



## **DUBE AGRILAB: TEMPORARY IMMERSION SYSTEM**

Evaluation of a new Temporary Immersion System Bioreactor  
(Plantform™ Bioreactor) for *In Vitro* Plant Production  
in a Commercial Tissue Culture Facility

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# 16

HECTARES GLASS HOUSE GROWING AREA

40 TONNES  
OF FRESH  
PRODUCE  
GROWN  
WEEKLY

90 PHASE 2  
HECTARES  
AVAILABLE  
FOR INVESTORS & TENANTS

702kWp ENERGY GENERATING CAPACITY  
BY SOLAR PANELS  
80% OF AGRIZONE  
GREENHOUSE  
WATER DEMAND IS  
RAIN-WATER HARVESTED

4 DEDICATED  
PACKHOUSES

DISTRIBUTION  
AND VALUE-ADDED CENTRE  
OPERATED BY  
FARMWISE



# BRINGING THE SCIENCE OF FARMING TO YOU

# YOUR PROPAGATION DIVISION OF YOUR FARM

<b>TISSUE CULTURE</b> 	<b>OUR INVESTMENTS IN TECHNOLOGIES AND EQUIPMENT</b>   <b>ENHANCE PRODUCTION</b> REDUCE ENVIRONMENTAL IMPACT
<b>PLANT TISSUE CULTURE OR MICRO-PROPAGATION FACILITY</b>  <b>CAPACITY TO PRODUCE AND SUPPLY</b> ♦♦ IN EXCESS OF ♦♦ 5 MILLION PER ANNUM	<b>LOGISTICS</b> 
<b>ADVANCED TECHNOLOGY</b> 	<b>WITHIN DUBE AGRIZONE AND ADJACENT TO KING SHAKA INTERNATIONAL AIRPORT</b>   <b>IDEALLY POSITIONED TO SUPPLY AND EXPORT TO INDUSTRIES WORLD-WIDE</b> 

## Dube AgriLab

- Aim: To service the horticultural and agricultural industries' plant propagation needs, locally and internationally
- Ideal location on the doorstep of King Shaka International Airport
- Contract plant propagation
- Respect plant breeder's rights and confidentiality

**01** INCUBATION >



**02** INITIATION >



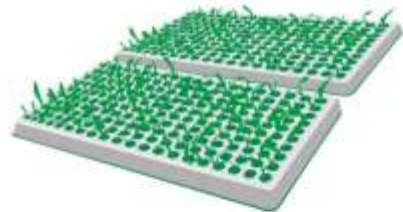
**03** MULTIPLICATION >



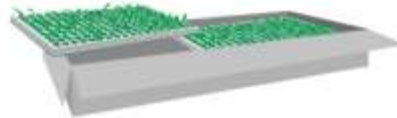
**04** ROOTING >



**05** HARDENING >



**06** PACKING >



**07** TRANSPORTING >



**08** FARMING



## Plant Tissue Culture: Uses & Benefits

- High volume, high multiplication rate
  - Cost of scale
- Disease free
  - Eliminate viruses and other disease through meristem tip culture
  - Isolated environment, sterile technique excludes recontamination
- Cleaning of mother stock
- Elite clonal material (vegetative propagation)
  - True-to-type, select cultivars
- Propagation of scarce plants
- Recalcitrant (“difficult”) plants
  - Increase propagation rate
  - Overcome common problems such as rooting or low germination rates

## Our Goal

- To multiply plants at a good rate to keep up with clients' needs without compromising plant quality.

## Our Problem

- Currently conventional plant tissue culture practices are in place which are limited.



## Conventional *in vitro* multiplication

- Gel growth medium
- Gas exchange not regulated
- Restricted number of plants/culture vessel – labour intensive
- Substantial storage requirements
- Hyperhydricity (also known as ‘vitrification’) may be an issue



## *In vitro* multiplication via the Plantform™ bioreactor system

- Liquid nutrient medium
- Gas exchange can be regulated
- Hyperhydricity is avoided
- Improved plant quality
- Increased multiplication rates
- Larger amount of plants per unit – less labour costs
- Reduced storage requirements

# Plantform™ Bioreactor





## **CONNECTED BIOREACTORS**

Dube AgriLab

## Preliminary Trials

- **Test samples:** several *Saccharum* (sugarcane) species, hybrids N50, N52, 02K0663, 99B0325, N51, N53, N57, N48, N41, and N12.
- **Aim of study:** To evaluate the benefits of using the Plantform™ bioreactor system with the possibility of it replacing current conventional micropropagation techniques.
- **Controls:** Concurrent trials were carried out in conventional vessels.

## Materials and Method

- 500ml medium per bioreactor is pumped upward (2 immersion frequencies tested)
  - every 3 hours for a 10-minute period, 5 minutes to drain out, total immersion time is approximately **15 minutes every 3 hours**.

**OR**

- **15 minutes every 6 hours**
- This was compared to regular culture vessels (i.e. polypropylene containers) filled with 120ml of medium. Plant to vessel ratio maintained.

## Results

- Plants in regular culture vessels produced more phenolics, were smaller in size and multiplied at slower rates than those in the Plantform™ bioreactors.
- The temporary immersion system offered greater yield with minimal handling of plant material.
- Superior plant quality than the conventional production system.
- Preferred immersion frequency: 10 minutes every 3 hours.

02K0663

Plantform™ Bioreactor



Conventional Culture Vessel





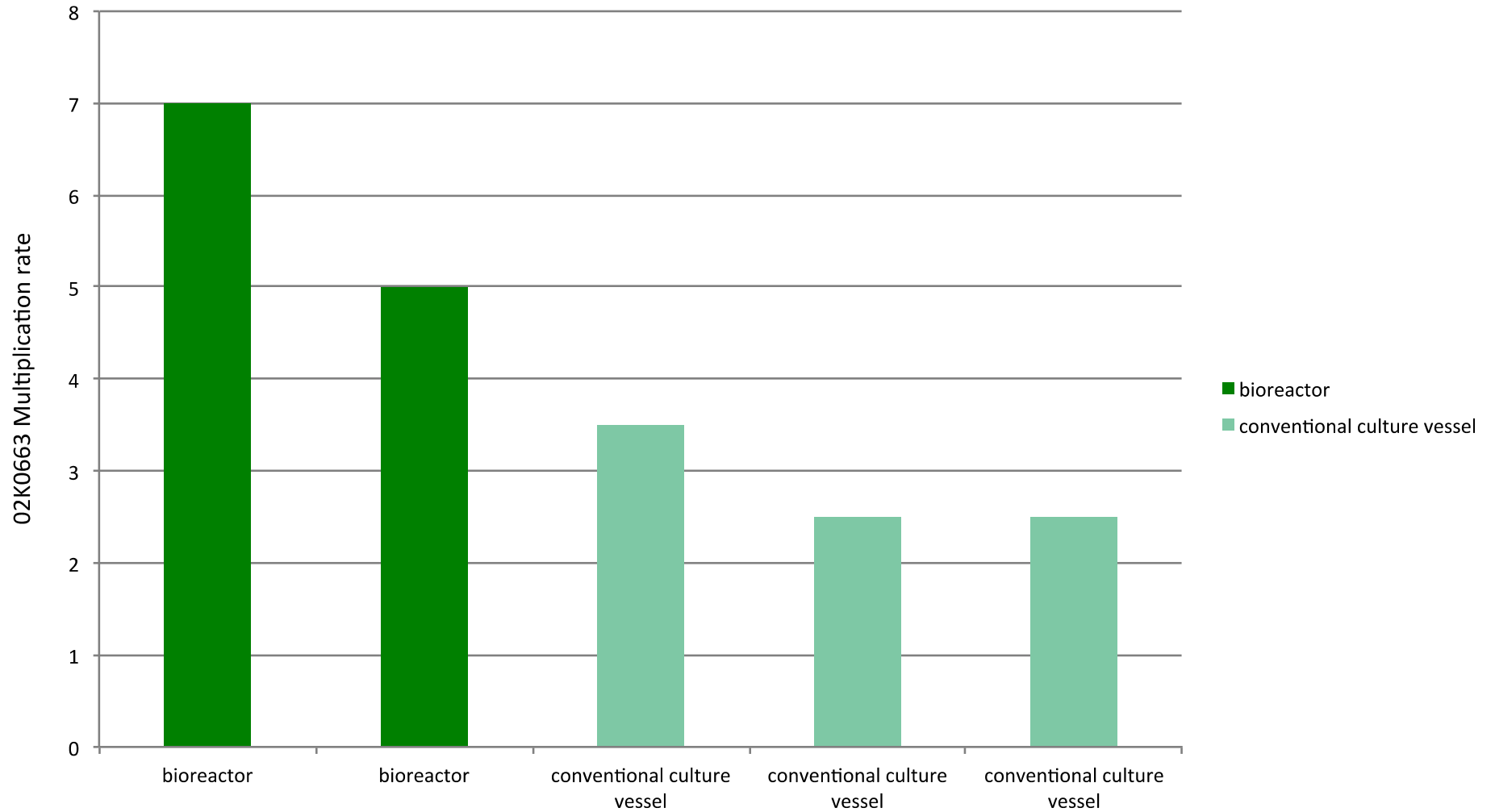
99B0325

Plantform™ Bioreactor

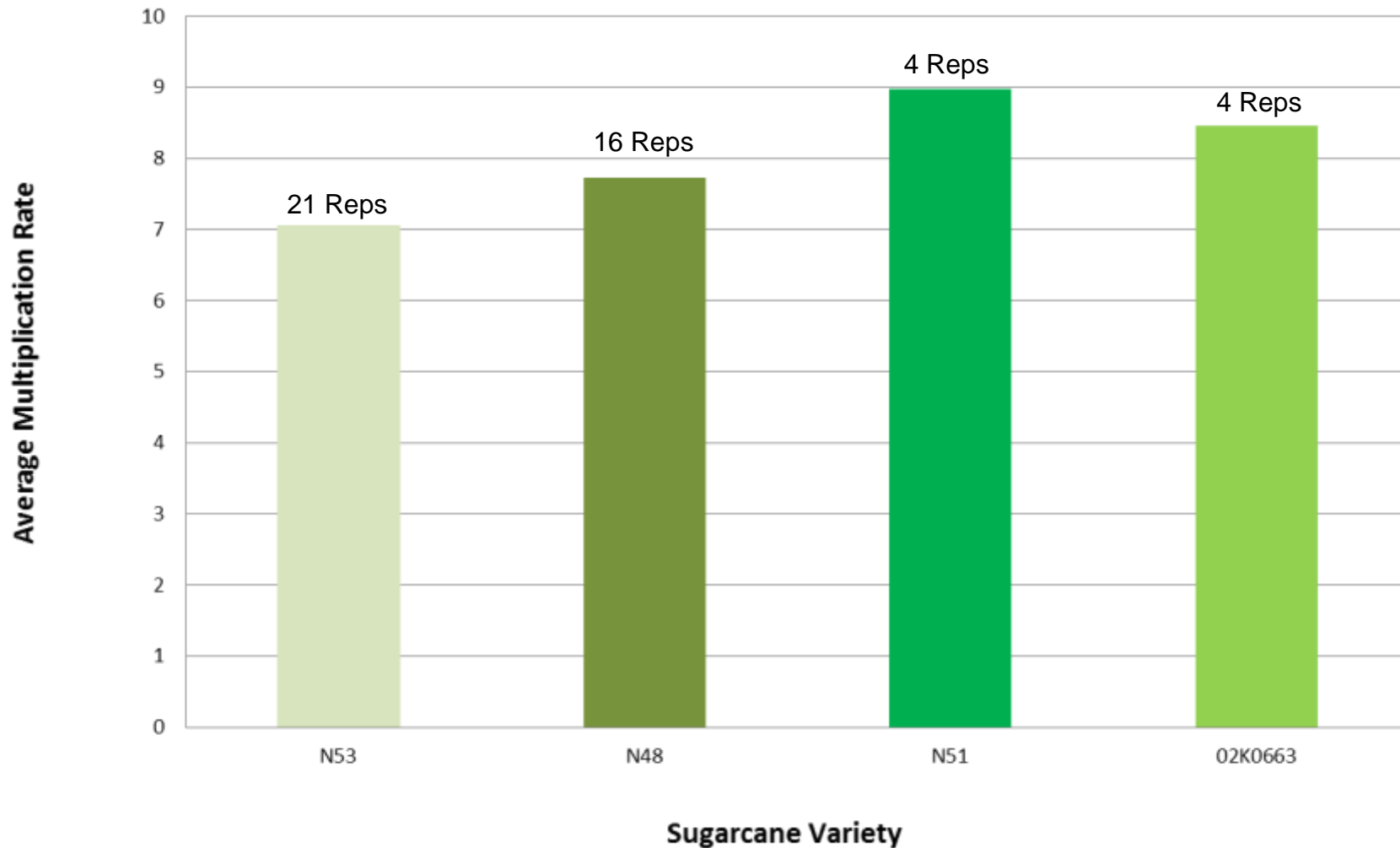
Conventional Culture Vessel



# Multiplication Rates



# Bioreactor Multiplication Rates



## Conclusion

- The Plantform™ bioreactor system shows promise to significantly improve current productivity.
- The AgriLab has invested in a further 1500 units.

## Future Trials

- Future trials will aim to optimise immersion frequencies for each of the plant types in stock.
- Trials will be carried out to ascertain rooting success in this system.
- Hardening-off investigations will be carried out to see if there are any differences in acclimatisation of conventionally produced plants and those attained from the Plantform™ bioreactor system.

THANK YOU