



IT-Solutions for
Animal Production

INTERBEEF R & D – PROJECT

International GE for Fertility Traits

- Genetic parameters -

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Genetic Evaluation Unit

Vereinigte Informationssysteme Tierhaltung w.V. (**vit**), Verden

Database

- Participating countries, Charolais (5)
 - CHE, DEU, DFS, FRA, IRL

- Participating countries, Limousin (6)
 - CHE, DEU, DFS, FRA, GBR, IRL

- Traits
 - Traits without extra data collection
 - All traits can be derived and verified from birth and calving dates
 - Age at 1st Calving
 - Calving Intervall
 - Number of Calvings
 - (Number of calvings along cow career → Longevity)
 - Number of calvings at a target age → Reproductive Efficiency

Data files

- 603 Parameter file
- 604 ET file
- 606 Performance file
 - Information belongs to the cow, e.g. birthdate or culling date
 - Information belongs to each known calving, from 1st to last calving
 - Trait code (FCODE): AFC
 - One record for each cow for all calvings
- Pedigree Files
 - The numerical part in the IDs (IBID19) is renumbered

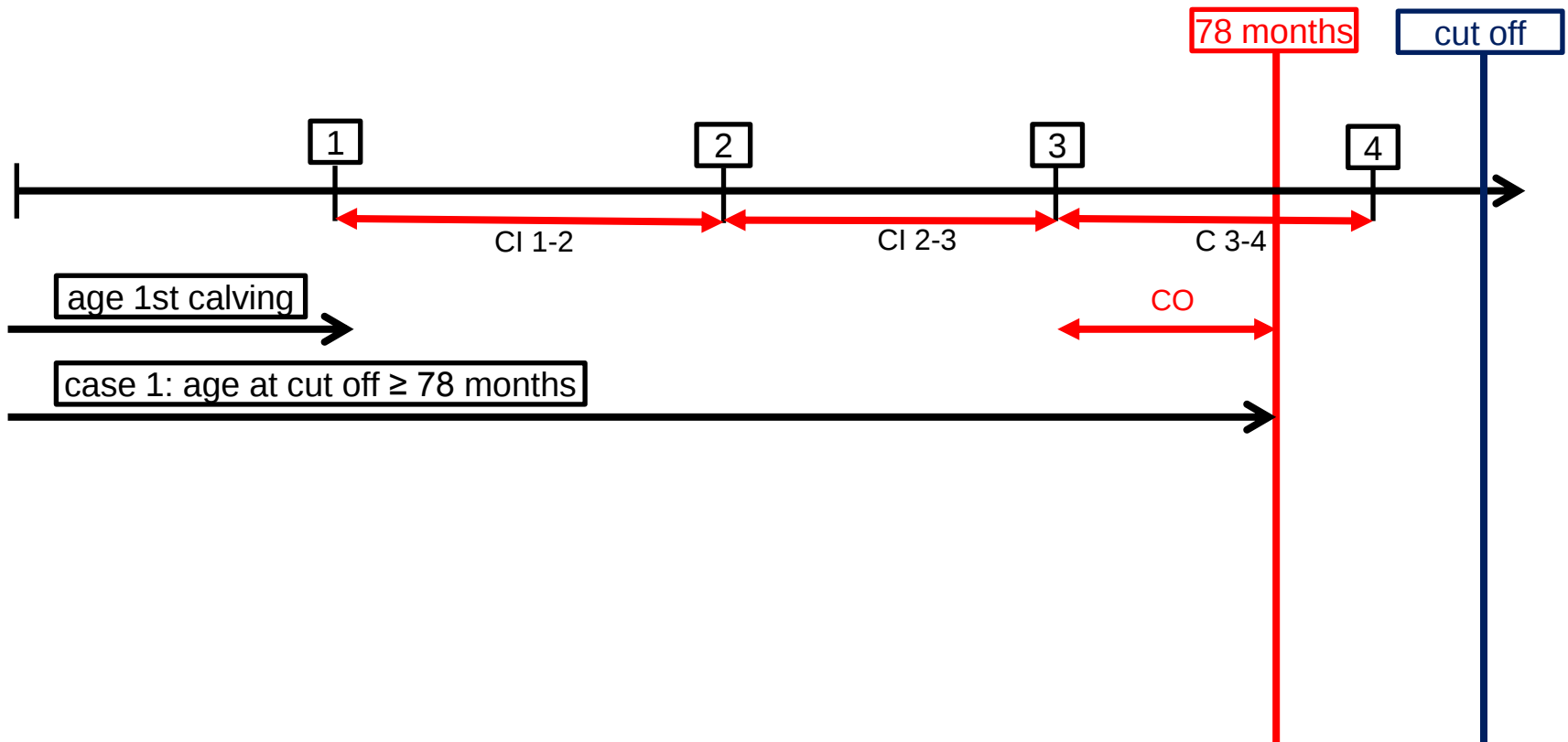
Conclusion & next steps in Germany (Krakau)

- First data preparation and analysis ✓
- Issues with delivered data (format, content) were solved directly with Interbull/Interbeef Center ✓
 - considered in the next data call
- Plausibility checks within breeds
 - Age at 1st calving
 - Calving Intervall
 - Number of Calvings / 78 month
- Preparing data for estimation of variance components
 - Software: PEST VCE
- Model development (for/with MIX99)
 - „univariate“ GE per trait – „multivariate“ between countries

Definition of Traits

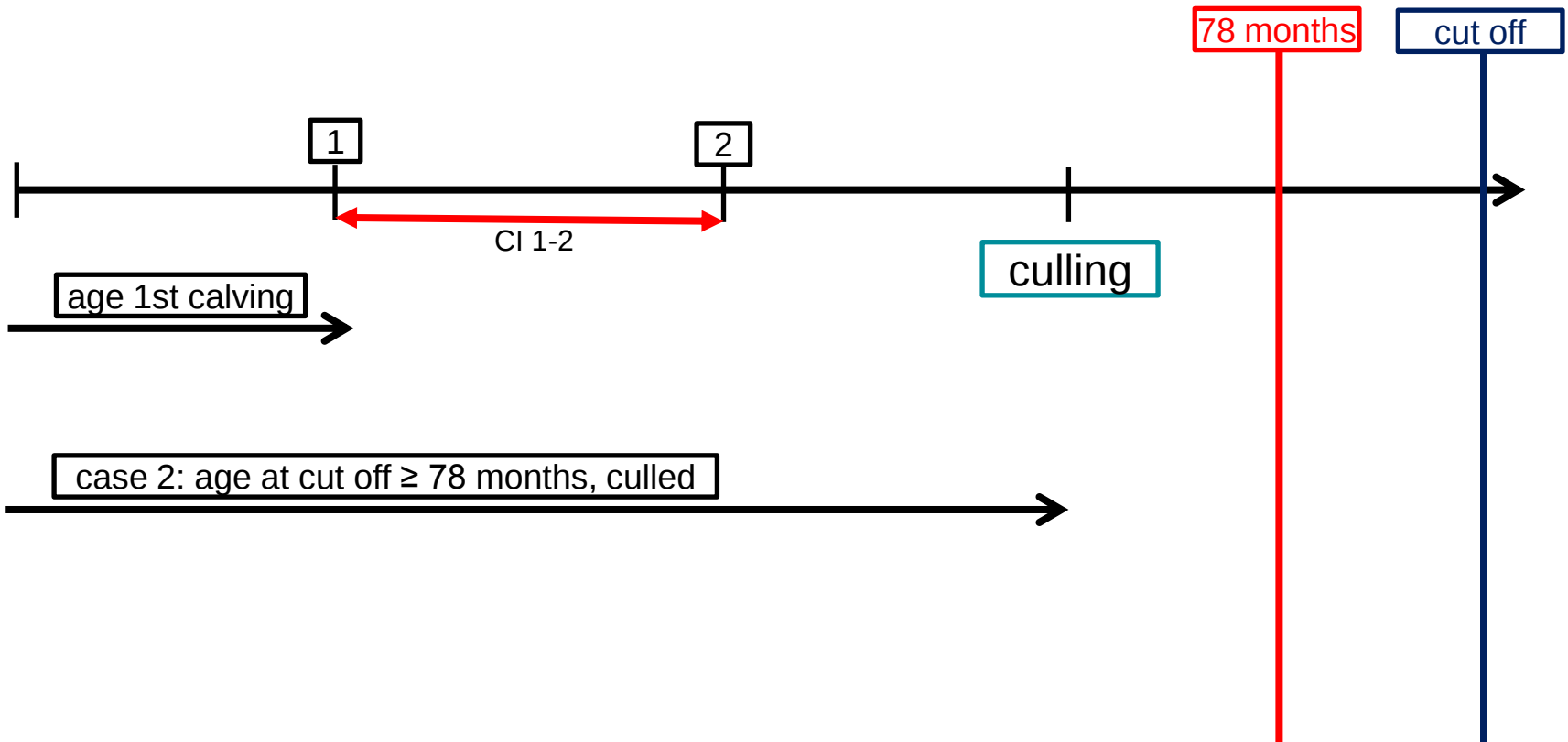
- Age at first calving
 - allowed range 650 – 1450 days
- Calving interval
 - only cows having a reasonable age at first calving (650 – 1450)
 - reasonable range in CI (270 – 1450? days)
 - repeated trait, max 5 observations (1-2, 2-3, 3-4, 4-5, 5-6) ?
- Number of calvings up to an age of 78 months
 - case 1: age > 78 mon. (complete)
 - case 2: age > 78 mon., culled (complete)
 - case 3: age < 78 mon., culled (complete)
 - case 4: age < 78 mon., alive (censored)

Definition of number of calvings - CASE 1



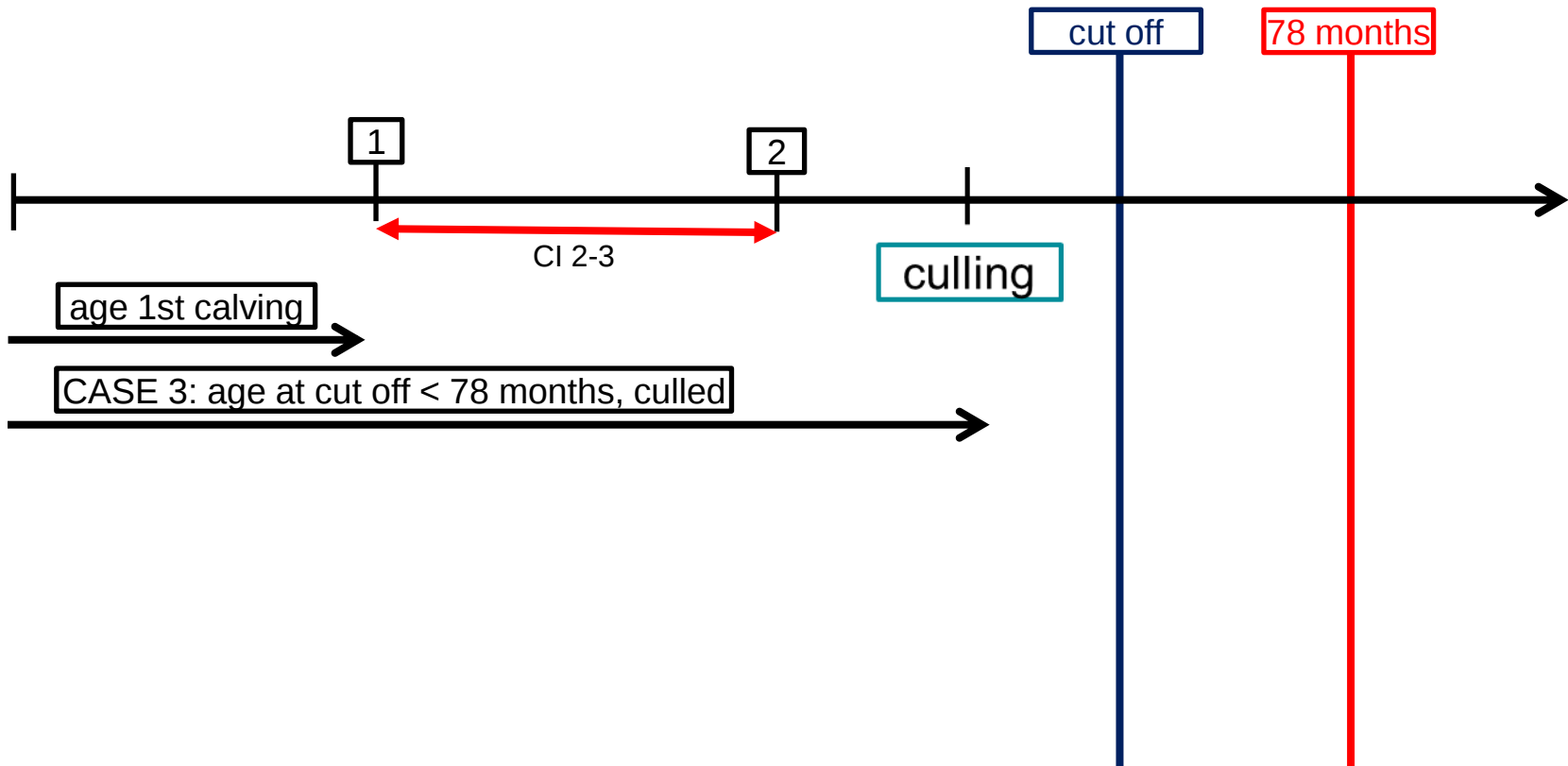
CASE 1 : age at cut off $\geq$ 78 months, alive $\rightarrow$ number of calvings = $3 + \text{CI (3-4)} / \text{CO} = 3.8$

Definition of number of calvings CASE 2



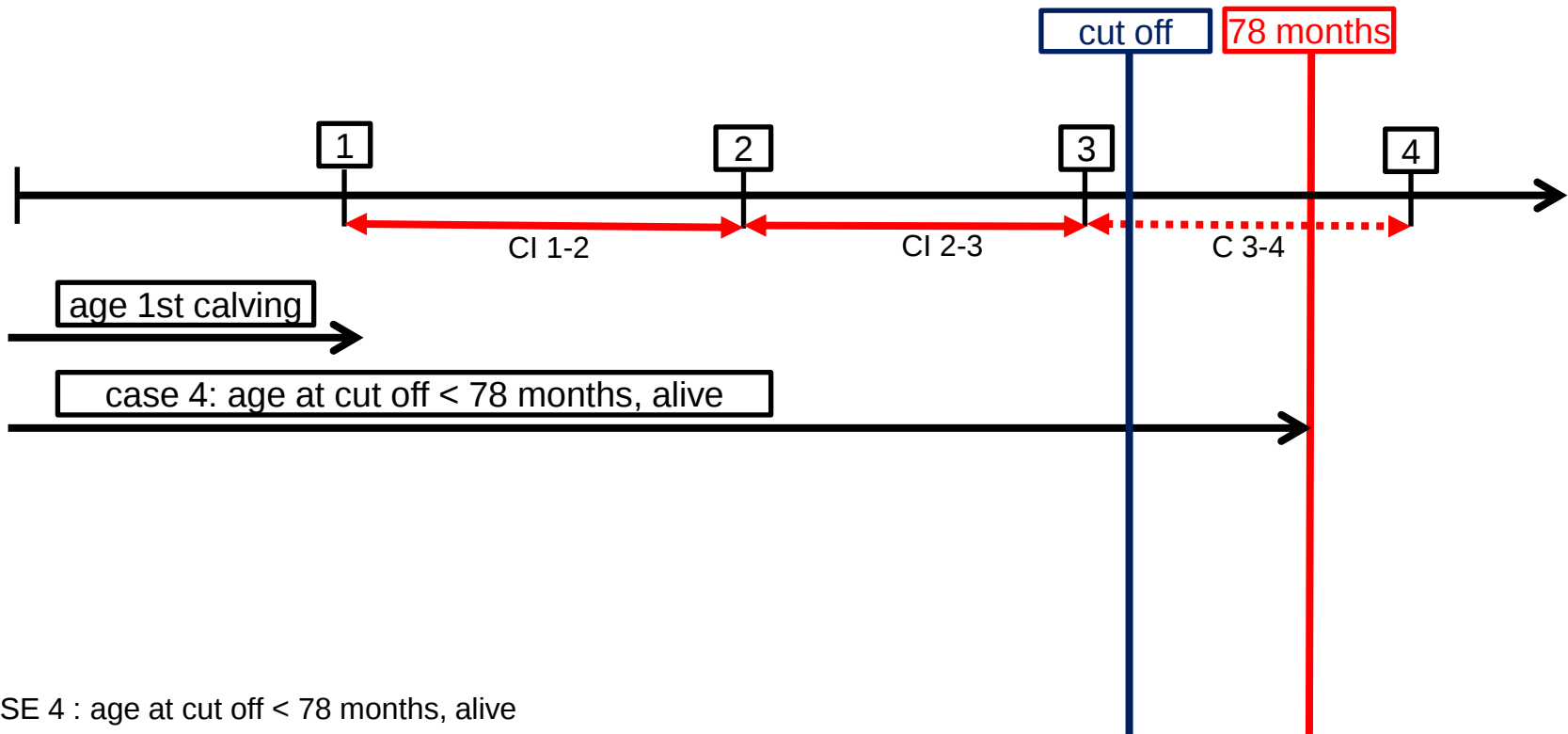
CASE 2 : age* at cut off $\geq$ 78 months, CULLED ► number of calvings = 2

Definition of number of calvings – CASE 3



CASE 3 : age at cut off < 78 months, CULLED → number of calvings = 2

Definition of number of calvings - CASE 4



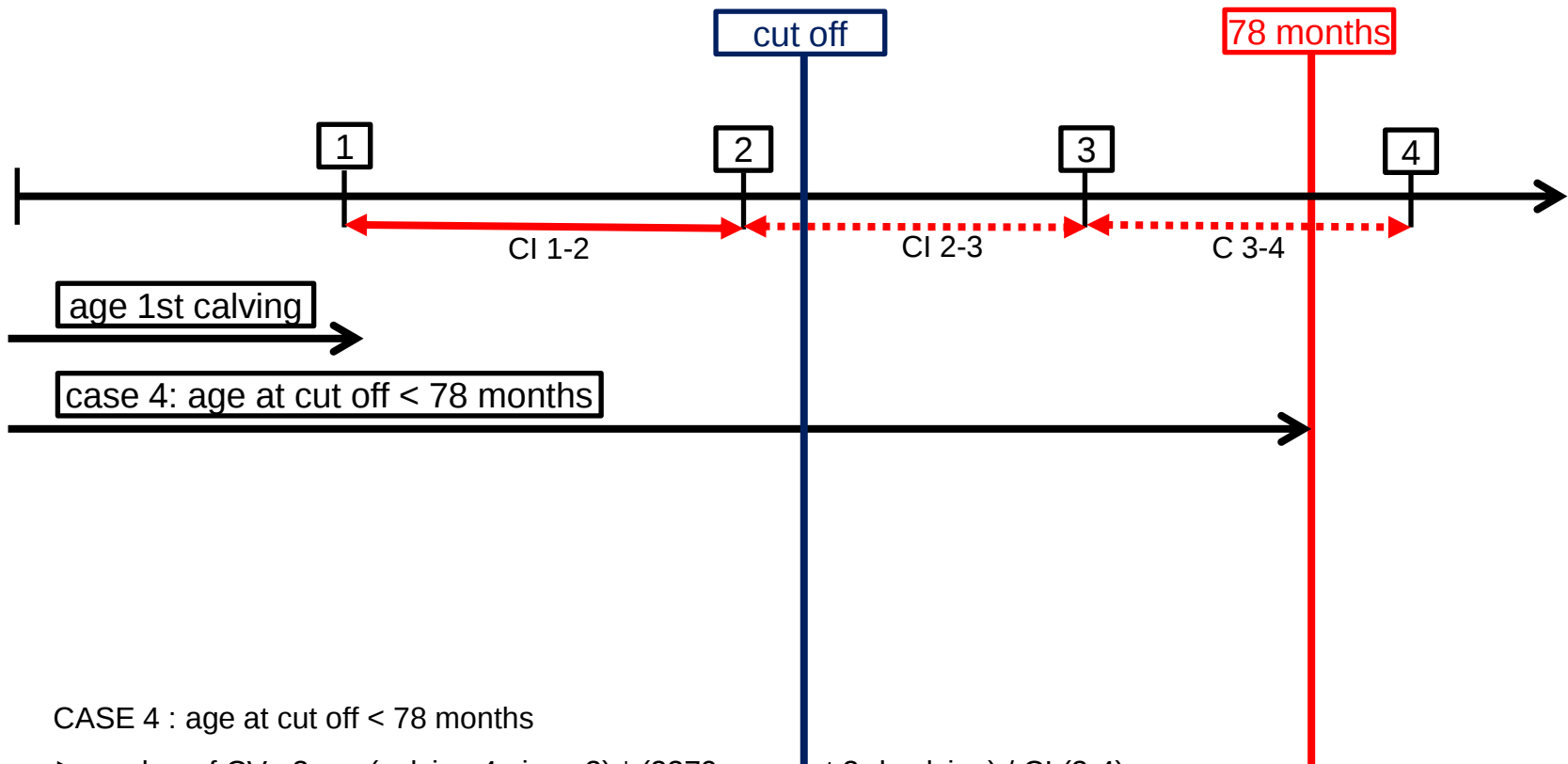
CASE 4 : age at cut off < 78 months, alive

→ Exp. number of calvings = $3 + p(\text{calving 4 given 3}) * (2379 - \text{age at 3rd calving}) / \text{CI (3-4)}$

$p(\text{calving 4 given 3})$ and CI (3-4)

is based on all animals having, being at least 78 months old at cut off and full filling the requirements according age at first calving and calving intervals

Definition of number of calvings - CASE 4a



CASE 4 : age at cut off < 78 months

► number.of.CV= $3 + p(\text{calving 4 given 3}) * (2379 - \text{age at 3rd calving}) / \text{CI (3-4)}$

$p(\text{calving 4 given 3})$ and CI (3-4)

is based on all animals having, being at least 78 months old at cut off and full filling the requirements according age at first calving and calving intervals

Definition of number of calvings

	1	2 ₁	3 ₂	4 ₃	5 ₄	6 ₅	7 ₆
probability	1.0	0.8228	0.8427	0.8457	0.8102	0.7712	0.7011
CI		410	392	385	384	384	382

COW 1	1	2 ₁	3 ₂	4 ₃	5 ₄
AFC (d)	1092				
Expected		1502	1894	2279	2663 (2379-2279)/384=0.26
No. calvings		1+0.8228	1+1.5162 (= 0.8228+ 0.8228*0.8427)	1+2.1026 (= 1.5162+ 0.8228*0.8427* 0.8457)	1+2.4728 (= 2.1026+ 0.26* 0.8228*0.8427* 0.8457*0.8102)
Exp. No. calvings	3.5				

Probabilities for subsequent calving – Charolais

Verteilung Kalbungen & Wahrscheinlichkeit fuer nachfolgende Kalbung

KNr	CHE		DEU		DFS		FRA		IRL	
	N	%	N	%	N	%	N	%	N	%
1	2370	100.00	26339	100.00	55074	100.00	1265152	100.00	23742	100.00
2	2025	85.44	21310	80.91	42391	76.97	982552	77.66	17988	75.76
3	1724	85.14	17723	83.17	33352	78.68	772065	78.58	14280	79.39
4	1491	86.48	14595	82.35	26245	78.69	611435	79.19	10896	76.30
5	1154	77.40	11536	79.04	19917	75.89	457402	74.81	7480	68.65
6	810	70.19	8643	74.92	14363	72.11	323914	70.82	4704	62.89
7	516	63.70	6172	71.41	9840	68.51	216963	66.98	2645	56.23
8	305	59.11	4227	68.49	6536	66.42	134226	61.87	1257	47.52
9	160	52.46	2733	64.66	3993	61.09	76183	56.76	402	31.98
10	76	47.50	1673	61.21	2308	57.80	39032	51.23	0	0.00
11	29	38.16	933	55.77	1219	52.82	17866	45.77	0	0.00
12	16	55.17	443	47.48	580	47.58	7259	40.63	0	0.00
13	3	18.75	195	44.02	258	44.48	2509	34.56	0	0.00
14	1	33.33	88	45.13	96	37.21	768	30.61	0	0.00
15	1	100.00	27	30.68	36	37.50	192	25.00	0	0.00
16	1	100.00	7	25.93	9	25.00	40	20.83	0	0.00
17	0	0.00	2	28.57	1	11.11	3	7.50	0	0.00

Probabilities for subsequent calving – Limousin

Verteilung Kalbungen & Wahrscheinlichkeit fuer nachfolgende Kalbung

KNr	CHE		DEU		DFS		FRA		GBR		IRL	
	N	%	N	%	N	%	N	%	N	%	N	%
1	7042	100.00	22163	100.00	49916	100.00	646990	100.00	55198	100.00	20294	100.00
2	6236	88.55	18359	82.84	38019	76.17	537707	83.11	44198	80.07	16407	80.85
3	5566	89.26	15579	84.86	30014	78.94	455285	84.67	36420	82.40	13705	83.53
4	4940	88.75	13165	84.50	23712	79.00	388459	85.32	29648	81.41	11011	80.34
5	4010	81.17	10445	79.34	18232	76.89	317822	81.82	23495	79.25	7946	72.16
6	2886	71.97	7935	75.97	13466	73.86	247974	78.02	17517	74.56	5175	65.13
7	1990	68.95	5877	74.06	9667	71.79	186566	75.24	0	0.00	3081	59.54
8	1372	68.94	4167	70.90	6785	70.19	134548	72.12	0	0.00	1532	49.72
9	905	65.96	2854	68.49	4608	67.91	91553	68.04	0	0.00	599	39.10
10	540	59.67	1851	64.86	2947	63.95	58084	63.44	0	0.00	0	0.00
11	305	56.48	1139	61.53	1791	60.77	33811	58.21	0	0.00	0	0.00
12	193	63.28	652	57.24	1013	56.56	17923	53.01	0	0.00	0	0.00
13	93	48.19	334	51.23	534	52.71	8276	46.18	0	0.00	0	0.00
14	44	47.31	149	44.61	267	50.00	3257	39.35	0	0.00	0	0.00
15	17	38.64	66	44.30	117	43.82	1033	31.72	0	0.00	0	0.00
16	8	47.06	28	42.42	32	27.35	255	24.69	0	0.00	0	0.00
17	1	12.50	5	17.86	7	21.88	40	15.69	0	0.00	0	0.00
18	0	0.00	1	20.00	1	14.29	2	5.00	0	0.00	0	0.00

Estimation of variance components

Sire model / environmental effects in the models

Traits:

- Age at 1st Calving
 - Herd x year
 - Calving year

- Calving Intervall
 - Herd x year
 - Calving year
 - Permanent effect of cow

- Number of Calvings / 78 month
 - Herd x year
 - Year of 1st calving

First estimations (VCE):

- Bivariate (2 countries)
- Multivariate (all countries)

First results

Estimated variance components – Limousin AGE at 1st calving (bivariate, 2 countries)

- PEST VCE

	CHE	DEU	DFS	FRA	GBR	IRL
CHE	0,80	0,47	*	0,15	0,08	0,08
DEU		0,72	0,79	0,42	0,99*	0,62
DFS			0,63	0,90	*	*
FRA				0,55	0,29	0,81
GBR					0,40	0,07
IRL						0,23

*) status > 1 → we have to control the results!

Estimated variance components – Limousin AGE at 1st calving (multivariate, all countries)

- PEST VCE
- status 3 → we have to control the results!

	CHE	DEU	DFS	FRA	GBR	IRL
CHE	0,84	0,51	0,66	0,24	0,38	0,52
DEU		0,76	0,76	0,46	0,92	0,74
DFS			0,64	0,83	0,75	0,95
FRA				0,52	0,46	0,78
GBR					0,40	0,84
IRL						0,36

Estimation of variance components – Charolais AGE at 1st calving (bivariate, 2 countries)

- PEST VCE

	CHE	DEU	DFS	FRA	IRL
CHE	0,08	*			
DEU		0,56	-0,03	0,58	0,00
DFS			0,46		
FRA				0,29	
IRL					0,08

*) status > 1 → we have to control the results!

Estimation of variance components – Limousin NC78 (multivariate, all countries)

- PEST VCE
- status > 1 → we have to control the results!

	DEU	DFS	FRA	GBR	IRL
DEU	0,14	0,67	0,25	<i>0,60</i>	0,60
DFS		0,19	0,89	<i>-0,15</i>	0,59
FRA			0,08	<i>-0,58</i>	0,40
GBR				0	0,02
IRL					0,04

Conclusion & next steps in Germany

- New data call for participating countries
 - Charolais & Limousin
 - AGE at 1st calving
 - Calving Intervall [CI]
 - Number of calvings up to an age of 78 months [NC78]

- VCE
 - All traits
 - NC78: Only complete data ?

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