



The response of Scottish dairy farms under increasing financial pressures: an integrated farm level model approach

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Leading the way in Agriculture and Rural Research, Education and Consulting

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Background



- CAP reform post 2015
 - Internal convergence
 - Implemented at MS level
- Scottish farm payment
 - Historically based
 - Higher payments to more intensive farms than extensive
 - 4.6 m ha eligible land

New payment scheme



- 3 regions payment scheme
 - Three rates of payment
 - Region 1: arable land, temporary grassland and permanent grassland
 - Region 2: rough grazing land grade 1 & 2
 - Region 3: rough grazing grade 3
 - Voluntary coupled payments (Calf + Ewe payment)

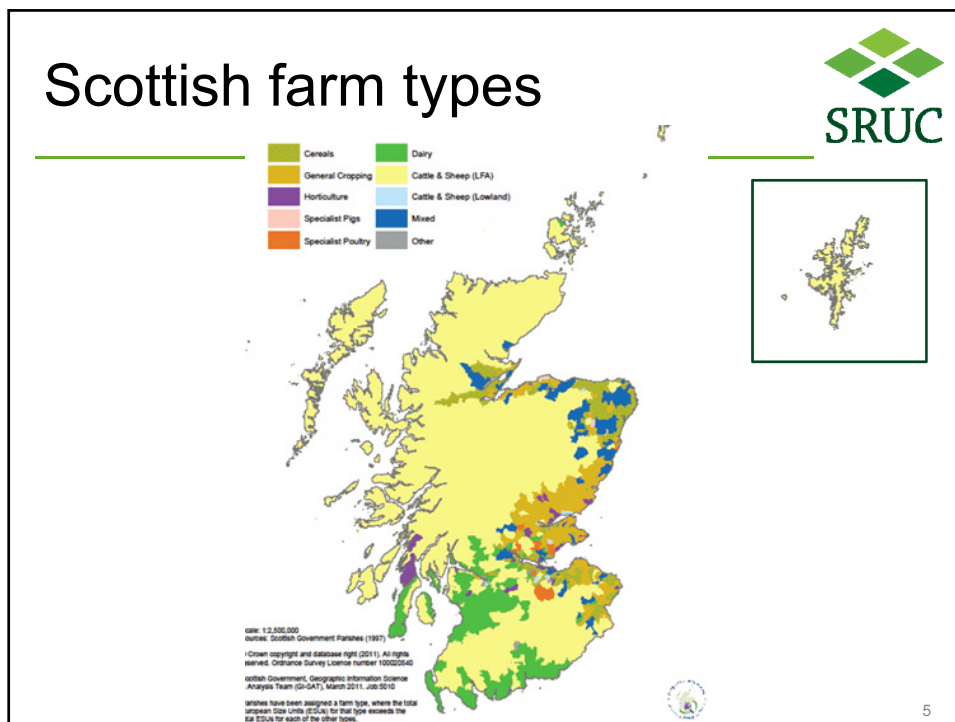
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Impact on farms



- Redistribution of payments
- >85% of land – LFA, majority of which are extensive farming systems
- Effect at farm level could be severe especially for intensive farms
- Dairy farms - among the most efficient and most profitable farms in Scotland
- Expected to lose out financially - how much? How they respond?

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Rates of payment

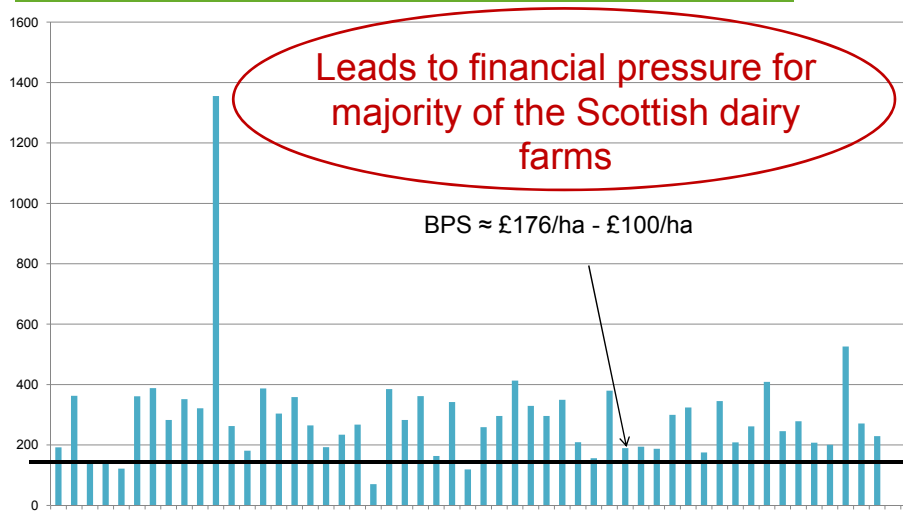


Payment rates under 3-Region Scottish payment scheme

	BPS+Greening	calf VCS	Sheep VCS
Arable land	220.00	100.00	0.00
Rough Grazing (1-2)	35.00		0.00
Rough Grazing (3)	10.00		25.00

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SFP payments



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Data input



- Scottish Farm Accountancy Survey (FAS)
 - Dairy farms - 55 farms
- Physical data: land, animals, labour
- Production level: milk, crop, grass yields
- Management: feeding, land use, stocking rate
- Prices/costs
- Coefficients: LU, feed contents, labour requirements, feed requirements

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ScotFarm – an integrated farm level model



- Linear programming – optimising profits
- Farm system analysis
 - Replicates farm activities
 - Financial and physical parameters
 - Decision makings
- Pseudo-dynamic
 - Runs over 15 year timeframe but results averaged out of middle 9 years
 - yearly runs with month as a subset

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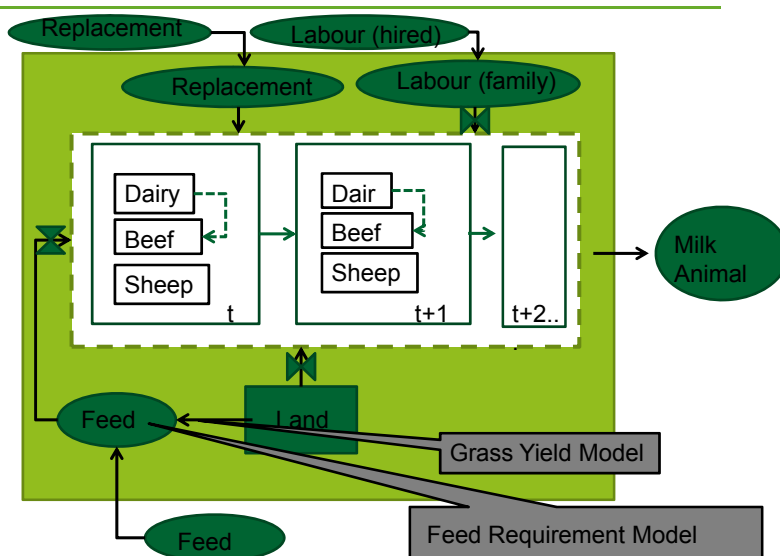
Modules



- Livestock module
- Crop module
 - Crop yield model
- Feed module
 - Feed requirement model
- Grass module
 - Grass yield model
- Price projections – FAPRI model

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Livestock module



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Feed module



- Feed considered
 - Fresh grass, grass silage, hay, maize silage
whole crop grain, concentrate
- Feed – produced on farm/bought in
- Energy and protein content required for each feed

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Feed requirement model



- Model is written in excel
- Based on feed requirement criteria set by Alderman and Cottrill (1993)
- Determines monthly requirement of energy, protein and feed intake per animal
- Considers species, age, production level of an individual animal

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Feed module



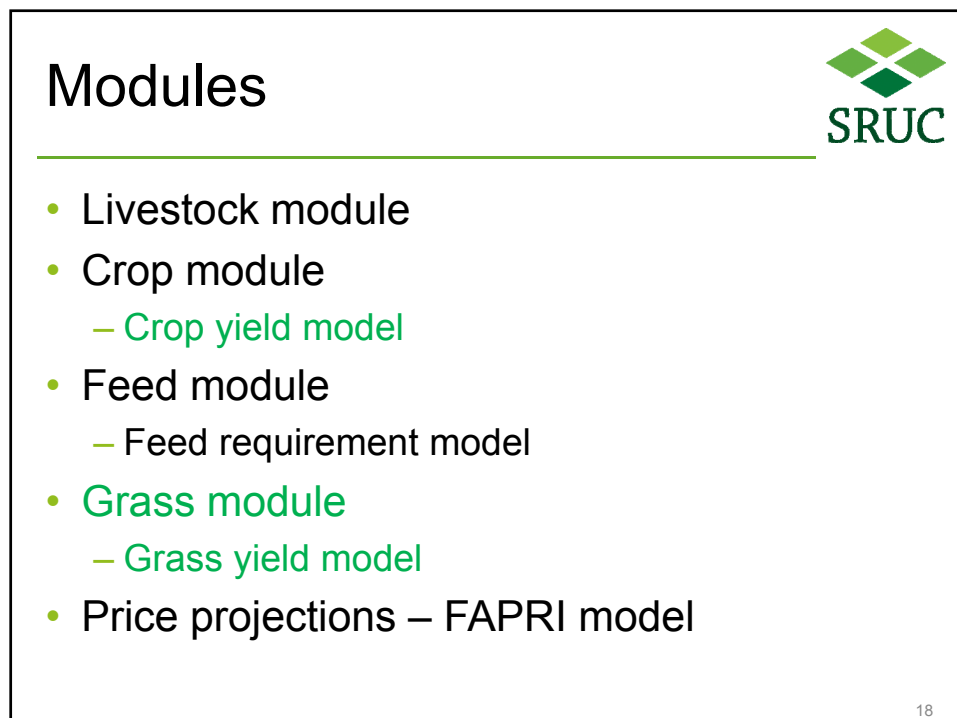
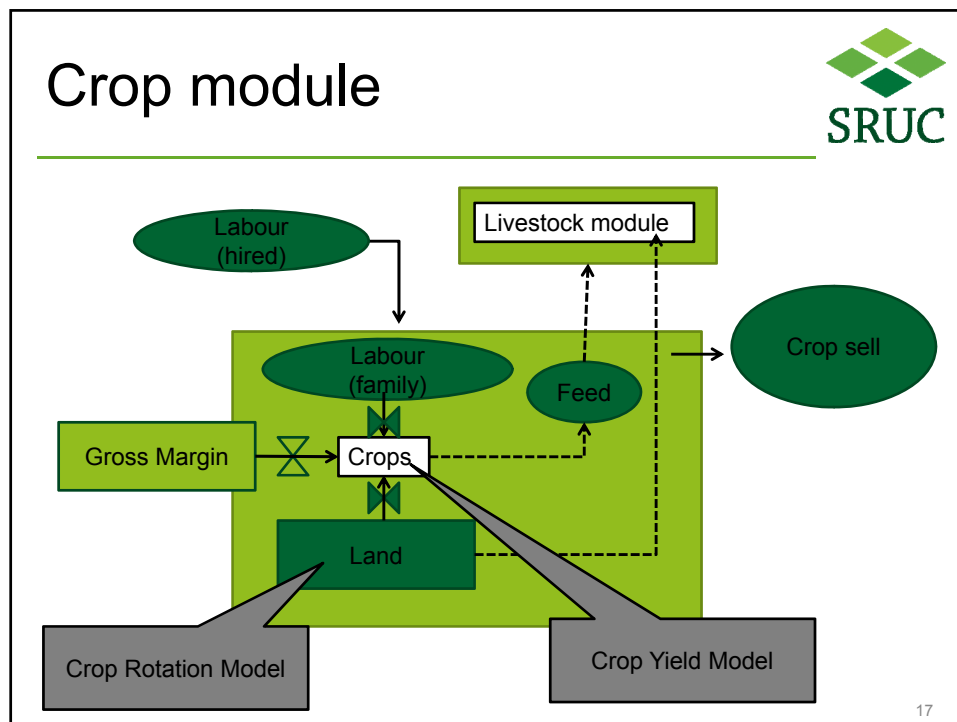
O29 $f_0 = 10^{(151.665-151.64 \cdot \text{EXP}(-0.0000576 \cdot 105))}$

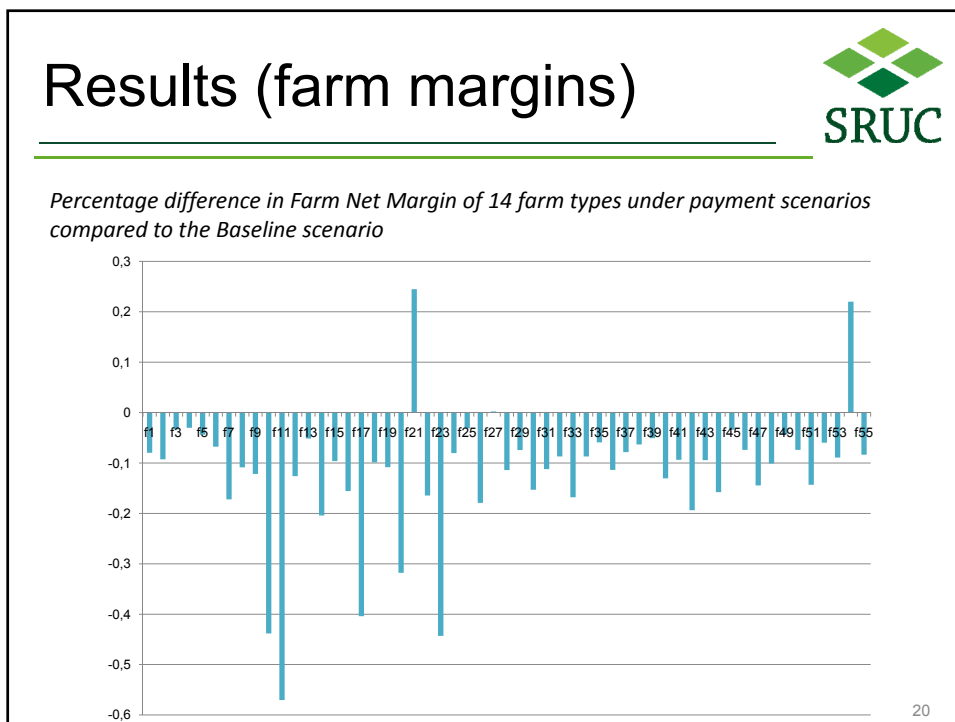
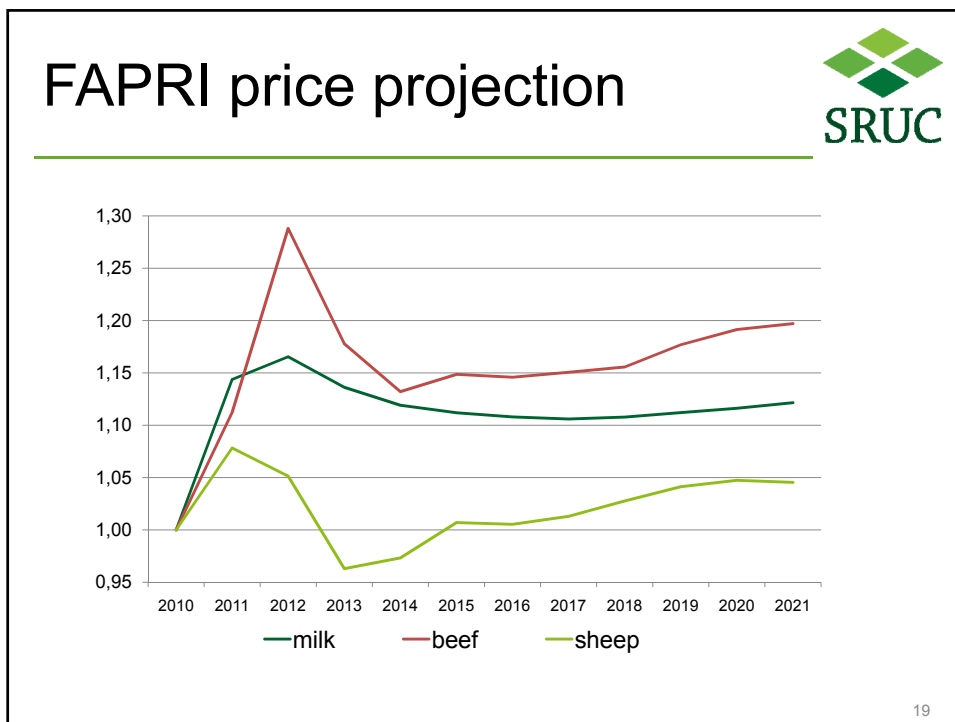
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	animal	month	energy requirements (MJ/month)				protein requirements (g/month)				DMI	EV (grow EV (preg EV (m EVgrowth/beef))												
2			maintenance	growth	pregnancy	lactation	total	maintenance	growth	pregnancy	lactation	total												
3	3	calv (d1)	274.24	90.28	0.00	0.00	464.51	1525.58	3115.84	0.00	0.00	4641.42	61.09											
4	4	calv (d1)	435.91	125.57	0.00	0.00	561.48	1799.26	3843.52	0.00	0.00	5642.78	72.05											
5	5	calv (d1)	498.04	145.72	0.00	0.00	643.77	2077.52	4035.69	0.00	0.00	6113.21	83.19											
6	6	calv (d1)	560.06	165.66	0.00	0.00	725.72	2357.42	4167.72	0.00	0.00	6525.14	94.40											
7	7	calv (d1)	621.49	184.89	0.00	0.00	806.38	2636.50	4246.64	0.00	0.00	6833.14	105.58											
8	8	calv (d1)	681.95	202.98	0.00	0.00	884.93	2912.72	4279.75	0.00	0.00	7192.47	116.64											
9	9	calv (d1)	741.13	219.55	0.00	0.00	960.68	3184.38	4274.18	0.00	0.00	7438.56	127.52											
10	10	calv (d1)	798.79	234.30	0.00	0.00	1033.09	3450.12	4236.55	0.00	0.00	7686.68	138.16											
11	11	calv (d1)	854.73	247.05	0.00	0.00	1101.77	3708.87	4172.83	0.00	0.00	7881.70	148.52											
12	12	calv (d1)	908.80	257.65	0.00	0.00	1166.45	3959.78	4088.28	0.00	0.00	8048.06	158.57											
13	13	calv (d1)	960.91	266.07	0.00	0.00	1226.98	4202.22	3987.41	0.00	0.00	8189.63	168.26											
14	14	calv (d1)	1010.98	272.32	0.00	0.00	1283.30	4445.74	3874.09	0.00	0.00	8309.83	177.63											
15	15	beef(d2)	1058.97	276.48	0.00	0.00	1335.46	4660.04	3751.55	0.00	0.00	8411.59	186.61											
16	16	beef(d2)	1104.87	278.67	0.00	0.00	1383.53	4874.94	3622.48	0.00	0.00	8497.42	195.21											
17	17	beef(d2)	1148.67	279.02	0.00	0.00	1427.69	5080.38	3489.11	0.00	0.00	8569.49	203.44											
18	18	beef(d2)	1190.40	277.70	0.00	0.00	1468.10	5276.39	3353.25	0.00	0.00	8629.63	211.29											
19	19	beef(d2)	1230.09	274.89	0.00	0.00	1504.98	5463.05	3216.37	0.00	0.00	8679.42	218.76											
20	20	beef(d2)	1267.78	270.78	0.00	0.00	1538.55	5640.35	3079.68	0.00	0.00	8720.20	225.87											
21	21	beef(d2)	1299.66	210.27	1.41	0.00	1568.34	5776.67	2404.06	1.25	0.00	8181.97	231.32											
22	22	beef(d2)	1343.05	366.37	2.63	0.00	1712.05	5995.55	3773.11	2.96	0.00	9771.61	240.09											
23	23	beef(d2)	1386.98	360.57	4.89	0.00	1752.44	6203.07	3610.09	6.53	0.00	9819.68	248.40											
24	24	beef(d2)	1430.71	374.20	9.09	0.00	1814.00	6409.89	3618.37	13.45	0.00	10041.72	256.68											
25	25	beef(d2)	1472.16	366.86	16.88	0.00	1855.90	6606.11	3465.43	26.04	0.00	10097.58	264.54											
26	26	beef(d2)	1513.29	378.18	31.30	0.00	1923.27	6801.49	3471.90	47.36	0.00	10320.99	272.39											
27	27	dairy(d)	1489.86	370.12	57.97	0.00	1920.05	6987.03	3350.47	82.37	0.00	10399.87	268.47											
28	28	dairy(d)	1529.24	380.32	107.25	0.00	2016.81	7171.66	3336.76	135.79	0.00	10644.21	275.56											
29	29	dairy(d)	1564.79	371.39	198.19	0.00	2134.38	7347.34	3207.55	213.95	0.00	10768.64	282.31											
30	30	dairy(d)	1598.70	0.00	0.00	2071.11	3579.82	7070.22	0.00	0.00	18484.98	2555.19	271.66	20.64	15.83									
31	31	dairy(d)	1546.63	392.26	0.00	4620.79	6550.69	7257.60	3594.16	0.00	41241.26	3189.02	278.86	23.05	28.80									
32	32	dairy(d)	1576.74	313.83	0.00	4908.02	6798.60	7406.42	2750.88	0.00	43804.82	3392.12	284.58	23.04	52.32									
33	33	dairy(d)	1611.66	378.95	1.41	4657.37	6649.39	7579.14	3187.70	1.25	41567.69	3233.78	291.22	23.80	94.97									
34	34	dairy(d)	1644.96	345.59	2.63	3919.21	5910.00	7734.05	2898.21	2.96	34980.52	45616.04	297.17	24.03	172.19									
35	35	dairy(d)	1670.79	311.69	4.89	4003.75	5961.09	7871.86	2612.44	6.53	35733.83	46224.65	302.46	24.20	311.89									
36	36	dairy(d)	1696.06	286.96	9.09	3535.03	5527.14	7997.03	2399.55	13.45	31550.65	41960.69	307.27	24.40	511.27	3.13								
37	37	dairy(d)	1719.47	269.50	16.88	3301.07	5306.93	8113.04	2245.28	26.04	29462.56	39846.92	311.73	24.60										
38	38	dairy(d)	1741.55	257.72	31.30	2833.96	4884.23	8222.51	2136.91	47.36	25471.95	35878.93	315.94	24.81										
39	39	dairy(d)	1712.54	0.00	0.00	5797	2597.05	4367.56	8078.69	0.00	82.37	23179.06	31340.11	310.41	23.19									
40	40	dairy(d)	1737.73	295.29	107.25	1128.18	3268.43	8203.56	2420.82	135.79	10069.19	20829.37	315.21	24.95										
41	41	dairy(d)	1762.43	294.61	198.19	0.00	2252.32	8326.05	2393.29	213.95	0.00	10933.40	319.92	25.25										
42	42	dairy(d)	1684.33	0.00	0.00	2071.11	3755.45	7938.95	0.00	0.00	18484.98	2643.93	305.04	23.84										
43	43	dairy(d)	1713.68	341.00	0.00	4620.79	6675.47	8084.34	2778.49	0.00	41241.26	32104.09	310.63	24.88										
44	44	dairy(d)	1747.14	402.82	0.00	4908.02	7057.99	8250.23	3173.96	0.00	43804.82	35229.02	317.00	25.59										
45	45	dairy(d)	1774.74	334.46	1.41	4657.37	6760.98	8387.11	2669.41	1.25	41567.69	32625.46	322.26	25.60										

Modules



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- Grass module
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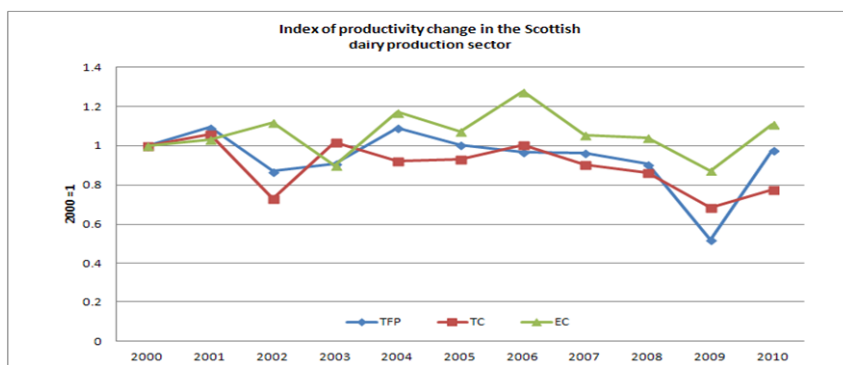
Farm responses



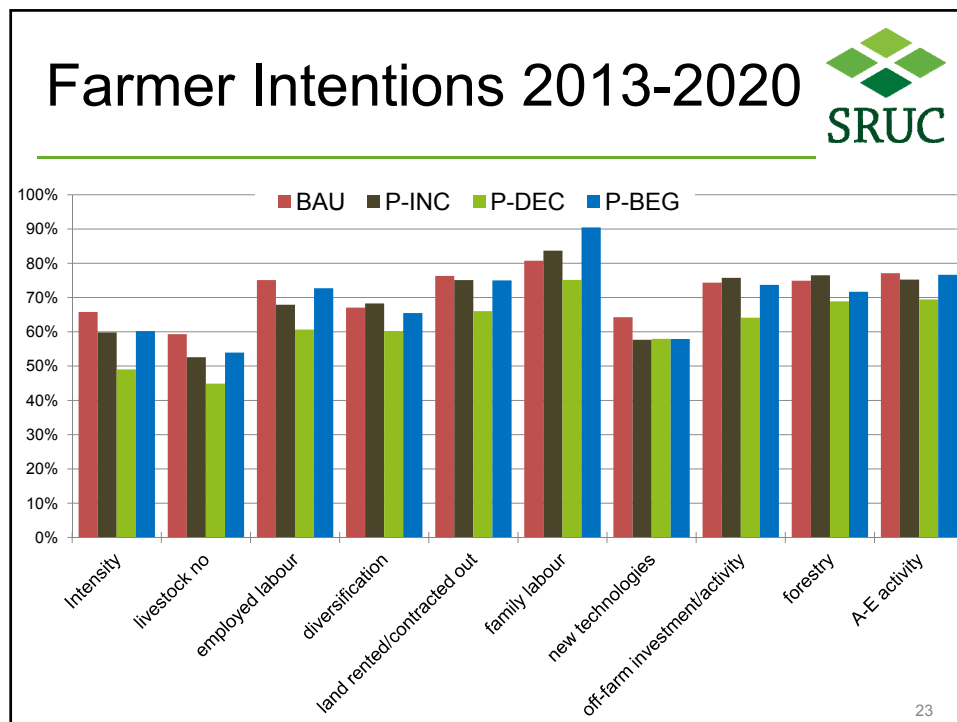
- No change in production level and animal numbers
- Slight adjustments to feed rationing – concentrate feeding lowered by up to 5% on some farms

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Dairy farming considered most technically advanced sector in Scotland



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Conclusions

- The majority of Scottish dairy farms loose out under the new BPS rates
- Coupling the calf and sheep payments had negligible impact on dairy farms
- Large farms are the biggest losers (reduction in margins by up to 30% - 55%)
- No significant adjustments on dairy farm – all of the farms maintain production level and animal numbers on farms
- Only slight change on feed rationing on some farms to adjust over all costs
- Negligible response to reduction in support payment suggests that these farms do not rely significantly on subsidy payments like other farm types and are efficient enough to maintain farming structure

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