Benefits of Gene Ireland and GIBB herds

Introduction

- Gene Ireland maternal beef breeding program launched in Autumn 2012
- Currently around 300 qualified Gene Ireland maternal beef breeder (GIBB) herds
- Model developed to estimate benefits of GI and GIBB initiatives
- How these benefits may change with genomics and the BDGP

- Case study based on Limousin breed (100 GIBB herds)

Benefits Model

- Recursive model with multiple flows of genetic merit
- Sire usage stats estimated from data on both
  - GIBB and non-GIBB pedigree herds
  - Commercial herds
- 25% of replacements from suckler beef x dairy heifers

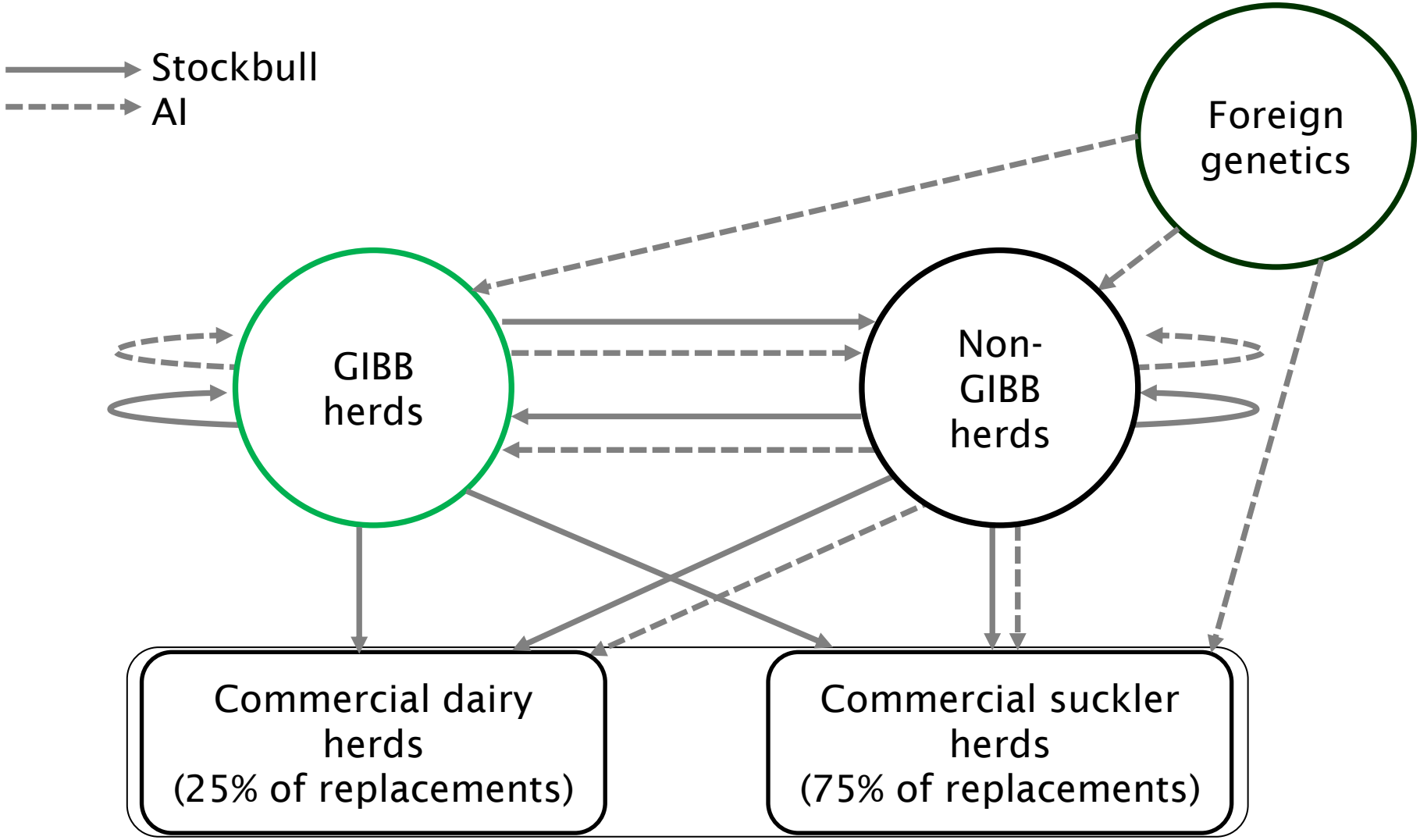
Sire types and usage

Bull origin	Bull type	Cow herd			
		GIBB	Other pedigree	Commercial	Dairy
Foreign	AI	71.1%	50.7%	15%	0%
	Stockbulls	3.7%	1.7%	0%	0%
GIBB	Gene Ireland AI	0%	0%	0%	0%
	Homebred stockbulls	2.1%	N/A	N/A	N/A
	Stockbulls	4%	1.9%	5%	10%
Other pedigree	AI	7.7%	13.8%	10%	10%
	Homebred stockbulls	N/A	3.5%	N/A	N/A
	Stockbulls	11.1%	28.2%	50%	60%
Non pedigree	Stockbulls	0%	0%	20%	20%

Key questions

- Changes in total benefits when:
  - Gene Ireland AI bulls have larger impact
  - Genomics is used
  - AI usage from Gene Ireland bulls is increased in commercial herds
  - More Gene Ireland candidates are available
  - Foreign AI bulls improve
  - Stockbulls from GIBB herds have larger impact
  - A higher proportion of replacements are sourced from dairy crosses

Overview



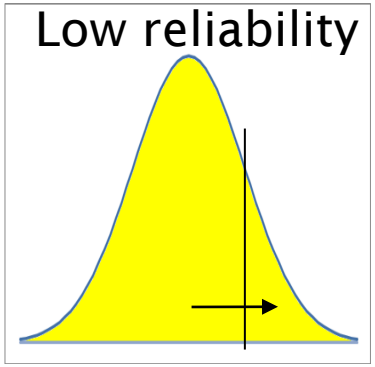
ICBF.com

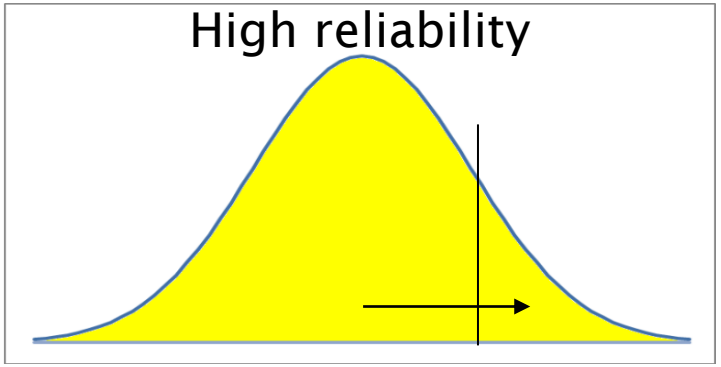
Key Parameters

Description	Parameter
Number of expressions of sire index superiority per year (20% replacements kept x 5 lactations)	400,000
Proportion of expressions of sire index superiority via beef cross dairy	25%

Key Parameters

Description	Parameter
Range in young bull replacement index values	€60
Lift if select the best 50%	€16
Range of young bull index values after progeny recorded	€120
Lift if select the best 50%	€32
Range of Gene Ireland progeny tested candidates	€150
Lift if select the best 20%	€74





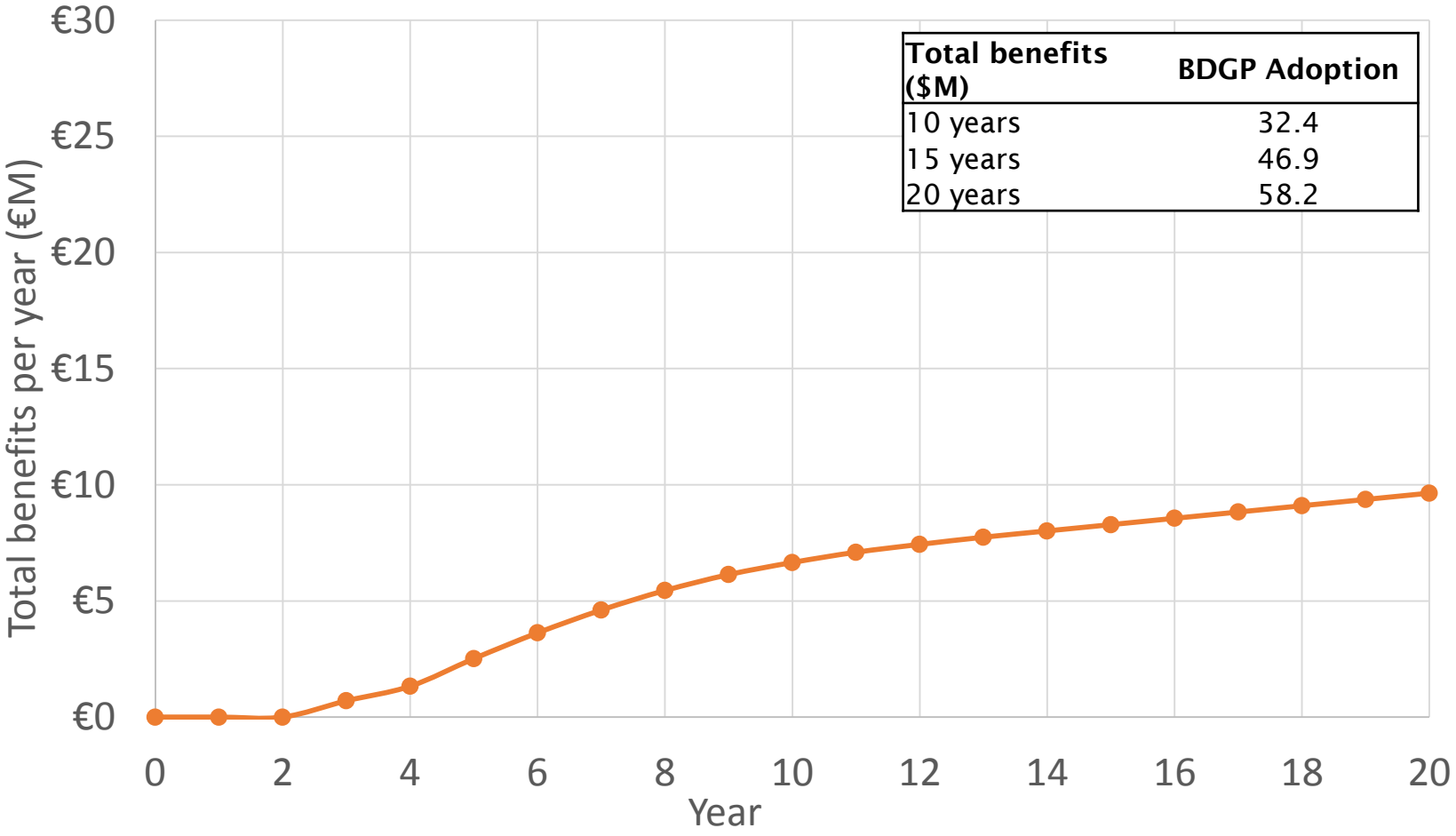
Key Parameters

Description	Parameter
Annual gain in replacement index of foreign bulls used (year on year)	€2
Superiority of a dairy cross relative to a suckler replacement	€15
Immediate lift from BDGP sourcing of improved heifers	€30

Early release of GI bulls with genomics

	Progeny proportion	
Age of selected GI sire(years)	Without genomics	With genomics
2	0	0.3
3	0	0.5
4	0	0.2
5	0.3	0
6	0.4	0
7	0.3	0

BDGP adoption – keeping better replacements



Total benefits ($M)	BDGP Adoption
10 years	32.4
15 years	46.9
20 years	58.2

Benefits of BDGP adoption

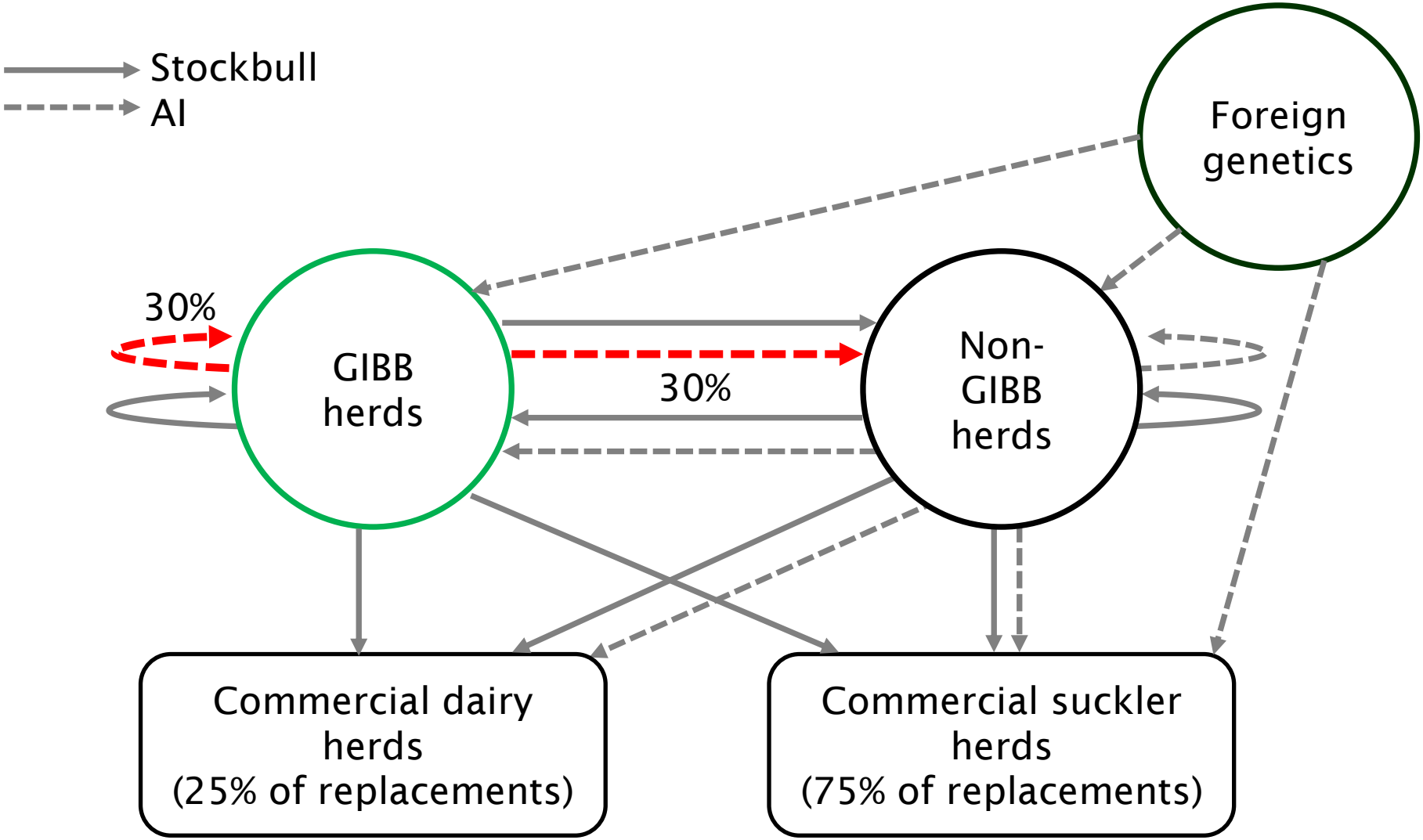
- Using higher euro star bulls and keeping higher quality replacements has a substantial impact on the total benefits after 10 years, with €32.4M additional total benefits over status quo

- Zero progress without the BDGP

Increasing Gene Ireland AI usage

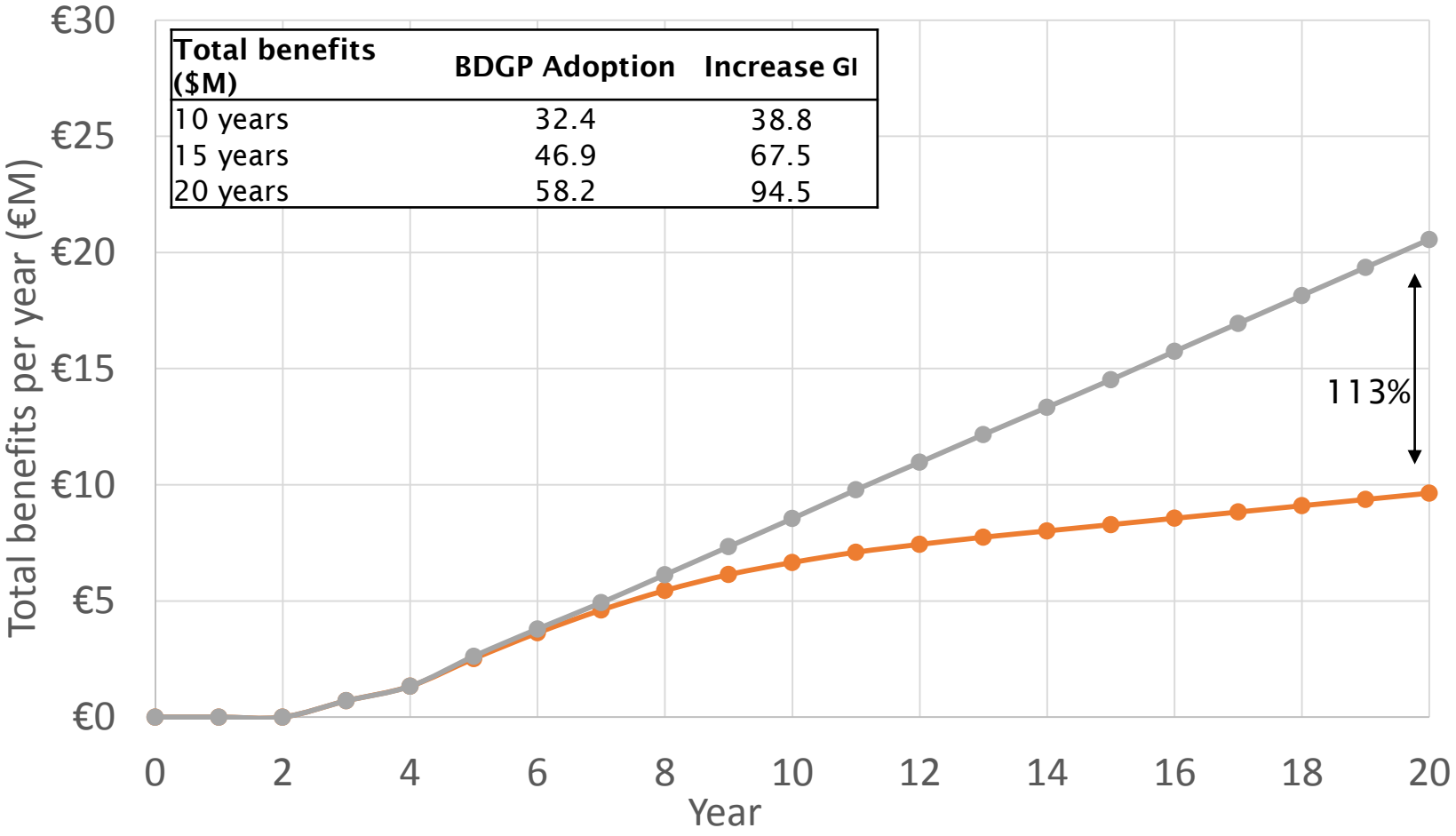
- What is the impact of replacing foreign AI usage in pedigree herds with more Gene Ireland AI?
  - Gene Ireland AI use increased to 30% (50%) in all pedigree herds, only GIBB herds, and increased to 20% in commercial herds
- Impact of doubling the size of the Gene Ireland program
  - Gene Ireland AI use increased to 30% in pedigree herds with the top 10% of bulls selected instead of the top 20%
- Impact of using genomics with traditional progeny testing to "release" top AI bulls earlier
  - Gene Ireland AI use increased to 30% in pedigree herds, with main usage at 3 years old instead of 5.
- Impact of a higher proportion (50%) of replacements sourced from dairy herds

Increasing Gene Ireland AI usage



Increasing Gene Ireland AI usage – 30% usage in pedigree herds

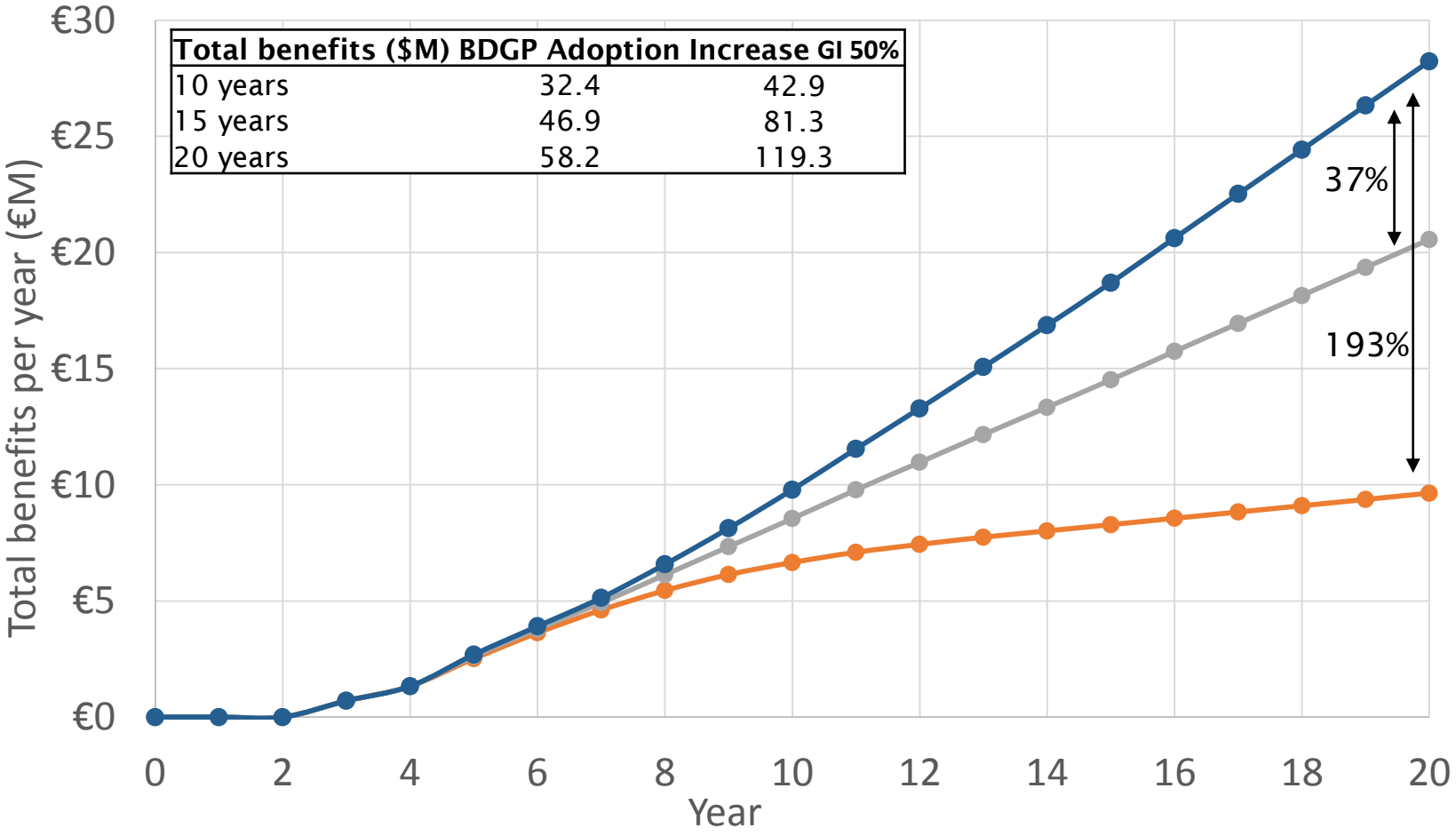
Total benefits ($M)	BDGP Adoption	Increase GI
10 years	32.4	38.8
15 years	46.9	67.5
20 years	58.2	94.5



ICBF.com

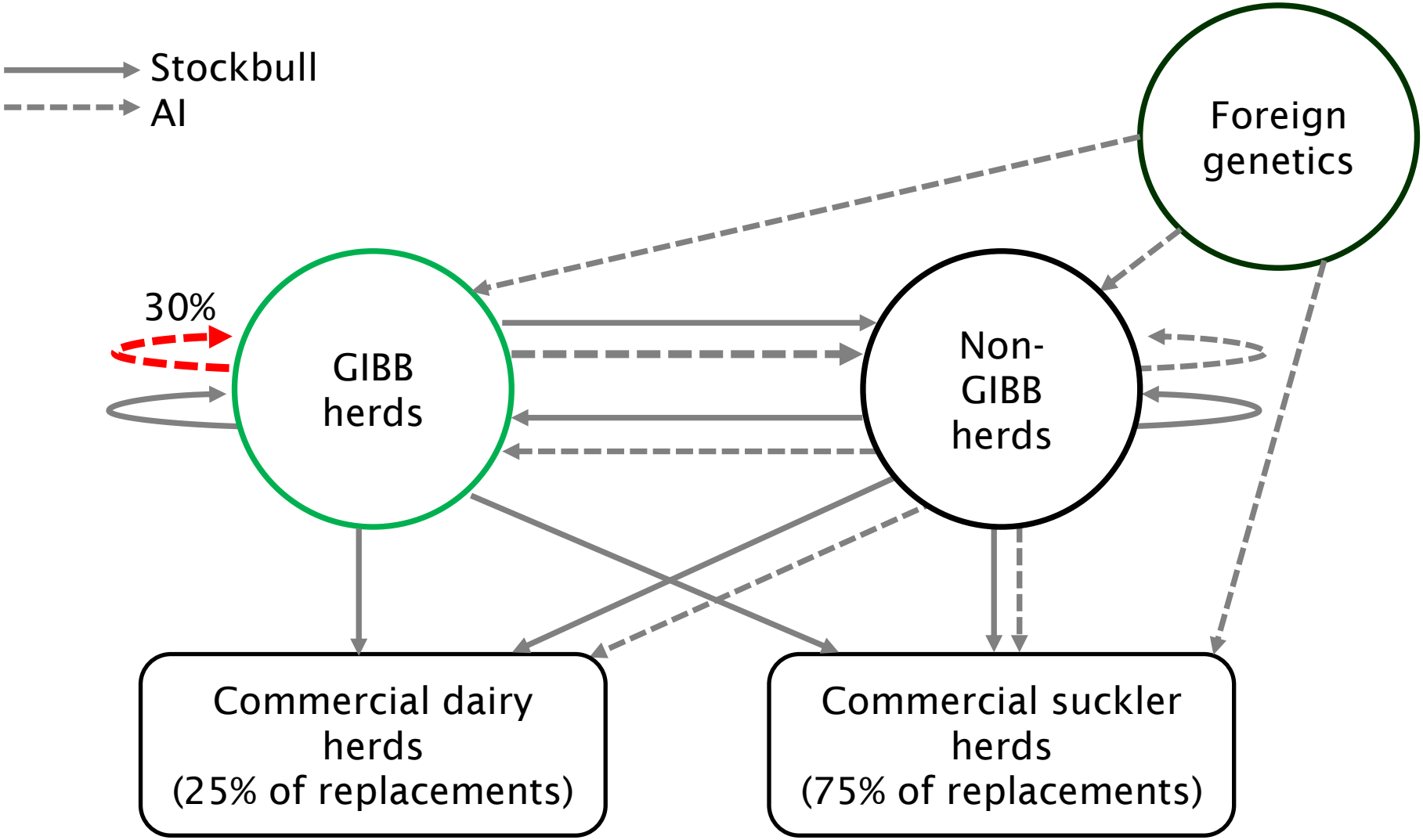
Increasing Gene Ireland AI usage – 50% usage in pedigree herds

Total benefits ($M)	BDGP Adoption	Increase GI 50%
10 years	32.4	42.9
15 years	46.9	81.3
20 years	58.2	119.3



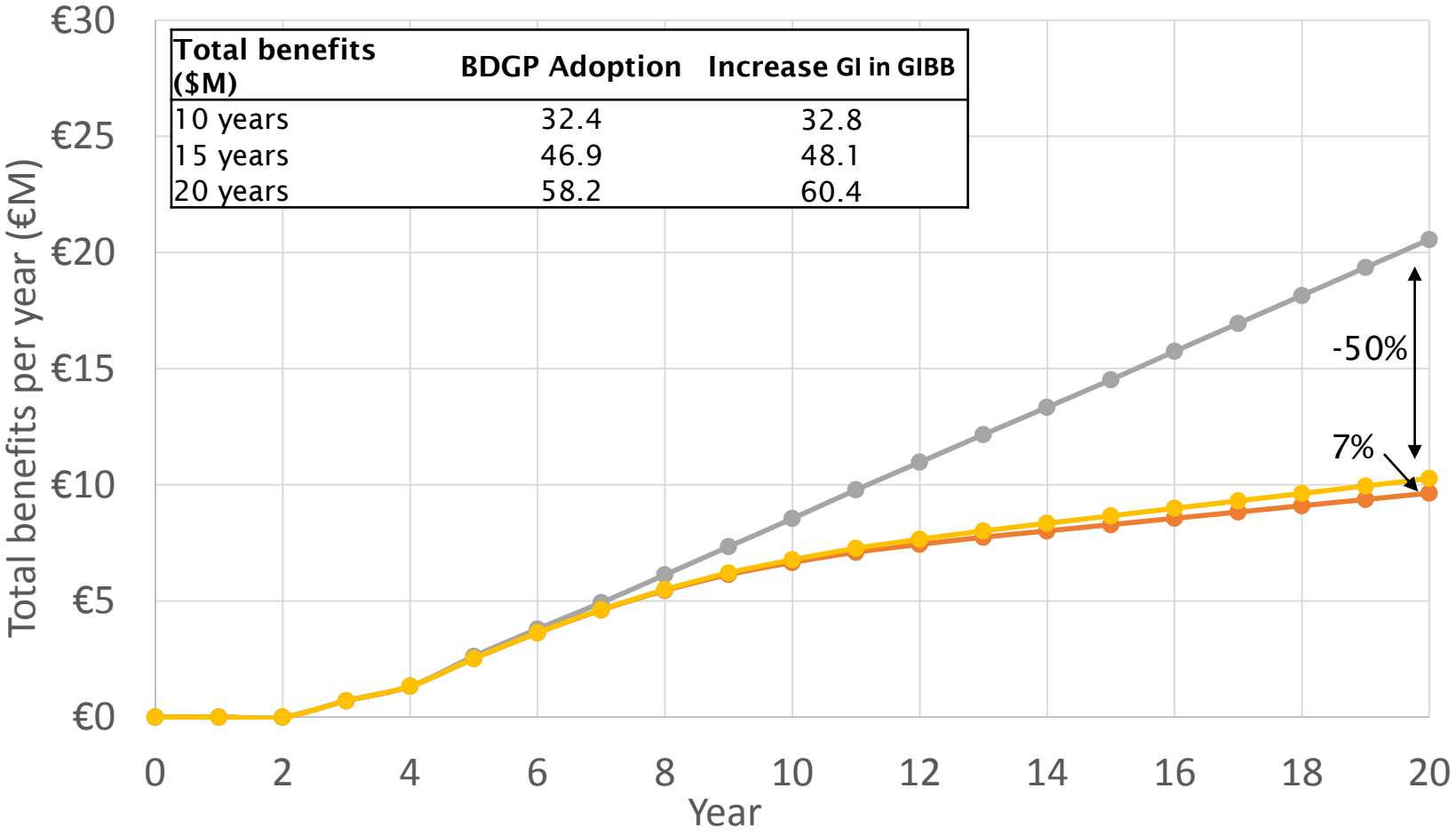
ICBF.com

Increasing Gene Ireland AI usage



Increasing Gene Ireland AI usage – 30% usage in GIBB herds only

Total benefits ($M)	BDGP Adoption	Increase GI in GIBB
10 years	32.4	32.8
15 years	46.9	48.1
20 years	58.2	60.4



ICBF.com

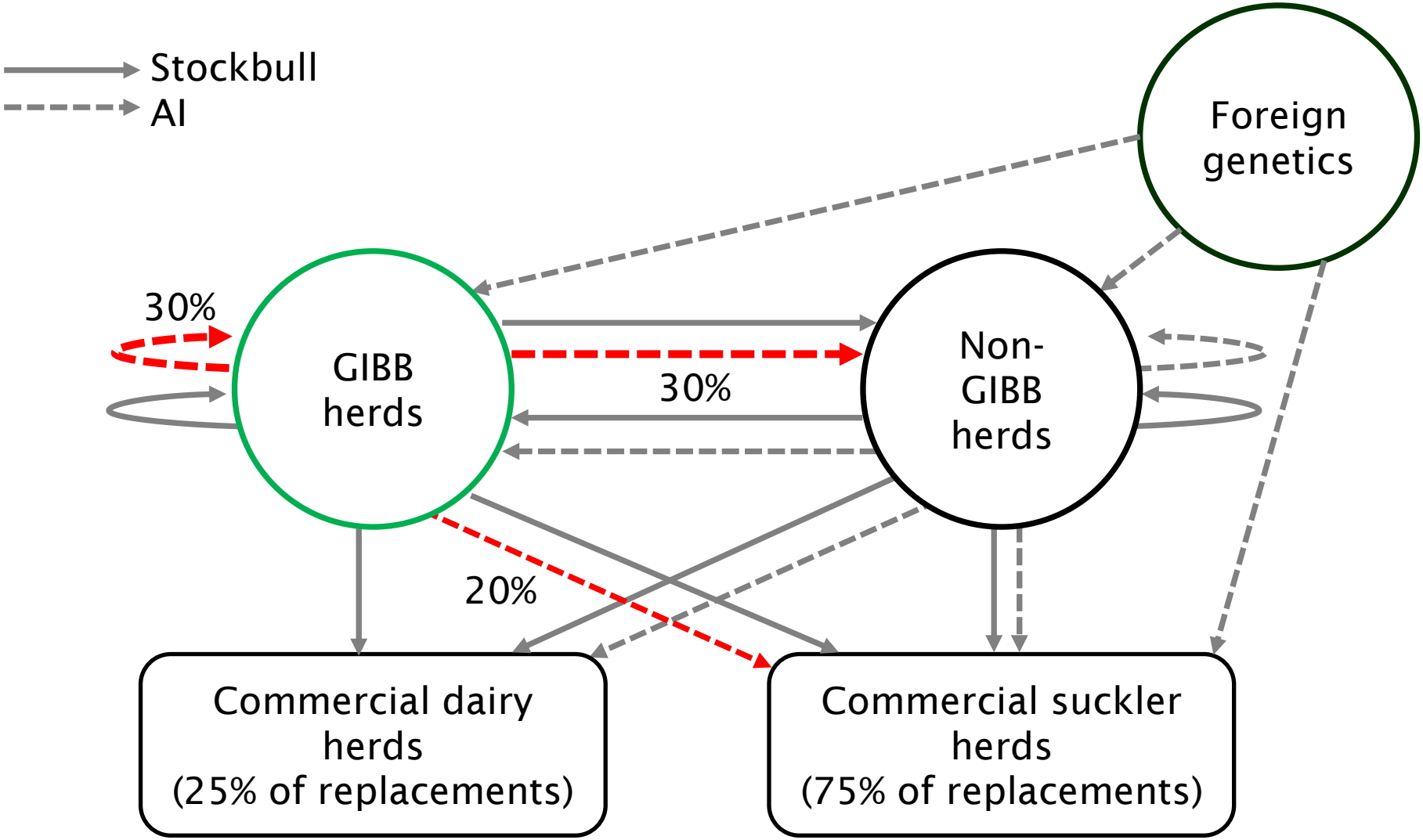
Increasing Gene Ireland AI usage – 30% usage in GIBB herds only

- Currently GIBB herds contributing a small proportion of stock bulls and AI bulls
- This needs to change!

Sire types and usage

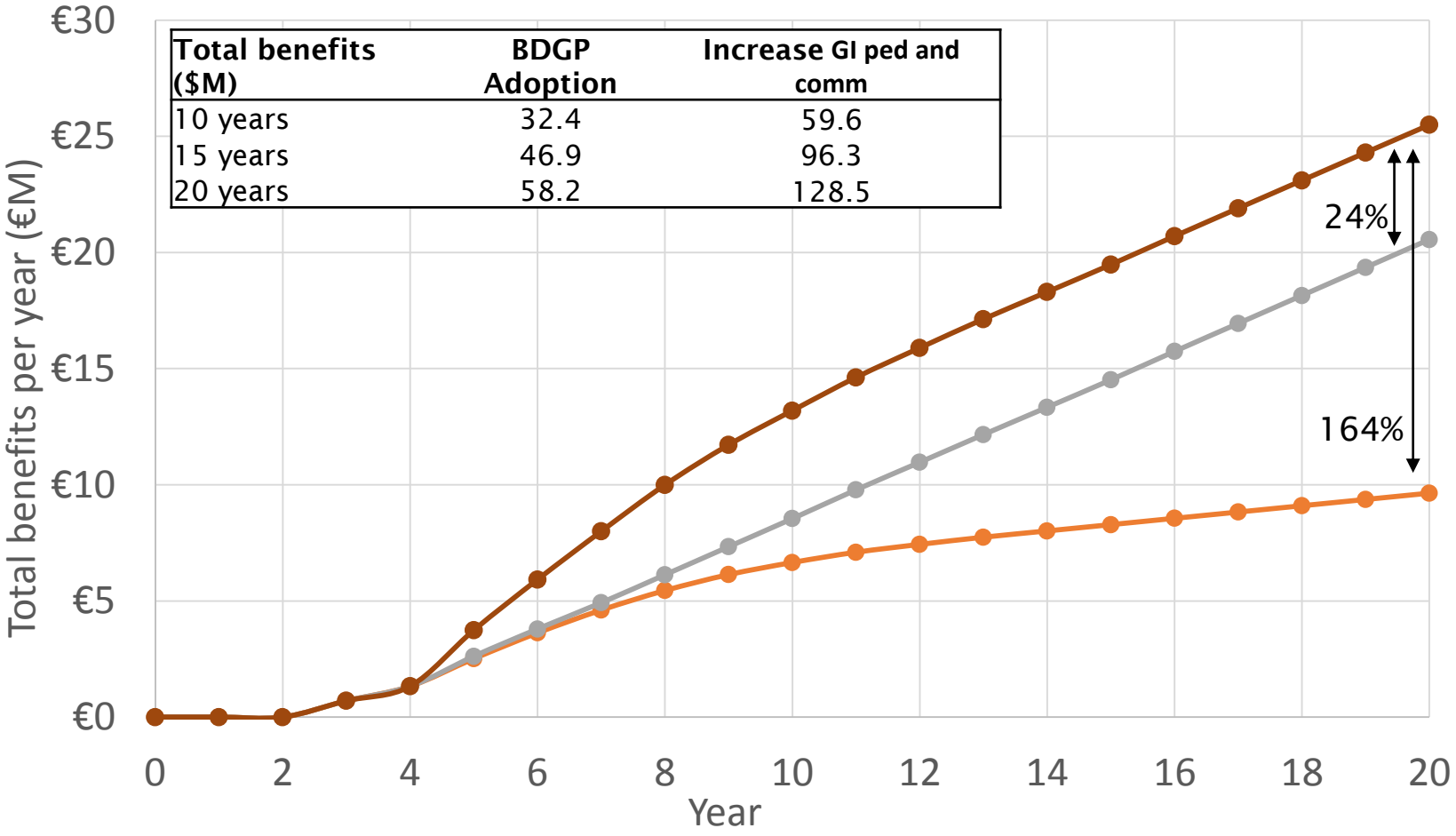
Bull origin	Bull type	Cow herd: GIBB	Cow herd: Other pedigree	Cow herd: Commercial	Cow herd: Dairy
Foreign	AI	71.1%	50.7%	15%	0%
	Stockbulls	3.7%	1.7%	0%	0%
GIBB	Gene Ireland AI	0%	0%	0%	0%
	Homebred stockbulls	2.1%	N/A	N/A	N/A
	Stockbulls	4%	1.9%	5%	10%
Other pedigree	AI	7.7%	13.8%	9%	10%
	Homebred stockbulls	N/A	3.5%	N/A	N/A
	Stockbulls	11.1%	28.2%	46%	60%
Non pedigree	Stockbulls	0%	0%	25%	20%

Increasing Gene Ireland AI usage



Increasing Gene Ireland AI usage – 30% usage in ped and 20% in commercial

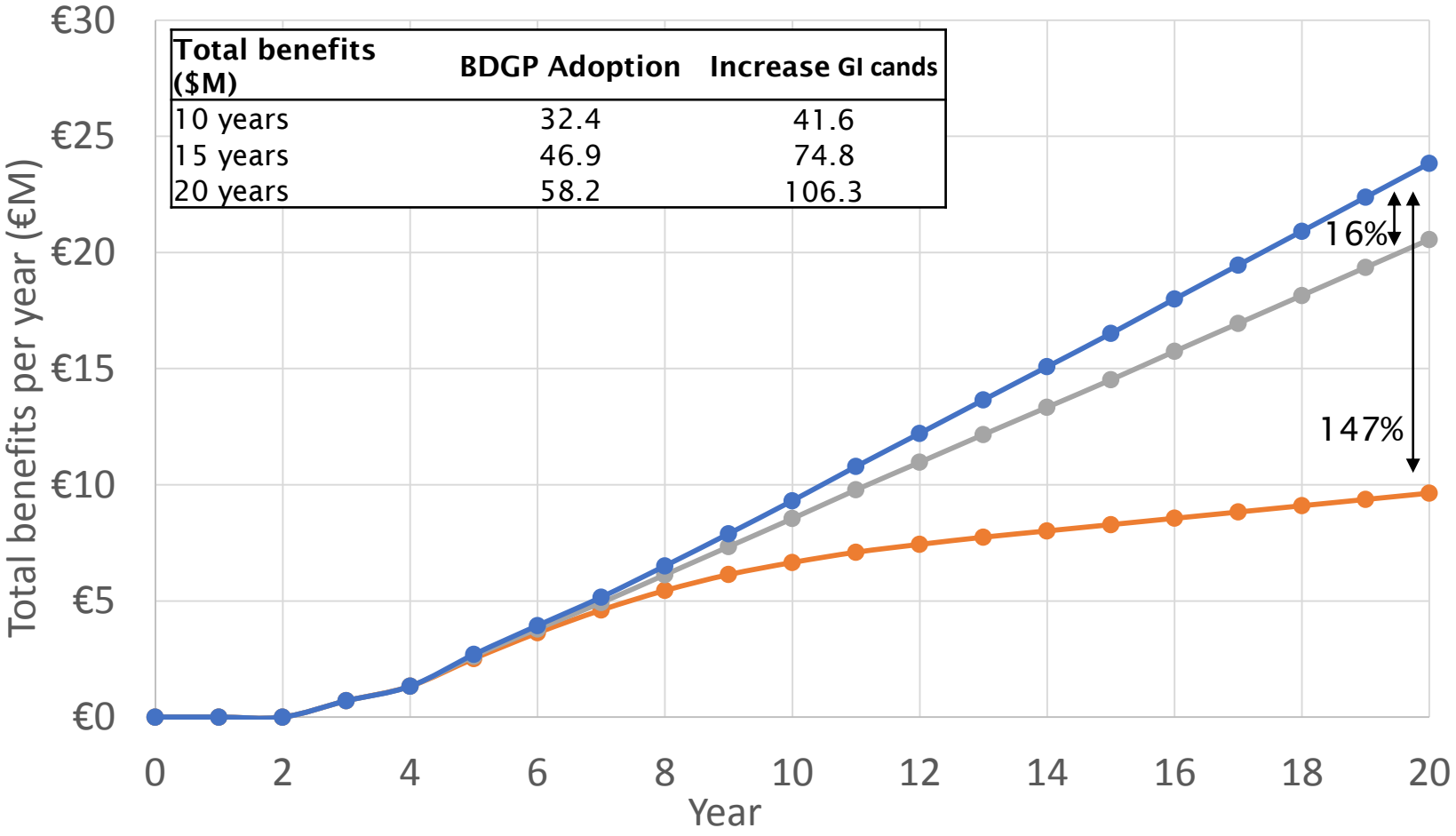
Total benefits ($M)	BDGP Adoption	Increase GI ped and comm
10 years	32.4	59.6
15 years	46.9	96.3
20 years	58.2	128.5



ICBF.com

Increasing Gene Ireland AI usage – twice as many Gene Ireland bulls tested

Total benefits ($M)	BDGP Adoption	Increase GI cands
10 years	32.4	41.6
15 years	46.9	74.8
20 years	58.2	106.3



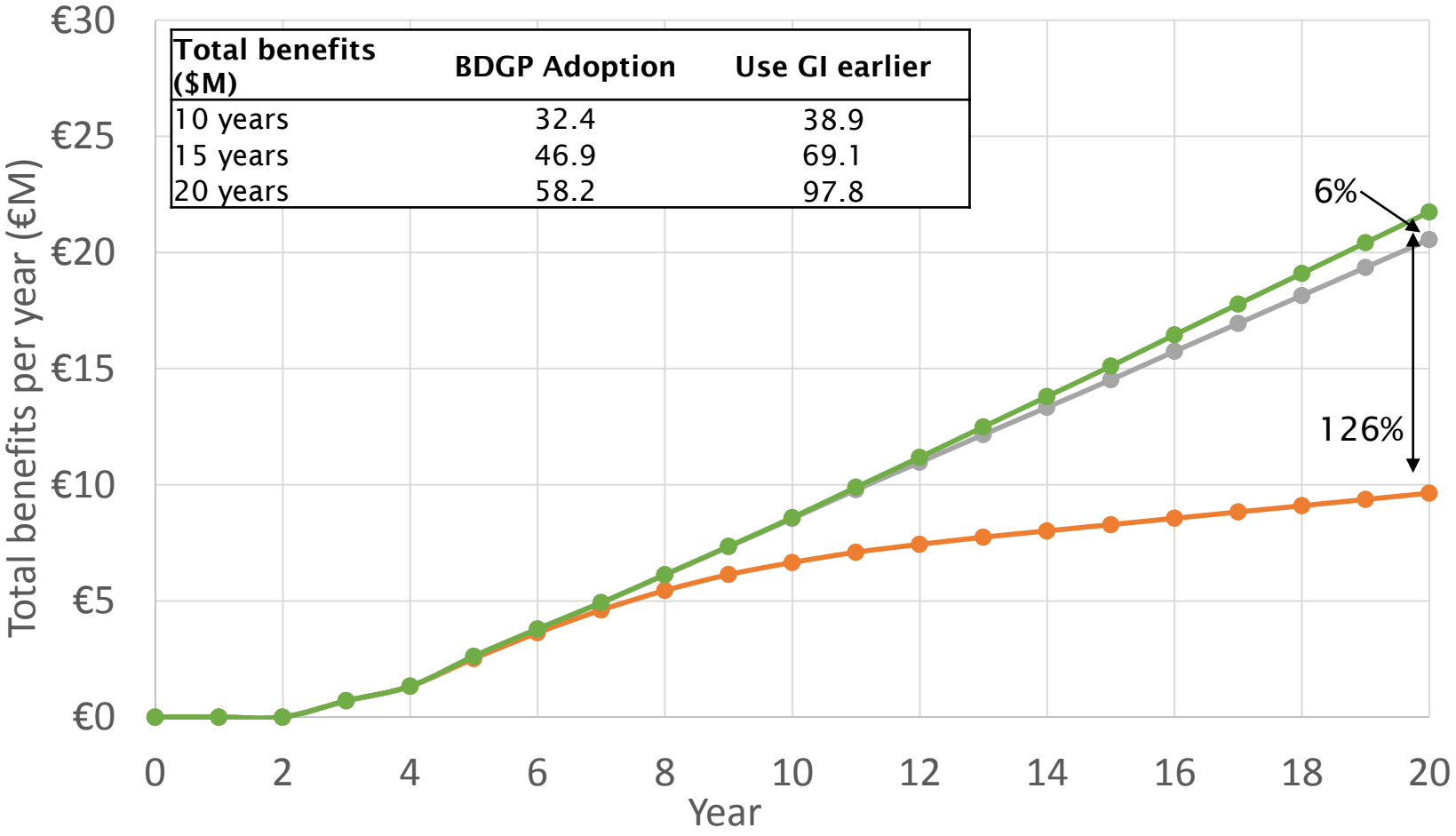
ICBF.com

Increasing Gene Ireland AI usage – twice as many Gene Ireland bulls tested

- Only 25% increase in selection intensity
  - AI bulls taken from top 10% c.f. top 20% of those PT'd.
- Gene Ireland only part of the driver of genetic progress
- Gene Ireland needs to have a bigger impact before expansion justified
- Need to clarify the important of GI for training and improving genomic selection

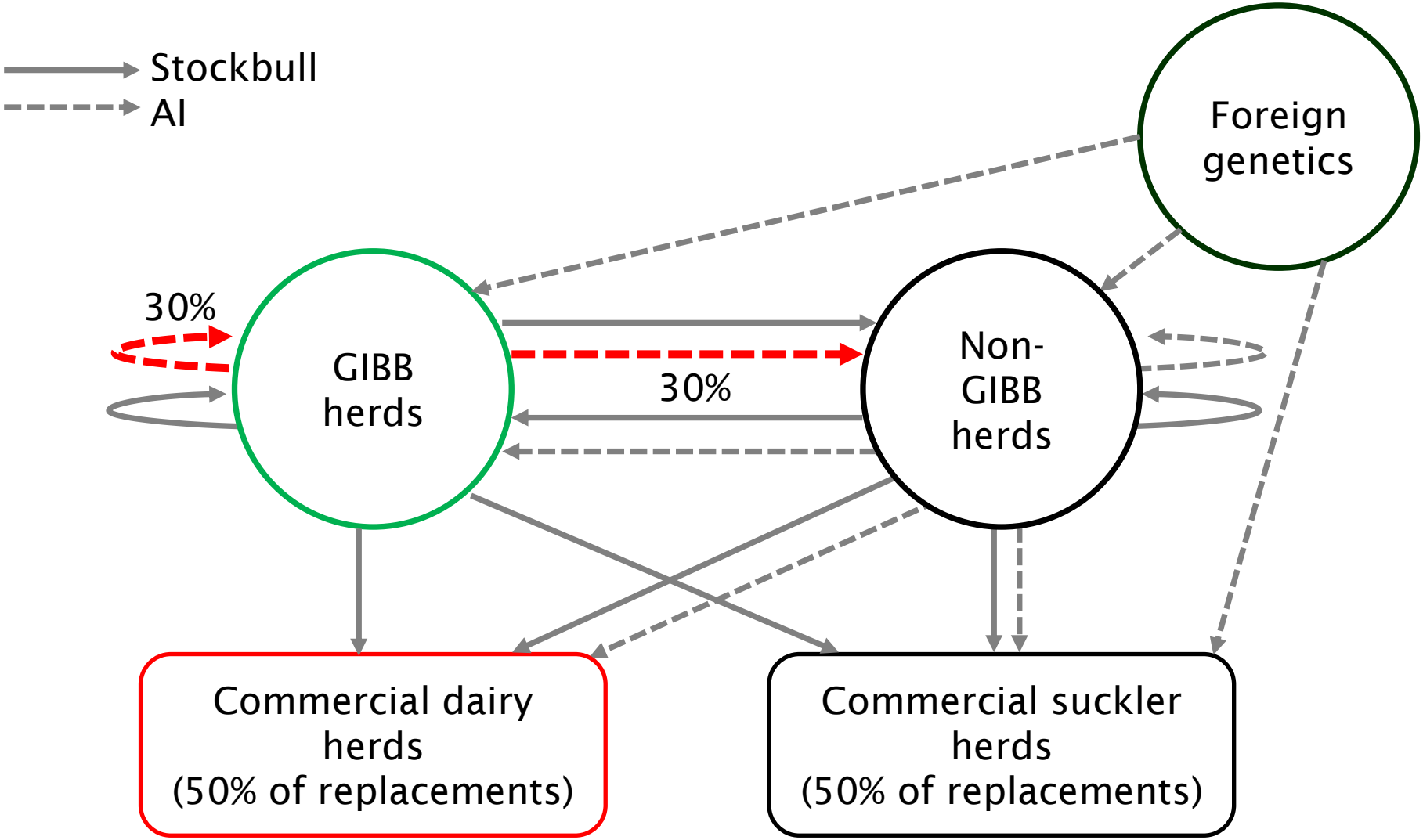
Increasing Gene Ireland AI usage – Gene Ireland bulls used earlier

Total benefits ($M)	BDGP Adoption	Use GI earlier
10 years	32.4	38.9
15 years	46.9	69.1
20 years	58.2	97.8



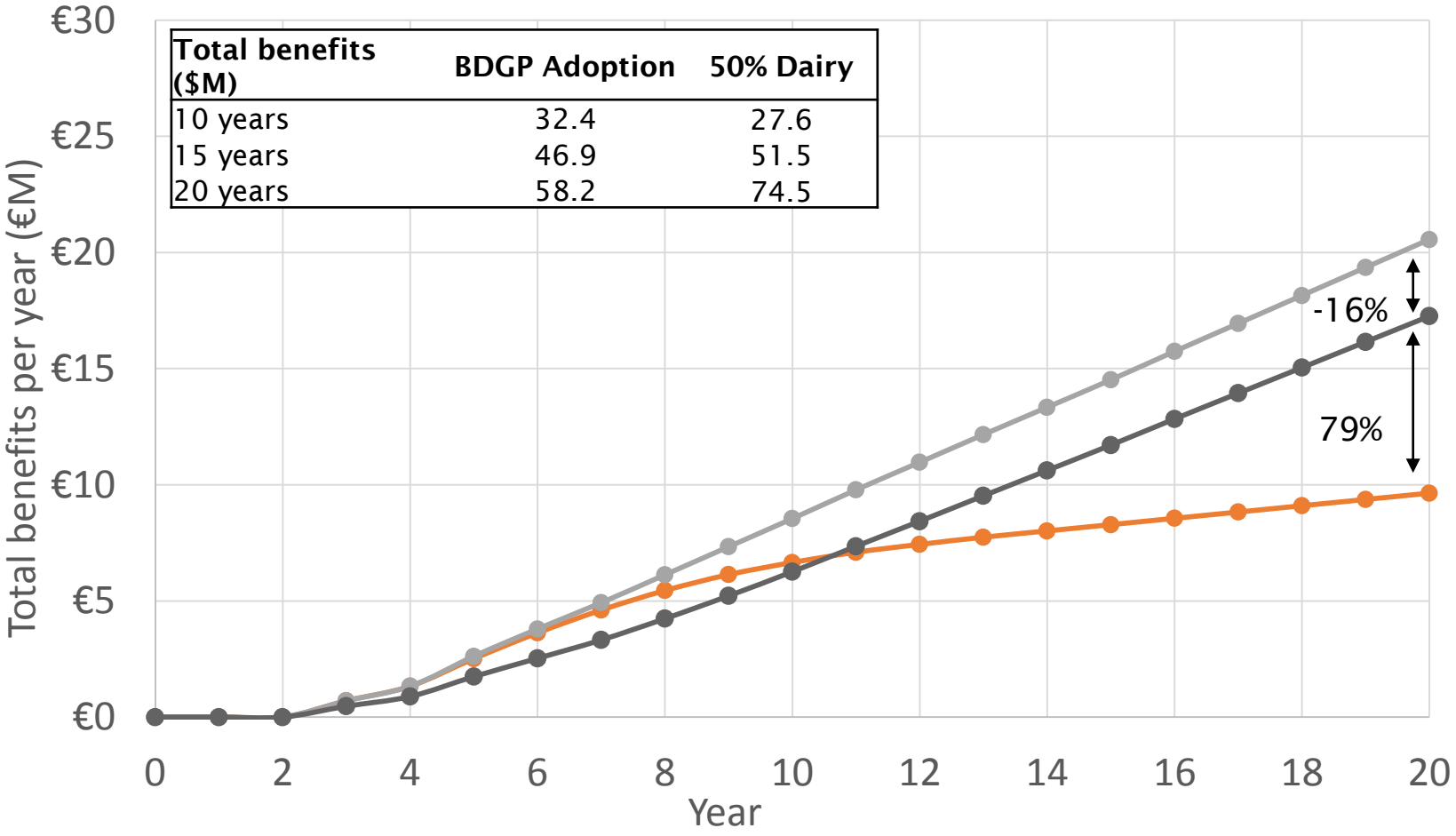
ICBF.com

Increasing Gene Ireland AI usage



Increasing Gene Ireland AI usage – 50% of replacements from dairy

Total benefits ($M)	BDGP Adoption	50% Dairy
10 years	32.4	27.6
15 years	46.9	51.5
20 years	58.2	74.5



ICBF.com

Increasing Gene Ireland AI usage – 50% of replacements from dairy

- If more dairy genes coming into suckler herd, then less opportunity to exploit gains in maternal beef genetics
- Dilution
- Decision on dairy cross replacements depends on future merit of dairy crosses vs suckler replacements

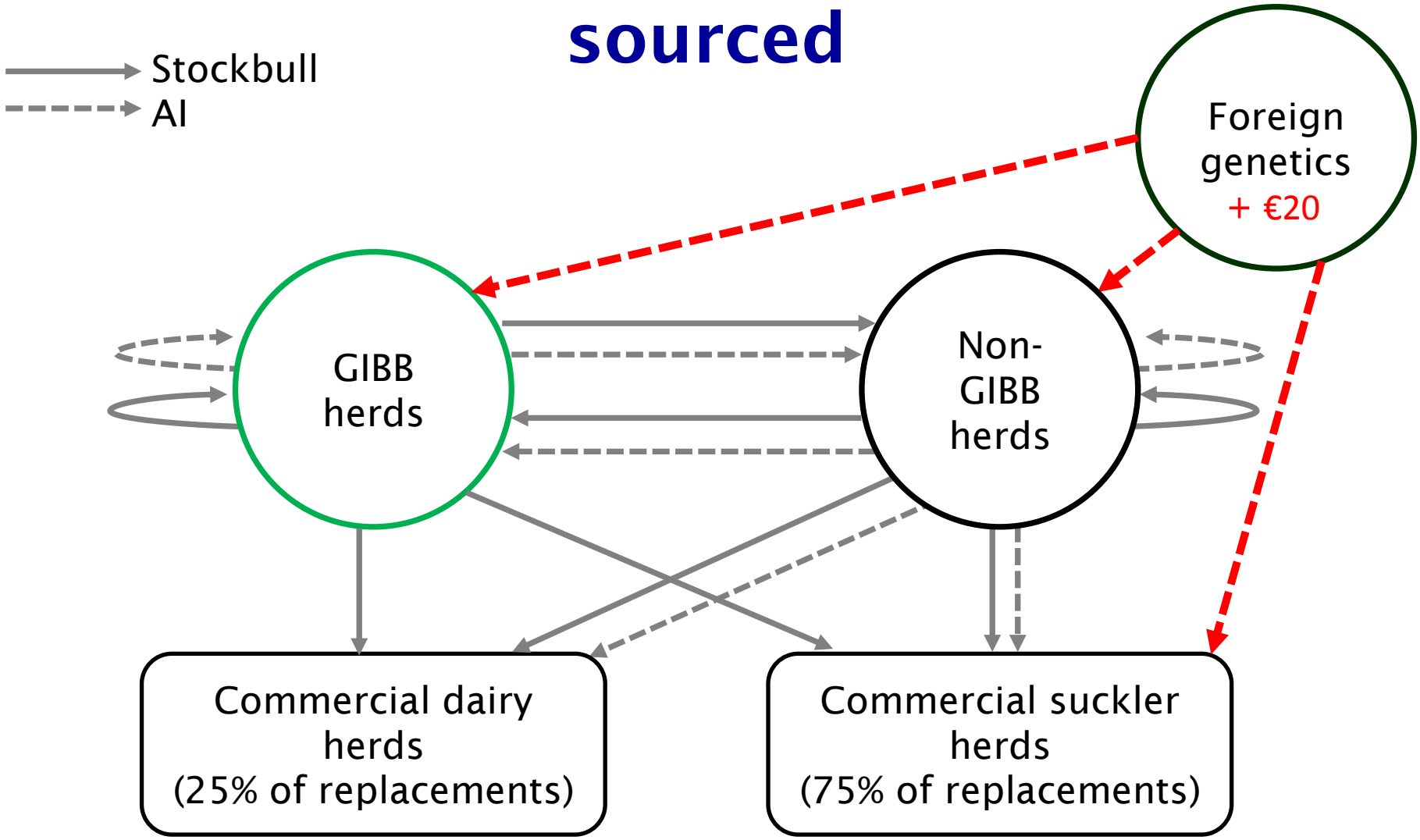
Increasing Gene Ireland AI usage - outcomes

- Using 30% Gene Ireland AI in pedigree herds yields €36M more in benefits after 20 years over BDGP
- Increasing this to 50% yields an additional €25M after 20 years
- Using 30% Gene Ireland AI in GIBB herds only yields €2M more after 20 years at current usage of GIBB stockbulls
- 20% usage of Gene Ireland AI in commercial leads to an additional €34M over pedigree herd usage
- A higher proportion of dairy replacements led to a €20M drop in benefits after 20 years

Increased merit of foreign AI bulls sourced

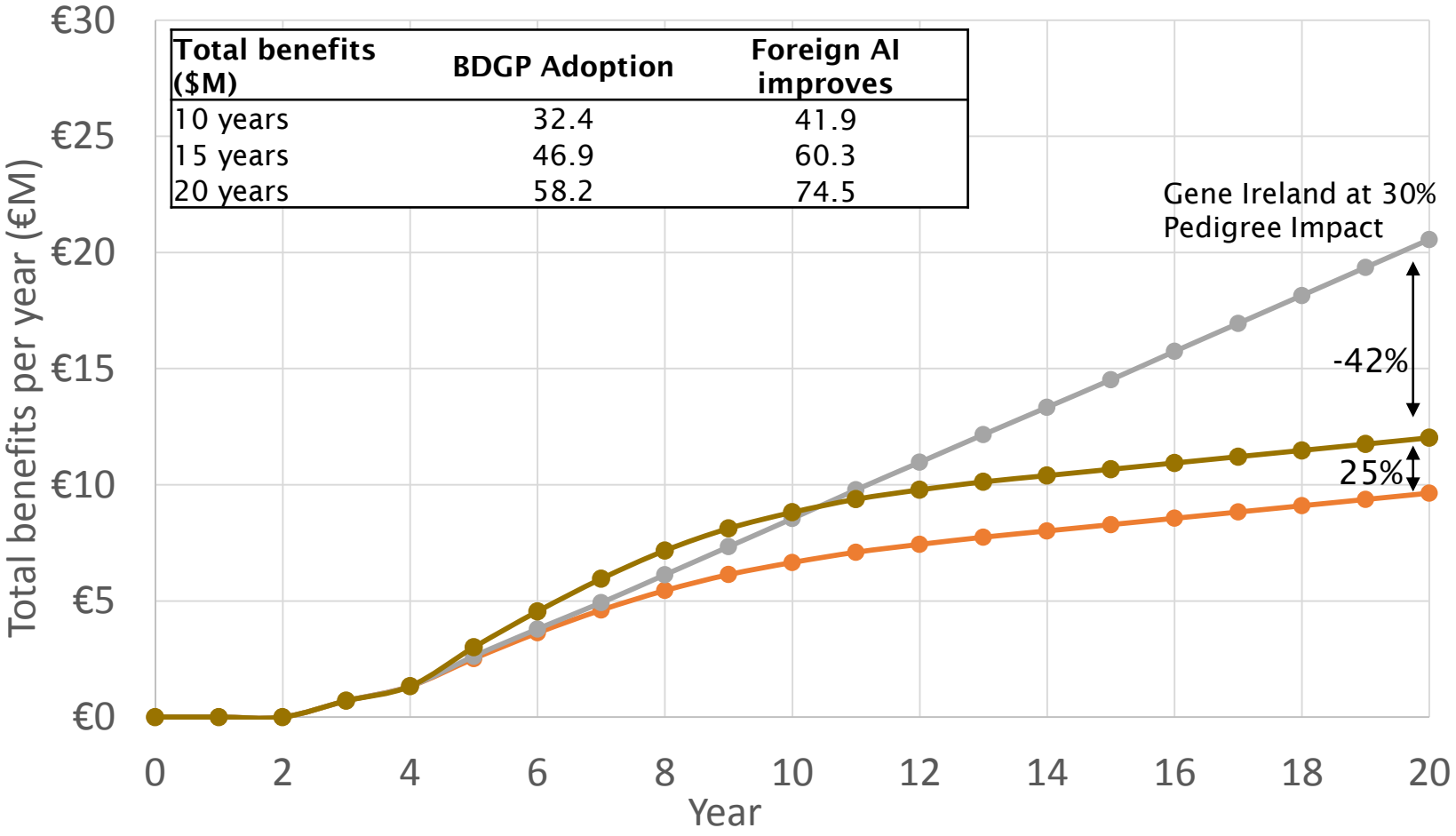
- How will the total benefits change if the Foreign AI sires improve (more maternal)
  - The superiority of the foreign AI sires over Irish sires was set to €20 at year 0
  - This superiority was assumed to remain at a constant level going forward (i.e. not diverging)

Increased merit of foreign AI bulls sourced



Increased merit of foreign AI bulls sourced

Total benefits ($M)	BDGP Adoption	Foreign AI improves
10 years	32.4	41.9
15 years	46.9	60.3
20 years	58.2	74.5



ICBF.com

Increased merit of foreign AI bulls sourced

- Increasing the merit of the foreign AI sires led to the highest short term benefits (after 10 years), €9.5M higher than status quo with BDGP

- After 10 years the total benefits per year were parallel to status quo, with the total benefits after 20 years €16M higher than status quo with BGDP
- Long term underperforms Gene Ireland based strategy

Key results.

- Better replacements through the BGDP leads to €27M more in total benefits in 10 years time
- Increasing usage of Gene Ireland AI to 30% in pedigree herds produces the largest benefits - extra €36.2M total benefits in 20 years time
- Doubling the number of Gene Ireland candidates adds €12M after 20 years
- 20% usage of Gene Ireland AI in commercial herds leads to an additional €34M over just pedigree herd usage after 20 years

Key results (continued)

- Higher merit Foreign AI sires produce good short term results, but wider usage of Gene Ireland AI is a significantly better long term strategy
- Genomics increases accuracy, confidence, and should make the logistics of AI simpler
  - Market semen earlier from a bull

The unanswered question

- Can genomics replace Gene Ireland progeny testing?

- Answer
  - To do this, genomics would need to identify maternal bulls sufficiently accurately for them to be used widely by AI in pedigree herds (displacing Foreign AI usage)

- But
  - Gene Ireland progeny test is important to underpin genomics – data quality

Additional scenarios?

- This is complicated……how do we communicate it better?
- What are the key questions?
- What is realistic?
- Additional scenarios
  - More GIBB herds
  - Data quality