How international collaboration fostered an efficient use of the genomics for a reliable cattle breeding

INTERBULL: INDUSTRY SEMINAR IN VERDEN (GERMANY) 25/02/15

Clotilde Patry, EuroGenomics

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▶ EuroGenomics key figures

▶ How breeding companies and farmers took up genomic tools

▶ Joined efforts to keep improving the quality of the tools

Presentation of EuroGenomics

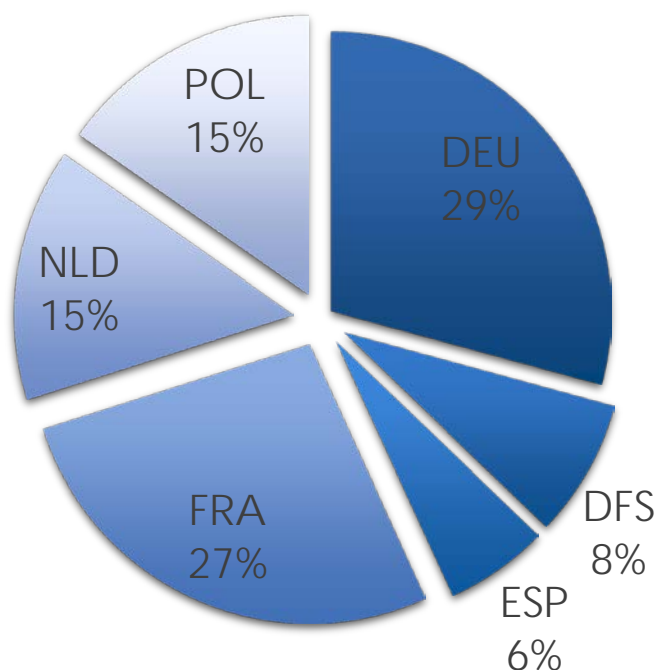Since 2009: 5 then 7 members joined forces for a reliable cattle

9 European countries

Presentation of EuroGenomics

Since 2009: 5 then 7 members joined forces for a reliable cattle

9 European countries

15 millions of AI in Holstein breed

POL 15%

DEU 29%

NLD 15%

FRA 27%

DFS 8%

ESP 6%

Merge of the reference population

Number of bulls with genotypes and phenotypes

In 2014 (9 countries)

30,000

16,000

4,000

Before June 2009: separate reference population

From 2009: First joint reference population

+ 12 % reliability for all traits in 5 years

J. A. Jiménez-Montero et al., 2012
Lund et al., 2011

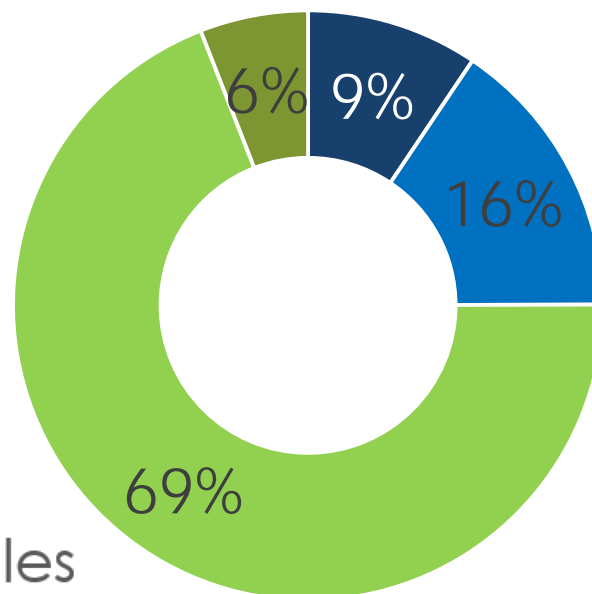Interbull Industry Seminar, Verden, Germany – 25/02/15

Genotyping activities in 2014

~130,000 Holstein animals:
¾ females
¼ males
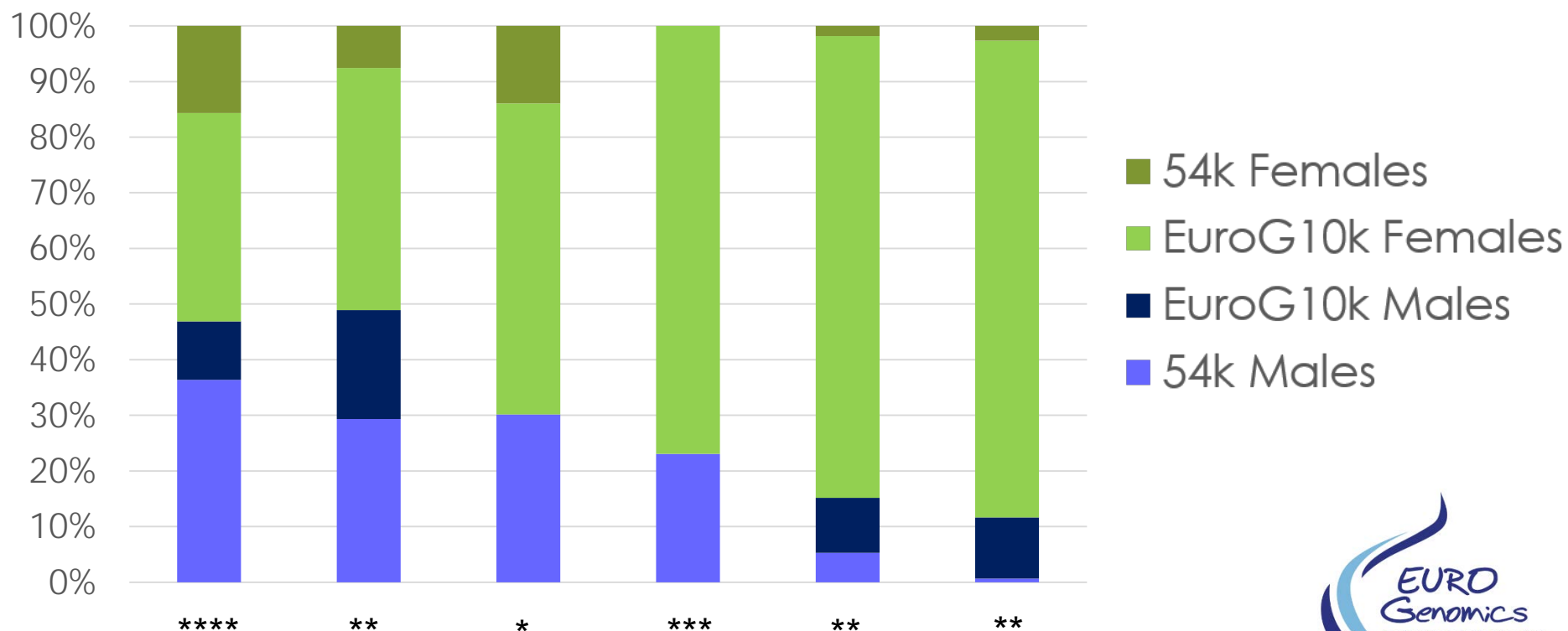
About 30,000 candidates (before GS: < 3000 progeny tested bulls)

Official information for about 1,500 young bulls per year (from 10 months)

6% 9%

16%

69%

- 54k Females
- EuroG10k Females
- EuroG10k Males
- 54k Males

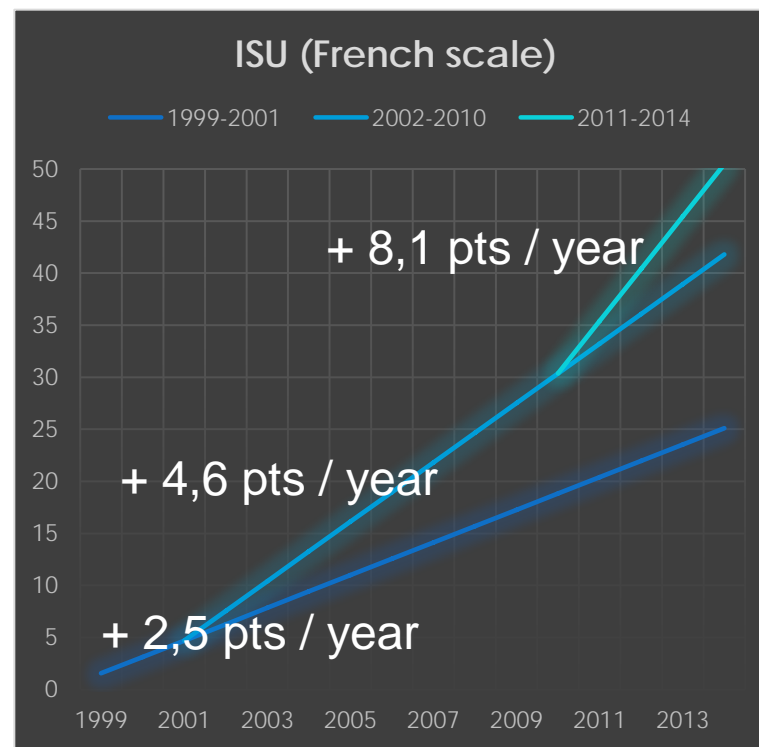EURO Genomics
for reliable cattle breeding

Contrasted strategies between countries

Distribution in 2014 (beeing adapted over the years)

Legend:
- 54k Females (dark olive)
- EuroG10k Females (green)
- EuroG10k Males (dark blue)
- 54k Males (purple)

Bar groups labeled: **** , ** , * , *** , ** , **

EURO Genomics
for reliable cattle breeding

Accelerated genetic progress

RZG (German scale)

—— 1999-2001 —— 2002-2010 —— 2011-2014

+ 5,6 pts / year

+ 2,2 pts / year

+ 1,8 pts / year

ISU (French scale)

—— 1999-2001 —— 2002-2010 —— 2011-2014

+ 8,1 pts / year

+ 4,6 pts / year

+ 2,5 pts / year

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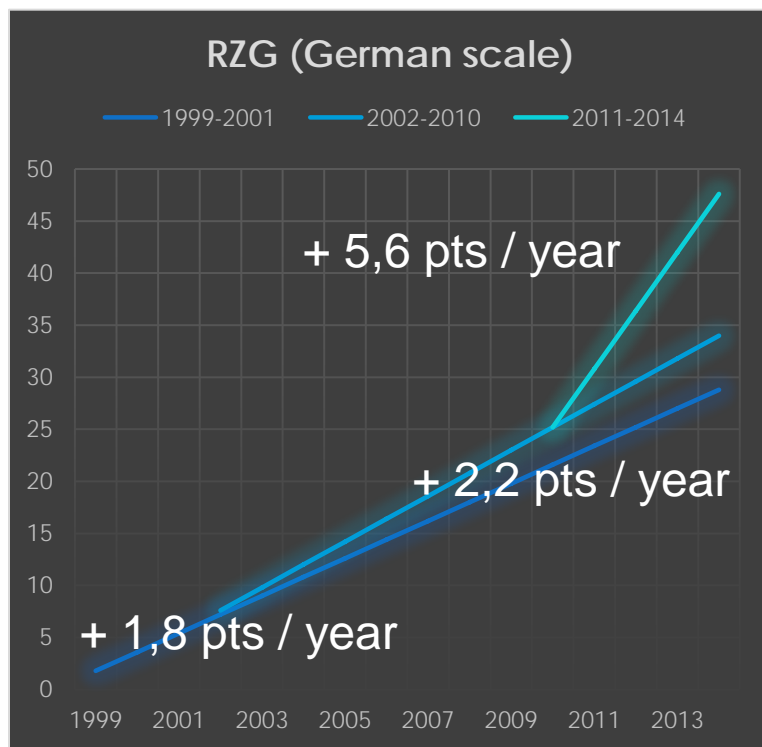
A quick adoption of the genomics in the breeding schemes

NVI (Dutch scale)

— 2000-2008　— 2009-2014

+ 33 pts / year

+ 20 pts / year

1999　2001　2003　2005　2007　2009　2011　2013

ICO (Spanish scale)

— 2000-2005　— 2005-2009　— 2009-2013

+ 256 pts / year

+ 111 pts / year

+ 101 pts / year

2000　2002　2004　2006　2008　2010　2012　2014
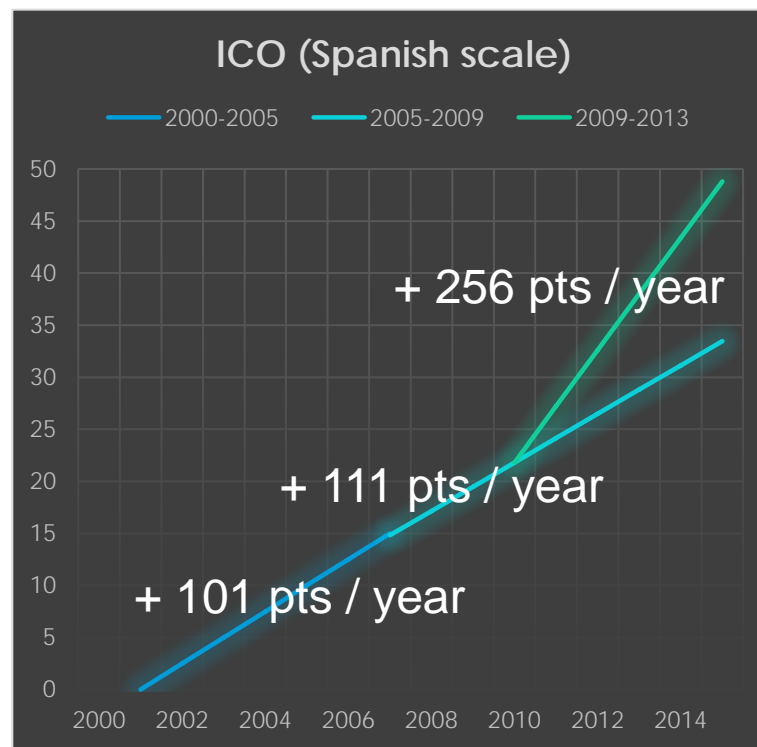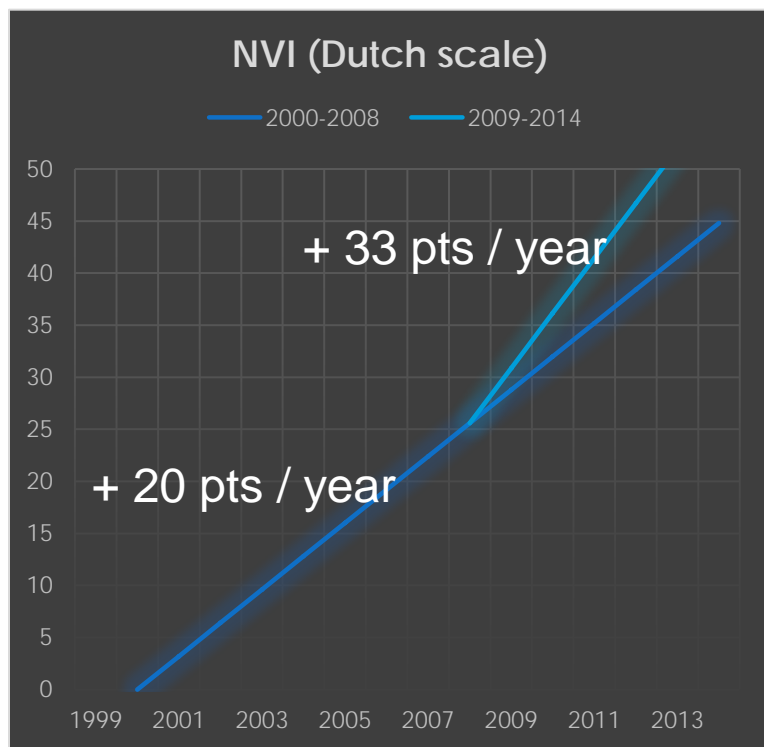
A quick adoption by dairy farmers

4 to 5 years after the 1st official GEBV

NLD: 50%
FRA: 67%
DEU: 70%
DFS: 95%
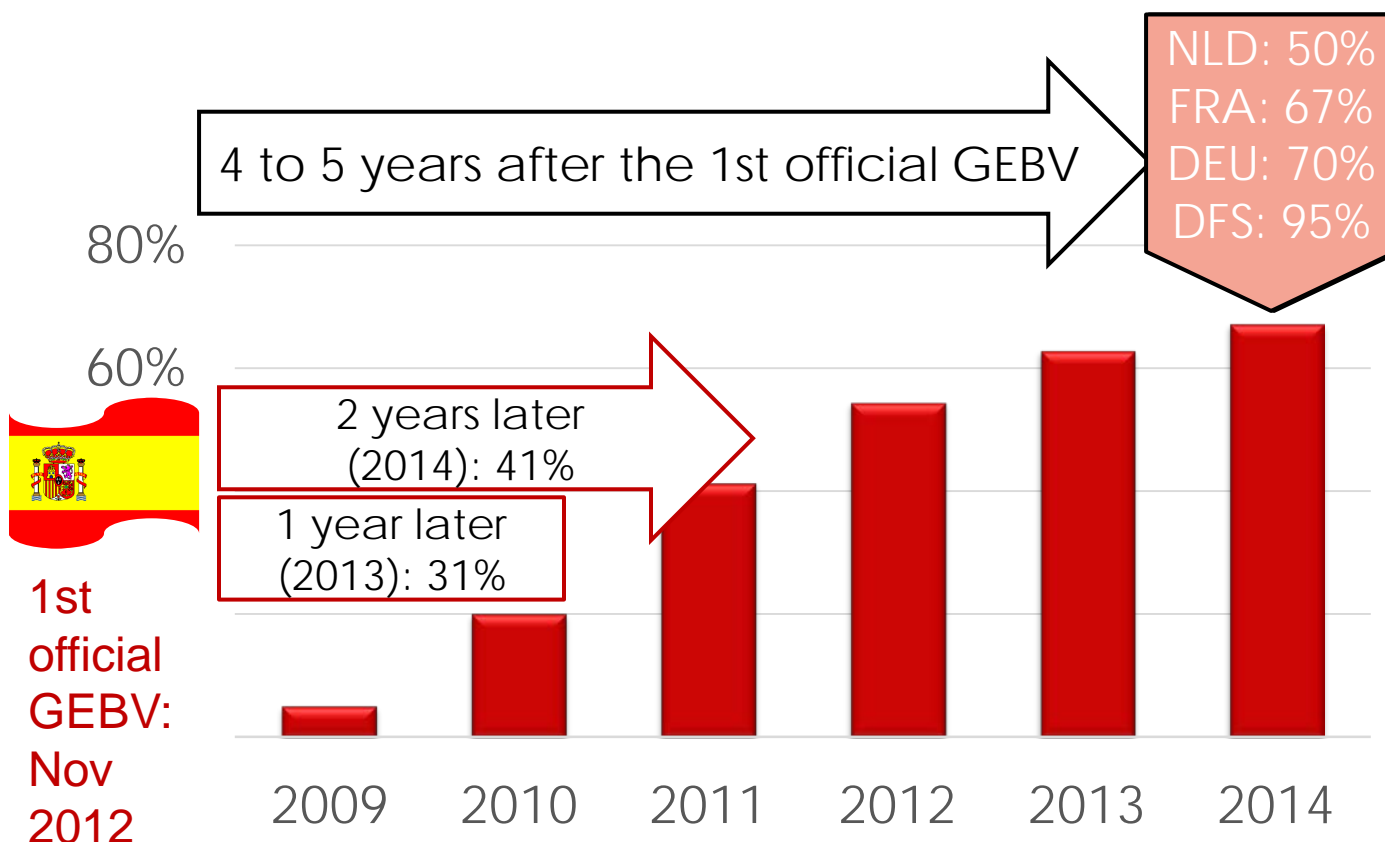
Proportion of AI done with young bulls (no daughter)

80%

60%

2 years later (2014): 41%

1 year later (2013): 31%

1st official GEBV: Nov 2012

2009 2010 2011 2012 2013 2014

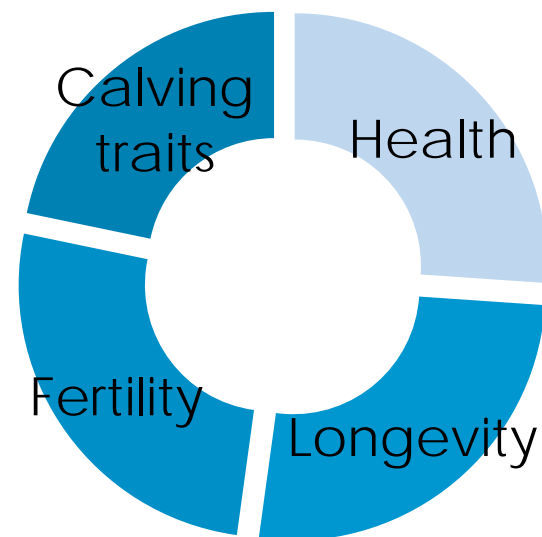EURO Genomics
for reliable cattle breeding

How to keep improving the quality of the GEBV?
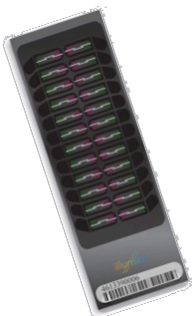
THE IMPORTANCE OF THE COLLABORATIONS

A better use of the available information

► From the reference population

   ► Harmonisation of the traits

   ⇒ Quality of the prediction equations

Calving traits

Health

Fertility

Longevity

More relevant information for decisions on selection

▶ EuroG10k = a customized chip, adapted to the needs, quickly evolving (v4)

▶ A result from collaboration (research & industry)

▶ Increased the quantity of relevant information :

  ▶ Imputation — Quality of the predictions

  ▶ Genetic abnormalities
  ▶ Genes of interests — Mating plan, breeding schemes

More information at the time of AI use

« Domestic » versus « foreign » bulls : reliability of the predictions should be the same with genomics

▶ 2014: Rankings of young bulls also became international

  ▶ Exchange of genotypes

  ▶ Participation to GMACE

▶ Which encouraged

  ▶ A large number of very young bulls to be published

  ⇒ with or without semen available

  ▶ A quick turnover while breeding values are expected to evolve (R^2)
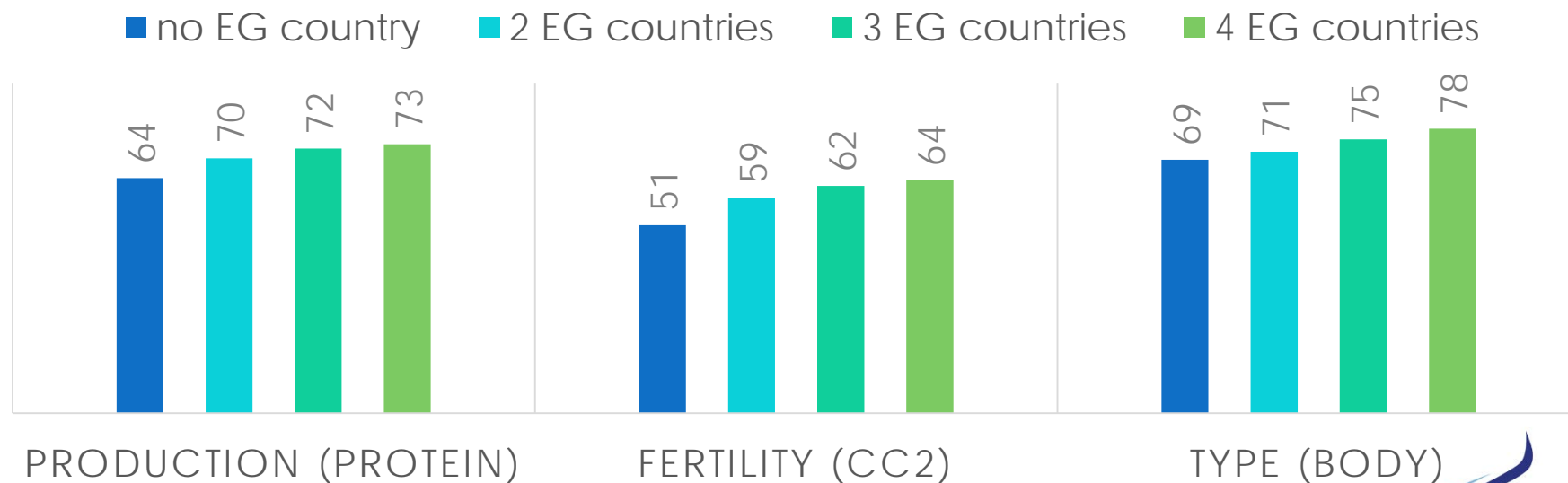
More information at the time of AI use

« Domestic » versus « foreign » bulls : reliability of the predictions should be the same with genomics

▶ The most complete information for the computation of GEBV
  ▶ Exchange of genotypes of the young bulls
  ▶ Completeness of the relationship information (genomic and non genomic data)
  ⇒ About 5000 additional bulls (/ Reference Population)

▶ Result: early information for each YB on different scales

⇒ Leverage to make the methodologies evolve

⇒ Useful for users: within the EG area and outside the EG area

More information at the time of AI use

▶ For farmers outside of the EG area (without own genomic evaluations): increased reliability

Legend: ■ no EG country ■ 2 EG countries ■ 3 EG countries ■ 4 EG countries

PRODUCTION (PROTEIN)
- 64
- 70
- 72
- 73

FERTILITY (CC2)
- 51
- 59
- 62
- 64

TYPE (BODY)
- 69
- 71
- 75
- 78

(R² of GMACE breeding values, Dec 2014)

Conclusions

▶ A quick adoption of the GEBV by breeding companies and by farmers

▶ Various needs of the farmers, various strategies and practices between countries

▶ Reliability level are still expected to be increased

▶ Joint efforts: research, calculation centers and industry accepted to collaborate in the interests of the dairy farmers

▶ A new way of collaboration = co-opetition

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