STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION - L2

BOTANY

PANKHURI MA'AM

Aakash + BYJU'S

Aakash Live Webinar

What differentiates a NEET Topper from the rest? The benefits of starting early

Dr. Sachin Kapur
Biology Expert

Anoop Vashistha
Chemistry Expert

16th Oct 2022 | 12:30 pm

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Aakash BYJU'S

NEET STUDENTS' SURVEY

LINK IN DESCRIPTION

https://t.me/neetaakashdigital

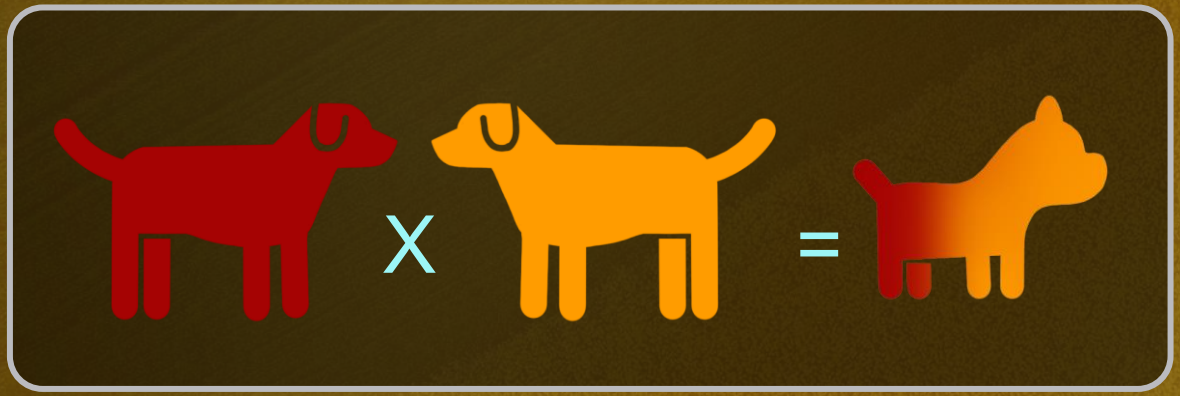
Recall! Breed

- Group of animals similar in characters
- Descended from **common ancestors**
- Distinct from other animals of **same species**

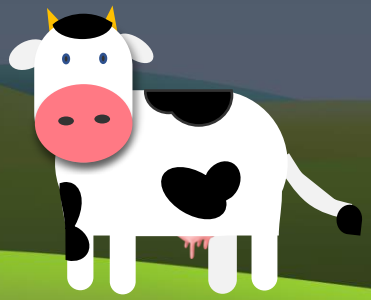
- Appearance
- Features
- Size

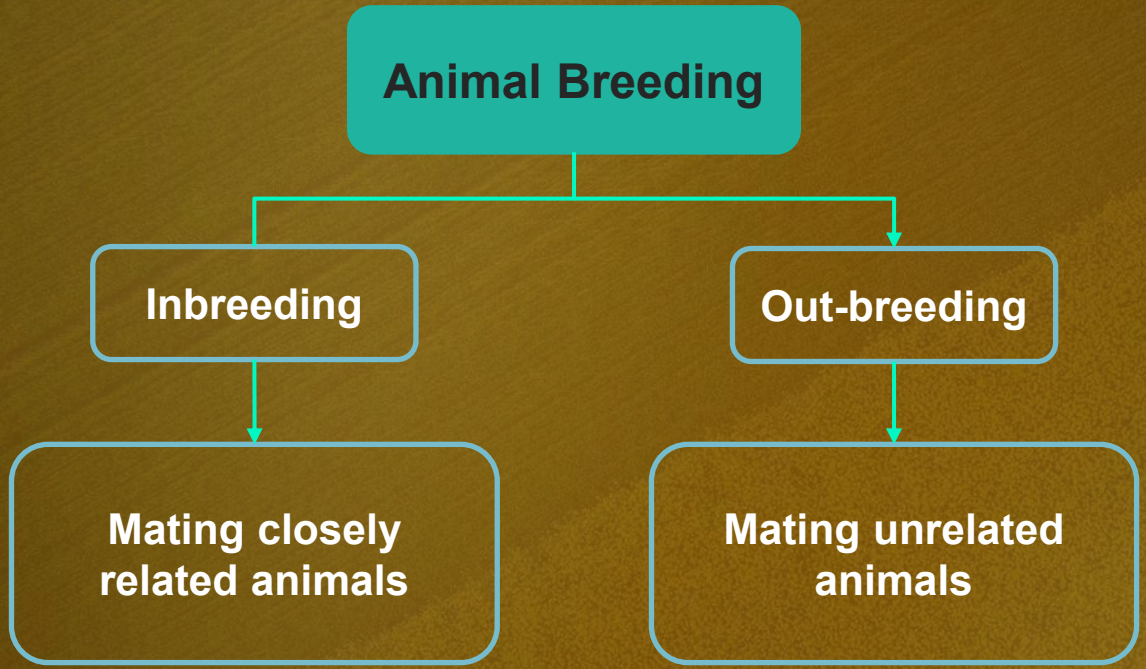
Recall! Animal Breeding

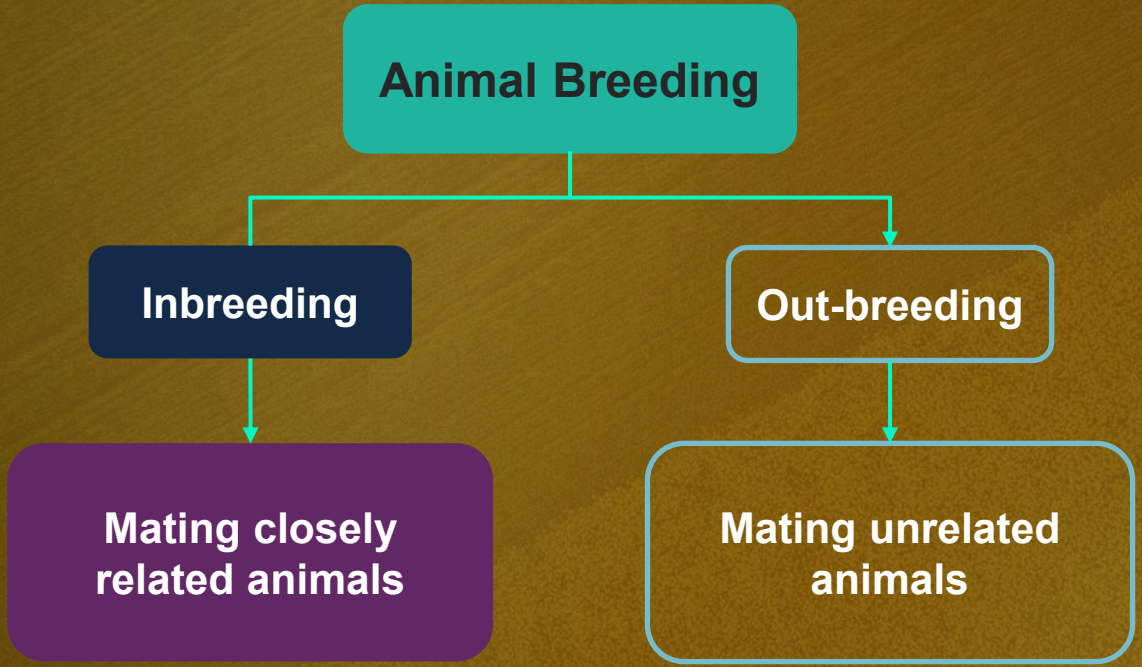
Selective mating of animals to produce offspring with desired qualities



Types of Animal Breeding

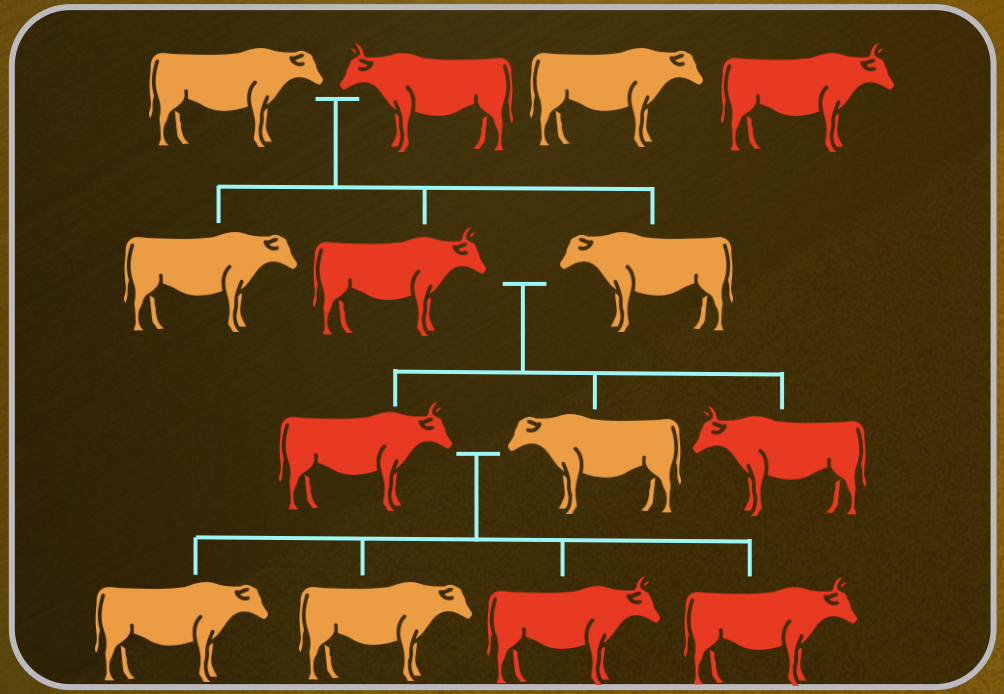



Animal Breeding
Inbreeding
Out-breeding
Mating closely related animals
Mating unrelated animals


Animal Breeding
Inbreeding
Out-breeding
Mating closely related animals
Mating unrelated animals

Inbreeding

- Mating of **closely related** animals of same breed for **4 to 6 generations**



Inbreeding

A **bull** with

- Strong immunity
- Vigour
- Virility

Inbreeding

A cow which:

- Produces more milk per lactation
- Gives good quality of milk

Inbreeding

Heterozygous

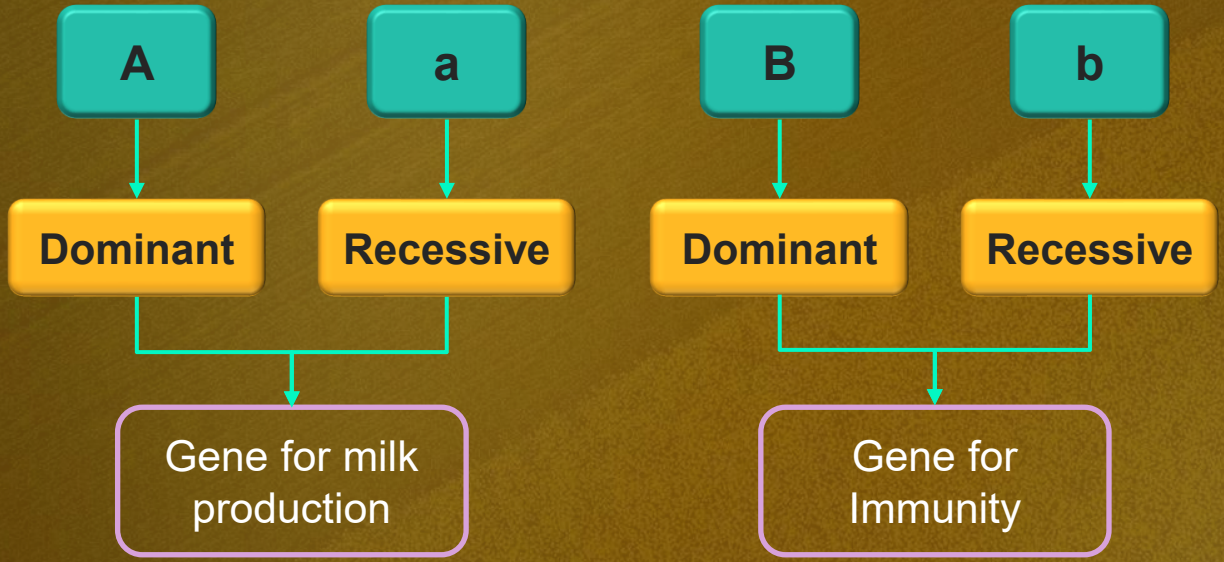
- Breeding heterozygotes raises possibility of:
  - Losing desired qualities in the next generation
  - Accumulation of recessive traits

Homozygous

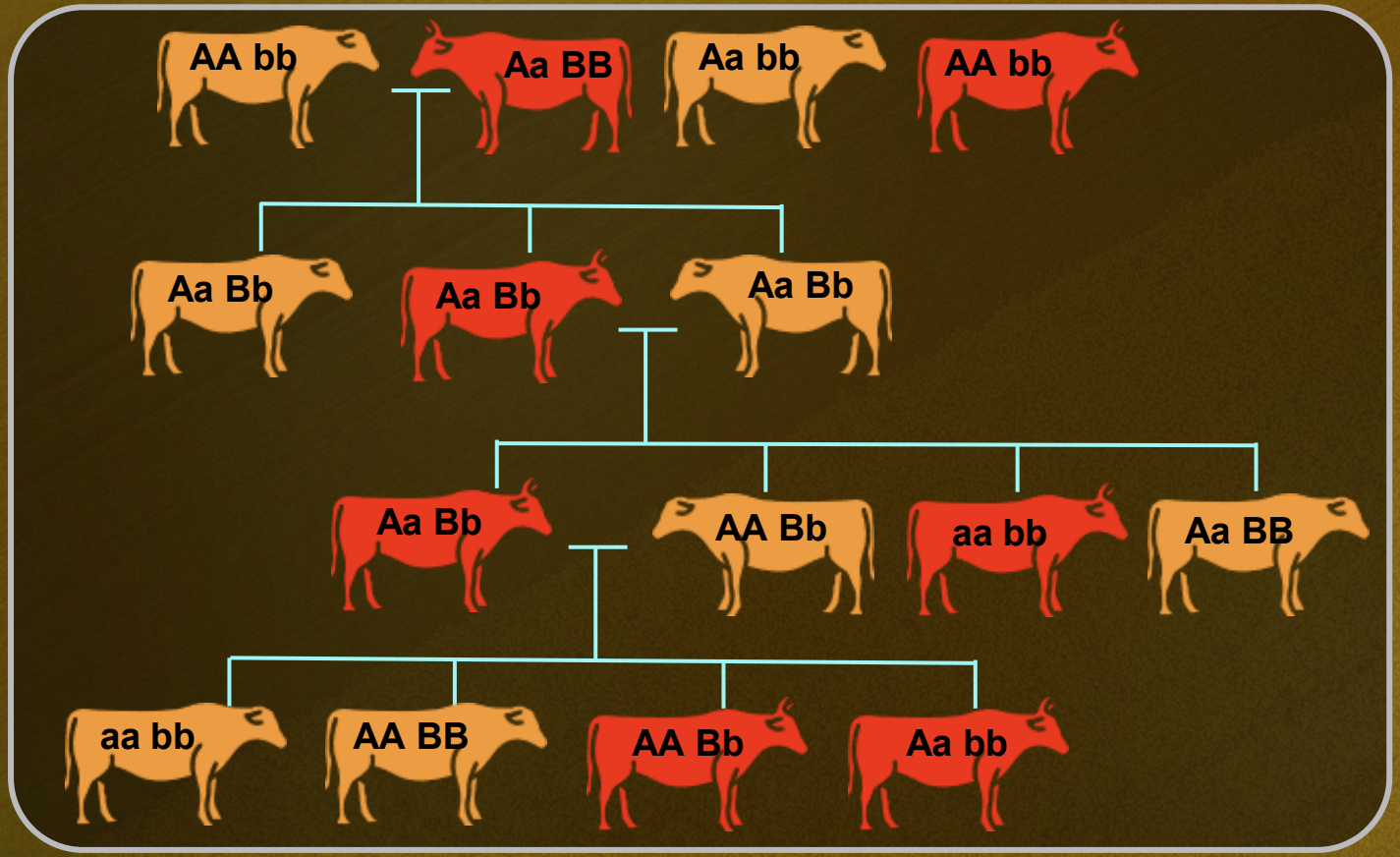
Animals are inbred to generate **pure lines** and

Eliminate these possibilities

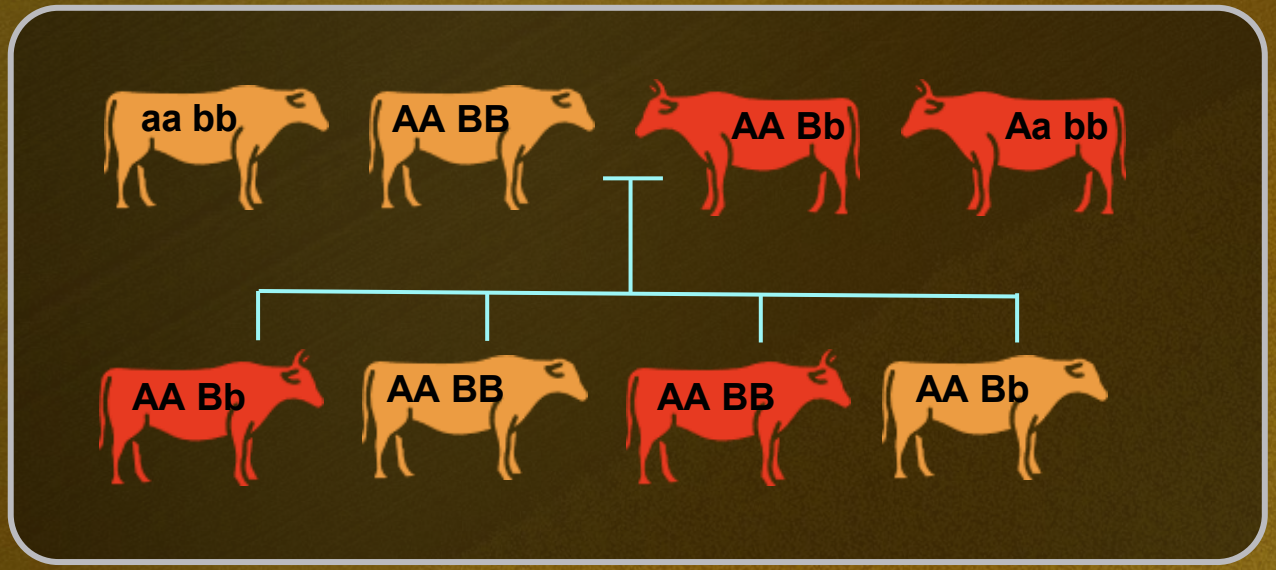
Inbreeding


A
a
B
b
Dominant
Recessive
Dominant
Recessive
Gene for milk production
Gene for Immunity

Inbreeding Strategy



Inbreeding Strategy



Inbreeding **increases** **homozygosity**

Recall! Mendel's True Breed

True Breed

Plant which undergo **self fertilisation for several generations**, such that their traits remain unchanged

Did You Know ?

Inbred for speed

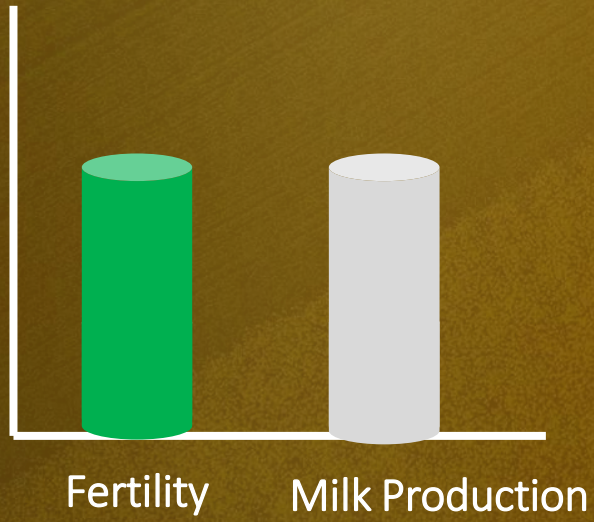
Racehorses are inbred to preserve the genes for speed and strength

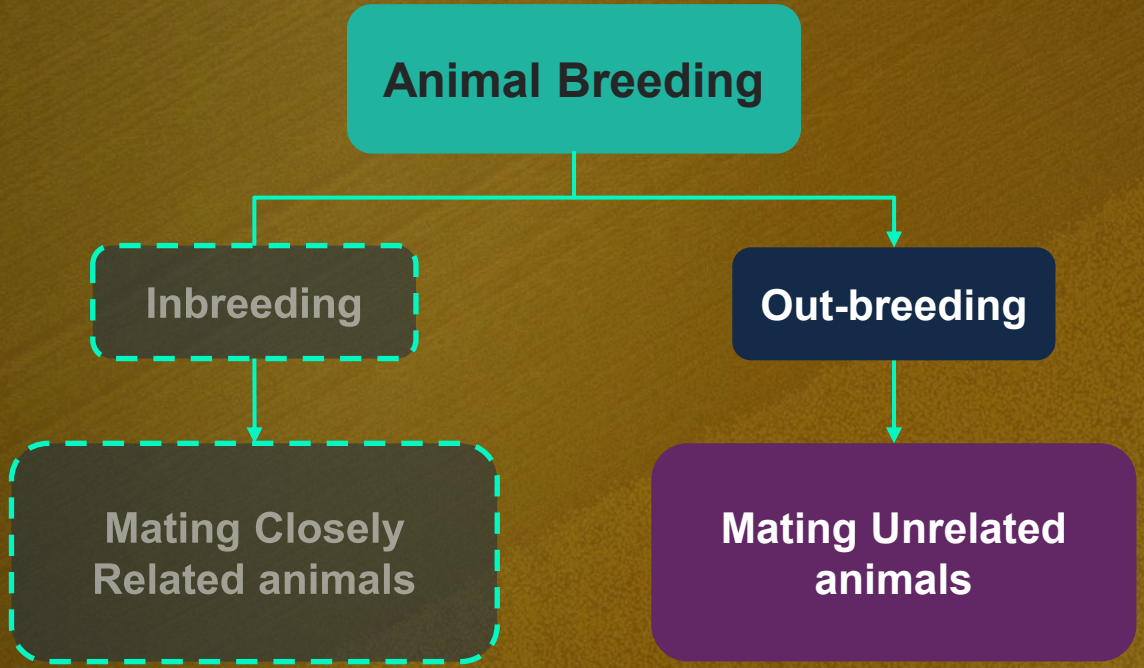
Inbred for speed

- Frankel never lost a race in his life
- He is worth 100 million dollars!

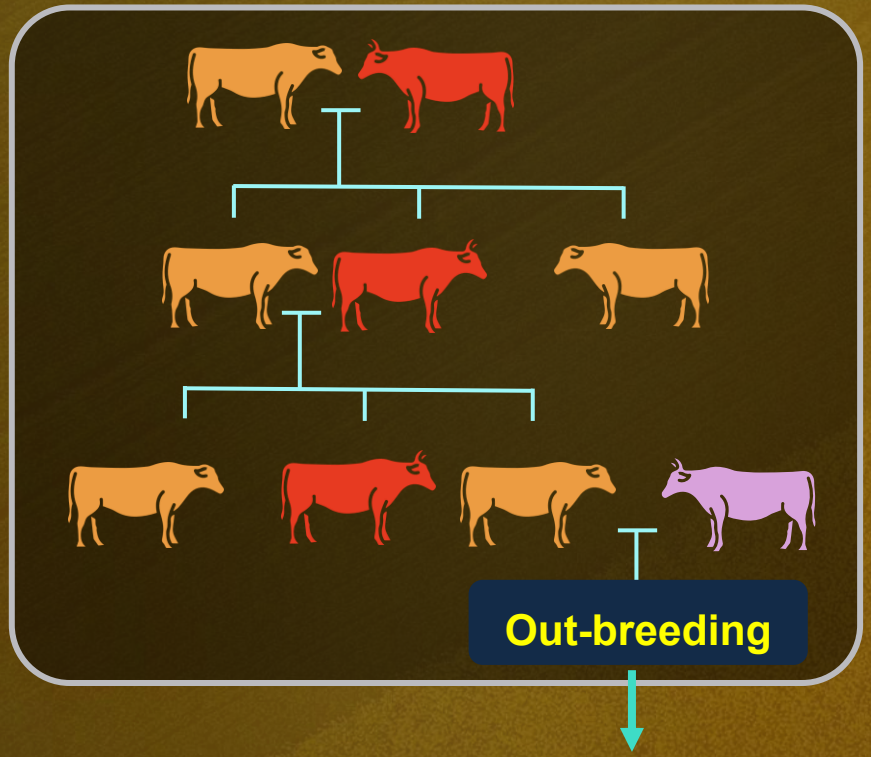
Inbreeding

- Recessive genes accumulated leading to Inbreeding depression
- Reduces fertility and productivity




Animal Breeding
Inbreeding
Out-breeding
Mating Closely Related animals
Mating Unrelated animals

Out-breeding

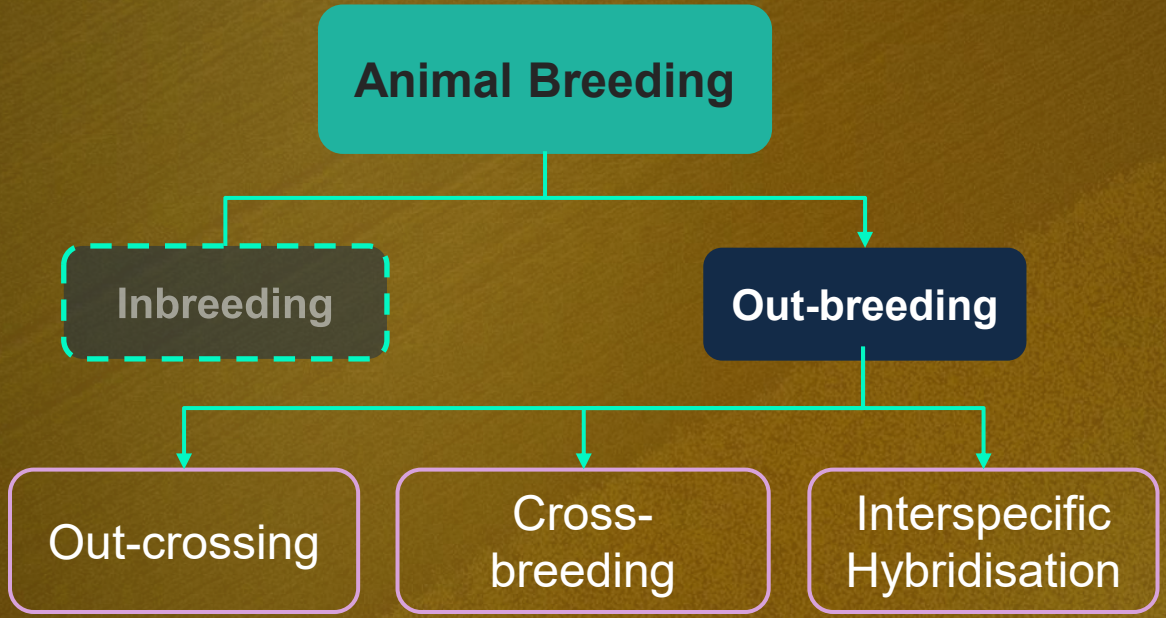


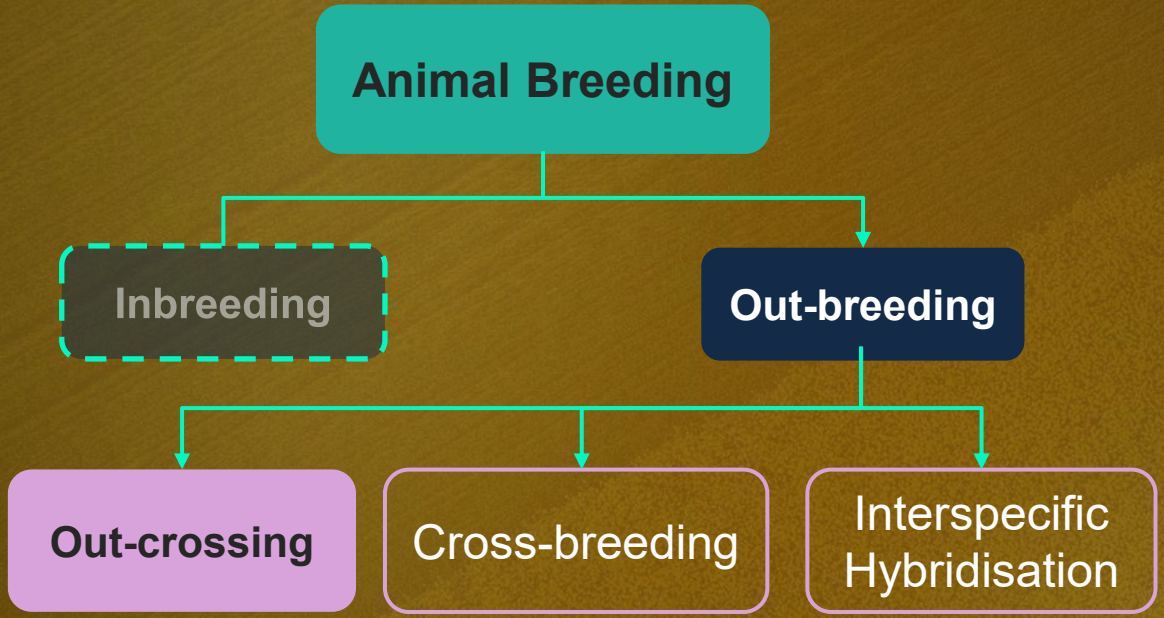
- Breeding of the **unrelated** animals of:
  - Same breed
  - Different breed
  - Different species

No common ancestors for at least 4 - 6 generations

Out-breeding Benefits

- **Overcomes** below **average productivity:**
  - **Lower milk production**
  - **Slow growth rate** in beef cattle, etc.


Animal Breeding
Inbreeding
Out-breeding
Out-crossing
Cross-breeding
Interspecific Hybridisation


Animal Breeding
Inbreeding
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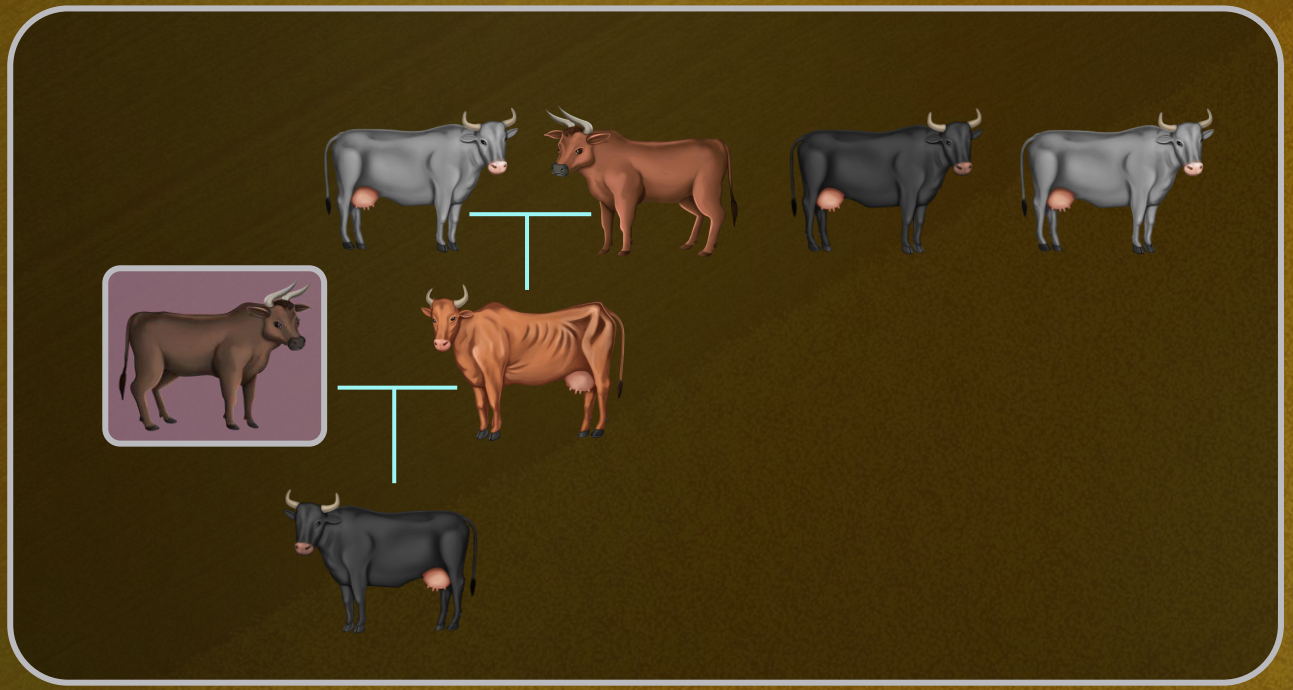
Interspecific Hybridisation

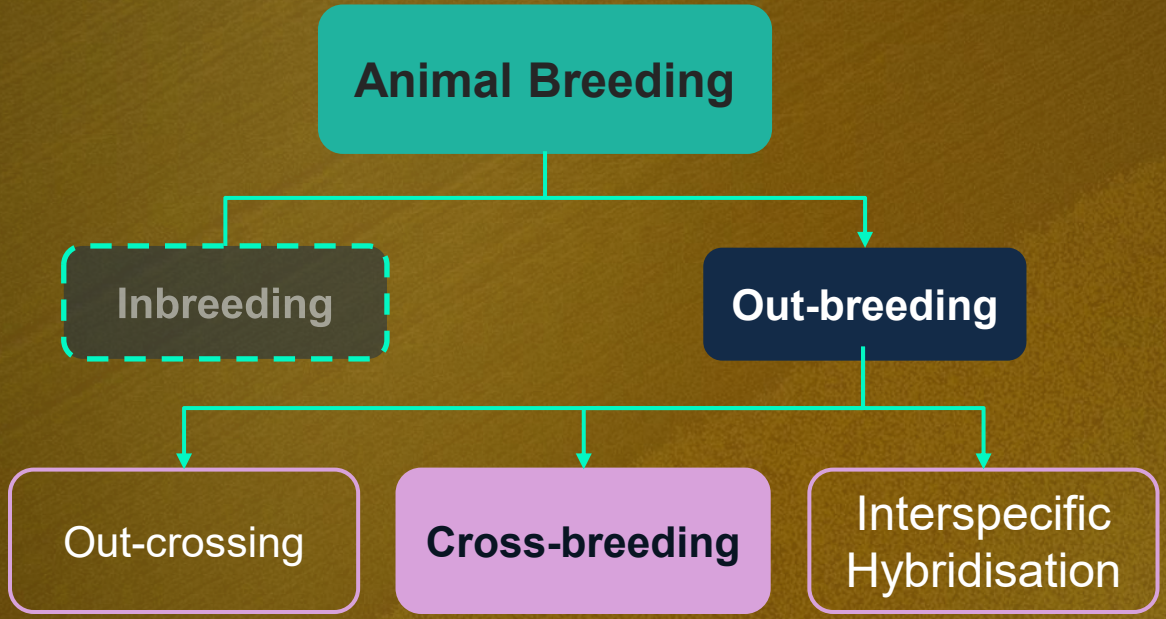
Out-crossing

- Mating unrelated animals within the same breed
- Offspring is known as out-cross

Out-crossing

Single outcross overcomes inbreeding depression




Animal Breeding
Inbreeding
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Interspecific Hybridisation

Recall!

- Mating animals from different breeds
- Combines desirable qualities of two different breeds

Friendly labrador

X

Less shedding poodle

=

Friendly and sheds less labradoodle!

Cross-breeding

Bikaneri Sheep

Wool in brilliant white colour

Marino Sheep

Soft wool in large quantity

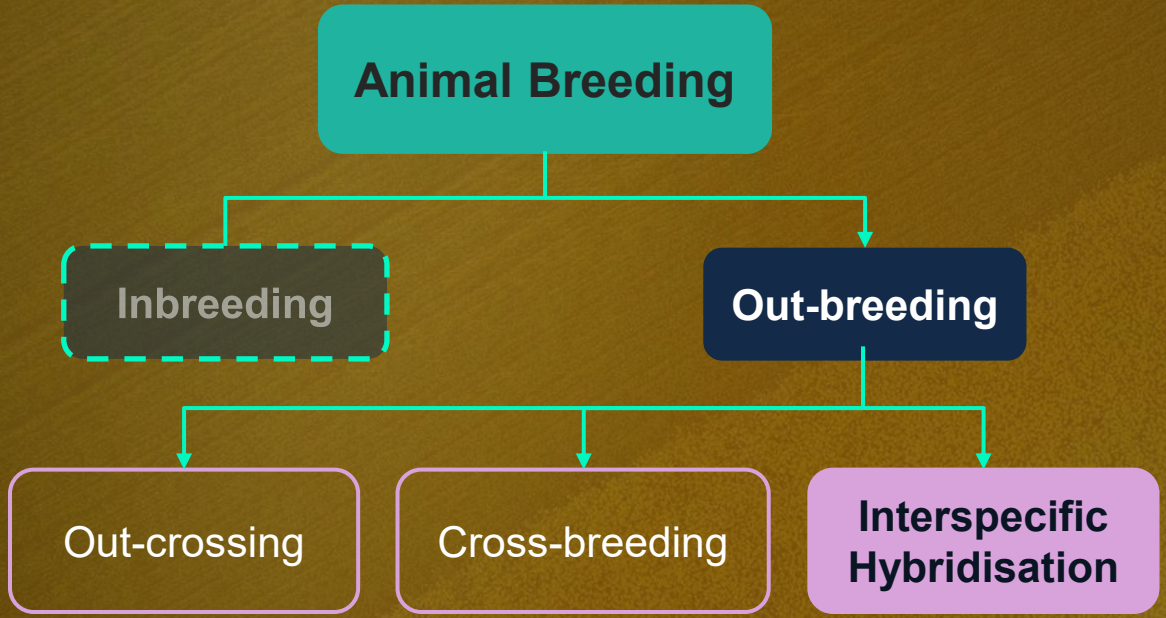
Cross-breeding

Hisardale – Brilliant white wool in large quantity

Bikaneri Sheep X **Marino Sheep** = **Hisardale**

Cross-breeding

- Used for increased commercial production
- Inbred to develop new and stable breeds


Animal Breeding
Inbreeding
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Interspecific Hybridisation

Interspecific Hybridisation

- Mating of animals from two different but related species
- The sterile offspring is called a hybrid

Equus quagga

Zebra

Equus caballus

Horse

Equus asinus

Donkey

Interspecific Hybridisation

Equus quagga

Zebra

X

Equus asinus

Donkey

=

Zonkey

Equus quagga

Zebra

X

Equus caballus

Horse

=

Zorse

Interspecific Hybridisation

- Used to obtain economically valuable hybrids

Equus asinus

Donkey

X

Equus caballus

Horse

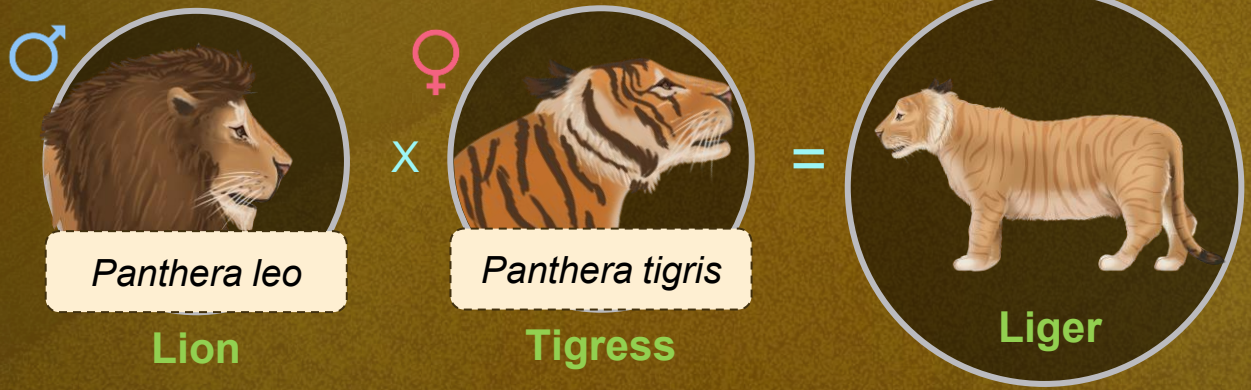
=

Mule

Interspecific Hybridisation Naming Convention

Name of hybrid = Prefix of Male parent + Suffix of the Female parent

Interspecific Hybridisation

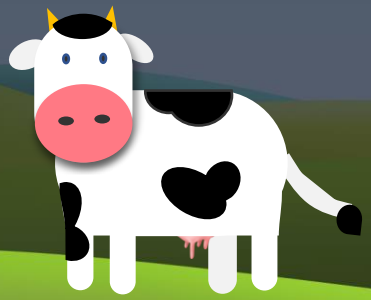


Interspecific Hybridisation

Caution!!

- Hybrids of all related species are not feasible
- Cannot generate hybrids for entertainment
- Made for economic or fundamental scientific purposes only

Controlled Breeding Experiments



Controlled Breeding Experiments

Controlled Breeding Experiments

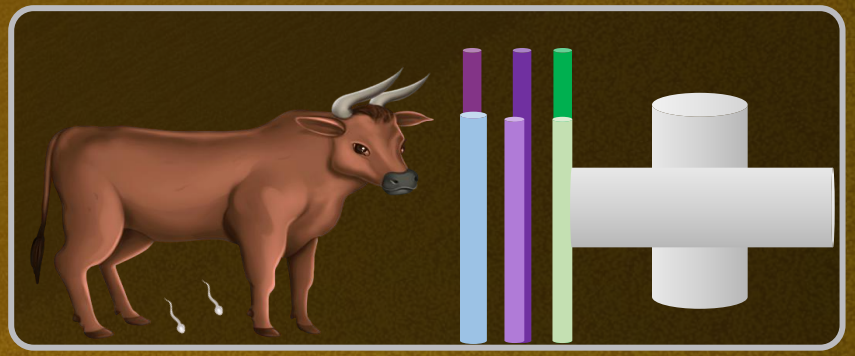
Improves quality and quantity of animal and its produce

Artificial Insemination

Artificial Insemination

Semen is introduced into selected female animal manually

Artificial Insemination Strategy



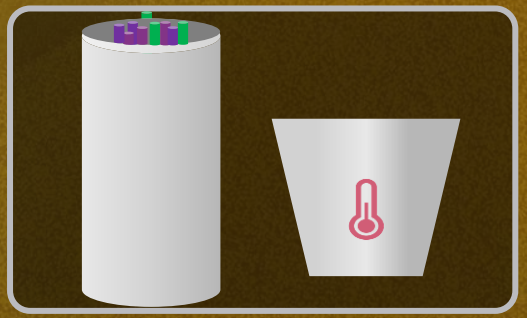
Step 1: Sperm collection

Semen collected from the male

Can be used immediately or can be frozen and used later

Step 2: Transport (if required)

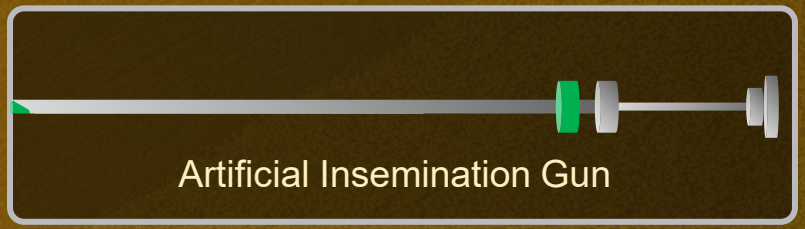
Semen can be transported to different farms where females are housed



Artificial Insemination Strategy

Step 3: Preparation for insemination

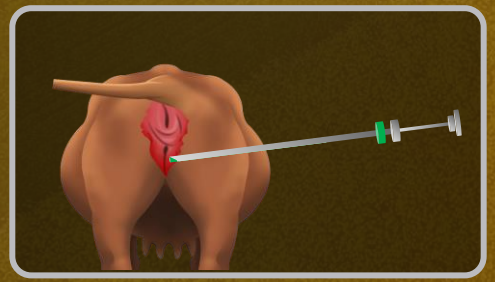
Semen is loaded into the artificial insemination guns.



Artificial Insemination Gun

Step 4: Insemination

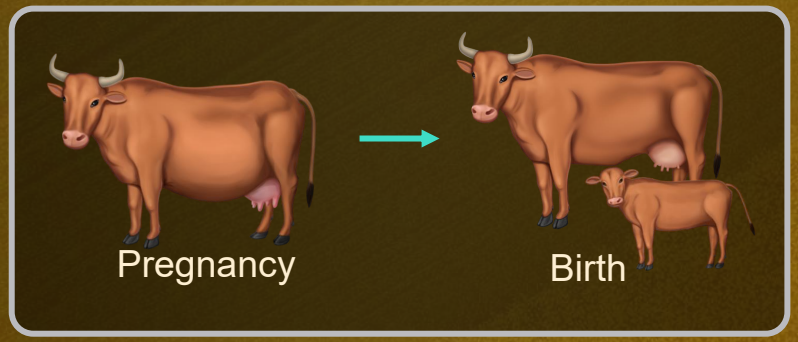
Semen is injected into the reproductive tract of the selected female by the breeder



Artificial Insemination Strategy

Step 5: Pregnancy and birth

The artificially inseminated cow is allowed to rest and is monitored during pregnancy.

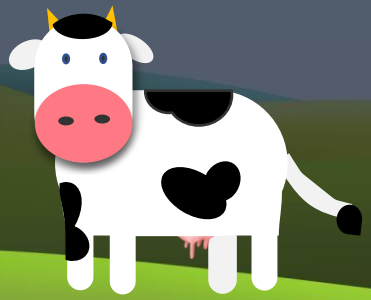


Later the cow gives birth to offspring.

Artificial Insemination

- It is advisable that the breeder is properly trained to perform these procedures
- The success rate of artificial insemination can be low sometimes
- The technique of MOET is useful in animal breeding

Multiple Ovulation Embryo Transfer Technology



Multiple Ovulation Embryo Transfer

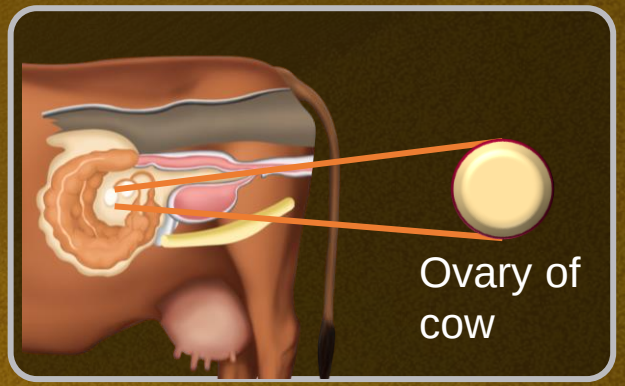
MOET

- Successful production of hybrid
- Hybrid number - increased

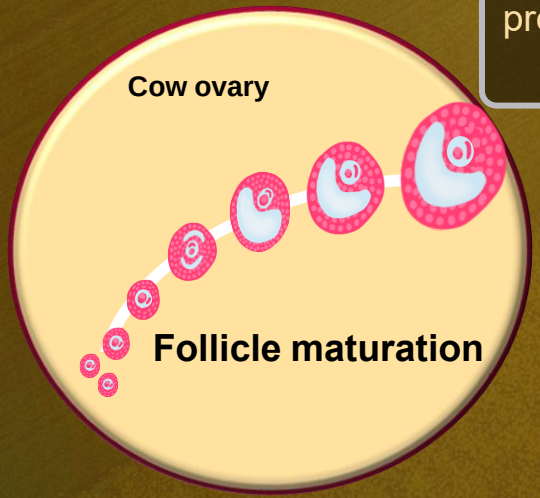
MOET Strategy

Step 1: Hormone therapy

- The hormone with FSH-like activity induces follicular maturation and super ovulation in the selected female.



Instead of 1 egg per cycle, the female produces **6-8 eggs**



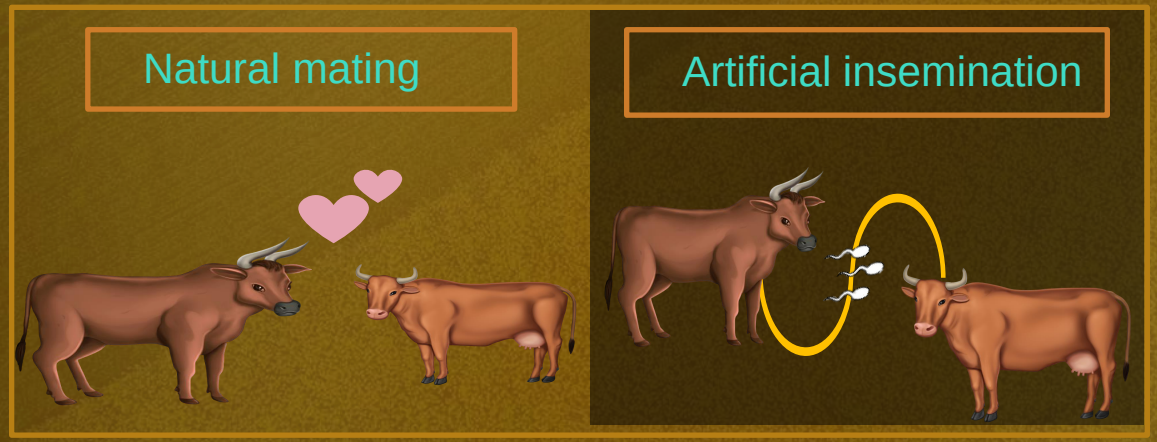
MOET Strategy

Step 2: Insemination

- The cow is either mated with elite bull by:

  - Natural mating

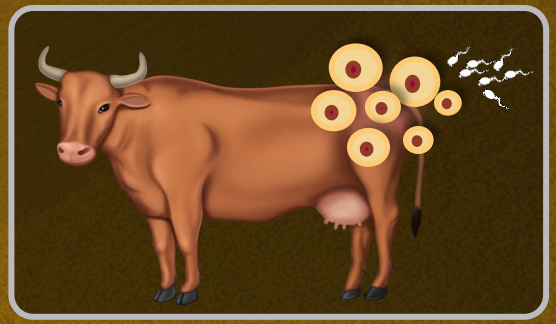
  - Artificial insemination

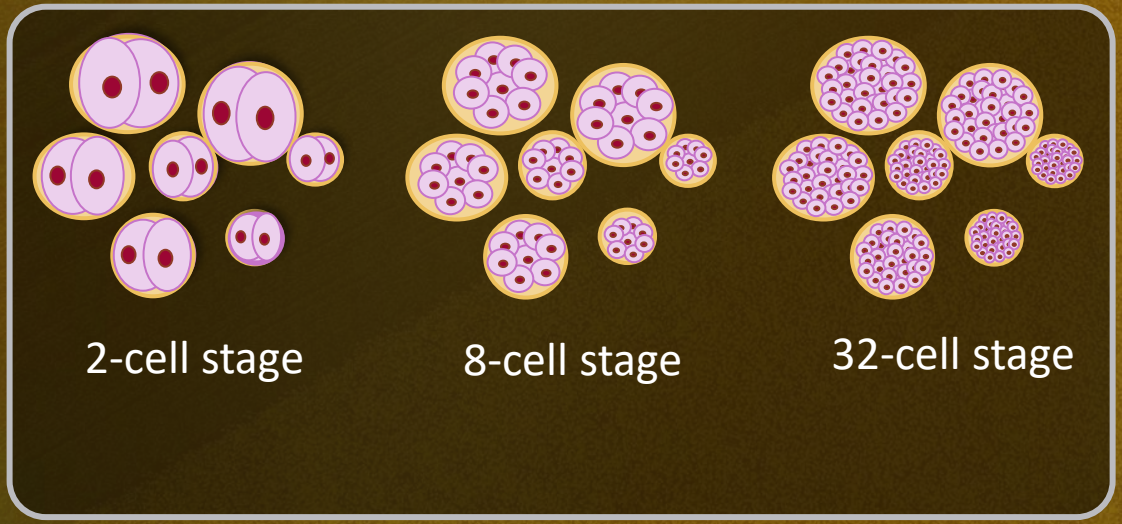


MOET Strategy

Step 3: Fertilisation

- The eggs are fertilized.

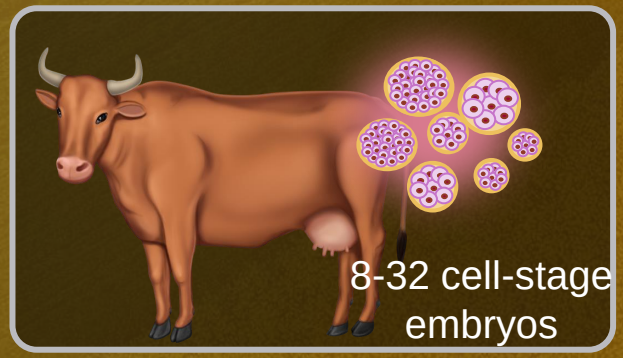




MOET Strategy

Step 4: Embryo recovery

- Embryos (of 8-32 cell stage) are non-surgically recovered from the cow.



- These embryos are then transferred to the surrogate mothers.

MOET Strategy

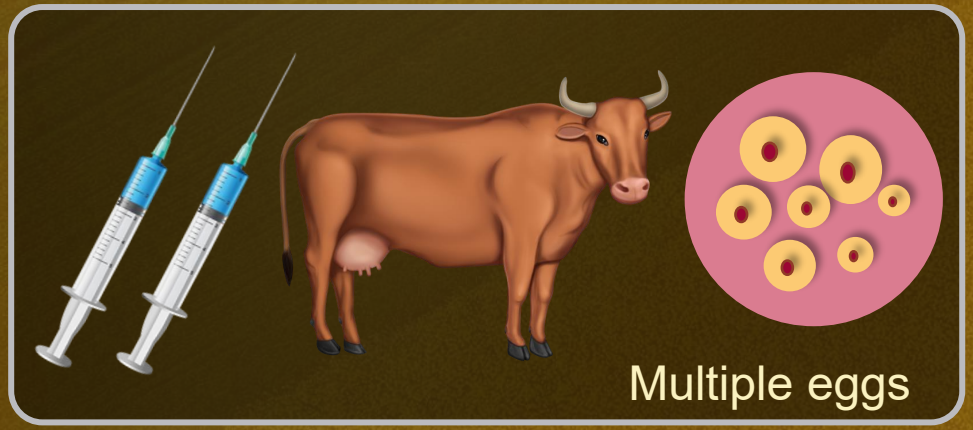
Step 5: Mating

- These embryos grow and develop in the surrogate mother and are finally delivered.

MOET Strategy

Repeat Step 1–4

- The genetic mother is ready for the next round of superovulation.



MOET

This is successfully done in:

- Cows
- Sheep
- Rabbits
- Buffaloes
- Mares

Cow

Buffalo

Horse

Sheep