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TECHNOLOGIES

MINERAL NUTRITION WITH A FOCUS ON ROOTSTOCKS AND OPTIMIZING CA UPTAKE AND TRANSLOCATION IN A DIVERSE PRODUCTION ENVIRONMENT

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HORTGRO SYMPOSIUM
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INTRODUCTION

WESTERN CAPE - DIVERSE PRODUCTION ENVIRONMENT:

CALCIUM

- Acidic Soil Type
- Micro Climate / Varying Topography
- Water Quality & Management
- Replant Disease / Root Health
- **Rootstock**
- Cultivar
- Spacing

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INTRODUCTION

THE BIG PICTURE - WHAT CHANGED?

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INTRODUCTION - BIG PICTURE

TRANSITION TO HIGH DENSITY PLANTINGS

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CG'S ROOTSTOCKS

- SECOND LEAF
- ROYAL BEAT
- G778
- BARE ROOTED TREE

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Ca↑

K↓

LARGER FRUIT SIZE

POTASSIUM & CALCIUM

INTRODUCTION
OPEN FIELD OR NETS

Open field – Less vigor

Nets – more vigor

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ACIDIFICATION

CALCIUM

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THE BIG PICTURE - WHAT CHANGED?

CHANGE	PROFILE AFFECTED	ELEMENT AFFECTED
Transition to high density plantings - Dwarfing & vigorous rootstocks	Vigour & Bearing Potential Improved	Nitrogen & Potassium [Mg & P]
Introduction of CG's rootstocks	Larger Fruit Size	Potassium & Calcium
Open field or Nets	Vigour	Nitrogen
Old wide plantings – broadcast lime & fertilizer	Soil – larger soil volume – less Ca leaching	Calcium
Narrow ridged plantings, strip application, short range micro or drip	Soil – smaller soil volume – more Ca leaching	Calcium

ROOTSTOCKS

INFLUENCE ON MINERAL NUTRITION

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ROOTSTOCKS

IS THERE A DIFFERENCE BETWEEN ROOTSTOCKS IN TERMS OF NUTRIENT UPTAKE?

- YES

CAN ONE DIFFERENTIATE ON INDIVIDUAL ROOTSTOCK LEVEL IN FIELD CONDITIONS ?

- NOT NECESSARILY

ROOTSTOCK INFLUENCE ON MINERAL NUTRITION MANIFESTS THROUGH:

- VIGOUR
- CROP LOAD
- FRUIT SIZE
- SENSITIVITY TO REPLANT DISEASE

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ROOTSTOCKS

There nutrition phases in an orchard's lifespan:

PHASE 1: Young tree without fruit.

PHASE 2: Growing canopy with increasing crop load.
- Period shortened by:
  - · High density plantings
  - · Vigorous rootstocks

PHASE 3: Filled canopy & stabilized crop load.

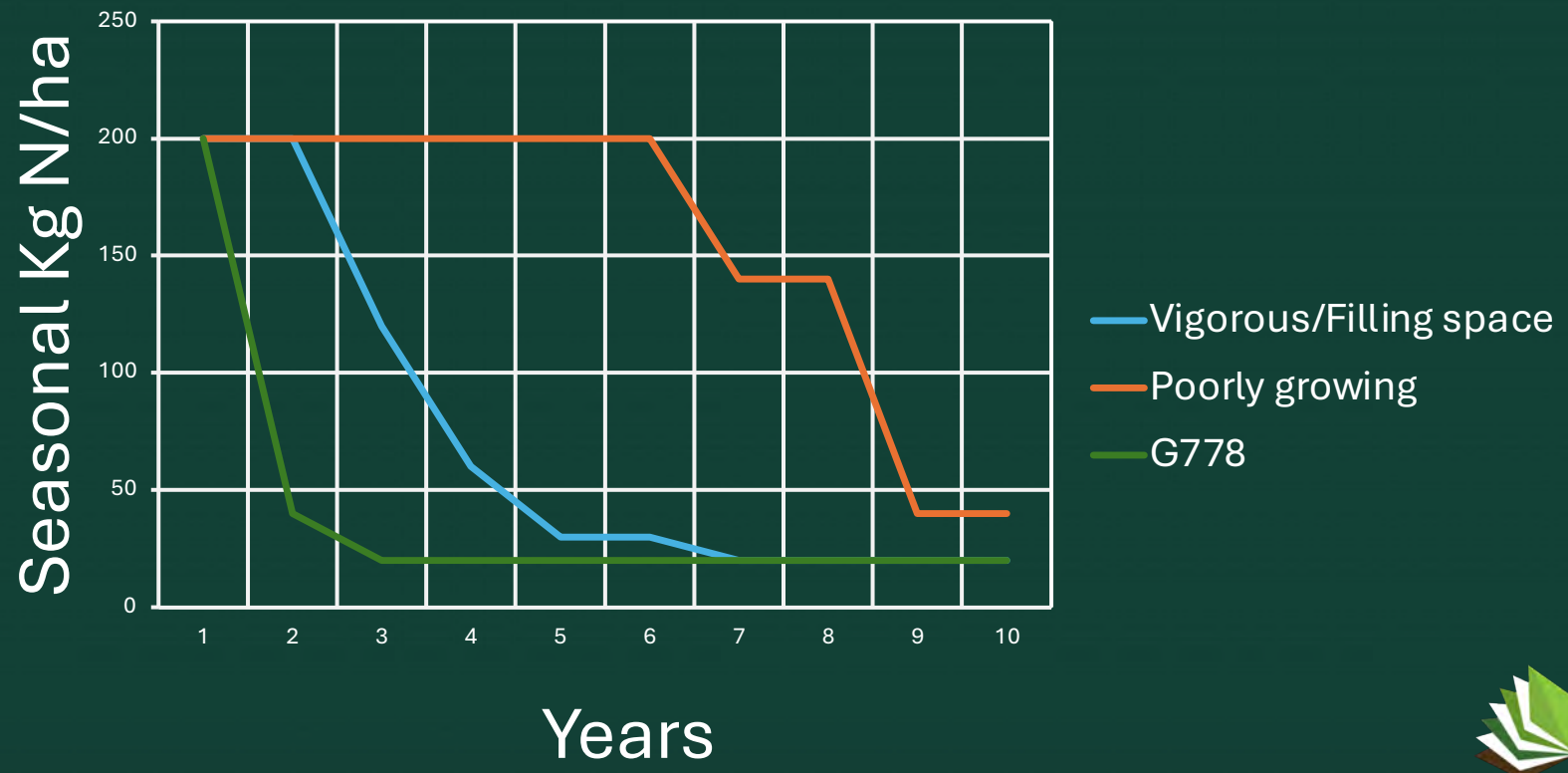
ROOTSTOCKS – INFLUENCE ON GROWTH / FILLING CANOPY

NITROGEN

2

1

Nitrogen fertilization in vigorous/high density or poor growing orchards - Gala types



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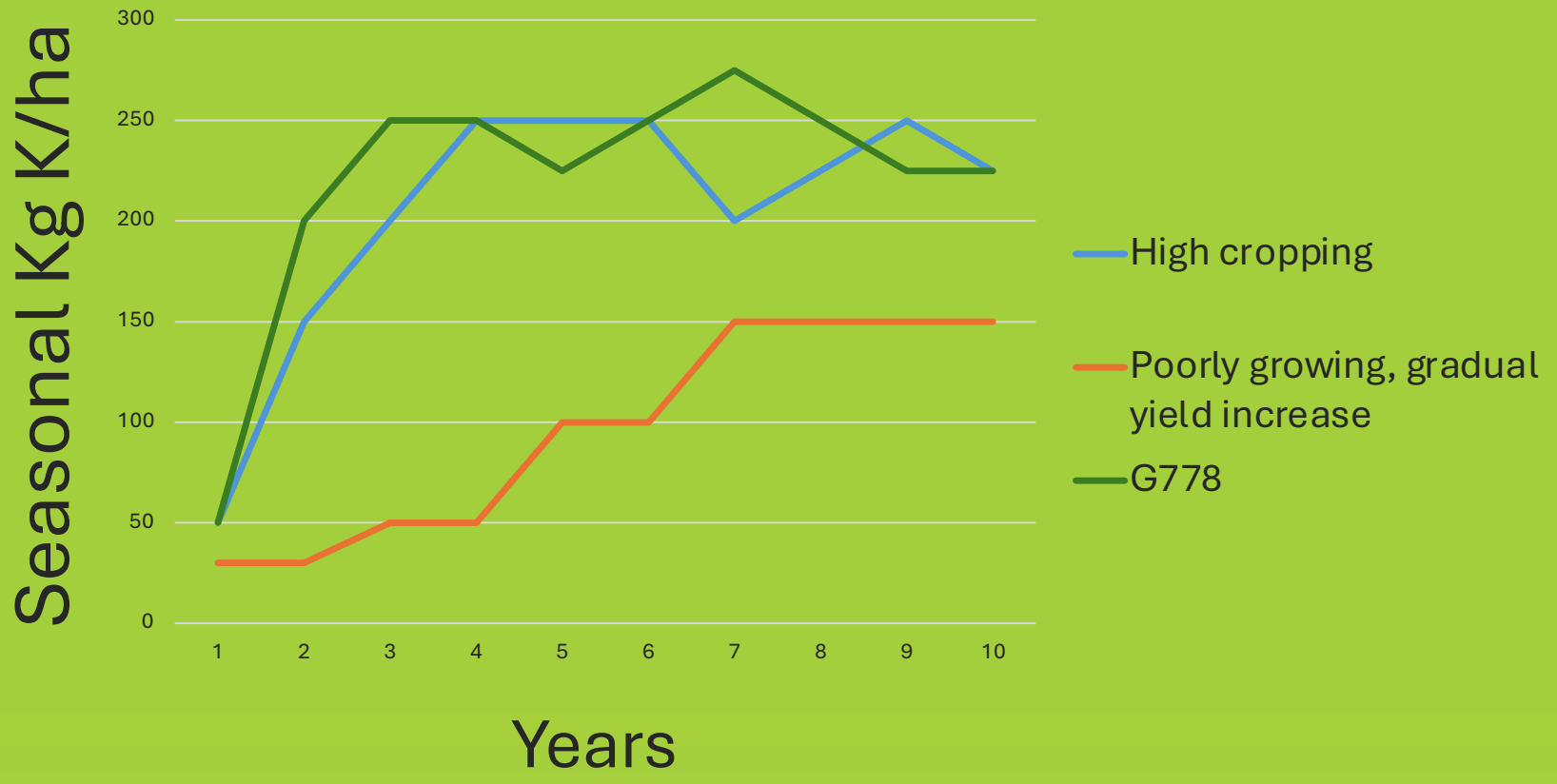
ROOTSTOCKS – INFLUENCE ON BEARING POTENTIAL

POTASSIUM

2

1

Potassium fertilization in low and high cropping orchards - Gala types



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ROOTSTOCK COMPARISON

POTASSIUM

Gala	Planted	Spacing	Cumulative ton/ha (2018-2023)	Ton/ha/season	Average Leaf K% (2018-2023)	Total kg K/ha (2018-2023)	Kg K/ton
M9	2011	3.5 x 1.2	578	96	1.40	1388	2.4
MM109	2012	4 x 1.75	437	73	1.59	1112	2.5
G778	2012	4 x 1.75	604	101	1.48	1127	1.9

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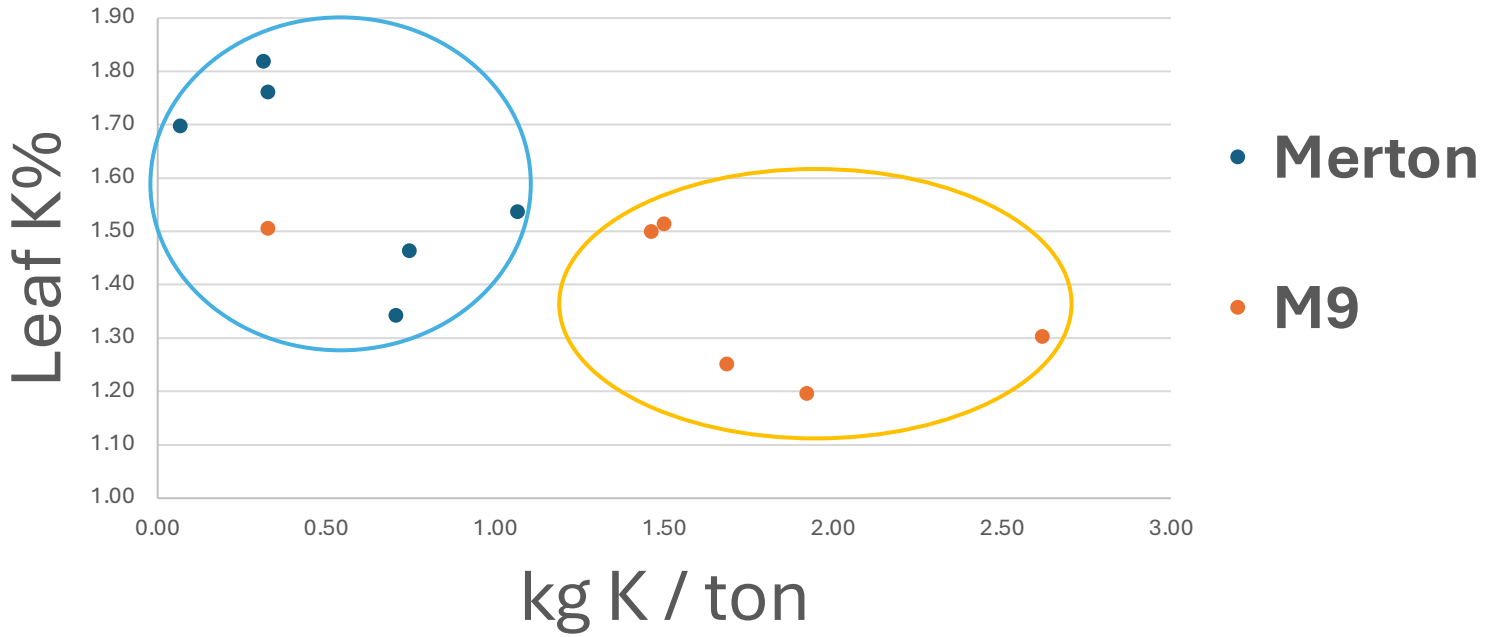
ROOTSTOCK COMPARISON

POTASSIUM

Difference between M9 and vigorous Merton's in kg K/ton fertilized vs Leaf K%



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CALCIUM (Ca) MANAGEMENT

MANAGE ENVIRONMENT AROUND ROOTSTOCK – SOIL & SCION

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Ca OPTIMIZATION

A combination of factors leading to calcium related defects:

- INCREASED VIGOUR
- LOW LIGHT DISTRIBUTION
- LOW CROP
- HIGHER K LEVELS
- LOW SOIL pH

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CALCIUM RELATED DEFECTS

Ca OPTIMIZATION

Reduce risk of defects:
Managing the N, Ca, and K levels.

MANAGE SUPPLY/AVAILABILITY OF CALCIUM (Ca):

- Liming (acidic soils)

CROP LOAD AND VIGOUR:

- Direct Ca flow; reduce competition

CROP LOAD:

- Potassium (K) Fertilization adjustment

KEY:

- Measuring Block/Cultivar Response

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Ca OPTIMIZATION

ACIDIC SOILS

HOW TO PRACTICALLY MANAGE Ca IN A DIVERSE PRODUCTION ENVIRONMENT?

1. LIME APPLICATION:

- Apply more lime.
- Aim for pH (KCl) 6.0 - 6.5
- Lime application per year is more critical than spatial pH variation within the block.

2. SAMPLING AND SUBSOIL ACIDITY:

- Reduce time between sample intervals (at least every two years).
- Sample deeper (40-50cm) to account for subsoil acidity effects.
- Pay attention to bitterpit occurrences and sample annually in those cases.

3. LABORATORY CONSIDERATIONS:

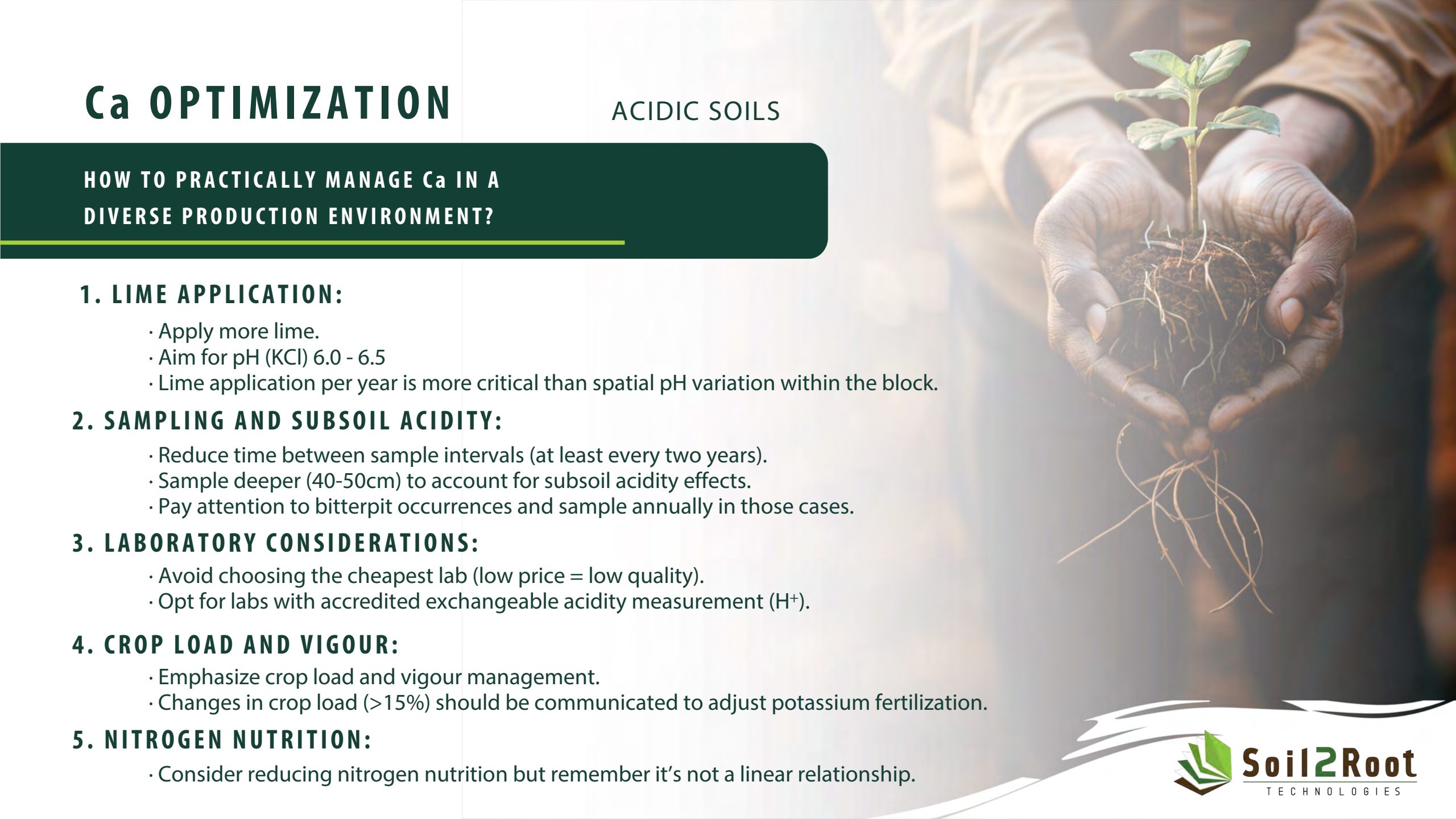
- Avoid choosing the cheapest lab (low price = low quality).
- Opt for labs with accredited exchangeable acidity measurement (H^+).

4. CROP LOAD AND VIGOUR:

- Emphasize crop load and vigour management.
- Changes in crop load (>15%) should be communicated to adjust potassium fertilization.

5. NITROGEN NUTRITION:

- Consider reducing nitrogen nutrition but remember it’s not a linear relationship.



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CONCLUSION

ROOTSTOCK SELECTION:

- Primary Consideration: yield, growth, and fruit quality characteristics.
- Choose rootstocks best suited to site, farm, and management.
- Rootstocks with varying yield and strong vigour worsen fruit defects.

DWARFING ROOTSTOCKS (M9 & G202):

- Require higher nitrogen (N) and potassium (K) fertilization.

HIGH DENSITY/YIELDING ORCHARDS:

- Need higher & earlier phosphorus (P), potassium (K), and magnesium (Mg) fertilization.

Ca OPTIMIZATION:

- Maintain soil pH - liming
- Manage nitrogen (N) - vigour
- Manage potassium (K) - crop load

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