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Undercover Farming Conference – Western Cape

29 & 30 October 2025 | Allee Bleue Estate, Groot Drakenstein

South Africa's agricultural sector is undergoing rapid transformation. Farmers face increasing challenges including climate change, water scarcity, rising input costs, and the demand for sustainably produced food. To remain competitive and resilient, growers are turning to protected agriculture methods—techniques that use greenhouses, shade nets, tunnels, hydroponics, and aquaponics to optimize yields, improve crop quality, and manage environmental risks.

For the past 15 years, the Undercover Farming Conference & Expo has been the premier platform for South African farmers to access practical knowledge, industry insights, and expert guidance on protected agriculture. The conference has earned a reputation as a trusted, action-oriented event where knowledge, innovation, and networking converge. It is uniquely focused on undercover agriculture, offering delegates information that can be directly applied to enhance productivity, sustainability, and profitability.

The upcoming Western Cape edition, hosted at the prestigious Allee Bleue Estate in Groot Drakenstein, continues this tradition. Over two days, farmers, agribusiness owners, and industry stakeholders will engage with top experts, explore the latest technologies, and discuss practical strategies for improving protected farming operations.

A Platform for Knowledge and Innovation

What distinguishes the Undercover Farming Conference & Expo is its practical, specialist approach. Unlike broader agricultural events, the conference provides a deep focus on the key aspects of undercover agriculture, including greenhouse construction, fertigation, soil health, pest management, biological crop inputs, climate control, harvesting, and packaging. This concentrated approach equips farmers to respond effectively to environmental challenges and market demands.

For 15 years, the conference has facilitated collaboration between experienced commercial farmers and newcomers alike. Delegates benefit from discussions of real-world challenges and solutions, ensuring they leave with knowledge and strategies that can be implemented immediately on their farms.

Key Speakers and Insights

This year's programme features a selection of leading experts addressing practical issues and innovative solutions in undercover agriculture:

Eldon Kruger (Pratley) will present on perlite as a growing medium, demonstrating how the correct growing medium can influence crop performance and yield.

Francois Knowles (Registrar, Apac) will provide guidance on making informed decisions in the fresh produce value chain, helping farmers align their operations with market requirements and compliance standards.

Kobus Pienaar (Woolworths) will discuss regenerative agriculture as a long-term investment in the future of farming, highlighting sustainable practices that move farming from short-term extraction to long-term environmental and economic regeneration.

The conference also includes presentations from other leading professionals covering crop inputs, cultivation practices, market access, biological control, and renewable energy solutions for agriculture. Delegates will gain insights into practical strategies that enhance crop quality, efficiency, and sustainability in a range of protected agriculture systems.

A Focus on Sustainability and Climate Resilience

With South Africa's increasingly arid climate, water scarcity and extreme weather events present significant challenges. Protected farming techniques such as shade nets, tunnels, and climate-controlled greenhouses allow for better control of temperature, humidity, and light, reducing crop stress and improving resource efficiency.

Sustainability is a central theme of the conference. Delegates will explore strategies for water conservation, renewable energy integration, biological pest management, and eco-friendly growing media. These insights provide farmers with practical approaches to reduce environmental impact while maintaining profitability, aligning with growing consumer demand for responsibly produced food.

Networking and Industry Connections

A key feature of the Undercover Farming Conference & Expo is the opportunity for delegates to connect with peers, industry experts, and suppliers. Farmers can engage with representatives of leading agricultural companies, compare solutions, and gather information on products and technologies that are relevant to South African farming conditions.

The Legacy of the Conference

Over the past 15 years, the Undercover Farming Conference & Expo has become a cornerstone of South Africa's protected agriculture sector. Its reputation is built on providing high-quality, specialist content that directly addresses the challenges faced by farmers. Delegates consistently report that the conference offers practical, implementable knowledge that improves farm operations, productivity, and sustainability.

By attending, farmers not only enhance their own practices but also contribute to the broader goals of South African agriculture: improved productivity, sustainable resource use, and strengthened food security. The continued success of the conference demonstrates its value as a trusted platform for learning, innovation, and professional development in the undercover farming sector.

Event Details

Venue: Allee Bleue Estate, Groot Drakenstein, Western Cape
Dates: 29 – 30 October 2025

Register now at: undercoverfarmingexpo.com

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SCRIPTURE

HOPE FOR THE FUTURE

Jeremiah 29:11

For I know the plans I have for you, declares the Lord, plans for welfare and not for evil, to give you a future and a hope.

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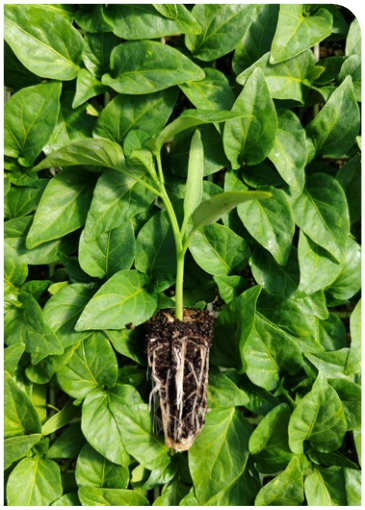

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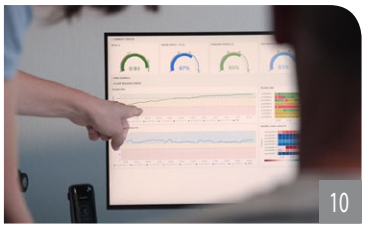

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Subscription details on p19

Greenhouse, Aquaponics and shade net covered farming still stay an important way to produce fresh produce, flowers, seedlings and some other crops. During the past summer season we experienced extra ordinary climate conditions which seriously affected agriculture in several parts of the country. Major open land crops like maize, sunflower and sorghum were affected and made a dent in our exports. Talking about exports; intensified delays and inefficiencies at the ports, deteriorating rail and road infrastructure, worsening municipal service delivery, increased geopolitical uncertainty and persistent episodes of load-shedding are all hurdles to be crossed for agriculture, but also many other locally manufactured export products. We are forced to import much of our agricultural requirements, which in turn inflate the producer's expense and thus harm food prices. Meaningful information was conveyed at the recent Undercover Farming Conference in Pretoria (read more in this edition). There is a definite need for proper training, young entrants and continuous information flow on market trends, innovative thinking and news on new systems to ensure quality and quantity of produce in the undercover farming trade in South Africa. This publication, being made available on different platforms with latest weekly news snippets, offers an essential service to all interested in cover protected agriculture. Readers are advised to obtain structural materials and services, electrical gear and pumps, seed and seedlings from reputable companies. All too many small start-ups fail due to poor service or over-night disappearance of fly by nights. We do not have the funds to loose through this. Winter approaches, therefore take heed, double check climate systems in greenhouses and consult your service providers regularly. Be productive, but be wise!

POWDERY MILDEW IN THE FLOWERS GREENHOUSE A PROBLEM?

Serious powdery mildew attack on roses.

Powdery mildew is one of the most common diseases in greenhouse production. Some greenhouse crops which are prone to infection include African violet, begonia, dahlia, gerbera daisy, hydrangea, verbena, roses, kalanchoe and poinsettia.

Many herbaceous perennials such as chrysanthemum, centaurea, coreopsis, delphinum, monarda, phlox, rudbeckia and sedum may become infected. Edible crops such as rosemary, sage, and mint as well as greenhouse tomatoes and cucumbers may become infected with this disease. Although powdery mildews rarely kill a plant, they reduce the aesthetic value and market value of the diseased plants or fruit.

Symptoms

Powdery mildew is easily recognized by its white talcum-like growth. Symptoms may appear first on the upper leaf surface, but they can also develop on the lower leaves. When symptoms develop on the more mature leaves, powdery mildew is harder to detect and seems to occur "overnight", catching many growers unaware. As soon as favourable environmental conditions develop, powdery mildew develops into an epidemic as more leaves become infected.

Causal Organisms and Host Range

Powdery mildews generally look alike so it is a common misconception that they are all caused by the same fungus. But, different types of fungi such as Golovinomyces (formerly Erysiphe), Leveillula, Microsphaera and Spaerotheca may occur in the greenhouse. All of these fungi are obligate parasites that need a living plant host in order to complete their life cycle. They usually survive in the greenhouse on crop or weed hosts.

Powdery mildews can attack healthy, vigorously growing plants. Golovinomyces (formerly Erysiphe) has a broad host range and attacks many members of the chrysanthemum family. Sometimes, mildews are relatively host specific. For example, Sphaerotheca violae only attacks Viola.

If you are growing a diverse mix of herbaceous perennials in the greenhouse, it is helpful to know the type of powdery mildew so you can better determine the potential spread of the disease to your crops. This will make scouting easier.

Conditions Favouring Powdery Mildew

Powdery mildew, unlike many foliar diseases, does not need free moisture on the leaf to thrive. Favourable environmental conditions include moderate temperatures of between 21°C to 30°C and relatively low light levels. High relative humidity (greater than 95%) especially at night and low relative humidity during the day contribute to the problem, as well.

Infections may be more common in the spring and autumn when changes between the day and night temperatures encourage high relative humidity levels, especially at night.

Spores (conidia) are produced in chains. Air currents and water splash in the greenhouse easily move these spores. The spores germinate and thread-like strands (hyphae) grow along the leaf tissue. Powdery mildews obtain plant nutrients by sending feeding organs (haustoria) into the epidermis. Once a spore lands on a plant, it may take as little as 3 days but, more often, five to 7 days for infection to develop. High humidity levels favour spore formation and low humidity levels favour spore dispersal.

Monitoring

Begin scouting early and as often as you can, at least once a week and more often, every two to three days, if possible. Look for the fluffy, talcum-like, powdery colonies especially on the upper surfaces of leaves. Stems and flowers may also be attacked. On susceptible varieties of sedum, brown scab-like lesions develop with little powdery growth. From a distance, it looks like a leaf spot disease or perhaps spray injury.

On greenhouse tomatoes, fungal growth is very sparse and easily overlooked. Use a 10x-hand lens to look for whitish threads radiating

▶ 5

A close-up view of powdery mildew.

Mango farmers may never become complacent over diseases on their trees. This picture shows what powdery mildew can do to mango trees!

out from a central point or for chains of spores. Spray residue does not appear as fluffy and tends to have more of a droplet like outline. If powdery mildew develops on the lower surface, you may see a small, yellow spot on the upper surface on poinsettia and other crops.

Powdery mildew may first be detected in locations with more changes between day and night temperatures. Hanging baskets or plants near the vents may first develop powdery mildew. Flag the affected area so you can easily revisit the plants after sprays have been applied.

If only a low level of disease is detected, remove infected leaves or plants. Because the spores are so easily airborne, carry a plastic bag and carefully place the infected material into the bag.

Managing Powdery Mildews in the Greenhouse

Prevent powdery mildew by maintaining proper plant spacing to reduce relative humidity levels within the plant canopy. (This will also help you gain better spray coverage). Keep relative humidity levels below 93 percent in the greenhouse.

Heat and ventilate in the late afternoon and early morning to reduce high relatively humidity at night. Clean your greenhouse thoroughly between crops, removing all weeds that could be potential hosts. Most ornamental crops are not selected for pest resistance. However, some resistant cultivars are available.

Chemical Controls

Powdery mildews only colonize the upper layer of cells, so chemical eradication is possible. You do not need to spray preventatively for powdery mildew, but you do need to spray as soon as the disease is detected. Rotate among fungicide classes to discourage development of resistance.

Certain fungicides, especially systemic fungicides, are "at risk" to development of resistance if they are used continuously. Fungicides with a high risk should be used in rotation with other fungicides or mixed with fungicides with different modes of actions. **Source: University of Connecticut.**

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CITRUS: U.S. MARKET calls for abundant supplies from Southern Hemisphere

The southern hemisphere citrus season is in full swing with supply coming from several countries. "We've been witnessing very good quality from South Africa, Argentina, and Uruguay," says Mark Lacey with Lange Farms.

Container shipments from South Africa have been arriving steadily since the end of May and the first dedicated vessel was unloaded during the last week of June and contained mandarins, grapefruit, and Navel oranges. "Growing conditions in South Africa have been ideal for all citrus varieties and as a result, quality of all items on the first few vessels that have arrived was very good," commented Lacey.

Oranges expected to perform well

In terms of volume, the supply of mandarins is heavier this season compared to last while total orange and grapefruit volume is expected to be slightly down compared to last season. "Mandarins remain a household staple, and with early-season volume hitting the U.S. market, we hope demand keeps pace. As a result of a lighter orange crop, oranges are expected to perform particularly well this season and will likely see strong demand." Grapefruit is also expected to be slightly down in volume, but arrivals did pick up in mid-to-late June. "Last year, grapefruit delivered one of the best eating experiences we've seen, and we expect similar results this year," Lacey said.

For both exporters and importers of South Africa citrus, the tariff situation is a new and evolving challenge. "Understandably, it has made all parties involved a bit nervous and there is a learning curve for everyone as we adapt." Since produce pricing fluctuates frequently, managing a variable 10 percent tariff and the possibility of a 30 percent tariff adds another layer of complexity. "It's something the industry will have to navigate carefully to maintain stable supply chains."

Lower lemon volume from Argentina

Out of Argentina, a few lemon shipments have arrived, and quality has notably improved compared to last season. "We anticipate a strong market throughout the season as the volume of lemons coming to the U.S. from Argentina is about 30 percent lower this season," shared Lacey. Many growers are shifting product to Europe due to crop shortages on the European continent and prices being more favorable. "That said, our grower partners in Argentina are committed to the U.S. market and view their relationship with us as a long-term strategy. They will support both our business and our clients even as global market dynamics shift."

Uruguay complements Navel shortage

Lange Farms has expanded their sourcing efforts in Uruguay this season. "We are working with excellent growers, supplying

Navels and mandarins." The first mandarins have already been received, showing great quality with Brix levels around 13. Navels are expected to arrive anytime and with the U.S. market being short on Navels, Uruguay has helped supplement that volume. More arrivals of both mandarins and Navels are expected in the coming weeks.

© Tom Lange Company

ECONOMIES OF SCALE IN THE PRODUCTION OF CANNABIS

Economies of scale is a term used to describe decreasing average cost of production (for example, the cost of producing a kilogram of cannabis) as a grower's total output increases. It furthermore prevails if unit costs fallas output increases (if the elasticity of costs with respect to the grower's outputis less than one).

Economies of scale might be realized either if there are diminishing marginal costs or if there are fixed costs of production (fixed costs such as capital equipment and plant construction are spread over a larger scale of output).

Economies of scale might also result from improvements in organizational structure, productivity gains from labour specialization (with a higher output, workers can specialize more narrowly on specific tasks that they may better perform than if they devoted only a small share of their time to that task), and technology improvements.

According to authorities about cannabis production, organized crime groups are running networks of houses and overseeing high-quality operations in terms of lighting, ballasts, layout, etc. These groups are employing professional electricians, greenhouse staff and at each step, as compared with the medical access point's providers who appear less sophisticated by comparison, with many doing their own construction and design (the consequence being a less sophisticated set-up).

Few of these are economically viable because of their lower production versus income, notwithstanding their expense on labour and input costs.

Even today's small producers might want to hire the 'professionals' currently employed by organized crime groups, if they dare to risk their businesses and lives in turning to these for help.

Although much focus is put on internal economies of scale (the change in costs a grower would experience because of an increase in his output) - cannabis growers may also benefit from external economies of scale. This in which increases in the output of an entire industry's produce marginal cost savings of the total industry, against decreasing the average costs of production for many businesses all at once.

External economies of scale exist if growers benefit from being close to other growers. These take the form of labour pooling, sharing common assets, better availability of intermediate inputs, and sharing know-how.

An important external effect for growers might be shared enforcement risk (governmental enforcement is more difficult as the number of growers increases).

For some external economies of scale, it does not matter whether growers can communicate (e.g., for enforcement swamping) but for other external economies. What may matter is not only the total number of growers in the area, but also the ability of those growers to trade information, expertise, share suppliers, etc.

If economies of scale are present, estimating the magnitude of the scale effects is important for informing decisions regarding the optimal number of licenses to issue. If the economies of scale are very large, and persist indefinitely for expanding operating scales, then growers producing at a large scale might exclude small-scale farmers from successfully competing.

Economies of scale therefore have implications for the number(and size) of growers that would be feasible in an unregulated market. This hasimplications for costs, price, product variety, and regulatory burden.

Strongeconomies of scale would favour large growers, an oligopolistic market structure, and concentrated production; accordingly, they may strengthen the arguments for policies intended to mitigate thoseoutcomes. Another reason to pay attention to economies of scale is that they affect

the severity of the legalization-induced price decline, which in turn affects regulators'ability to drive the illegal market out of business as well as combat likely associated increases in use and abuse.

From a study on the economic viability of producing cannabis in greenhouses by Botec Analysis Corporation.

GREENHOUSE DISEASES IN SPRING: Early warning!

Common spring greenhouse diseases include powdery mildew, gray mold (Botrytis), bacterial leaf spots, and root rots like Pythium. These fungal and bacterial diseases are often favoured by the high humidity and cool, wet conditions prevalent in spring, and can spread quickly via wind, insects, or infected plants and debris.

Early detection and preventive measures such as proper ventilation and removing plant debris are crucial for managing these common greenhouse problems.

Common Spring Greenhouse Diseases

Powdery Mildew
Symptoms: White, powdery patches on leaves, stems, and fruit; premature leaf drop, distorted new shoots, and stunted growth. Conditions: Favoured by high humidity and often affects plants in shady areas.

Gray Mold (Botrytis)
Symptoms: Fluffy, gray, moldy spores and fuzzy growth, often starting on or around flowers, causing blight, wilting, and rotting.

Conditions: Thrives in cool, humid conditions (60-75°F, 80%+ humidity), often seen in spring.

Bacterial Leaf Spots
Symptoms: Irregular, discoloured spots on leaves, which can lead to wilting and blight.

Conditions: Common in spring during cool, wet weather.

Root Rots (e.g., Pythium)
Symptoms: Wilting plants, root discoloration, and stunted growth due to root decay.

Conditions: Favoured by moist soil conditions that can be present in spring planting.

Factors That Contribute to Disease
High Humidity and Moisture are brought about by wet spring conditions create ideal environments for fungal and bacterial pathogens.

Poor Ventilation have stagnant, humid air promotes the growth and spread of many diseases.

Infected Plants and Debris
Diseased plants, seeds, or plant debris can harbour and spread pathogens throughout the greenhouse.

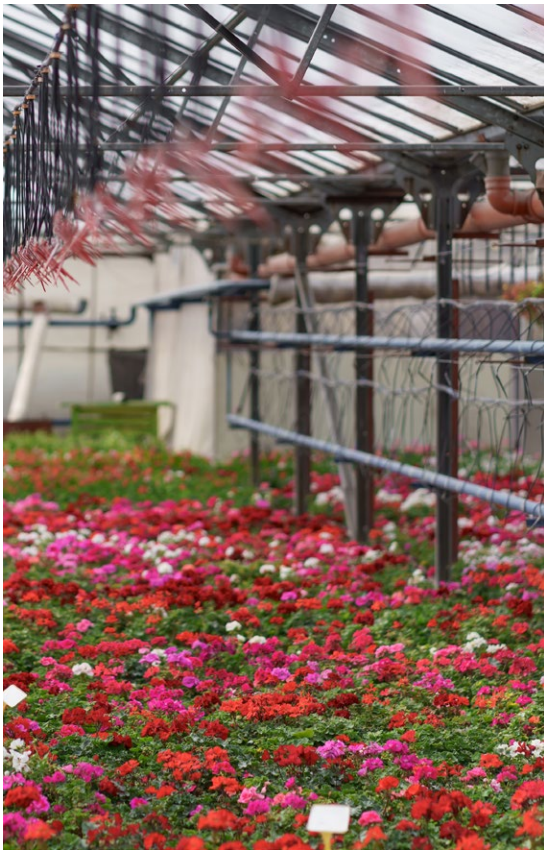
Wind may carry disease spores from outside the greenhouse or from plant to plant within the greenhouse.

Prevention and Control
Maintain Good Ventilation: Ensure adequate airflow to reduce humidity and prevent disease development. Sanitize: Remove and properly dispose of dead plant material and debris.

Monitor Plants Regularly
Inspect plants for early symptoms of disease to catch infections when they are easier to manage. Provide Proper Watering: Avoid overwatering and ensure good drainage to prevent root rot.

Use Fungicides
Apply preventative fungicides, especially for common root rot pathogens like Pythium, as a preventative measure during critical planting times.

Overall, close inspection on plants on a daily basis will lead to early detection and therefore quick action to deter further, or even great losses can be prevented.



Brown rugose virus on tomatoes.

AUSTRALIAN TOMATO GROWERS

to rebuild after brown rugose virus outbreak

During Australia's first outbreak of the tomato brown rugose fruit virus, three South Australian (SA) tomato-growing businesses were quarantined in 2024. These producers were to reopen without restriction. Sadly, one producer admitted he will have to start from the beginning.

Restrictions

Certain testing restrictions remain in place for sending SA tomatoes into Western Australia and Queensland, and a national management plan for the virus is being implemented. Tomato growers who were forced to shut down for a year and destroy thousands of plants due to an exotic disease outbreak have been given the green light to reopen.

One of three glasshouses north of Adelaide swiftly quarantined and closed in August 2024 after Australia's first detection of tomato brown rugose fruit virus. The disease does not pose a food safety risk but does reduce plant yields.

Peter Petsios has been growing tomatoes for 41 years and says he feels as if he has been sent back to square one.SA Tomato owner Peter Petsios vowed to rebuild his business after an extremely tough 12 months. "We've experienced a catastrophic experience here — our business has been completely barren for a year," he said.

"No income and a lot of expenses just keeping the lights on here, so it's not like we've got money in the bank we can survive off, so we did it very, very hard. We knew something was going to prevail eventually, but I think they could have done it a lot quicker and a lot smarter."

The Australian government's response to the outbreak left much to be desires, according to Mr Petsios. (ABC News: Brant Cumming)

Mr Petsios said retaining market access for the tomato industry was important but criticised of the state government's response to the outbreak. "We were probably the sacrificial lamb here to keep our facilities shut for a year, for the benefit of the community," he said.

The disease can cause deformities on the leaves of tomato, capsicum and chilli plants and can also affect their fruit.

Tomato brown rugose fruit virus was initially found on three properties in South Australia, prompting immediate quarantine, testing and decontamination protocols by the state government.

After detections in tomato crops in Victoria and New South Wales in 2025, the National Management Group of experts and industry representatives decided eradication was no longer technically feasible and moved to a management plan instead.

South Australian Primary Industries Minister Clare Scriven conceded the shutdown had been "incredibly difficult" for the three businesses involved but said the strict measures were necessary due to the risk. "We've been working throughout this time to try and make sure that there's the least disruption to trade with other states as possible," she said.

"The alternative would have been worse and more disruptive, in that the other states could have refused to receive all tomato fruit from SA, which would have put our entire industry in a terrible position. We've got around 230 tomato growers here in SA and potentially they could have all been locked out of all the other states, so that would have been a really catastrophic outcome and I'm glad we were able to avoid that."

Some testing restrictions remain for sending SA tomatoes into WA and Queensland, and a national management plan for the virus is being implemented.

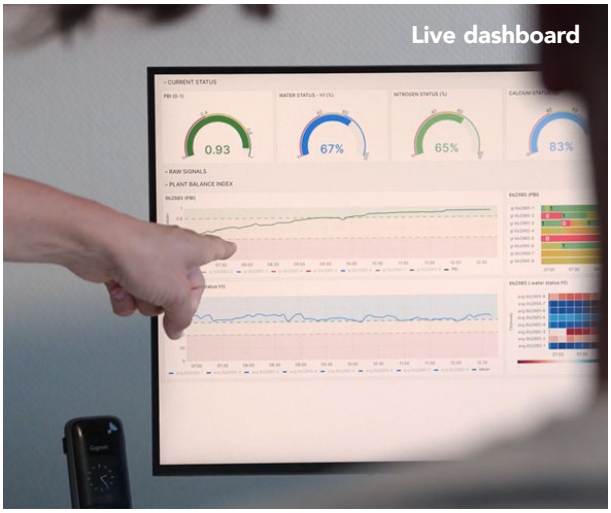
By Selina Green and Cassandra Hough, ABC

TIPS TO SOUTH AFRICAN TOMATO FARMERS

To prevent Tomato brown rugose fruit virus (ToBRFV), implement strict phytosanitary measures including using only virus-free seeds/seedlings, rigorous hygiene for staff and equipment, and dedicated tools for each section of a field or greenhouse. Wearing disposable protective clothing and regularly disinfecting hands, footwear, and tools are essential to prevent the virus's introduction and mechanical spread. Additionally, source planting material from reputable suppliers, avoid touching plants unless necessary, remove alternative host plants like weeds, and report any suspected infections to plant health authorities.

VIVENT BIOSIGNALS:

Presenting a technology leap in monitoring plant health and vitality



Vivent Biosignals delivers growers with a direct window into plant health by allowing plants themselves to signal stress responses before visible symptoms occur.

Understanding Vivent Biosignals Technology

Vivent Biosignals, a Swiss biotech leader (and B-Corp), uses advanced sensor electrodes and AI-powered analytics to monitor electrical signals generated within plant cells. These signals, allow growers to detect responses to both abiotic (nutrient deficits, drought, heat, etc.) and biotic (disease, insects) stressors, often days ahead of us being able to see visible symptoms. Sensor electrodes are placed directly into the stem and the system actively records ion flows and interprets data using machine learning (AI), with readings transmitted to an intuitive dashboard accessible via desktop or mobile app.

Practical benefits for crop managers

Early stress detection: Growers can intervene at the earliest electrical sign of stress—adjusting irrigation, nutrition, or crop protection—well before the plant shows visual decline.

Real-Time decision support: Live monitoring enables more targeted use of inputs, cutting costs and environmental impact through reduced waste and runoff.

Prevention over reaction: Diseases (such as mildew) and pest outbreaks (like thrips) can be mitigated, thanks to advance alerts.

Yield, quality, and consistency: The technology helps minimize stress during sensitive phases – optimal growing hours versus bad growing hours (leading to higher and more consistent crop yields)

Faster testing and breeding: Breeders, agronomists, and input developers gain rapid feedback on crop response to new genetics or products (fertilizers, biostimulants, substrates), helping accelerate product development and reduce reliance on subjective "snake oil" claims.

How the System Works

Two electrodes are inserted into the plant, and its natural internal signals are amplified and recorded. The electrodes typically stay in place throughout a full crop cycle.

In real time, signals are compared to a library of diagnostic algorithms (Machine learning models) and plant response metrics. Algorithms include a range of abiotic stresses, such as drought, nutrient deficits (N,P,K, Ca, Fe, Mn) as well as biotic stresses including thrips, aphids and plant diseases such as mildew. Response to light, water and circadian rhythm are clearly visible.

Vivent biosignals sensors can be used in any crop.

Integration and Value for Growers

Compatibility: Data from Vivent biosignals can be paired with other greenhouse management systems for holistic crop health reporting and rapid experiment analysis.

Research and efficacy: Real-time data offers convincing evidence for efficacy of crop treatments, letting growers compare product impacts, time applications accurately, and improve recommendations for stress mitigation.

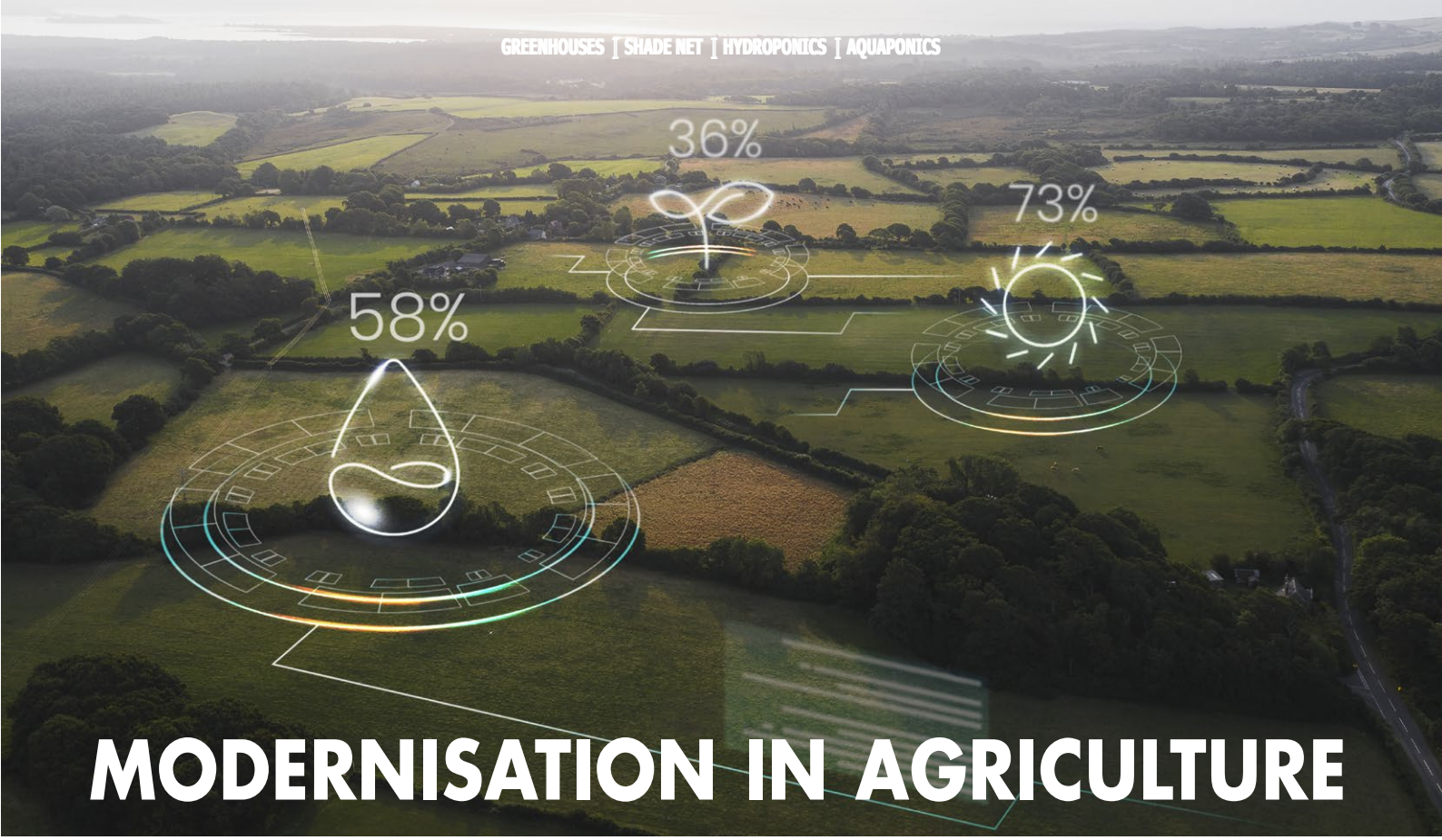
Sustainability: As a certified sustainable enterprise, Vivent's technology is a key tool to reduce input use and environmental impact while improving crop performance and profitability.

Conclusion

Vivent Biosignals shifts greenhouse management from observing external factors to actively listening and acting upon what plants communicate from within.

This leap enables growers to stay ahead of stress, ensure better crop protection, and maximize yield and quality—making precision agriculture more actionable and effective.

Source: Brett Young - Growrite



MODERNISATION IN AGRICULTURE

There is no doubt that farming in South Africa is changing. With the rising costs of seeds and other inputs, farmers must become more efficient in order to stay profitable and competitive. Viewing the farm as a factory will help to make the farming 'production line' as efficient as possible.

When examining the production process we can identify a few crucial points where improved nursery techniques and production methods can facilitate in maximising the farms capacity and yield within their greenhouse structures. When investing in quality seedlings, farmers can expect minimized seed use and maximum transplantable seedlings.

Uniform, quality seedlings will translate into better uniformity. This saves not only time and resources, but allows for more precise harvest planning.

A common concern amongst growers is the establishment of seedlings in the greenhouse. As the plug leaves the nursery it may be subjected to adverse conditions in the greenhouse, and the seedlings must acclimatise quickly. An improved plug design can ensure fast establishment with 'spring like' roots released into the ground. This root system is achieved at Hishtil SA with the use of our patented 'Straight Root System'. Beyond that, our XL seedlings offer the largest root mass available in the market. This ensures easier planting, reduced transplant shock and faster establishment.

Seedling health is of equal, if not more importance. Seedlings should be produced in protected structures. This shields the seedlings from insects and other disease vectors. This protection is provided at Hishtil SA with IP (Insect Proof) nets that can stop insects as small as white fly from penetrating the structures.

It is clear that in today's competitive market it is a necessity to utilize the best available technology and international standards such as GlobalGap and to invest in improved inputs such as quality seedlings in order to be a leader in the industry.

Source: Eloise Maartens - Hishtil

SUSTAINABILITY OF GROWING GRAFTED & UN-GRAFTED SEEDLINGS

HISHTIL SOUTH AFRICA IS A LEADING AND INNOVATIVE NURSERY FIRM SPECIALISING IN VEGETABLE SEEDLINGS SUITABLE IN ALL CLIMATIC CONDITIONS

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INNER-LEAF TIP-BURN ON LETTUCE

The inner leaves of this lettuce head clearly reveal burned tips.

Horticultural experts say not all nutritional problems are caused by supplying too much or too little of a certain nutrient. "Tip-burn" of inner leaves is a common problem in hydroponics lettuce, where the margins of the young emerging leaves develop necrosis and burn.

The necrosis is from a calcium deficiency, but the actual problem is more the result of poor environmental conditions and water uptake. The lettuce receives an adequate supply of all plant essential nutrients in the hydroponic nutrient solution, yet you find in the centre of the head's leaves tip-burn.

Inner leaf tip-burn on lettuce appears as necrosis along leaf margins at the center of the head and is a physiological disorder involving calcium and water uptake. Calcium moves through plants passively and is carried with the flow of water. As plants transpire and take up water, calcium is essentially "pulled" up from the roots and throughout the plant. Rapid transpiration promotes calcium uptake and distribution within the plant.

On the other hand, low transpiration rates decrease calcium uptake and transport. The growing tip of lettuce is enclosed by leaves that make up the lettuce "head," which block air movement and create a very humid micro-environment around the growing tip. This humid microenvironment results in low transpiration of the growing tip and reduces calcium transport to the new leaves, even if the outer leaves are transpiring adequately.

With low transpiration to the growing tip, insufficient transport of calcium causes the tissue along the young leaf tips to collapse and turn necrotic as the leaves expand. In this scenario, the problem is not insufficient calcium supplied to the root zone, but a physiological disorder related to poor transpiration of water and humid environmental conditions.

A similar type of physiological disorder occurs with fruiting crops such as tomato, cucumber, pepper, and eggplant, but is called "blossom end rot." Fruits have relatively low transpiration rates, and under rapid fruit growth and swelling, localized calcium deficiency occurs at the base of the fruit. The collapsed plant tissue also turns necrotic and resembles rotting.

Vertical airflow fans force air movement directly down to the crop. Drought stress, high soluble salts, and chemical phytotoxicity can also cause leaf tip-burn in lettuce and other leafy greens. However, symptoms of these problems tend to occur on older and mature leaves, whereas inner leaf tip-burn from poor transpiration and calcium transport occurs in young expanding leaves within the head.

Unfortunately, there is no way to salvage necrotic leaf tissue. But there are strategies growers can use to facilitate calcium uptake and prevent inner leaf tipburn. Fertilize with adequate amounts of calcium. First check that adequate calcium is supplied in the nutrient program. Supplying 40-50ppm of calcium in the applied fertilizer or hydroponic nutrient solution is a good starting point.

Depending on the source, the raw irrigation water may also contain calcium. Increasing calcium in the nutrient solution can help with calcium uptake and reduce inner leaf tip-burn problems, but remember the real problem is more often related to environmental conditions that affect water transpiration.

Weekly foliar sprays with calcium solution is a strategy to increase calcium concentrations directly in plant tissues. A starting rate is 400ppm calcium mixed using calcium chloride fertilizer salts (not calcium nitrate). Always trial on a few plants before the whole crop. This strategy can be labour intensive and may leave residues on leaf surfaces, and is not often used in commercial practice for lettuce.

Low relative humidity and air movement increase plant transpiration and facilitate calcium uptake. Consider manipulating the greenhouse heating and venting systems to dehumidify the air during cool and cloudy weather. Increase use of horizontal and vertical airflow fans to improve air movement.

Conditions that promote rapid plant growth and leaf expansion promote inner leaf tip-burn, and shading/cooling under excessively high light and temperature conditions can help minimize risk. Avoid antagonistic effects from other fertilizer nutrients. High concentrations of ammonium nitrogen, potassium, and magnesium in the nutrient solution can block calcium uptake by roots.

Tips to prevent nutrient antagonisms include limiting ammonium to 15% of total supplied nitrogen and maintaining the ratio of calcium:potassium at approximately 1:2 and the ratio of calcium:magnesium at approximately 2:1 in the applied nutrient solution. Avoid high soluble salts. High soluble salts reduce the ability for plants to take up water and calcium.

If possible, maintain root zone electrical conductivity below 2.0 mS/cm. Select resistant varieties. Work with your seed supplier to select varieties specifically bred for lower susceptibility to inner leaf tip-burn. **By: Ryan Dickson**

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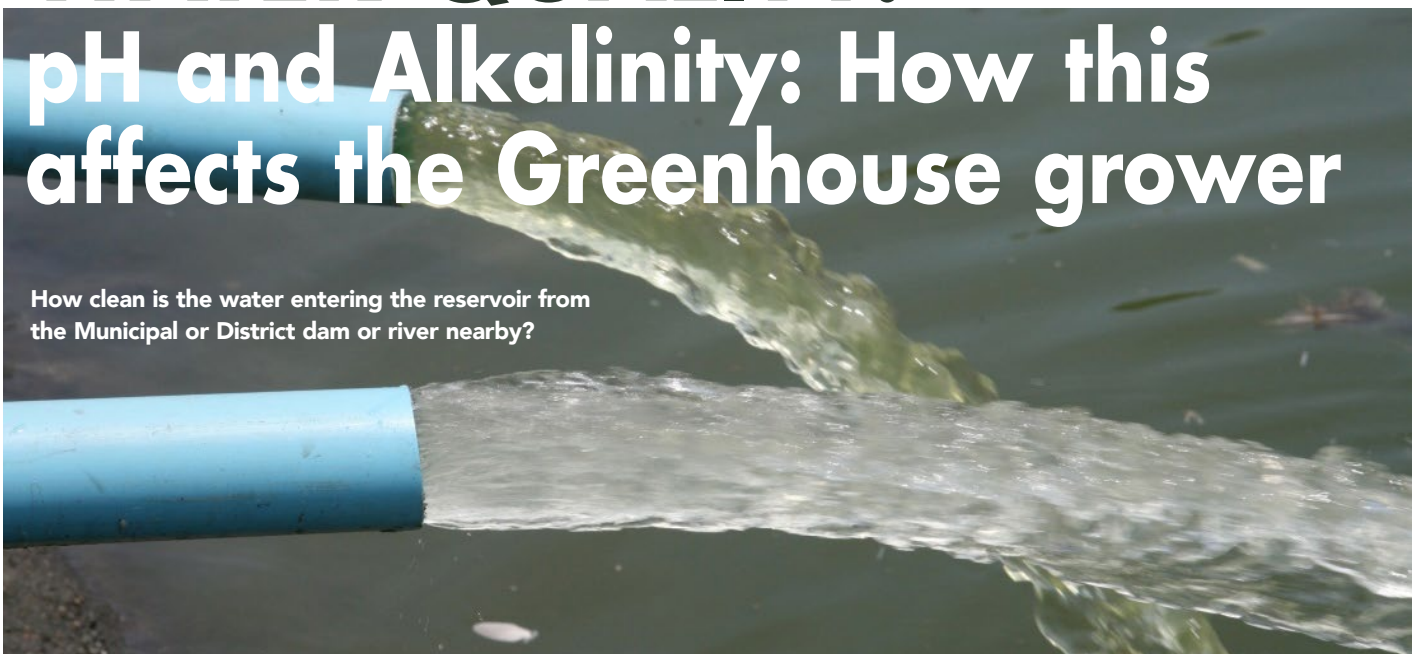
WATER QUALITY:

pH and Alkalinity: How this affects the Greenhouse grower



How clean is the water entering the reservoir from the Municipal or District dam or river nearby?

Alkalinity and pH are two important factors in determining the suitability of water for irrigating plants. pH is a measure of the concentration of hydrogen ions (H+) in water or other liquids.

In general, water for irrigation should have a pH between 5.0 and 7.0. Water with pH below 7.0 is termed "acidic" and water with pH above 7.0 is termed "basic"; pH 7.0 is "neutral". Sometimes the term "alkaline" is used instead of "basic" and often "alkaline" is confused with "alkalinity". Alkalinity is a measure of the water's ability to neutralize acidity.

An alkalinity test measures the level of bicarbonates, carbonates, and hydroxides in water and test results are generally expressed as "ppm of calcium carbonate (CaCO3)". The desirable range f or irrigation water is 0 to 100 ppm calcium carbonate. Levels between 30 and 60 ppm are considered optimum for most plants.

Irrigation water tests should always include both pH and alkalinity tests. A pH test by itself is not an indication of alkalinity. Water with high alkalinity (i.e., high levels of bicarbonates or carbonates) always has a pH value ÷7 or above, but water with high pH doesn't always have high alkalinity. This is important because high alkalinity exerts the most significant effects on growing medium fertility and plant nutrition.

High pH and High Alkalinity Effects on Plant Nutrition

Potential adverse effects: In most cases irrigating with water having a "high pH" (7) causes no problems as long as the alkalinity is low. This water will probably have little effect on growing medium pH because it has little ability to neutralize acidity. This situation is typical for many growers using municipal water, including water originating from reservoirs where poor management is prevalent.

Of greater concern is the case where water having both high pH and high alkalinity is used for irrigation. One result is that the pH of the growing medium may increase significantly with time. This increase may be so large that normal lime rates must be reduced by as much as 50%. In effect the water acts as a dilute solution of limestone!

The problem is most serious when plants are grown in small containers because small volumes of soil are poorly buffered to pH change. Therefore, the combination of high pH and high alkalinity is of particular concern in plug seedling trays. Trace element deficiencies and imbalances of calcium (Ca) and magnesium (Mg) can result from irrigating with high alkalinity water.

Potential beneficial effects; For some greenhouse operators, water with moderate levels of alkalinity (30-60 ppm) can be an important source of Ca and Mg. Most water soluble fertilizers do not supply Ca and Mg. Also, the Ca and Mg from limestone may be inadequate for some plants.

Moderately alkaline water could be beneficial as a source of extra Ca and Mg for crops prone to Ca and Mg deficiencies (e.g., poinsettia).

Other Effects of High pH and High Alkalinity

In addition to nutritional disorders of plants, water with high alkalinity can cause other problems. Bicarbonates and carbonates can clog the nozzles of pesticide sprayers and drip tube irrigation systems with obvious effects. The activity of some pesticides, floral preservatives, and growth regulators is markedly reduced by high alkalinity.

When some pesticides are mixed with water they must acidify the solution to be completely effective. Additional acidifier may be needed to neutralize all of the alkalinity. To determine if a chemical is affected by high alkalinity, carefully review the product's label.

Unfortunately this potentially important information is not always printed on the label, so considerable extra effort may be necessary to find the information. A call to the manufacturer will probably be needed for most chemicals. **By: N Mattson**

Testing the pH in a greenhouse.

GROWTH MEDIUM - the yield and quality response of tomatoes

Generally, pine sawdust-shavings (Pinus spp.) has always been a very popular soilless substrate employed in South African greenhouses. Some growers still use fresh pine sawdust-shavings (which is biologically highly unstable) as a substrate.

Therefore, the greenhouse industry looked at alternative organic substrates such as coco peat, which already went through a decomposition process and is more stable. A biological inactive substrate such as sand was included to compare micro-organism activity with organic substrates.

The main objective of a study at the University of Stellenbosch was to compare the growth, yield and quality of hydroponically grown tomatoes in response to different growth mediums in combination with nitrogen source, irrigation frequency, period of substrate uses and liming.

In general, the drainage water pH declined with an increase in NH4+-N in the nutrient solution. Low pH values in the drainage water, especially when coco peat was used, had a detrimental effect on marketable yield. The drainage water pH of pine sawdust-shavings increased during the growing season when 100 % NO3--N was used.

Due to the higher cation exchange capacity of coco peat, the drainage water electrical conductivity tends to increase more rapidly than with pine sawdust-shavings, during conditions with high temperatures and when insufficient irrigation volumes per irrigation cycle is applied.

As expected, the drainage water NO3--N content decreased as the NH4+-N content increased in the nutrient solution. Pine sawdust-shavings recorded a much lower NO3--N and NH4+-N content than sand and coco peat and thus supports the hypothesis that microbiological activity is higher in pine sawdust-shavings, especially in the second season of substrate use.

Also, coco peat produced the highest number of marketable fruit and yield per plant, followed by pine sawdust-shavings and sand in the first season of substrate use. The number of marketable fruit and yield decreased with an increase in NH4+-N content in the nutrient solution during production in warmer, summer conditions. Contrary to these findings, production in cooler, winter conditions recorded high yields when only NO3--N or 80% NO3--N: 20% NH4+-N was applied.

The unmarketable yield increased with an increase in NH4+-N in the nutrient solution. Visual evaluations showed that blossom-end rot (BER) was the main contributor to unmarketable yield. Increasing levels of NO3--N as nitrogen source in the nutrient solution, reduced weight loss and increased the loss of fruit firmness of tomatoes during storage. Increasing levels of NO3--N also increased fruit pH and reduced total titratable acidity.

Coco peat produced fruit with a higher pH than pine sawdust-shavings. An increase in irrigation frequency affected fruit firmness negatively when coco peat was used as substrate. Different irrigation and fertigation practices are needed for different growth mediums and management needs to be adapted according to the growing season (winter vs. summer).

Electrical conductivity

The drainage water electrical conductivity (EC) increased during production in warmer, summer growing conditions due to the build-up of fertilizer salts because of high temperatures and insufficient water volumes applied per irrigation cycle. However, the increase in EC was significantly higher in coco peat than pine sawdust-shavings or sand.

During cooler, winter conditions the EC was generally lower and more acceptable for production in all the substrates, but coco peat and sand still recorded a higher EC than pine sawdust-shavings.

Growth and fruit yield

Stem diameter of tomato plants decreased in pine sawdust-shavings and coco peat when the NH4+-N content of the nutrient solution was increased from 0% to 40% in the first season of substrate use. However, no difference was recorded when only NO3--N and 20% NH4+-N was used. In the second season of substrate use, stem diameter decreased significantly when 20 - 40% NH4+-N was used in sand and coco peat, but plants grown in pine sawdust-shavings only indicated a decrease in stem diameter when 40% NH4+-N was used. A similar trend was observed between the first and second season of substrate use.

Fruit quality

Increasing levels of NO3--N as nitrogen source in the nutrient solution, reduced weight loss and increased the loss of fruit firmness of tomatoes during storage. Increasing levels of NO3--N also increased fruit pH and reduced total titratable acidity as a result of the negative correlation that exists between these parameters. However, 100% NO3--N was responsible for the highest increase in fruit pH during storage.

Coco peat produced fruit with a higher pH than pine sawdust-shavings. Fruit firmness was the lowest in sand before storage, and after storage when 3 irrigations were applied per day but increased with 6 and 12 irrigations per day.

Furthermore, coco peat produced the highest number of marketable fruit and yield per plant, but it is of the utmost importance to treat the substrate with lime prior to planting to prevent the development of BER and a low drainage water pH during the growing season. Coco peat needs to be irrigated at least 12x per day to ensure high yields. Irrigation scheduling is very important when coco peat is used.

PERISHABLES DAMAGED during transportation

Damaged fresh produce after transportation and those which reaches its 'Best before (date)' time are now researched upon by using nanotechnology, to re-introduce it in edible condition. The core of the research programmes, according to scientists, is to reach further solutions for food security by reducing the large percentage of out of date and damaged fresh produce which get dumped.

Micro and nanotechnologies offer unique opportunities to measure and detect molecules and organisms with higher specificity and sensitivity. Moreover these concepts provide better cost efficiency, speed and ease of use. In this programme research will be done to transfer these concepts to the economically important application field of food and nutrition.

The results will enable the sector not only to monitor and control processes in the food industry more accurately, it will also provide tools to determine sensory qualities of food products and to effectively assess product quality and safety throughout the production and logistic chains.

The programme consists of three projects. Quality and safety of food products is the common denominator of the projects. One project aims at biological detection mechanisms for the detection of food borne pathogens and quantification of spoilage organisms. It focuses on quality and safety assessment in the various fresh food chains.

The second project focuses on the measurement of molecules, e.g. in packaging, that correlate to specific product attributes like ripeness and quality status. It will provide the devices to present quality and safety information to the retailer and the consumer.

The third project is directed towards the quantification of the ultimate food quality characteristic: appreciation by the consumer using assays based on human taste and olfactory receptors. The results will enable food companies and plant breeders to optimise their products and cultivars.

According to chemist Tom van Dijkman of Leiden University, as fruit and vegetables ripen, ethylene gas is released. Ethylene also influences the speed at which they ripen. He studied how small and inexpensive sensors that measure ethylene concentrations during transportation can be made. His research was done within NanoNextNL, within the programme Food process monitoring and product quality assessment. He worked in partnership with Wageningen UR and the companies Nanosens and EMS.

A lot of fruit, vegetables and flowers perish during transportation, partly because the current sensors for ethylene are too big and too expensive. Small, inexpensive sensors are needed that can be placed in the containers transporting fruit and vegetables to measure the ethylene concentrations.

Van Dijkman, under the supervision of Professor Lies Bouweman, discovered that the chemical properties of several copper compounds can be modified for air sensitivity, melting point, solubility and bonding characteristics with ethylene gas. His research also showed that when such compounds are placed on graphene, extremely large concentrations of ethylene and ethanol in the air can be measured.

"I tested a lot of copper compounds using a broad range of analytical methods. The copper compounds were then put onto graphene. The minute amount of material that 'sticks' to the graphene forms a thin layer that has high reactivity with gases in the air," Tom van Dijkman explained.

"By first analysing the chemical properties of the copper compounds, it was possible to understand the chemical reactions on the surface of the graphene sensors. The measurements give a clear picture of these reactions. By looking at the same reaction to different gases, it was possible to show that the proposed reaction mechanism works for different gases and that the differences in the various measurements could be both predicted and explained."

The compounds were tested, placed on a chip and developed into actual sensors, all within the context of the NanoNextNL research programme Food process monitoring and product quality assessment, in partnership with Wageningen UR and the companies Nanosens and EMS. **Source: NanoNextNL**

ENERGY RESOURCES FOR GREENHOUSE FARMING: The Way Forward?

Employing natural gas.

Although it is said South Africa has an abundance of sunlight to harness this is still costly - especially for the start-up greenhouse farmer. It is one of the answers to sustainable energy requirements for producing under cover but at this point and time still expensive to adopt.

The fact of the matter is that electricity costs rose by 96.16%. What many people do not take in consideration is the availability costs to the farm or production area. For an installation to a one-hectare greenhouse with high usage systems (pad & fan, etc) required for production, the producer needs to budget between R35K - R100K in order to ensure continuous energy to his farm.

A three-phase cable from the Eskom point to the greenhouse costs R35 a metre. If high efficiency fans are used, to have enough power available, Eskom charges R275K for a 350KVa transformer point.

Should the producer require a larger or more greenhouses or especially a unit that incorporates another or larger greenhouse climate control, understandably if the financials do not work out it will take the farmer longer to reach his bottom-line target.

Without a back-up system like a generator, the producer may lose his whole tomato crop in 10 - 15 minutes as the temperature on a hot, clear summer day on the Highveld can rise to such an extent it could almost boil tomatoes in the plastic greenhouse. This may wipe out the whole crop in one go.

But the hourly rate of running the generator is around R420 per hour. It is therefore essential to have a climate control system that functions well when you need it - and have the energy available right away to run such a system.

The more equipment one requires, the more finance must be laid out and therefore equally higher production must be arrived at to remain economically viable. Plus, the fact that more power is required to run the expanded production, which doesn't make the producer very popular with the energy supplier.

Management and manpower systems also require power to run and execute daily chores in the greenhouse, cold room or pack house.

The options for the greenhouse operator are as outlined above or a structure which opens at the top, have screens for climate control and pumps for irrigation or heating in winter from a coal fired boiler.

Point is either it is an enclosed system costing more money to manage offering slightly higher production or a system which opens and uses screens to control temperature costing less with less production - it depends on the producer which system he wants to venture into.

The alternative resource for energy is wind power which, technically speaking could work better, but where there is a lot of wind, there is the possibility of damage to tunnel structures and in areas where there is less wind, the producer's energy source is inconsistent.

Solar power in any case is better where there is continuous sun and not at coastal areas where more days are over clouded and in winter shorter sunlight is experienced.

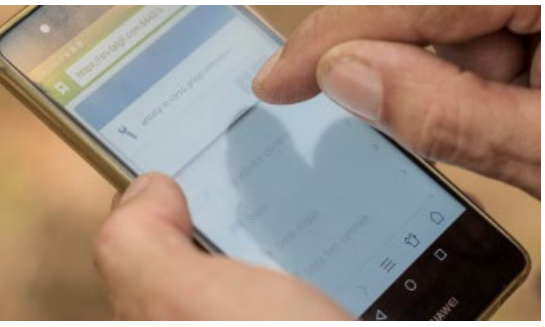
There battery back-up is required but - it comes at a price. Another resource is methane gas from pig or poultry farms but in Europe mostly from garbage, but it requires a daily flow of these resources in order to maintain production of gas. In certain countries using gas installations already a shortage of garbage exists.

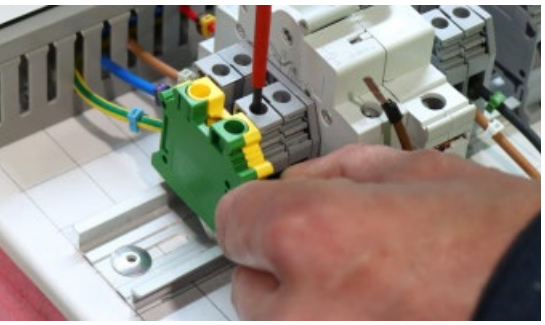
It is of importance to a greenhouse operator, before he decides to expand and introduce solar or wind power to his farm, to obtain proper readings from the equipment in the system he wishes to install in order to find out his exact power needs so as not to invest in a system from which he does not obtain continuity in energy or on the other hand overspend on a system which would affect his bottom-line in the long run.

Adopting solar power on your greenhouse plant requires a mind-shift towards good energy resource management - in short, to switch off unnecessary lights, pumps and other extra electrical components and only switching these on when it is the right time and for the correct endurance of the greenhouse's requirements,

At this point and time the individual farmer cannot sell extra generated power back into the national grid otherwise it would have helped with his profits over a period but there are systems without batteries which turn the electrical clock back into credit - though there is an amount payable to the energy provider for its basic usage tariff.

Therefore, it remains in the hand of the would-be or expanding farmer to plan his actions well financially and not with his heart. **Source: The Editor**





A DIGITAL KEY TO UNLOCK Irrigation Precision

Irrigation automation unlocks the full potential of precision irrigation and fertigation. Taking into consideration the level of precision we want to achieve in the field to truly grow more with less, we realise that only by applying the appropriate technologies, and managing these technologies optimally, can we use every drop of water and gram of fertilizer with extreme precision. "Even with a lot of effort and time, and the right precision emitter at the plant, 100% precise execution of strategic irrigation and fertigation tasks will not be possible without automation," explains Nickie Theron, Digital Farming Product Manager at Netafim South Africa.

"This statement is not about labelling automation technologies as the be all and end all of precision irrigation. It is about understanding the role of these technologies in unlocking the full precision potential of other important precision irrigation technologies. It is about the ability to timeously and accurately execute irrigation strategies based on precise data."

The relevant question is: can the benefits and level of efficiency described in these snippets truly be achieved without irrigation automation?

"Efficient irrigation is about timely, need-based water delivery that integrates all influencing factors to manage the crop based on phenological stages for optimal production. A holistic approach is necessary where all data and impacting factors are integrated."

"Precision irrigation delivers the correct amount of food and water to the plant uniformly distributed at the correct time and in the right place. It requires an irrigation system that is designed and installed with all resources and production goals in mind, with the aim of ensuring optimal production."

Whenever precision irrigation is discussed, a lot of emphasis is placed on precise scheduling and knowing how much water to deliver when. There is emphasis on gathering still more data and managing irrigation systems with increasing efficiency. But what is the purpose of knowing when to deliver water, knowing the moisture levels of the root zone, and knowing what a plant will need on a certain day, if we do not have the tools to action the derived irrigation tasks.

Let's say the data collected from the field and your knowledge of the soil and crop informs you, for example, to practice pulse irrigation with a pause of 20 to 30 minutes between pulses. You however need to open and close valves manually and cannot practically start and stop the irrigation system at the right times to carry out these efficient pulses. "These tasks must be actioned at the exact right moment to achieve the targeted precision. The valve must be opened to start the irrigation cycle at 9:00, for example, not at 9:05 or 8:55. Even if execution is possible, actions cannot be done with the right level of precision if they are done manually. The margin of error is just too great, leading to less precise application of water and fertiliser, and therefore wasting precious resources," adds Theron.

But, says Theron, these technologies must be set up correctly. "We must ensure that every aspect of the irrigation system, such as hydraulics, necessary controller programming, and other aspects must be designed, set up and managed correctly to ensure the system can achieve the level of precision we want it to." He further emphasises that digital farming solutions cannot magically turn poor irrigation equipment into an efficient irrigation system. "Do not forget that we still need to prioritise selecting the correct equipment for the job, from the head control room to the field. We must also remember to prioritise equipment quality in every decision."

Beyond Opening the Taps

Controlling valves is the mere tip of the iceberg when it comes to how irrigation automation can affect increased irrigation efficiency. Digital farming solutions take responsibility for numerous important precision irrigation tasks, including EC/pH control, fertilizer injection, issuing alerts when parameters are crossed, taking actions according to parameters set, collecting data from the field for reporting, enabling you to manage a large irrigation system from one platform with a holistic view, making remote access and control a reality, and more. In short, digital farming solutions enable users to manage irrigation systems efficiently with minimal resources, even if these systems are large and complex.

The Road Ahead

Advanced digital farming solutions are becoming increasingly common on farms in Southern Africa. In this context, solutions master tasks such as integrating sensor technology and real-time data to adjust irrigation schedules. "The integration of real-time data and automation in irrigation systems is not just a vision for the future, it's already happening on many farms across the world. At this level, monitoring devices and controllers are fully automated leading automated irrigation management. We see systems using sophisticated algorithms to analyse sensor data and adjust watering schemes in real-time. These technologies further enable farmers to leverage data-driven strategies to optimise water use, reduce costs, and ensure long-term sustainability," explains Charl van Reenen, Agronomy Manager at Netafim South Africa.

"I believe the future of precision irrigation will be rooted in advanced, user-friendly systems that integrate all farming aspects into a single platform, simplifying farm management and empowering farmers to succeed in the competitive agricultural landscape," Theron concludes.

A Changing Landscape, Led Locally

According to Theron the irrigation automation industry has changed and developed massively over the past 10 years. "In my experience the irrigation

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automation industry in South Africa is developing in quite a different way compared to other countries. The automation needs on our farms are driven by the fact that our farmers need to farm with extreme precision in order to be sustainable and competitive. The South African irrigation automation industry is therefore much more sophisticated than in other countries. Technology developers must align with farmers' evolving needs."

A decade back, says Theron, advanced solutions were being applied in greenhouses, with precise EC/pH control practiced in these growing conditions. "Today, the same level of precision is applied in many open-field irrigation systems. This is because of the increased need for precision, as well as the fact that irrigation controllers now exist that can perform the necessary tasks to achieve this high level of precision for a much wider range of irrigation systems and conditions. The latter is, of course, linked to the overall development of digital technologies across many industries."

"The development of these technologies is greatly driven by market needs, and I can honestly say that most companies prioritises staying aligned with the needs communicated from the field." Theron stresses that digital farming solutions must align with sound irrigation practices, guiding the market to these practices where necessary.

Limiting Factors

No discussion about embracing technological solutions is complete, without acknowledging the limitations in adopting these technologies.

"System cost is always raised as the first limitation," says Theron. "There is no doubt that these technologies are expensive, but it is placed in perspective when we view these costs in the context of both the total irrigation system cost and the crucial role it plays in the success of the total irrigation system.

Two other important limitations are the availability of electricity and signal (whether radio or cellular). "These are valid concerns, and a challenge we face every day when implementing digital farming solutions on farms. These limitations are however not impossible to obstacles. Existing technologies can overcome these challenges and new technologies are continuously being developed. Most importantly a farmer (and the irrigation industry) can always make a plan, as the Afrikaans idiom states."

Lastly, technological literacy of users is a potential limitation. "This is easily solved by offering user-friendly technologies on the one hand, and diligently training users on the other hand," says Theron.

It greatly depends on the team's mindset. "Do they truly want to embrace technology, enhance efficiency and implement precision? If that is the case, any limitation can be overcome."

Connected Control

Having mentioned the possible limitation of signal availability, we cannot omit discussing the role of communication systems that connect different digital farming components to make the many valuable automation actions a reality. "It is very valuable to ensure that a two-way communication system is in place to integrate all components in the head control room and field. This not only ensures that tasks can be actioned, but also that the farmer receives the necessary feedback on in-field circumstances and more."

Focusing on connection methods, Theron reiterates that valves, for example can be connected with either physical wiring or radio, depending on whether they are positioned in the head control room or in the field. "This opens another discussion on the optimal placement of valves as well as dedicated versus shared mainlines. Relevant to this conversation is the reminder that any wiring outside of the head control room is a risk. It opens the possibility of theft, damage and leading lightning strikes to valuable equipment in the building. We focus on moving away from physical wiring where possible, to prioritise radio connection. Cloud connectivity also unlocks many possibilities where feasible."

Esmeraldo highlights Netafim South Africa's commitment to delivering and advancing digital farming solutions. "We will continue to place focus on expanding this segment of our business. We strive to make technology adoption accessible and encourage farmers to adopt these technologies, driving efficiency and sustainability on farms. Furthermore, we will always focus on impacting the development of these solutions to ensure that solutions are well-suited to local industry needs." **Source: Nickie Theron, Netafim South Africa.**

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