A survey to investigate the impact of on farm management factors on herd fertility of commercial suckler beef farms

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Background

- Suckler beef production economically inefficient
  - Red meat task force (2007) found beef production unsustainable unless farm gate prices or efficiency increased
  - Cost/kg production has risen from £2.80 in 2006/07 to £4.44 in 2014/15 (DAERA farm business survey)
- Cows taking longer than 12 months to produce and wean a calf incur a higher cost per kilo of calf produced than cows which produce a calf in 12 months (Herd and Sprot, 1998)
  - Fertility linked to profitability

Background

- Fertility in Northern Ireland commercial suckler herds widely reported to be poor
  - Average calving interval of 416 days (BovIS, 2013)
  - Great Britain 394 days (Gates, 2013)
  - Republic of Ireland 395 days (ICBF, 2013)
  - Optimum 365 days
- Little research on farm management decisions that contribute to poor fertility

Objectives

- Establish current level and range of fertility in the Northern Ireland suckler herd
- Investigate differences in fertility between herds and identify management strategies contributing to range in herd fertility
- Identify where and how improvements to herd fertility levels can be made

Farms selected

- Five years of fertility information held on 150 farms
  - Selected from farm census
  - Stratified by farm type and land area type
  - 105 returned survey within allotted timeframe
- Wide range of management practices
  - AI / natural breeding
  - Home bred replacements / bought in
  - Cattle sold prior to finishing / finished

Survey

- Comprehensive: 59 questions, 441 variables
  - Free form boxes
  - Optional (discreet) (e.g. rate perception of herd fertility from 1-5)
  - Continuous variables; (e.g. proportion of cows selected for breeding by AI)
- Designed with the cooperation of specialist beef extension officers (CAFRE)
- Face to face survey; 1.5 hours to complete

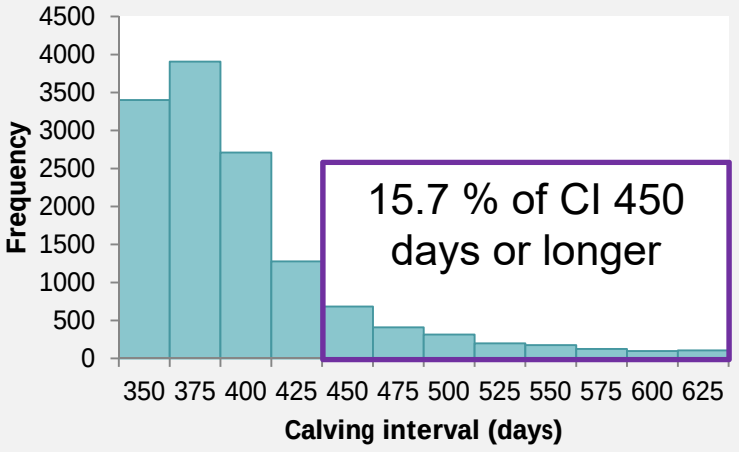
Measuring herd fertility

- APHIS queried to remove birth details for dams within herd
  - APHIS is an extensive government database which holds birth death and movement records of all cattle in Northern Ireland
- Calving interval calculated as the difference in days between two parturitions

HERD	DAM	COW BIRTH DATE	CALVING DATE	PARITY	PREVIOUS CALVING DATE	CALF TAG	AGE MTS	CI	AGE AT FIRST CALVING	DVO	YEAR ID
1	UK9XXXXXXXXX1	20/06/2010	13/06/2012	1		UK9YYYYYYYYY1	23		23	5	4
1	UK9XXXXXXXXX2	18/04/2009	20/06/2012	1		UK9YYYYYYYYY2	38		38	5	4
1	UK9XXXXXXXXX3	08/01/2007	07/09/2010	2	12/06/2009	UK9YYYYYYYYY3	43	452	29	5	3
2	UK9XXXXXXXXX4	15/04/2007	09/09/2010	2	26/07/2009	UK9YYYYYYYYY4	40	410	27	5	3
4	UK9XXXXXXXXX12	16/04/2007	19/09/2010	2	09/08/2009	UK9YYYYYYYYY12	41	406	27	5	3
5	UK9XXXXXXXXX13	10/08/2009	26/06/2012	1		UK9YYYYYYYYY13	34		34	5	4
5	UK9XXXXXXXXX14	25/04/2010	29/06/2012	1		UK9YYYYYYYYY14	26		26	5	4

Measuring herd fertility

- Two measures used
  - Mean herd Calving interval (CI) (difference in days between two calvings)
  - Proportion of herd with extended CI (ECI) (calculated as proportion of herd with a CI over 450 days, a recognised industry standard employed by extension officers)



- Mean herd calving interval 385 d (± 15.8); mean range within herd 254 days (±57.76)
- Mean proportion ECI 13.7 %, (± 9.4); maximum value of 37.5 %

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Measuring herd fertility

- Analyses performed after extensive consultation with statistician
- Adjusted using linear mixed models using a REML algorithm
  - Fixed effects: geographical area, year of parturition, and parity-age
  - Random effects: herd and dam within herd

Variables available for analysis

- Due to structure of responses not all variables could be analysed
  - Any with less than 70 % response rate removed
  - Screening technique- univariate linear regression between response variable and explanatory variables carried out
  - Non significant (P>0.05) variables with less than 95 responses removed

Variables available for analysis

- Six multivariable analyses carried out

Analysis	Variables (n)	Common data points (n)
General information	27	71
Herd information	86	70
Breeding information	126	71
Replacement heifer management	21	77
Cow management	27	62
Comprehensive analysis	233	64

Results

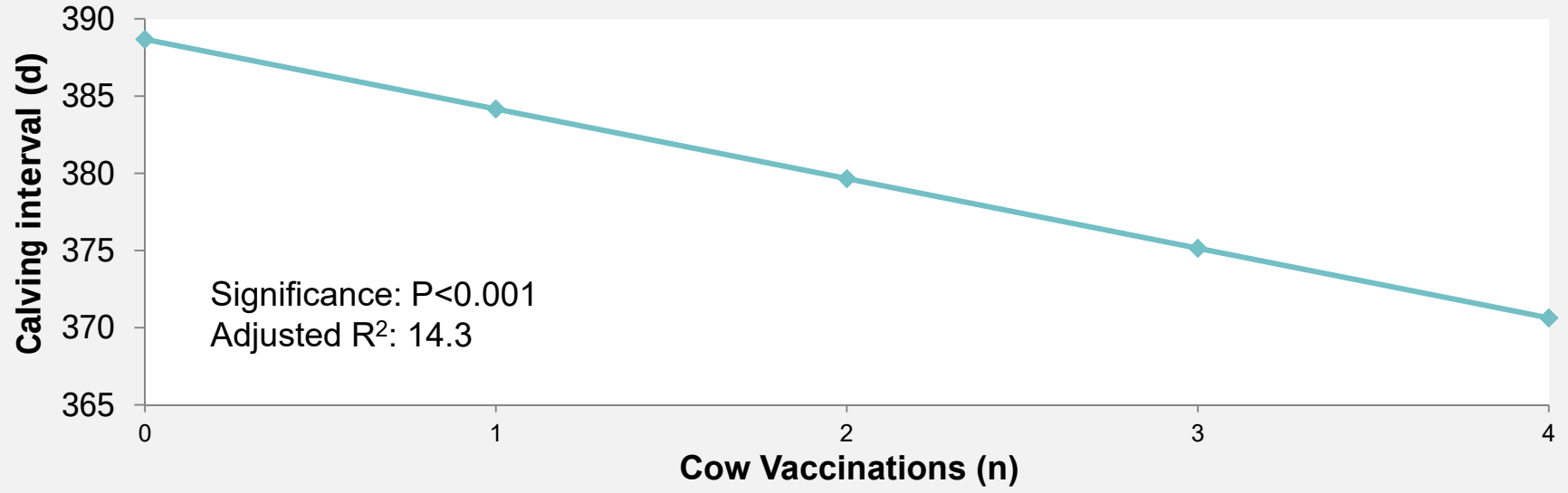
- Management practices found to be significantly associated with herd fertility:
  - Vaccinations
  - Sire selection
  - Perception of extension services
  - Fertility management
  - Record keeping

Vaccinations

- Herds which did not vaccinate cows had a 5 % higher proportion ECI (P<0.05)
  - Vaccinations listed included leptospirosis and BVD- known to cause abortions in cows

- Herds which vaccinated breeding bulls had a 9 day shorter CI than those who did not (P<0.001)
  - Ill health can adversely affect a bull's libido (Palmer 2011)

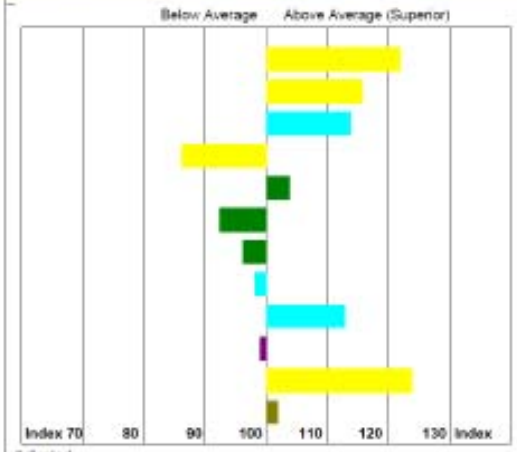
Vaccinations



- CI decreased as number of vaccinations increased
  - Additive effect of vaccinations?
  - Reflective of better management practices of progressive producers who employed a comprehensive vaccination regimen

Sire selection

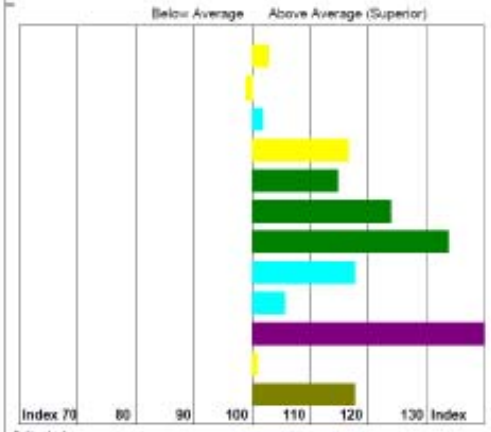
- Several interactions between sire selection and herd fertility
  - Herds which sourced bulls from breed sales had a 4.25 % lower proportion ECI than those which did not
- Respondents who chose sires by estimated breeding values (EBVs) rather than visual appearance consistently better herd fertility
  - EBVs genetic merit of bull, half of which will be transferred to its progeny



Analysis date: 23/07/2013		EBV	Acc %
Gest. Length (days)		-1.7	78
Birth Weight (kg)		0.4	77
Calving Ease (%)		-0.3	69
Mat.Calv. Ease (%)		-0.1	58
200 Day Milk (kg)		0	60
200 Day Growth (kg)		13	73
400 Day Growth (kg)		29	76
Muscle Depth (mm)		2.2	68
Fat Depth (mm)		-0.3	55
Beef Value	LIM	22	76
Calving Value	LIM	4	76
Maternal Value	LIM	5	57

Adjusted Weights (kg)	100	200	300	400	500	Scanned
	145	0	402	592	739	NO

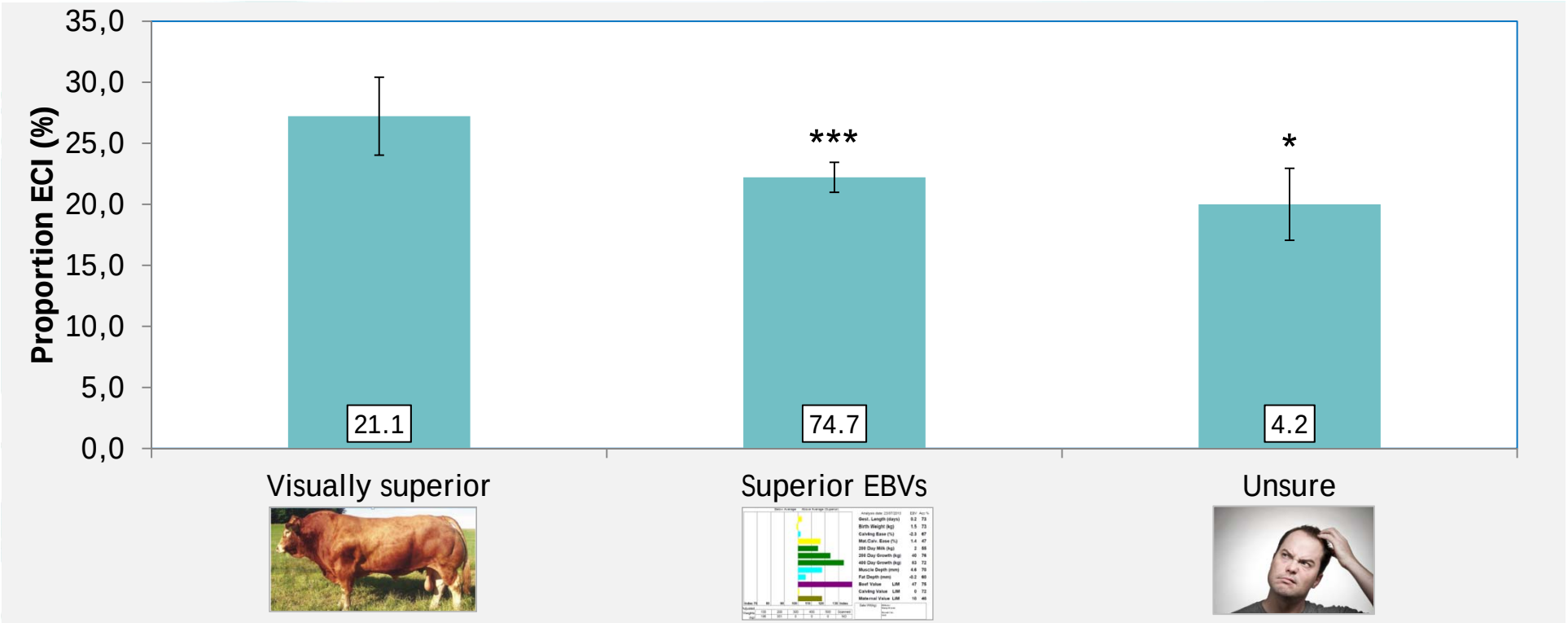
Sale Wt(kg)



Analysis date: 23/07/2013		EBV	Acc %
Gest. Length (days)		0.2	73
Birth Weight (kg)		1.5	73
Calving Ease (%)		-2.3	67
Mat.Calv. Ease (%)		1.4	47
200 Day Milk (kg)		2	55
200 Day Growth (kg)		40	76
400 Day Growth (kg)		83	72
Muscle Depth (mm)		4.6	70
Fat Depth (mm)		-0.2	60
Beef Value	LIM	47	75
Calving Value	LIM	0	72
Maternal Value	LIM	10	46

Adjusted Weights (kg)	100	200	300	400	500	Scanned
	156	351	0	0	0	NO

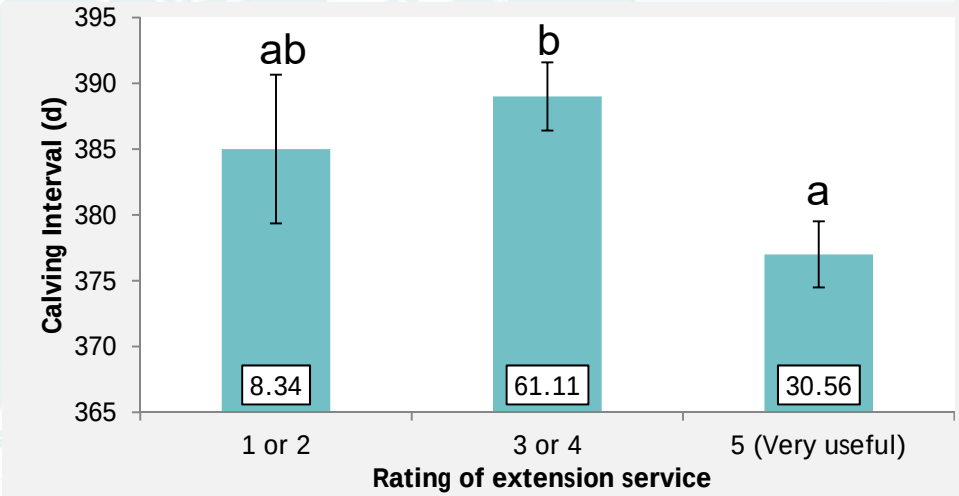
Sale Wt(kg)

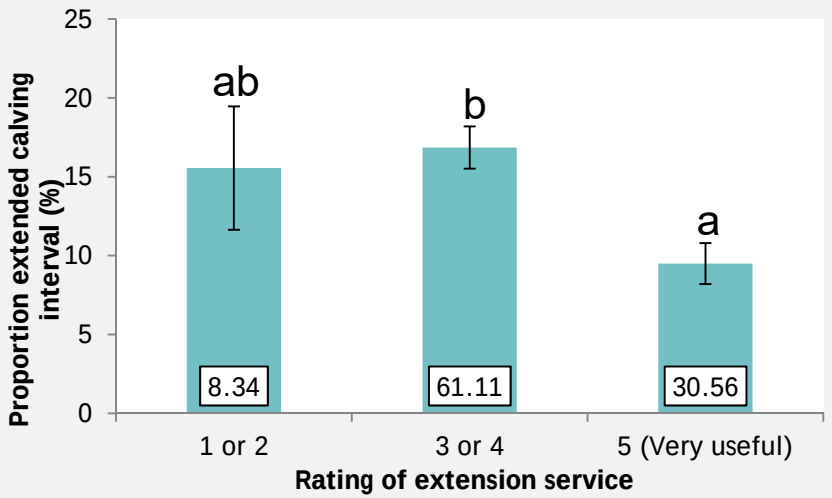


*Data labels denote proportion of respondents who chose each option, labels above bars denote significant difference from visually superior bull: * P<0.05; *** P<0.001*

- Lower proportion ECI in herds which select sire on EBVs than visual appearance (P<0.001)

Perception of extension service





Data labels denote proportion of respondents who chose each option

- Shortest CI ($P<0.05$) and lowest proportion ECI ($P<0.05$) observed in respondents who rated the extension service as "Very useful"
  - Technology Acceptance Model: user acceptance and usage of technology is determined by perceived usefulness and perceived ease of use (Flett *et al*., 2004)

Fertility management

- Unexpectedly, as proportion of cows artificial inseminated incremented, CI increased by 0.16 days ($P<0.05$)
- Could be indicative of poor heat detection
  - First heat usually silent (Crowe, 2008)
  - Bull can predict onset of oestrus by several days
  - Recommended time for heat detection 2-3 periods of 30 minutes
  - Over half of respondents had checks of less than 10 minutes
- Argument for employing a synchronised AI breeding program

Record keeping

- Record keeping is one of the most valuable sources of specialised information about the farm operation (Lewis,1998)
- Keeping records of CI as a measure of fertility
  - Reduced proportion ECI by 5.55 % (P<0.001)
  - 11 day shorter CI (P<0.001)
- Accurate records important to aid in decision making process
- Once problems are identified, remedial action can be taken
  - For example, an adjusted breeding protocol

Summary

- Key parameters for beef production are genetics, environment and management
- Management factors which are associated with improved herd fertility include
  - Extensive vaccination regimen
  - Sire selection through EBVs rather than visual alone
  - Perception of extension services
  - Fertility management
  - Keeping accurate records

Acknowledgements

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- College of Agriculture, Food and Rural Enterprise
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