



CODE EFABAR
the commitment to responsible breeding

Definitions, terms and abbreviations

Code EFABAR 2020

DEFINITIONS, TERMS AND ABBREVIATIONS

Albumen firmness	Quality description of the albumen (egg white) of an egg. Albumen is judged based on the clarity and firmness or thickness. A clear albumen is defined as being free from discolorations or from any foreign bodies.
Animal integrity	Maintenance of normal physiological functions (Gamborg and Sandøe, 2005 ¹).
Animal Model	Mathematical approach to determine the genetic and environmental factors which may affect animal performances. It is an approach for estimation of the individual breeding values based on all known relatives, including sire, dam, offspring, siblings. This system allows an accurate prediction of the breeding values of future reproducers. This increases the accuracy of evaluation and should be a major step in breeder acceptance of the new evaluation system.
Artificial fertilisation (aquaculture)	The bringing together of semen and oocytes under adapted sanitary conditions and spermatozoa/oocyte ratio
Artificial fertilisation (livestock)	The bringing together of semen and eggs under laboratory conditions.
Artificial insemination (AI)	Collecting semen from a male and transferring this genetic material into the genital tract of a female.
Balanced breeding	Breeding for a combination of characteristics, concerning animal biology, animal health, efficiency, environment, animal welfare, sustainability, robustness, quality and economic viability, taking into account the variety of environments the animals are destined for.
Beef cattle	Bovines bred for meat production.
Best Linear Unbiased Prediction (BLUP)	Statistical method, that gives the estimation of Breeding Values (BV). This is a rating or breeding quality number and is a prediction of the breeding potential of the individual animal and how likely it is that the offspring of selected animals will be better than the current generation. BLUP calculations are used to predict the genetic make-up of an animal for all kinds of traits. With BLUP it is possible to track and predict the different inherited traits through complicated mathematical and statistical calculations.
Biopsy	A small tissue sample taken from the animal (i.e. hair, skin, blood, saliva, fat, fin, gill, mantle, pleopod) to analyse its DNA or other components. The protocol for biopsy is specific for the different species, countries and must be customised to the current analysis.
Breeding organisation (BO)	Organisation involved in the breeding and/or reproduction of farm animals.
Breeding pyramid	The general structure of livestock and aquaculture industry, with respect to the creation and dissemination of genetic improvement, can be described as a pyramid with nucleus, multiplier and commercial levels. Although selection may be practiced at all levels, it is selection at the nucleus that determines the rate of permanent genetic improvement in the industry. Thus, the selection objectives addressed in nucleus herds must accurately reflect production goals at the commercial level. Selection in the nucleus must be managed to maintain genetic diversity, in order to minimise increase of inbreeding and ensure that there is enough genetic variation for future selection. Typically, in the pig and poultry industry commercial products, are crossbreds between different genetic lines.

¹ Gamborg C. and Sandøe P. (2005). Sustainability in farm animal breeding: a review. *Livestock Production Science* 92, 221-231.

Breeding value (BV)	The estimated additive genetic value of an individual. The part of an individual's genotypic value that is due to independent and therefore transmittable gene effects.
Broiler	A type of chicken bred for meat production.
Carcass	Dead body of an animal, especially one that has been slaughtered for food, with the head, limbs, and entrails removed.
Challenge test	Tests designed to identify differences between individuals, families, lines or strain crosses in their ability to cope with diseases or stress factors likely to be encountered in practice. Results from challenge tests are used to select relatives for improved resistance. In case of transmittable diseases, test farms are operated with maximal biosecurity and always under EU regulation authorization. Challenge tests are normally outsourced by breeding companies to companies that specialise in managing individuals in these conditions. If conducted inhouse, test farms are located away from individuals used for breeding. No individuals exposed to a disease pathogen officially considered by the EU regulation within a challenge test is used for breeding.
Chick sexing	Gender determination of poultry at day of hatch by professionally trained specialists either by vent, feathering, colour or head spot. Method used is dependent on the type of mating the chicken is made with.
Cisgene	It is a natural gene, coding for an (agricultural) trait, from the crop plant itself or from a sexually compatible donor plant that can be used in conventional breeding.
Cisgenesis	The process by which genes can be artificially transferred between organisms that could be conventionally bred, as opposed to transgenesis.
Cloning	Organism cloning (also called reproductive cloning) refers to the procedure of creating a new multicellular organism, genetically identical to another. In essence this form of cloning is an asexual method of reproduction, where fertilization or inter-gamete contact does not take place. Asexual reproduction is a naturally occurring phenomenon in many species, including most plants, some insects, crustaceans and fishes. In mammals, in the case of identical twins, this process takes place spontaneously. The source nuclear material can be embryo-derived (ENCT), foetus-derived, or taken from an adult somatic cell (SNCT). The first mammal, sheep Dolly, was cloned by nuclear transfer from somatic cells in 1997 (Somatic Cell Nuclear Transfer Cloning - SNCT).
Congenital defects	Defects present at birth.
Controlled feeding	Feeding procedure designed not to over- or under-feed farm animals. Not equal to ad-lib feeding where animals have uncontrolled access to "unlimited" amount of resources.
Cross-bred animals	A cross of two or more lines or breeds.
Crossbreeding	Usually refers to animals with purebred (grand)parents of at least two different breeds, varieties, or populations. The intention is to create offspring that share the traits of all parent lineages or producing an animal with hybrid vigor.
Cryopreservation	Preservation by means of freezing, e.g. semen, embryos, larvae.
Dairy cattle	Bovines bred for milk production.
Dual purpose cattle	Bovines bred for both milk production and beef production
Embryo transfer	Recovering embryos from a donor animal and transferring these embryos to a recipient animal.
Energy efficiency	The extent to which animals are capable of transforming a given energy-intake into desired produce.

Epigenetics	Study of changes in gene expression or cellular phenotype, caused by mechanisms other than changes in the underlying DNA sequence – hence the name epi- (Greek: επί- over, above, outer) -genetics, some of which have been shown to be heritable.
Farm animal breeding	Strategies applied by specialized farmers to increase desirable traits by selecting the appropriate animals as ancestors of the new generations.
Feed efficiency	The extent to which animals are capable of transforming a given feed-intake into desired produce. (i.e. 1 kg Feed results in 0.496 kg of egg)
Fertility	Fertility is the natural capability to produce offspring. As a measure, fertility rate is the number of offspring born per mating pair, individual or population.
Food and Agriculture Organisation (FAO)	A specialized agency of the United Nations that leads international efforts to defeat hunger (www.fao.org).
Fry	Young fish at an early stage.
Gene editing	Gene editing is a technique used to insert or remove genetic material, by changing, deleting or adding a single or more nucleotides in the DNA. The technique can be applied to; <ul style="list-style-type: none"> • edit deleterious mutations to correct a genetic defect (gene therapy) without the need to bring in new or foreign DNA, • reproduce naturally occurring mutations for introgression into a population, • introduce novel mutations in genes without the need to bring in new or foreign DNA.
Genetic diversity	Variety of alleles of genes within a population or between populations.
Genetic line	Purebred pedigree population breeding its own replacements to be parents of the next generations. A, B, C and D in the crossbreeding structure refer to genetic lines.
Genome wide selection (in genomic selection)	Use of Genomic Breeding Values for animals, that combine predictions from a large number of estimated marker haplotype effects across the whole genome with “traditional” breeding values. Single Nucleotide Polymorphisms (SNPs) are used as high-density markers in genome wide selection.
Genomic selection	A form of marker-assisted selection in which genetic markers covering the whole genome are used. The assumption is that all quantitative trait loci (QTL) affecting a trait of interest are in linkage disequilibrium with at least one marker. This approach has become feasible thanks to the large number of single nucleotide polymorphisms (SNP) discovered by genome sequencing and new methods to efficiently genotype large number of SNP.
Genomics	Study of an organism's genome and the use of the genes (the genes of a cell, or tissue, at the DNA (genotype), mRNA (transcriptome), or protein (proteome) levels). It deals with the systematic use of genome information, associated with other data, to provide answers in biology, medicine and industry. The field includes intensive efforts to determine the entire DNA sequence of organisms and fine-scale genetic mapping efforts, and also includes studies of intragenomic phenomena such as heterosis, epistasis, pleiotropy and other interactions between loci and alleles within the genome. The major tools and methods related to genomics are bioinformatics, genetic analysis, measurement of gene expression, determination of gene function, and gene interaction networks in cellular pathways. Such identified genes can be classified as Quantitative Trait Loci (QTL). Although the term QTL strictly applies to genes of any effect if these will be large enough to be detected and mapped on the genome. Following the pattern of inheritance at such QTL might assist in selection.

Haugh units	A measure of the firmness of albumen in the eggs, correcting albumen height for variable egg weight (layer chicken).
Hermaphroditism	Biological mode of reproduction in which an individual present alternatively or simultaneously male and female territory in its gonad. Common naturally in fishes and Molluscs.
IMF	Intramuscular fat or marbling of muscle meat.
In vitro embryo production	Production of embryos outside an animals" body using sperm and unfertilised eggs.
Inbreeding	Genes that two animals have in common due to common ancestors. Inbreeding can be used to increase genetic variation between families to increase response to selection, mainly in plant breeding programmes. In livestock commercial breeding programmes, inbreeding is seldom used and is managed in order to minimize it within the whole population. Loss of genetic diversity due to inbreeding depends on effective population size and selection intensity.
Interbull	International breeding value estimation in dairy cattle. Interbull is a non-profit organisation, responsible for the standardisation of international genetic evaluations for cattle. In practice this means that a French farmer may use semen from a South American bull with known breeding value for French conditions, because the international breeding value is comparable globally. There is an extensive international trade of bull semen, globally.
Inter-specific hybridization	Interspecific hybrids are bred by mating two species, normally from within the same genus. The offspring display traits and characteristics of both parents. The offspring of an interspecific cross are very often sterile; thus, hybrid sterility prevents the movement of genes from one species to the other, keeping both species distinct (Keeton 1980 ²). Sterility is often attributed to the different number of chromosomes the two species have, for example donkeys have 62 chromosomes, while horses have 64 chromosomes, and mules and hinnies have 63 chromosomes. Mules, hinnies, and other normally sterile interspecific hybrids cannot produce viable gametes, because differences in chromosome structure prevent appropriate pairing and segregation during meiosis, meiosis is disrupted, and viable sperm and eggs are not formed. However, fertility in female mules has been reported with a donkey as the father.
Layer	A type of chicken bred for egg production.
Life Cycle Assessment (LCA)	Method to calculate the inputs and outputs of (agricultural) production systems. It is a technique to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave.
Longevity	Total lifetime of individuals.
Marker assisted selection (MAS)	Selection using genomic markers. The idea behind marker assisted selection is that there may be genes with significant effects that may be targeted specifically in selection. Some traits are controlled by single genes (e.g. hair colour) but most traits of economic importance are quantitative traits that most likely are controlled by a fairly large number of genes. However, some of these genes might have a larger effect.
Mass selection	A form of selection at the population level in which only individuals with phenotypic values greater or less than a threshold level is used for breeding. It involves no use of family information. (Compare with pedigree selection)
Maternal ability	Ability of a sow to raise all its progeny to weaning age.

² Keeton W. T. (1980). Biological science. New York: Norton. ISBN 0-393-95021-2 Page 800

Monofactorial genetic effects	One gene being responsible for a certain genetic effect, e.g. halothane gene, BLAD, CVM, RYR-1.
Monosex population	Production of population of animals of only one phenotypic sex by gamete management (sperm sexing, gynogenesis, sex inversion) or by the control of environmental factors as grading or for example in fish by the application of hot or cold temperature during the sexual differentiation period.
Muscle hypertrophy	Extreme growth of skeletal muscle as in some breeds of cattle, sheep, pigs (double muscling).
Oestrus induction	Hormonal stimulation of oestrus at desired moment to ensure a better control and care of reproducing females and their offspring.
Ovum Pick-Up (OPU)	It is a technique used in conjunction with in vitro fertilization (IVF). These technologies allow the collection of oocytes from ovaries of donor female animals, fertilizing these oocytes with the use of IVF outside the body, and enabling larger numbers of fertilized embryos to be available for implantation in recipient animals.
Pedigree selection	Combines Animal Model and BLUP of breeding values to identify the candidates to be used for breeding the next generation.
Pedigree tracing	Identification of mothers and fathers using DNA-based parentage assignment technologies (microsatellites, SNP's) (Vandeputte and Haffray, 2014 ³).
Polyploid	Individual from mostly plants (orange, tobacco, wheat, strawberry...) but also animals with more than 2 sets of chromosomes (2n) as triploid (3n), tetraploid (4n)... Polyploids are not GMO according to EU regulation. Some sturgeons are naturally octoploid (8n). Some triploids are naturally produced in the wild in fishes. All female triploids have sterile gonads. Triploids are produced to avoid loss of flesh quality with fish or shellfish sexual maturation. Tetraploids may be used to produce triploids by crossing diploids and tetraploids. Production of triploids is advocated by international NGOs to limit risks of genetic perturbation of wild population by unwanted escaped fish.
Progeny testing	It is used to determine the breeding value of an animal (especially males) which are used extensively for propagation of best germplasm. The extensive use of artificial insemination in domestic animals has helped in increasing the selection intensity on the male animals. This selection tool is usually used for characters that are sex-limited (milk or egg production), expressed after death (meat characteristics) and usually for traits with low heritability. It is also applied for traits that show low correlations between purebred and crossbred performance, i.e. through GxE-interactions.
Resilience	Ability to recover quickly from illness, challenging-situations, or misfortune.
Robustness	Animals that combine high production potential with resilience to external stressors, allowing for unproblematic expression of high production potential in a wide variety of environmental conditions. In short, animals are robust if they are healthy, fertile and profitable (Knap, 2005 ⁴).

³ Vandeputte M. and Haffray P. (2014). Parentage assignment with genomic markers: a major advance for understanding and exploiting genetic variation of quantitative traits in farmed aquatic animals *Frontiers in Genetics* 10.3389/fgene.2014.00432.

⁴ Knap P. W. (2005). Breeding robust pigs. *Austr. J. Experim. Agric.* 45, 763–773. 10.1071/EA05041

RYR-1 gene	Also known as halothane gene, is a gene that encodes for the skeletal muscle ryanodine receptor in pigs. The locus RYR-1 has two alleles (N: normal, dominant and n: halothane sensitivity, recessive). Pigs with nn or Nn genotype are more susceptible to stressful stimuli. This pork gene causes the pork to be pale, soft, and exudative. A DNA-test has been developed to detect this gene in pigs, so that the pigs carrying this gene are not used for selection. It was the first genome test in farm animal breeding.
Single step breeding value estimation	Often used in genomic selection as a statistical method which combines traditional breeding value estimation with DNA information. DNA information is used to obtain more accurate pedigree relations between the animals in the genetic evaluation.
Somatic cell count	Somatic cell count (SCC) is commonly used as a measure of milk quality. Somatic cells are simply animal body cells present at low levels in normal milk. High levels of these cells in milk indicate abnormal, reduced-quality milk that is caused by an intramammary bacterial infection (mastitis).
Specific Pathogen Free (SPF)	Delivery of breeding material, free of specific pathogens, e.g. Salmonella spp. Leucosis, Mycoplasma ssp.
Sperm cells from embryonic stem cells	Creating fully functional sperm from embryonic stem cells.
Sperm sexing	Separation of male and female spermatozoa. After the sexing procedure, the semen can be used to produce predominantly either male or female offspring (not applicable in poultry / only applicable in mammals).
Sustainability	Sustainability in farm animal breeding and reproduction means the extent to which animal breeding and reproduction, as managed by professional organisations, contribute to maintenance and good care of animal genetic resources for present and future generations. (www.responsiblebreeding.eu).
Synchronisation	Synchronisation of ovulations (or oestrus in mammals) or sperm production by means of hormonal (LH or GnRH) stimulations (Mylonas and Zohar, 2001 ⁵).
Tetraploid parent	Polyloid parents with 4 sets of chromosomes. As in plant breeding, such parents are used by crossing with diploid parents to produce sterile triploids progenies in aquaculture (Piferrer et al., 2009 ⁶).
Traceability	Organisation of a production process in such a way that all the steps can be "traced". E.g. when a piece of meat is bought in a supermarket, it should be possible to "trace" back to the farm where it was produced, and to the parents of the animal.
Transgenesis	Transgenesis is the process of introducing an exogenous gene -called a transgene- into a living organism so that the organism will exhibit a new property and transmit that property to its offspring. Transgenic organisms are able to express foreign genes because the genetic code is similar for all organisms. This means that a specific DNA sequence will code for the same protein in all organisms. Due to this similarity in protein sequence, scientists can cut DNA at these common protein points and add other genes.

⁵ Mylonas C.C. and Zohar Y. (2001). Use of GnRH α -delivery systems for the control of reproduction in fish. Reviews in Fish Biology and Fisheries 10: 463-491. 2001.

⁶ Piferrer F., Beaumont A., Falguiere J.C., Flajshans M., Haffray P. and Colombo L. (2009). Polyploid fish and shellfish: Production, biology and applications to aquaculture for performance improvement and genetic containment. Aquaculture 293 (2009) 125-156.

Transgenic	Animals with an artificially modified gene or a gene of another species introduced into their genome, e.g. a gene that can produce milk causing no allergic reactions in humans. Introducing such a different gene into an organism is called "genetic modification" (GM).
Trap-nest pedigree pens	Group-Pens equipped with trap-nests in order to link every egg produced to the female who produced it, for the purpose of a correct pedigree-construction.
Triploidy	Biological mechanism happening in which an individual developed with 3 sets of chromosomes (i.e. 2 from its mother and 1 from his father) instead of 2 in diploids (1 from each of its parents).
Weaning	Accustom animals to do without the mother's milk (mammals) or leaving prey by artificial feed (fish).
Yolk/albumen ratio	Amount of yolk compared to amount of albumen in an egg. It can be used as a measure of egg quality in layer breeding programmes.
Zoonotic disease	Disease that can be transmitted from animals to humans.

