

INTRODUCTION TO ANIMAL BREEDING

Lecture Nr 1

General introduction

Context, purpose and tools of animal breeding

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General introduction

Selection, populations, organisation

Definition of breeding goals

Selection tools

Summary



Role of animal breeding and genetics in animal production

Type of animal used

Health

Management of reproduction

Husbandry and feeding

Work

Processing of animal products



Purpose and tools for animal breeding

To provide animals **well suited**
to the needs of both producers and consumers
by exploiting genetic differences between animals
within-population and/or **between populations** (or species)

Going toward **goals** defined in advance

by implementing **tools** and applying **methods**
allowing to make a **genetic progress**
in the desired direction



General introduction

Selection, populations, organisation

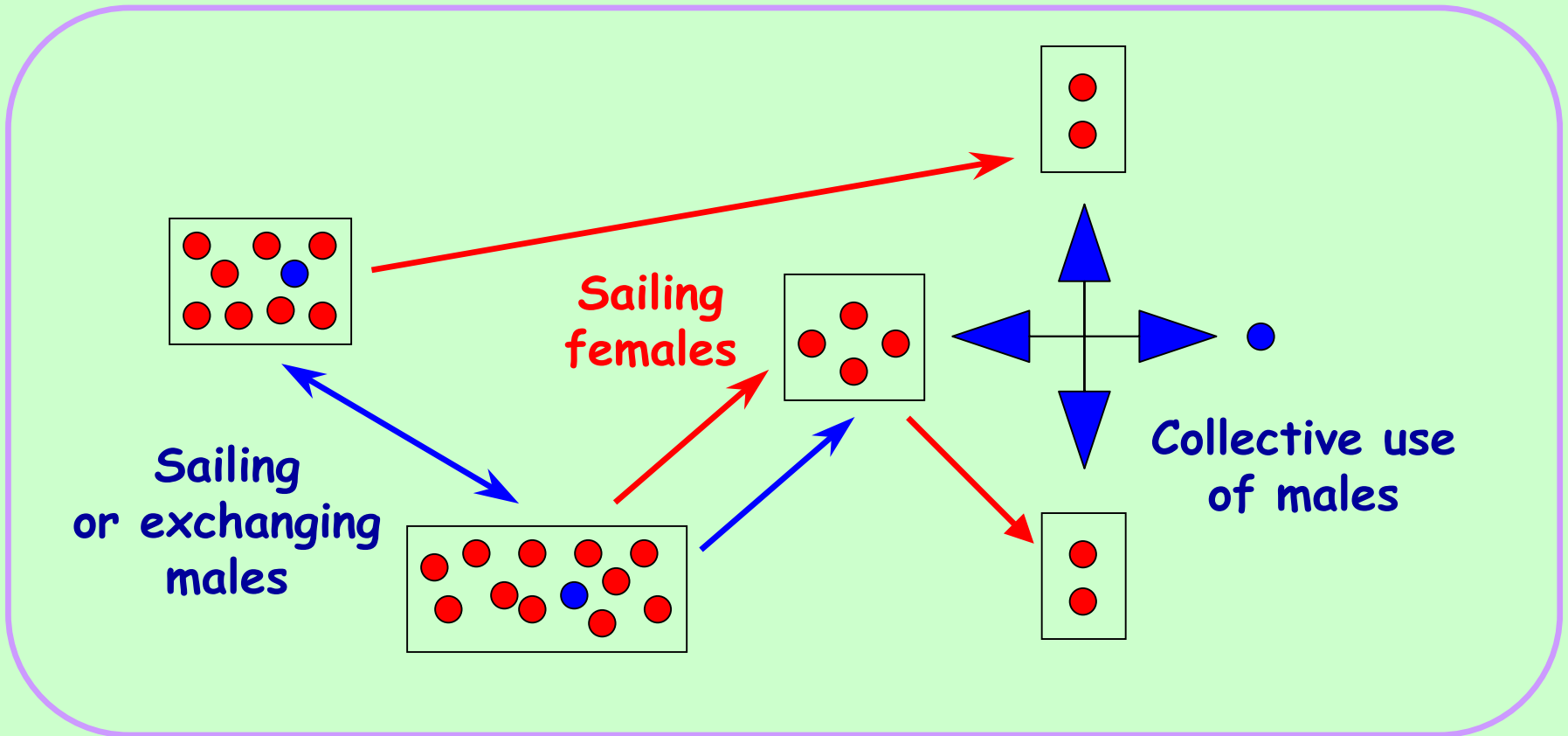
Definition of breeding goals

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Farms, breeders and populations

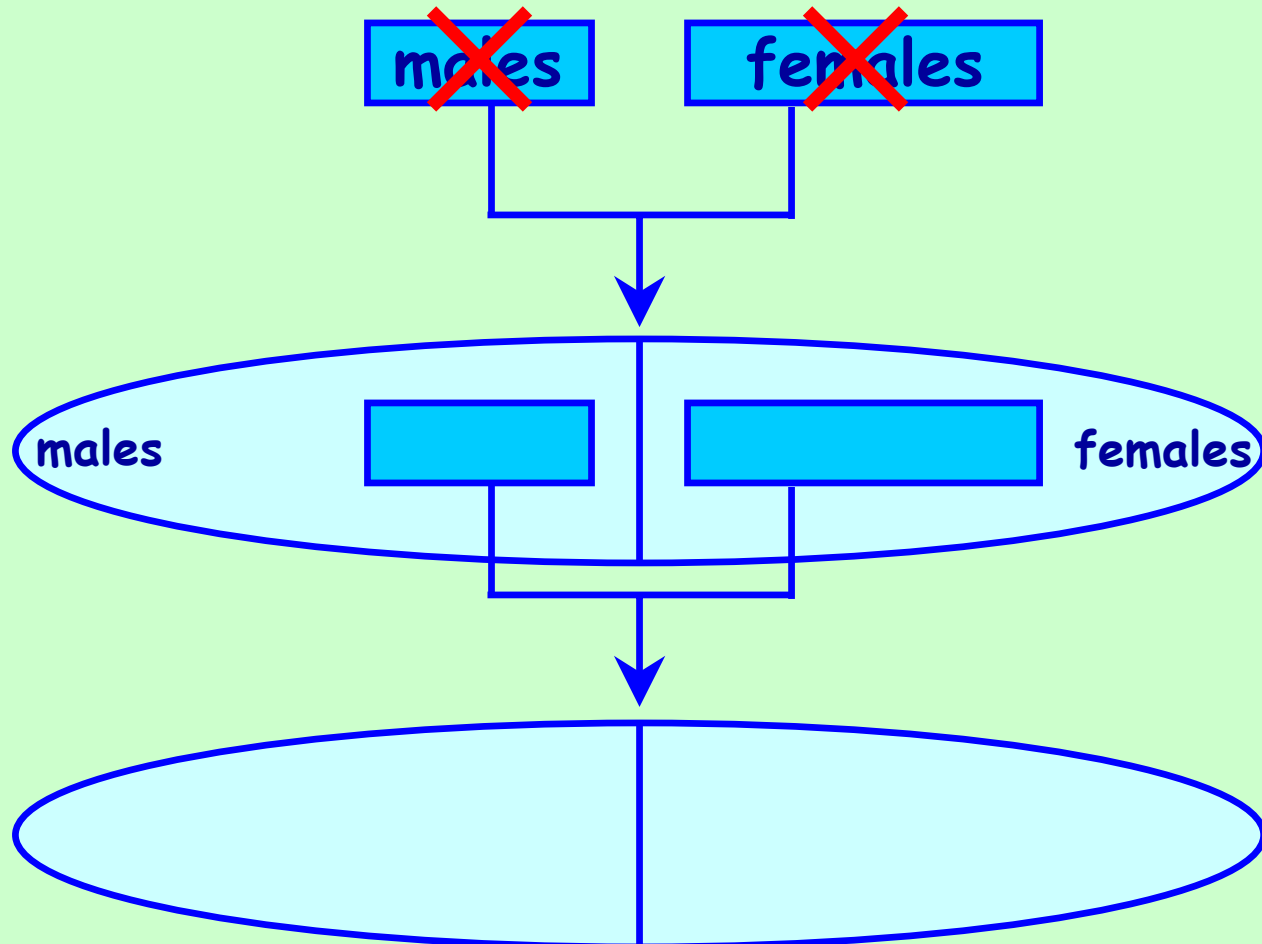


Working within an individual farm is necessary but not sufficient:
working within the whole population of animals

→ Need for a collective organisation

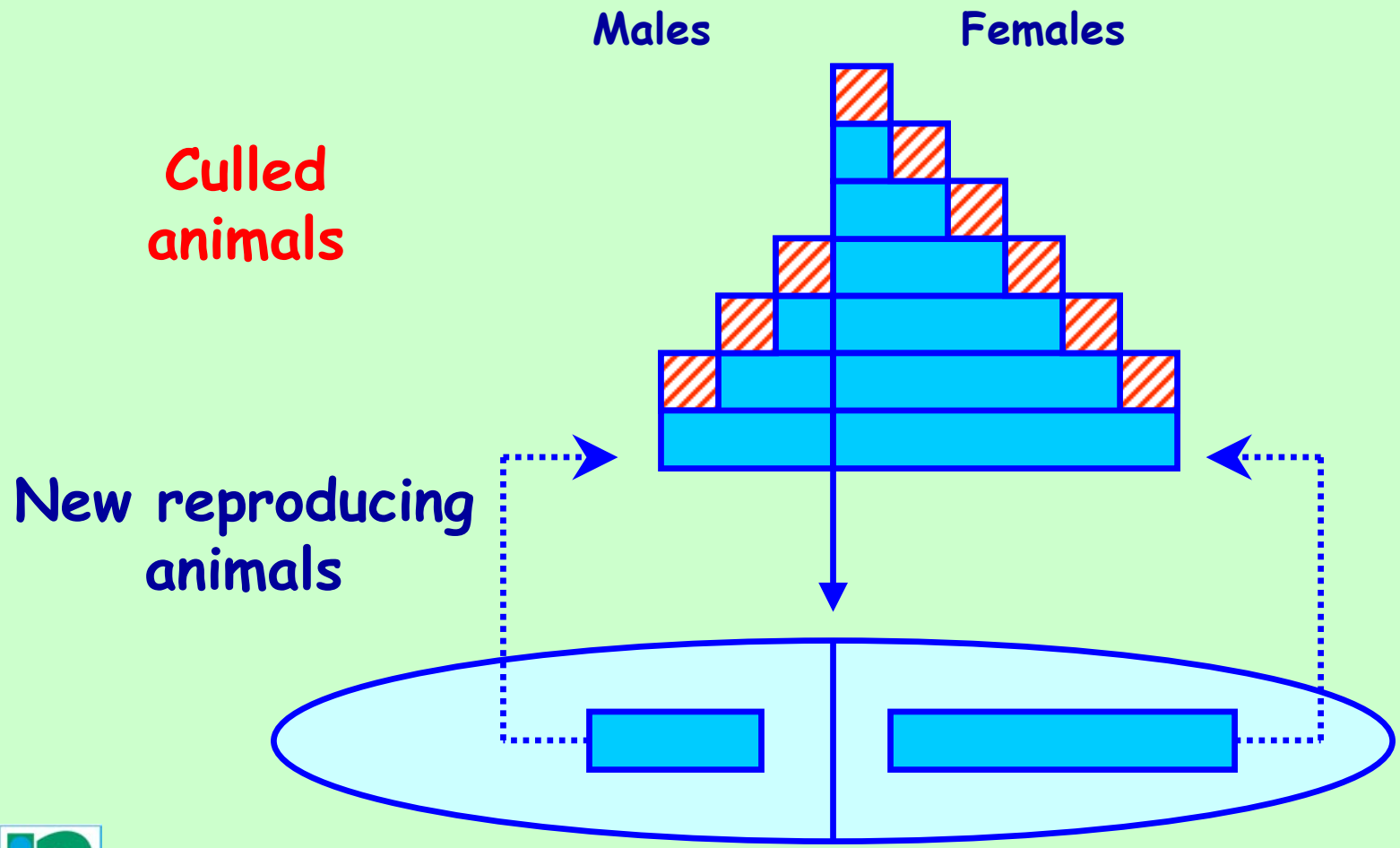
Evolving populations: discrete generations

Poultry, Fish



Evolving populations : overlapping generations

Pigs, Ruminants, Equids



Evolving populations and selection

For discrete generations,
as for overlapping generations

Strategic event
=
Choice of new reproducing animals



General introduction

Selection, populations, organisation

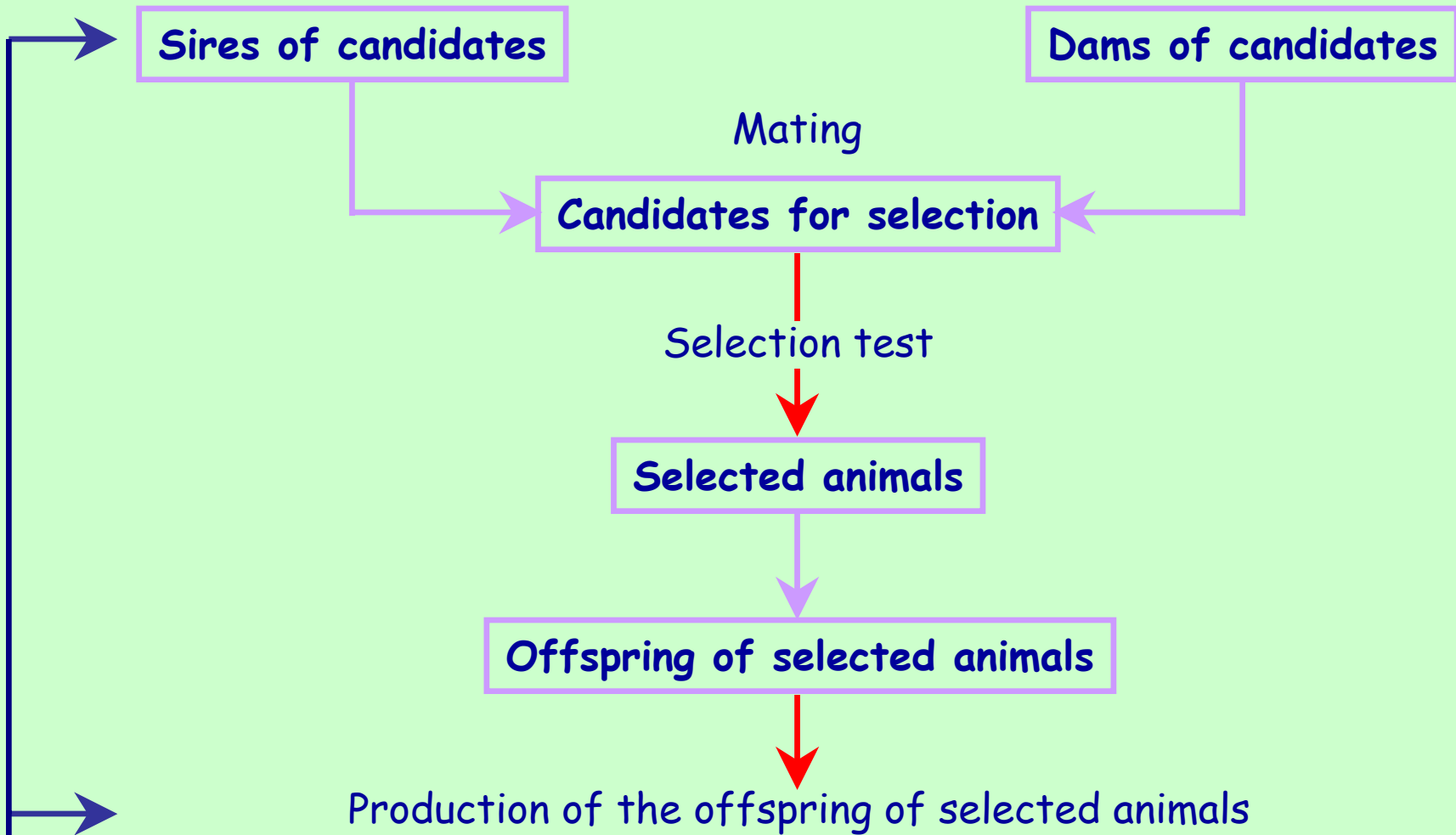
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Need for looking to the future



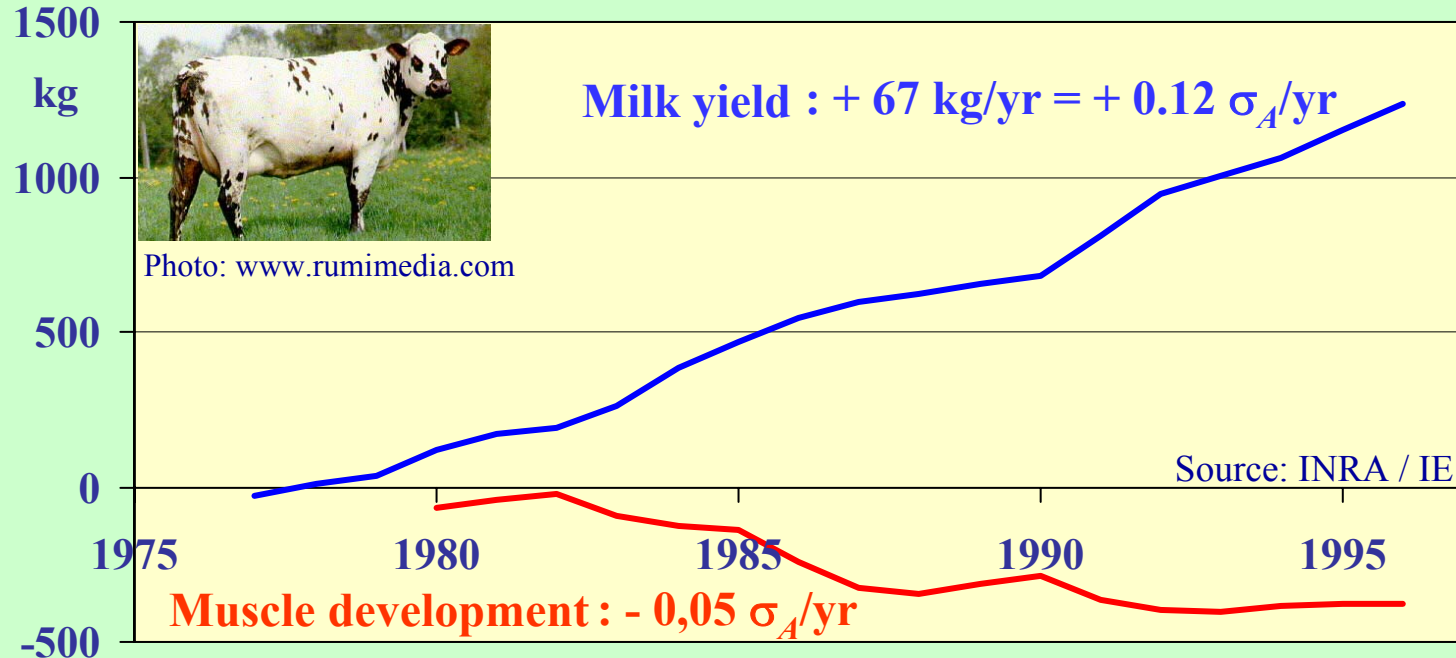
Delay = 3 years (chicken) to 10 years (dairy cattle)

E. Verrier, Introduction to Animal Breeding, Hanoi, December 2004



Oppositions between traits

Estimated genetic evolutions in the *Normande* dairy cattle breed



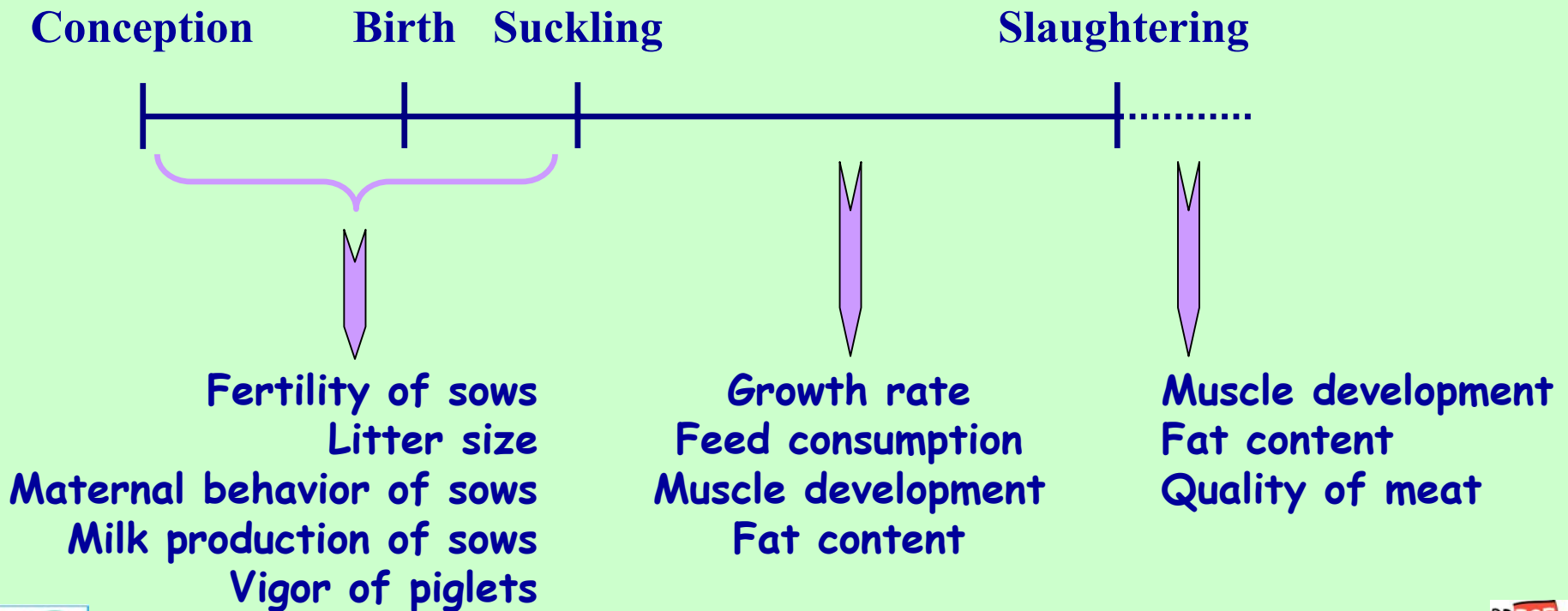
To avoid unfavourable correlated responses

- Simultaneously taking into account several traits
- Necessary dispersal of the selection pressure



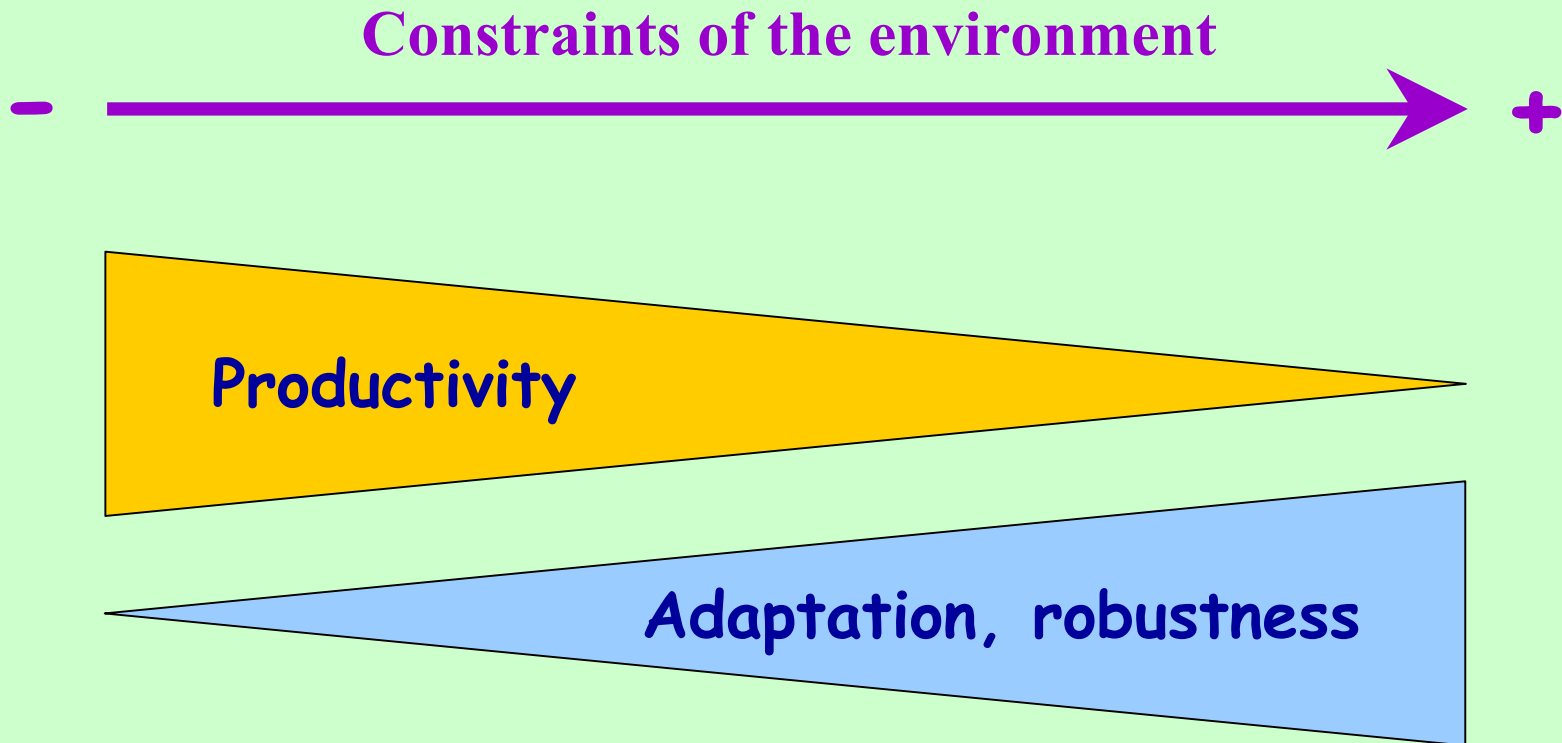
Is the concept of improved animal absolute?

1) Depends on the period in the life of animals and on the "user": e.g. pig production



Is the concept of improved animal absolute?

2) Depends on the environment



Constraints on the breeding goals

What is possible to do is limited



Definition for a more or less proximate future

Several traits, more or less correlated

Different steps in the life of animals, different uses

Environmental constraints



The concept of improved animal is relative



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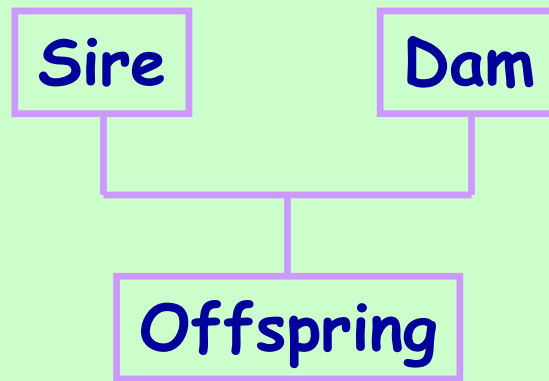
Tools - 1. Identification

- To give an unique number to each animal
- To have an individual document for each animal
- To put a mark on the animal as early as possible
 - Ear tag
 - Tatoo
 - Leg or wing tag

Practical problems in some species (fish)
and under some conditions (ranching)



Tools - 2. Parentage recording



- Possible control:
 - use of a single male
 - artificial insemination
- Practical problems:
 - large herds in open air and with several males
- Mammalians:
 - no major difficulty
- Poultry, fish:
 - control of the laying location

Recording → Pedigree files (on computer)



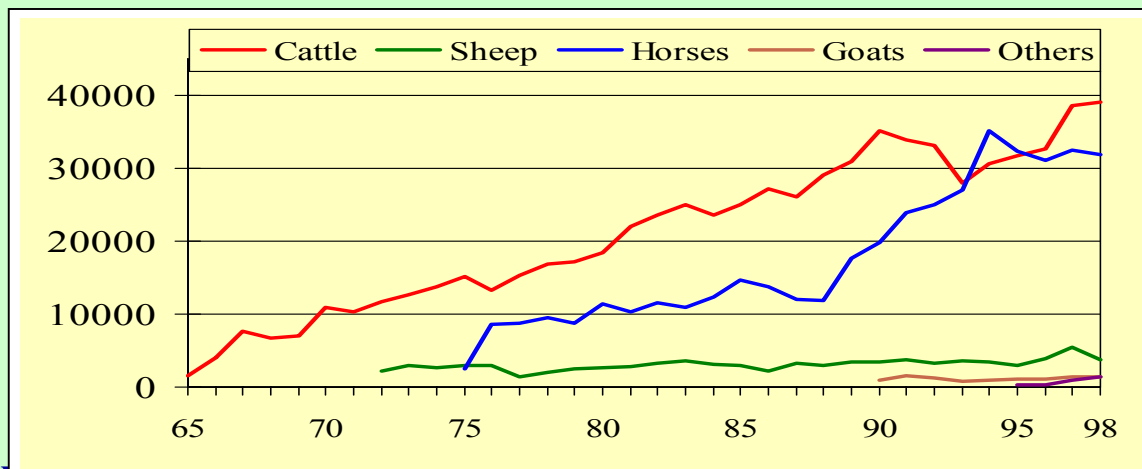
Recording and validation of parentage

Generally, recording is based on breeder's declarations

Possibilities of parentage control:

- Typing for some genetic markers
the offspring and its assumed sire and dam
- Checking the consistency between Mendelian rules
and the observed genotypes

Evolution of the
No of parentage controls
for livestock species
in France



Source: Labogéna

E. Verrier, Introduction to Animal Breeding, Paris, December 2007



Tools - 3. Performance recording

- Within stations
- On farm

Systematic measurement of performances of all animals from several herds

Criteria for the usefulness of performance recording :

- Dealing with traits important from an economic or social point of view
- Results should be used for managing herds (selection, feeding, ...)
- Measurements should be simple, cheap and little time-consuming
- Measurements should be made by experimented people, according to a unique and accurate protocol



Some figures on performance recording in France

Dairy Performance	2 700 000 Cows (64 %)
	800 000 Ewes (77 %)
	290 000 Goats (40 %)
Reproduction	500 000 Cows (12 %)
	400 000 Ewes (8 %)
	350 000 Sows (30 %)
Growth	450 000 Calves
	200 000 Lambs
	150 000 Pigs

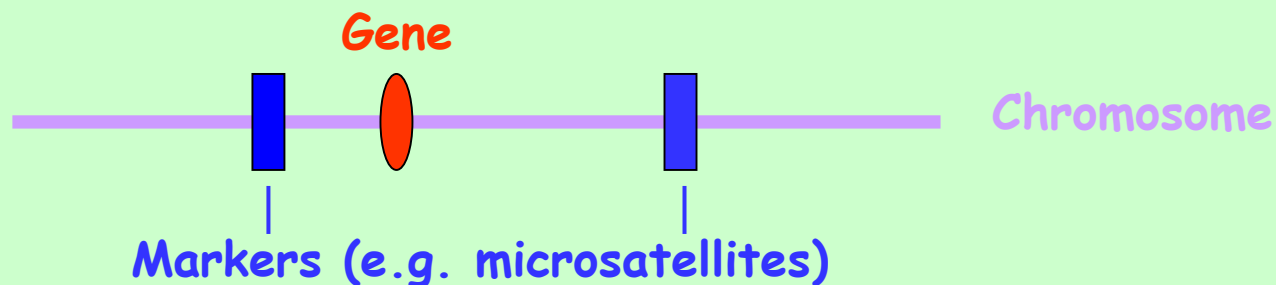


Tools - 4. Genotyping (a) known genes

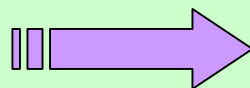
Diseases	BLAD - Cattle PrP (scrapie) - Sheep
Double muscle	Myostatin - Cattle Halothane - Pig
Caseins	κ -Cn - Cattle α S1-Cn - Goats



Tools - 4. Genotyping (b) markers of QTL



Joint analysis:
Genotypes for markers,
Pedigrees, Performances



QTL Detection
(Quantitative Trait Locus)

Large programmes of QTL detection in some species and productions

Dairy cattle
Pigs
Chicken



Summary

Animal breeding is a way to improve animal production, which takes place through the rational choice of new reproducing animals which gradually replace the old ones

First step: to define the breeding goal

Second step: to implement tools to collect the required information

All that requires an organisation

