	-				Γ	Π	Ι	Π			Π	
Nitrate, NO <sub>3</sub> "			Τ	Ι				Π		Ι	Ι	Ι	Ι			Iodine, I	-				Γ	Π	Ι	Π			$\Box$	
K:Mg ratio	0.2 :1		Τ					Π		Τ	Τ	Γ				Selenium, Se	-				Π	Π	Τ	Π			Π	
Mg:P ratio	74.7 :1												1			Chloride, Cl	-				П	Π	Т	Π	Т	Γ	Π	

Cation Exchang	s (cmol <sub>o</sub> /kg)	Deficit	Low		Good	ł	lgh	ł	Exce	ess	mg/l	K mag(kg)	BCSR	Soil Parent I	Natorial	Deficit	Low	•	600	bd	Hķ	gh	Ex	cess	
Total CEC	31.30							Τ						Soil pH	6.4					Π		$\Box$		Τ	
Calcium, Ca <sup>2+</sup>	19.70					Γ		Τ			3946.4	-2281.2	62.94	Conductivity	2104.0 uS							$\Box$			
Magnesium, Mg <sup>2+</sup>	4.64				<mark>/</mark>						544.8	745.4	14.50	Bulk Density	4.148 s/ust				/						
Potassium, K*	0.25					Γ		Τ			97.5	-335.0	0.80	Infiltration ratio	0.002 mt/s			Π		Π		$\Box$		Ι	
Sodium, Na*	0.11			Τ		Γ		Τ			28.6	-73.7	0.35	Sand	12.0 %					Π		$\Box$			
Iron, Fe <sup>2*</sup>	0.50				<b>.</b>						159.0	220.6	1.61	Silt	42.0 %					-		$\Box$			
Aluminium, Al <sup>3+</sup>	3.26							Τ			311.6	324.4	10.37	Clay	46.0 %									Τ	0.944 Kx
Hydrogen, H	2.82							Τ			28.5	35.7	9.00	Organic Carbon	1.89 %		/		1	Π		$\Box$		Τ	0.056 Kr
Other cations	0.13					Γ		Τ				-8.6	0.42	Microbial assay	وب 211.0 يو					Π		Π		Τ	FDA extract
Ca:Mg ratio	4.3 :1			Τ				Τ						C:N ratio	-					Π		$\square$		Γ	
Mg:K ratio	18.2 :1													N:S ratio	-					Π		$\Box$		Τ	

Results relate solely to sample provided. Analysis conducted to ISO 17025, DEFRA ref 42720 & EC Soil & Water Framework Directives. Developed in association with the Albrecht Foundation for use throughout the EC. All rights reserved @ 1985-2009

### CATTS Soil Solutions - Provisional Fertiliser Recommendation

group 3 Mineral

O.M.(%) 3.3

SNS index

Mg index (MgO)

2

7

104 mg/l

672 mg/l

Nov '09

9 mg/l

114 mg/l

P index (P2O3) 0

Kindex (K,O) 1+

W Bullock & Partne	rs		
The Mill Farm, Malvern		soil type	Clay
Drive Field		pH	6.4
W Wheat	feed		Fertiliser sel

	W Wheat feed		Fortilisor selection			con	spositio	on			Application rate			Nutri	ent app	blied			Commont
				N	P <sub>2</sub> O <sub>8</sub>	140	MgO	CeO	50,	Ne <sub>2</sub> O	(per hectore)	N	P2Os	K <sub>2</sub> O	MgO	CaO	503	Na <sub>2</sub> O	
BUTLDING	This soil requires organic matter & routine Co to maintain structure. Consider using an o	Section of the sectio	Cal.lime	1			12.14	60	10	<i>a</i> :==	4000 kg/ha units/ac	·	27 - X	·	21	2400 1920	-	3 35.0	
SOL BU	fortiliser to condition soil. Cover cropping with would be beneficial.	h rye or oats	45 % avail								available in yr 1					1080			
en i	Starter fert - placement N with P.	65 12/14	MAP	ш	52		-		- 25	3	100 kg/ha	Ш	52	5 12	23 J	864	15	3 0	
	Consider foliar P as an alternative. Microbial or Manganese seed treatment		1000	0	102						units/ac	9	42		3				
	NI - feeding active growth. Use an NKS	65 24-30	NK5	23		25		- 24	30	1	200 kg/ha	46		60	8 <u>0</u>		60	2	
BUILDING	compound or a Urea-Potassium blend										units/ac	37		40			48		
	N2 - canopy development	65 31-32	NK5	23		25	6=3	-0	30	0=	250 kg/ha	67.6	<u> </u>	62.5	0 <u> </u>	-	75	5=0 C	,
2											units/ac	46		50			60		
	N3 - grain building	65 37-39	Urea + 5	38	- 53		3 34		19	4) - S	175 kg/ha	66.5	94	8 - 18 	W		33.3	a 18 8	
	6C/ (B	0000000000		1996					2.6325		units/ac	53			9		27		
-				6 - Y		83	TOTA	LN	JTRI	ENT	APPLIED (kg/ha)	181	52	113	0	1080	168	0	
							1	RB2	09 n	ecom	mendation (kg/ha)	180	110	70	25 - Y		с.	11 - 11 A	

220	Action	Stage	Requirement	Commonts	Agronomist : Neil Douglas Fulle	ler.
ION	Nutritional inputs for optimising plant	65 24	Phosphorous, Magnesium, Manganese, Zinc		office tel: (+44) 08453 704	706
e	growth, environemt <mark>n</mark> al tolerance & disease	65 32	Phosphorous, Magnesium, Zinc, Sulphur		mobile : (+44) 07887 743	035
Z	resistance	65 39	Magnesium, Sulphur		e-mail: soilsolutions@msr	m.com
ą	Foliar Nitrogen with Magnesium & Sulphur	65 69	Nitrogon, Sulphur, Magnesium		BASIS R/IE/1964/H A	WITRA ACCR
IIO	to maintain grain protoin			1	FACTS FE/1684 10	CM/646
					SWM090 M	ETA

ALL RECOMMENDATIONS TO BE CONFIRMED BY SOIL ANALYSIS & CROP INSPECTION. Whilst every are is taken in the preparation of these recommendations, no lability can be accepted for unastisfactory results, as no guarantee can be given for product quality, sampling accuracy, method of application, disclosure of field history or third-party interpretation. Many factors can affect the efficacy of the recommendation, either before, at or after application, which are beyond our direct cantral. If in doubt that conditions have changed since these recommendations were made, please contact your agronomist. Always read manufacturers instructions prior to application, calibrate equipment & follow product label advice. Responsibility can not be accepted for efficiency of their customers. Check the statutory information on product labels for details of environmental, operator safety, application & other requirements. Browers are responsible for ensuring that the recommendations comply with any protocols or restrictions placed on them by their customers, directors, local authority or National government.

### CATTS Soil Solutions - Provisional Fertiliser Recommendation

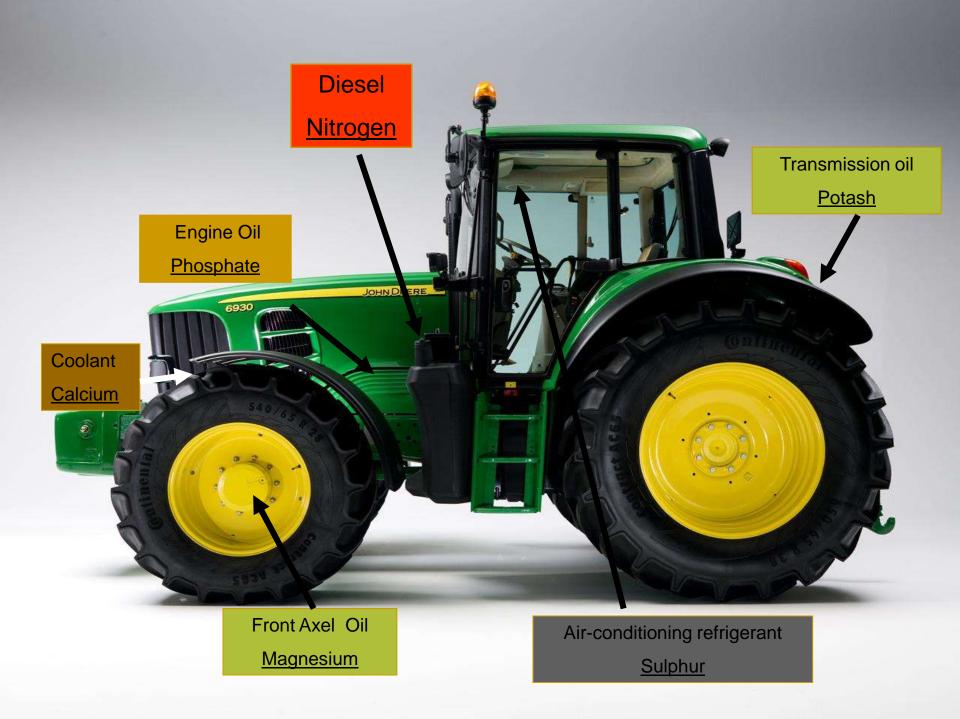
Nov '09

W Bul	lock	å	Partners
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The	Mill Farm, Malvern Drive Field	soil type pH	Clay 6.4		roup L(%)		Min	snal			SN5 index Mg index (MgO)	2 7		mg/l mg/l		P index K index	12.00		9 mg/l 114 mg/l
Oilseed rape		Fertiliser selection composition					Application rate	Nutrient applied					Commonts						
				N	P <sub>2</sub> O <sub>0</sub>	140	MgO	60	50,	Ne <sub>2</sub> O	(per hectore)	N	P2Os	K <sub>2</sub> O	MgO	CaO	503	Na <sub>2</sub> O	
me.	This soil requires organic matter & routine to maintain structure. Consider using an	1.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0.1	1.2	0	0.2	5	0.8	1.3	12000 kg/ha	12	144	4.8	24	600	96	156	
	for tilisor to condition soil. Cover cropping wi	2000 1 100	CONTRACTOR			L					units/ac	10	115	4	19	490	77	125	
	would be beneficial.	ni i je ci ocis	25 % avail								available in yr 1	3	36	1	6	160	24	39	
201							<i>c</i> =	5 3	- 33	32		2	29	4	5	120	19	31	÷
	Seedbed nutrition - Nitrogen &	drilling	MAP	п	52						100 kg/ha	п	62						
	Phaspharous. DAP or Urea with foliar P as an alternative. Manganese on seed.		and agen								units/oc	9	42		<b>3</b> )			-	
	NI - feeding active growth. Use an NK5	4-6 leaf	NK5	23		25		0 - 23	30	÷	175 kg/ha	40.26	<u> </u>	43.76	<u> </u>		62.5		
BUILDING	compound or a Uree-Potassium blend										units/ac	32	î.	35	1		42		
	N2 - canopy development	stom ext	NK5	23	i=è	25	5==	:==0	30	<i>0</i> =	275 kg/ha	63.25	3 <u> </u>	68.75	: <u></u>	2	82.5	s=0	0
CBOP											units/ac	51		55			66		
	N3 - pod building	pre flower	Urea + 5	38		⊢	3	6 - 3 - 3	19	3)=	200 kg/ha	76	N	: 18 	54	-	38		
	PRF 10	9999 CB 99199655									units/ac	61	Į		Į	-	30		
0	5. S.			-	_	- 8	TOT	AL N	UTRI	ENT	APPLIED (kg/ha)	194	88	114	6	150	197	39	2 2 2
								RB2	09 r	ecom	mendation (kg/ha)	220	100	65	25 V		2. C	10 - CA	

120	Action	Stage	Requirement	Commonts	Agronomist : Neil Douglas F	uller
NOL	Nutritional inputs for optimising plant	2 loaf	Phosphorous, Magnesium, Manganese, Zinc		office tel: (+44) 08453 7	704706
æ	growth, environemtnal tolerance & disease	stam axt	Phasphorous, Magnesium, Zinc, Boron, Sulphur		mobile : (+44) 07887 7	43035
5	resistance	pre flower	Magnesium, Boron, Sulphur		e-mail: soilsolutions@	msn.com
¥	Foliar Nitrogen with Magnesium & Sulphur	pod	Nitrogen, Sulphur, Magnesium	l.	BASIS R/1E/1964/H	AM TRA ACCO
TIO	to maintain oil & seed production				FACTS PE/1684	ICM/646
					SWM090	RETA

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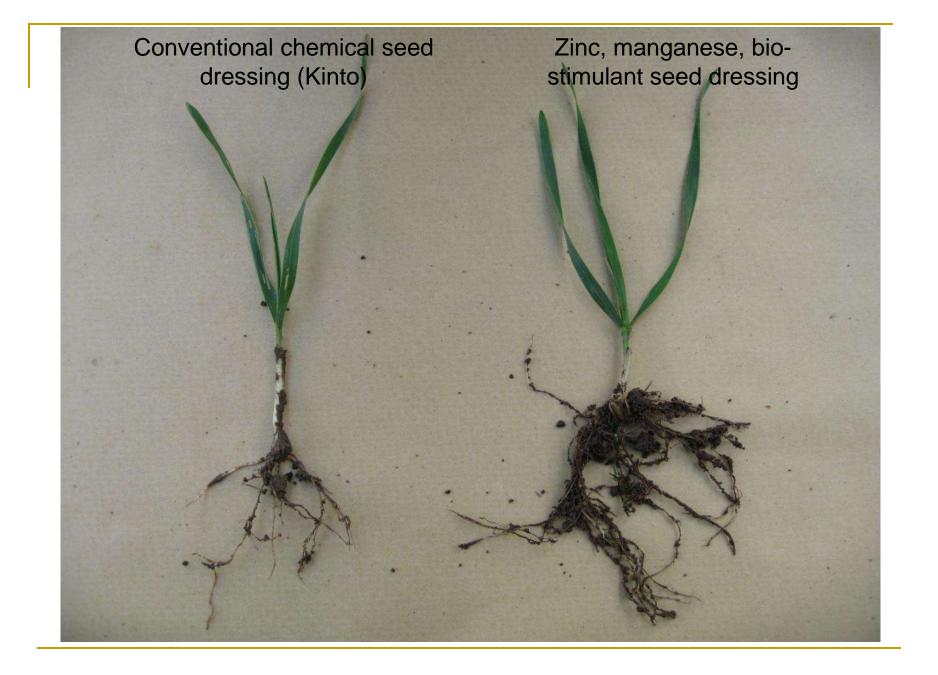


Solution:

to attempt to rebalance Calcium/Magnesium ratio

- Compost Organic Matter
- <u>Gypse</u> (Calcium Sulphate 19%-21%)
   @ 5tons/ha
- <u>Limex</u> Calcium, phosphate and sulphur @ 5 tons/ha







### Maxi-phi products

Product & rate	Winter Wheat	Timing	Cost/ha
		Thining	0000/114
Maxi-phi Manganese	1.0 l/ha		£2.15
Maxi-phi Zinc	+ 1.0 l/ha		£2.56
	+		~=!00
Maxi-phi Hi-Mag	1.0 l/ha		£1.50
Activate MP	+ 1.0 l/ha		£4.42
Maxi-phi Manganese	0.5 l/ha		£1.08
	+		
Maxi-phi Hi-Mag	2.0 l/ha +		£3.00
Maxi-phi Sulphur	2.0 l/ha		£5.20
	+		
Activate MP	0.5 l/ha		£2.21
Maxi-phi Manganese	0.5 l/ha		£1.08
	+		
Maxi-phi Hi-Mag	2.0 l/ha		£3.00
Maxi-phi Sulphur	+ 2.0 l/ha		£5.20
	+		
Activate MP	0.5 l/ha		£2.21



## Grain Quality 2010 harvest

Field Code	Variety	Treatment	Moisture	Specific wt	Protein	Hagberg	Estimated yield
OH1	Solstice	Maxi-phi	14.60	79.5 kg/hl	14.01	349	7.5 ton/ha
OH2	Solstice	Conventional	15.10	79.7 kg/hl	13.95	300	7.5 ton/ha
С3	Solstice	Max-phi	14.60	81.8 kg/hl	13.86	393	7.5 ton/ha
C4	Solstice	Conventional	14.80	79.1 kg/hl	12.80	313	7.5 ton/ha
F5	Solstice	Maxi-phi	14.90	80.2 kg/hl	13.01	353	8.75 ton/ha
F6	Solstice	Conventional	15.20	80.9 kg/hl	10.47	342	8.75 ton/ha

## SD v Strip-Till Soil Temperature

Starter Fertilisers – Fertiliser placement ?

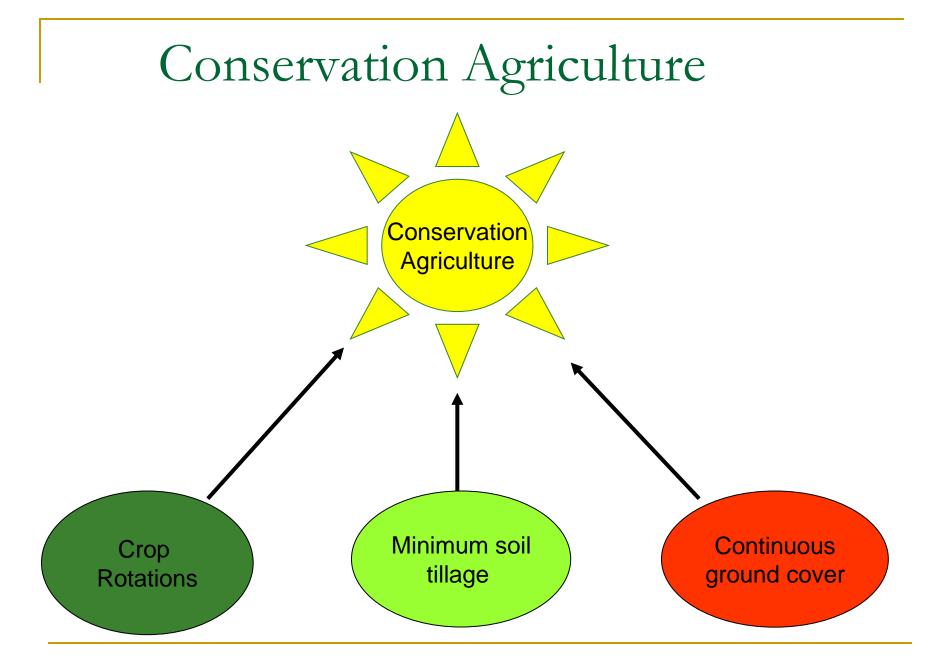
## Summary

- Rotation
- Residue management
- Soil type/structure/drainage
- Weed control
- Choice of varieties
- Drill early
- Check soil fertility status
- Monitor and control slugs









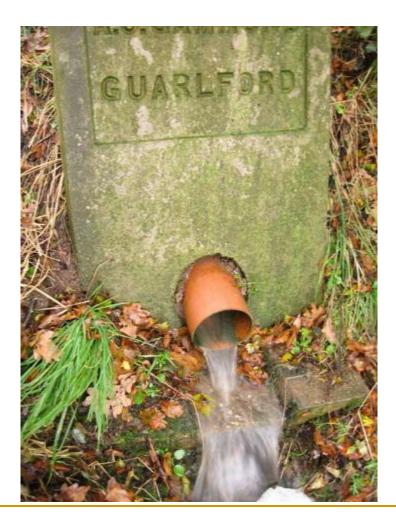
## Financial pressures are now even greater



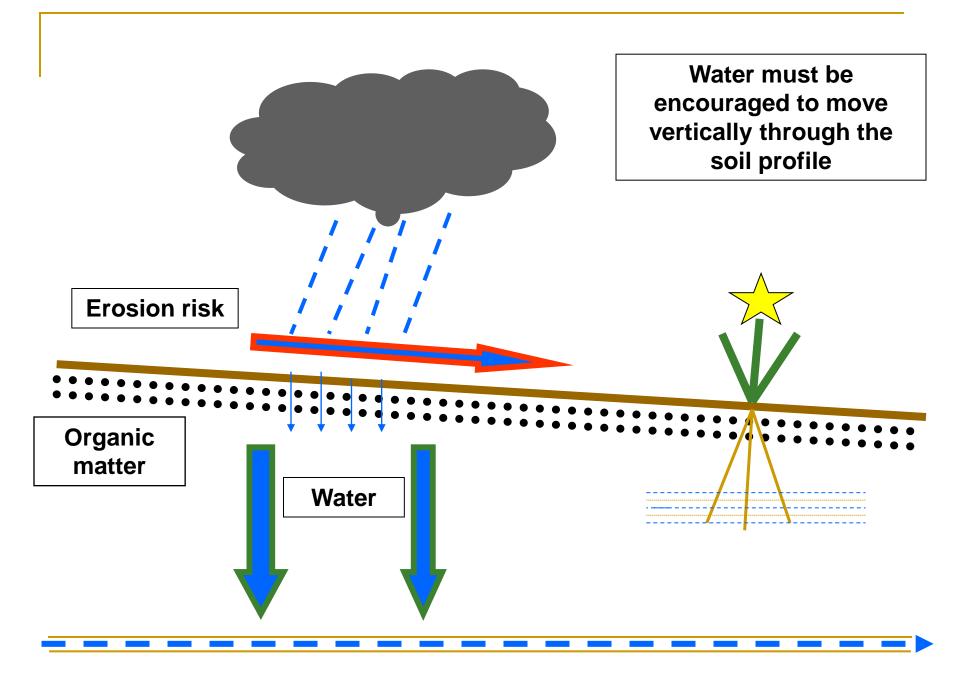
- Fertiliser
- Fuel
- Transport
- Machinery
- Rents
- Labour
- Interest rates/loan repayments

Who has actually Banked £200/ton for wheat in the so called good times?

## Drainage water – how clean is yours?







# Mechanical soil re-structuring

#### Only if necessary. Dig first!

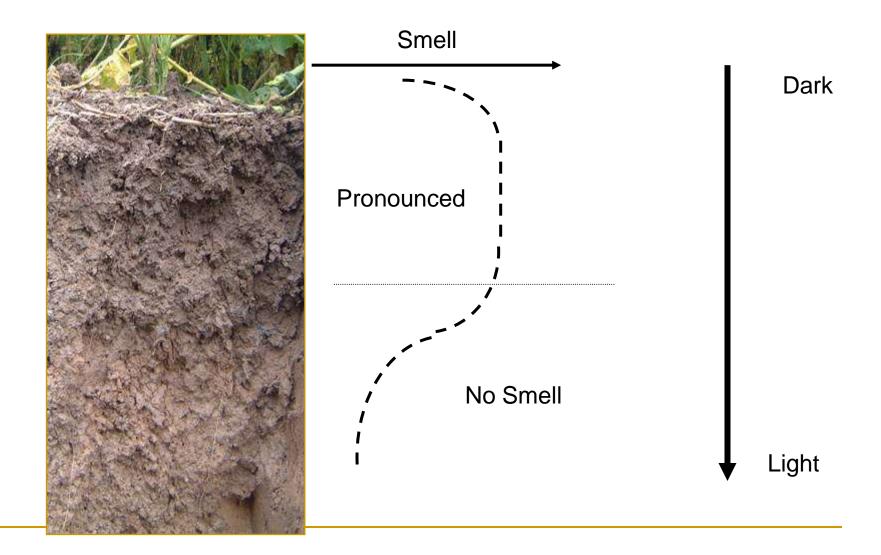
- Possibly only compacted headlands & access points
- Danger of disrupting natural soil structure
- Expensive and time consuming



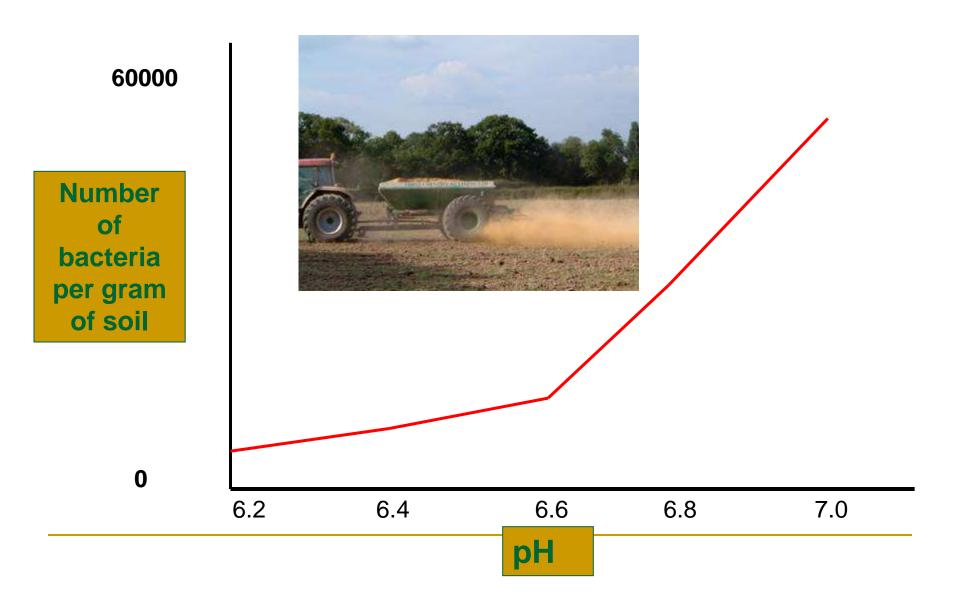
### Evolution of natural soil structure



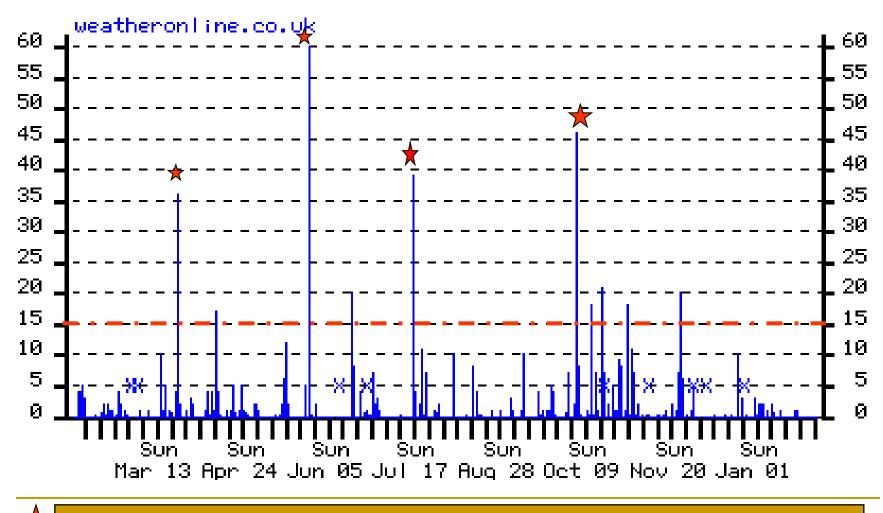
# Organic Matter - Soil Smell/Colour



#### The influence of pH on soil biological activity



# Rainfall Great Malvern 2005/06



25% of rainfall in 4 days and a further 15% in 6 days = 40% in 10 days









# Naturally soils are colonised by restructuring and fertility building plants



# Always wait for weeds and volunteers to emerge





 Grass weeds growing in crop

# Slug control



- Monitor immediately after harvest
- Apply pellets pre-drilling if slug problem
- Monitor until crop fully emerged
- Always apply pellets to OSR at emergence
- Slug problem reduced after 3-4 years

## Min-till – it doesn't work.....?



Stale seedbed Triggers -

 Weed and volunteer germination

 Breakdown of crop residues

# Unless time is on your side.....

# Min-till promotes germination of weeds & volunteers



# Poor crop establishment due to N lock-up



# Long stubble



- Less material passing through combine - reduced fuel consumption
- Straw remains evenly spread
  - Residue takes longer to breakdown reducing Nitrogen tie-up (OSR)

Provides soil cover

# OSR direct drilled with disc drill



# Poor establishment due to

- Hair-pinning
- Slugs
- Smeared and compacted slots
- Water-logging

# OSR in Chopped Straw



Winter beans direct into undisturbed wheat stubble and chopped straw





# Roots – stabilise soil structure







# Volunteer OSR as a cover-crop

- Inexpensive
- Maintains soil structure
- Re-cycles nutrients
- Adds organic matter
- Maintains soil moisture
- Possible slug problems
- High rates of glyphosate required to destroy cover
- Weed control ?







#### Wheat min-tilled into oat residue



# Crops ready for harvest August 2007/08





# Wet straw – severe wheelings





#### Worse in 08 than 07

# Cultivation necessary to remove compaction and level soil surface







# The most cost effective piece of cultivation machinery !

