

# The European Perspective for Livestock Cloning



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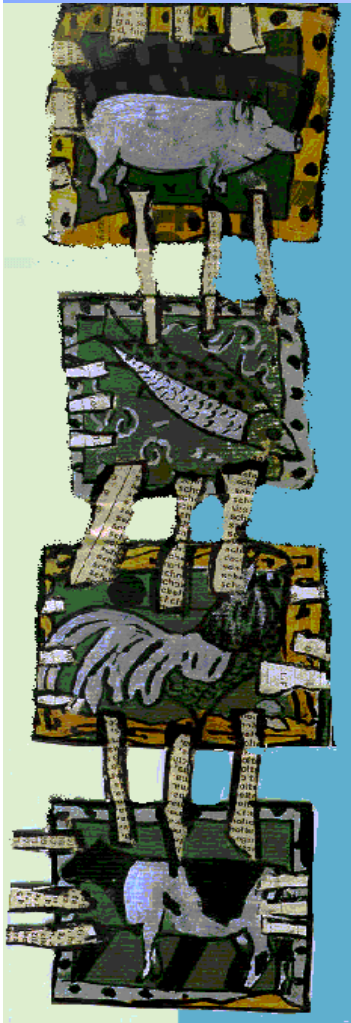
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Institute for Pig Genetics



# Background of Perspective presented

FABRE • TP



- EU study: <http://www.sl.kvl.dk/cloninginpublic/> and EU - JRC policy study (spring 2006)
- EFFAB: European Forum of Farm Animal Breeders (industry) [www.EFFAB.org](http://www.EFFAB.org)
- FABRE TP: European Technology Platform for Farm Animal Breeding and Reproduction (industry, science and NGOs) [www.FABRETP.org](http://www.FABRETP.org)
- IPG: Institute for Pig Genetics, private knowledge centre animal breeding and genetics [www.IPG.nl](http://www.IPG.nl)

# European Community 2006





# Assumptions

(for this presentation)

- Animal cloning considered sec (without GM)
- Cloning = copy of genotype, not of phenotype
- Scope restricted to
  - Farm animals for food, not pet nor sport animals, nor for pharmaceuticals!
  - Perspective of cloning along breeding programmes and dedicated production chains
- Combinations of technologies to be expected, cloning 1<sup>st</sup> hurdle ??

# Commercial Livestock Cloning.

some remarks

Technical feasible, examples in many species, but:

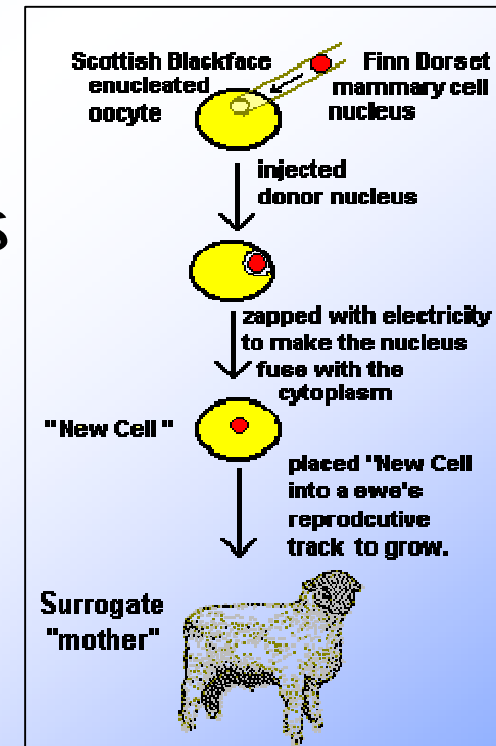
- No consensus with regard to economic benefits of applications

- Cloning  $\hat{=}$  100% identical individual?

(e.g. mitochondrial DNA, imprinting effects)

- Cloning on large scale without physiological disappointments?

(e.g. cloning syndrome, post-natal death)



# Applications foreseen for Livestock

## 1. Increased Uniformity in Livestock

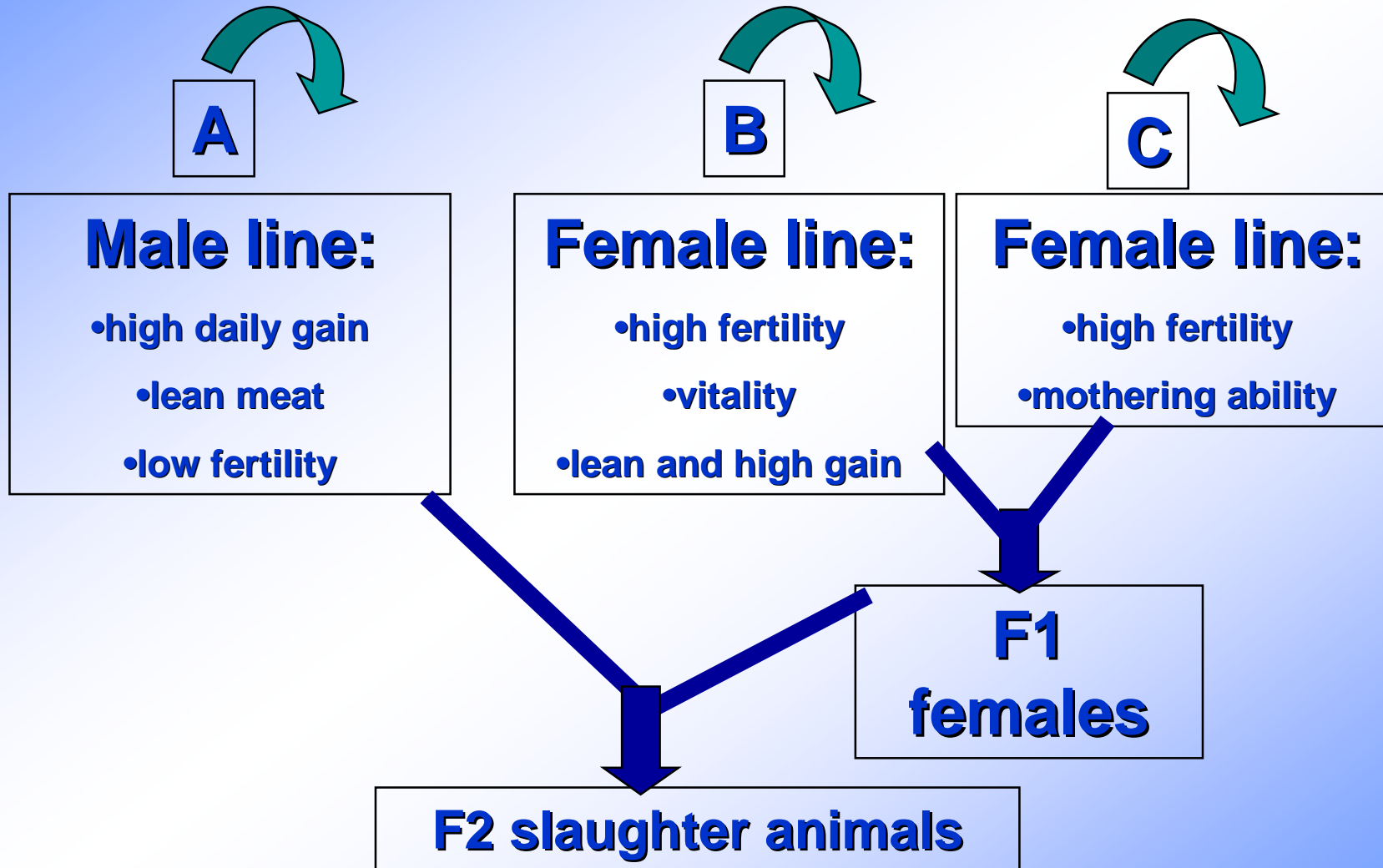
Theoretical studies show 10 to 50% reduction of variability for single trait (dependent on  $h^2$  and non additive effects)

## 2. Decrease genetic lag between nucleus and commercial level

- A. Cloning of best boar(s) and bulls for production level
- B. Use of specialized lines in combination with cloning, AI and ET

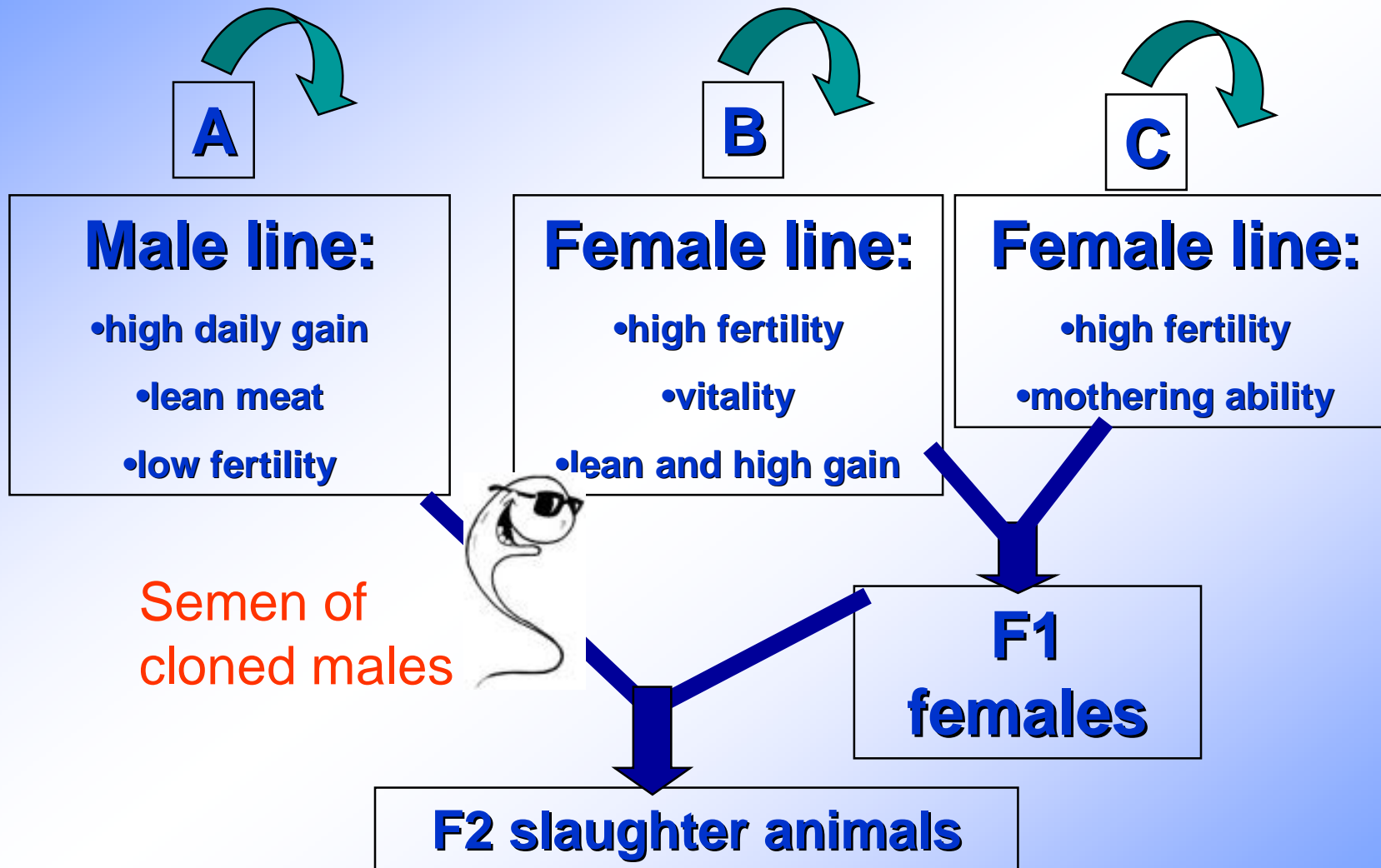


# Standard = Single Cross Breeding Program



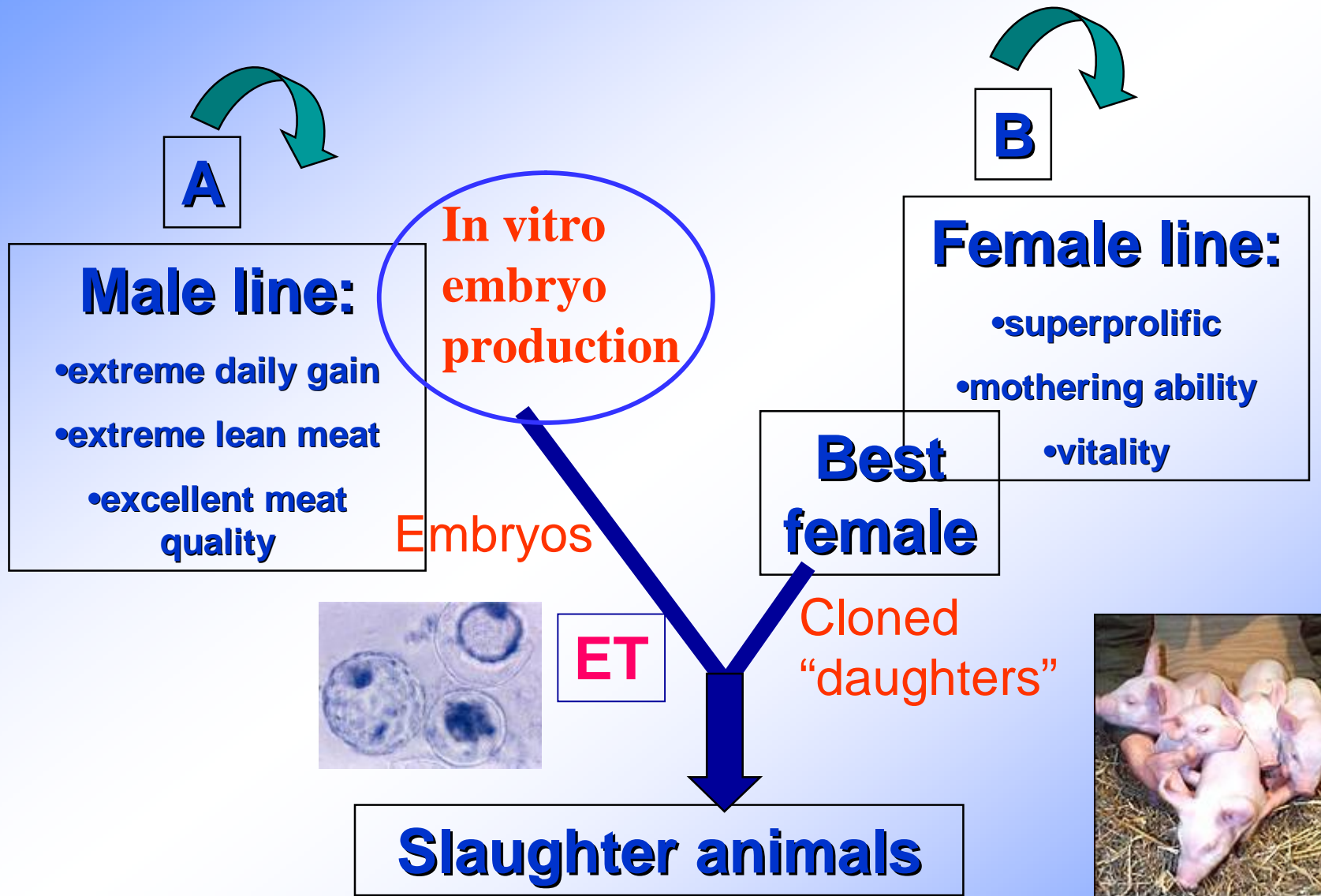


# Option A: Single Cross Breeding Program with semen of best Cloned males





# Option B: Breeding Program with Cloning and ET



# Applications foreseen for Livestock

## 3. Acceleration of Genetic Progress

- Theoretical studies show increase but very dependent on species (pigs **ó** cattle)
- Investment in cloning or in genetic programs with more genetic progress?

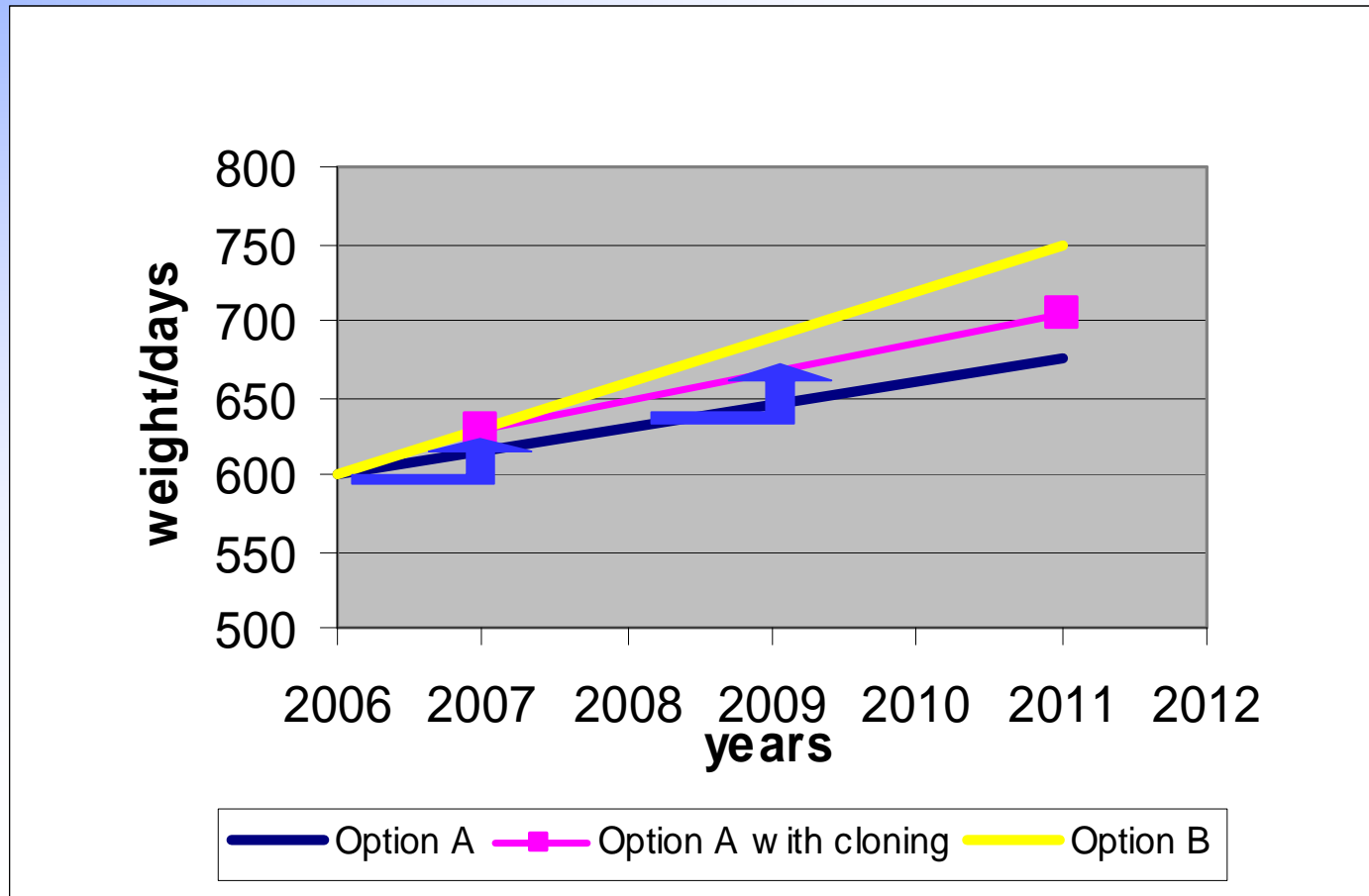
Example for  $1 \times 10^6$  sows with 100% AI = 1500 new boars/year for AI

Option A: nucleus with 500 sows: 3 boars/s/y

30 best boars to produce 1500 cloned AI boars

Option B: nucleus with 1000 sows: 1.5 boar/s/y

# Genetic progress along different options



# Summary:

## economic perspective industry

- Economic perspective for use semen or embryos of cloned animals → for more uniformity in animal production  
(although no consensus on size of perspective)
- Cloning to increase genetic progress or to decrease genetic lag  
(although no consensus on size of perspective)
- Economic value dependent on:
  - Species (more for meat than for milk and eggs)
  - Value of uniformity
  - Availability of cheap reproduction techniques

# European Societal Perspective (1)

<http://www.sl.kvl.dk/cloninginpublic/>

- Concerns related to Animal Welfare:
  - Negative mental experience: pain and suffering of the cloned animals (e.g. low success rate)
  - Ability of animal to live a natural life: fulfilling species-specific potentials
- Notions related to animal integrity:
  - Genetic integrity: ethical dilemma
  - (In)dependence of animal from humans

# European Societal Perspective (2)

<http://www.sl.kvl.dk/cloninginpublic/>

- Human Health: no clear differences between products of cloned versus non-cloned animals and their offspring BUT risks associated UNKNOWN
- Uncertainty about possible environmental (biodiversity) and socio-economic impact of farm animal cloning

# European Attitude towards Cloning

<http://www.sl.kvl.dk/cloninginpublic/>

## Two important Scales for Attitude

1. Scale of Organism: animal cloning addresses higher organism: more concern
2. Scale of Application: medical applications generally more acceptable than food applications (deep skepticism by the public), partly due to ignorance



# Cultural Differences in Breeding

(Schakel and Broekhuizen, 2003)

- Norway: maintenance of distinctive rurality
- Italy: preservation and development of food products
- France: agricultural diversity
- United States: uniformity, but differentiation a promising opportunity
- Thailand: juxtaposition

# Conclusions

## The European Perspective for Livestock Cloning

- Clear Economic Perspective (uniformity and additional genetic progress at commercial level)
- Serious Societal Concern with regard to Animal Welfare and Integrity
- Uncertainty about Environmental and Socio-Economic Impact
- Clear Differences (due to Cultural Differences) in Societal Discussion between EU and USA

=> Livestock Cloning is presently  
a Bridge Too Far for EU:  
⇒ Research embryonic development  
⇒ Technical & Risk analysis  
⇒ Socio-Economic Research



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# Thank You

<http://www.sl.kvl.dk/cloninginpublic/>  
Results of EU JRC study: spring 2006

