dube agriLAB
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SOUTHERN AFRICA'S PREMIER AIR LOGISTICS PLATFORM

What a year 2016 was!
Here, on the North Coast of KwaZulu-Natal, we are very relieved by some good rains recently; our dams are looking great for the time being, long may it last.

In this newsletter we share some of our progress over the past year, and other ideas that are of interest in the agricultural community. We discuss the importance of cultivar selection, measures for water saving in intensive agriculture and some new product developments at Dube AgriLab, as well as an update on some ongoing projects.

We wish all our clients and stakeholders a prosperous and productive 2017!


Marieke Mendes
Senior Manager: AgriLab

PLANT TISSUE CULTURE – A TOOL TO MEET THE CHALLENGES OF SUSTAINABLE CROP PRODUCTION


"In vitro production of genetically improved crops allows for mass production at a faster rate," Melissa Timothy

As the world's population increases and the changing global climate puts more pressure on sustainable crop production, farmers need to start embracing tools such a plant tissue culture in order to ensure food security. By the year 2045, the world's population is expected to reach 9 billion, which means the world will need an additional 730 million tonnes of fruit and vegetables to feed itself, translating to an overall 70 percent increase in food production.

This is compounded by the current challenges that face the agricultural sector, which include access to suitably productive land, high labour costs and restricted water supply. With water supply being the immediate challenge faced by crop farmers, at present 70 percent of the world's water use is for agricultural purposes. As such, two things need to happen on a massive scale in order to meet global food demand and improve crop production; the first is the implementation of water management initiatives, such as rain water harvesting, storage, and recycling; the second is the introduction of improved crop varieties, such as the production of drought- and saline-tolerant crops. The focus needs to be on biotechnological research and production of crops that can thrive in less than ideal environments, which are likely to result from climate change in years to come, where we could see warmer summers and colder winters, which are factors that have huge implications on sustainable crop production.

"In an effort to keep up with the latest international research in the field of micropropagation and to grow our knowledge base in order for us to provide our clients with the best solutions, earlier this year our Plant Tissue Culture Technologist, Melissa

Timothy, attended the International ISHS Symposium on Production and Establishment of Micropropagated Plants, Italy, and the International Symposium on In Vitro Culture and Horticultural Breeding, Egypt," says Marieke Mendes, Senior Manager, Dube AgriLab.

Both of these forums attract a large participation of researchers and experts from around the world, with the aim being the transfer of knowledge and ultimately to facilitate innovations for both scientific and commercial application.

Plant breeders are challenged to produce more resilient crops, carrying genes which afford tolerance to harsh climatic conditions in order to sustain food production worldwide. Production of transgenic crops, which have the ability to grow in regions previously deemed unsuitable, will allow for increased crop production. The potential of genetically modified organisms (GMOs) is highlighted as the effects of global warming become more apparent with drought, warmer summer and colder winter temperatures, increased frost, etc. For example, in South Africa's current water crisis, drought-tolerant crops would thrive with less irrigation, thus permitting crop production despite decreased rainfall. Farming of GMOs allows for an increase of 'arable' land in spite the effects of climate change.

As Melissa Timothy points out, "Consumer expectations for high quality and affordable horticultural products continue to be the key driving factors of the agricultural sector. There needs to be greater public awareness to educate consumers on the benefits of GMOs and their potential to alleviate food shortages in years to come, as the effects of global warming become more real. In vitro production of genetically improved crops allows for mass production at a faster rate than permitted via conventional propagation techniques and, if sustainably carried out, may be one of the solutions to future threats posed by global warming on sustainable crop production."

WATER SAVING

With sustainability at the core of our operations, Dube AgriLab's Lindani Nzimande unpacks some of the water saving processes being undertaken within the facility and the Dube AgriZone precinct:

Rainwater Harvesting:
The main source of irrigation water used within Dube AgriZone is harvested rainwater. As a result of this, we don't have to use municipal water, which is a huge cost saving for farmers operating within the precinct.

Rain is caught in gutters on the roof and directed into storage dams (totalling 43 700m^3, 300m^3 of which is at Dube AgriLab), after which it is filtered prior to use. Unlike borehole water in a coastal region such as ours, this harvested rainwater is low in salts (EC) and therefore won't affect our nutrient rations.

The water is continually tested on-site by our Water Quality Technician and measured against our parameters to ensure suitability for hydroponic use.

Water testing includes the sampling and analysis of irrigation and drain water by both an external SANAS accredited laboratory as well as our on-site laboratory. Tests are conducted at least once a month, and up to 50 parameters are checked each time. Through analysis of these test results we are able to pick up toxicities and deficiencies in the water, and address these accordingly.


Rainwater storage and management

Water Recycling:
Irrigation water in the Dube AgriLab hardening greenhouse is recycled using an automated control system. It responds to programmed irrigation requirements customised per crop each season.

How it works is that after the plants soak up water in the ebb-and-flow system, excess water drains down to submerged storage tanks. This drain water cannot be re-used directly as irrigation water as it may contain bacteria, fungi, nematodes and viruses that can harm the crop.

It therefore goes through ultraviolet (UV) disinfection (we use a world-class Priva Vialux unit). Drain water is automatically pumped from the storage tank and flows through a radiation chamber, where high speed brings the water flow into complete turbulence so that all particles receive equal treatment. From there, the treated water is delivered to a disinfected water tank, ready for the preparation of new irrigation water.

Benefits of this system include:

- Use of UV means that no chemicals are required in the disinfection process;
- No water is unaccounted for;
- The return water still contains nutrients which can be re-used; and
- Harvested rainwater is required only for fogging (misting), evapotranspiration and water lost during a filter back wash.

These water saving techniques allow us to run an efficient operation and take us closer to our goal of environmental sustainablity.

"Using the UV filter means that no chemicals are required in the water disinfection process," Lindani Nzimande

PRODUCT DEVELOPMENT

Research and development into new product lines is an on-going part of Dube AgriLab's operations, the aim of which is to supply the highest quality, disease-free crops to meet our clients' needs.

The following products are currently being developed within Dube AgriLab:

NovaCane® (sugarcane):
Dube AgriLab's main research and development focus still lies with sugarcane. We delivered a controlled amount of plants throughout the 2016 year and, from the feedback we received from clients, we saw increasingly better yields of first generation seedcane from tissue cultured material. This, in conjunction with faster release of new varieties, indicates the great potential for NovaCane®. During 2017 we will be implementing further field trials to determine average yields and will aim to release these results in early 2018. Our focus is on consistency in rooting during our tissue culture period and successful take of young plants in the field.

Planting of Novacane® plantlets

Forestry:
With an increased demand for renewable energy and building material, bamboo has become an increasingly interesting prospect. Dube AgriLab is

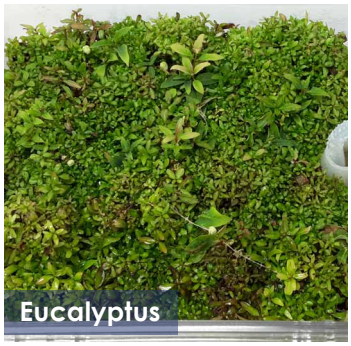
currently developing product lines and a selection of elite varieties of asper (*Dendrocalamus asper*), balcooa (*Bambusa balcooa*) as well as japonica (*Pseudosas japonica*). Uses for these crops include furniture, floors, counter tops, biomass to energy production, fencing, paper, windbreaks, charcoal production, and many more. The advantage of this crop is that it has low input requirements and a very quick turnaround compared to other forestry crops.

In addition to this, we are also working on select *Eucalyptus* and *Corymbia* varieties that will be evaluated in the field.

Ornamental plants:
We have been working on *Curcuma* and are currently releasing these to the market, both as plugs (seedlings) and as finished pot plants. Part of the ginger family, these plants are very popular in the retail market due to their beautiful, unique flowers, hence their demand is increasing. They flower in late summer to autumn, which in South Africa means perfect timing for Valentine's Day and Mother's Day. Other ornamental crops in development include select varieties of *Spathiphyllum* and carnivorous plants.

Subtropical crops:
We are currently working on ginger, pineapple and banana and limited amounts of these are available. The banana varieties currently stocked are Williams and Grand Nain, and the pineapple variety is Smooth Cayenne.


Bamboo


Eucalyptus


Curcuma


Ornamental Pineapple

FULLY OPERATIONAL HARDENING GREENHOUSE

Dube AgriLab is proud to have recently completed phase one of the hardening facility, where plants dispatched from the laboratory are quality checked and transferred to the greenhouse for planting.

The various areas within the new facility prepare the plants for an outdoor environment.

Planting area: Where plants are quality controlled, graded and planted accordingly. The tray and pot medium used for planting is primarily coir (coconut husk), due to the high water retention ability, aeration properties, being pest and disease free, and being a renewable resource that is environmentally sustainable and therefore beneficial over alternatives, such as peat.

Zone 1: This area is for hardening the delicate plants from the laboratory to a greenhouse environment. Climate controls are set to maintain specific humidity and temperature levels by way of fogging, vents and shading. Root heating is also used when required to prevent transplant shock and encourage rooting. Some unique features of the greenhouse are the butterfly vents on the top, the insect netting ensuring that no pests and viruses enter, and the rolling benches allowing for optimal use of the space.

Zone 2: This area is for further hardening or growing on. Plants in this zone are less "pampered" than in Zone 1, as they need to prepare for the hardier outdoor environment.

In addition to the new greenhouse, we are currently building a technical area which consists of packing, storage and dispatch areas, including a cold room for plants prior to dispatch as well a change room for staff and visitors. These additions will allow us to adhere to the strictest quarantine standards, ensuring that we maintain our pest- and disease-free status and optimum climatic conditions throughout the value chain.