Country — The Netherlands

Trait category:	*Individual trait(s):*
Reproduction-calving	**Calving difficulty (direct)**
	Gestation length (direct)
	Birth weight (direct)
Reproduction-fertility	**Interval calving to first insemination (female)**
	Non-return rate 56 (female, male)
	Non-return rate 28 (male)
Health	**Somatic cell count**
Workability	**Milking speed**
	Temperament
Conformation	**Udder**
	Locomotion
	Other

Royal Dutch Cattle Syndicate
P.O. Box 454
NL-6800 AL Arnhem, The Netherlands
Telephone +31 26 3861111
Facsimile +31 26 3861520
E-mail Jong@NRS.NL
Lugt@NRS.NL
Wilmink@NRS.NL

Reproduction calving traits	**Calving difficulty (direct)** **Gestation length (direct)** **Birth weight (direct)**
Breed(s)	Holstein Friesian, MRY, other milk and dual purpose breeds, beef breeds
Trait definition and unit(s) of measuring	Calving difficulty is scored in 4 categories; easy (1), normal (2), heavy pull or veterinary aid (3), caesarian/fetotomy (4) Gestation length is the interval between insemination and calving (in days) Birth weight is scored in 12 categories of 5 kilogram from ≤ 22 kg (1), 22 ≥ 27 kg (2), ..., ≥ 73 kg (12)
Method of measuring and collecting data	Calving difficulty and birth weight are scored by farmer and collected by AI-organizations Gestation length is computed from insemination data (from data base) and the given birth data (from farmer)
Time period for data inclusion	Since 1986
Age groups considered	Mostly 2nd calvers
Genetic parameters	$h^2_{\text{calving difficulty (direct)}} = 0.13$ $h^2_{\text{gestation length (direct)}} = 0.46$ $h^2_{\text{birth weight (direct)}} = 0.18$
Sire categories	All AI and NS sires with data
Environmental effects pre-adjustment evaluation model	None Management groups, month of calving, breed of the MGD of calf, sex of the calf x parity x breed group of sire, sire of calf, breed group MGS of calf, MGS of calf
Base for age adjustment	2nd parity
Use of genetic groups and/or relationships	Groups of sires according to breed and all relationships between sires, grandsires are considered
Method (model) of genetic evaluation	ST BLUP SM
System validation	-
Expression of proof	ETA (of sires for second parity cows) expressed in percentage difficult births, days and kilograms, respectively
Genetic (reference) base	Average proof of the AI-bulls born in 1988 and 1989
Criteria for official publication of sire proofs	REL ≥ 55%
Number of evaluations/ publications per year	Two; April, September
Use in total merit index	No
Key reference on methodology applied	Meijering, A., 1986. Dystocia in dairy cattle breeding (with special attention to sire evaluation for categorical traits). PhD thesis (IVO-report B-280, IVO-Schoonoord, P.O. Box 501, 3500 AM Zeist, NL)

Reproduction fertility traits	**a)**	**Interval calving to first insemination (female)**
	b)	**Non-return rate 56 (female)**
	c)	**Non-return rate 28 (male)**
	d)	**Non-return rate 56 (male)**
Breed(s)	a-d)	Holstein Friesian, MRY, other milk and dual purpose breeds
Trait definition and unit(s) of measuring	a)	Interval between calving and 1st insemination (in days)
	b)	Re-inseminated (0) or not re-inseminated (1) within 56 days after first insemination
	c)	Re-inseminated (0) or not re-inseminated (1) within 28 days after first or second insemination
	d)	Re-inseminated (0) or not re-inseminated (1) within 56 days after first or second insemination
Method of measuring and collecting data	a,b)	Computed through central data base from AI-records from herdbook registered cows during the first lactation
	c,d)	Computed through central data base from AI-records from heifers and cows
Time period for data inclusion	a,b)	Since 1987
	c,d)	Last 6 months
Age groups considered	a,b)	1st lactation
	c,d)	All
Genetic parameters	a)	$h^2_{\text{interval calving to first insemination (female)}} = 0.06$
	b)	$h^2_{\text{non-return rate 56 (female)}} = 0.02$
	a,b)	$h^2_{\text{calving interval (female)}} = 0.04$ calving interval is indirectly evaluated from a and b
	c)	$h^2_{\text{non-return rate 28 (male)}} = 0.02$
	d)	$h^2_{\text{non-return rate 56 (male)}} = 0.02$
Sire categories	a-d)	All AI and NS sires with data
Environmental effects pre-adjustment evaluation model	a-d)	None
	a,b)	Herd x season of insemination, month of insemination, breed group of the cow's dam, effect of cow's sire
	c,d)	Adjustment: herd of insemination, parity x season, day number in week, rang number of insemination (1st or 2nd), AI-technician x month of insemination, effect of the bull
Base for age adjustment	a,b)	No
	c,d)	Average age of cows in analysis
Use of genetic groups and/or relationships	a,b)	All relationships

Reproduction fertility traits *continued*	**a)**	**Interval calving to first insemination (female)**
	b)	**Non-return rate 56 (female)**
	c)	**Non-return rate 28 (male)**
	d)	**Non-return rate 56 (male)**
Method (model) of genetic evaluation	a-d)	ST BLUP SM
System validation	a,d)	-
Expression of proof	a,b)	ETA on original scale. Estimated direct from data. Calving interval is computed from the ETA's of a and b $ETA_{calving\ interval} : ETA_{a)} - 0.4\ ETA_{b)}$ A lower ETA indicates a shorter interval
	c,d)	Expressed in non-return rate 28 and non-return rate 56 percentage units as deviation from the population average. Male fertility is considered as management tool for AI-industry and farmer
Genetic (reference) base	a,b)	AI-bulls born in 1988 and 1989 with an ETA for calving interval with REL ≥ 0.55
	c,d)	Rolling population average of the year before
Criteria for official publication of sire proofs	a,b) c,d)	REL ≥ 45% Bull ≥ 350 first and/or second inseminations
Number of evaluations/ publications per year	a,b)	Two; April, September
	c,d)	Monthly evaluation, two official publications; April, September
Use in total merit index	a-d)	No
Key reference on methodology applied	a-d)	-

Health traits	Somatic cell count
Breed(s)	Holstein Friesian, MRY, other milk and dual purpose breeds
Trait definition and unit(s) of measuring	Mean of log 2 transformed testday somatic cell count records (x 1000/ml milk). Samples are taken at every milking or 4 times a year. Minimum requirement is 1 testday record per lactation
Method of measuring and collecting data	From milk recording
Time period for data inclusion	Since 1990
Age groups considered	1st to 3rd lactation of official pedigree recorded cows
Genetic parameters	$h^2_{\text{somatic cell count}} = 0.15$, t = 0.35
Sire categories	All AI and NS sires
Environmental effects pre-adjustment evaluation model	Stage of lactation x parity effect (on test-day records) Herd x parity x year x season, year x month of calving, permanent environment, additive genetic effect of the cow
Base for age adjustment	Average heifer lactation
Use of genetic groups and/or relationships	Unknown parents are grouped together according to country of origin, selection path (6 paths), breed and birth year. All known relationships of cows and sires are considered.
Method (model) of genetic evaluation	ST BLUP AM for repeatable records
System validation	-
Expression of proof	ETA x 1000 cells / ml milk. The log 2 ETA is transformed to a SCC-scale (x 1000), where the base group is a group of heifers, having an average SCC during the lactation of 75 (x 1000)
Genetic (reference) base	All herdbook cows born in 1990 with at least 87.5% Holstein genes and maximal 12.5% Dutch Friesian genes born in 1990 with official lactation records.
Criteria for official publication of sire proofs	REL ≥ 0.50, and ≥ 15 daughters in ≥ 5 herds
Number of evaluations/ publications per year	Two; April, September
Use in total merit index	Mastitis resistance index (M-index): - 6.603 x log 2 transformed somatic cell count - 0.193 x (milking speed - 100) + 0.173 x (udder depth - 100) + 0.063 x (fore udder attachment - 100) - 0.108 x (teat length - 100) + 100
Key reference on methodology applied	-

Workability traits	Milking speed Temperament
Breed(s)	Holstein Friesian, dual purpose (MRY), other milk and dual purpose breeds
Trait definition and unit(s) of measuring	Milking speed is linear scored from slow (1) to fast (9) Temperament during milking is scored from difficult (1) to easy to handle (9), with an average of approximately 5, relative to herd average
Method of measuring and collecting data	Scored by farmer and collected in the herd classification program.
Time period for data inclusion	Since 1994
Age groups considered	1st score in 1st lactation
Genetic parameters	$h^2_{milking\ speed} = 0.30$ $h^2_{temperament} = 0.15$
Sire categories	All AI and NS sires with data
Environmental effects pre-adjustment evaluation model	None Milking speed: herd x visit of classifier, age at scoring, lactation stage at scoring, effect of milk yield as deviation of contemporary herd average, genetic effect of the bull Temperament: herd x visit of classifier, month of calving, lactation stage at scoring, effect of milk yield as deviation of contemporary herd average, genetic effect of the bull
Base for age adjustment	Heifer age
Use of genetic groups and/or relationships	All relationships between sires, grandsires, etc are considered
Method (model) of genetic evaluation	ST BLUP SM
System validation	-
Expression of proof	RBV with M = 100 and SD = 4, higher values indicate faster milking and easier to handle, respectively
Genetic (reference) base	AI-bulls born in 1988 and 1989 with a RBV with REL ≥ 55%
Criteria for official publication of sire proofs	REL ≥ 50%
Number of evaluations/ publications per year	Two; April, September
Use in total merit index	Milking speed is included in mastitis resistance index, see page 105
Key reference on methodology applied	-

Conformation traits	**Udder:**	**fore udder attachment, fore teat placement, teat length, udder depth, rear udder height, udder central ligament, udder overall**
	Locomotion:	**rear leg sets, feet diagonal, feet & legs overall**
	Other:	**stature, body depth, rump angle, rump width, muscularity, size overall, type overall, muscularity overall**

Breed(s)	All breeds of milk and dual purpose type
Trait definition and unit(s) of measuring	Individual traits are scored on a 1-9 point linear scale, following recommendation of the European and World-wide group for harmonization of linear type classification The overall traits are scored on a 65-99 point scale with an average of approximately 80. Scored in one of the two classification standards: dairy and dual purpose
Method of measuring and collecting data	Scored by classifier, collected in the herd classification program
Time period for data inclusion	Since 1981
Age groups considered	1st score in 1st lactation
Genetic parameters	$h^2_{\text{udder traits}}$ = 0.25 to 0.45 $h^2_{\text{locomotion traits}}$ = 0.20 to 0.25 $h^2_{\text{other traits}}$ = 0.30 to 0.60
Sire categories	All AI and NS sires with data
Environmental effects	
pre-adjustment	Standardization for differences in standard deviations of scores within classification standard x classifier x half year
evaluation model	Standard x herd x classifier x visit, age of the heifer at time of inspection, additive genetic effect of the cow
Base for age adjustment	Average age at classification
Use of genetic groups and/or relationships	Unknown parents are grouped together according to country or origin, selection path (6 paths), breed and birth year. All known relationships of cows and sires, and phantom relations are considered.
Method (model) of genetic evaluation	ST BLUP AM
System validation	-
Expression of proof	RBV with M = 100 and SD = 4 Dairy base: Total score = 0.34 x (size - 100) + 0.28 x (dairy type - 100) + 0.56 x (udder - 100) + 0.23 x (feet & legs - 100) + 100 Dual purpose base: Total score = 0.34 x (size - 100) + 0.33 x (dual purpose type - 100) + 0.44 x (udder - 100) + 0.18 x (feet & legs - 100) + 100

Conformation traits *continued*	Udder Locomotion Other
Genetic (reference) base	Two bases: 1995 Holstein cow base: all herdbook cows with at least 87.5% Holstein genes and maximal 12,5% Dutch Friesian genes born in 1990 with an official type classification 1995 Red and White cow base: all herdbook Red and White cows with at least 50% MRY genes born in 1990 with an official type classification
Criteria for official publication of sire proofs	REL ≥ 50% and ≥ 15 daughters in 5 herds
Number of evaluations/ publications per year	Two; April, September
Use in total merit index	Udder depth, fore udder attachment and teat length are included in the mastitis resistance index, see page 105
Key reference on methodology applied	-