Sustainable agriculture for the future

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Building Resilient Farms

Healthy Soils, Smart Management and Sustainable Growth

The Plant's Secret Pantry

Ancient Seeds for a Drier Future

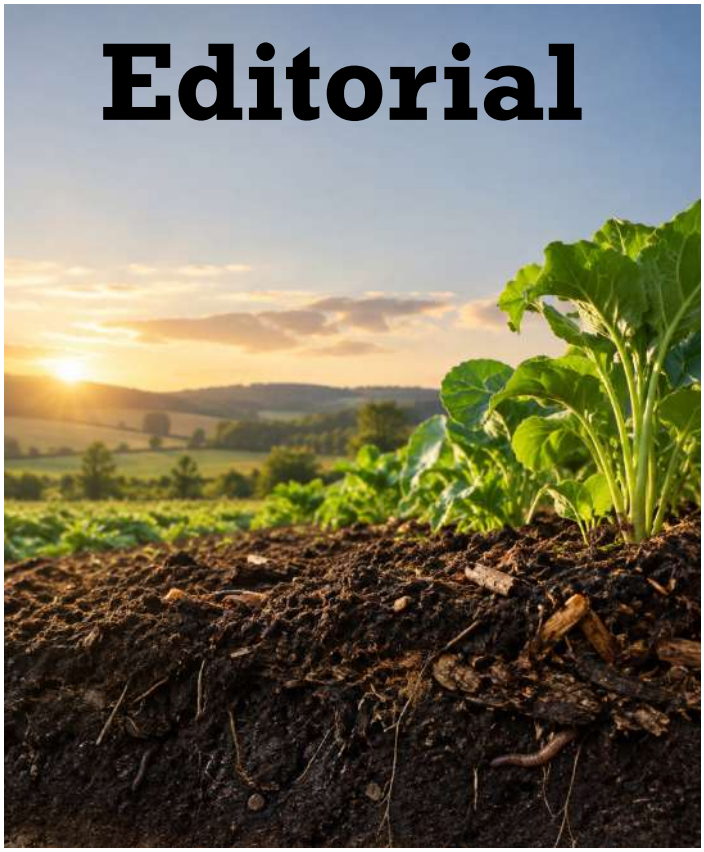
No water, no crops

Healthy Soils, Resilient Vineyards

Breërivier-Landbouvereniging: 'n Eeu van groei en trots


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Editorial



Farming has never been without challenges. Weather patterns shift, water resources come under pressure, and producers are constantly called upon to adapt to changing conditions. Yet resilience remains one of agriculture's greatest strengths.

This edition of *AgriAbout* explores the many ways in which resilience is built, from the soil beneath our feet to the communities that support agricultural success. While the topics vary, a common message emerges sustainable farming depends on understanding and working with the natural systems that sustain production.

Healthy soils and responsible water management feature prominently throughout this issue. Several articles examine how these resources influence productivity, environmental sustainability and the ability of farms to withstand future challenges. As climate variability becomes an increasingly important reality, careful stewardship of soil and water will remain central to agricultural success.

We also explore how innovation and tradition can work hand in hand. From scientific insights into plant processes and soil function to the value of landrace crops and locally adapted farming practices, the articles in this edition highlight the importance of both new knowledge and lessons learned over generations.

Beyond the farm gate, resilience is found in people as well. The centenary of the Breërivier Agricultural Association offers a timely reminder that agriculture is strengthened by collaboration, shared experience and a commitment to supporting one another through changing times.

While the challenges facing agriculture are considerable, this edition demonstrates that there is no shortage of ideas, innovation and determination within the sector. By investing in healthy soils, managing water wisely, embracing knowledge and strengthening agricultural communities, we can continue building resilient farming systems for generations to come.
We trust that the stories and insights shared in these pages will inform, inspire and encourage you in your own agricultural journey.

Until next time

Chris

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Building Resilient Farms: Healthy Soils, Smart Management and Sustainable Growth

Resilience has always been part of farming. The ability to endure difficult seasons, recover from setbacks and adapt to change is deeply rooted in agriculture. Yet South African farmers today face growing pressures from climate variability, rising input costs, infrastructure challenges and increasingly competitive markets.

The question is no longer whether farms will face disruption, but how well they are prepared to manage it.

Resilient farming businesses are built through healthy soils, efficient resource management, informed decisions and long-term planning. These foundations are established over time, not during a crisis.

"Resilient farms are rarely built during times of crisis. They are built quietly during ordinary seasons through careful stewardship, sound management and long-term thinking."

Resilience Starts Below the Surface

Healthy soil is one of agriculture's most valuable assets. Beyond supporting plant growth, it stores moisture, cycles nutrients, encourages biological activity and helps crops withstand environmental stress.

Soils with good structure and higher organic matter content generally retain water more effectively during dry periods while improving infiltration and reducing erosion during heavy rainfall.



Across South Africa, practices such as conservation agriculture, reduced tillage, crop rotation, cover cropping and organic matter management are increasingly recognised as practical tools for managing production risks.

Although improvements take time, the long-term benefits of healthier soils include greater water efficiency, improved productivity and stronger resilience against unpredictable weather.

A drought seldom creates weaknesses in a farming system. More often, it reveals weaknesses that have existed for years.

Making Every Drop Count

Water management remains one of South African agriculture's greatest challenges. With increasing pressure on available resources, efficient water use is becoming essential for both sustainability and profitability.

Improved irrigation scheduling, soil moisture monitoring, infrastructure maintenance and a better understanding of crop requirements can help farmers achieve more with limited water.

Technology provides valuable information, but effective management determines how successfully that information is applied.

Building water resilience is not necessarily about securing additional resources. Often, it means using existing resources more intelligently.

"A drought seldom creates weaknesses in a farming system. More often, it reveals weaknesses that have existed for years."

Smart Management Builds Stronger Businesses

Agricultural resilience extends beyond production practices. Sound financial and operational management is equally important.

Accurate record-keeping, budgeting, cost analysis, succession planning and regular enterprise evaluation enable farmers to identify risks early and make informed decisions.

Digital management platforms, satellite imagery and precision agriculture technologies can further improve efficiency and support planning. However, their value lies in the decisions they help farmers make.

Diversification can also strengthen resilience. Integrating crop and livestock enterprises, exploring value-added products or developing alternative income streams may reduce dependence on a single market or commodity.

Successful diversification must, however, align with available resources, management capacity and market opportunities.

Resilient farms do not necessarily use more resources. They use the resources they have more effectively.

Sustainability Supports Profitability

Profitability and sustainability should not be viewed as competing objectives.

Farms that protect their soil, manage water responsibly and maintain productive capacity are investing in their future competitiveness.

Responsible production practices are also becoming increasingly important in local and international markets, where environmental stewardship, efficient resource use and traceability receive growing attention.

Sustainability is therefore not simply an environmental consideration. It is a fundamental business strategy.

Thinking Beyond the Next Season

Resilience requires a long-term perspective. Improving soil health, establishing orchards, investing in infrastructure and developing sustainable production systems often take years to deliver their full benefits.

Successful farming businesses balance immediate production needs with decisions that will strengthen the enterprise for future generations.

Every investment and management decision should therefore answer two questions: Will it improve current performance, and will it leave the farm stronger in years to come?

Five Questions Every Farmer Should Ask

Regularly evaluating a farming operation can reveal vulnerabilities before they become serious problems.

- Are my soils improving or deteriorating?
- Could my farm withstand a season of significantly below-average rainfall?
- Do I have reliable production and financial



information to guide decisions?
- Am I using available water as efficiently as possible?
- Is my business prepared for long-term sustainability and succession?

Building Farms That Endure

Farming conditions differ across regions, commodities and production systems. What works in the Swartland may not suit the Overberg, and strategies appropriate for grain producers may differ from those needed by livestock or fruit farmers. Yet the principles of resilience remain consistent.

Healthy soils provide strength. Smart management provides direction. Sustainable growth ensures continuity.

Farmers cannot control the weather, global markets or every challenge facing agriculture. They can, however, strengthen their businesses through responsible resource management, informed decisions and continuous improvement.

Resilience is not built in a single season. It is cultivated through the decisions farmers make every day, creating stronger farming enterprises for generations to come.

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The Plant's Secret Pantry:
How Starch Keeps Plants Alive

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Plants are remarkable organisms. Every day they capture sunlight, water and carbon dioxide to produce the sugars that fuel growth through the process of photosynthesis. Yet photosynthesis can only occur when sunlight is available. What, then, keeps plants alive during the night, periods of drought, or other times when their ability to produce food is limited?

The answer lies in starch, a vital energy reserve often described as the plant's "secret pantry". During the day, plants convert part of the sugar produced through photosynthesis into starch and store it for later use. This stored energy sustains essential life processes when photosynthesis cannot take place, ensuring continued growth, development and survival.

Why Plants Store Starch

Unlike animals, which store excess energy as glycogen or fat, plants primarily store energy in the form of starch. Starch is insoluble in water, compact and highly efficient for long-term storage. Large quantities can be accumulated without disrupting normal cellular processes.

Different plant organs store starch according to their biological function:

- Roots such as cassava and sweet potato store starch to support survival and regrowth.
- Tubers such as potatoes and amadumbe serve as major long-term energy reserves.
- Seeds including maize, wheat and legumes store starch to nourish the embryo during germination.
- Stems and rhizomes such as ginger, turmeric and sugarcane also act as storage organs for future growth.

These reserves are later broken down into sugars that support root and shoot development, flowering, fruit production and survival during unfavourable environmental conditions.

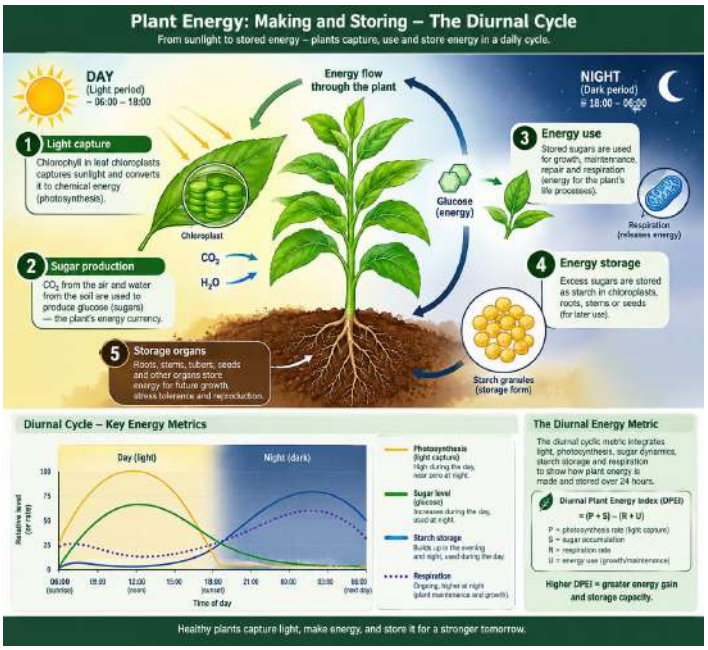


Figure 1: Plants produce sugars through photosynthesis and store excess energy as starch, creating a reserve that can be used when photosynthesis stops.

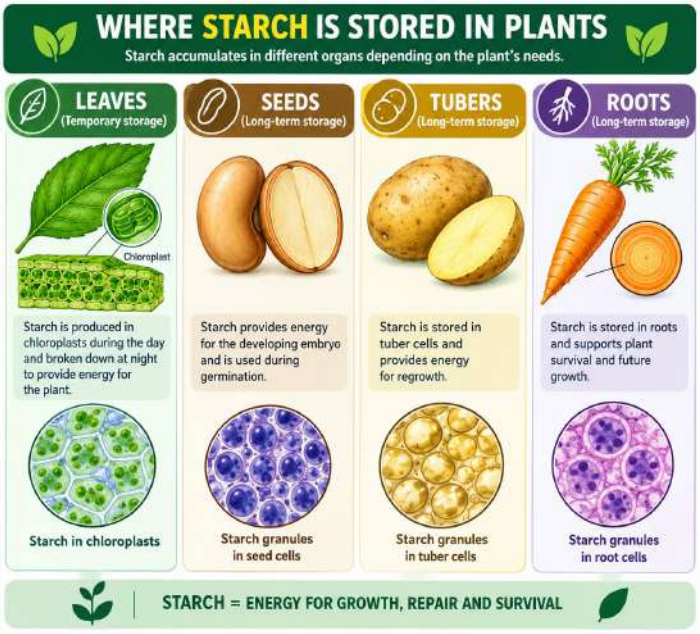


Figure 2: Major storage organs where plants accumulate starch reserves for future growth, reproduction and survival.

Building Starch from Sunlight

Starch production begins in the chloroplasts, where the Calvin cycle converts atmospheric carbon dioxide into simple carbon compounds during photosynthesis. Through a series of biochemical reactions, these compounds are transformed into glucose-based molecules that serve as the building blocks of starch.

Specialised enzymes assemble these molecules into two major starch components:

- **Amylose**, which consists of long linear chains.
- **Amylopectin**, which forms a highly branched structure.

Together they create starch granules, the compact energy stores that accumulate in leaves, seeds, roots and tubers. While starch in leaves is typically used within a daily cycle, starch stored in seeds and underground organs can remain available for much longer periods, supporting future growth and reproduction.

A Plant's Internal Timekeeper

One of the most fascinating aspects of starch storage is the way plants manage their reserves during the night. Researchers have discovered that plants regulate starch consumption with extraordinary precision.

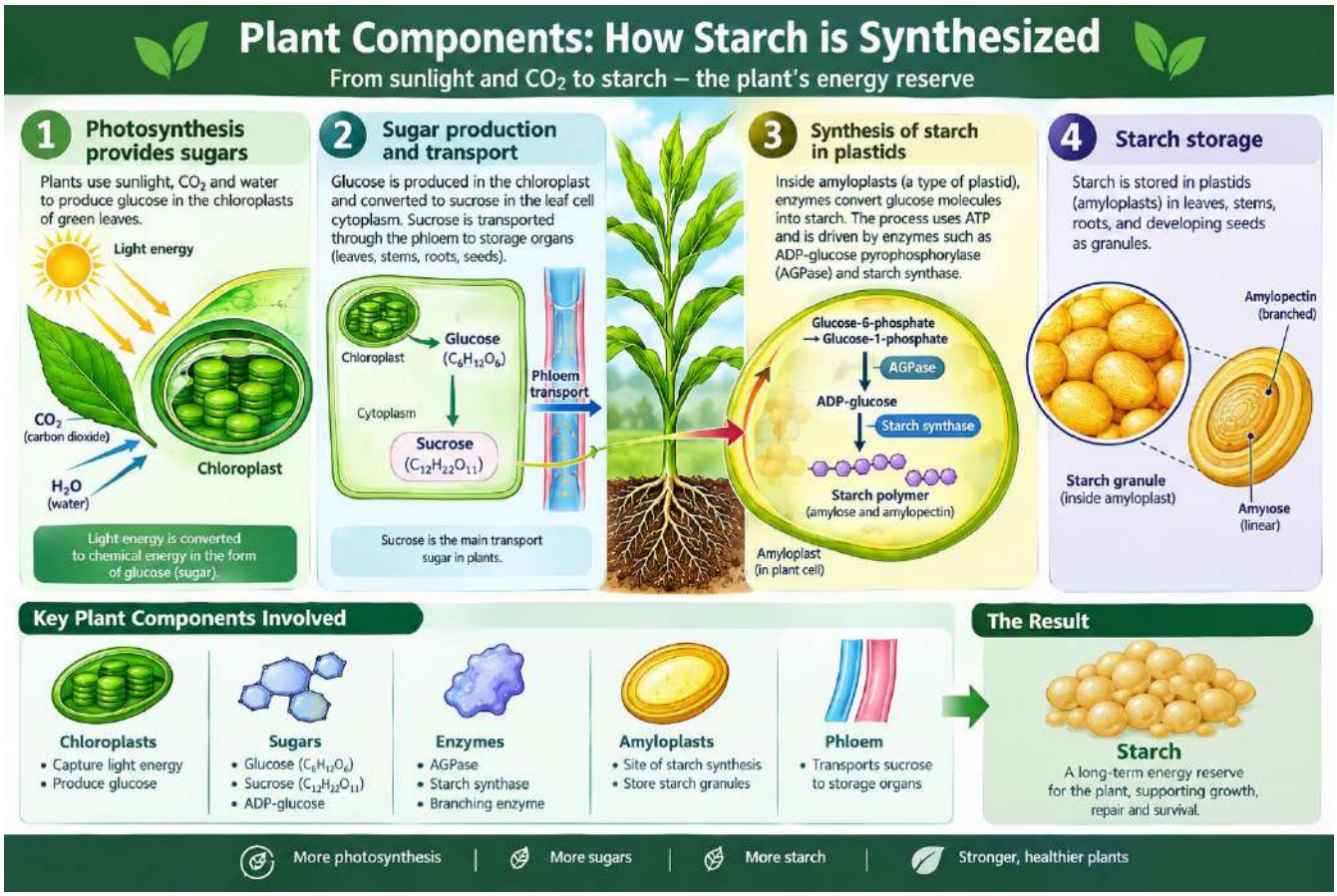


Figure 3: Starch biosynthesis in plants. Sugars produced during photosynthesis are converted into the starch molecules amylose and amylopectin and stored as energy reserves in plant tissues.

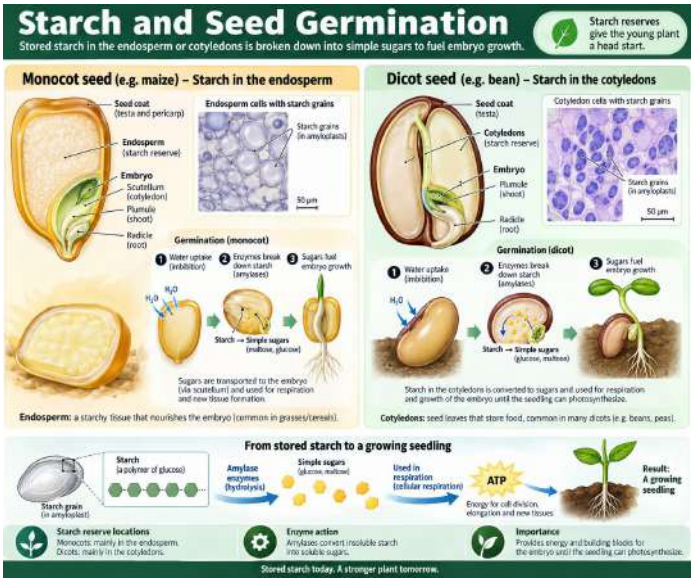


Figure 5: During germination, starch reserves stored in seeds are converted into sugars that power early seedling growth.

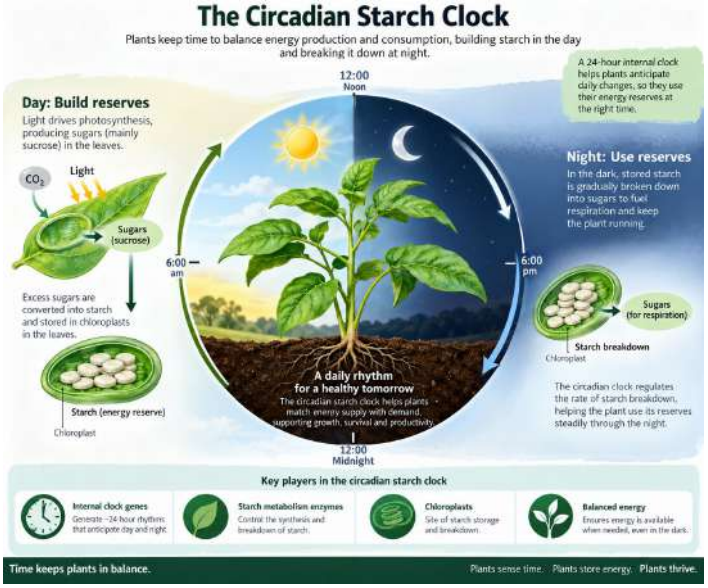


Figure 4: The circadian "starch clock" regulates how stored starch is used throughout the night so that reserves last until dawn.

As darkness falls, plants calculate how much stored starch is available and adjust the rate at which it is used so that supplies last until dawn. This process is controlled by an internal circadian clock that effectively enables plants to "budget" their energy throughout the night.

This biological timekeeping system prevents plants from exhausting their energy stores before sunrise while also avoiding unnecessary starch accumulation. It allows plants to balance growth and survival under constantly changing environmental conditions.

The Role of Starch in Seed Germination

Before seedlings develop leaves and begin photosynthesis, they depend entirely on stored food reserves. Starch acts as the seed's first source of energy.

When a seed absorbs water, enzymes become active and begin breaking down starch into simple sugars such as glucose and maltose. These sugars fuel cell division, root emergence and shoot growth, allowing the young plant to establish itself successfully.

Once the first leaves develop and photosynthesis begins, the seedling gradually becomes independent of these stored reserves. Healthy starch reserves therefore play a critical role in successful germination, vigorous seedling establishment and ultimately strong crop performance.

Starch as an Emergency Reserve During Stress

Starch is not only important for growth. It also serves as an emergency reserve during environmental stress.

When plants experience drought, salinity or extreme temperatures, photosynthesis often becomes restricted. Under these conditions, plants begin converting stored starch into soluble sugars, including glucose, fructose and sucrose.

These sugars perform several important functions:

- They provide energy when photosynthesis is reduced.
- They help cells retain water and maintain turgor pressure.
- They protect proteins and cell membranes from damage.
- They support stress response mechanisms within the plant.

During drought, this starch-to-sugar conversion can mean the difference between survival and death. Once favourable conditions return, plants rebuild their starch reserves and resume normal growth. This dynamic process is a key factor in plant resilience and adaptation.

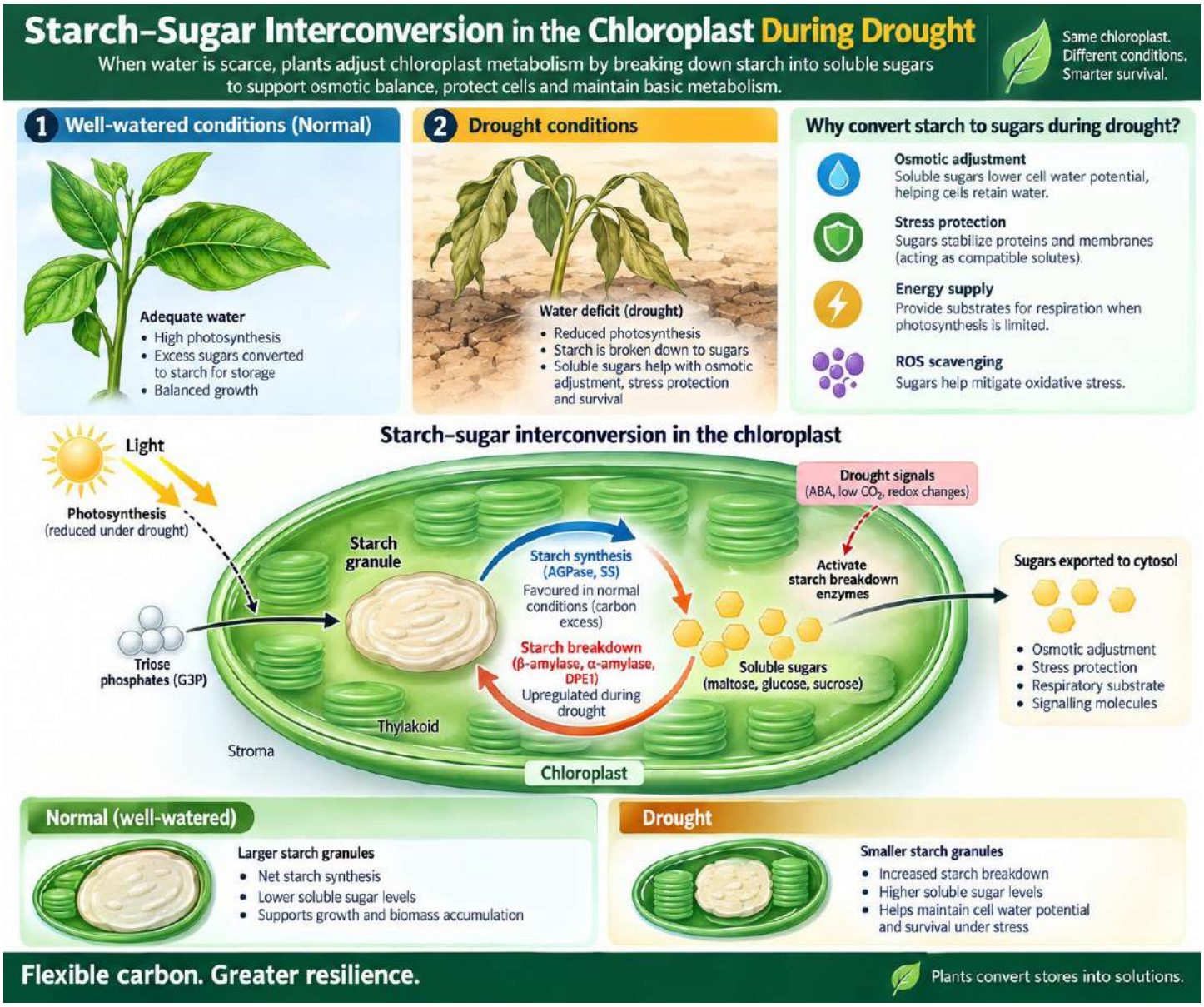


Figure 6: During drought stress, stored starch is converted into soluble sugars that help plants maintain energy supplies and protect cellular structures until conditions improve.

The Future of Crop Improvement

Understanding how plants produce, store and use starch has important implications for agriculture. Starch-rich crops such as maize, wheat, potatoes and cassava form the dietary foundation for much of the world's population. Improving the efficiency of starch production and utilisation can enhance crop productivity, food security and resilience to climate-related stresses.

Today, plant breeders and agricultural scientists are using conventional breeding techniques, biotechnology and genetic engineering to develop crop varieties with improved starch metabolism. These advances may help farmers maintain production in increasingly challenging environments while supporting sustainable agricultural systems for future generations.

Conclusion

Although largely hidden from view, starch is one of the most important substances in plant life. It fuels growth, sustains plants through the night, supports seed germination and provides a vital buffer against environmental stress. As researchers continue to unlock the secrets of plant starch storage and utilisation, this humble carbohydrate is proving to be a cornerstone of crop productivity, resilience and global food security.

Landrace Crops:
Ancient Seeds for a Drier Future



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As climate change increases rainfall variability and drought risk across South Africa, farmers are searching for crops and farming systems that can remain productive under increasingly challenging conditions. While modern crop breeding has delivered remarkable gains in agricultural productivity, some of the solutions for future resilience may already exist in traditional crop varieties that have been cultivated, selected and preserved by farming communities for generations.

These traditional varieties, known as **landraces**, represent an important component of South Africa's agricultural heritage and crop genetic diversity. They are living repositories of farmer knowledge, environmental adaptation and biological resilience.

Today, however, many of these traditional crop populations are declining or disappearing altogether. Their loss would not only reduce agricultural biodiversity but could also eliminate valuable genetic resources that may help farming systems adapt to future climatic challenges.

What Are Landraces?

Landraces are locally adapted crop varieties that have been maintained and selected by farmers over many generations. Unlike modern commercial cultivars that are produced through formal breeding programmes, landraces have evolved through continual interaction between farmers, crops and local environmental conditions.

As a result, landraces often exhibit considerable diversity within a population and are well adapted to the environments in which they have traditionally been grown.

Importantly, a landrace is not necessarily indigenous. For example, maize originated in Central America, but many traditional maize populations grown in South Africa are

regarded as landraces because they have adapted to local conditions through decades or even centuries of farmer selection.

Landraces cultivated within South African communities include cereals, legumes, cucurbits, leafy vegetables and root crops, many of which continue to contribute significantly to household food security, nutrition and cultural traditions.

Table 1. Examples of Crop Categories and Characteristics of Landraces in South African Communities

Crop Category	Crop Types	Distinct Characteristics
Cereal crops	Maize, Sorghum, Pearl millet	Grain colour, taste, maturity, drought adaptation and food-processing quality
Grain legumes	Cowpea, Bambara groundnut, Common bean	Seed colour, cooking quality, nutritional value and adaptation to local conditions
Oilseed and multipurpose crops	Marama bean, Groundnut	Food and oil use, seed characteristics and adaptation to environments
Cucurbits	Pumpkin, Bottle gourd, Watermelon	Fruit shape, flesh colour, taste, storage quality and use of leaves or seeds
Indigenous leafy vegetables	Amaranth, Spider plant, Black nightshade	Leaf yield, taste, nutritional value, seasonal availability and culinary uses
Root and tuber crops	Taro, Sweet potato, Turmeric	Tuber colour, texture, taste, cooking quality and local adaptation

This diversity is one of the most valuable characteristics of landrace populations. Within a single crop species, farmers may maintain plants that differ in grain colour, seed size, flavour, maturity period and adaptation to environmental conditions. Such variation provides a valuable resource for farmers and plant breeders alike.

Why Landraces Matter

Genetic Diversity
Landraces contain a broad range of genetic variation, including alleles that may no longer be present in many modern breeding lines. This diversity represents an important resource for future crop improvement.

Adaptation to Local Conditions
Over many years, landraces have been selected under specific local environmental conditions. Consequently, many possess traits associated with drought tolerance, heat tolerance, poor soils, salinity and low-input production systems.

Pest and Disease Resistance
Numerous resistance genes used in modern breeding programmes have originated from landrace populations. Their genetic diversity can also reduce vulnerability to widespread pest and disease outbreaks.

Support for Agroecological Farming
Landraces frequently form part of traditional farming systems that rely on biodiversity, ecological processes and local adaptation rather than high external inputs.

Nutrition and Dietary Diversity
Many landraces possess distinctive flavours, textures and nutritional qualities that contribute to dietary diversity and food culture.

Preservation of Farmer Knowledge
Landraces represent generations of farmer experience regarding seed selection, cultivation practices, harvesting methods and food preparation.

When landraces disappear, valuable agricultural knowledge is often lost as well.

The Advantages and Limitations of Landraces
Like all crop varieties, landraces possess both strengths and limitations.

Table 2. Comparison of Landrace Advantages and Disadvantages

Aspect	Advantages	Disadvantages
Yield	Stable under variable seasons and low-input conditions	Lower yield potential than improved cultivars
Genetic diversity	Wide pool of useful alleles	Less uniformity
Environmental adaptation	Drought and heat tolerance	Often adapted to specific locations
Pest and disease resistance	Resistance genes and reduced risk of total crop failure	Some remain susceptible
Input requirements	Performs well under low-input conditions	May not respond strongly to high-input systems
Quality and nutrition	Unique flavour and nutritional characteristics	Quality variation may occur
Market value	Supports niche markets and local food identity	Often excluded from formal value chains
Agronomic traits	Well adapted to traditional production systems	May mature later or lodge more easily
Cultural and social value	Preserves traditions and local knowledge	Economic benefits may not always be recognised
Seed systems	Enables seed saving and exchange	Seed quality depends on farmer practices
Conservation value	Critical resource for future breeding programmes	Vulnerable to genetic erosion



Landraces should therefore not necessarily be viewed as replacements for improved cultivars, but rather as complementary resources within diversified farming systems.

Why Landraces Are Disappearing
Despite their value, many landraces are gradually disappearing from farming communities. Several factors contribute to this trend.

Declining Intergenerational Knowledge Transfer
Migration, changing livelihoods and declining interest in agriculture have weakened the transfer of traditional knowledge.

Weakening Farmer-managed Seed Systems
Poor storage facilities, pest damage, diseases and reduced seed exchange can compromise local seed stocks.

Reduced Access to Land and Resources
Competing land uses, labour shortages and insecure tenure can discourage continued cultivation.

Limited Institutional Support
Compared with commercial crops, many landraces receive limited research investment, extension support and policy recognition.

The continued loss of these resources threatens crop genetic diversity that may become increasingly important under future climatic conditions.

The Role of Landraces During Below-Normal Rainfall Seasons
One of the most important characteristics of many landraces is their ability to cope with environmental stress. Although landraces are not drought-proof, some possess traits that help them survive or remain productive under limited moisture conditions.

Table 3. The Role of Landraces During Drier Seasons

Role	Contribution During Below-Normal Rainfall Seasons
Drought tolerance	Maintains productivity under limited water availability
Early maturity	May complete its life cycle before severe drought develops
Adaptation to local conditions	Well suited to local environmental conditions
Yield stability	Reduces risk of total crop failure
Efficient water use	Maintains growth under water-limited conditions
Deep root systems	Accesses deeper moisture reserves
Flexible planting and harvesting	Supports staggered production
Household food security	Provides food under difficult conditions
Seed security	Maintains access to locally adapted seed
Preservation of indigenous knowledge	Supports traditional adaptation strategies
Climate adaptation	Builds resilience to rainfall variability

Conserving Seeds, Preserving Futures
The conservation of landraces requires collaboration between farmers, communities, researchers and policymakers.

Farmer-led conservation initiatives, community seed banks and participatory research programmes all have important roles to play in protecting these valuable genetic resources.

As climate change places increasing pressure on agricultural systems, landraces provide more than a connection to the past. They offer valuable genetic diversity, strengthen food security and contribute to the long-term resilience of farming systems.

Preserving these traditional crop populations today may help secure the options needed for tomorrow's agriculture.

Take-home Messages

- Landraces are not drought-proof and can still suffer losses during severe drought.
- Crop performance depends on the specific variety and local conditions.
- Landraces are generally most effective as part of diversified farming systems rather than as complete replacements for improved cultivars.
- Consecutive poor seasons can reduce seed availability, highlighting the importance of community seed banks.
- Conserving landraces today helps safeguard agricultural resilience, biodiversity and food security for future generations.

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No water, no crops:

irrigation schemes could be a powerful way for South Africa's smallholder farmers to adapt to climate change

Thulasizwe Mkhabela,
University of KwaZulu-Natal.

Across South Africa's rural landscape, thousands of hectares of fertile land lie unused. Irrigation systems have collapsed, water no longer reaches crops reliably, and many farmers lack the support needed to keep production going.

This is visible in one of the country's most impoverished provinces, the Eastern Cape, where more than 53% of the communal land that has irrigation installed is currently unused. (Most of this land falls under communal tenure and is farmed by smallholders on fragmented plots where they grow produce for household consumption and to sell at local markets.) Despite significant public investment over several decades, many irrigation schemes have fallen into disrepair, water delivery has become unreliable, and large areas of farmland have been abandoned.

As an agricultural economist specialising in land systems, irrigation, and food security, I examined whether revitalising smallholder irrigation schemes in the Eastern Cape is economically and socially viable, and what makes them work.

My study examined 10 irrigation schemes in the Eastern Cape, covering over 9,400 hectares of land. I went into the field to see how the projects were working, interviewed irrigation experts and used a systematic method to compare what matters most:

- infrastructure condition
- good management
- reliability of water delivery to farmers.

My research found that irrigation schemes don't only fail when they break down. Unstable arrangements to use land and weak day to day management stops water from flowing regularly and consistently.

This matters because as rainfall becomes more erratic and droughts more frequent, farmers relying on rainfed agriculture will need to be able to irrigate crops. If their irrigation systems fail, farmers will be left fully exposed to climate shocks.

Failed communal irrigation schemes are also a missed opportunity. If revived properly, these could become a powerful tool for climate adaptation.

How irrigation for communally owned land is supposed to work

Between the 1940s and 1980s, the apartheid government set up large, state-run irrigation systems as part of the Bantustan or homeland system. After South Africa's first democratic elections in 1994, the new democratic government tried to move control of these systems from the state directly into the hands of the local farmers and communities. The post-apartheid government also began trying to revitalise smallholder farmer irrigation systems.

The idea was that the irrigation systems would help industrialise agriculture and ensure food security in rural areas where jobs were scarce and unemployment rates and poverty were high.

A communal irrigation scheme in the Eastern Cape typically consists of shared infrastructure – such as canals, pumps and pipelines – serving multiple farmers. It is supposed to be kept in good working condition through a combination of government support, farmers working together in water user associations, and local management committees. Communal irrigation schemes in the Eastern Cape typically draw water from rivers, dams, or springs via gravity-fed canals and electric pumps.

Financially, the system is a shared responsibility. The government generally pays for large-scale infrastructure and major rehabilitation. Farmers, organised into water user associations, are responsible for daily operational costs like electricity, fuel, and minor maintenance.

What we found: the real problem isn't just broken pipes

Over the last 30 years, many communal irrigation schemes across South Africa have been plagued by chronic underperformance and system collapse, leading smallholder farmers to abandon farming. Hundreds of millions of rand of irrigation equipment lie derelict due to low productivity, broken infrastructure and the desertion of farmland by the people meant to use it.

The people we interviewed told us that government efforts over the years have focused heavily on repairing physical infrastructure. But my study found that even when infrastructure exists or management structures are in place, breakdowns in coordination, maintenance or operation still disrupt water supplies. For example, blocked canals, poor scheduling, or uneven use of water prevent irrigation from reaching crops.

Managers became stuck in administrative bureaucracy and conflict resolution rather than the technical and logistical reality of farming. Their core function was to oversee the schemes, but they frequently lacked the specialised technical skills or the budget for constant repairs. They could hold meetings, but they couldn't guarantee that water would reach the crops.

What needs to happen next

Maintenance must be prioritised: Funding must be specifically allocated to routine repairs and spare parts.

Water delivery must be scheduled: Managers must follow precise calendars that dictate who get water and when. This helps ensure that the system isn't overwhelmed or unevenly used.

Technical support on the ground: Schemes need dedicated "water masters" or technicians. They should be at work every day, managing water flow levels. Distant committees that only meet to discuss problems after they occur aren't working out.



Systems must be suitable: Instead of generic high-tech systems, irrigation projects should be tailored to what the local farmers can afford to operate and fix themselves.

In short, the focus must shift from "Is the pipe in the ground?" to "Is there water in the pipe today?"

The key lesson from our research is that irrigation should be treated as a service, not just as infrastructure.

The way communal land in the Eastern Cape is governed must also change. Land-use rights for individual farmers are unclear when land is managed by traditional authorities. Legally, communal land is held in trust under customary systems, but in practice, individual farmers have informal or insecure use rights. They can't invest in their farms if they don't have secure and predictable access to land.

Stronger coordination between the government departments responsible for water, agriculture and land is also essential. Fragmented decision-making has been a major barrier in the past.

South Africa has already invested heavily in smallholder irrigation schemes. The challenge now is to revive them and make them work.

Some of the 10 Eastern Cape irrigation systems are still in working order and deliver water reliably. They also have formal agreements to use the land. The government should get these projects working at full capacity.

For those schemes that are derelict, the government must first negotiate formal agreements between farmers and traditional authorities. This will stabilise them.

Partnerships between smallholder farmers and private agribusinesses could bring skills, market access and funding if they are fair and do not weaken smallholder land rights.

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Healthy Soils, Resilient Vineyards:

Why Soil Type Matters When Reusing Winery Wastewater

Isabella van Huyssteen, Reckson Mulidzi, André Meyer and John Wooldridge
ARC Infruitec-Nietvoorbij, Stellenbosch

Early lessons from using soil enzyme activity and the Alteration Index Three (AI3) to assess vineyard soil responses to diluted winery wastewater

As water resources become increasingly constrained, many wine producers are exploring alternative water sources to improve sustainability and long-term resilience. One option is the reuse of diluted winery wastewater for irrigation. However, finding an alternative water source is only half the equation; its long-term impact must be evaluated against soil properties, biological functioning and overall vineyard resilience.

Researchers from the ARC investigated how diluted winery wastewater influenced the biochemical functioning of four contrasting vineyard soils from the Western Cape (Figure 1). Their findings show that soil type plays a major role in determining how soils respond to alternative irrigation practices. This knowledge allows growers to make more resilient irrigation decisions that protect soil function while reducing dependence on increasingly scarce freshwater resources.

Looking Below the Surface

Soil is a living system filled with microorganisms and the enzymes they produce that help recycle nutrients, break down organic matter and support plant growth. Measuring selected enzyme activities can therefore provide useful insight into how soil biochemical processes respond to different management practices.

The researchers measured the activity of



Figure 1

three soil enzymes involved in nutrient cycling: β-glucosidase (carbon cycle), acid phosphatase (phosphorus cycle) and urease (nitrogen cycle). In simple terms, these measurements help indicate how actively the soil is processing and recycling essential nutrients. Because these enzymes reflect microbial activity and nutrient transformation processes, they are widely used as indicators of soil biological health and functioning.

The enzyme activity measurements were then combined into a single indicator, the Alteration Index Three (AI3). AI3 provides an overall picture of changes in soil biochemical functioning and helps researchers compare how soils respond to irrigation with diluted winery wastewater.

Four Soils, Different Responses

The study compared four vineyard soils (Figure 2) representing contrasting soil types found in the Western Cape, specifically aeolian sand, alluvial sand, shale and granite. The soils were irrigated with either municipal water or diluted winery wastewater under controlled conditions over four simulated seasons.

The contrasting soils showed different enzyme responses. Soils containing more clay, silt and organic carbon (shale and granite) generally showed higher activities of the three enzymes. Clay minerals and organic matter can bind and stabilise enzymes, helping protect them from degradation. In contrast, sandy soils with low organic carbon were more responsive to repeated wastewater irrigation, indicating greater vulnerability to change and faster turnover of organic matter. Alluvial sands, on the other hand, remained comparatively stable.

These differences highlight the importance of understanding soil characteristics before introducing alternative irrigation strategies. For farmers, this reinforces an important principle: **soil organic matter is one of the most valuable assets on the farm**. Building and maintaining organic carbon improves biological function, nutrient cycling and long-term resilience.

Winery Wastewater Changes Soil Biochemical Activity

AI3 showed that diluted winery wastewater produced substantially greater biological responses (78%) than municipal water in all four soils (Figure 3). The largest responses were observed in the sandy soil and shale-derived soil, where selected enzyme activities increased by approximately 286% and 190%, respectively, followed by the granite soil at 40.5%. The alluvial sand showed a much smaller change of 7.6%.

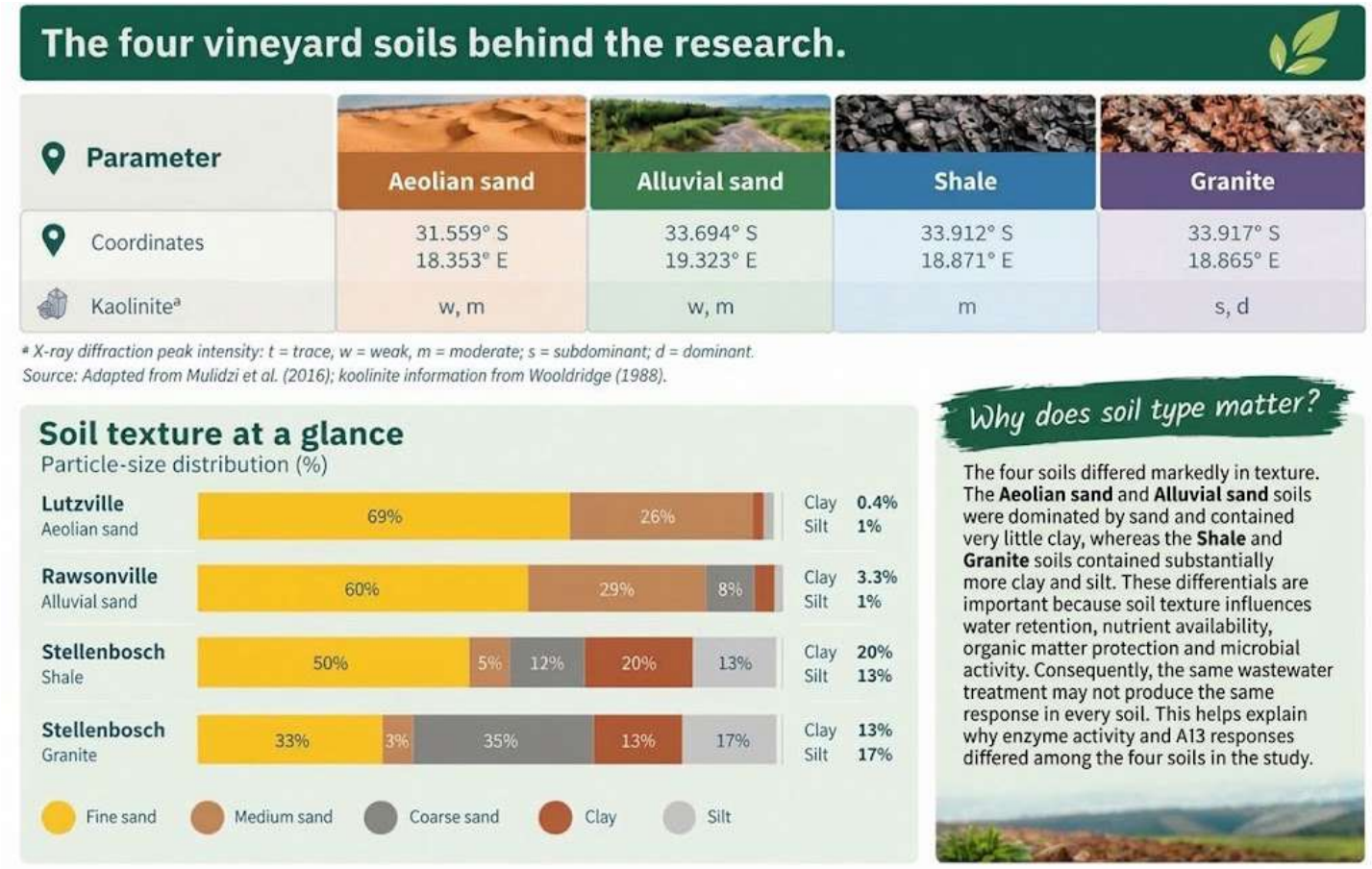


Figure 2

The wastewater supplied additional organic material that may have contributed to changes in enzyme activity. The results emphasise that soil responses to wastewater irrigation cannot be generalised across all vineyards. A practice that produces noticeable biological changes in one soil may have a much smaller effect in another.

Importantly, changes in AI3 do not automatically indicate either improvement or deterioration of soil health. Instead, they signal that the soil's biological functioning has been altered and that these changes should be interpreted alongside other factors such as soil texture and structure, organic matter content, drainage and nutrient-holding capacity.

Soil Resilience Begins with Understanding Soil Type

The study highlights an important principle for resilient farming systems: management practices must be adapted to local soil conditions. The same irrigation strategy can produce very different outcomes depending on soil texture, organic matter content and biological activity. Understanding these differences allows growers to manage risk more effectively and protect long-term soil productivity.

Practical Lessons for Growers

The findings offer several practical messages for vineyard managers:

- Know your soil before implementing wastewater irrigation or changing your irrigation strategy.
- Recognise that different soils may respond very differently to the same water source due to variations in texture, organic matter, drainage and water-holding capacity.
- Monitor a range of soil health indicators rather than relying on a single measurement.
- Maintain soil organic matter to protect biological function and improve long-term resilience.
- Consider biological indicators such as enzyme activity and AI3 as part of a broader, integrated soil monitoring strategy.

Building Resilient Vineyard Soils

- Know your soil type before introducing wastewater irrigation.
- Maintain soil organic matter.
- Monitor biological, chemical and physical soil indicators.
- Adapt irrigation strategies to local soil conditions.
- Use alternative water sources responsibly.

Looking Ahead

Water reuse is likely to become increasingly important as agriculture adapts to future resource challenges. This study demonstrates that soil enzymes and AI3 can provide useful tools for assessing how vineyard soils respond to alternative irrigation practices.

While the work was conducted under controlled conditions, the findings highlight the value of monitoring biological indicators together with physical and chemical soil properties when evaluating sustainable irrigation options. For growers, the message is clear: sustainable water management and healthy soils go hand in hand. Together they form the foundation of resilient vineyards that can continue to perform under increasing water constraints and changing environmental conditions.

Further Reading

van Huyssteen, I., Mulidzi, A.R., Meyer, A.H. & Wooldridge, J., 2020. *Alteration Index Three Facilitates Interpretation of β-glucosidase, Acid Phosphatase and Urease Activities in Soils Irrigated with Diluted Winery Wastewater.* South African Journal of Enology and Viticulture, 41(2), 238-244.

Acknowledgements

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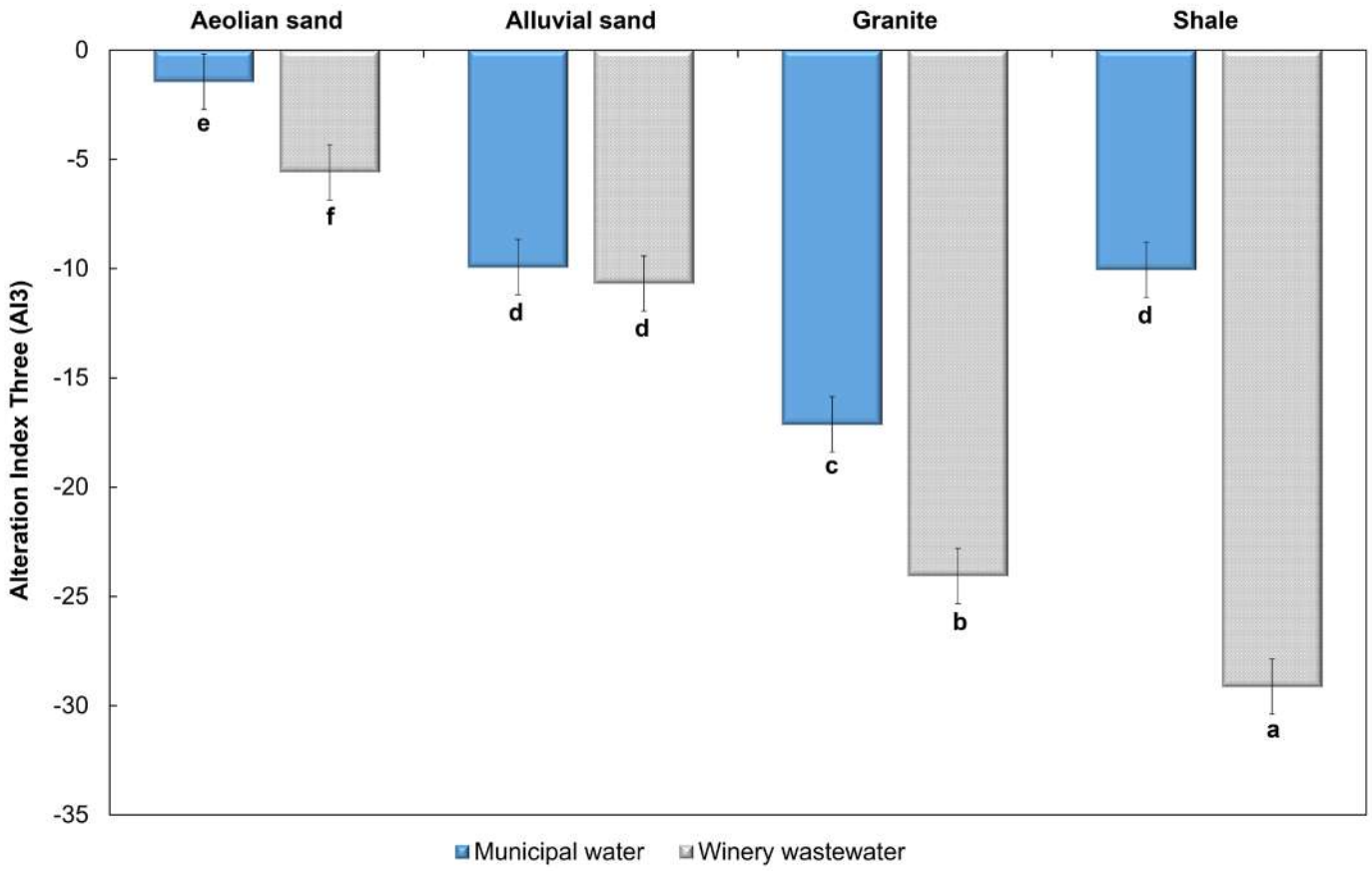


Figure 3

How El Niño-related conditions could affect farm water

Dr Kyle van Heyde, Dr Sarah Roffe and Dr Michael van der Laan
ARC– Natural Resources and Engineering

The El Niño–Southern Oscillation, or ENSO, is a naturally occurring cycle in the tropical Pacific Ocean that influences weather patterns across the world. El Ni*ño and La Niña* are the warm and cool phases of this cycle, respectively, with ENSO fluctuating irregularly between El Niño, neutral, and La Niña conditions, roughly every two to seven years. ENSO is one of the major drivers of seasonal climate variability globally, but it does not act alone. Its interactions with other ocean–atmosphere systems and regional processes mean its influence varies across regions and from one event to another.

In South Africa, the influence of ENSO is most evident during the summer months from December to February, particularly across the summer rainfall regions. El Niño events are generally associated with drier and warmer conditions than the long-term average, whereas La Niña events are typically associated with wetter and cooler conditions. These are statistical tendencies rather than certainties, and individual events do not always follow this expected pattern. South Africa has experienced wetter-than-average conditions during some El Niño events, drier-than-average conditions during some La Niña events, and near-average rainfall during either phase.

For water resources, the influence of ENSO extends beyond variation in rainfall alone. Reduced rainfall can contribute to lower runoff and inflows to rivers and dams, while warmer conditions can increase evaporative demand, water losses and water temperatures. In contrast, increased rainfall can lead to the mass mobilisation of sediments and pollutants, localised flooding and crop damage. The combination of land use and cover, rainfall amount and intensity, and catchment dynamics influences how pollutants are transported and mixed within watercourses.

Current observations indicate a very strong El Niño event, with seasonal forecasts suggesting further strengthening, which is expected to influence South Africa's 2026/2027 summer rainfall season. Much discussion has arisen over this event and potential upcoming implications, with a focus on rainfall, dam levels and irrigation supply. However, water quantity is only half the challenge. Farmers and communities must also consider how water quality may be affected if river flows decline, groundwater levels drop, farm dams shrink, and hot, dry conditions persist.

A strong ocean signal, but not a precise farm forecast

At the time of writing in early October 2026, very strong El Niño conditions are firmly established across the equatorial Pacific Ocean and continue to strengthen. Current forecasts indicate a high likelihood that El Niño conditions will persist through the remainder of 2026 and into 2027, potentially until around June 2027, with further strengthening possible during the austral spring and summer months.

The strength of an El Niño event does not,

however, directly determine the severity of its impacts in South Africa. Each event develops within a different combination of oceanic and atmospheric conditions that can strengthen or weaken its regional influence. A strong El Niño signal therefore does not necessarily translate into strong impacts at a particular location. For example, El Niño can increase the risk of drought, hot spells and heatwaves across South Africa's summer rainfall regions, but the severity and spatial extent of these impacts cannot be determined from the strength of El Niño alone.

The latest seasonal outlook indicates an increased likelihood of below-normal rainfall over most of South Africa's summer rainfall region during OND, NDJ and DJF. For OND, much of the region has at least a 40% chance of receiving below-normal rainfall. This dry signal strengthens into NDJ and DJF, when larger parts of the region have more than a 60% chance of below-normal rainfall. The temperature outlook shows an even stronger signal, with above-normal minimum and maximum temperatures forecast across most of South Africa throughout OND, NDJ and DJF. Together, these signals point towards an increased risk of drier- and warmer-than-normal conditions during the 2026/2027 summer season. The latest seasonal forecasts and updates on the developing El Niño can be accessed through seasonal forecasts provided by the South African Weather Service and the University of Pretoria's Seasonal Forecast Worx.

Seasonal forecasts cannot, however, determine exactly how much rain will fall, when it will occur, or what an individual farm or catchment will experience. Continued monitoring is therefore important as the season unfolds. The ARC's Agricultural Drought Early Warning System (ADEWS) provides information on current drought conditions and now includes information on drought observed at different timescales during previous El Niño events, helping users place the developing season within a historical context. The ARC's Weather Risk website complements this information with shorter-term weather forecasts, allowing farmers to monitor rainfall, temperature and other weather risks relevant to their location. Considering information across these different timescales - from ENSO and seasonal forecasts



Figure 1: El Niño-influenced dry periods can modify water quality. Lower flows may concentrate pollutants and salts, while returning rainfall can rapidly mobilise accumulated contaminants in the first flush.

to shorter-term weather forecasts and drought monitoring - provides a stronger basis for preparedness than relying on the El Niño signal alone.

Water quality and ENSO

The effects of ENSO-related conditions on water quality are complex, and research on the Crocodile River (East) in Mpumalanga shows this. Between 2016 and 2021, chemical oxygen demand, suspended solids and *E. coli* responded differently across El Niño, La Niña and neutral periods. Similarly, a study of Gauteng's Klip River found poorer overall water quality during the hot, dry 2015–2016 El Niño season compared to the wetter 2016–2017 season. However, the pollutants and areas of greatest concern changed between seasons. Together, these studies show that ENSO alters how existing pollution is diluted, retained and transported, while local land use, infrastructure, wastewater treatment and runoff determine the outcome (Figure 1).

During hot, dry periods, lower flows provide less dilution for sewage, industrial effluent and agricultural return flows. Evaporation may concentrate dissolved salts, while warmer water generally holds less oxygen and slower-moving water reduces mixing. Nutrient-rich water may encourage algal growth or cyanobacterial blooms, producing high oxygen during the day but sharp declines at night or when the algae decompose. Low dissolved oxygen within the water column may allow for ammonium to persist while also enabling bacteria to convert nitrate into nitrogen gas, removing it from the water. Near the bottom of a river or dam, oxygen depletion may release phosphate previously bound to iron compounds in the sediment, potentially sustaining algal or cyanobacterial blooms.

International studies reveal similarly varied responses. During the strong 2015/2016 El Niño, reduced rainfall in Malaysia's Kampar River coincided with unfavourable changes in dissolved oxygen, suspended solids, turbidity and ammonium. In Spain, a 44-year study of the Sau Reservoir linked declining inflows to an estimated 20% reduction in reservoir oxygen conditions. Agricultural studies also distinguish pollutant concentration from load. Research in Georgia (USA) found that ENSO was more clearly reflected in nitrate loads than concentrations because the quantity transported depended strongly on streamflow. A modelling-based study across the US Corn Belt found that different types of El Niño produce contrasting changes in nitrogen and phosphorus loads.

These international findings cannot be applied directly to the South African context, but they help us to identify changes worth taking note of, including flow, temperature, salts, oxygen, sediment, nutrients and microbial contamination. Because the outcome of impacts associated with El Niño events are dependent on local rainfall, land use, pollution sources and infrastructure, one parameter, or one sample, cannot tell the whole story. The ARC Water Science division has developed a water quality toolbox to help farmers, citizen scientists and water practitioners screen key indicators in the field, track changes in their water over time and identify when more detailed laboratory testing may be needed. More information on this toolbox and the results of testing are available on the Water Research Observatory citizen science website.

What this could mean for the farming sector

For the 2026/2027 summer season, the practical message is not that every farm will experience deteriorating water quality. Rather, water conditions may change quickly as rainfall, river flow and dam levels change. Two periods deserve particular attention. These are extended hot and dry spells, and the first substantial rainfall that produces runoff. During a severe drought associated with El Niño conditions, farmers may face a water quantity–quality paradox. Reduced rainfall and dam inflows can lower irrigation allocations and farm dam reliability, while higher temperatures increase crop water demand, soil moisture depletion, and evaporation losses. At the same time, declining river flows and greater evaporation may concentrate salts in irrigation water. This poorer-quality water can increase the leaching requirement needed to prevent salt accumulation in the root zone, precisely when less water is available. Crops may therefore experience water and salinity stress simultaneously, resulting in yield losses even where some irrigation water remains available (Figure 2).

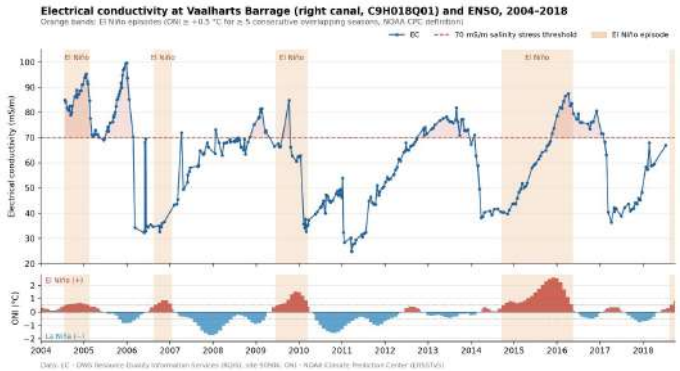


Figure 2: Salinity (measured as electrical conductivity, EC) in the water at the Vaalharts Barrage right canal from 2004 to 2018.

Readings above the dashed line exceed the 70 mS/m salinity stress threshold. Orange bands mark El Niño periods, and the lower panel shows the strength of El Niño (red) and La Niña (blue) over time. Salinity builds up gradually over a few years and then drops sharply, most likely when big summer flows flush the system. High salinity is not limited to El Niño or drought conditions, with elevated readings also occurring during neutral and La Niña periods. But when salinity does rise during a drought, it creates a double problem for irrigators. Saltier water means more water is needed to leach salts out of the root zone, and that extra water is needed just when it's scarcest. Data: Department of Water and Sanitation (site 90906) and NOAA Climate Prediction Centre.

Farmers who rely on watercourses and irrigation canals should not assume that low flow means cleaner water. Poorly treated wastewater and other continuous discharges may make up a larger share of the available flow during dry periods. When rain returns, it may increase water availability but also carry sediment, manure, fertiliser, pesticides, sewage and litter into rivers and dams. Elevated salinity and sodicity can affect sensitive crops and gradually damage soil structure, particularly where limited rainfall provides little flushing of the root zone.

Changes in farm dams and livestock watering points may be gradual and easy to miss. As water levels fall and less new water enters the dam, the remaining water can become warmer, while salts, nutrients and organic matter become more concentrated. These conditions can encourage algal or cyanobacterial blooms. Surface scums, unusual green or blue-green water, strong odours, animals avoiding the water or unexplained illness should trigger further investigation. Clear-looking water is not automatically safe, as salts, pathogens and some toxins are not always visible to the naked eye.

Groundwater generally responds more slowly than rivers and dams. Reduced recharge may only become apparent later through falling groundwater levels, declining borehole yields or longer pumping times. Increasing abstraction to compensate for declining surface-water supplies can worsen the problem and may draw more mineralised water towards the borehole.

Practical steps for farmers

Farmers cannot prevent drought (or drier conditions), but they can reduce its impacts by planning water use early, directing scarce supplies to where they deliver the greatest value, maintaining irrigation systems, conserving soil moisture and monitoring changes in both water quantity and quality. A useful approach is to establish a pre-season baseline for important water sources and repeat measurements during extended low flow and after the first major runoff-producing rainfall. Electrical conductivity provides a quick indication of changing salinity, while temperature, pH, turbidity, nutrients, and *E. coli* help identify other emerging concerns. The most effective response is not a single intervention, but a staged plan with clear thresholds for adjusting irrigation, crop area, water sources, or livestock numbers. The purpose is not to predict a farm's water quality from the El Niño label alone, but to detect changes before unsuitable water is repeatedly applied to crops, supplied to livestock or compensated for through excessive groundwater pumping. Under the drier and warmer conditions that can accompany El Niño, the concern is therefore not only whether farms will have enough water, but whether the water that remains will be safe, suitable and feasible to use. Water availability without suitable water quality is not water security.

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PROMOTION

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to the next, and the equipment must move with it.

The Husqvarna 321S15 is a petrol backpack sprayer built for farmers and landowners who need consistent output through a full day in the field, combining petrol power with the mobility to work anywhere on the farm.

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Long days in the field ask as much of the operator as they do of the machine. At 9.2 kg with a 15-litre tank, the 321S15 strikes a practical balance between capacity and manageability, while broad straps and ventilated back padding distribute the load across the shoulders and back, helping reduce fatigue and keep the pace up when there is a lot of ground to cover.

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The 321S15 is delivered with a straight 90 cm adjustable nozzle and a 3-lance nozzle with extension, giving operators two set-ups for different applications. The tank is filled through a strainer, and its transparent material keeps the level in view. The brass pump with plated pistons and corrosion-resistant stainless-steel lance keep the machine working season after season, with less spent on parts and servicing.

Safe Handling, Simple Upkeep
Spraying calls for full protection. Pair the 321S15 with Husqvarna's range of PPE and workwear, including protective clothing, gloves, boots, and eye protection. The sprayer is quick to clean down. Five litres of clean water sprayed through the nozzle clears the system, the waterproof harness wipes down easily, and it is ready for the next job.

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From Symptoms to Systems: PART 7

Working with the System

Dr Ida Wilson
Independent Crop Production Consultant

Across crops, regions, and production systems, many of the same problems appear repeatedly. They may look different on the surface - disease in one field, poor growth in another, inconsistent yield elsewhere. Crops differ, environments vary, and programmes are not identical. Yet similar patterns emerge when examined closely.

Symptoms Without Resolution
This reflects how crop systems respond to common constraints and interactions. Visible outcomes differ, but processes are often the same. One consistent pattern is symptoms recurring without resolution of the underlying cause.

A nutrient deficiency is corrected yet reappears later. A disease is controlled with fungicide, only to return under similar conditions. Pest pressure is reduced, but resurges, requiring continued interventions. The immediate problem is addressed, but the system that allows the problem remains unchanged.

Example: South African Wheat
In South African wheat production, fungicide applications are routine. This trend developed alongside no-till practices, which conserve moisture and improve soil structure. Yet crop residues (a result of not tilling) also provide a substrate for fungal pathogens. Benefits of no-till farming now depend on understanding pathogen survival, inoculum sources, and infection pathways, otherwise productivity and sustainability are compromised.

Escalation of Inputs
Another pattern is gradual input escalation. When initial interventions fail, fertiliser rates increase, crop protection intensifies, and applications become more frequent. This may stabilise yield temporarily, but over time the system becomes dependent on inputs. Management programmes grow ever more complex, costs rise, and outcomes remain inconsistent.

Example: Herbicide Programmes
Herbicides initially control weeds effectively. Over time, resistance to the herbicide develops. In response, more products are added, rates increase, mixtures become complex, and timing critical. Control becomes harder, not easier, because the system itself has changed.

Misinterpreting Failure
Failure is often attributed to the input itself, ineffective product, assumed resistance, or questioned rates. Yet conditions required for success may never have been present.

A rain event may wash off product. Fungicides may fail under extreme disease pressure. Fertiliser may appear ineffective if root uptake is restricted. Herbicides underperform when conditions misalign with their mode of action. Outcomes are interpreted as input failure, but system conditions are overlooked.



The Cycle of Adjustment
This leads to repeated adjustments without addressing causes. Rates increase, products change, applications multiply. Responses grow more intensive but not more effective. Over time, the negative cycle reproduces itself, creating systems unresponsive to specific interventions.

Preventative Programmes
Uncertainty drives reliance on preventative strategies. Fungicides applied before disease confirmation, insecticides before infestations, fertiliser programmes intensified to avoid deficiencies. These protect yield but reflect a shift away from understanding underlying drivers. Systems become managed through routine intervention rather than informed response, increasing dependency while leaving instability unresolved.

Connected Patterns
These patterns, repeated symptoms, escalating inputs, misinterpreted outcomes, growing variability, reliance on preventatives, are connected. They reflect management at the level of symptoms, not causes.

Viewed in isolation, each pattern seems manageable. Viewed as a system, they reveal consistent misinterpretation of variables that compromise health and productivity.

From Reaction to Recognition
Recognising these patterns changes understanding. Instead of asking what went wrong once, ask whether the same pattern has occurred before. Instead of focusing on symptoms, shift attention to processes producing them.

This creates opportunity to move from reaction to recognition, from managing problems to understanding systems. These patterns are not evidence of poor decisions, but of a framework misaligned with modern crop systems.

Once recognised, the next step is not simply to respond differently, it is to think differently. Working with the system is not passive. It is active, informed, and strategic.

In the last part of this series, available in the next edition of AgriAbout, I discuss how we can farm systems and not symptoms.

Contact the author: ida@cropgeniusai.com

Read PART 8 (**Farming Systems, Not Symptoms**) in the next edition of AgriAbout

Breërivier-Landbouvereniging: ’n Eeu van groei en trots

Lynette du Toit

Honderd jaar se geskiedenis is veel meer as ‘n versameling datums. Dit is die verhaal van mense wat die land bewerk het, saam uitdagings aangepak het en ‘n gemeenskap opgebou het waarvan die waarde veel verder as die plaashek strek.

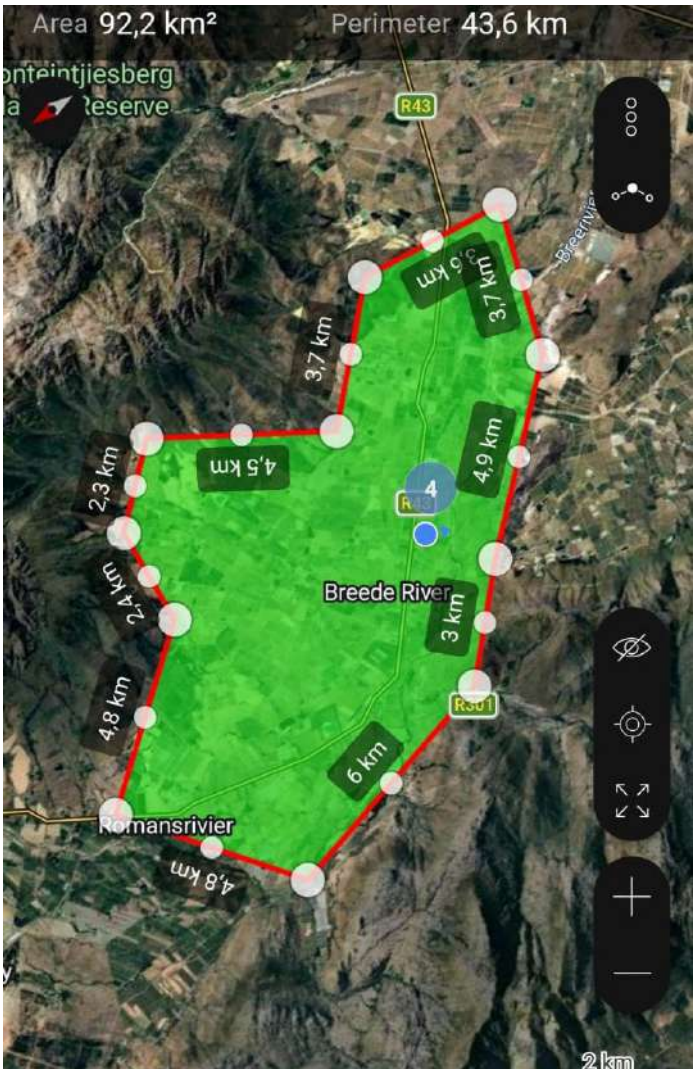
Op 22 September 1926 is die Breërivier-Landbouvereniging gestig. Honderd jaar later vier die vereniging hierdie besondere mylpaal, ‘n eeu waarin die landboubedryf saam met die vallei ontwikkel het en deur verandering, uitdagings en nuwe geleenthede gevorm is.

Agter elke datum in die vereniging se geskiedenis lê mense se stories: boere wat met perdekarre dorp toe gery het, gesinne wat saam die seisoene se werk aangepak het, bure wat mekaar bygestaan het en leiers wat geglo het dat boere sterker staan wanneer hulle saamstaan.

Die vereniging se eeufees is daarom nie net ‘n terugblik op ‘n organisasie se ontstaan nie. Dit is ook ‘n geleentheid om die mense, gewoontes, boerderymetodes en gemeenskapsbande te onthou wat Breërivier oor ‘n honderd jaar help vorm het.

’n Geelhoutkissie en die waarde van geskiedenis

Die vereniging se vroeë geskiedenis bevat ‘n klein raaisel. Volgens ‘n berig wat op 20 Junie 1986 in *Die Burger* verskyn het, het die eerste twaalf jaar se notuleboeke ontbreek. ‘n Geelhoutkissie en die dokumente wat wel behoue gebly het, vorm deel van die verhaal wat oor die jare aan die vereniging se geskiedenis gekoppel is.



Die Breëriviervallei waar ‘n eeu se landbougeskiedenis afgespeel het.
Foto: Voorsien.

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Die ontbrekende notules herinner ons daaraan hoe maklik 'n gemeenskap se geskiedenis verlore kan gaan. Wanneer dokumente, foto's en persoonlike herinneringe bewaar word, kan toekomstige geslagte verstaan hoe die omgewing waarin hulle leef, ontwikkel het.

Die beskikbare aantekeninge en koerant-uitknipsels help om die groter prentjie te skets. Dit vertel van 'n landbougemeenskap wat voortdurend moes aanpas by nuwe vervoermiddels, beter paaie, elektrisiteit, veranderende markte en die wisselvalligheid van die natuur.

Die dae van perdekarre en lang ritte dorp toe

Voordat motors en moderne vervoermiddels die landskap verander het, was 'n rit dorp toe 'n fyn beplande affêre. Perde het die swaar werk gedoen, en 'n reis wat vandag betreklik maklik is, kon 'n groot deel van die dag in beslag neem.

Die dorp het 'n belangrike ontmoetingsplek geword. Winkels het tot laatmiddag diens gelewer. Vroue het inkopies gedoen, terwyl mans op bankies voor winkels gesit en gesels



Die geelhoutkissie waarna in die teks verwys word
Foto: Voorsien

het. Tuishuise het ook deel van die sosiale lewe gevorm. Op die plase is ‘n verskeidenheid gewasse verbou om in boerderygesinne se behoeftes te voorsien. Hawer is vir hooi en veevoer gesaai, terwyl koring en rog vir eie gebruik geplant is. Vrugteboorde met Royal-appelkose, Muir-perskes en pruimedante was volop.

Van die eerste motor tot nuwe kommunikasie

Die ontwikkeling van vervoer en kommunikasie het die lewe in die vallei geleidelik verander. Volgens historiese aantekeninge was mnr. S.F. du Toit se motor reeds in 1913 deel van die omgewing se geskiedenis. In 1914 het Beyman Lategan ‘n telefoonlyn by Monte Vue aangebring. Dit was ‘n belangrike stap in ‘n tyd toe kommunikasie tussen plase en dorpe baie meer omslagtig was.

Onderwys en taal het ook ontwikkel.

Afrikaans het in 1920 die onderrigmedium by Breërivierskool geword, terwyl die Afrikaanse Bybel in 1933 verskyn het. Hierdie mylpale herinner ons daaraan dat die geskiedenis van ‘n landbougemeenskap nie net oor oeste



‘n Tipiese kapkar uit die vroeë jare.

By Suzi-k - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=28362918



en boerdery gaan nie. Dit gaan ook oor taal, opvoeding, tegnologie en die geleenthede wat nuwe geslagte help vorm het.

Elektrisiteit, water en die ontwikkeling van boerdery

Toegang tot elektrisiteit en water het ‘n groot invloed op die ontwikkeling van landbou gehad. Elektrisiteit het nuwe moontlikhede vir plase geskep, hoewel dit nie oornag oral beskikbaar was nie. Volgens historiese inligting het Guillium du Toit van die plaas Breërivier en Fanie du Toit van Tierboschkatvlei, vandag bekend as Avondson, reeds in 1929 waterkrag gebruik om elektrisiteit op te wek en twee plase van krag te voorsien. Dit was ‘n voorbeeld van plaaslike vernuf en die bereidwilligheid om nuwe oplossings te probeer.

Paaie en brûe verbind die vallei

Paaie was nog altyd noodsaaklik vir die vervoer van mense, produkte en voorrade. Vir boere was ‘n bruikbare pad dikwels die verskil tussen ‘n oes wat betyds die mark bereik en een wat deur vervoerprobleme benadeel word. Oom Ernst Botha van Witelsboom vertel

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Yara wens die Breërivier Landbouvereniging geluk met 100 jaar se toewyding aan die landboubedryf.

Ons vier hierdie besondere mylpaal saam met die boere en gemeenskappe wat die toekoms van landbou in Suid-Afrika vorm.

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dat die eerste teerpad tussen Worcester en Bainskloof reeds in 1928 deur die Worcesterse Afdelingsraad gebou is. Die ontwikkeling van brûe en paaie het die streek toenemend met groter markte en sentra verbind.

Die wynbedryf groei saam met die landbougemeenskap
Die geskiedenis van Bothas-Halte en Waboomsrivier se koöperatiewe wynkelders weerspieël die waarde van samewerking in die streek. Ná die Tweede Wêreldoorlog het die behoefte aan groter verwerkingskapasiteit toegeneem. Wynkelders het produsente in staat gestel om hul druiwe gesamentlik te verwerk, beter toegang tot markte te kry en die waarde van hul oeste te verhoog. Hierdie ontwikkeling was veel meer as net ‘n landboukundige sukses. Dit was ‘n praktiese bewys dat samewerking nuwe geleenthede kon skep.

Wanneer die natuur sy eie planne het
Geen geskiedenis van ‘n landbougemeenskap is volledig sonder die natuur se invloed nie. Van droogtes en swak oesjare tot vloede, sneeu, aardbewings en die COVID-19-pandemie moes die gemeenskap deur die jare telkens aanpas. Die natuur herinner boere voortdurend daaraan dat sukses nie net van beplanning afhanklik is nie, maar ook van veerkragtigheid. Vir boere is die natuur nooit bloot agtergrond nie. Dit bepaal wanneer geplant, gesnoei, geoes en besproei word.
Van vyftig jaar tot honderd

Toe die vereniging in 1976 sy vyftigste bestaansjaar gevier het, is daar teruggekyk op die geskiedenis, waardes en karakter van die landbougemeenskap. Tien jaar later het die vereniging se sestigjarige viering weer die belang van georganiseerde landbou beklemtoon. Die boodskap was duidelik: sterk landbou begin by plaaslike betrokkenheid, samewerking en gemeenskap.

Die vereniging se waarde lê in mense
Vir voormalige voorsitter Jakobus van der Merwe lê die vereniging se waarde nie bloot in vergaderings of besluite nie, maar in mense



Die Springbokke speel: Gesellige saamkyk op die groot skerm tydens die eeufeesvieringe
Foto: Voorsien

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wat mekaar help. Hy onthou hoe lede op 'n Saterdag gehelp het om 'n brand te blus op 'n plaas waarvan die eienaar nie eers 'n lid van die vereniging was nie. Die antwoord was eenvoudig: "Ons help almal."

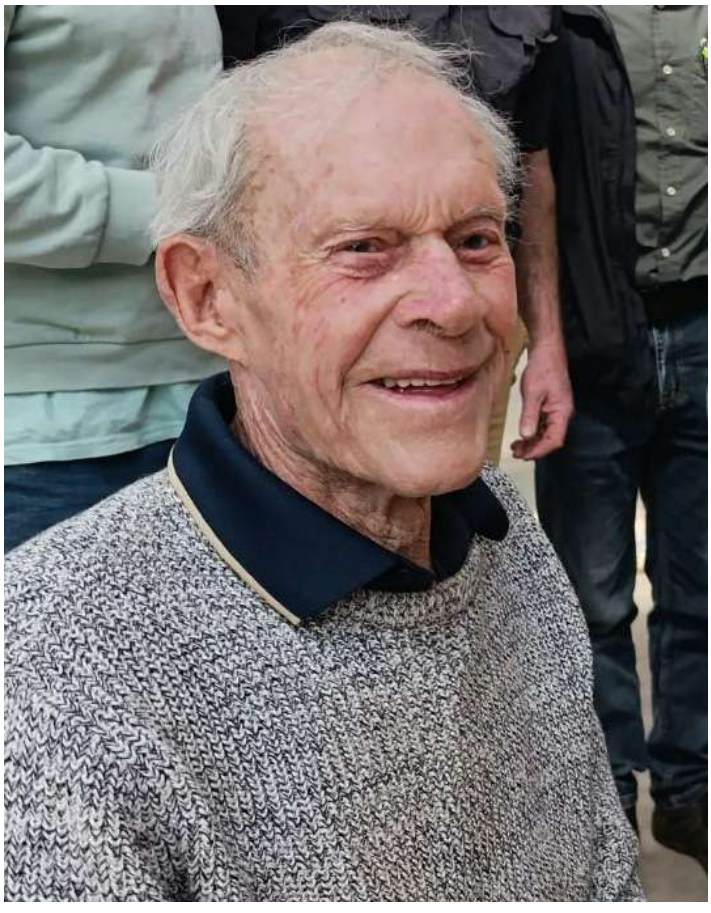
Rian Botha beskryf die vereniging as die hartklop van die buurt. Landbouskoue, danse, fondsinsamelings en byeenkomste het mense bymekaar gebring en verhoudings versterk.

'n Nuwe geslag bou voort

Ludwig van der Merwe se perspektief bring die verlede en die hede bymekaar. Volgens hom het tegnologie baie verander, maar boerdery bly afhanklik van mense wat bereid is om te leer, aan te pas en verantwoordelikheid te neem. Sy woorde, "Ouderdom is net 'n getal", pas by 'n vereniging wat honderd jaar oud geword het, maar steeds relevant bly.

'n Eeufees om te onthou

Op 5 September 2026 het die gemeenskap by Bosjes byeengekom om hierdie merkwaardige mylpaal te vier. Een van die hoogtepunte



Joubert Lategan (89),Foto: Voorsien.

'n Eeufees
van georganiseerde landbou

Wanneer 'n landbouvereniging honderd jaar oud word, vier 'n mens nie net 'n geskiedenis van boerdery nie, maar ook 'n eeu van samewerking, diens en betrokkenheid by die landbougemeenskap.

Volgens Heinie du Toit, voorsitter van Agri-Witzenberg en visepresident van Agri Wes-Kaap, beklemtoon Breërivier-Landbouvereniging se eeufees die belangrike rol wat plaaslike landbouverenigings binne georganiseerde landbou speel.

'n Sterk struktuur, 'n groter impak

Agri-Witzenberg vorm deel van Agri-Wes-Kaap, wat uit 19 streke bestaan en ongeveer 90 landbouverenigings en 3 500 produsente verteenwoordig. Op nasionale vlak bestaan Agri-SA se struktuur uit nege provinsiale affiliasies, 21 kommoditeitsorganisasies en 53 korporatiewe lede. Die netwerk sluit ongeveer 1 000 landbouverenigings en 14 000 vol betaalde boere lede in.

Die krag van hierdie struktuur lê daarin dat produsente se behoeftes van grondvlak af deurgevoer kan word. Plaaslike landbouverenigings gee boere 'n stem en verbind hulle met streek-, provinsiale en nasionale strukture. Agri Wes-Kaap en Agri SA se mandaat sluit in om beleid te beïnvloed, wetgewing te monitor en namens produsente met relevante rolspelers in gesprek te tree om hul belange te bevorder.

> *"Die boerevereniging is die grondslag van georganiseerde landbou in Suid-Afrika."*
>
> – **Gert Kotze**
> Destydse adjunkminister van Landbou, Ekonomiese Sake en Waterwese (1986)

Dié beginsel is reeds in 1986 beklemtoon toe die destydse adjunkminister van Landbou, Ekonomiese Sake en Waterwese Gert Kotze gesê het: "Die boerevereniging is die grondslag van georganiseerde landbou in Suid-Afrika." Die boodskap bly vandag relevant: 'n Sterk landboustruktuur begin by aktiewe plaaslike verenigings waar produsente saamwerk en hul stem laat hoor.

Saamstaan wanneer die landbou uitdagings beleef

Produsente kom voortdurend voor uitdagings te staan. Graanprodusente ervaar druk rondom koringpryse, die sitrusbedryf het met aanbodkwessies te make, sagtevrugte- en tafeldruifprodusente kan deur toeganklikheid tot hawens geraak word, en die rooivleisbedryf moet die bedreiging van bek-en-klouseer hanteer. Natuurrampe en ander onvoorsiene gebeure verhoog die druk op boerderye verder.

Juis daarom is samewerking en georganiseerde verteenwoordiging belangriker as ooit. Deur sy strukture en bande met landboubedrywe en besigheidsvennote kan Agri-SA help om produsente se probleme onder die aandag van toepaslike rolspelers te bring en hul belange te bevorder.

'n Eeufees om te vier

Du Toit beklemtoon dat 'n landbouvereniging net so effektief is soos die bestuur en lede wat bereid is om tyd en moeite daaraan af te staan. Hierdie diens vereis betrokkenheid, toewyding en 'n opregte bereidwilligheid om produsente se behoeftes te verteenwoordig.

Hy het Philip Botha en die Breërivier-Landbouvereniging se bestuur hartlik gelukgewens met die vereniging se honderdjarige mylpaal en hulle bedank vir hul volgehoue betrokkenheid en diens aan produsente.

Hy sê Agri Witzenberg is bly om so 'n aktiewe vereniging in sy streek te hê en wens Breërivier-Landbouvereniging voorspoed toe vir die volgende honderd jaar.

Breërivier
LANDBOUVERENIGING
1926 – 2026

Breërivier Landbouvereniging
ons klink saam met julle 'n glasie
op julle 100 jaar mylpaal.

Hierdie geskiedkundige oomblik spreek van harde werk, toewyding en deursettingsvermoë in die landboubedryf.

Breërivier Landbouvereniging julle is voorwaar 'n inspirasie vir die ander Landbouverenigings in die Agri-Witzenberg streek.

Mag hierdie besonderse mylpaal julle motiveer om die nuwe generasie boere te help bou aan die volgende 100 jaar.

Agri-Witzenberg staan bankvas agter julle asook **Agri Wes-Kaap**.
Julle kan verseker wees van ons volgehoue ondersteuning, raad en advies.

Ons is saam met julle trots op die ryke geskiedenis van 100 jaar!

100 Jaar

Agri-Witzenberg
GEAFFILIEER BY
AFFILIATED TO AGRI WES-KAAP · WESTERN CAPE · IKAPA

van die dag was die teenwoordigheid van mnr. Joubert Lategan, wat op 89-jarige ouderdom die oudste lewende lid van die vereniging is. Die eeufees was ‘n huldeblyk aan die stigters, bestuurslede, boeregesinne en gemeenskapslede wat oor die jare tot die vereniging se voortbestaan bygedra het.

Die goue draad deur honderd jaar

Wanneer ‘n mens terugkyk oor honderd jaar, is dit maklik om die verhaal aan die hand van datums te vertel: die stigting in 1926, die ontwikkeling van kommunikasie en elektrisiteit, beter paaie en brûe, die groei van die wynbedryf en die mylpale van 1976, 1986 en 2026.

Maar die goue draad deur al hierdie gebeure is die mense. Dit is die boere wat met beperkte middele begin het, die mense wat nuwe tegnologie probeer het, die produsente wat saamgewerk het, die bure wat gehelp het wanneer nood ontstaan het en die lede wat geglo het dat ‘n vereniging slegs lewendig bly wanneer mense bereid is om betrokke te wees.

Die Breërivier-Landbouvereniging se eeufees was daarom nie net ‘n viering van wat verby is nie. Dit was ook ‘n geleentheid om te besin oor wat die huidige geslag vir die volgende honderd jaar wil nalaat.

Die paaie, brûe, wingerde, plase en geboue vertel ‘n deel van die verhaal. Die ander deel leef voort in die herinneringe, waardes en verhoudings van die mense wat die vallei hul tuiste noem.

Vandag staar landbou nuwe uitdagings en geleenthede in die gesig. Tegnologie, markte, klimaatsverandering en volhoubaarheid bly belangrike gesprekspunte. Wat egter onveranderd bly, is die waarde van samewerking.

Honderd jaar se liefde vir die grond, deursettingsvermoë en ‘n gemeenskap wat weet dat ‘n mens verder kom wanneer jy nie alleen probeer nie. Dit is die verhaal wat Breërivier-Landbouvereniging vandag vier. En dit is ‘n verhaal wat nog lank nie klaar geskryf is nie.



Die huidige bestuurskomitee Foto: voorsien

Climate change is a challenge for smallscale farmers:

how a mix of old and new techniques produced a superior maize harvest in a dry part of South Africa

Abeeb Babatunde Omotoso:,
Oyo State College of Agriculture and Technology, Nigeria, North-West University
Abiodun Olusola Omotayo:
North-West University

New research into rural small-scale farms in South Africa's North West province has found that climate-smart farming techniques lead to a better maize yield, a more regular supply of food for the farmers, and a wider variety of crops.

Small-scale farmers often produce primarily for their own consumption, but many also sell produce in local markets. Because small-scale farmers rely on their crops both to survive and as their only form of income, they are particularly vulnerable to the impacts of climate change.

Some of the climate-smart techniques being successfully used are:

- planting drought-tolerant maize seeds (a new variety of maize that grows well even when there is a drought)
- mulching (covering the soil with a layer of leaves or bark to keep the moisture in)
- cover cropping (planting grasses or legumes between the main crop to nourish and protect the soil)
- mixed cropping (growing two or more crops together to repel pests)
- zero tillage (placing mulch over the soil and planting seeds in that layer instead of digging beds).

The North West province of South Africa has a semi-arid climate with hot summers and mild winters. More frequent and intense droughts and unpredictable rain have created an unstable environment. Traditional farming practices have become less reliable, underscoring the urgent need for adopting climate-smart agriculture.

Across South Africa, rural small-scale farming families are very vulnerable to climate change. They do not own expensive irrigation systems. These days, rains are often delayed. This means the small-scale farmers can no longer plant as early as they used to. This affects growing seasons and reduces their crop output, creating food insecurity in their households.

We are agricultural economists who research how climate-smart agricultural practices can make small-scale farmers more productive and resilient. As our findings show, adopting certain agriculture practices helps mitigate climate impacts. It also leads to increased food availability and a more diverse range of foods, enhancing overall food security for rural farmers. Maize is an important crop in South Africa. Tens of millions of people eat 5.2 million tonnes a year of this staple food, which provides essential nutrients and forms a significant part of their diet.

The study

We interviewed more than 300 small-scale maize farmers from 30 rural communities across the North West province, which borders Botswana. We asked them what farming practices they had used during the



2022 and 2023 agricultural seasons. Our research found that they'd started adapting their farming to climate change since 2010, based on their Indigenous knowledge of how to cope with droughts, storms and changes in the climate, how to conserve water, protect the soil, and how to introduce new crops.

In 2011, South Africa released the National Climate Change Response White Paper. As part of this, climate smart agriculture was integrated into agricultural policies and programmes run by agricultural scientists, non-governmental organisations, and government agriculture extension services in the study area. This specialist advice plus the farmers' grassroots solutions evolved into the climate smart agriculture they practise today.

This synergy is an important part of helping small-scale farmers adapt to climate change because, ultimately, the individual farmer's unique perception of climate change determines what farming practices they choose to implement.

What we found

We found that 86% of the farmers interviewed (or 272 farmers) had adopted climate smart agriculture. As one farmer said: *The weather used to be more predictable, and we knew when to plant and harvest. However, the rain comes late or not at all. I've had to change how I farm through trying new seeds and planting techniques... It is not just about growing food; it is about adapting to the new reality we face.*

That most farmers began adapting to climate change on their own highlights their ingenuity and resilience and shows that small-scale maize farmers can farm while the climate changes.

The farmers who adopted climate smart agriculture had more maize to consume than farmers who had stuck to ordinary farming methods. They harvested around 6.2 tonnes of maize per hectare per year, earned about R15,000 (US$824) per hectare from selling their maize, and sold 4.1 tonnes of maize per year.

The farmers who stuck to ordinary farming methods harvested 3.9 tonnes per hectare, sold 2.7 tonnes of maize, and earned about R11,500 (US$632) per year. The 30% improvement in earnings for farmers who use climate smart agriculture is meaningful and transformative. Small-scale farmers often operate on thin profit margins. A 30% improvement in earnings provided these farmers with economic stability, the chance to re-invest the money in their farms, and improved livelihoods.

The benefits of climate-smart agriculture

Enhanced soil health: Practices like cover cropping and using organic fertilisers improve soil structure and fertility. This leads to more crops for harvesting. **Environmental sustainability:** Climate smart agriculture includes conservation agriculture (combining intercropping, mulching and zero tillage) and agroforestry (planting trees and bushes with crops). These store carbon and reduce greenhouse gas emissions from farming activities, contributing to environmental sustainability.

Improved food security: With more diverse farms came additional food and income sources. This reduced the farmers' dependence on a single crop. It improved their resilience to climate shocks. This diversification can also buffer farmers against the risks of crop failure.

Increased productivity: We found that climate smart agriculture in the North West province improved soil health (helping the soil retain water), water management and pest control. This meant that farmers could continually rely on their crops doing well.
Economic benefits: Switching to climate smart agriculture, which is nature based, meant the farmers reduced chemical inputs such as pesticides. This saved them money. Climate smart agriculture practices can open opportunities and new markets for eco-friendly products, providing additional income for farmers.

Why government and stakeholders should make changes

The government must provide support through extension services (agricultural specialists who visit farmers with advice and training, such as on the use of climate forecast services).

The government should also provide small-scale farmers with financial incentives to switch to climate smart agriculture now. Agricultural co-operative societies must become stronger so that all small-scale farmers have access to climate smart agricultural equipment.

Government policies should be geared towards climate smart agriculture and include community engagement. Academics and government departments can also work with small-scale farmers on researching new ways for these farms to produce more crops.

Through this, South Africa can build more resilient and sustainable agricultural systems. These will secure the livelihoods of maize farmers in the face of climate change.

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The Secret Life of Soy: How a Humble Bean Becomes a Creamy Beverage

Theresa Siebert
ARC Natural Resources and Engineering

Soymilk is the aqueous extract of soybeans. When first introduced to the Western World, it was not very popular due to the "beany" taste that traditional extraction methods imparted to the product. However, modern extraction techniques have substantially improved the flavour as well as the product yield, making it more economic for processors and producers alike.

Soymilk is consumed in much the same way as dairy milk. It has also found an important market as an alternative food source for babies who are allergic to dairy milk. It can be formulated and fortified to be consumed as a beverage or food supplement. Soymilk can also be concentrated by evaporation or spray drying and can serve as substrate to prepare dairy analogues such as tofu, soy yoghurt, and soy ice cream.

Modern soymilk extraction methods seek to eliminate the development of undesirable elements and improve the flavour of the final product. To do this successfully and understanding of the chemistry of the "beany" flavour formation is required. The characteristic flavour of soymilk results mainly from reactions catalysed by an enzyme known as lipoxygenase. These enzymes need to be released to come into contact with its target-chemicals, in the presence of water. All these conditions are met when soybeans are ground and mixed with water to form a slurry. The temperature of the soy-slurry has a great effect on the rate of flavour development. As the temperature increases, so the number and volume of volatiles decrease. The enzymes are inactivated at 80°C and therefore it is critical that the slurry be heated to 80°C or above as soon as possible after, or even during, wet grinding. As an alternative, the dehulled beans can be blanched prior to grinding. Most commercial soymilk plants employ a combination of these techniques, or variations of the traditional means of producing soymilk. Regardless of the variation I process, the basic steps and principles of soymilk extraction are essentially the same.

Raw Material Selection
The selection of the right variety of soybeans is essential to successful soymilk production. Not only does it influence the quality of the product, but also the economy of the process. High yield and protein extraction is desired from the cultivar. The typical soybean used for milk extraction should yield 80% or more protein and between 55-65% total solids.

Cleaning of Soybeans
The first step in preparing the soybeans for processing is to remove foreign materials, including plant rests, stones, and dust. Cleaning is performed by a series of vibrating screens followed by aspirators and cyclone separators.



Dehulling for Milk Extraction
Most manufacturers choose not to remove the hull of the soybeans prior to extraction, because dehulling can damage the cotyledon and released oxidative enzymes that cause off-flavours. There are various arguments for and against dehulling.

If the manufacturer does preform dehulling, they need to keep a few key points in mind:
- It should be done in-line with grinding, with no residence time in between.
- It must be dome with minimum heating/ heat-hold time.
- It must be done in the absence of water.
- It must be done with a little as possible damage to cotyledons.

Soaking
There are several ways of incorporating water with the beans to obtain an aqueous extract. Soaking is one of these ways. Traditionally it was done overnight in cold water, but the soaking time can be greatly reduced by increasing the temperature of the soak water. The beans can increase in weight 2-2.3 times during soaking. The benefits include:
- Reduced power input requirements for grinding.
- Less erosion of millstones/blades.
- Reduced blanching/cooking requirements.
- Increased dispersion of “milk” solids.
- Increased yield.

Blanching
Blanching is done to inactivate the enzymes that are responsible for off-flavours and reduces the surface microbial load of the soybeans. Anti-nutritional factors such as trypsin inhibitors are also partially deactivated, and the beans are hydrated if the soaking step was not performed. Blanching is done as a two-step process with or without the addition of sodium bicarbonate.

Step 1: The beans are heated for 5 minutes in boiling water containing 0.25% sodium bicarbonate.
Step 2: the beans are drained, rinsed, and boiled again for 5 minutes in water containing 0.05% sodium bicarbonate. The addition of sodium bicarbonate to the blanching water is optional, but has several advantages:

- If the beans were not dehulled, it softens the hulls and tenderises the beans.
- Shortens the blanching time.
- Reduces the energy input required during grinding and homogenisation.
- Raises the pH, making soy proteins more soluble and increasing protein and solid recovery.

The disadvantages include:

- The possible addition of acid to neutralise the pH.
- The destruction of some key nutrients'
- The possibility of a soapy after taste.

Grinding

The purpose of grinding is to disrupt the tissues and release proteins, lipids and other solids for solubilisation and suspension in water. The method used depends largely on the preceding hydration and preparation steps. Grinding may be performed dry or wet, with hot or cold water:

- Dry grinding: This method is used by some processors to bypass soaking and blanching. The dry flour is mixed with water to form a slurry.
- Cold, wet grinding: Soaked soybeans were traditionally ground at ambient temperatures.
- Hot, wet grinding: This is the most used method. Grinding and hydration is performed in one step. Hot water and controlled conditions are required to coincide with grinding to prevent off-flavour development. The air may be saturated with steam to reduce the available oxygen and inactivate lipoxygenase enzymes.



Grinding equipment include the traditional stone mills, large blenders, hammer mills, pill milks and large commercial grinders.

Filtration and Milk Extraction
The efficiency of extraction directly determines soymilk yield. Soymilk is extracted from the slurry by:

- Filtration through cloth or vibrating screens.
- Pressing sacks.
- Centrifugation.

Extraction methods can be repeated or combined to improve extraction efficiency. The insoluble solid residue (soy pulp/okara) still contains some protein and other solids. To maximise the yield, the okara is often washed with hot water and filtered again. Filtration is omitted all together in certain cases to produce a soymilk with 100 % solids content. This naturally delivers a product with the highest yield but requires proper homogenisation and may have an unusual "chalky" mouthfeel.

***PLEASE NOTE**: The following processing steps (Cooking, Deodorization, Formulation, Fortification, Homogenisation), are optional depending on the intended final product, but are highly beneficial and as such is encouraged.*

Cooking
Cooking the soymilk increases its storage life by inactivating microorganisms and enzymes that cause spoilage. It improves the flavour of the product by inactivating the enzymes responsible for off-flavour development, improves the nutritional value by inactivating anti-nutritional factors such as trypsin inhibitors and lectins, and denatures the soy proteins, making them more easily digestible. Heating at 85-87°C for 20 minutes is common, but overheating should be avoided to prevent Maillard browning, loss of vitamins, and the development of a cooked flavour.

Deodorization
Soymilk can be deodorized to improve the flavour, or to remove off-flavours that formed during the production. This is done in a vacuum pan at high temperatures and high vacuum conditions (115°C, 0.526mm/HG). It is a very expensive process but strips the milk of all volatiles and produces a very bland product.

Formulation
Formulation involves the addition of sweeteners and flavours to soymilk to produce a more acceptable product for drinking. Ingredients that are commonly added include honey, maple syrup, sugar, vanilla extract, cocoa powder, orange juice, malt, coffee, almond extract, oil, and lecithin.

Fortification
Fortification aims to improve the nutritional profile of a food product by adding nutrients such as vitamins and minerals. Soymilk intended for baby formulas in typically fortified with calcium, B-vitamins, and essential amino acids like methionine and lysine.

Homogenisation
Homogenisation is the process whereby a liquid is forced through a very narrow opening under high pressure with the aim of breaking up fat globules, reducing them in size and ensuring they remain suspended throughout the liquid. Homogenisation prevents the separation of the fat and aqueous phases, producing a stable emulsion.

Soymilk contains aqueous and fat phases as well as large solids and added-in ingredients that need to be thoroughly mixed to form a stable food system. This is usually done at 2000-3500psi at a temperature of 90°C. The homogenised product has a smooth, creamy mouthfeel, and whiter appearance. *Homogenisation is essential for unfiltered milk and milk formulations*.

Stabilisation and Packaging
Soymilk is a highly nutritional food product and the ideal growth medium for bacteria. Commercial soymilk requires a heat stabilisation treatment such as pasteurisation or sterilisation to make it safe for consumption and the extend the shelf life. The heat stabilisation treatment is given just before or just after packaging or can even be part of the packaging process as in the case of aseptic packaging.



There are 3 basic processing options:

- Pasteurisation involves heating the milk to 75°C for 15 seconds in a heat exchanger to ensure that all vegetative bacteria that cause spoilage is destroyed. The pasteurised product is packed in glass bottles, plastic pouches, or gable-top cartons. It has a shelf life of 7 days and requires refrigerated storage. It is the best method of preservation for nutrients and original flavour.
- Sterilisation involves heating the milk to 121°C for 20 minutes in an autoclave to ensure that all forms of bacteria and their spores are destroyed. The milk is filled and sealed into cans, glass bottles, or retort pouches prior to sterilisation. The sterilised product has a shelf life of 2 years and does not require refrigerated storage. However, the high temperatures and long processing time involved causes signification vitamin loss, browning, and flavour deterioration.
- UHT processing involves heating the milk to 140-150° for 2-8 seconds in as aseptic system followed by flash cooling in a vacuum system prior to aseptic packaging in laminated box cartons, plastic bottles, or pouches. The process destroys all vegetative bacteria and their spores with minimal thermal damage to the product. The product has a shelf life of 6-8 months and requires no refrigerated storage. An added advantages of the process for unflavoured milk is the deodorisation that takes place during flash cooling.

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Thai Chicken Bowls

Ina Paarman

This simple Thai chicken with rice dish is perfect for a quick meal. The coconut cream gives it depth, while lemon or lime and our Coriander Pesto add some freshness.

Serves: 4 - 5

You Will Need:

400 g tin coconut cream

4 large or 6 smaller skinless chicken breasts

Ina Paarman's Chilli & Garlic Seasoning

½ cup (125 ml) water

1 x 25 g sachet Ina Paarman's Liquid Chicken Stock

1 x 125 g Ina Paarman's Coriander Pesto

1–2 green chillies, finely sliced

2 T (30 ml) fish sauce

1 lime or small lemon

To Serve

Rice

Sambal with mango or papaya



Method:

Place coconut cream in the freezer for 30 minutes.

Season chicken breasts with Chilli & Garlic Seasoning.

Open tin of coconut cream and spoon out thick cream that solidified at the top into a frying pan.

Heat the thick coconut cream to a fast boil over high heat.

Add the chicken breasts and half cook.

The final cook happens when the chicken is added to the sauce.

Move chicken to one side. Add the remaining coconut liquid to the pan together with the water, Chicken Stock sachet, Coriander Pesto, sliced chillies and fish sauce.

Boil for 5–10 minutes, without a lid to reduce the sauce a little.

Slice chicken into small bite-size pieces. Add the sliced chicken and any juices that might have leaked out to the pan. Cook gently for another 2 minutes.

Taste and add lemon/lime juice.

Serve with rice and mango sambal.



Eggplant Involtini

Ina Paarman

These stuffed eggplant rolls are one of best Italian-inspired recipes and ideal for a vegetarian treat. They pair perfectly with crusty bread and a salad.



Serves: 4 - 6

You Will Need:

4 medium/large eggplants, cut lengthways into 1 cm thick slices

Ina Paarman's Garlic & Herb Seasoning

Olive oil

1 x 125 g Ina Paarman's Basil Pesto

⅓ cup (80 ml) fresh white breadcrumbs

½ t (2.5 ml) Ina Paarman's Chilli & Garlic Seasoning

250 g ricotta or full cream chunky cottage cheese

½ cup (125 ml) Italian hard cheese, grated

1 x 400 g Ina Paarman's Tomato & Basil or Roast Pepper Pasta Sauce

Ina's Tip

Always shake our pasta sauce bottles out with ¼ cup (60 ml) of water to dislodge everything and add it to the sauce.

Method:

Adjust the oven rack to the middle position and preheat the oven to 200˚ C.

Arrange the eggplant slices on a large baking tray lined with baking paper, you might need two trays.

Season the slices, on one side only, with Garlic & Herb Seasoning and then drizzle generously with olive oil.

Bake for 25–30 minutes until nicely browned (no need to turn).

Remove from the oven and turn the temperature down to 180˚ C.

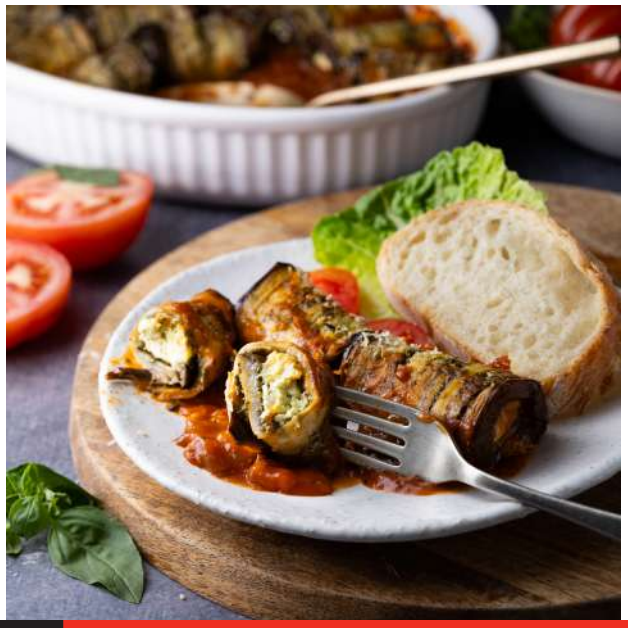
Decant the Tomato & Basil Pasta Sauce into a medium ovenproof dish. Rinse out the jar with a little water, shake and add to the sauce.

Turn the slices over and spread each underside with Basil Pesto.

Mix the breadcrumbs, Chilli & Garlic Seasoning, ricotta cheese and half the grated cheese to from a firm paste. With the widest end of eggplant slices facing you, place a generous tablespoon of cheese mixture on the wide third of each eggplant slice. Roll up.

Arrange the eggplant rolls, seam side down, in the sauce. Top with the remaining grated cheese. Bake for 25–30 minutes until bubbly.

Serve with an Italian-style bread to mop up the sauce. Dress the accompanying green salad with our Classic Balsamic Vinaigrette.



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