

ucf Undercover farming

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die pols van landbou



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THE SCRIPTURES

*For we are labourers together
with God: ye are God's
husbandry, ye are
God's building.*

1 Corinthians 3:9



ucf **Undercover** farming

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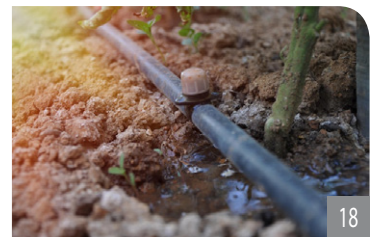
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Undercover Farming hosts its Western Cape Conference in October again. It is always an event to look forward to as delegates are ensured of a number of most extensively experienced presenters. Greenhouse farming in South Africa is under economic pressure for a number of reasons; be it electricity services, water, and the recent varied weather patterns causing havoc in many areas. We must remember the country from Cape Town to Messina, Port Nolloth to Durban, is a vast area in which differences in climate is the norm. It is therefore imperative that new entrants to the greenhouse farming sector position themselves in a climate area where less wind, less extremes in temperature and good market opportunities exist. The old, existing greenhouse farmers are major suppliers to local and foreign markets. New technologies are the answer to less labour intensive practices, but might not carry the favour of policies regarding job opportunities in SA. But all of the above should not deter anybody with an agricultural degree, experience of greenhouses or just simply keen-to-be-successful individuals to enter this exciting sector. According to local agricultural economists, the food prices for consumers are stabilising to a large extent which means the enormous local fresh produce market, served by open land, but to a large extent greenhouse and under shade net producers, will still be able to supply consumers. This news in itself is good news for new undercover practicing producers. Advice to new greenhouse farmers is, when negotiating finance for the new enterprise, not to plan for as short an ROI as earlier entrants to the trade; it will be in your interest to very thoroughly investigate the fresh produce markets, have a business plan drawn up with the aid of an agricultural economist, before making an appointment with the finance house. With open land producers experiencing more and unprecedented climate interference, undercover farming is the answer to a stable fresh produce supply sector.

Johan Swiegers

NAMIBIA BERRIES plans major expansion



Namibia Berries, a subsidiary of the South African venture capital company Loxworth Capital, plans to invest 1.5 billion Namibian dollars (US\$80.2 million) over the next 7 years in the production of blueberries.

The Namibia Investment Promotion Development Board (NIPDB) report this project include the development of a 250-hectare farm based in Divundu in the Kavango East region, which will mainly focus on exports.

The investment in the farm, which will employ nearly 800 people and also create 7000 jobs during the harvest seasons, will be provided by two large Spanish agri-food companies, namely Puliberries SL and Agricola SL. Namibia Berries expects to export its first harvest in September 2024.

“This partnership, which also involves other European investors, aims to expand development and diversify production to include blackberries, as well as additional established sales channels,” said a spokesperson from Loxworth Capital on the project.

The first-ever commercial harvest of blueberries in Namibia commenced on the banks of the Okavango River between Mashare and Mupapama villages in Kavango East, northern Namibia in 2020.

The 20-ha project was considered a forerunner for other high-value crops that could be produced under

irrigation in the semi-arid country, according to Willem Mostert, manager of the company in charge of the irrigation and fertigation management system for the project.

Meanwhile, Knigstein Capital, through its investment vehicle Spitz Capital, is currently growing blueberries at Mashare Green Scheme. So far, the company has invested over N\$100 million and is planning to increase its investment to over N\$1 billion in the next 10 years.

The Bureau for Food and Agricultural Policy (BFAP) reports there is a strong production growth in recent years in Southern African countries such as Zimbabwe, Zambia, and most recently in Namibia.

These countries have the advantage of harvesting fruit early and entering the European markets before South Africa’s ability to supply and when market prices are generally higher. It is expected that this growth will continue in conjunction with expansion in other African countries in the next few years.

Blueberries are enriched with many phytochemicals, including phenolic compounds. This fruit is considered a “superfood” as its bioactive compounds have many health

benefits, including antioxidant, anti-inflammatory, and vasoprotective effects.

These nutritional and health benefits make blueberries a high-demanding fruit globally. High sugar content and a high acidity are essential for good-tasting blueberries.

Blueberries with a soluble solid content and titratable acid (SSC/TA) ratio of 10 – 33 and a pH of 2.2 – 4.2 are considered good commercial quality. The SSC/TA ratio is an indicator of the fruit maturity index. Source: Knigstein Capital

During 2020, the global supply of blueberries stood at 1.4 million tons; from around 200,000 hectares planted across the world. With this, the International Blueberry Organisation (IBO) projects that world production will increase by 12.6% by 2024. 🌹





Greenhouse Computer control systems optimise crop management

Good crop management depends on having the right information to make necessary decisions. In the past, the grower has been the greenhouse sensor and control system – checking conditions and adjusting equipment settings as needed to optimise crop growth.

To improve crop management, a number of sensors and instruments can (and should) be used to gather information. A computer control system can then use this information to make regular adjustments to equipment settings to optimise growing conditions.

Monitoring growing conditions is essential. Even without automated control of the production system, it is not possible to make the right decisions about the crop without having the right information.

Temperature and relative humidity (and/or vapour pressure deficit) need be monitored in every greenhouse.

Light levels should be checked at least periodically to make sure covering materials are performing adequately, but ideally light levels need to be checked on a regular basis in order to know the optimal temperature regime for the crop. The electrical conductivity and pH of both the feed and drain

solutions should be monitored in every hydroponic system.

Temperature and relative humidity sensors should be placed level with the growing tip of the crop. Placing a thermometer near the door of a greenhouse might be convenient but it will not give you the information needed for producing an optimal crop.

Medium and high technology greenhouses make use of a range of sensors which link into automated control systems. These systems can monitor temperature, relative humidity, vapour pressure deficit, light intensity, electrical conductivity (feed and drain), pH (feed and drain), carbon dioxide concentrations, wind speed and direction and even whether or not it is raining. The information is used to control heating, venting, fans, screens, nutrient dosing, irrigation, carbon dioxide supplementation and fogging or misting systems.

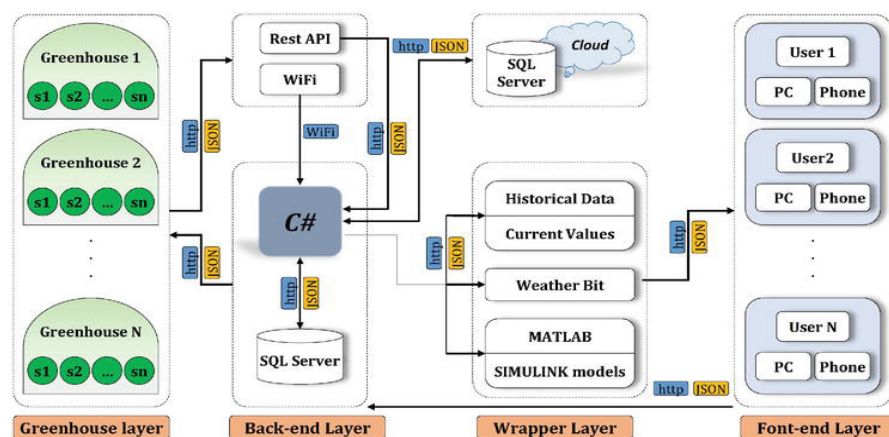
Correct operation of the automatic controllers is essential to management of an optimal growing environment. Emergency alarms and backup generators may be used in case of problems or power failure due to the large investments made in producing a crop.

Closer monitoring of the greenhouse environment with sensors and advanced software can greatly improve yields and economic performance by optimising plant growth. The cost of automated equipment and computer control systems can generally be recovered within a couple of seasons through savings in labour and better crop production.

Increasingly sophisticated sensors are being developed and adopted in commercial greenhouse operations to monitor the plants directly. Today's growers have access to continuous measurement of a wide range of aspects of plant growth including stem diameters, sap flow rates, expansion of fruit and leaf temperatures. The integration of this information into production decisions is still new, but is rapidly providing better data about growing conditions and even assisting in the early detection of plant stress.

Good control in the greenhouse is the ultimate aim of controlled environment horticulture. The most important benefit of control in the greenhouse is the efficiency and effectiveness of your management decisions. There are a lot of other benefits too which save money and result in a better crop. These include greater energy and labour efficiency, more efficient use of water and fertilisers and fewer pesticides. Better control also gives you a more uniform crop so it costs you less to sell. 📌

Source: NSW-DPI



A basic lay-out of the different electronic components in greenhouse farming.

Woolworths story:

“Crunchita™ lettuce is one of our iconic Woolworths products”



Thrilled... that was how Mari de la Buscagne, Produce Technologist Leafy Crops at Woolworths South Africa, felt when she was first introduced to the Rijk Zwaan Crunchy Lettuce varieties in 2013. “This remarkable natural cross between a cos and a crisp lettuce is bright green, has a unique visual appearance and an appealing taste,” she says. Ten years later, Crunchita™ is an exclusive brand in the retailer’s 330 Food stores, and Woolworths customers know they are purchasing the real deal. “And the Crunchita™ era has just begun,” predicts Mari.

Many firsts in the retail sector

Founded in Cape Town in 1931, today Woolworths is the largest retailer in South Africa. It operates full-line fashion, home and beauty stores, many of which incorporate a premium food retail offering. According to Mari, the company has accomplished many firsts in the sector: “We were the first to offer employee benefits like a pension fund, maternity leave and medical aid, the first in advancing in

technology in the late 1960s, the first to introduce sell-by dates on food packaging in 1974, and the first to offer pre-washed lettuce.”

Distinctively sweet, super crunchy and very juicy

Crunchita™ was officially introduced into the South African market in the summer of 2014. “We launched it successfully into the lettuce heads and pillow pack range, exclusively with our partner Rijk Zwaan and eight of our best farmers nationally,” she recalls. “We love it because it gave us the leading edge due to it being



exclusive to us in the market. The taste is distinctively sweet, super crunchy and very juicy. It also has a vibrant green colour that kids and adults love, and it has an excellent shelf life. The best advantage is that

it can be eaten just as a healthy snack, instead of a bag of crisps.”

Purchasing the real deal

In the subsequent years, a range of successful products was introduced, always under the trademarked Crunchita™ brand. “When customers know and love the Crunchita™ products, they can just look for the name. They know that what they are purchasing is the real deal. Now, it has become one of our iconic Woolworths products. We offer the washed and ready-to-eat Solo Leaf, Mixed and Italian pillow packs. And during summertime we have an upper-tier Baby Spinach, Beetroot & Cranberry Mix on the shelf. This year, a special Crunchita™ Crunch salad is available for purchase in-store or online.”

The Crunchita™ era has just begun

Leafies are part of Woolworths’ extremely important produce and horticulture categories, and Mari is optimistic about the future opportunities. “I foresee a bright future with stable continuous growth for the lovely Woollies’ lettuces and millions of satisfied customers. The Crunchita™ era has just begun and I believe it is going to take over the Iceberg lettuce heads!”

She is also enthusiastic about other Rijk Zwaan innovations like the Knox™ trait for lettuce which delays pinking and therefore keeps the lettuce fresher for longer. “We are constantly looking for new ways to improve quality and shelf life. This phenomenal trait will reduce waste on the farms, in our stores and in customers’ homes,” Mari concludes.

Interested? Read more about the Rijk Zwaan innovations Crunchy Lettuce and Knox™.





TOGETHER WITH OUR PARTNERS...

we actively contribute to the world's food supply and stimulate vegetable consumption by laying the foundations for healthy and appealing vegetables.



RIJK ZWAAN

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SMART FARMING PROJECT launched in KZN to benefit Youth Graduates

KZN Premier Nomusa Dube-Ncube together with MEC for Agriculture and Rural Development, launched Ukulinga Smart Farming Project in Mkhondeni in Pietermaritzburg. This smart farming includes the App that assist in monitoring the greenhouse conditions and remote control the greenhouse functions.

Other key part of smart farming includes smart sensors, automated irrigation, crop monitoring and automated harvesting.

The farm has been the site of unique and groundbreaking research in several agricultural disciplines, providing an invaluable resource for close to 5000-smallholder farmers in the region. The innovative solution incorporates state-of-the-art technology, such as Smart Sensors, Automated Irrigation, Crop Monitoring, Automated Harvesting and many more.

In her remarks, Premier Dube-Ncube emphasized the importance of investing in the province and the role of technology in farming. "We are proud to launch this ground-breaking

Smart Farming technology solution that



combines innovation, efficiency and sustainability.

Investing in technology is key to growing our economy and ensuring sustainable food production in the region. We need to embrace the concept of smart farming and the use of technology, to ensure that many more people are employed in the value chain and we have resilient farming," said Premier Dube-Ncube.

The Smart Farming system is designed to integrate seamlessly into any farming operation, regardless of the size of the farm. Key components include a smart greenhouse, which incorporates smart automated irrigation systems, sustainable energy generation, and a mobile app for real-time insights and remote control of greenhouse functions.

The importance of smart farming technologies to upskill and capacitate residents in the province, particularly rural women and youth was highlighted; to improve the quality of life for rural communities by reducing the need for manual labour and providing new opportunities for economic development.

The Premier said government investment through UIF Funded Projects will ensure that 14 771 food handlers are to be trained and employed by the KwaZulu-Natal Department of Education.

"With an average of five members per Cooperative, each supporting an average of three family members – this Fuze Institute Smart Farming initiative will uplift close to 80 000 lives out of poverty and boost family incomes. Over and above that, more than 3 000 Unemployed Youth Graduates will be trained in Smart Farming including agricultural drone operators," said Premier Dube-Ncube. 🌅





Dutoit Agri is navigating challenges to ensure uninterrupted apple production. Delicious apples really are a gift from nature, a crisp, juicy taste experience whether enjoyed as a snack or used as part of a hearty salad or dessert.

PRODUCTION OF MORE QUALITY APPLES UNDER SHADE NETTING

One often wonders how does this crunchy nutritious creation reach our fruit bowl, especially with all the weather and power challenges facing farmers? According to Gysbert du Toit, Marketing Director at the Dutoit, increasing erratic weather patterns severely impact the management of apples.

“Extremes in heat, rainfall, and hail have become the new normal,” he says, adding that a spike in temperature even if only for a day, can cause fruit to get sunburnt. Drought is another constant threat. “The lack of consistent power inhibits our ability to apply irrigation where needed most effectively,” he says.

The current energy crisis has also affected the apple production process, not only from a cost perspective at farms and packing facilities but also when it comes to human capital. “On the farm side, the worst has been during the summer months when the daily irrigation cycles could not be completed within normal working hours, or even within daylight hours, and production staff had to work through the night to start pumps to irrigate,” Du Toit says.

Another challenge has been to cool down the apples after harvest, in order to maintain the shelf life of the fruit. “When there is no electricity, the cold rooms do not have the capacity to chill fruit within the required time, and the packhouses cannot run as

normal”. Du Toit Agri was one of the first implementors of innovative new cold storage technologies including dynamically controlled atmosphere storage of fruit to maintain fruit quality. Because apple production must go on at Du Toit, generators have been fitted at the farms and packhouses at an enormous cost.

Du Toit produces 200 000 tons of fruit in total annually, 80% of which is apples, which equates to over 900 million apples per year. As a leading South African producer and distributor of superior fruit and vegetables, Dutoit is dealing with these ongoing challenges while trying to keep their produce affordable to the consumer.

“The cost to produce, pack and transport fruit is exposed to the same inflation as all other sectors. Du Toit is constantly re-evaluating what we do to be more efficient, smarter and precise,” continues Du Toit. He cites precision fertilisation as one effective way of reducing the variability within an orchard. This saves on application rates, which not only has a cost-saving implication, but also a positive effect on the environment.

Apples undergo various quality checks to ensure that delicious nutritious apples reach our kitchen counters. These include pre-harvest nutrient analysis samples of leaf, soil and fruit; fruit quality checks on the farm during harvest and at the pack shed prior to and during packing, as well as final quality control at load out. Fruit held

in storage is also regularly sampled to ensure the best quality. These fruit quality checks include but are not limited to, sugar content and firmness of the fruit; colouration of the fruit; size; weight, and any other parameter that could impact on fruit quality.

Importance of shade netting

“Research and development are crucial to the sustainability of the Dutoit business. To become more effective, we need to work smarter, and the only way to do that, is to learn more and to do better!” says Du Toit. “For example, if we grow smaller trees at higher densities, we can not only increase our production of apples per hectare, but we can pick more from the ground which means our labour is more effective.

“We can also more easily cover the orchard with nets which decreases the incidence of sunburnt fruit and the amount of irrigation water we need to apply, and also protects the orchard from hail. We can do more with less,” he says.

Du Toit is actively engaged with Hortgro Science which coordinates industry research. “It is our mission to produce, pack, market, and distribute quality fresh produce in a sustainable manner, to the satisfaction of our clients and other stakeholders. By forging long-term relationships with our end buyers and consumers, we keep the handling chain as short as possible, enabling us to ensure fruit quality at a price the end consumer can afford,” Du Toit concluded. 🍎

The Internet of foodstuffs packaging explained



As consumers, we tend to take packaging for granted, often discarding it without a second thought. However, behind the scenes, a great deal of thought has gone into developing embedded digital technologies to help manufacturers enhance efficiency, visibility, and control throughout the production and supply chain processes. Manufacturers are integrating advanced technologies into product packaging, and these advances in smart packaging are revolutionising their ability to track packaging, manage supply chains and ensure seamless consumer product experiences.

Manufacturers, and particularly food and beverage manufacturers, need to maintain quality control to ensure food product safety, transparently track their products throughout the value chain, and monitor their products throughout the length of the supply chain. Embedded digital technologies are playing an increasingly important role in the industry to help manufacturers ensure that the products that consumers receive are safe to consume or use, and that they arrive in the consumer's hands in the condition intended.

The technology of printing barcodes onto packaging is nothing new and has been widely used for many years. However, technology such as QR codes, smart labels, RFID (Radio Frequency Identification) tags and NFC (Near Field Communication) chips offer value-added benefits of security, authentication, and connectivity, making product packaging a data carrier and digital tool.

Benefits of smart packaging

There are multiple benefits for manufacturers employing smart packaging technologies to manage inventory and product life cycles. RFID tags, which use radio waves to transmit data stored on a chip to a reader device, are useful throughout the supply chain. They can be embedded in packaging to enable accurate inventory management by monitoring inventory levels to mitigate or reduce stock shortages, improve supply chain visibility and enhance the efficiency of tracking product through the distribution process, which helps to streamline logistics operations.

Smart labels, which incorporate electronic components, sensors or indicators to provide real-time information about the product's status are to be used. For example, food manufacturers can use temperature-sensitive labels to monitor any deviations to the desired range for perishable items, helping the manufacturers maintain product quality and safety and instantly flagging when a product deviates from the desired temperature range. Smart labels and RFID codes also enable a swift recall in the hopefully unlikely event of a product recall.

NFC chips allow communication between devices in close proximity, and when integrated into packaging, NFC technology enables interactions between the product and a smartphone or other NFC-enabled device, which allows manufacturers to connect with consumers, offering them personalised experiences such as accessing product information or loyalty rewards. QR codes and RFID codes can also help manufacturers

Under SA Government Food Regulations, "Front-of-Pack- Labelling (FOPL)" means the labelling system outlined in regulation 51 and Annexure 10 and comprises a system of logos presented on the principle display panel on the packaging of a foodstuff and beverages (in the principal field of vision and an underpinning profiling model relating to nutrients of concern for NCDs; and present simple, often graphic information on the nutrient content of nutritional quality of products, to complement the more detailed nutrient declarations usually provided on the back of food packages.

authenticate products and traceability, helping to prevent the circulation of counterfeit goods within the marketplace.

Data must be analysed to provide value

All these smart packaging tools can provide a huge stream of data for the manufacturer, capturing data points on everything from factors like product location, temperature and handling conditions to end-to-end visibility in the supply chain. However, as has been said many times before, data must be analysed to provide valuable insights for strategic decision-making.

ERP systems can seamlessly integrate with smart packaging technologies to play a significant role in maximising the value of smart packaging by enhancing efficiency, visibility and control throughout the production and supply chain processes. An ERP system can identify areas of waste or inefficiency, and can provide insights into supply chain productivity. The data generated can improve visibility into buying and supplier trends, creating valuable business intelligence and value stream analysis, including consumer behaviour and

TOMATO PRODUCERS: combatting Tuta Absoluta and save production

A most destructive vegetable pest in South Africa is the tomato leaf miner. Although this pest is more commonly known as Tuta, the species has recently been moved to the same genus as the potato tuber moth, i.e. *Phthorimaea* (we retain the genus *Tuta* and common name Tuta here to prevent confusion).

Both these pests are leaf mining caterpillars of two very similar micro-moths, and are often mistaken for each other, both in the damage they cause as well as in identifications of the moths and caterpillars. In this article we highlight the most common differences between the two species, to aid farmers in identifications and therefore correct implementation of control strategies.

Moths

The moths of both species are small (<10 mm), and difficult to see in crop fields under normal pest pressure. They hide during daytime and are only encountered when the foliage of plants is disturbed. However, Tuta is known to occur in such huge numbers that "clouds of mingling moths" may sometimes be noticed in fields, even during daytime. For the untrained eye the difference between the moths of these two species is only evident in their size; tuber moth is slightly larger than the moths of Tuta (approximately 8 mm vs 6 mm).

Caterpillars

The caterpillars (larvae) of both species are leaf miners. They are seldom found outside their blotch-like leaf mines and therefore are seldom seen. Leaf mines must be dissected or "broken open" to inspect the caterpillars for identifications. Most of the leaf mines will be empty, however, except under high pest pressure.

The larvae of the tuber moth are greenish brown to pinkish and about 10 mm in length. Tuta larvae are more greenish and approximately 8 mm in length. A diagnostic feature of the larvae is the thin black line on the prothoracic shield (dorsally behind the head) of Tuta, while the tuber moth larva has a broader dark brown to black shield.

Host plants

Both species attack plants in the Solanaceae family, e.g. potato and tomato. However, the potato tuber moth prefers potato, while Tuta prefers tomato. A mixture of both these species will always be found in potato and tomato fields.

In tomato fields Tuta will always be the more abundant and damaging species. The occurrence of the two species in potato fields is, however, more complicated. Under certain conditions, which are still unclear, Tuta numbers may be much higher than that of the tuber moth (see "damage" and "monitoring" paragraphs below for more information).

Tuta absoluta, the tomato leafminer moth, has become an increasingly important pest in South Africa since 2016, undermining tomato production. Farmers have suffered serious yield losses, and increased expenditure in their attempts to control the pest.

This insect can reproduce at an alarming rate during warm to hot conditions (15 days per cycle at 35°C). Since the larvae tunnel into a tomato plant's leaves as soon as they emerge from their protective egg cases, they easily escape contact insecticide applications. A completely integrated pest management (IPM)

programme is the only effective means offering sustainable control of Tuta absoluta.

Several principles have to be strictly followed in an IPM programme:

Sanitation is extremely important and involves the removal of leaves when the first signs of feeding damage are noticed. This should only be practised up to a point. Plants must not be debilitated by excess loss of leaf area or so that fruit suffers sunscald.

At the end of the season, plants and all plant material must be removed as soon as possible and buried to prevent new moths emerging from pupae in or on the plant material. A host-free period of about six weeks will further reduce the number of moths when the season starts.

Weed control of especially solanaceous weeds (thorn apple, nightshade, bitter apple) and crop rotation out of the potato family (potato, tobacco, pepper, eggplant, tomato, gooseberries) should help break the pest cycle.

Early detection using pheromone delta traps, mass traps (~40 per ha installed 80 cm above ground, even before transplant) and black



◀ **TOMATO PRODUCERS:** from page 11

or yellow sticky traps can give an early indication of increases in pest populations. Traps can also reduce the population of male moths. Insect-attracting ultraviolet light systems used at night in closed greenhouses can further reduce the moth populations.

Biological control might not be the fastest-acting control measure, but it is one of the most sustainable. These eco-friendly products range from bacteria (e.g. *Bacillus thuringiensis*, *Paenibacillus chitinolyticus*), fungi (e.g. *Beauveria bassiana*, *Metarhizium* spp.) and granuloviruses that will infect the moths and larvae, to parasitic insects and nematodes that will feed on the pest and reduce populations.

Chemical control is probably the most favoured measure of most farmers, but care must be taken to prevent pests from developing resistance to the products, something for which *Tuta absoluta* is renowned. Spray application can be improved by pruning plants to two leaders and allowing better cover on the developing fruit. Principles to follow in chemical control of *Tuta absoluta* include:

An anti-resistance management programme allowing block sprays of two applications of a chemical from a specific mode of action (MoA – referring to specific IRAC codes); alternation should allow for at least 60 days between chemicals from the same MoA

Always check the label of the chemical to determine its optimal pH, and adjust the spray mix accordingly (spray water quality is very important). Use only registered chemicals and adhere to the relevant label dosages; this prevents under- or overdosing of a chemical.

Utilise improved stickers or wetting agents to improve application efficacy

Eco-friendly chemicals that don't kill beneficial insects should be preferred to the older, harsher alternatives. An environmentally friendly approach to farming will lead to wider biodiversity and the proliferation of the natural enemies of *Tuta absoluta*, including insect-eating birds and bats.

The damage potential of this species lies in its ability to reproduce at a very high rate, and occurring in much higher numbers compared to the potato tuber moth. In potato fields, however, their high reproduction rate is mostly suppressed in comparison to their occurrence on tomatoes. This may be due to host preferences. However, under certain conditions, which still are not completely understood, *Tuta* may occur in potato fields in such high numbers that the mining larvae may cause foliage dieback.

However, because the lure formulations are species specific, and because the effectiveness of the formulations may differ between the two species, counts and analyses must be interpreted carefully when tuber moth and *Tuta* pheromone catches are compared. In general, we

**Tuta
Absoluta
Moth**



Caterpillars



Tuta leaf miners are greenish and approximately 8 mm in length.



Damaged tomato

have found that the *Tuta* pheromone lures are much more potent, and that more *Tuta* moths are caught in traps compared to tuber moths in the same fields. 🌅

By: Dr Diederich Visser of the ARC's Insect pests research centre

◀ **THE INTERNET OF FOODSTUFFS** from page 10

preferences. Pairing these insights with predictive analytics can help manufacturers to adjust stock production and inventory levels to avoid stock or supply shortages and improve forecast accuracy, leading to cost savings and improved consumer satisfaction. One of the challenges for food and beverage manufacturers is ensuring product and food safety not just in the factory, but throughout the supply chain process. Smart packaging, in combination with an ERP

system, can ensure compliance with regulatory requirements, particularly those related to food safety and environmental regulations. It's crucial to have real-time data visibility when it comes to food safety, and smart packaging offers manufacturers real-time traceability that enables data-led decision-making and informed business decisions. ERP systems can leverage data to enforce quality control measures and regulatory compliance. All of these technologies

help manufacturers understand where their products are in the supply chain and ensure that they arrive in the hands of consumers in the state intended. By leveraging the real-time data produced by smart packaging, manufacturers can improve quality control, optimise production planning, reduce waste and cost and above all, enhance customer experiences. 🌅

By Johan du Toit, Strategic Sales Executive for SYSPRO Africa

STARTING GROWING TOMATOES IN GREENHOUSES: WHEN, HOW & CARE TIPS

Absolutely nothing compares to the flavour of a home-grown tomato: sliced, with a sprinkling of salt and pepper. One of the best ways to ensure a bountiful harvest is by growing tomatoes in a greenhouse.

Growing tomatoes in a greenhouse has advantages and disadvantages

Tomatoes, *Solanum lycopersicum*, are a wonderful addition to our gardens. Unfortunately, in cooler climates, bountiful harvests are, at times, hard to come by. These plants with their wonderful lush, verdant green foliage, and beautiful fruit, are often susceptible to many pests and diseases.

The ripening of the fruit is very temperature-dependent; when conditions are too cool, or too hot, the ripening, or maturation of the fruit slows down considerably. Planting tomatoes in a greenhouse, however, allows you to increase your harvest by controlling the temperatures and by reducing the risk of pests and diseases. This article will give you tips on how to successfully grow tomatoes in a greenhouse.

Advantages and disadvantages

Advantages

Greenhouse production concerns a type of controlled environment cultivation. Being able to control the environment, temperatures, humidity, and even light, provides many obvious benefits to growing tomatoes in a greenhouse.

In temperature-controlled greenhouses, you can start seeds

earlier, pot out plants earlier, and enjoy earlier, longer and more plentiful harvests.

Basic, unheated greenhouses can also provide a long and bountiful harvest. They will extend your harvest, as daytime temperatures will be warmer inside the greenhouse.

The risk of tomato blight (*Phytophthora infestans*), one of the most common problems associated with growing tomatoes in the UK, can be reduced by growing tomatoes in greenhouses, but not totally eliminated, as fungal spores can still enter the greenhouse through windows and doors.

Beneficial insects are also easier to utilise in a greenhouse than in outdoor cultivation.

Disadvantages and how to overcome them

While growing tomatoes in greenhouses provides many benefits, there are also accompanying disadvantages. Why? Because, while the plants in your greenhouse enjoy this environment, so do pests and diseases. However, many of the problems can be avoided by closely monitoring the health and conditions of your plants. Here are some ways to overcome disadvantages:

Keep your greenhouse clean and organised. Remove old dead plant matter, pots, and growing media. This will reduce areas that could harbour insect pests and reduce the risk of disease contamination.

Screen or net your entrances and windows to prevent pests from entering.



Rotate your crops to avoid long-term accumulation of pests and diseases.

Closed off greenhouses can have problems with mildews and fungal diseases. Ensure you have good air circulation to prevent this. Also keep foliage dry, especially at night, as the moisture benefits fungal pathogens.

Catch fungal diseases and those caused by other pathogens early. Keep a close eye on your plants for symptoms. If they develop, remove the plants immediately.

Due to the high humidity, fungal diseases such as mildew can spread quickly in the greenhouse [Photo: Taew Jari/ Shutterstock.com]

Pollinating tomatoes in greenhouses

Tomatoes have perfect flowers, which mean they have both male

◀ STARTING GROWING TOMATOES IN GREENHOUSES: from page 13

and female floral parts on the same flower. They are typically pollinated by the wind and by some insects. Therefore, it may be necessary to pollinate your tomatoes by hand in greenhouse unless you have enough ventilation to provide a breeze, or you employ the use of pollinating insects in your greenhouse.

Pollinating by hand can easily be done with a gentle touch of the finger, a small painter's brush, or cotton bud, or even by shaking or vibrating the plants. Personally, I give the plants a gentle thump with my finger just below the flowers. This shakes the pollen off the anthers of the stamens and onto the stigma on the pistil.

Alternatively, a vibrating device, as simple as an electric tooth brush can provide enough vibration to shake loose the pollen. This is best done at the warmest time of the day, when relative humidity is at its lowest, and may need to be repeated daily while the plant is flowering.

When to plant

If you have a heated greenhouse, you can sow tomato seeds late February right through the middle of March. If your greenhouse is unheated, start your plants indoors in mid-March and move them out in April after the last frost. Harden off your starts to reduce transplant shock. You can sow your seeds in the greenhouse after the last frost.

With plenty of sunlight and fresh air, the ideal temperature for growing tomatoes in a greenhouse is between 21 °C and 27 °C. Keeping night time temperatures above 10 °C is sufficient for growth. However, flowering and fruiting is reduced and slowed when temperatures are below 15 °C and above 32 °C. Maintaining optimal temperatures will provide vigorous growth and an abundant harvest.

Tomato plants are sown in the warm from March onwards [Photo: sophiecat/ Shutterstock.com]

Best greenhouse tomato varieties

There are two main types of tomato plants, bush-type and indeterminate. Choosing the best tomatoes to grow in your greenhouse depends on the space you have. If your greenhouse is small, a smaller tomato variety like these may be a better choice.

Indeterminate tomatoes will benefit the most from the extended growing season provided by a greenhouse.

This is because they will continue to flower and fruit as long as conditions are favourable. Bush-type tomatoes, on the other hand, only grow to a specific size, then produce their flowers and fruit.

Planting tomatoes in a greenhouse

While the greenhouse is a great tool for cultivation, there are several key points

to keep in mind when planting tomatoes in a greenhouse.

How to plant tomatoes:

Use nutrient rich, well-draining soil.

Plant your young tomato plant into soil deep enough to cover 2/3 of the plant, or at least up to the second set of true leaves. Prune any leaves off that will be below the surface of the soil. Tomato plants will sprout roots along the stem below the soil surface to promote strong and vigorous growth.

If planting in pots or small beds, fill your containers to a level 2 to 3 centimetres below the lip of the pots, or bed edge. This will ensure that none of your soil will spill out when watering.

After planting, water enough to completely saturate your soil. After this, allow your soil to dry to a point where the surface is dry, but moisture can still be felt at 1 to 2 centimetres depth into the soil. From here, establish your watering regime according to the plants' needs.

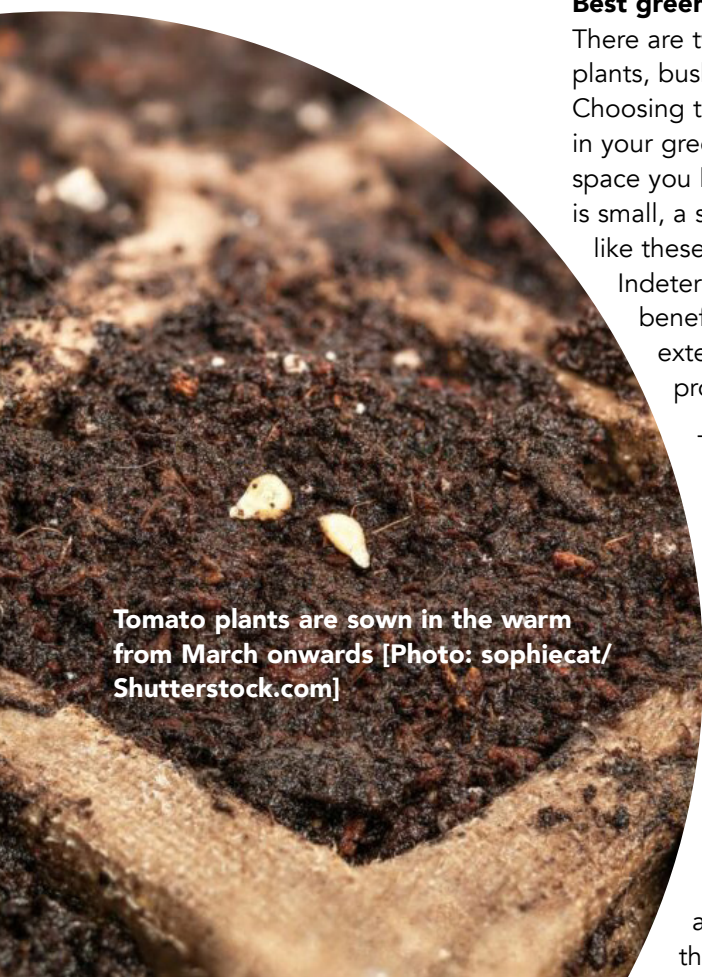
With temperatures kept within a more optimal range, plants can grow faster and, therefore, will consume water and nutrients more quickly. So, keep an eye on the moisture level of your soil, and look for signs the plants will give you to tell whether you are over or under feeding.

Greenhouse tomato plant care

The growing conditions inside your greenhouse are different and more intense than those in the rest of your garden. Take care not over or under water plants. Monitor your plants for signals on how they are growing: the colours of green in the leaves, curled edges, or mottled patterns, as well as any signs of pests or diseases.

Watering tomatoes in greenhouses

When watering tomatoes in greenhouses, irrigate water on the soil instead of sprinkling it on the leaves or spraying the plants. Generally, greenhouses maintain



Tomato plants are sown in the warm from March onwards [Photo: sophiecat/ Shutterstock.com]

a higher humidity inside than the atmosphere outside. Therefore, keeping water off the leaves will help you to avoid excessive foliage moisture that could facilitate fungal diseases. For the same reason, watering your plants in the early mornings is best. Tomato fruits benefit from consistent watering.

Too much water will cause damage like rot and fungal pathogens, while excessive dry periods can crack and damage the fruit. A good way to judge water needs is to saturate your soil and then allow it to dry out a bit before you water again. How often you should water tomato plants in a greenhouse depends on the size of the plants, the size of the containers, and temperature. For light, well-drained soil in beds, or in containers with drainage holes, it is best to allow excess water to drain away. Check the moisture level of your soil regularly to establish your own watering schedule.

Tip: Watering every day in the hot summer months is normal. Automated irrigation systems, either drip based or micro emitters, can be set up to provide a steady and consistent supply of water.

Fertilising greenhouse tomatoes

Tomatoes are heavy consumers of nutrients, and this is no different when cultivating in a greenhouse. Potassium helps the plants grow strong and robust, while phosphorous increases flower and fruit production. While, excessive nitrogen will facilitate rapid lush leaf growth, this foliage is softer and more susceptible to fungal leaf diseases.

Preparing your soil with good quality compost and manure is a good start to provide the right nutrition for your plants. As your plants grow and develop you will need to replenish nutrients with a good quality fertiliser which, slowly and steadily releases nutrients as the plants grow. When you need to remedy a deficiency, use a fast-acting liquid fertiliser. Using a fertiliser complete with



Beneficial insects, such as the lacewing larva, can be selectively released in the greenhouse [Photo: Tomasz Klejdysz/ Shutterstock.com]



Due to the high humidity, fungal diseases such as mildew can spread quickly in the greenhouse [Photo: Taew Jari/ Shutterstock.com]

micronutrients will help you avoid issues like blossom end rot.

Supporting greenhouse tomatoes

When it comes to supporting your tomatoes in greenhouses, there are many options. Bush-type tomatoes can easily be grown in medium-sized containers or even in a bed with one stake to support the plant from the centre. Indeterminate types can grow very tall, so these are best supported with strings, wires, or trellis systems.

Strings or wires can be hung from somewhere near the roof of your greenhouse and secured to individual plants. You can train the plant to wrap around the string or wire as it grows. Alternatively, you can use a large mesh wire fencing,

like pig stock fencing, as a trellis, and train the plant through it as it grows.

The fence needs to be large enough to stick your hand through and pull fruit back out. The fencing can be installed as a row for several plants, or used as a circular cage for individual plants. Whichever way you go, just remember that the weight of the fruit is too much for the plant to carry on its own, so it needs a little extra support. 🍅

The above is for a newcomer to tomato production, albeit smaller in size. Understanding the basics is the best step to enter the large greenhouse tomato production world! From various sources.

MAINTAINING SUSTAINABLE FOOD PRODUCTION AMID ESCALATING RISKS IN THE AGRI-SECTOR

Risks such as heavy rain, flooding, hail, frost, drought and fire are by no means new to the South African agricultural sector, but due to the effects of climate change, they are increasing in frequency and severity. These risks are also becoming more unpredictable amid changing weather patterns, which complicates risk management efforts for farmers.

The impact of climate change will worsen over time, with forecasts predicting that South Africa will become hotter and that the average temperature is rising. Heat waves will occur more frequently increasing the risk of veld fires and more severe droughts. Managing water resources will become more challenging, making it vital for farmers to improve and conserve soil quality to allow for better water infiltration.

In addition to climate change and severe weather events, infrastructure risks also threaten the productivity of our agricultural sector. The most obvious example is the on-going energy crisis in the form of load shedding, which is severely impacting farmers. Particularly when you consider that 100% of fruit and vegetables and a third of field crops require irrigation, which requires electricity. These mounting challenges put our agricultural outputs at risk.

Agriculture is an export-oriented sector in South Africa with more than half our produce – to the value of

\$13 billion – being exported annually. It's an important contributor to our economy and we cannot afford to let escalating agricultural risks impact our food production outputs.

Crop insurance serves as an integral tool in maintaining sustainable levels of food production by providing a safety net for farmers, ensuring access to financial resources in the event of crop failure and other disasters. It enables farmers to invest in new crops and continue producing food, thus maintaining their operations and securing their livelihoods. Insurers also assist farmers with employing risk mitigating measures to minimize damages.

In addition, agricultural insurance can help reduce the vulnerability of developing farmers who are considered high-risk borrowers. This perceived risk prohibits these farmers from gaining access to much needed credit from lenders. However, insurance reduces the risks that developing farmers face and improves their credit worthiness as it provides a degree of certainty, making it easier for them to access the capital they need to invest in their farms and improve productivity.

Malawi and Kenya have introduced insurance schemes for developing farmers and their food security status has improved year-on-year, according to the 2022 Global Food Security Index Report. Malawi has an overall score of 48.1 and improved

by 2.6 points from 2021 to 2022, and Kenya has an overall score of 53 having improved by 10 points over this period. This improvement can be attributed to their robust risk mitigation strategies, particularly in agricultural insurance.

South Africa, with a food security status score of 61.4 ranks the highest in Africa and 59th out of 113 countries, has its own proposed scheme for developing farmers – of which there are approximately 1.3 million in SA. Index Insurance has the potential to be a game-changer in the local insurance landscape.

Index insurance is a type of insurance that pays out if a particular measure, for example, rainfall, is above or below a certain predetermined level. Small-scale farmers could opt for a weather index or a yield index. These products are more flexible and cost-effective because this model of insurance does not require insurance assessors to visit the farm to determine damages. But it will require greater collaboration between insurers and Government to fast-track the development of legislation to make this a reality for smallholder farmers in South Africa.

In conclusion, agriculture insurance is a necessary tool for the sustainability of farmers by ensuring uninterrupted production and assisting with risk management in an escalating risk environment, which is critical for food security, beyond our borders. 🌅

Santam Agri

TRANSNET'S COMMITMENT TO IMPROVE CAPE TOWN PORT TERMINALS FOR FRUIT EXPORTERS



Loading fruit containers in Cape Town Harbour.

Hortgro, the South African deciduous fruit industry organization, welcomes the commitment of Transnet Port Terminals (TPT) to address problems at the Port of Cape Town. This follows a meeting that was held in Paarl last week between TPT and fruit industry stakeholders.

TPT said that they are working on contingency plans to ensure that the upcoming fruit export season runs smoother than in recent years, given plans to ensure that equipment failure is prevented, while pro-active maintenance contracts and inventory of spares have been put in place. TPT is confident that equipment breakdowns will be addressed more

quickly, given that mechanics and spares will be on site.

The deciduous fruit export season starts in November and lasts until May, with peak export weeks expected from week 52 to week 10. It is considered one of the busiest times for the Cape Town Terminal.

"We welcome their commitment, but the proof will be in the pudding," said Hortgro Executive Director Anton Rabe. "We will, as in the past, work together with TPT and proactively share information and meet regularly to monitor events and to prevent bottlenecks and other problems in a pro-active manner." He added that many producers and logistical service providers had experienced severe financial losses in recent years due to port congestion. "This cannot happen again, and we will hold Transnet accountable for service delivery."

According to TPT, the Cape container yard exported 183 430 standard-sized containers during the past deciduous fruit season. This year, growth of 21% is expected, and the container yard will need to handle more than 220,000 refrigerated fruit containers. A Western Cape government study about problems at the Cape Town Port indicated that in addition to bad weather and wind delays, the way trucks accessed the port was

problematic, as well as container handling equipment breaking down.

Problems with rubber-tired gantry cranes (RTG) have also been identified as a contributing factor. TPT said in a letter that 13 RTGs are currently available, with seven new ones on order that will be delivered by mid-November. When the season starts, there will be 28 operating RTGs. RTGs are essential equipment and are used to move containers from container piles or from trucks.

Earlier this year, stone fruit producers said that they would dump their rotten fruit at the Cape Terminal in protest to poor service delivery. Hundreds of container trucks queued for hours to download fruit. Stone fruit, specifically, is a sensitive product, and quality is severely affected if the cold chain is not maintained. **TPT**



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HOW TO COMPILE NUTRIENT SOLUTIONS USING WATER AT INCREASING SALT CONCENTRATIONS AND ALKALINITY

When feeding water quality is taken into consideration, some micronutrients may have phytotoxic effects at high concentrations and that high levels of Fe and Mn in feeding water may block drippers. Should the Fe- and/or Mn-levels be too high in feeding water, it should be removed in advance.

It is seldom possible to remove all the Fe and Mn but these nutrients should at least be lowered to safer lower levels. The micronutrients may be topped up to its required level, but due to the quick oxidation of Fe, the Fe in the feeding water must be ignored and the total Fe-need must be applied, using Fe-chelate. As with macronutrients, the other micronutrient levels in the feeding

water should be topped up to their optimum levels.

Should the micronutrient levels in feeding water exceed the levels it may be toxic. The physical procedure to add macro- and micronutrients to water will be discussed after a closer look at the solubility of salts. It should be noted in advance that the pH of solutions should be monitored while preparing macro- and micronutrient stock solutions.

Some micro- and macronutrients may precipitate as insoluble compounds in high pH solutions. On the other hand, Fe-EDTA may disintegrate, leaving the Fe-ion unprotected at pH levels lower than 3.5.

Solubility of salts

Some growers use shaded portapool reservoirs to mix their nutrient solutions. After filling these reservoirs with water, fertilizers are dissolved into it, using pumps to circulate the water. The modern

trend is to switch to smaller fertilizer tanks, containing concentrated stock solutions to be injected into passing feeding water.

Recipes for specific crops

Using inert soil-less substrates, only the roots interact with the nutrient solution that may change ratios between the different ions due to different uptake tempos. More changes are found in organic substrates where N-reserves may be used and bicarbonate levels may increase during decomposition of the organic matter.

To prevent significant deviations in nutrient levels, frequent irrigations with fresh nutrient solution is done in drain-to-waste production systems. The applied volume of nutrient solution must exceed the plant's need, allowing about 10-20% drainage. This prevents salt accumulation and ensures that the relatively small root volumes are flushed out a few times per day, to be replaced with fresh nutrient solutions.

Dutch growers mainly use rock wool, whereas most South African growers use organic substrates, such as pine sawdust or coir. Apart from the chemical N- or bicarbonate changes in decomposing organic substrates, its physical properties also change. Its water holding capacity will increase to the detriment of its aeration, necessitating less frequent but bigger fertigation pulses per day.

By allowing more time for air to move into the substrates and root zones between fertigation pulses, root respiration will be sustained, enabling the uptake of water and nutrients. By ignoring this or with too many fertigation pulses per day, waterlogging may be induced at a late stage of the crop's development.

This will be associated with symptoms of premature ageing, such as yellowing of leaves that may be confused with nutrient deficiencies.

For closed systems, where the nutrient solution is re-circulated, slightly lower levels are used, only for some nutrients that tend to accumulate during re-circulation. To optimize plant nutrition De Kreij et al developed procedures to change input nutrients, as soon as root zone solutions indicate that imbalances are developing. This practice is essential where solutions are re-cycled, but it is also effective to

optimize plant nutrition in drain-to-waste systems where nutrient needs may change when plants develop from vegetative- to reproduction stages or with changes in climatic conditions.

Drain-to-waste production systems

Lower nutrient concentrations are proposed for South African conditions, due to our warmer conditions and higher light intensities.

Closed production systems

In a closed system, the drained nutrient solution is re-used. When the solution is recirculated, the input solution should be less concentrated than 'drain-to-waste' solutions in anticipation of the accumulation of some ions.

Despite these well-planned nutrient solutions, imbalances may develop during production. The same root zone target values, as mentioned for the drain-to-waste production system are also used to check deviations from optimum levels in closed production systems.

Stricter feeding water norms apply for closed systems due to its zero run-off. Using feeding water with high levels of Na and Cl may be problematic due to the accumulation of these ions since most crops absorb Na and Cl at very low rates. Due to the low rainfall in most of South Africa's production

areas and the use of tunnel-shaped structures, accumulation of rainwater is not a practical solution in most of our production areas.

However, it is possible to use feeding water with relatively high Na and Cl concentrations, if the expected accumulation of Na and Cl is closely monitored to avoid concentrations from reaching their critical levels (substratemax) where yield losses will set in. Cherry tomatoes can be considered as more tolerant to saline conditions than standard tomato cultivars. A grower at Yzerfontein manages to grow cherry tomatoes, chillies, basil and rocket with feeding water containing Na at 12 meq L-1 in a drain-to-waste production system.

When using root zone solutions

To correctly apply nutrient solutions, the drainage percentage should lie between 10% and 30% to ensure that the calculation process works well. Due to economic reasons (saving on water and nutrients), growers who use the 'drain-to-waste' production system try to keep their drainage percentages as low as possible. However, it is important to manage the pulse volume in such a way that all the containers do drain after each fertigation pulse. 🟡

By Dr JJ Combrink, SU

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