



A stakeholder view on fair and equitable exchange of AnGR; an industry perspective

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Export of bovine semen 2005

From Gollin & Blackburn, Interlaken 2007

Exporting country	Percent of world trade
USA	32.6
Canada	31.5
Netherlands	7.4
France	6.2
Germany	5.6
Other OECD	15.5
None OECD	1.3

• North = developed countries

- Well developed recording schemes
- Domestic breeding evaluation programs
- Most traits of economical importance are recorded
- Breeding companies are COOPs or Limited Companies
- International comparison of breeding values via Interbull

- Conventional semen, sex sorted semen, embryo transfer and (cloning) are widely used reproductive techniques

• South = developing countries

- Limited number of recording schemes
- Limited number of recorded traits
- In many countries no national breeding evaluation is conducted
- Not participating in Interbull activities
- Conventional semen, sex sorted semen, embryo transfer and (cloning) are available reproductive techniques

Traits evaluated by Interbull in August 2010

Trait	Number of countries	Number of breeds
Production	27	6
Conformation	20	5
Udder health	22	6
Direct longevity	21	6
Calving traits	13	3
Female fertility	18	6
Workability	6	4

Breed groups are Holstein, Brown Swiss, Jersey Red Dairy Cattle, Guernsey and Simmental.

• Source of AnGR: North
Market: North

- By far the largest market for semen exchange
- Holstein is the most important breed in the international trade
- Minor trade in Red Dairy Cattle, Jersey and some continental breeds
- Semen mainly used for pure breeding but an increasing interest for cross breeding and an adoption of a cross breeding concept
- Market price often based on breeding values expressed in the domestic scale, Interbull conversions

• Source of AnGR: North
Market: South

- Important market for semen export
- Holstein is the most important breed in the international trade
- Minor trade in Red Dairy Cattle, Jersey and some continental breeds
- Semen used for pure and cross breeding. Cross breeding is also performed with local breeds
- Market price often based on breeding values expressed in the exporting country scale, no Interbull conversions
- Genotype X environmental interaction the biggest challenge

• Genotype X environmental interaction

- Presence of GxE causes reranking between animals due to environment
- The effect of different sires/breeds are not the same in different combinations
- Functional traits might be more important during harsh conditions. This is favoring colored breeds in comparison with Holsteins.

• Source of AnGR: South
Market: North

- Very limited market for semen or animal export
- Traits specific for South are not considered in North
- No international breeding values available

• Source of AnGR: South
Market: South

- Very limited market for semen exchange
- Traits specific for South are not widely recorded
- No international breeding values available
- Interaction between genotype and environment

- Use of synthetic breeds

• Sourcing for novel traits

- According to Blackburn & Gollin (2007) very small quantities of germplasm are moved from South to North, implying that developed countries are not searching widely for genetic resources in developing countries. Furthermore, results suggest that importation for a specific trait is not sufficient to lead to long-lasting genetic impact, unless other productivity traits are competitive.
- Polledness has been introduced into several beef breeds but not into Holstein.
- New traits must be recorded to estimate individuals and breeds merit.

• Genomic Selection

- Exceptional rapid implementation of Genomic Selection in several breeding programs in developed countries.
- The number of genetic markers has exploded from a couple of hundred micro satellites to 3 K, 50 K or 800 K SNPs.
- Direct Genomic Values (DGV) are estimated for candidates based on Estimated Breeding Values (EBV) from large reference populations.
- Reference animals = bulls with both known DNA-profile and EBVs with high reliability

• Genomic Selection

- EuroGenomics is a cooperation between VikingGenetics and partners from The Netherlands, Germany and France. Altogether, 18 500 bulls are in a common reference population connected via Interbull proofs. Records from more than 20 million cows are included.
- No DGVs without EBVs!
- Expected result from Genomic Selection is an increased genetic progress for all traits with DGVs.
- Genomic Selection gives an improved ability for adaptation to local condition in synthetic breeds if recording of suitable traits are present.

• Conclusion

- The major part of the trade with bovine semen is between developed countries.
- The semen exported to developing countries has today international proofs for the most important traits. It is important for the importers to have a selection profile suitable for local production conditions. The interaction between genotype and environment is still a challenge.
- The impact of germplasm from developing countries in breeding programs in developed countries is at the moment unimportant and the exchange needs no regulation.
- Genomic Selection can be a tool for adaptation of synthetic breeds to local conditions.