

Eucalyptus seed production

Improved seed supply is a key step for plantation production and resilience

IEFC - Let's Talk About Planted Forests

18th of March 2022



A synopsis of R&D in eucalyptus at Altri Florestal

Altri, through Celbi, has an accumulated R&D experience of over 50 years. The R&D activity is organized in three areas:

- **Genetic improvement:** started in 1965, focused on the continuous improvement of growth, wood quality, genetic diversity, tolerance to biotic and abiotic threats.
- **Silviculture:** in collaboration with Academia, R&D to improve the productivity and sustainability of eucalyptus plantations. Focus has been in forestry production and protection practices, as well as growth and yield models.
- **Forestry Operations:** R&D on operations from stand establishment to delivery of wood to mills. The R&D objectives have been to reduce costs, reduce the environmental impacts of forestry operations, as well as improve safety conditions.

Seed production: moving from genetic gain to operational gain

Scope of the talk

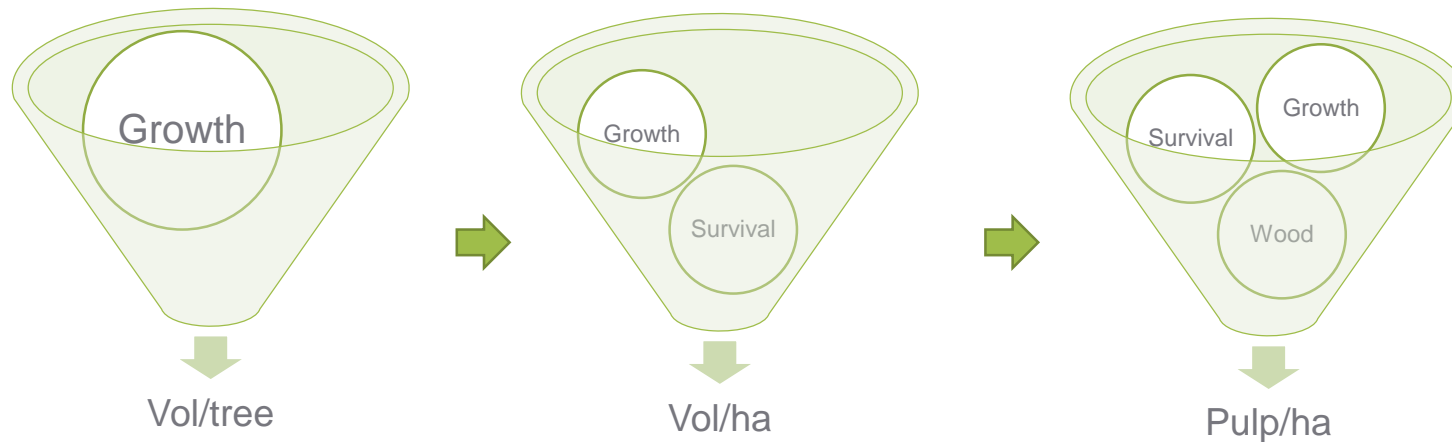


Experience shows that **creating value from tree breeding is more limited by the ability to deliver genetic value on the ground than it is by the ability to improve genetic potential** through breeding, testing and selection (Talbert, 1993).

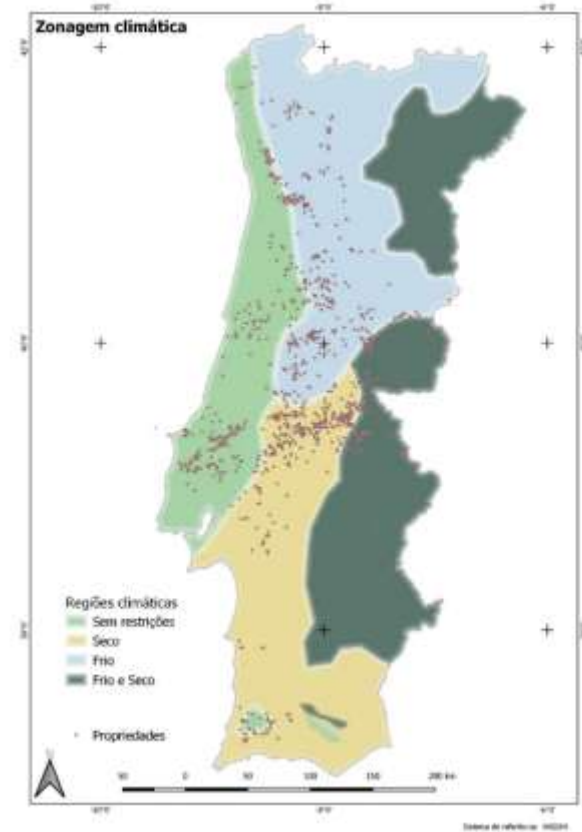
Matching genotype-site: planting the right tree in the right place

Which is the right tree? => we need to know our trees!

- **3rd eucalyptus breeding generation:** it is not only important to have improved trees but it is essential to know for what trees have been improved for and their characteristics

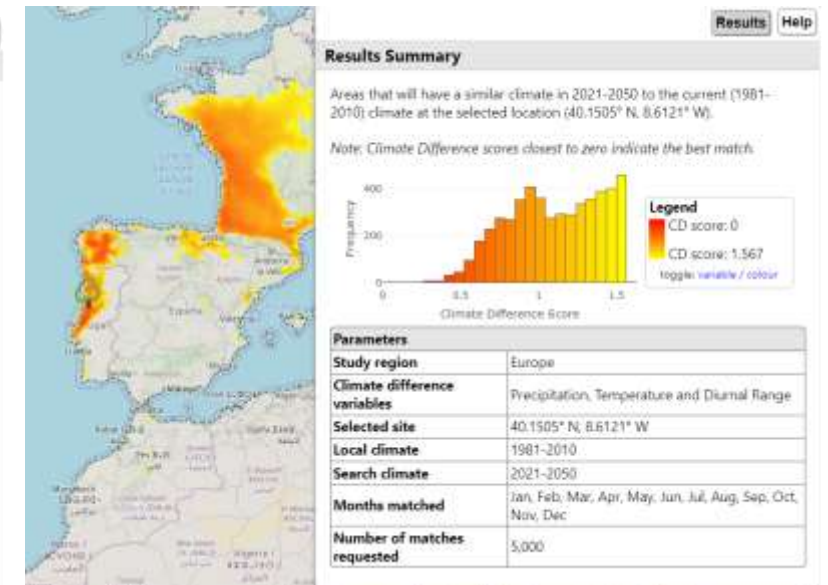
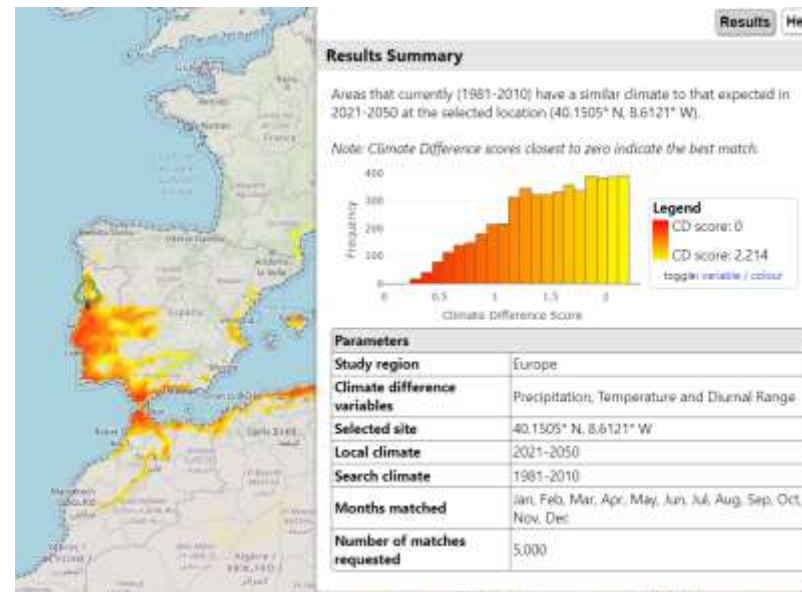
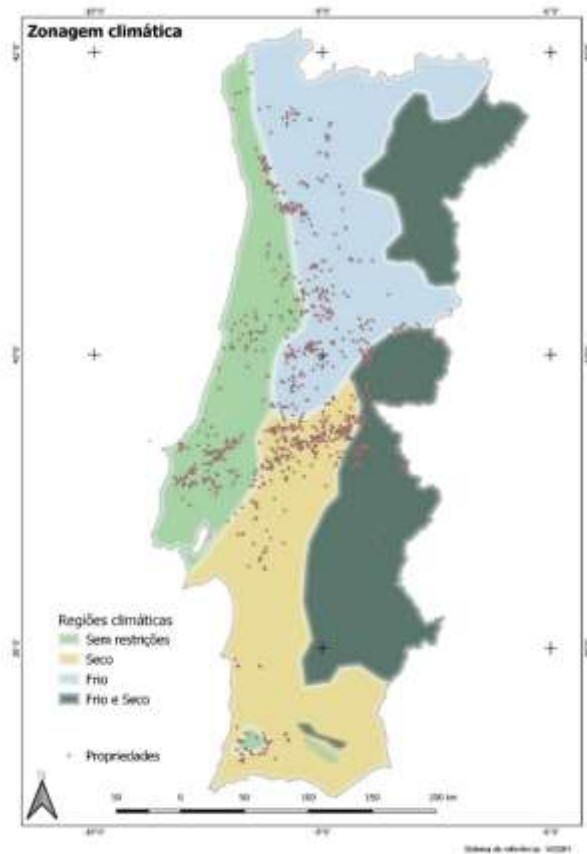


- **Vol/ha** depends not just on growth but also on survival so for some regions (drought region) those that produce higher vol/ha are not necessarily the ones that have fastest growth
- **Generalist genotypes (full-sib seedlings)** with good performance overall or across a region and **specialist genotypes (clones)** which maximize productivity on specific sites either with high productivity or with a particular limitation (e. g. waterlogging)



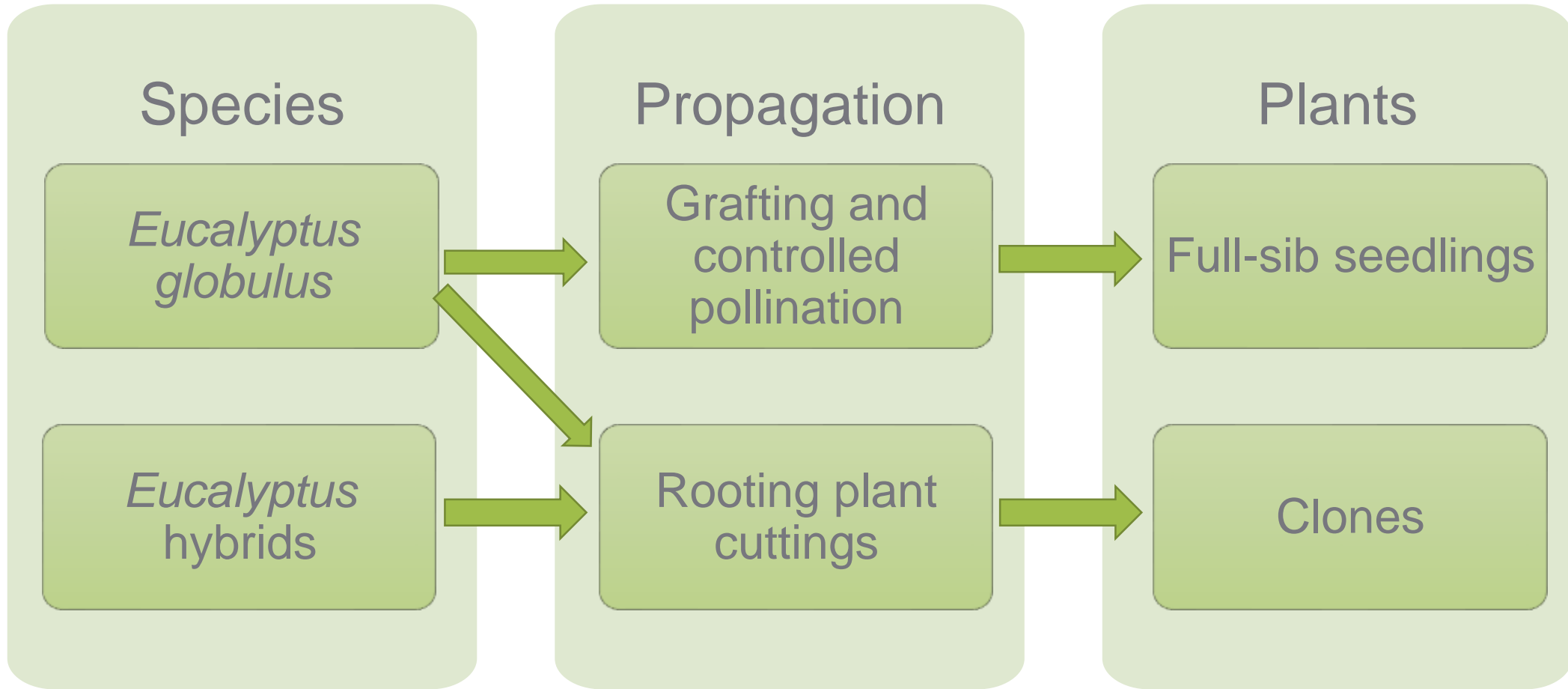
Planting the right tree in the right place

Which is the right place? => In the context of climate change to know what is the right place is an evolutive concept



Climate matching tool: <https://climatematch.org.uk>

Evaluating ability to mass propagate improved FRM



Improved FRM production capacity

Seedlings

- Mass controlled pollination:
around 700.000 flowers/year



Clones

- Nursery with 150.000 mother-plants



Seed orchards, trees and genotypes available

Seed orchards	Area/ha	Nr of trees	Genotypes
P1	3	395	11
P3	7	955	4
P4	8	1503	145
P5	2.5	458	84
P6	1.7	323	36
P7 Z1	2.4	455	45
P7 Z2	3.2	731	50
P7 Z3	2.9	792	182
P7 Z4	0.1	18	2
P8	3.4	859	37
Furadouro 1	0.2	62	62
Furadouro 3	4.6	962	319
	39	7513	977



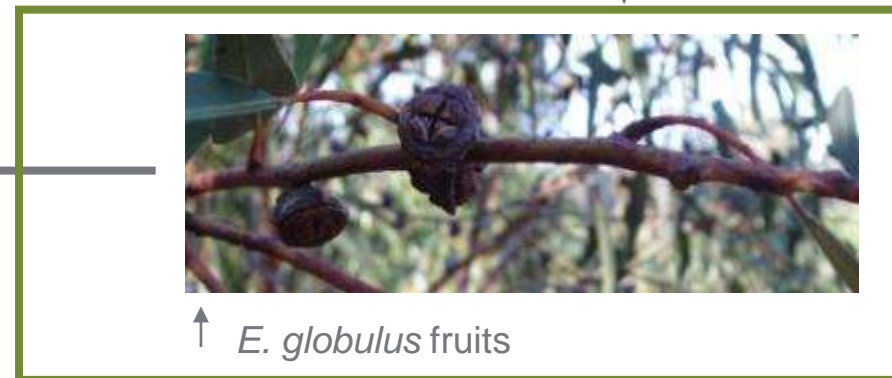
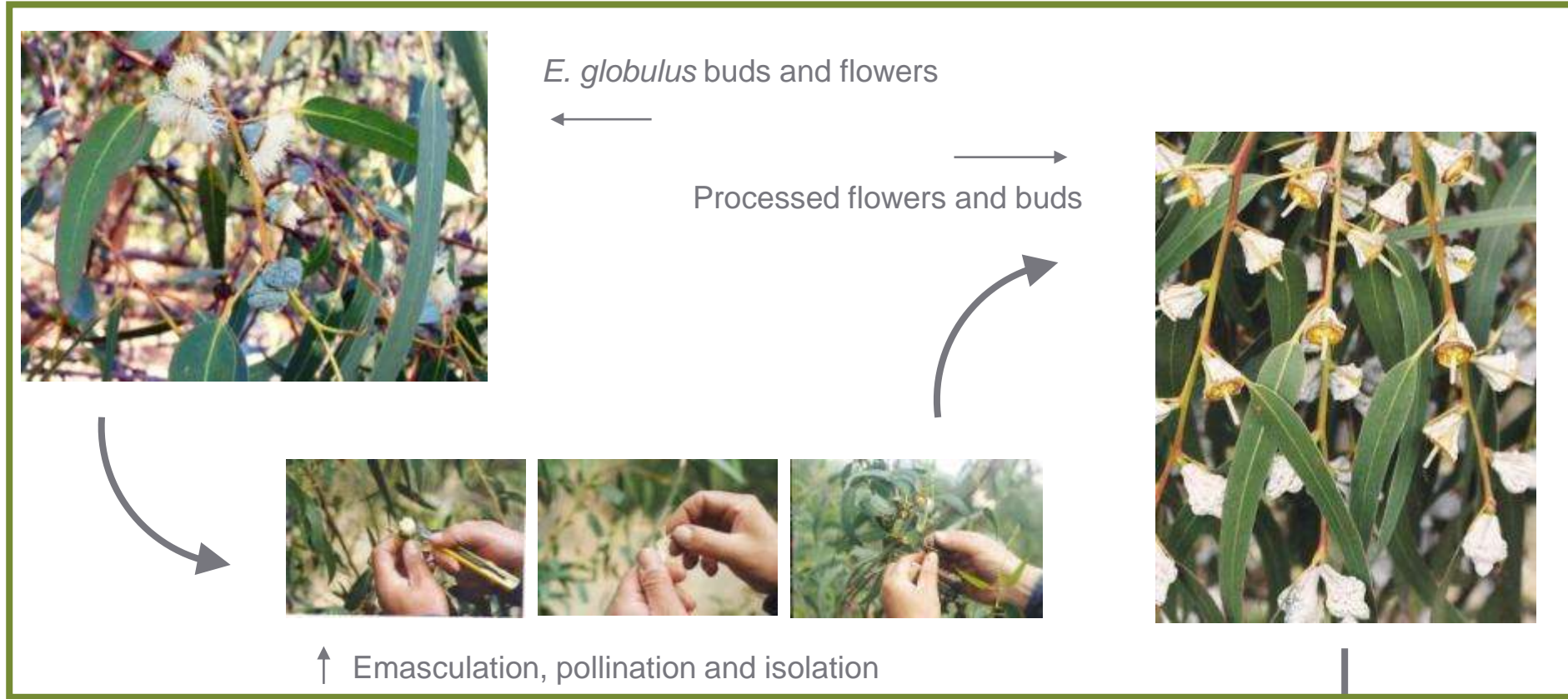
P9 - is being prepared, it will have 8 ha, in the last months more than 4500 graftings have been carried out – composition is in accordance to BLUP 2021 and expected seed needs

Controlled pollination in the 80's



- Controlled pollination a 5 visits process
- Work done from the floor, scaffolding or small cranes

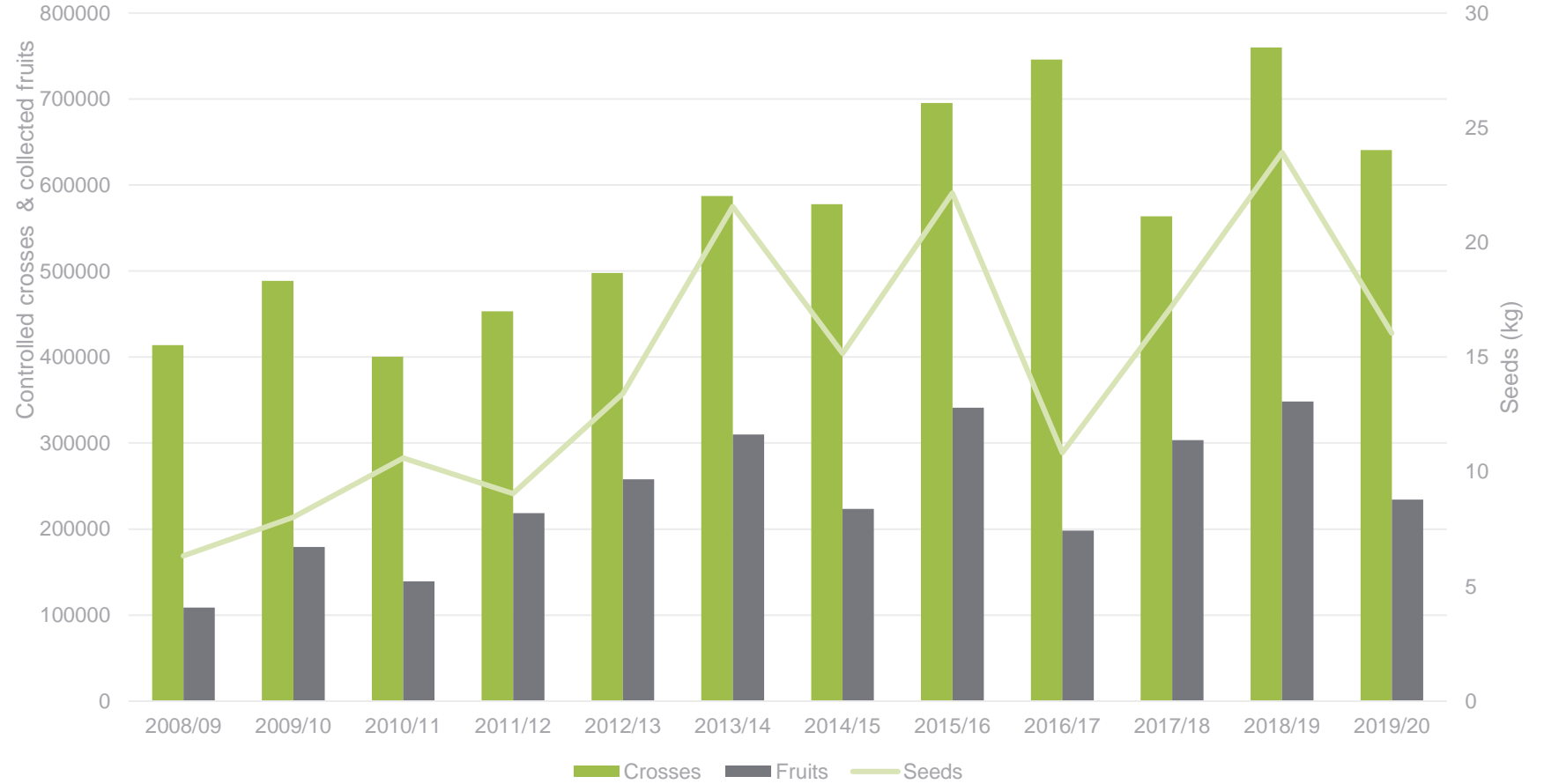
Mass controlled pollination – 2 visits process & cranes 16-20m



Mass controlled pollination programme in numbers



Controlled pollination, collected fruits and seed produced



Not every year will have the same production, for instance frost can damage a lot of fruits (e. g. 2016/17), so it is important to have a **seed stock**

Flowering phenology - pollen stock management

Family	StartM	EndM	StartP	EndP
VR1014xVR180	9	12	12	4
VR1014xVR444	9	12	12	1
VR1014xVR593	9	12	12	1
VR1014xVR875	9	12	10	12
VR1056xVM14	11	1	11	1
C33xVM14	12	1	11	1
CI8xC29	12	1	12	3
VR1061xVR441	12	1	12	2
VR1130xVR599	12	1	12	2
VR212xVR593	12	1	12	1
VR216xVR533	12	1	12	1
VR216xVR593	12	1	12	1
VR216xVR778	12	1	9	11
VR1061xVR585	12	1	10	1
C29xC33	12	3	12	1
C29xC25	12	3	12	3
VR174xVR881	1	1	9	12
VR252xVR1014	1	2	9	12
VR1117xVR444	3	5	12	1
VR1117xVR435	3	5	11	2



These “Father” trees flower after “Mother” trees => without pollen stock its impossible to do carry out such crosses



Maintaining a good nutritional status



- NPK + Ca Mg and B applied with a low impact operation

Increase flower induction and fruit-set

- Some genotypes in the orchards, are having low seed production, in partnership with Tradecorp Portugal (<https://tradecorp.pt/>) two products are being tested:
 - “Flower Spray”: a NPK fertilizer with magnesium, boron and molybdenum;
 - “Fitoalgas Green” a bioestimulant from an organic extract of *Ascophyllum nodosum*.
- Two foliar applications have been carried out (November and January) and next month results will be evaluated



Seed planning for the right tree in the right site

- **Improved plants, either generalist or specialist, have different characteristics** depending on the breeding objectives (e.g. growth or tolerance to drought) and it is critical to know them
- Ongoing climate change implies that for the same site **climate where the eucalyptus improved material was tested will be different than the climate which new plantations will face.**
- **Achieving operational gain**, implies not only to develop improved seed but also to look at all the silviculture steps involved => **Choosing the right improved FRM for the right site is one of the first and crucial steps but:**
- **It is only possible to deploy available plants in the nursery=> an estimate of what type of improved plants, and how many, will be needed in the future is essential**
 - It might take 5 years or more to do the grafting and start having flowers for mass controlled pollination plus another year for having seeds available



Thank you very much!

