Planasa
INNOVATION IN PLANT VARIETIES

Driving Genetic Gain in Berry Breeding through Genomics and Digital Phenotyping by PLANASA

Alfonso Lopez

Table of content

Planasa
INNOVATION IN PLANT VARIETIES

Get to Know Planasa

PLANASA IS A GLOBAL LEADER IN BERRY BREEDING WITH OWN NURSERY OPERATIONS TO PROMOTE ITS VARIETIES AND ENSURE PLANT QUALITY

R&D

We develop unique varieties for our customers and consumers through our various breeding programs in six locations

NURSERY

We own +1.500 hectares and well-equipped facilities to produce the best quality plants close to our customers

TECHNICAL SUPPORT

We count on a technical team dedicated to our customers to get the most out of each variety

MAIN CROPS

Blueberry

Blackberry

Raspberry

Strawberry

ADDITIONAL BUSINESS LINES

Garlic

Endive

Avocado

Asparagus

Cherry

Planasa
INNOVATION IN PLANT VARIETIES

PLANASA´S HISTORY START IN 1973 TO BECOME ON OF THE TOP BREEDING COMPANIES IN BERRIES WORLD WIDE

Get to know us

Planasa under ownership of founding family Darbonne

1973
Planasa is founded by the **Darbonne family**.

1975-78
Beginning of **strawberry and asparagus breeding**.

2003-04
Planasa launches **Sabrosa - Candonga®** strawberry.

2010-11
Operations begin in Mexico and USA. Launch of **Sabrina**.

2013-16
Planasa turns 40! Launch of the **Adelita®**.

2018
UK Cinven (65%). Launching **Savana® and Sayulita.**

PE Fund Civen (65%) & Alexandre Pierron-Darbonne (35%) as owners of Planasa

2020
Blueberry launch with **Blue Manila** and **Blue Maldiva®**, among others.

2021
Black Sultana® launch to the market.

2022
Launch of **RedSayra®**

2023
New **R&D centre** opening in Mexico.

EW Group owns 100% of Planasa

2024
Planasa is acquired by **EW Group**.

Planasa
INNOVATION IN PLANT VARIETIES

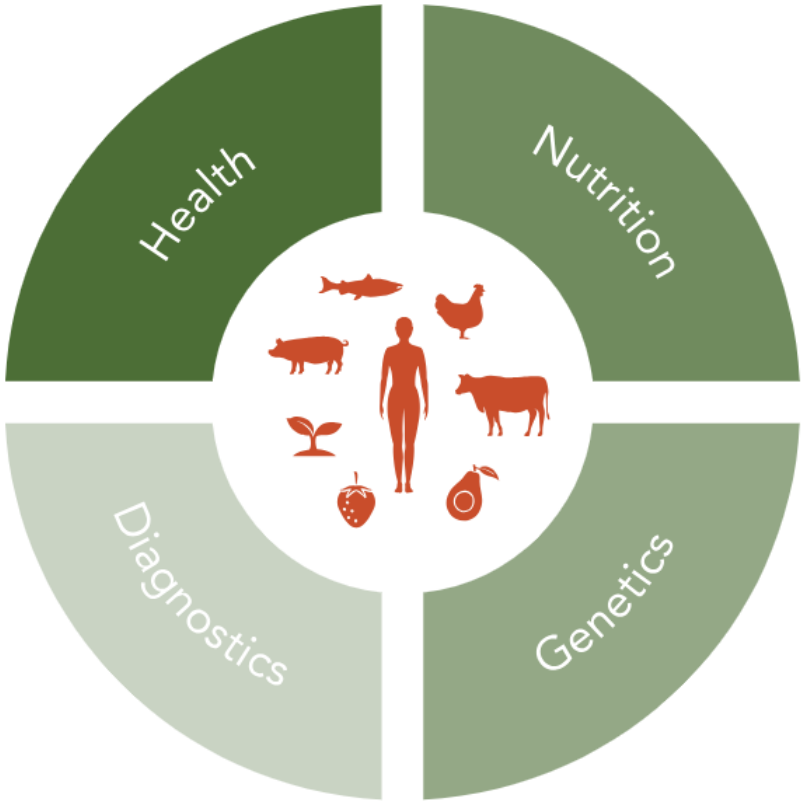
EW Group. Key facts

> **The independence and entrepreneurial freedom of the subsidiaries are core elements of our success.**
>
> Dirk and Jan Wesjohann

Origin	Founded In	About	More than	Locations in more than	Products in more than	
1928	**1998**	**19.000**	**250**	**45**	**165**	**100%**
		employees	subsidiaries	countries	countries	family-owned

EW Group. Business activities

EW GROUP



Broiler/Turkey Genetics

Aviagen
Hubbard
Aviagen Turkeys

Plant Genetics

Planasa
INNOVATION IN PLANT VARIETIES

Fish Genetics

AquaGen
GenoMar

Layer Genetics

LOHMANN BREEDERS
H&N
Hy-Line
NOVOGEN

Food

Pilzland
AUS GUTEM GRUND
MGG
EIPRO

Nutrition

ew | nutrition

Vaccines and Vaccine Eggs

vaxxinova
VALO BioMedia

Diagnostic

hygiena
BioChek
SMART VETERINARY DIAGNOSTICS

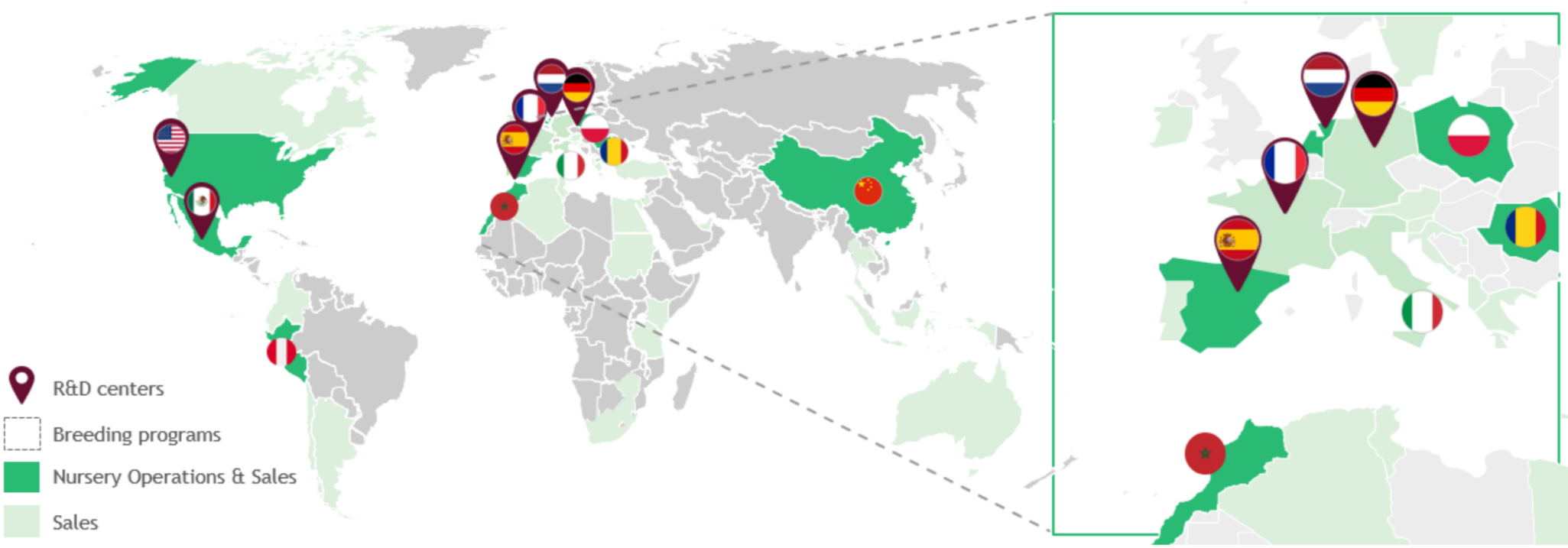
Automation Technology

AAT
EW GROUP COMPANY
Innovatec
Healthy Hatchery Solutions

Planasa
INNOVATION IN PLANT VARIETIES

7

PLANASA HAS GLOBAL PRESENCE PROVIDING A TOP-QUALITY PORTFOLIO OF LOCALLY-TAILORED GENETICS AND HIGH-QUALITY PLANT SUPPLY



KEY DATA

>25 countries presence

>250 registered Berry varieties

>50 club members (some belong to more than one club)

>20k planted has incl. proprietary genetics

>1bn plants produced every year

4

Planasa
INNOVATION IN PLANT VARIETIES

BEST IN CLASS R&D with FOUR N-EU FACILITIES

Netherlands (Hedel)

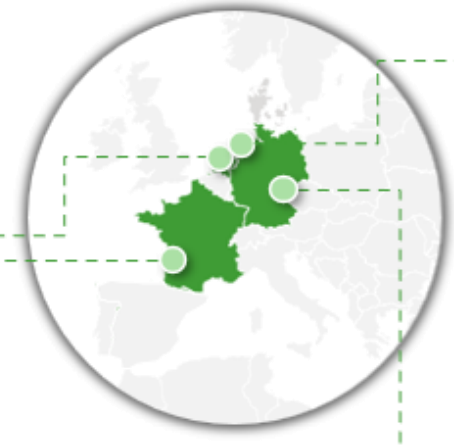
Floricane & Primocane high performance varieties across the globe

2021

Netherlands (Andijk)

Seed technology breeding for ornamental and fresh produce worldwide

2025



France (Le Barp)

Development / trial site for Strawberry and breeding for non-core crops

1975

Germany (Dresden)

High-chill varieties for open air production and continental/northern climate

2008

Strategically-located testing & development sites in all relevant countries close to growers in their climatic conditions

Breeding / Genetics capabilities

- Genomic Selection
- Molecular markers
- Genome-wide association study (GWAS)
- True Seed Hybrid Breeding

x Year adquisition | Breeding centre | Trial site

Planasa FRANCE

hansa bred

Advanced Berry Breeding

ABZ SEEDS GOURMET STRAWBERRIES

R&D PRESENCE ACROSS KEY REGIONS ENHANCE THE POTENTIAL FOR COMMERCIAL SUCCESS OF PLANASA VARIETIES

Planasa INNOVATION IN PLANT VARIETIES

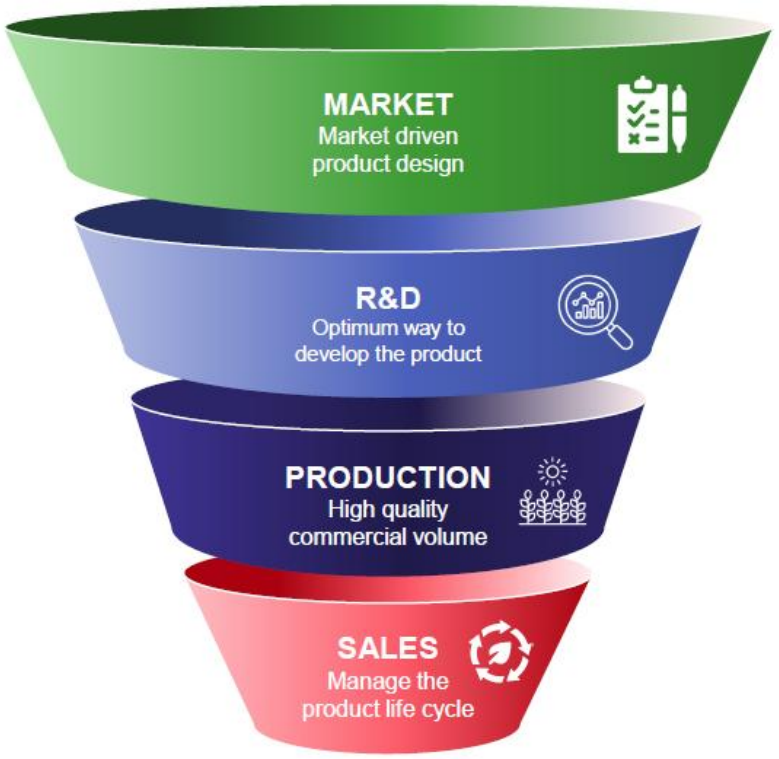
Planasa

INNOVATION IN PLANT VARIETIES

GLOBAL PRODUCT PORTFOLIO PROCESS

DISCIPLINED DEVELOPMENT APPROACH ENSURES CROP VARIETIES ARE ALIGNED WITH GROWER NEEDS AND LOCAL CONSUMER TRENDS

END-MARKET DRIVEN PRODUCT DEVELOPMENT APPROACH



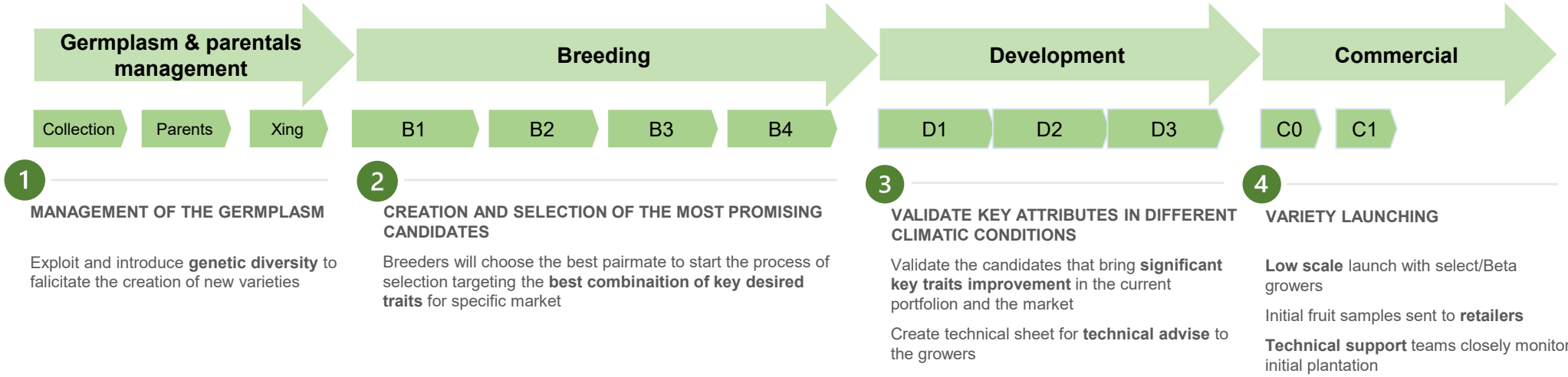
Steps involved

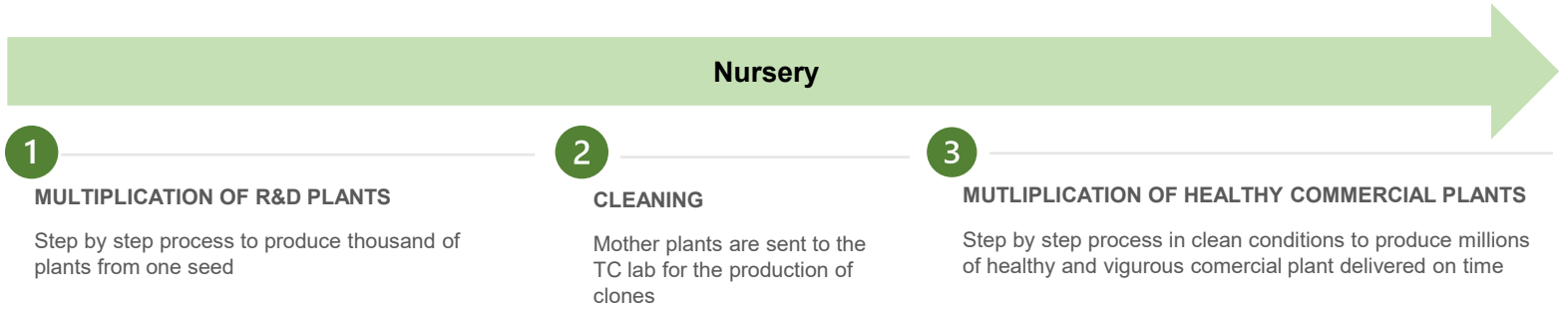
- Define Market segment
- Identify market preferences
- Build product profile
- Crossing
- Evaluation
- Selection & Development
- Increase and purify
- Production research
- Product launch
- Sales growth

Planasa
INNOVATION IN PLANT VARIETIES

WELL STRUCTURED PROCESS FOR VARIETY CREATION AND COMMERCIALISATION

From the Breeding Cross to the Launch Phase 8 to 10 years are needed. In the meantime, anticipation and planning is required to be on time for Launching.

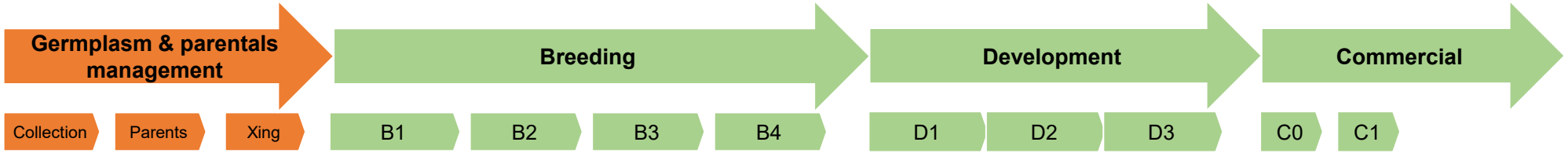




Planasa
INNOVATION IN PLANT VARIETIES

WELL STRUCTURED PROCESS FOR VARIETY CREATION AND COMMERCIALISATION

The selection of the **Breeding Cross** is key for the success of the program. The genotype and the phenotype are used to classify the parent and select the best Pair Mates.



MANAGEMENT OF THE GERMPLASM

Explore and introduce **genetic diversity** to falicitate the creation of new varieties

Genotyping of all the parentals and comercial varieties

Classification of the germplasm in **GENETIC GROUP**

FINGER PRINTING

COMBINING ABILITY

PAIR MATING

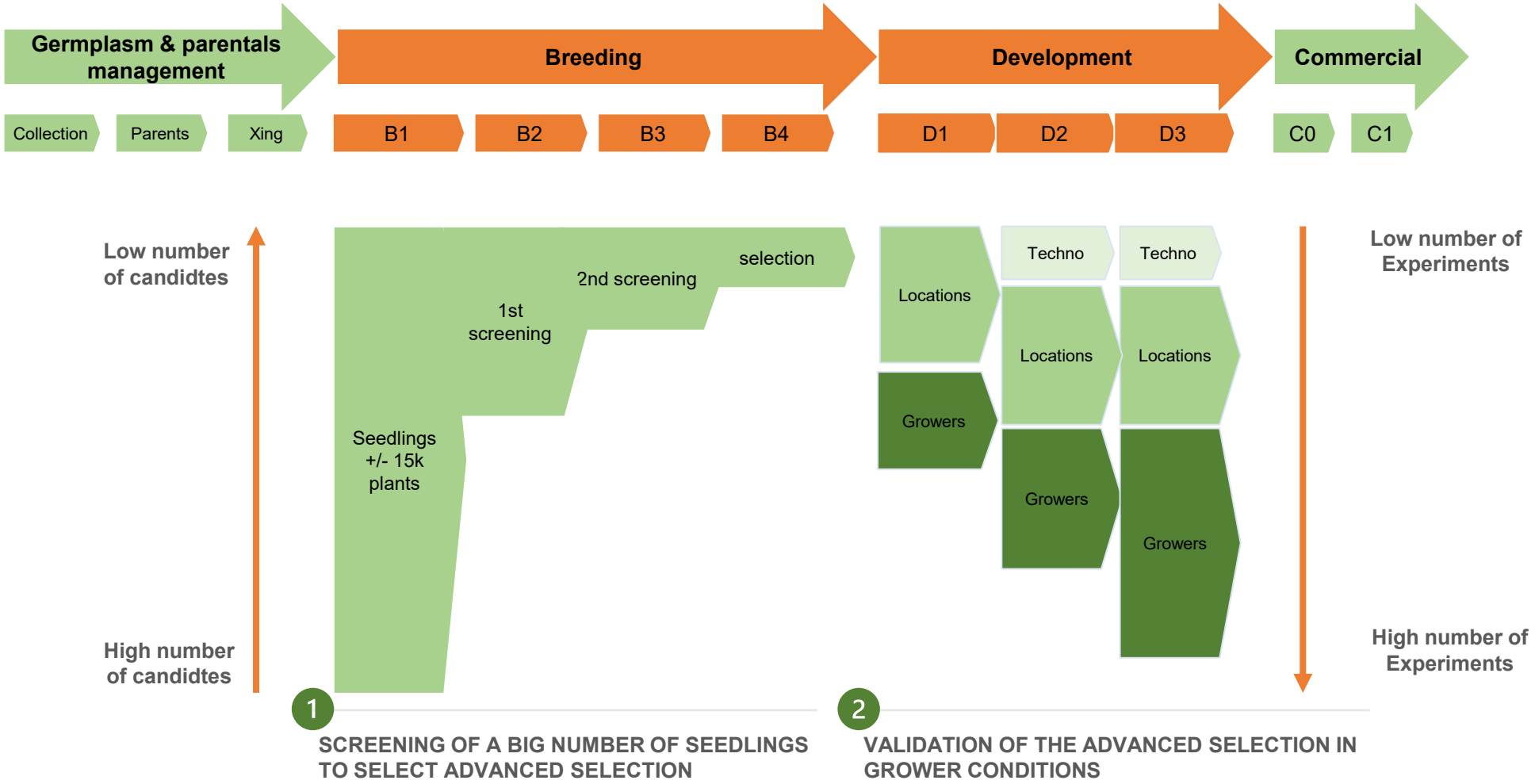
Source: Company information

Note: [1] Variable per crop, but typically each step (B1-B4, D1-D3, C0-C1) takes one season

Planasa
INNOVATION IN PLANT VARIETIES

WELL STRUCTURED PROCESS FOR VARIETY CREATION AND COMMERCIALISATION

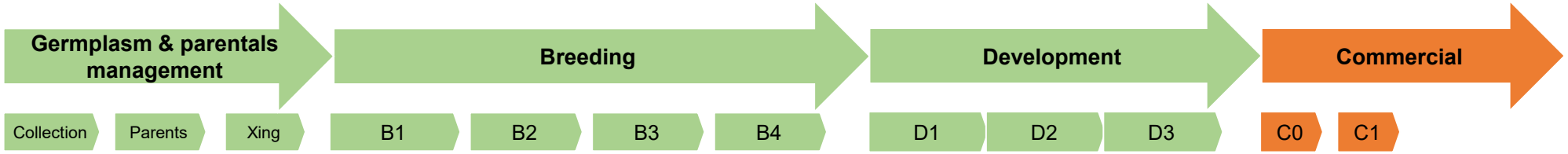
From the Breeding Cross to the Launching Stage two main steps are needed: **Breeding** for screening and selection then **Development** for validation in grower conditions.



Planasa
INNOVATION IN PLANT VARIETIES

WELL STRUCTURED PROCESS FOR VARIETY CREATION AND COMMERCIALISATION

The new varieties are launched after a **cross validation approach** betwen R&D team, grower feedback and marketing and sales inputs.



C0 – PRE-COMMERCIAL

- **Low-scale launch with selected/beta growers**
  - Bigger volume trials (~0.5 ha) than development-phase trials (50-100 plants)
- **Initial fruit samples sent to retailers** for quality feedback and to let them anticipate for higher volumes
  - In turn, retailers might ask growers to grow it in order to have commercial volumes in the future

On the ground technical support teams ensure successful commercial production for growers

C1 – LAUNCHING

- Promote the new varieties through **internal showrooms and marketing events**
- **Technical support teams** closely monitor initial plantations and help growers to **optimize the productivity** of new varieties

Planasa
INNOVATION IN PLANT VARIETIES

Planasa

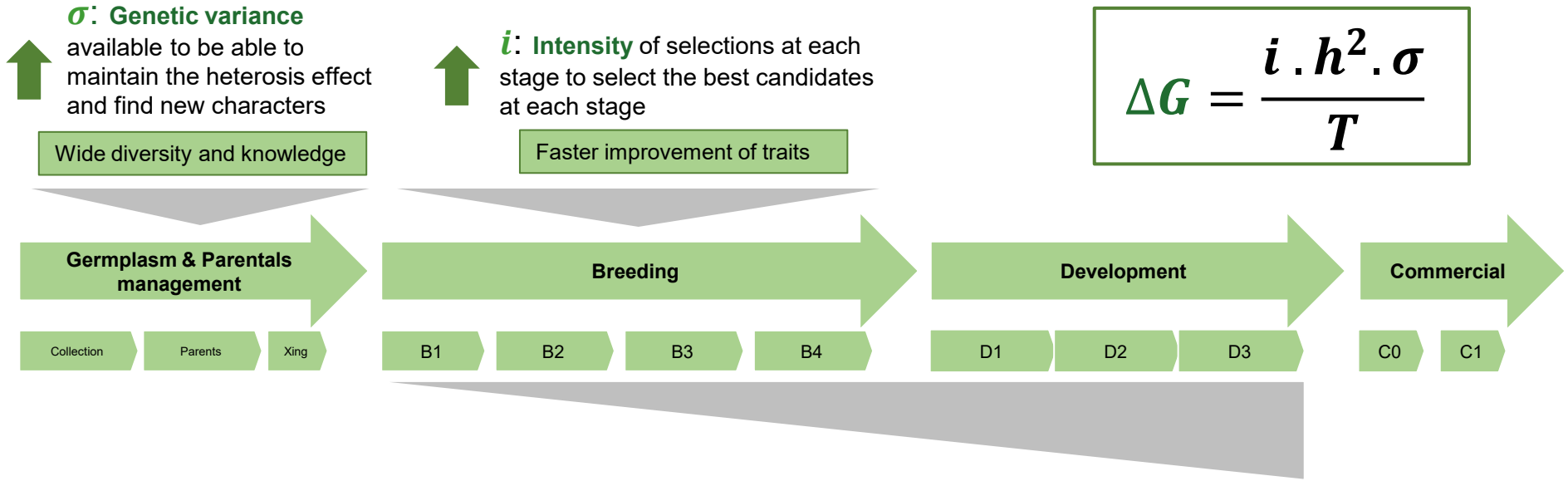
INNOVATION IN PLANT VARIETIES

GENETIC GAIN AS A DRIVER TO CREATE THE BEST VARIETIES

GENETIC GAIN: MAIN DRIVERS AND METRICS

The Genetic Gain increase (ΔG) is the key indicator to evaluate the success of an R&D strategy and is based in 4 different variables: intensity, heritability, genetic variance and time required to reintroduce germplasm.

$$\Delta G = \frac{i \cdot h^2 \cdot \sigma}{T}$$



h^2: **Heritability** is the parameter that certifies that the effect you measure in the evaluation is due to a genetic effect

Multi-location validation and higher market adaptability

T: **Time** required to improve a trait and implement it in elite varieties

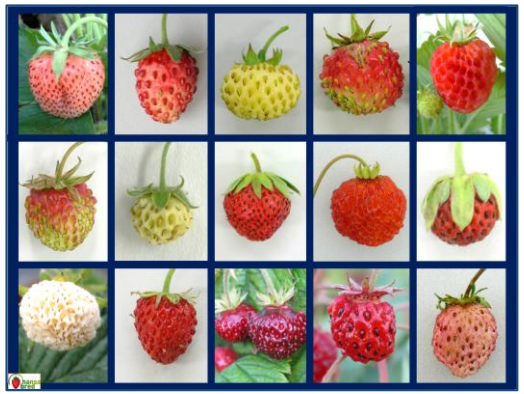
Identify earlier best potential parents in the crossing block

Planasa
INNOVATION IN PLANT VARIETIES

GENETIC GAIN: WIDE DIVERSITY AND KNOWLEDGE

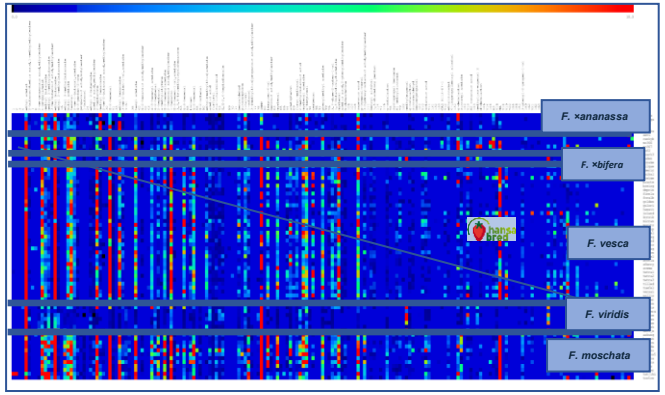
Planasa breeders have access to the widest germplasm collection. This diversity is studied to identify new traits and create new germplasm to use in breeding.

Species collection, „Professor Staudt Collection“ (>900 accessions)

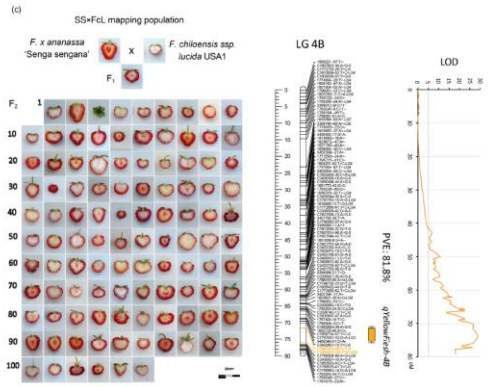


>300 cultivars from 1847 until now

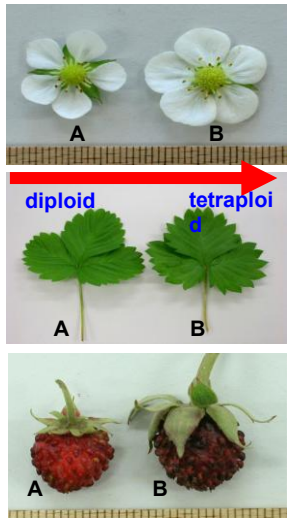
Aroma Patterns



Interspecific hybridisation and inheritance studies.



Mutation breeding: doubling of chromosomes, Fragaria vesca



Planasa
INNOVATION IN PLANT VARIETIES

GENETIC GAIN: WIDE DIVERSITY AND KNOWLEDGE

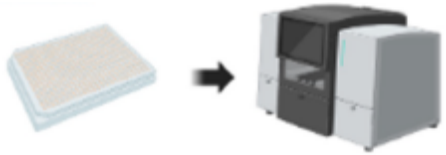
We build a complete genotyping toolbox to tackle all the challenge of the breeding programs

From de novo sequencing to single snp technology, planasa is developping all the tools for their implementation in breeding

Trait discovery	**Marker assisted selection**	**Genomic selection**	**Quality Control**
QTL or GWAS to find Associations for quantitative and qualitative traits in a population	Diversity analysis, cross mate pairs, back cross, quality controls	Selections in early stage with Genomic prediction model	Identification and evaluation of the purity of the commercial plants
HIGH DENSITY GENOMA COVERAGE	LOW DENSITY GENOMA COVERAGE	MID DENSITY GENOMA COVERAGE	SMAL SNP PANEL

DNA Sequencing

Axiom SNP Array



Multiplxage

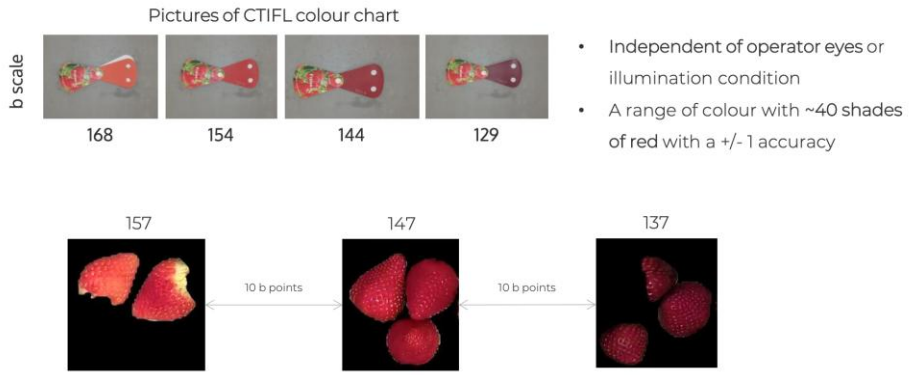
Axiom SNP Array

Single marker

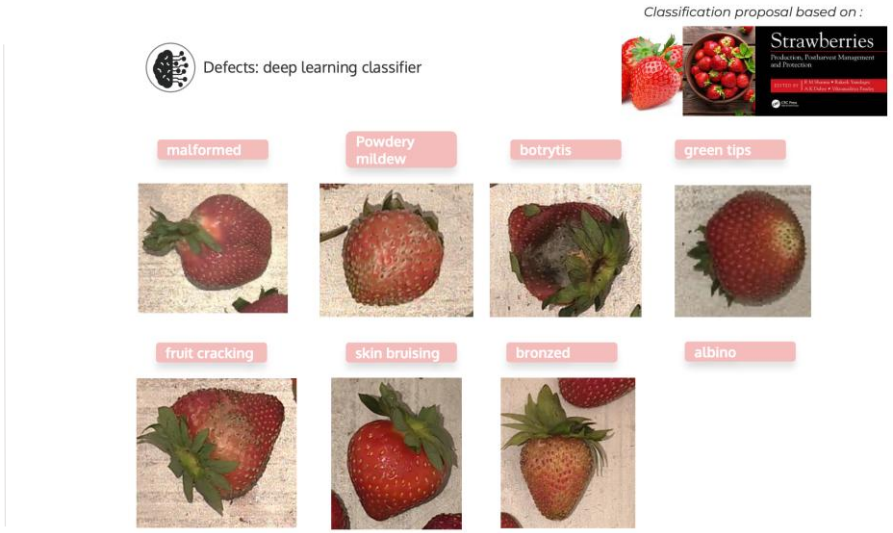
Planasa
INNOVATION IN PLANT VARIETIES

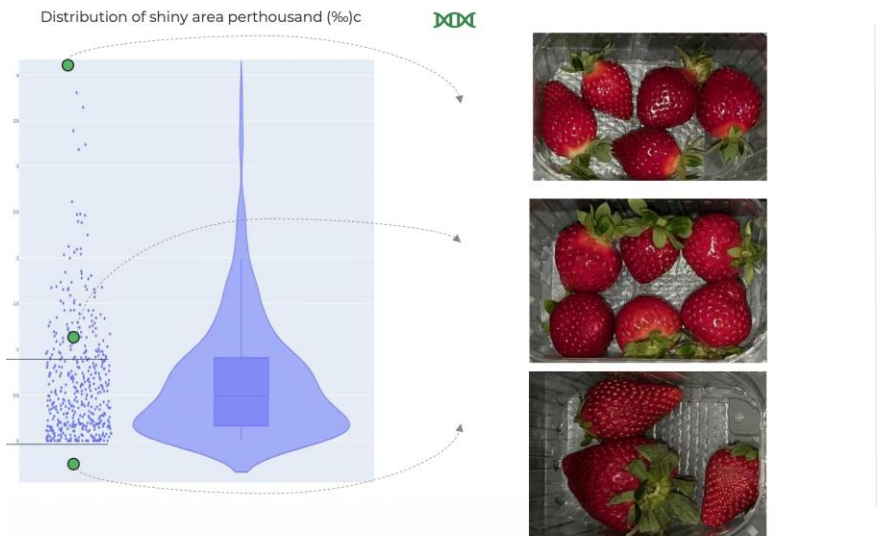
GENETIC GAIN: MORE DIGITAL PEHENOTYPING

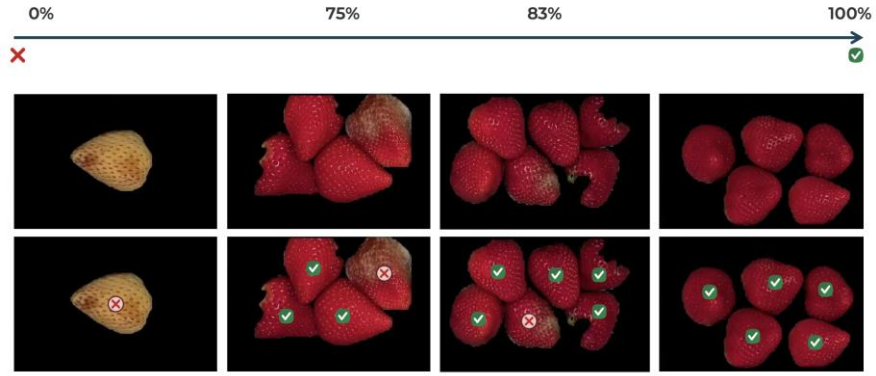
Transform the phenotyping into quantitative data is mendatory to increase the accurary of the selection and the predictions. We use machine learning to get quantitative data.



- Independent of operator eyes or illumination condition
- A range of colour with ~40 shades of red with a +/- 1 accuracy







Planasa
INNOVATION IN PLANT VARIETIES

Conclusion

WELL STRUCTURED PROCESS FOR VARIETY CREATION AND COMMERCIALISATION

From the cross to the commercialisation between 8 to 10 years are needed. In the meantime, anticipation and planning is required to launch the product on time.

Germplasm & parentals management → **Breeding** → **Development** → **Commercial**

Collection | Parents | Xing | B1 | B2 ✖ | B3 ✖ | B4 | D1 | D2 | D3 | C0 | C1

1 MANAGEMENT OF THE GERMPLASM

2 CREATION AND SELECTION OF THE MOST PROMISING CANDIDATES

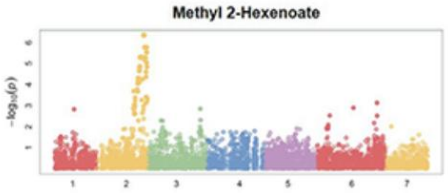
3 VALIDATE KEY ATTRIBUTES IN DIFFERENT CLIMATIC CONDITIONS

4 VARIETY LAUNCHING

Exploit and introduce **genetic diversity** to falicitate the creation of new varieties

DNA Sequencing

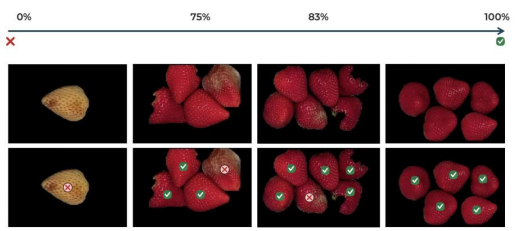
TRAIT DISCOVERY
Find QTL or SNP linked to trait

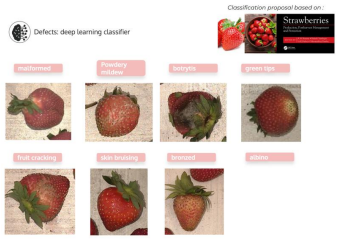


MARKER ASSISTED SELECTION
Diversity analysis, back cross

GENOMIC SELECTION
Selections in early stage with Genomic prediction model

DIGITAL PHENOTYPING
Transform image and subjective qualification into quantitative data





GROWER & RETAILERS
Define a specific Trial network for market and grower validation

Planasa
INNOVATION IN PLANT VARIETIES

VARIETAL AVAILABILITY FOR NORTHERN EUROPE

We look forward to seeing you at our stand

Raspberry

Kwanza®

Malaika®

Zawadi®

Pink Rosita®

Pink Rosalita®

Strawberry

Red Makalu®

Dream®

Red Himalaya®

Plared 15107®

Soraya®

Delizzimo®

Estevana®

Rowena®

Blackberry

Sweet Royalla®

Garden

Delizz®/Queeny®/Lizzy®

Summer Breeze®

Montana®/Gasana®/Toscana®

Elan®/Beltran®/Frisan®/

Roman®/Ruby Ann®

Loran®/Merlan®/Tristan®

Planasa

INNOVATION IN PLANT VARIETIES

Thank you!

planasa.com

FOLLOW US

Planasa