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Plant Breeding Programs for Pasture and Forage Species

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The breeding programs for pasture and forage species at INIAV-Elvas have the following global objectives:

- **Select varieties** suitable for the different environments prevalent in Mediterranean climate regions;

- Contribute to **increasing the profitability of agro-silvopastoral systems** in a sustainable way (systems capable of providing quality feed for animals, meeting their nutritional requirements, in an economically viable and environmentally respectful way);

- **Increase plant biodiversity**, in order to prevent the reduction of ecosystem services.

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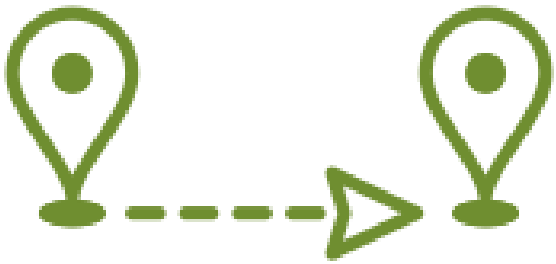
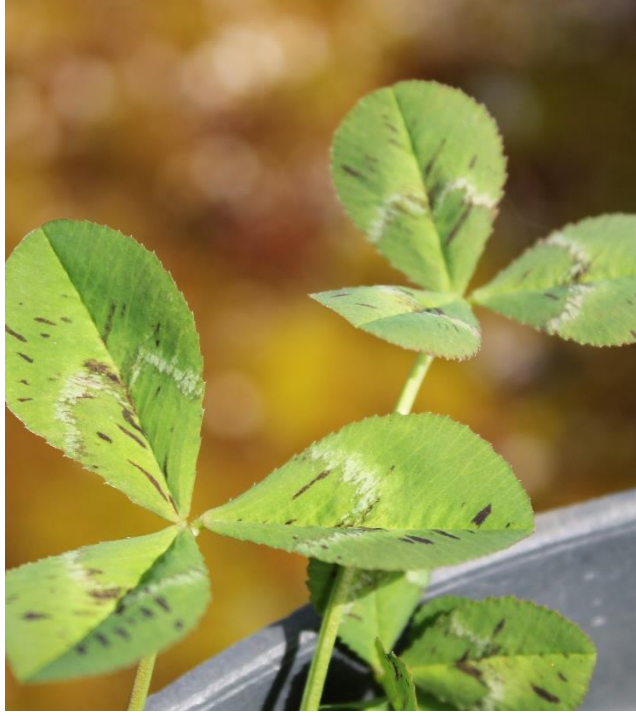


What is our starting point?

We take advantage of the genetic diversity between species



And of the diversity within species

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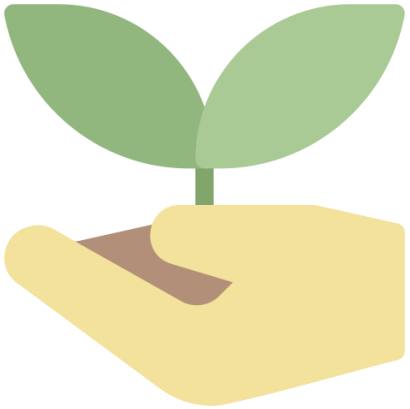

Origin of Germplasm

where do we get it?

Portuguese Plant Germplasm Bank

Collecting germplasm from nature

Portugal's spontaneous flora is still rich

Germplasm exchange between institutions

We're talking about 'animal feed'

(mainly ruminants)

PASTURES - When they eat directly in the field

FODDER CROPS - When they eat preserved 'grass' in the form of …

hay

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COMMON CHARACTERISTICS SPECIES* FOR ANIMAL FEEDING

*these species belong mainly to 2 large families, *Poaceae* and *Fabaceae*

High biomass productivity

Climatic adaptability

Regrowth capacity

Use in intercropping systems (fodder crops)

High forage value

Low toxicity or presence of antinutritional factors

Tolerance to climatic variations and soil types.

Nitrogen fixation ability (for legumes)

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Specific Characteristics Desired in Pasture Species

High regrowth capacity

Persistence and longevity

Good soil coverage

Resistance to trampling

Drought or waterlogging tolerance

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Specific Characteristics Desired in Forage Species

High palatability

Resistance to diseases and pests

Resistance to cutting

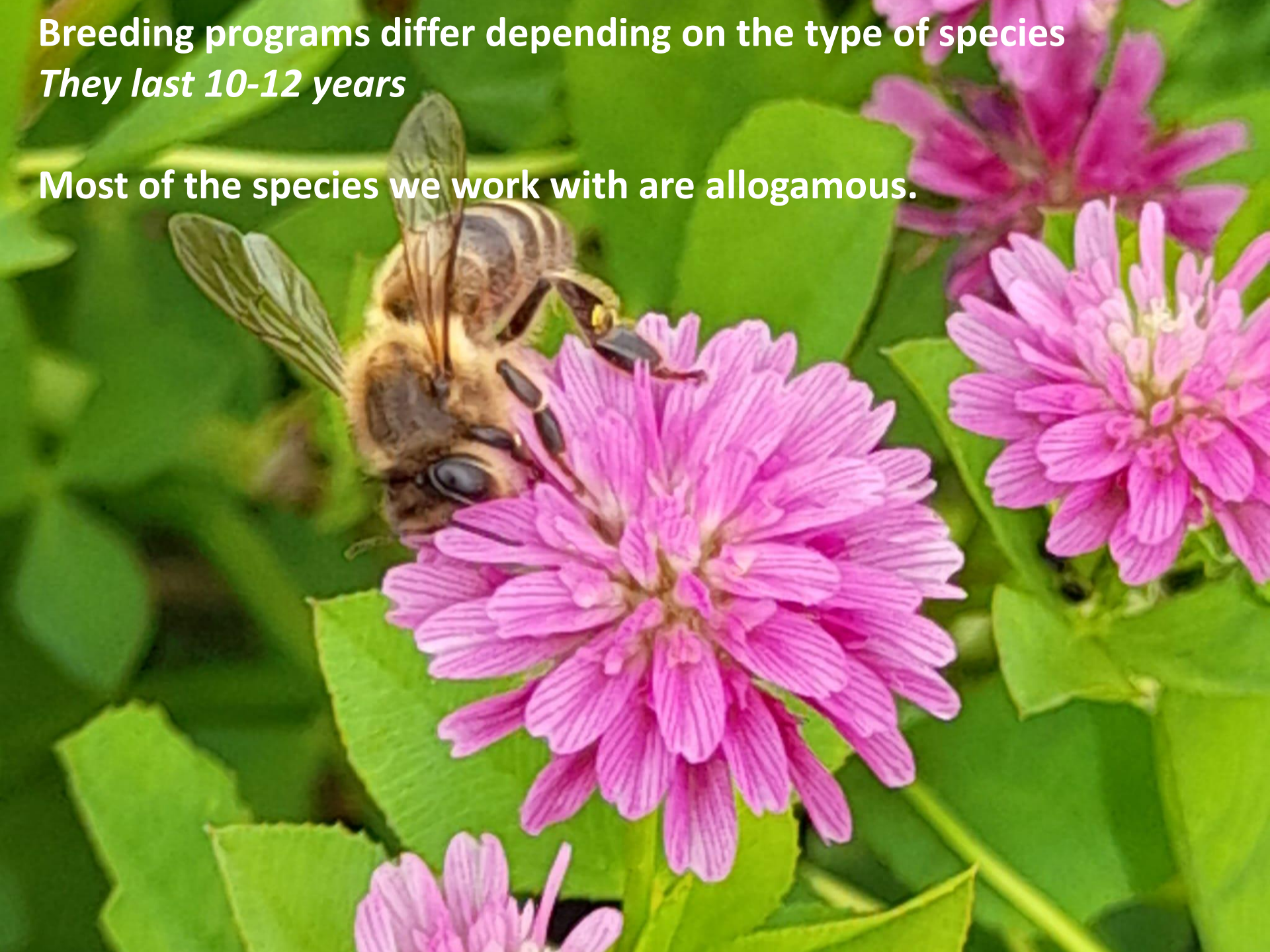
Tolerance to climatic variations and soil types

Good response to fertilization

Good conservation potential *(hay, silage, etc.)*

ANNUAL LEGUME BREEDING PROGRAMS

Trifolium alexandrinum
Trifolium angustifolium
Trifolium arvense
Trifolium bocconei
Trifolium campestre
Trifolium cernuum
Trifolium cherleri
Trifolium diffusum
Trifolium dubium
Trifolium fragiferum
Trifolium glomeratum
Trifolium hirtum
Trifolium incarnatum
Trifolium isthmocarpum
Trifolium lappaceum
Trifolium leucanthum
xplorar
lappaceum



Breeding programs differ depending on the type of species
They last 10-12 years

Most of the species we work with are allogamous.

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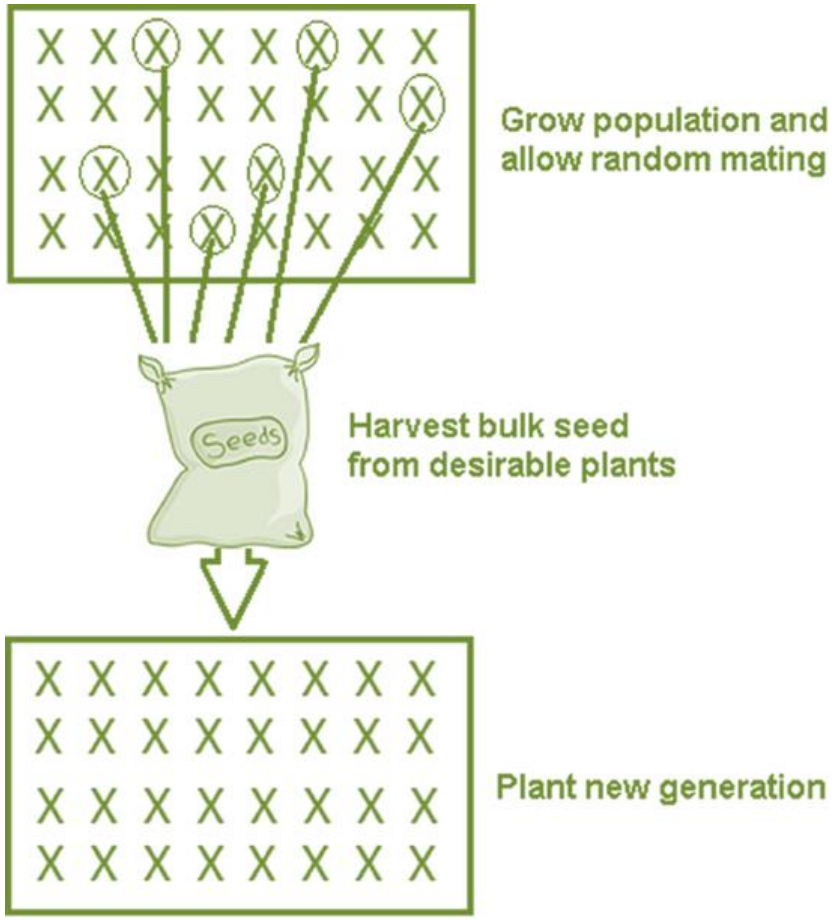
The breeding method we use is:

Mass selection

(phenotypic selection)



- Simplest and oldest method.
- Seeds are collected from phenotypically superior individuals from a population
- seed is mixed and sown in the next generation.

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Annual legumes with self-reseeding ability

These are annual species whose seeds can withstand summer conditions without losing viability, allowing them to regenerate naturally and persist across multiple cropping cycles.

For permanente pastures

Annual legumes

Annual plants complete their life cycle within a single growing season and require reseeding in subsequent years to maintain their presence in the system.

Fodder crops

Main selection criteria:

- Vigorous winter growth
- High dry matter and seed yield
- High metabolizable energy content
- Good protein value
- High palatability
- Persistence

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The integration of legumes into permanent pastures is particularly important:

- naturally fix atmospheric nitrogen -

- enriching soil fertility without the need for synthetic fertilizers -

Improves pasture productivity and forage quality for grazing animals

Contributes to a more closed nutrient cycle

Reduced greenhouse gas emissions

More resilient agroecosystems

Harmonious coexistence between livestock production and natural ecosystems

. Higher dry matter production

. Provide more energy

. Greater competitiveness (light; weeds)

…

Annual and Perennial grasses

Perennial grasses

- *Permanent pastures* -

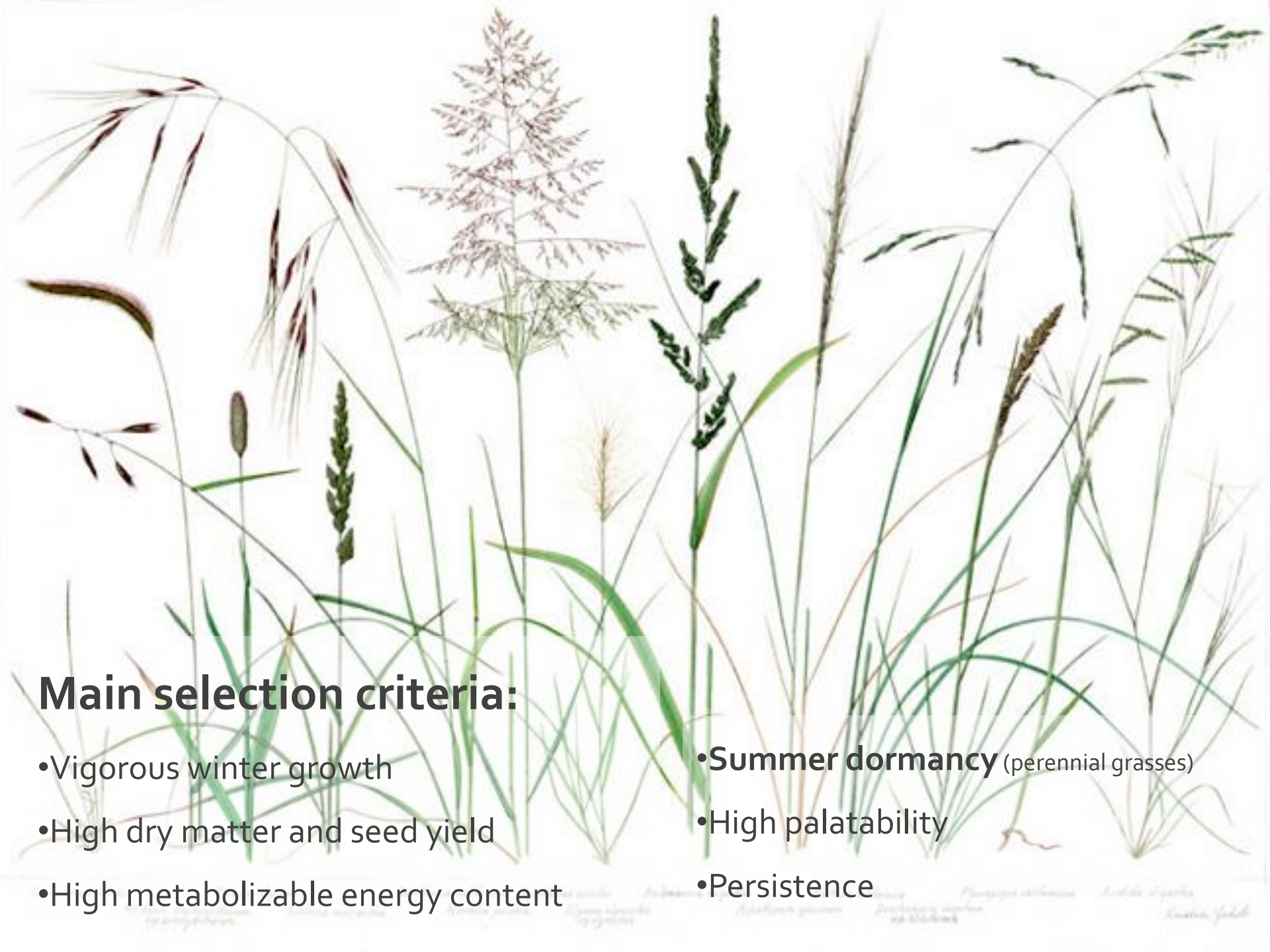
Dactylis glomerata

Festuca arundinacea

subesp. arundinacea

Annual grasses

- Fodder crops -



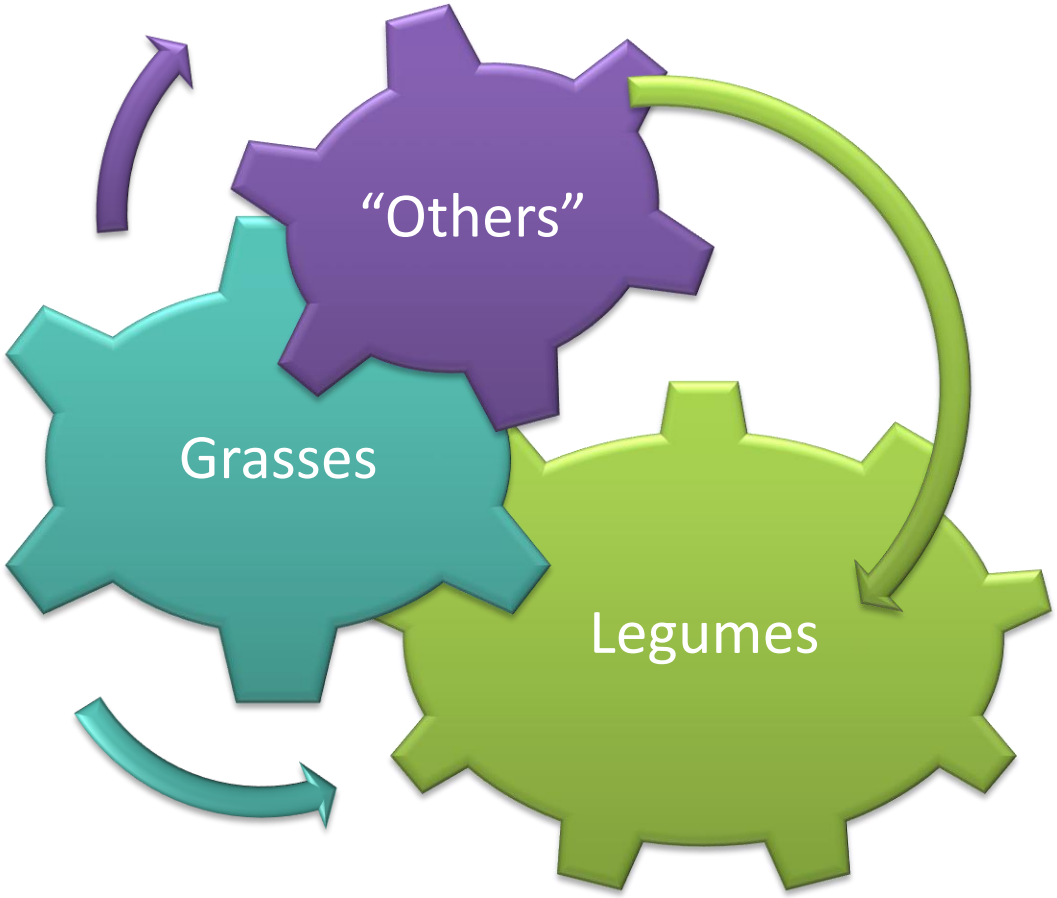
Main selection criteria:

- Vigorous winter growth
- High dry matter and seed yield
- High metabolizable energy content
- **Summer dormancy** (perennial grasses)
- High palatability
- Persistence

Biodiverse pastures/forages

Associate/combine multiple species and improved varieties

(certified seeds/mixtures).



Biodiverse mixtures

If the mixture contains many species and/or varieties, it will have a greater capacity to fill ecological niches.

Better nutrient absorption from the soil
(denser and deeper root system)

More productive pasture
•Enhanced ecosystem services

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Thank´s

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