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BUSINESS AIM

High yielding, efficient arable crops while working safely alongside the environment.

BUSINESS OVERVIEW

- Myself and 1 full time member of staff, plus father and uncle at peak times
- All work carried out ourselves apart from variable rate lime spreading
- Plant business and buildings rented – both benefit the arable side of the business
- Total of 415ha owned plus 75ha rented

KEY RELATIONSHIPS

- Family
- Staff
- Bank manager
- Insurance
- Accountant
- Agronomist
- Grain Traders and Maltsters
- Neighbours
- SRUC - trials and consulting for IACS etc

CROPPING AREAS

Crop	Total Crop (%)	Total Crop (ha)
Green Cover	5.88	21.64
Potatoes	4.04	14.87
Spring Barley (Diablo) malt and seed	47.78	40.56
Spring Barley (Laureate)		86.85
Spring Barley (KWS Sassy)		48.57
Winter Barley (KWS Orwell)	13.40	45.35
Winter Barley (KWS Tower)		4.00
Oilseed Rape (DK Platinum)	7.31	26.94
Winter Wheat (KWS Lili) 2	21.60	26.31
Winter Wheat (Skyscraper) 4		23.83
Winter Wheat (Barrel) 3		29.41
Total (not including trials)		**368.33**

GREENING AREAS

	Location	Field	Notes	Area (ha)
Margins/ buffer strips	Kirkton	Clay Kinaldie	19.90m along top	0.61
	Kirkton	MidHaugh	6m round don ajusted for Bam Road	0.84
	Kirkton	Station Haugh	6m round don ajusted for Bam Road	0.30
	Kirkton	Footpath Bothy	6m top headland only	0.10
	Kirkton	Deystone	6m, 3 sides but not road	0.36
	Kirkton	Manse	6m, bottom headland	0.14
	Aquherton	Ditch	6m, bottom headland next to wood	0.09
	Aquherton	Howe	6m next to all ditches	0.49
	Aquherton	House	Aqu cottage to Thomson gate	0.20
	Aquherton	50 acre	Ditch along beside track	0.12
	Aquherton	Gushet	6m, 3 sides but not road	0.61
	Aquherton	Low	6m, 3 sides but not next to grass	0.28
	Aquherton	Cottage	6m Round ditches	0.12
	Aquherton	Burnside	6m side and top	0.20
	Aquherton	Scattie DW(new)	4m bottom and burnside side	0.30
	Floors	Pump	6m next to Feithhill	0.19
	Floors	Cottage	6m next to ditch feithhill side	0.35
			Total	**5.31**
			Weighing factor	1.50
			Total * Weighing factor	**7.96**
Fallow	Aquherton	Low	Rory's sheep park	2.70
	Floors	Steading	Steep area can graze after 15th July	2.22
	Floors	Top gushet	Grass for sheep after 15th July	8.09
			Total	**13.01**
			Weighing factor	1.00
			Total * Weighing factor	**13.01**
Total area of buffer/margins + fallow				**18.31 (5.22% of total area)**

AECS AREAS

Scheme	Area (ha)
Grass margins	3.10
Green manure	20.00
Water margins	0.25
Wild bird seed	1.95
Total	**25.3**

- Efficiency/ha is everything - poorest yielding areas now in schemes.
- Total area of farm environmental schemes (greening areas and AECS) is 11% plus 34ha of winter stubble.

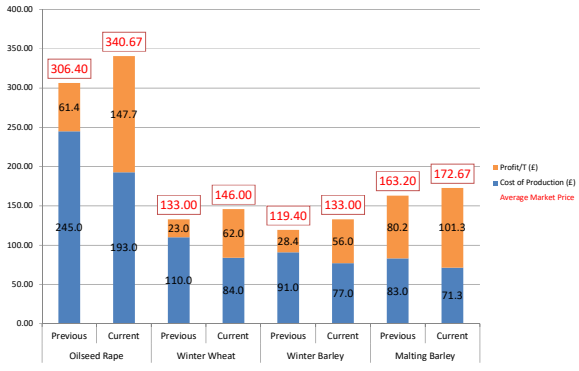
MAIN CHALLENGES

- **Crop establishment**
  - Costs were high and fuel use was getting ridiculous . I did not know what was costing the money and where savings could be made.
  - Wet areas in fields and some fields used to be unsuitable for winter cropping, some could not be cropped at all. Brome and annual meadow grass did not give us the chance to grow seed crops.
  - Narrow machinery and stones in fields resulted in high labour and time to remove them.
  - Wheel markings from rollers and crop deficiencies causing yield loss.
  - Soil erosion was bad and had no cover crops or correct equipment to cope with it.

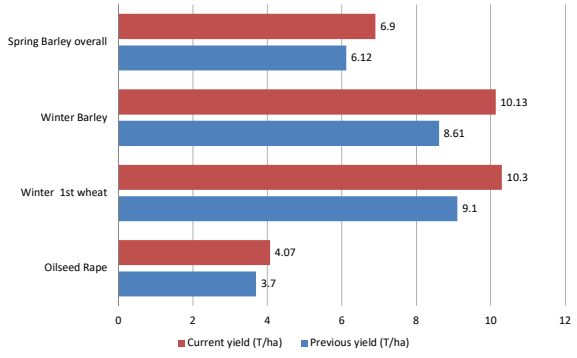
MAIN CHALLENGES

- **Working in a family business**
- **Marketing** - previously mostly spot, I have now gained far more experience of grain marketing and contracts and got all averages up.
- **Input costs** - did not have any control as had no FYM or slurry. Also struggled to buy bagged N early due to lack of storage.
- **Storage** - a lack of storage on farm meant we could only grow 1 malt variety.

COSTINGS



YIELD IMPROVEMENTS



OILSEED RAPE EXAMPLE

OSR					
Sprays (weeds, LLSX2 +2 mid flower, pod stick roundup)	£249.00				
Fertiliser (including slurry and FYM)	£219.00				
Lime (& soil testing)	£24.71				
New platinum seed	£93.80				
TOTAL INPUTS	**£586.51**				
Work involved including fuel (£0.60), insurance, tyres, repairs, time, spares and depreciation			Fuel	Litres	Cost
Terrano	£20.00		TERRANO	8.6	£ 5.16
Horsch drill cali fert or P&K	£25.00		DRILL	7.4	£ 4.44
Discing ends/stones	£2.50		ROLL	2.5	£ 1.50
Rolling/stones	£5.00		SPRAY	11	£ 6.60
Fert spreading (x3)	£13.40		FERT	11	£ 6.60
Spraying (x6)	£26.80		HANDLING	10	£ 6.00
Slugs	£16.00		COMBINE	21	£ 12.60
Combining	£50.00		other	1	£ 0.60
Grain Handling	£7.50		DRYER	49	£ 24.50
Drying @ 6%	£30.00	slow dry	**Total**	**121.5**	**£ 68.00**
TOTAL WORK	**£196.20**				
TOAL COST	**£782.71**				
Income (4.05t/ha x £350 including bonus)	£1,417.50				
Profit / ha	£634.79				
Growing cost/T	£193.26				
Growing cost/T 4years ago	£245.00	Swather, sprayer and ploughing. Bagged fert less yield due to clubroot and sclerotinia.			

SPRAYER EXAMPLE

Cost to buy	£ 56,500.00	Sep-14	
Estimated sale value	£ 45,000.00	Mar-19	
	£ 0.67	/ha on fuel	
	£ 500.00	/year on insurance	
	£ 2,300.00	/year on parts, MOT & chassis service	
	£ 2,875.00	/year depreciation	
Total annual costs	£ 5,675.00		

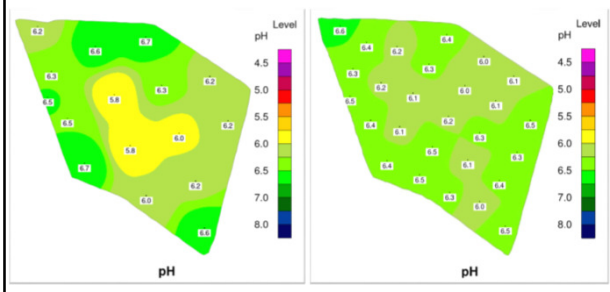
	Number of runs	Crop	Hectares	Total fuel costs	Total hectares for all runs	Time taken (hours), assuming 9ha/hour	Cost of hours (£15/hour)
	11	Wheat	61	£ 449.57	671	74.56	£ 1,118.33
	6	Spring Barley	170	£ 683.40	1020	113.33	£ 1,700.00
	10	Winter Barley	40	£ 268.00	400	44.44	£ 666.67
	10	Oilseed Rape	62	£ 415.40	620	68.89	£ 1,033.33
Totals	**37**		**333**	**£ 1,816.37**	**2711.00**	**301.22**	**£ 4,518.33**

Total cost per year	£ 12,009.70	
Cost/ha	£ 4.43	(for info - Agrii are £10/ha)

IMPROVED CROPS & COSTINGS

- Aim to always increase yields through improving soil health, tissue testing and modernisation while remembering the basics
- Choosing varieties which are suitable for local markets and as good as practically possible for disease ratings
- Having control over input costs now via slurry and farmyard manure and working with neighbours
- Tailor made Seed and Agchem programs

SOIL MAPPING COMPARISON (pH)



2012 2018

GPS LIME

- One of the ways we have improved yields, especially for winter barley for not locking up manganese, is by more efficient lime application – a challenge on our sandy loam soils.

	Average pH	Lime rate required (at 1T/ha per 0.1pH for calcium lime)	Field Size	Lime required	Lime cost (£25/T)	Spreading cost	Sample/ walking cost	Total cost
Traditional W format	5.9	4T/ha	13.64ha	54T	£1350	£300 (£5.50/T)	£98	£1748
Using GPS data	See map	*GPS*	13.64ha	19.8T	£495	£134 (£6.75/T)	£314	£943
								Cost saving for field: £805 £59/hectare

- In 2018, I had ordered lime for the field but only 10T was required when got maps back so I was able to apply the leftovers to another field to save waste.

DRAINAGE

- Old, shallow stone drains causing lots of problems and loss due to burst drains drowning crop and damaging soil
- Invested to improve drainage with jetter over last 5-10 years. Advanced Laser technology and vast experience gained in last 3 years.
- Resulted in improvement in yields and better soil health particularly for winter crop to keep rotations as planned.

FERTILISER & FARMYARD MANURE

- Savings on fertiliser due to FYM and slurry from neighbour (av £25/ha over last 3 years)
- Move to liquid fertiliser 3 years ago. Benefits include reduced handling costs and labour, and more accurate use of nutrients.
- Up to 30% yield increase on headlands

CROP ESTABLISHMENT

- Recently moved to a Horsch trailed drill saving 50% fuel usage plus reduced soil erosion, resulting in better yields.
- More efficient use of tractors - have managed with a tractor less.
- 14.3m rollers giving controlled traffic farming saving tramping around 20ha of crop with 710 tyres.
- Others in area have seen benefit allowing us to take on contracting work.

MACHINERY

Machinery purchases	Year of Purchase	Cost if new	Price Paid	Comments
New Holland T7260	2016	£110,000.00	£68,000.00	With GPS fitted
Bateman RB35SPRAYER	2015	£200,000.00	£56,500.00	Ideal size and age for us
Horsch Pronto Drill	2017 (2 year demo before)	£75,000.00	£36,000.00	Did some work on it to make it like new for not very much money
Volvo Loading Shuffle/Tele Handler	2018	£70,000.00	£30,000.00	More capacity and reliable than a tele handler
		£455,000.00	£190,500.00	
With the £264,500 saving we built a new tray drier (95k) and invested in a Terrano (£13k) and JCB Fastrac (£115k). Working closely with the accountant we also took benefit of the AIA before Brexit.				

IMPROVEMENTS

- 2014 benchmarked my farm average over the event Cereals in Practice.
- Whole farm Winter Barley average up 1.52T/ha over last 4 years
- Winter Barley at Aquherton saw biggest improvement of 2.71T/ha (7.9T/ha in 2013 to 10.61T/Ha in 2018) due to a range of improvements driving on yields.

GRAIN MARKETING

- New moisture meter
- Storage for everything
- Grain contracts
  - Benefits of malting over feed (average of £43.80/T premium over 5 years)

GRAIN RESULT DATA

	Reference			Movement		Details			Carrier		Adjustments
#	Contract	Movement	DI/Booking Ref	Date	Weighbridge	Product	Quantity	UOM	Carrier	Vehicle Reg	Price Adjustment
1	P874102	MN/05641361	1838250 DI 4641362 BK	27/09/2018	99539	Laureate Malting Barley	20.600	mt	THOMAS EDDIE XX924	SV12AUW	
				MOI 12.40% ADM 0.00% NIT 1.27% 2.5 2.90% 225 1.30% GER 98.00%							
2	P874102	MN/05641450	1838250 DI 4641363 BK	27/09/2018	99549	Laureate Malting Barley	20.460	mt	THOMAS EDDIE XX924	SV12AUW	
				MOI 12.67% ADM 0.00% KG 65.40kg/hl NIT 1.23% 2.5 2.40% 225 1.00% GER 98.00%							
3	P874102	MN/05641618	1838250 DI 4647230 BK	27/09/2018	99560	Laureate Malting Barley	20.460	mt	THOMAS EDDIE XX924	SV12AUW	
				MOI 14.25% ADM 0.00% NIT 1.32% 2.5 2.30% 225 0.90% GER 98.00%							
4	P874102	MN/0007351NEWGR	1839705 DI 4649460 BK	01/10/2018	41149	Laureate Malting Barley	28.020	mt	MACKIE	SV61FEU	
				MOI 14.90% ADM 0.00% KG 64.40kg/hl NIT 1.31% 2.5 2.00% 225 0.50% GER 98.00%							
5	P874102	MN/05645526	1840840 DI 4651708 BK	04/10/2018	99693	Laureate Malting Barley	28.400	mt	W&W MACKIE YY1300	SV11ASO	
				MOI 14.51% ADM 0.00% NIT 1.31% 2.5 2.30% 225 0.80% GER 98.00%							
6	P874102	MN/05646668	1842181 DI 4655438 BK	05/10/2018	99731	Laureate Malting Barley	28.100	mt	W&W MACKIE YY1300	WW18MAC	
				MOI 14.78% ADM 0.00% NIT 1.32% 2.5 3.10% 225 1.40% GER 98.00%							
7	P874102	MN/05646728	1842181 DI 4655439 BK	05/10/2018	99733	Laureate Malting Barley	28.940	mt	W&W MACKIE YY1300	WW69MAC	
				MOI 14.43% ADM 0.00% KG 66.10kg/hl NIT 1.32% 2.5 3.10% 225 1.10% GER 98.00%							
8	P874102	MN/05649437	1843885 DI 4657968 BK	11/10/2018	99804	Laureate Malting Barley	28.360	mt	W&W MACKIE YY1300	SV11ASO	
				MOI 14.09% ADM 0.00% KG 65.30kg/hl NIT 1.34% 2.5 2.20% 225 0.60% GER 98.00%							
9	P874102	MN/05649663	1843885 DI 4657969 BK	11/10/2018	99810	Laureate Malting Barley	28.680	mt	W&W MACKIE YY1300	SV11ASO	
				MOI 14.05% ADM 0.00% NIT 1.34% 2.5 3.00% 225 0.90% GER 98.00%							

THE FUTURE

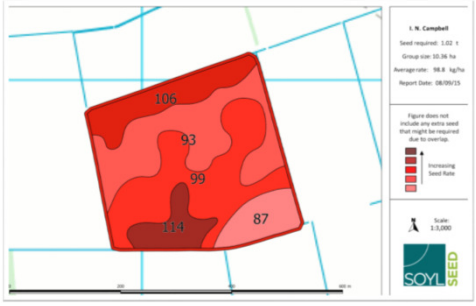
- Lower establishment costs (use of chicken muck, Pot ale and digestate) **£80 wheat/T cost**
- Continue to look after soil and plant health.
- Have a good succession plan and staff who continually can do multiple tasks.
- Use technology (RHIZA) map in Wild oat patches, vary rate N etc.
- Whatever Brexit brings I believe I have set the business up as well as possible to cope with any challenges ahead.

INVOLVMENT/ACHIEVMENTS

- Over 500 SRUC students on visits/Wheat Challenge
- Young Farmers
- Local Brownie Group visit
- Involvement in local shows and with schools
- Chair of North East Farm Management Association
- Benchmarking & Networking

EXTRA SLIDES FOR DISCUSSION IF REQUIRED

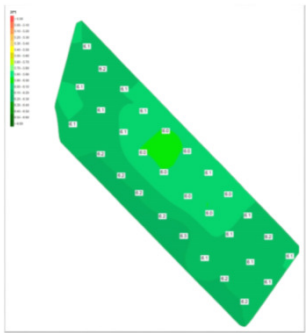
V.R SEED



Trial over 2 seasons, including dissertation by SRUC student, concluded that there wasn't a benefit for our soil type for variable rate seed. Chose to prioritise spending on drainage and soil health.

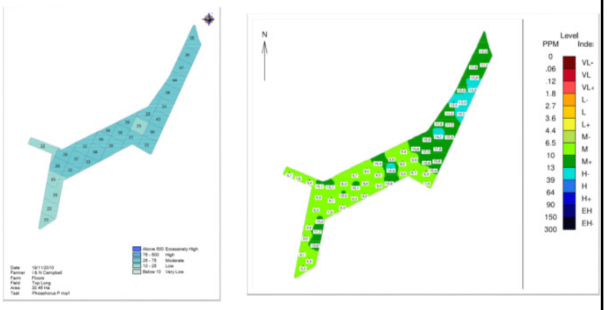
SOIL MAPPING COMPARISON (pH)

2013



2018

SOIL MAPPING (phosphate)

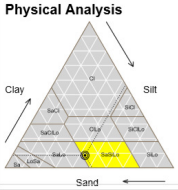


2010 2017

SOIL ANALYSIS RESULTS

Sample Ref 50 ACRE
Sample No E244841/02 / CAMP0053
Crop WHEAT
Date Received 04/05/2018
Area 20

Physical Analysis



Analysis	Result (%)
Sand	48.33
Silt	43.12
Clay	8.55
Soil Type	SaSiLo
	Sandy Silt Loam

Property	Assessment
Available Water	Low to Medium
Drainage Rate	Rapid
Inherent Fertility	Low to Medium
Potential C.E.C.	Low to Medium
Leaching Risk	High to Moderate
Warming Rate	Rapid

Biological Analysis

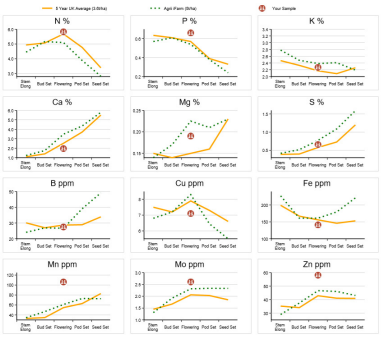
Analysis	Result	Ideal
Solvita Burst CO2-C (ppm)	N/A	>70
C:N Ratio	N/A	10-12

Solvita Calculated Parameters	Result
Microbial Biomass (mg/kg)	N/A
Solvita Potentially Mineralizable Nitrogen (kg N/ha)	N/A
Solvita Soil Health Score	N/A

TISSUE TEST RESULTS

Sample No E213936/01 / CAMP0053
Crop OILSEED RAPE (FLOWERING)(4.0-4.9)
Area 12

Agrii Leaf Growth Stage Report



TISSUE TEST RESULTS

Analysis	Result	Comments
Nitrogen (%)	5.83	Nitrogen is critical to plant growth and, with the production of large leafy plants, an oilseed rape crop has a high requirement. Optimising canopy size to increase light interception is an essential role of nitrogen, helping maximise crop yield. N requirement of a developing OSR crop is BEST MEASURED BY GREEN AREA INDEX.
Phosphorus (%)	0.66	Phosphorus is essential for the production of ATP within the plant and, therefore plays a major role in providing the energy behind many plant metabolic processes, enzyme activity and root development. This energy is also needed for the active uptake of other plant nutrients.
Potassium (%)	2.27	Potassium plays a major role in the uptake, and subsequent redistribution, of water and nutrients into the plant whilst also influencing protein and starch production. It also affects turgor pressure in the plant helping to strengthen it, reducing lodging and making it less susceptible to disease.
Calcium (%)	1.96	Essential for cell wall formation, calcium increases the mechanical strength of the plant improving its disease resistence. Adequate supply of calcium promotes proper plant cell elongation stimulating development of roots and shoots. Calcium plays an important role in minimising clubroot..
Magnesium (%)	0.19	Serving as the central atom in chlorophyll molecules, magnesium is essential for the formation of plant chloroplasts and therefore, photosynthesis. Other roles include involvement in protein production, mobilisation of plant carbohydrates and acting as one of the building blocks of ATP.
Sulphur (%)	0.66	Sulphur is essential for the formation of plant proteins, amino acids, vitamins and enzymes. Part of the enzyme required for nitrogen uptake, adequate sulphur is required to optimise nitrogen use efficiency. As N requirement is high in oilseeds, so too is the demand for sulphur.
Boron (ppm)	27.5	Boron is a key nutrient for oilseed rape and, as with all brassica crops, the requirement is high. Crucial for pollen germination and adequate seed set in the pod, boron also plays a key role in cell wall synthesis and cell division and elongation. It is critical during periods of rapid growth.
Copper (ppm)	7.1	Copper is particularly important for the formation of viable pollen and, subsequently, seed set and yield. It also has roles in plant respiration and the synthesis of structural lignin increasing resistance to fungal attack.
Iron (ppm)	141	Iron is essential for chlorophyll formation and function and is, therefore, critical for healthy vegetative growth, particularly early season.
Manganese (ppm)	106.2	Primary functions of manganese include chlorophyll formation, the evolution of oxygen during photsynthesis and protein synthesis. Manganese deficient crops are likely to have lower oil content, and yield less.
Molybdenum (ppm)	2.61	Adequate molybdenum is required for optimal nitrogen utilisation. It plays a specific role in the reduction of nitrate to nitrite and, subsequently, proteins. Sufficient molybdenum improves flowering and even maturity.
Zinc (ppm)	58.1	Zinc is a catalyst in many of the enzymes used for protein formation and carbohydrate metabolism. Zinc is also responsible for the utilisation of auxins that act as internal plant growth regulators and this is important for key growth processes. Low levels of zinc have been shown to reduce plant disease tolerance.

TISSUE TEST RESULTS

Analysis	Result	Guideline	Interpretation	Comments
Nitrogen (%)	5.83	4.00	High	Above normal range.
Phosphorus (%)	0.66	0.35	Normal	Adequate level.
Potassium (%)	2.27	2.80	Slightly Low	CONSIDER TREATMENT.
Calcium (%)	1.96	1.00	Normal	Adequate level.
Magnesium (%)	0.19	0.25	Slightly Low	Consider foliar applications of MAGNESIUM
Sulphur (%)	0.66	0.40	Normal	Adequate level.
Boron (ppm)	27.5	30.0	Slightly Low	Consider foliar applications of BORON
Copper (ppm)	7.1	5.0	Normal	Adequate level.
Iron (ppm)	141	30	Normal	Adequate level.
Manganese (ppm)	106.2	30.0	Normal	Adequate level.
Molybdenum (ppm)	2.61	2.00	Normal	Adequate level.
Zinc (ppm)	58.1	25.0	Normal	Adequate level.

OSR FIELD 3

Land capability	3	Soil	
Height above sea level (m)	100M	Texture	Sandy silt loam
Annual rainfall (mm)	750mm	% Organic matter	7
Land capability group		pH	6.2
		P status	H
		K status	M/L
Previous cropping			
2016-17		SB and green manure from AAECS scheme	
2017-18		WW	
2018-19		WB orwell/cassia blend	
2019-20 (present crop)	OSR Platinium Pod shatter/clubroot	Min till Terrano cultivator and Horsch pronto. Fert down spout of drill	Market for crop: Export, Crushing, Bio fuel
Date sown	17/8/2019	Likely harvest date	10/8/19 (spray off 3 weeks before), direct cutting
Seed rate or plant number/m²	2kg/ha, 40 plants/m2 in spring		
Fertiliser application	Total P_2O_5	43kg/ha of nutrient	
125kg/ha of 14,35,14	Total K_2O	70kg/ha of nutrient	
Slurry saving Bagged N	Total N S03, 70 kg/ha nutrient	Can put on n in autumn up to 1/9/19 30kg/ha. Total N we use is around 220kg/ha	
Weeds present /expected	Mayweed amg bromes volunteer barley		
Diseases expected	Light leaf spot, sclerotinia clubroot		
Pests expected	Slugs, pigeons, flee beetle pod midge at midflower		

Crop 3 50 acre at Aquherton 3.5 miles away £325/T plus bonus

KIRKTON KINELLAR

GRAIN MARKET REPORT