IRISH CATTLE BREEDING FEDERATION

G€N€ IR€LAND User Meeting

Cork Marts, Corrin, Fermoy

13th November 2008

NATIONAL DEVELOPMENT PLAN

FBD TRUST

IRISH CATTLE BREEDING FEDERATION

Genomic Selection
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G€N€ IR€LAND®

CORK MARTS

13 Nov 2008

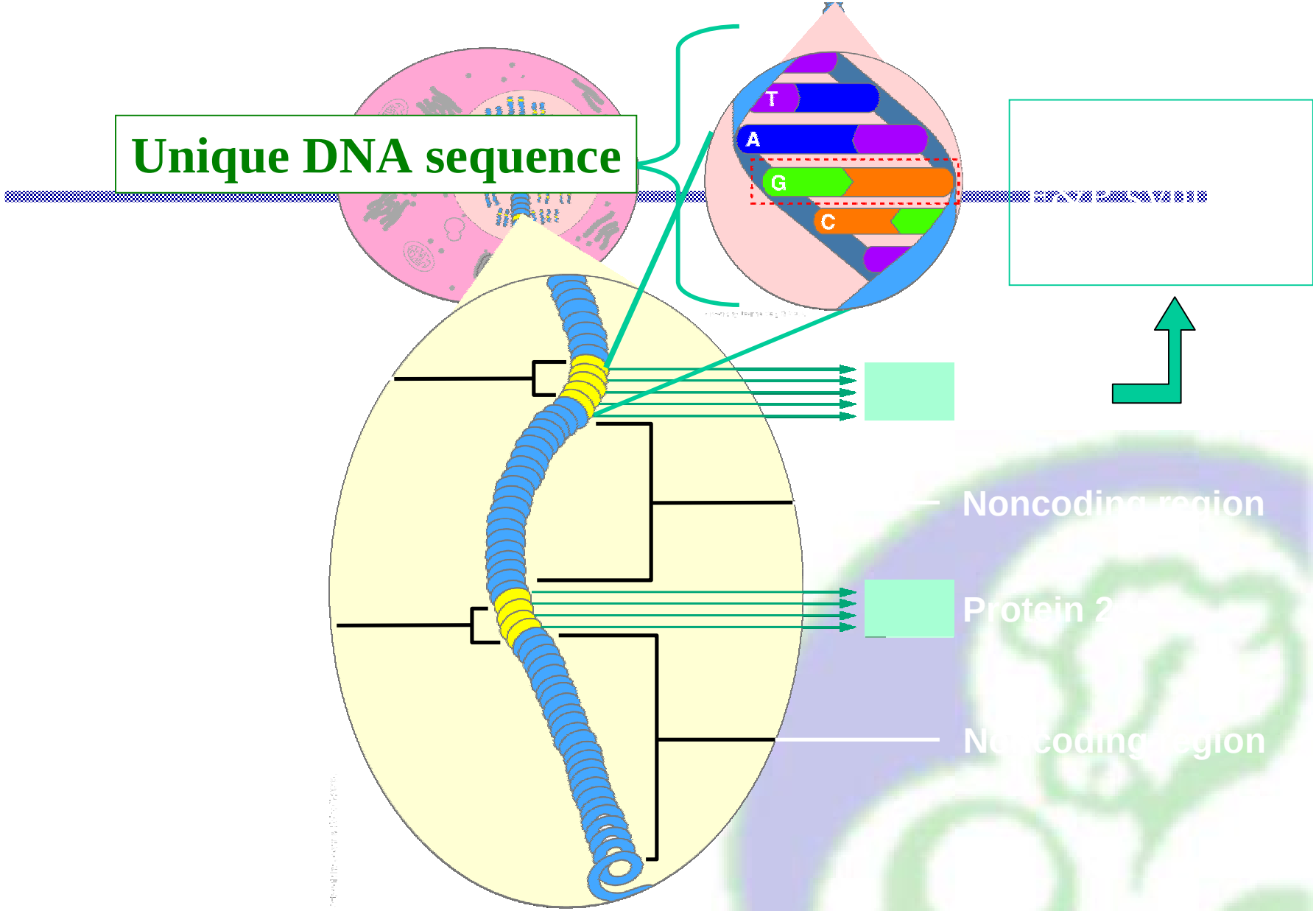
NDP
NATIONAL DEVELOPMENT PLAN

eagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

Current Approach

- Increase profitability of farming by making genetic progress in traits of economic importance
- Based on recording information (phenotypes) of animals on farm, marts, factories etc…
  - e.g., fat & protein, fertility, carcass yield and quality, calving ease
- Quantitative approach (black box) – do not use DNA to estimate genetic merit/ don't know what genes contribute to superior animals

The Genome Contains Genes



Why the interest in Genomics?

- **Example Bulls – 2 full brothers.**

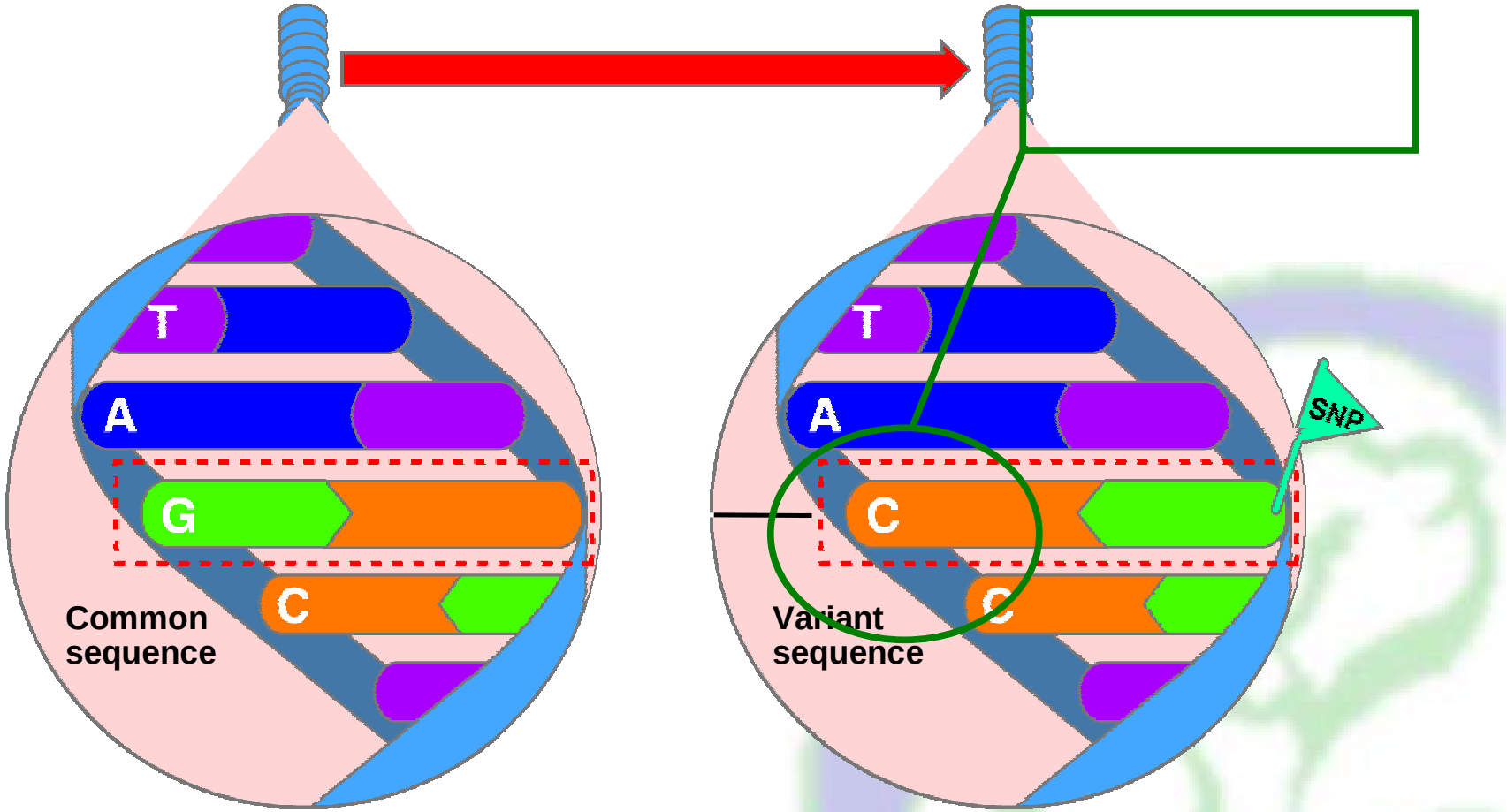
Bull	Addison	Slogan	Difference
EBI	€35	€77	**-€42**
Milk	€77	€35	**+€42**
Fertility	€-72	€43	**-€115**
Milk kg	754	64	**+690**
F+P	27.5	10	**+17.5**
CI	4.4	-2.7	**+7.3 days**

- **How could 2 full brothers be so different?**
- **Need to progeny test bulls to determine value**
- **Could genomics have told us earlier?**

Genomic Selection – How?

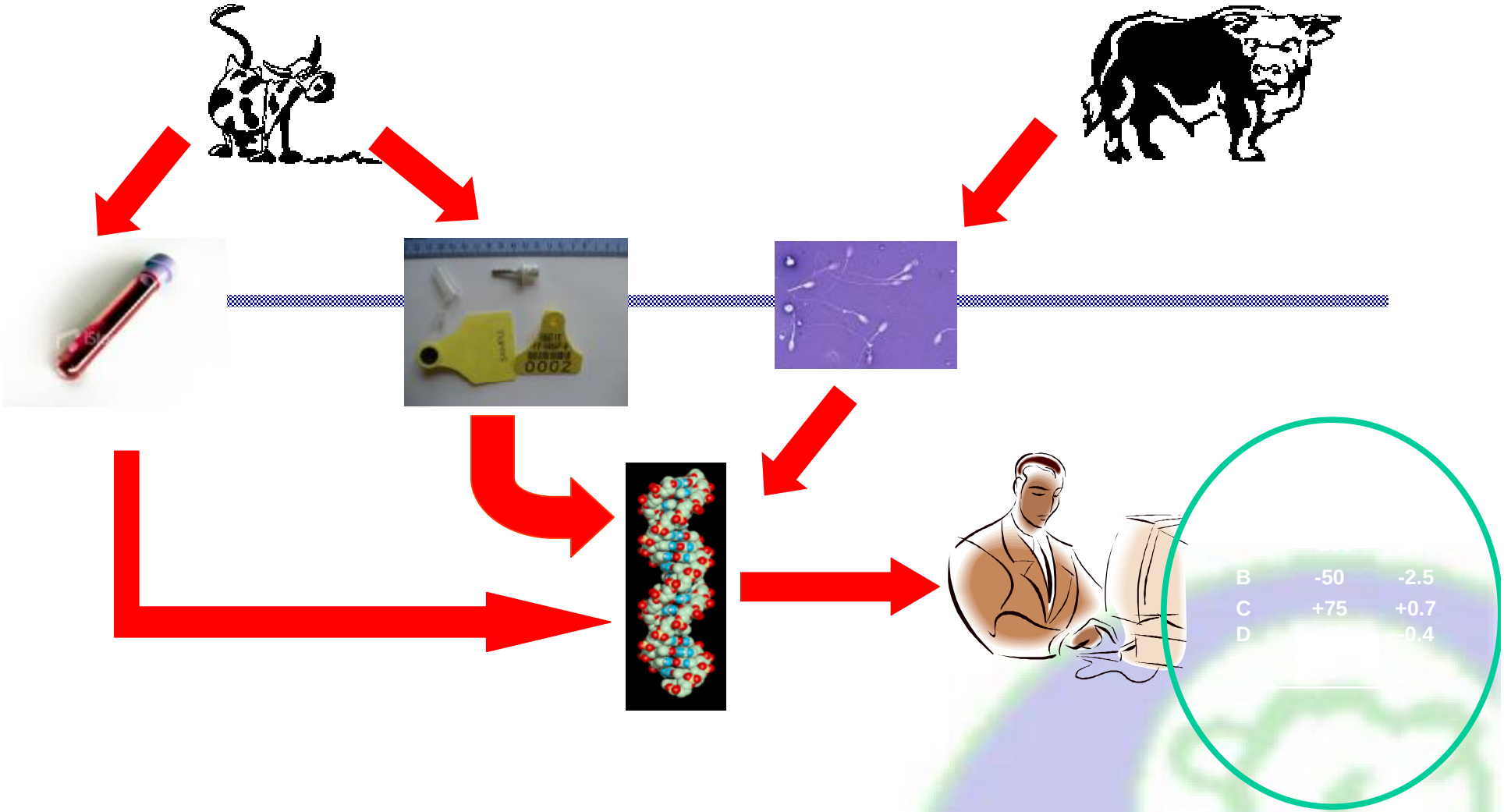
- The bovine genome.
  - 30 chromosomes & 3 billion pieces of DNA
  - 30,000 genes controlling all functions
  - We do not know many of these genes
- ***S***ingle ***N***ucleotide ***P***olymorphism's are a type of variation
  - These are known markers (sign-post). Many genes associated with this sign-post.
  - We do know the location of all SNP but not function
- 54,000 pieces of DNA information available on a chip (SNP chip)

How Does it Work?

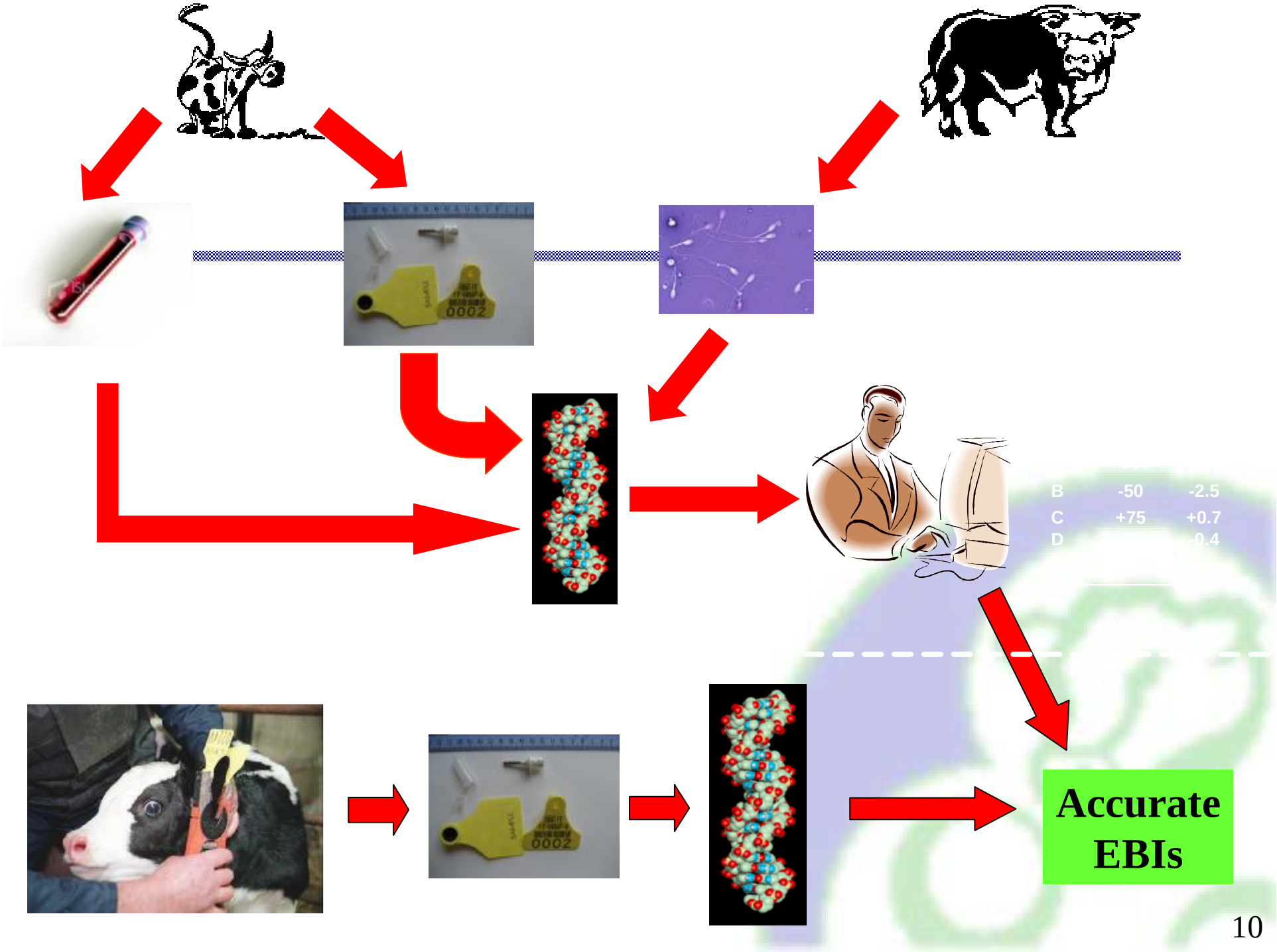


How does it work?

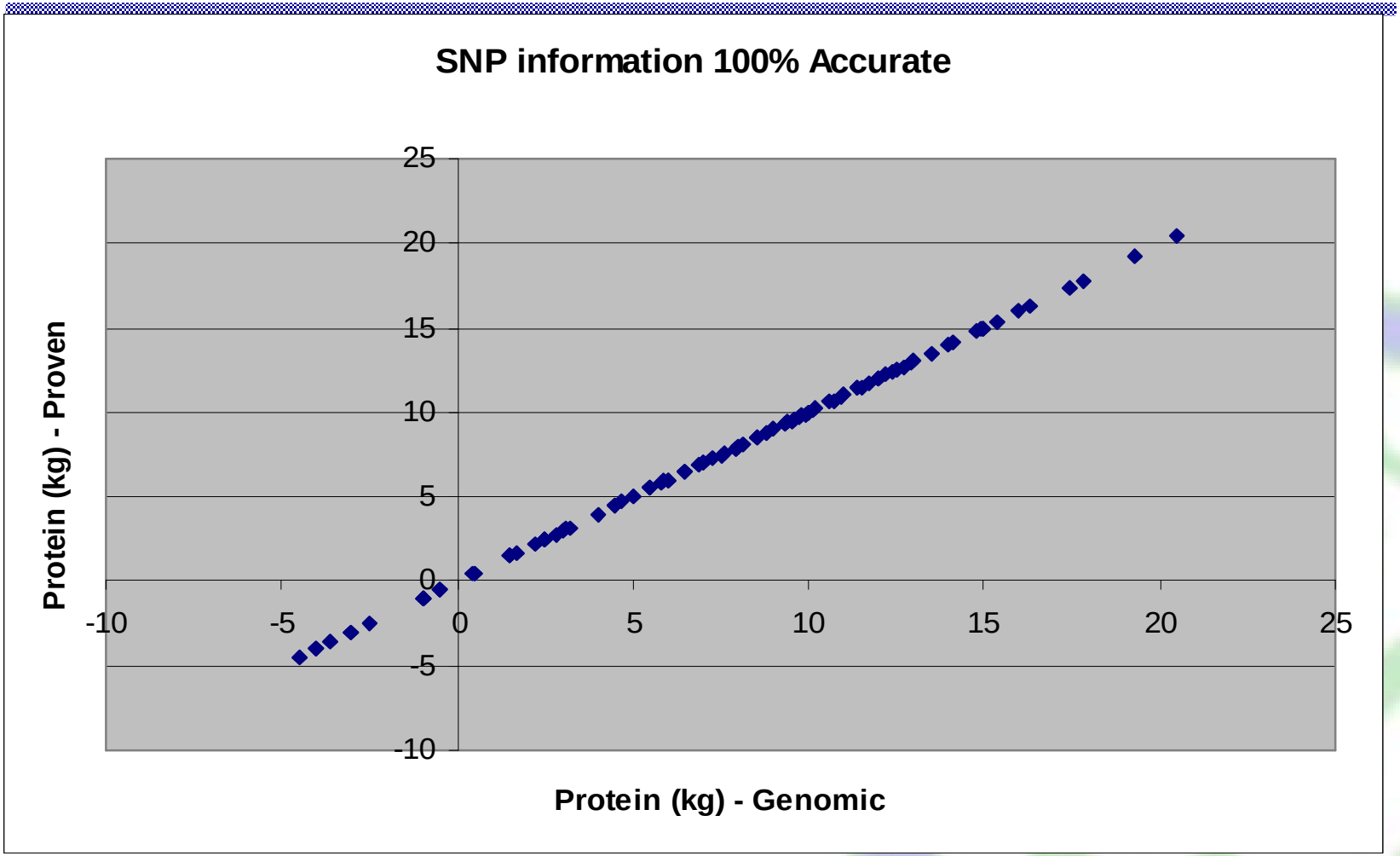
- Estimate what effect each SNP has on each of the traits in the EBI (Genomic Key)
- To do this we need a ‘training population’
- A training population is a group of proven bulls
  - With reliable EBI and traits
  - Genotypes (54k SNP chips)
- Potential to use cows also



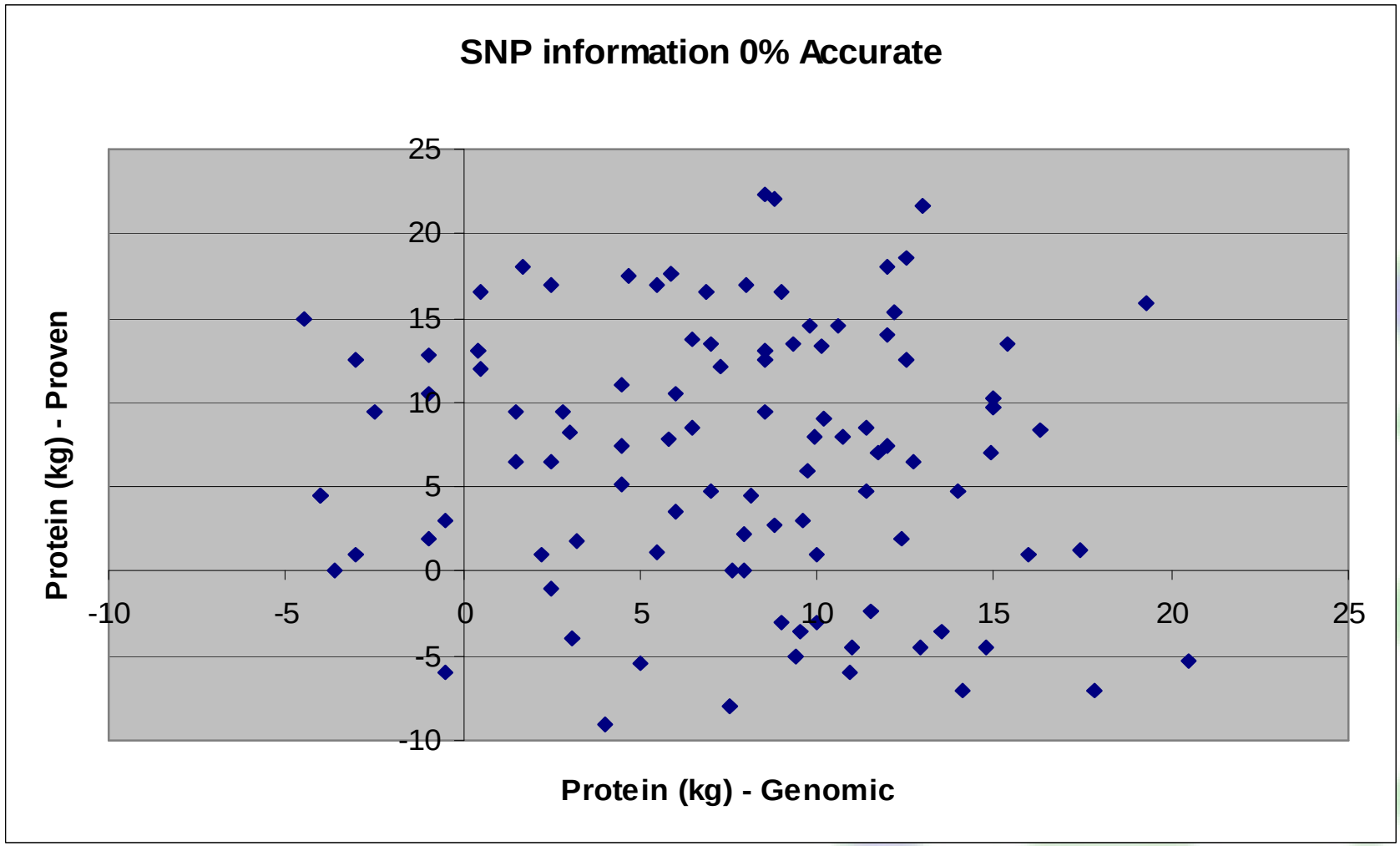
IRISH GENOMIC KEY


B -50 -2.5
C +75 +0.7
D -0.4
Accurate EBIs

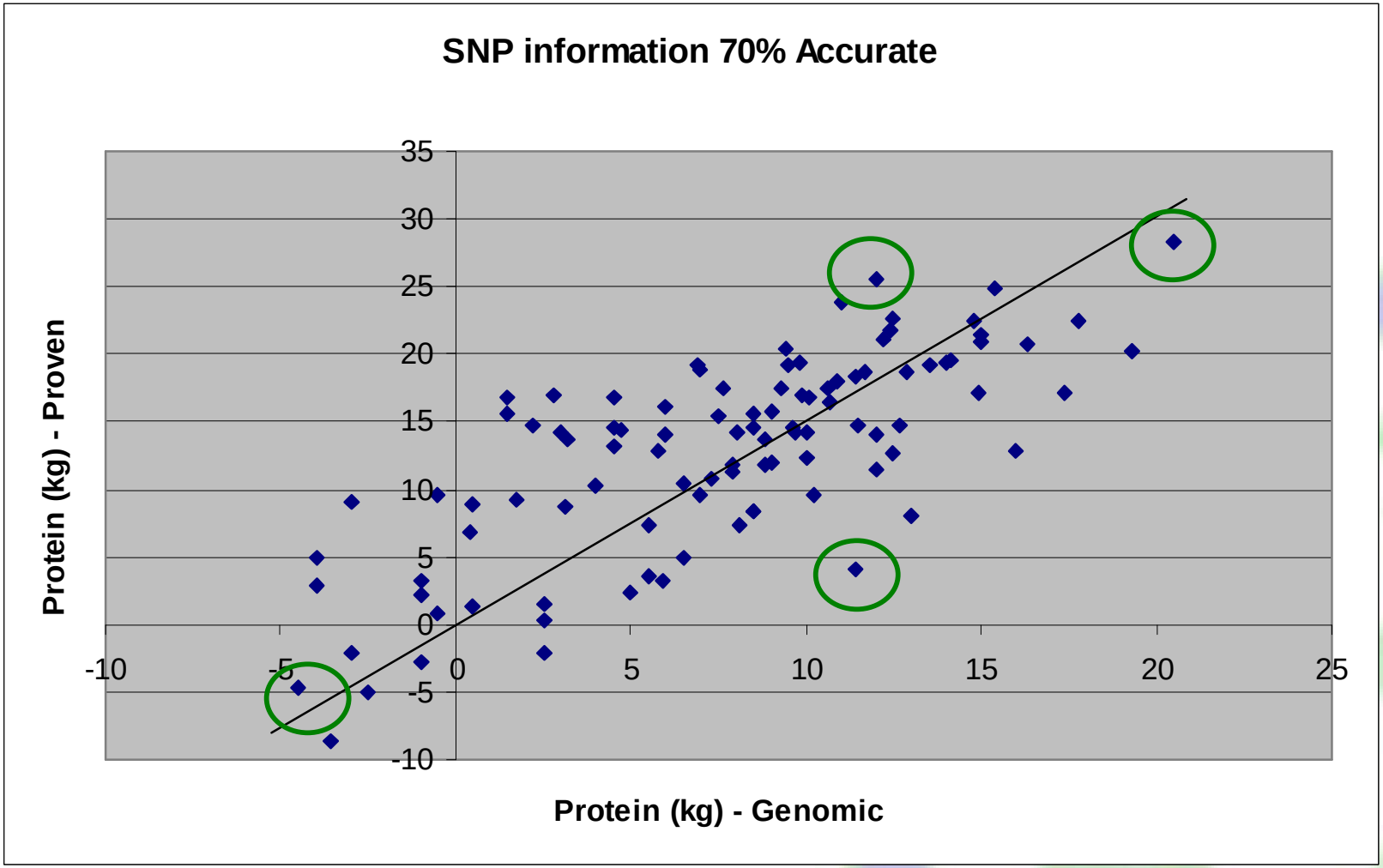
SNP Info – Perfect Predcition



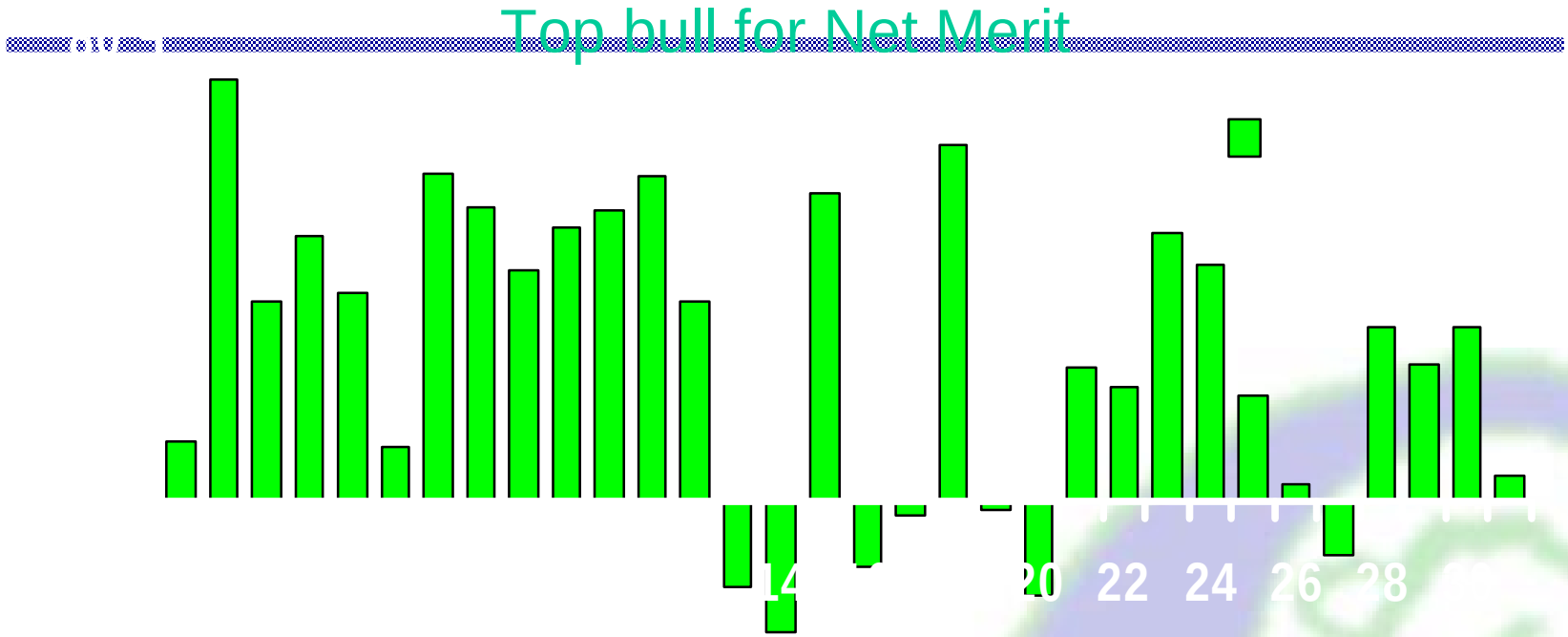
SNP Info - Useless



SNP Info - Expected



Net Merit by Chromosome for O Man



Genomic Prediction very close to actual Net Merit

Current Scenario

No. bulls	Yr -1	Bull	x	Cow
		€180		€140

130	0	Bull Calf €160 @35% rel
100	1	G€N€ IR€LAND LAY OFF
	4	100 Daughters
10?	5	AI Bull €160+ @80% rel

GS Scenario

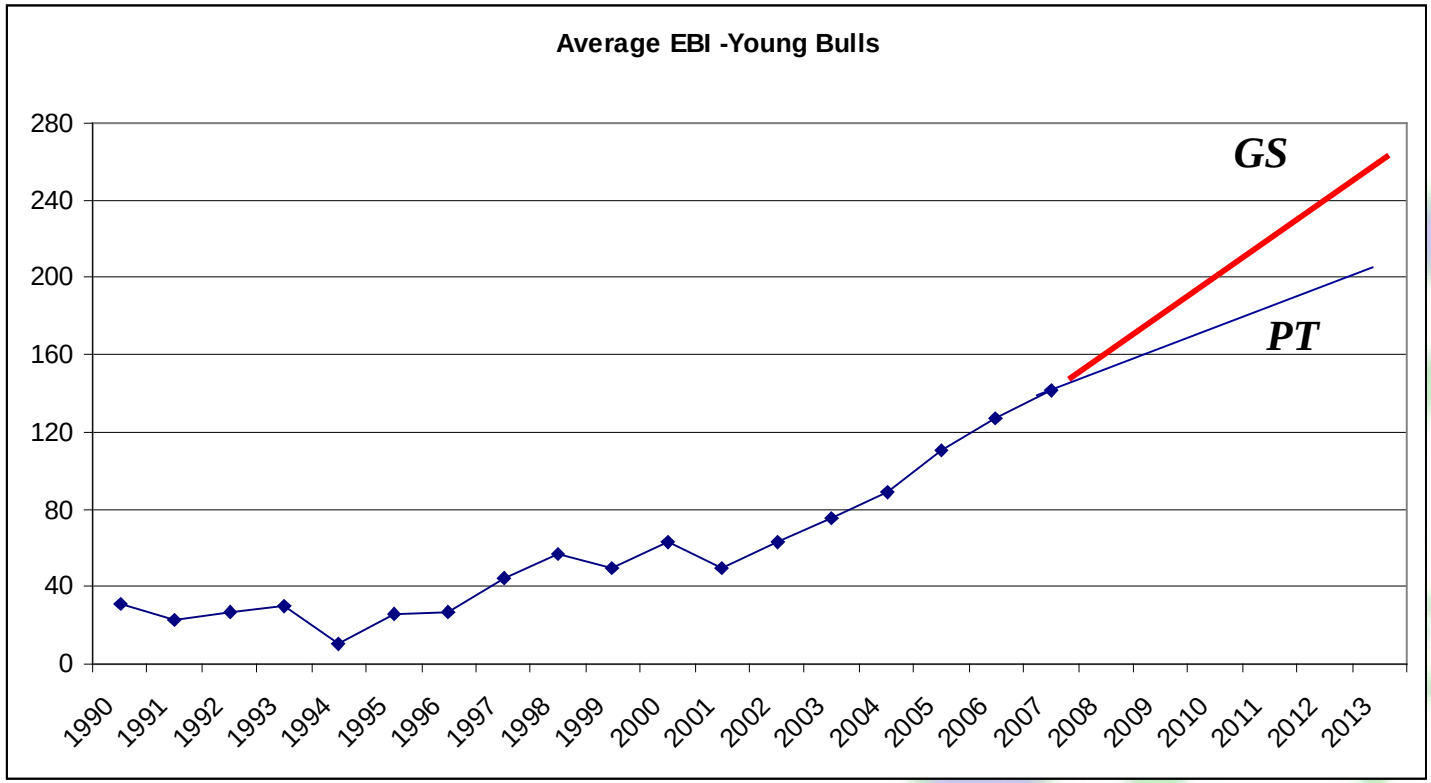
No. bulls	Yr -1	Bull	x	Cow
		€180		€140

1000?	0	Bull Calf ← DNA €160± @50-55% rel
100	1	€180 G€N€ IR€LAND
50?	2-3	Widespread AI in *TEAMS (€200+)*

THREE YEARS ADVANCED GENETIC GAIN

Genetic Gain

- 50% more gain when used at 3yrs;



Genomics & ICBF Services

- EBI's (including GS data) available for AI companies & farmers.
  - DNA sample…lab…genotype…ICBF database…GE….EBI (including genomics)
- EBI's (inc GS data) on ICBF website, Active Bull List & HerdPlus reports
  - Increased reliability for these animals
  - Considering including "GS Teams" on Active Bull Lists

Cost

- Current cost is about €300/animal
- May be able to develop a smaller SNP chip based on most relevant SNP?
- Used to screen cows (bull dams) and young animals – lower cost?

Where is the Irish research work?

- Currently working on genotyping bulls
- Need as many bulls as possible to get best estimate of SNP effects (Irish Key)
- Bulls still wanted (ICBF website, Farmers Journal 8/11, Lists available today)
- Estimating SNP effects – initial results promising

Where is the Irish research work?

- Goal of having GS data incorporated into National EBI's
  - Parent Average + Genomics + Foreign Data + Performance in Ireland
  - How to combine this data in an optimal way?
  - Integrated research: Irish training population (now ~800 AI sires) + data from other countries (LIC, CRV…..?)

Summary

- Genomics has much to offer Irish farmers and dairy industry.
- New technology….but there will be some teething problems. Not dissimilar to any new launch, e.g., new EBI, fertility proofs.
- Not the “silver bullet”….an extra tool on which to make better breeding decisions.
- Working towards having GS for young bulls in Spring 2009.
- Wider application Spring 2009+