



IRISH CATTLE BREEDING FEDERATION

Integration of genomics into the Irish Dairy Breeding Program.

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Overview.

1. Central genomics database.
 - Functionality & performance.
2. Developments in genomic evaluations.
 - Results to date.
3. Genomic services.
 - 3K user pays service.
4. Integration of genomics into Irish breeding program.
 - Cost:benefits & optimal program.



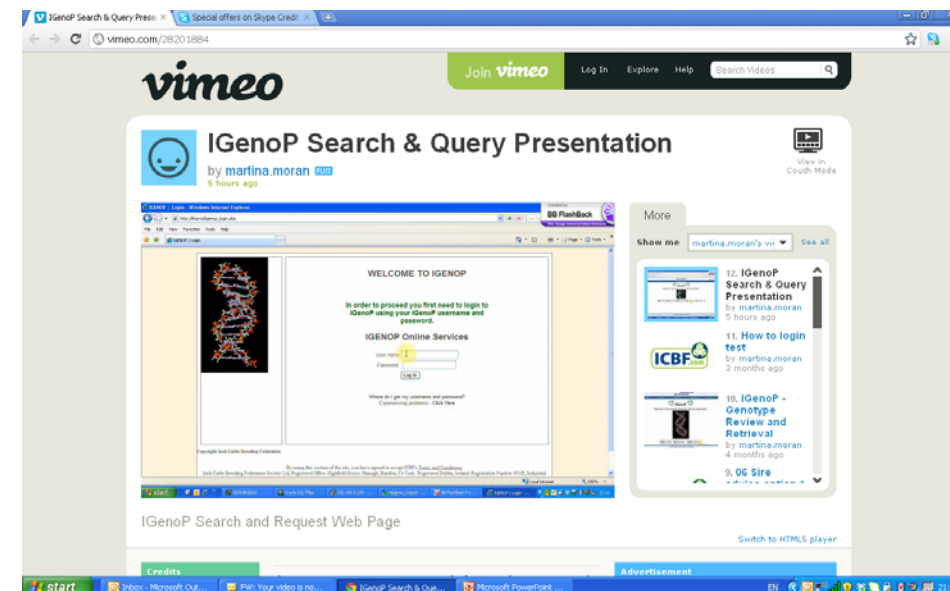
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(i) Genomics database.

- ICBF – all data stored in a central database, except genotypes!
- Designed for ICBF use.
- Available to other countries interested in international sharing.
 - IGenoP.....-> Interbull.
- Much consultation – thank you for feedback.
- Database now built (by ICBF) & being tested.
 - ~12k genotypes (50% from IRE & 50% international)
- Further details in paper.



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<http://vimeo.com/28201884>



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Functionality (i)

- Access control
 - Owner of genotypes defines who has access.
 - For example, parentage SNP's (ALL), 50k (country 1 only), HD chips (country 1 & country 2).
- IGenoP repository.
 - High level view of all genotypes (csv file).
- Request genotype.
 - Search, view & extract individual animal (you can only extract if you have access!).

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Functionality (ii)

- Advanced genotype search.
 - Breed, age range, progeny of individual sires, chip type, all genotypes added since last login....
- Upload files.
 - File of animals of interest. Upload against database. Returns file of requested genotypes for which you have access.

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Performance.

- Rapid download.
 - 3K & 50K = <1 sec.
 - HD = 7 sec.
 - File of genotypes - 13 HD = <1 min.
- Please review
 - IGenoP - user testing.
 - ALL - [Vimeo.com/28201884](https://vimeo.com/28201884) & demo login using some ICBF genotypes.
- Feedback welcome.

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(ii) Genomic Evaluations.

- Introduced in February 2009.
- Training population of 1k animals initially, now 4.5k+, based on international collaboration.
 - GS reliability for EBI 0.30 -> 0.45 -> 0.56.
- High level of uptake - 45% of recorded inseminations.

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Are GS proofs working?

- GEN IRELAND progeny test bulls.
 - 69 bulls tested over 2 years.
- Comparison.
 - Parent Average proof in 2005/2006.
 - GS proof in 2009/2010.
 - Actual progeny test proof in 2011.
- The test that the farmer will do!

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Mean Bias in Proofs.

	Parent Ave 2005/2006	Genomic 2009/2010	Progeny 2011
Protein kg (Gen SD = 6.20)			
Group average (kg)	11.1	10.6	8.1
Group average reliability (%)	37.1	56.8	89.8
Daughters/herds	0/0	0/0	81/54
CI Days (Gen SD = 3.61)			
Group average (days)	-2.0	-2.6	-3.2
Group average reliability (%)	15	41.4	55.6
Daughters/herds	0/0	0/0	81/54
EBI (Gen SD = €74.0)			
Group average (€/lact)	€108.5	€129.4	€116.6
Group average reliability (%)	27.2	51.9	75.8
Daughters/herds	0/0	0/0	81/54

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Correlation in proofs.

	Parent Ave 2005/2006	Genomic 2009/2010	Progeny 2011
Protein kg			
Parent Average	1.00	0.846	0.631
Genomics		1.00	0.698
Progeny			1.00
CI Days			
Parent Average	1.00	0.772	0.554
Genomics		1.00	0.651
Progeny			1.00
EBI			
Parent Average	1.00	0.372	0.186
Genomics		1.00	0.517
Progeny			1.00

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(iii) Genomic services.

- User pays service.
- Launched Feb 2011 by ICBF.
- Based on 3K Illumina chip.
 - Berry & Kearney (2011) - correlation of 0.97.
- Cost of €50 inc VAT.
- Males & females.
- Farmers &/or AI companies.
- 2.3k ordered since launch.
 - 83% AI companies & 17% farmers.
- Very positive feedback.

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(iv) Breeding programs.

- The fuel on the fire.....but are we going in the right direction?!
 - Veerkamp et al (2002) - 100 bulls & 100 daughters = €23/year.
 - Sonnesson et al (2008) - 50% more gain, watch inbreeding.
 - McParland et al (2009) - the "Oman effect", directed advice for herd-owners.
 - McHugh et al (2010) - potential role of females. Further 50% gain.
 - Amer 2011 - Cost:benefits analysis of different scenarios (14 scenarios in total).

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Optimal program for Ireland.

- Based on cost:benefits of Amer 2011,
 - 30 GS bulls for widespread use.
 - Selected from 5,000 GS young bulls.
 - Directed advice to bull breeders.
 - % of bulls from "next generation herd".
 - 100:1 return on investment, based on annualised cost:benefits.

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Balancing gain versus risk?

- Bull breeding herds (1000 herds & 100k cows).
 - Genotyping of all calf births + trait recording.
 - Directed breeding advice.
- Next generation herds (5 herds & 1k cows).
 - Genotyping all females + additional trait recording.
 - Directed breeding advice.
- Animals for breeding program + data for future genomic prediction, validation and monitoring.

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Summary.

- Open and integrated approach.
- Future = more genotypes -> Increased gain -> additional risk.
- Need better systems to support our breeding program.
 - Genotype database.
 - Coherence in our breeding program (next generation & bull breeder herds).
- Current focus of our activities.

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