Genetics in practice on Northern Ireland Dairy Farms and at AFBI Hillsborough

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Outline of presentation

- Milk production trends in Northern Ireland and changes in dairy cow genetics

- Have genetics delivered within NI dairy herds?

- Overview of the AFBI dairy herd

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Northern Ireland dairy industry

- 2 billion litres of milk produced in 2013
- 279,481 dairy cows
- 2684 farms classed as dairy farms
- Continued trend for increased herd size (~+3 cows/year)
  - Almost 60% of dairy cows in herds of 100+ cows
- Yield per cow continuing to increase (~+100 litres per cow per year)
- Genetically how are we doing?

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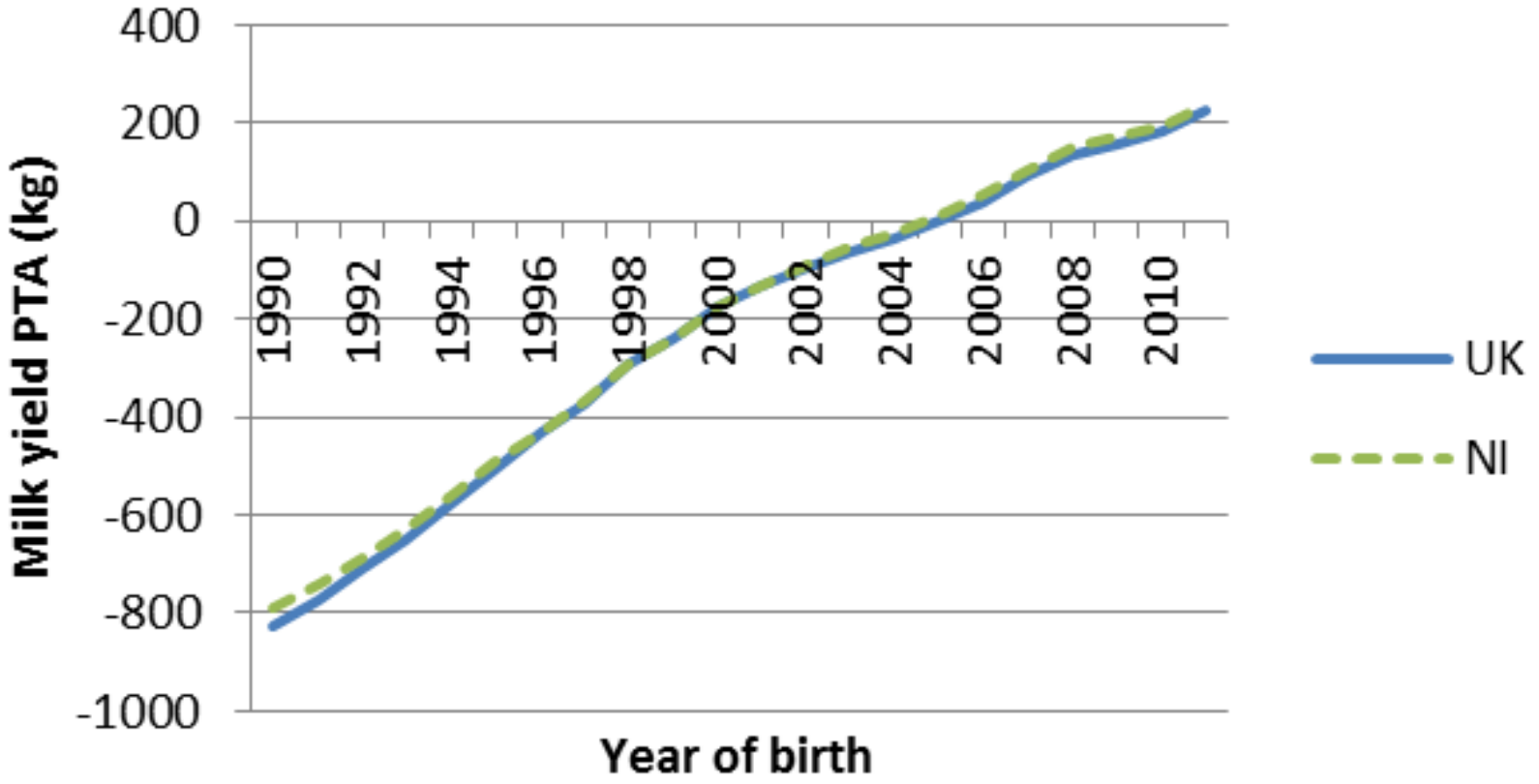
PTAs for milk yield (kg) by year of birth for milk recorded cows



Data supplied by Eileen Wall (SRUC) and Marco Winters (DairyCo)

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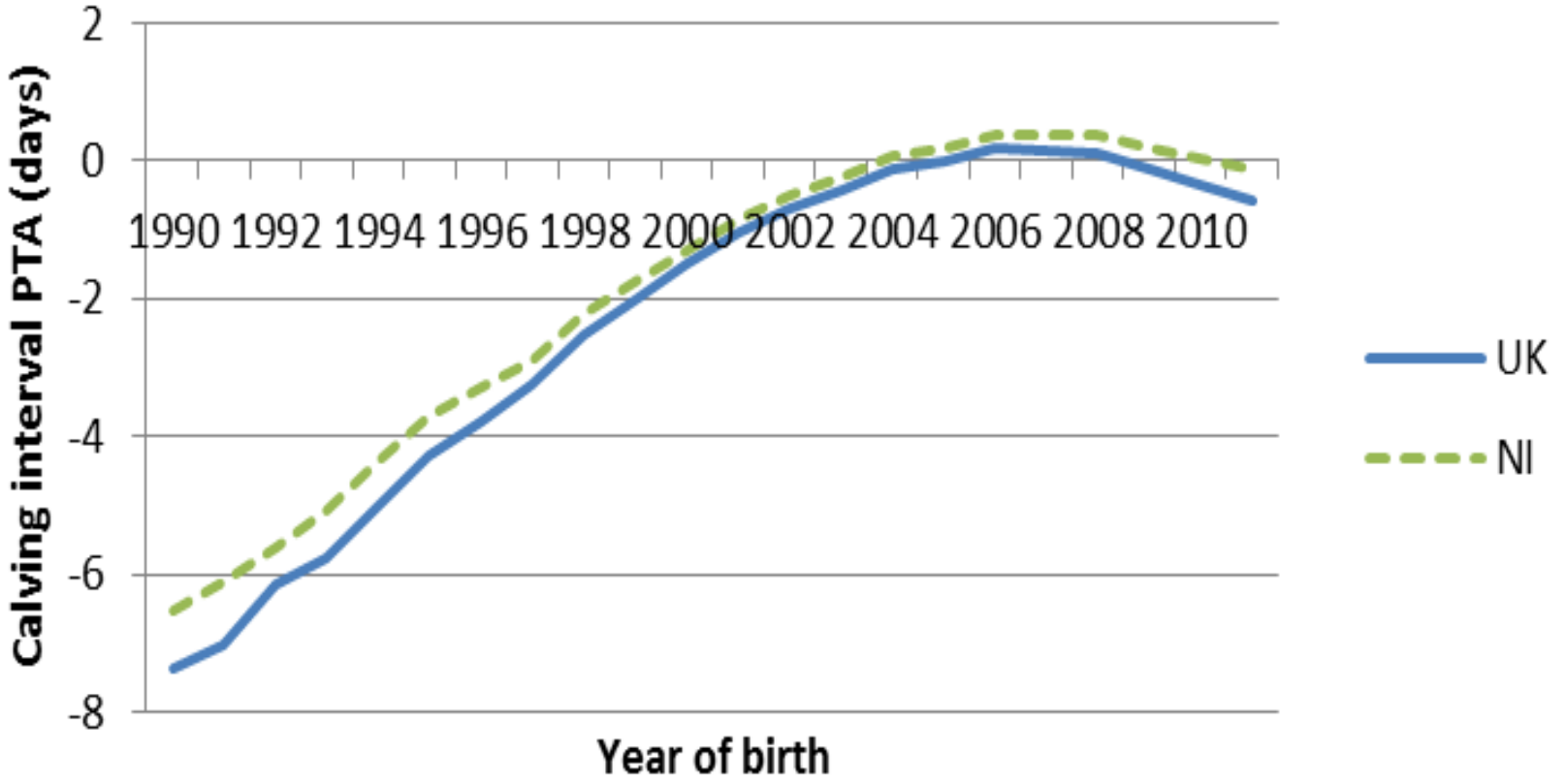
PTAs calving interval (days) by year of birth for milk recorded cows



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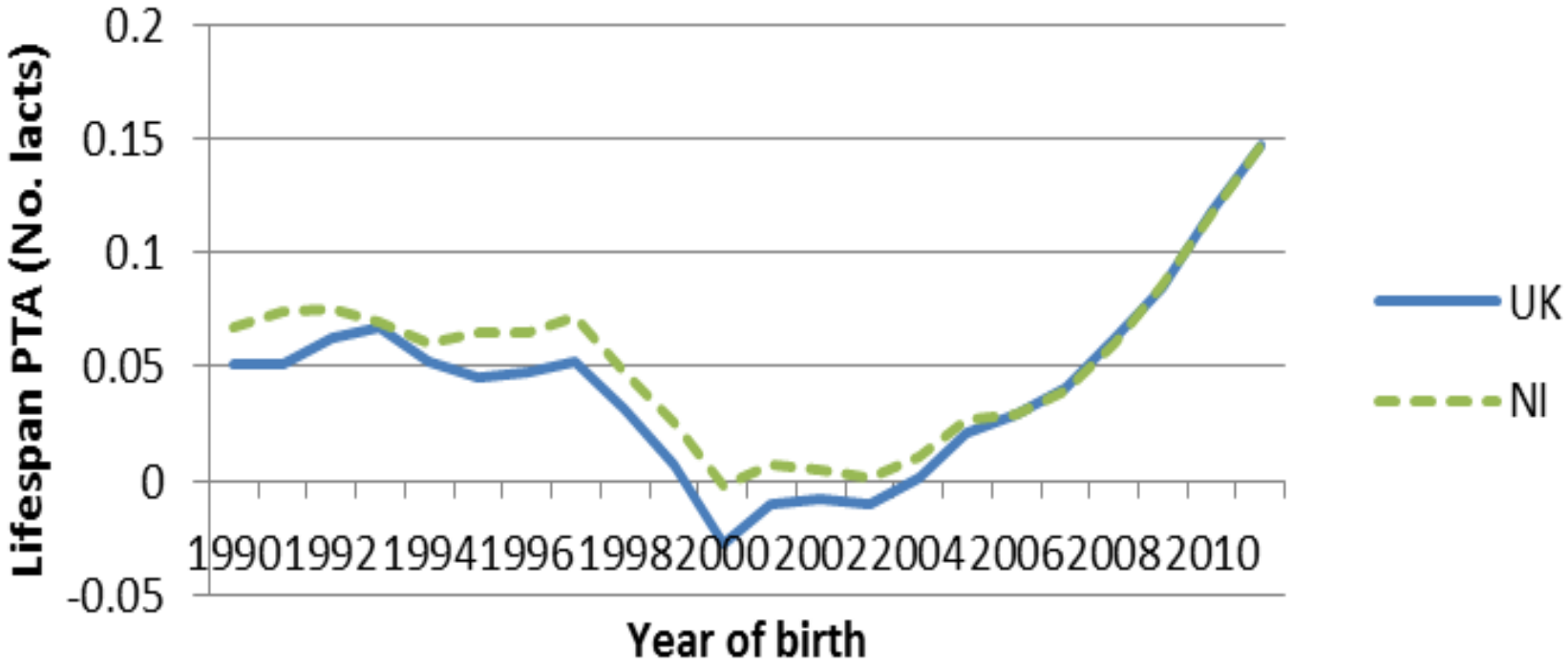
PTAs for lifespan (No. of lactations) by year of birth for milk recorded cows



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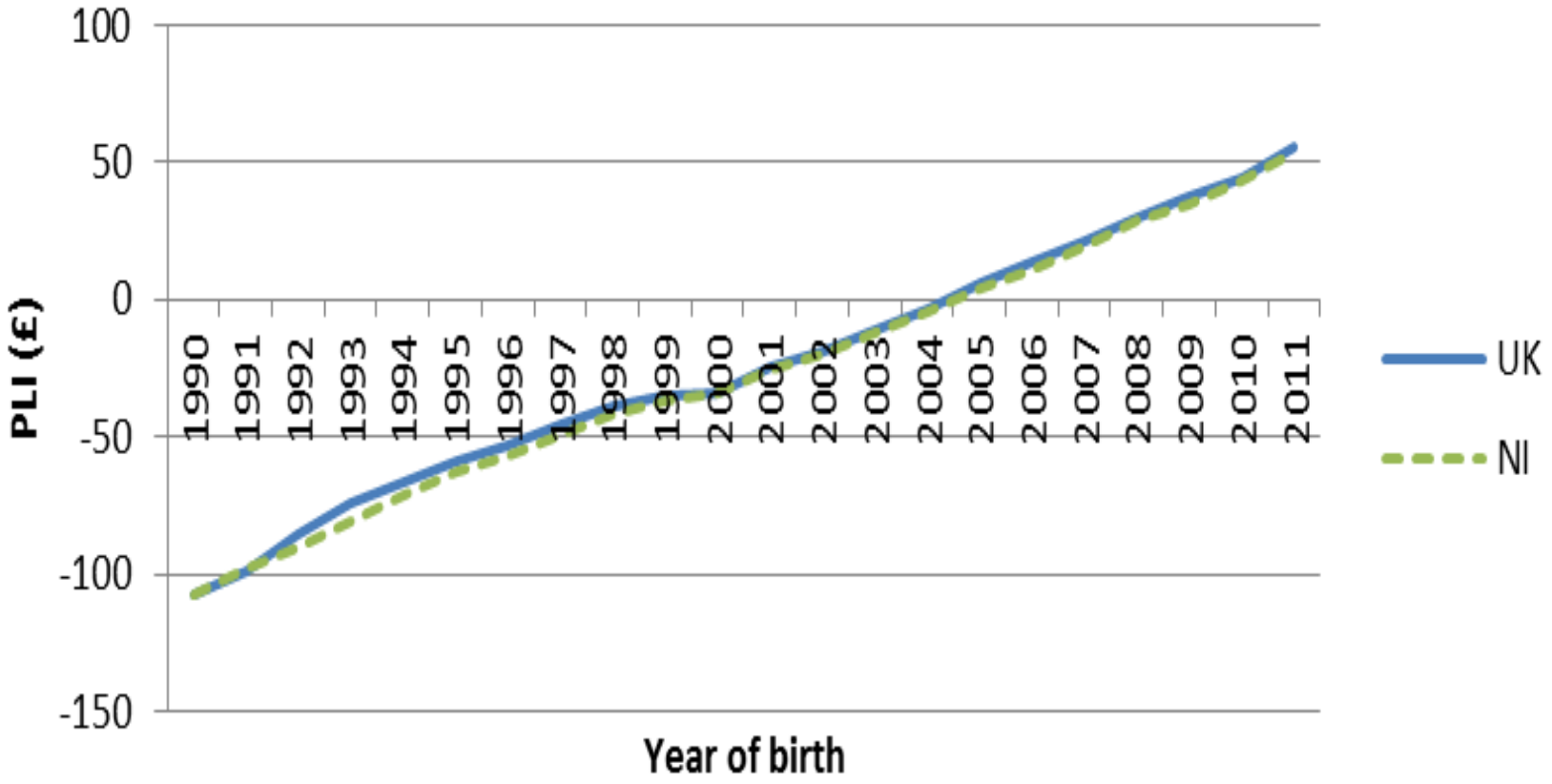
PLI (£) by year of birth for milk recorded cows



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Relationship between genetic merit and actual performance of Holstein cows on Northern Ireland dairy farms

- Relationship between genetic merit (Predicted Transmitting Ability for selected traits) and phenotypic performance.
- Northern Ireland farms with milk recording and genetic evaluations
- Data provided by NMR and UDF:-
  - 1,112,116 production records
  - 306,176 individual animals
  - 1,187 herds
  - Sire was recorded for 275,334 individual animals

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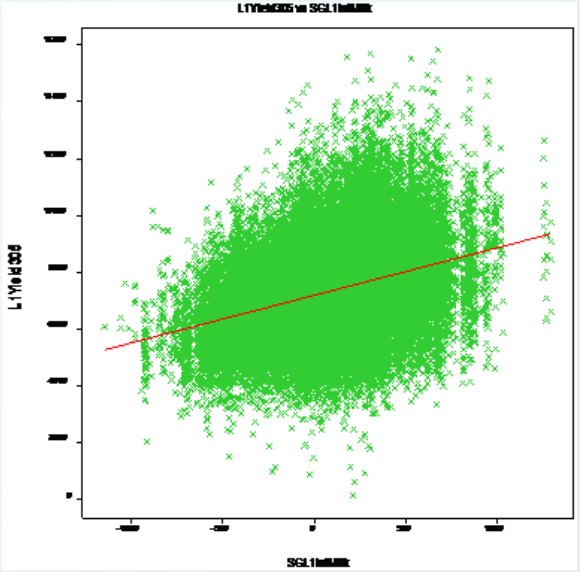
1st lactation heifers

Relationship between Sire PTA and daughter 305d yield of milk, fat and protein

Genetic trait	Actual performance	Base	Slope	R^2
Milk PTA (kg)	Milk yield	7003	1.00	0.43
Protein PTA (kg)	Protein yield	223	1.08	0.46
Fat PTA (kg)	Fat yield	273	1.16	0.43



- Within a farm, on average 43-46% of the variation in first lactation yield of milk, fat and protein was due to genetics
- 1 kg increase in Sire PTAs for yield of milk equated to a 1kg increase in milk yield potential of an individual heifer

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All lactations

Relationship between Sire PTA and daughter 305d yield of milk fat and protein

PTA	Actual performance	Base	Slope	R^2
Milk PTA (kg)	Milk yield	7729	0.73	0.40
Protein PTA (kg)	Protein yield	247	0.74	0.42
Fat PTA (kg)	Fat yield	303	0.47	0.41

- Within a farm, on average 40% of the variation in lactation yield (all lactations) of milk, fat and protein was due to genetic traits
- 1 kg increase in Sire PTAs for milk yield equated to 0.73 kg increase in milk yield potential of an individual animal

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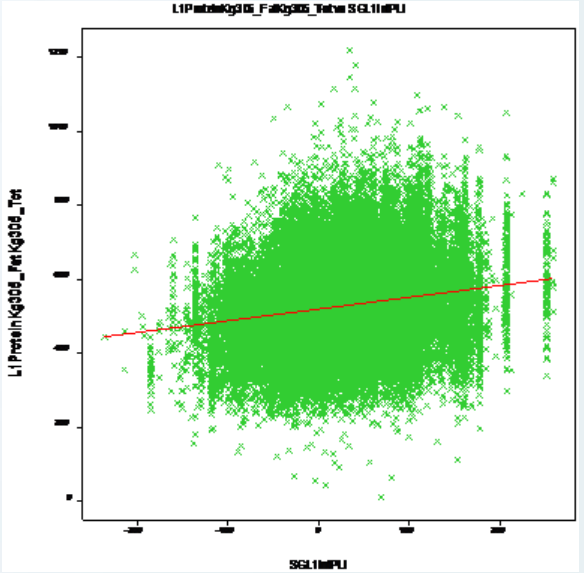
1st lactation heifers

Relationship between Sire PIN and PLI and daughter 305d yield of milk fat and protein (litres)

PTA	Actual performance	Base	Slope	R^2
PIN	Milk yield	6989	10.22	0.42
	F+P yield	496	1.19	0.45
PLI	Milk yield	7044	1.20	0.41
	F+P yield	501	0.21	0.44



- Positive associations with PIN and PLI with:
  - Milk yield and Fat + Protein yield

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Relationship between Sire PTA for Fertility index and daughter calving interval

EXPECTED

For every £ increase in a bull's FI, an improvement in his daughters' calving interval of just under half a day is predicted

	Base	Slope	R^2
2nd lactation	388	-0.37	0.04
All lactations	390	-0.40	0.06

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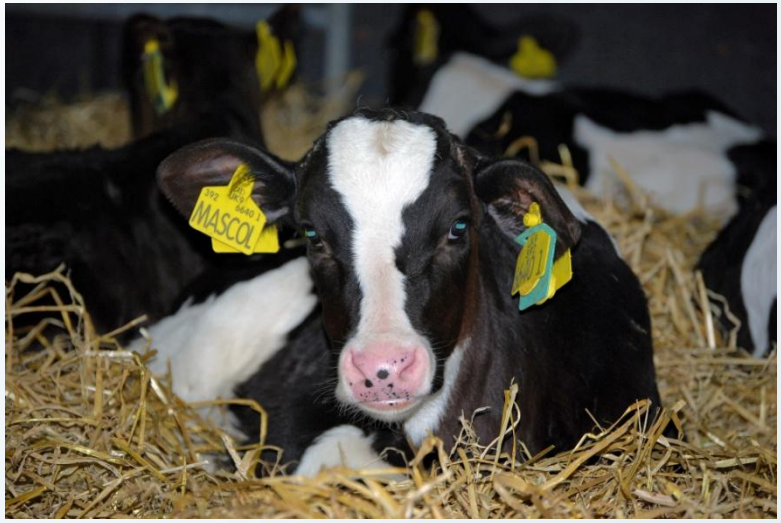
Sire PTA for Direct and Maternal Calving ease – association with daughter calving interval

	Base	Slope	R^2
Direct calving ease			
2nd lactation	390	-0.56	0.05
All lactations	392	-0.70	0.06
Maternal calving ease			
All lactations	391	-0.84	0.06



Selection for improved calving ease was associated with reduced calving interval

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Sire selection within the AFBI herd

- Normally 5-6 sires/year for Holstein component
- Essential criteria
  - Top £PLI sires (normally within top 20)
  - +ve for fertility
  - Reliability >75%
- Highly desirable criteria
  - +ve for Fat and Protein %
  - -ve SCC
  - +ve lifespan
- Genomics
  - One ‘conventional’ sire replaced by a team of 3-4 genomic sires during the last 2 years

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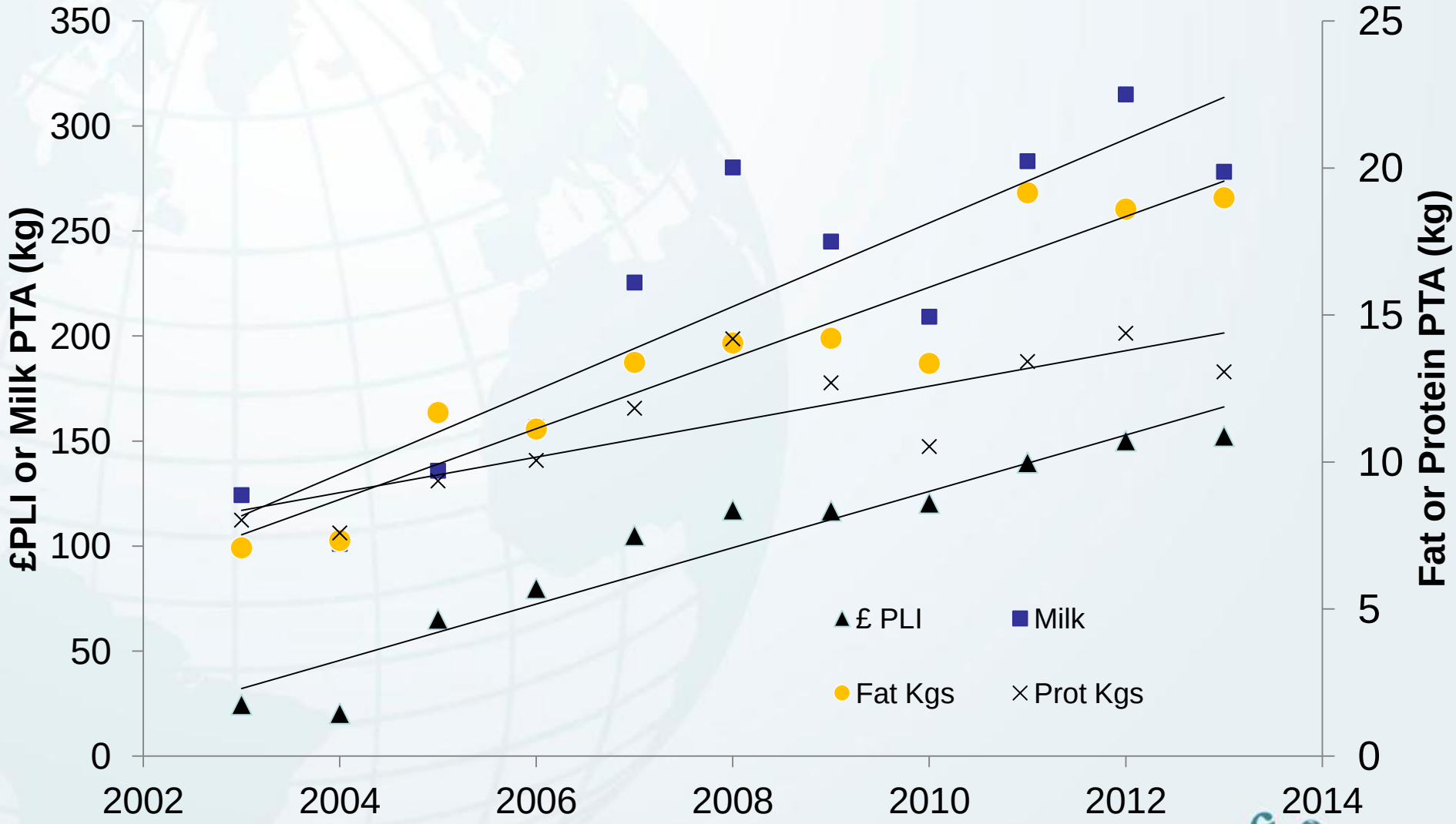
How has the AFBI dairy herd developed over the past 10 years?



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Current genetic make up of the AFBI herd (by lactation number)

Lactation	£PLI	Inbreeding Percent	Milk (kg)	Bfat (kg)	Prot (kg)	£PIN	Lifespan	SCC	Fertility Index
1st	136	3.9	283	18.8	13.1	30	0.17	-4	2
2nd	118	3.3	198	13.2	10.3	23	0.21	-9	2.3
3rd	120	3.6	270	14.5	13.5	27	0.13	-6	1.4
4th	126	3.3	256	14.6	13.3	28	0.17	-8	1.9
5th	81	4.1	194	9.8	9.8	19	0.11	-4	-1.6
>5th	80	3.1	108	9.3	9.6	21	0.09	-3	-1.1
Overall	118	3.5	232	14.3	11.8	25	0.17	-7	1.5

Current herd breed profile	
244 Holstein cows	90 Cross bred cows
Fertility	
Calving interval – 389 days	
Production (305d)	
Milk yield – 7666 kg	Fat - 4.18%
SCC – 144,000/ml	Protein - 3.39%

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Where does the AFBI dairy herd rank within the UK?

Percentile	£PLI	PTA Milk (kg)	PTA Fat (kg)	PTA Protein (kg)	£PIN	Lifespan	SCC	Fertility index
1	83	414	13	10.2	18	0.29	-9	7.7
5	63	323	9.8	7.3	13	0.23	-7	4.6
10	55	274	8.4	6.2	11	0.2	-6	2.9
15	50	241	7.5	5.4	9	0.18	-5	2.2
20	47	212	6.7	4.9	8	0.16	-5	1.7
25	44	190	6.2	4.4	8	0.15	-4	1.4

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Summary

- Sire PTAs are working in practice giving close to expected gains on Northern Ireland dairy farms

- Through using PLI for selecting bulls significant improvements can be realised helping to improve the sustainability of the NI dairy industry

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