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Biodiversity

Sustainable agriculture & bioenergy production

Global biodiversity targets

Cover Crop technologies

Yellow Mealworm in Poultry Diets

From the Wild to the Aisles

Rural women, heritage and food security

Shaping South Africa's weather & climate services

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Editorial

October brings a shift in seasons and a timely reminder of nature's intricate balance. In this edition of *AgriAbout*, we explore a theme that lies at the heart of resilient farming systems: biodiversity.

Far from being a distant ecological concept, biodiversity is a living, breathing force in agriculture. It is the diversity of life - above and below ground - that enables farms to thrive in the face of climate change, soil degradation, and water scarcity.

We look at **cover crop technologies**, where innovation meets ecology. These crops do more than protect soil - they foster microbial life, attract pollinators, and create habitats for beneficial insects. It is a simple yet powerful way to embed biodiversity into everyday farm practice.

Water conservation is another thread in this tapestry. Biodiversity doesn't just support crops—it safeguards the resources they depend on.

Looking skyward, we examine how **South Africa's weather and climate services** are evolving to support agriculture. By integrating ecological data into forecasting, these services help farmers adapt to shifting conditions with greater precision.

We also explore the role of biodiversity in **sustainable bio-energy**. As the world seeks cleaner energy sources, bio-energy must be rooted in ecological integrity. Diverse landscapes can support energy crops without compromising food systems or natural habitats.

Together, these stories reveal biodiversity as more than a buzzword, it is a strategy for survival and renewal. As you read, we invite you to see biodiversity not as a separate concern, but as the foundation of sustainable agriculture.

Until next time

Chris



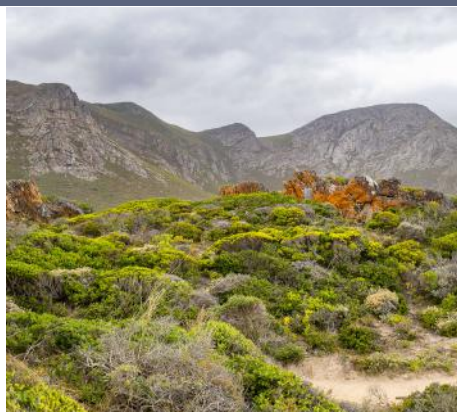
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Biodiversity supporting sustainable agriculture and bioenergy production

Dr Ashira Roopnarain and Dr Haripriya Rama
ARC-Natural Resources and Engineering

As spring gradually covers the landscape with a myriad of colours and vast diversity of birds and animals, we turn our attention to the less visible but just as important force constantly working beneath our feet: soil biodiversity. Microbes form the heartbeat of agricultural systems where they drive nutrient acquisition, improve soil structure and facilitate nutrient cycling. In fact, plant growth in soil would be impossible without the aid of microbes. These organisms are so small that they often receive minimal consideration, but it is amazing to note that a single teaspoon of soil may contain as many microbes as the people on Earth! This army of microbes including bacteria, fungi, archaea and microscopic nematodes are constantly hard at work in agricultural systems. Like plants and animals, the rich biodiversity of microbes needs to be protected and nurtured to ensure that we continue reaping the benefits of their presence in soils.

Microbes: Nature's tiniest engineers

Microbes are indeed nature's tiniest and most efficient engineers. They recycle organic matter in the soil, thereby improving soil structure and promoting plant growth. Apart from soil, this strong workforce has also been adopted in engineered systems to convert waste into a nutrient-rich product and gases through sequential intricate biochemical reactions. Interestingly, anaerobic digestion (AD), which is the microbe-mediated

conversion of organic waste to renewable energy (biogas), mirrors the natural process of soil microbes in a controlled environment. Hence, diverse microbes not only drive sustainable agriculture but may also be used to facilitate biotechnological applications, such as renewable energy generation. This emphasizes the need to protect microbes to ensure that they can protect us, by provisioning food and energy, amongst several other environmental services.

Closing the circular loop between soil biodiversity and renewable energy production

In general, nature operates in a circular manner where nothing is wasted and every process feeds into another, with soil biodiversity lying at the heart of this cycle. In the soil, an array of microbial communities breakdown organic residues, release nutrients and stabilize carbon. These same microscopic processes that support plant growth and ecosystem health also inspire technologies for renewable energy production.

Microbes serve as nature's recyclers in both natural and engineered systems, such as the soil and anaerobic digesters, respectively. In the soil, microbes convert organic matter (like leaves) into nutrients that support other lifeforms, whereas in biotechnological systems such as anaerobic digesters they convert organic waste (like food and agricultural waste) into biogas, which is a renewable

energy source that can be combusted for heating, lighting, cooking and electricity generation. This distinct parallel in the biodiversity of soils and the biodiversity within engineered systems speaks to the importance of microbial diversity in all aspects of life, from 'from provisioning the food on our tables to the energy required for food preparation.

In anaerobic digestion systems, the output from the system is biogas (gas fraction) and digestate (semi-solid fraction). Following proper handling, digestate can be returned to the land as it can enrich the soil with both nutrients and beneficial microorganisms for crop growth. This "soil-to-energy-to-soil" cycle underpins the circular and sustainable conversion of organic waste by microbial biodiversity to various products. It demonstrates how microbial ecosystems can transform waste organic matter into energy and improved crop production.

At the Agricultural Research Council (ARC), this principle is brought to life through a project titled **"Water wise waste management: Two ends of the size scale, macro and nano augmentation for dry anaerobic digestion optimisation (W3M-Dry AD)"** which is being conducted in partnership with Mozambique and Japan. Inspiration was drawn from natural soil ecosystems where microbial diversity impacts crop production and soil structure. Through this project we anticipate creating solutions for improving microbial cooperation to optimize renewable energy generation while producing nutrient-rich digestate that restores soil health (Figure 1). By mimicking nature's loops, the W3M-Dry AD project displays how protecting and learning from nature's tiniest engineers can drive innovation for cleaner energy, climate resilience and sustainable agriculture.

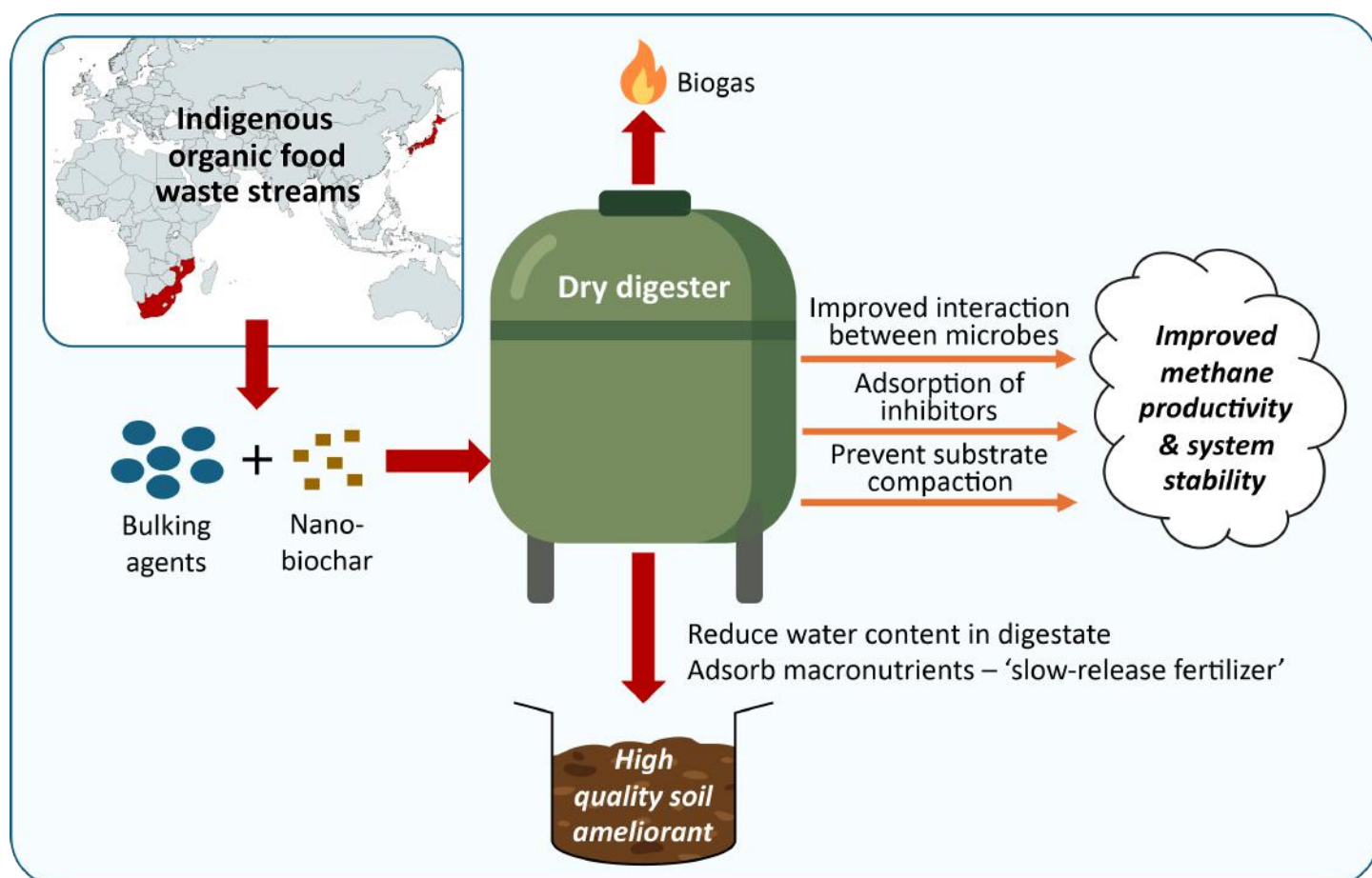


Figure 1: Overview of the W3M-Dry AD project showing the integration of indigenous organic food waste streams with bulking agents and nano-biochar to enhance microbial interaction, stabilize the dry anaerobic digestion process, and generate high quality soil ameliorants.

Microbes, farmers, and the future of innovation

Globally, farmers are benefitting from microbes through several innovations such as composting, organic farming and renewable energy initiatives – just like those that form the basis of the W3M-Dry AD project. By forming a bridge between waste management, renewable energy and soil health, this project aims to show how innovation can work hand in hand with nature, not against it.

On 24 September, each year South Africa celebrates Heritage Day, a time to honour and celebrate our diverse traditions, rich cultures and beautiful landscapes that shape who we are. Beyond food, art and music, our heritage also lies in the living biodiversity that nourishes and sustains us. The soils under our feet, teeming with microbial life, are part of that heritage. We have inherited a beautiful ecosystem that is constantly evolving with our farming and energy practices. It is our responsibility to protect this biological

legacy, which means that we need to value and nurture all lifeforms that inhabit our environment, including those that are invisible to the naked eye. In projects like W3M-Dry AD, this spirit of heritage extends to conserving the natural microbial wealth that supports clean energy, fertile soils and climate resilience for future generations.

The SA W3M-Dry AD project team is funded by the National Research Foundation (NRF) with team members affiliated to the Agricultural Research Council (ARC), University of South Africa (UNISA) and University of Venda (UNIVEN).

Please contact Dr Ashira Roopnarain (e-mail: RoopnarainA@arc.agric.za) or Dr Haripriya Rama (e-mail: RamaH@arc.agric.za) at the ARC-Natural Resources and Engineering to relay your thoughts, questions and comments on the technology and our project. We would love to hear your feedback!





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South Africa set to play key role in achieving global biodiversity targets

As a mega-biodiverse country, South Africa is ideally placed to be a world leader in efforts to protect global biodiversity.

With civil society, government, business and communities working together on a whole-of-society approach, South Africa could show the way to achieving the goals of the Global Biodiversity Framework (GBF) – but only if it increases its domestic ambition.

This was the core message from South African civil society during the final G20 Environment and Climate Sustainability Working Group (ECSWG) Technical and Ministerial Meetings in Cape Town this week.

At side events during the ECSWG meetings, participants heard how more ambitious domestic biodiversity targets, aligned with the

[South African National Parks' 2040 Vision](#), could unlock significant international funding through a variety of innovative funding mechanisms to achieve these goals.

With its complex history and socio-economic challenges, South Africa has already shown itself a world leader in adopting more inclusive and innovative approaches to conservation by promoting a stewardship model. This aligns with the SANParks' Vision 2040 which places people at the centre of conservation, recognising people as the primary custodians of their land and its biodiversity.

Over the past 20 years, more than 95% of all new protected areas (some 2,5 million hectares) have come about through biodiversity stewardship mechanisms which incentivise communal and private landowners to protect



biodiversity while they continue to live and thrive on their land.

South Africa's draft Biodiversity Economy Strategy also provides a roadmap for conserving biodiversity while contributing to economic growth and job creation through the promotion of sustainable use of the country's natural resources.

Why this matters now

South Africa is currently in the process of setting targets for its third National Biodiversity Strategic Action Plan (NBSAP) for the next 10 years (2025 to 2035).

A key component of the NBSAP will be South Africa's national contribution towards Target 3 of the GBF, which sets out a global ambition to conserve 30% of land, waters and seas.

The level of South Africa's ambition will be a key factor in determining how competitive South Africa will be in attracting additional international and national finances to bolster strained government budgets.

This is therefore a critical juncture to build an ambitious, people-centred, whole-of-society approach, with government, the private sector, and civil society working together for the benefit of people and nature.

A whole-of-society approach

According to the Department of Forestry, Fisheries and the Environment (DFFE), sources the current baseline of terrestrial protected and conserved areas is around 20.6 million hectares (close to 17% of South Africa's land surface).

To engender a whole-of-society approach towards setting an ambitious and realistic contribution to the GBF Target 3 in the NBSAP, NGOs working under the banner of the IUCN National Committee assembled data on existing funded project contributions (secured funding) as well as planned contributions (unsecured but in the process of fundraising).

WWF CEO Dr Morné du Plessis

"Vision 2040 challenges us to rethink conservation, not as something separate from society, but something deeply embedded in it. Civil society stands ready to support this journey. We believe

with the right ambition, leadership and partnerships, South Africa can show the world what people-centred conservation truly looks like."

More about the Global Biodiversity Framework (GBF)

- South Africa is among 200 countries to have committed to a 30x30 target, a key part of the Kunming-Montreal Global Biodiversity Framework, to protect 30% of Earth's land, rivers and oceans by 2030. This global agreement, adopted in December 2022, sets the framework for countries to halt and reverse biodiversity loss and ensure the healthy functioning of vital ecosystems.
- Article 3 of the GBF reads: "Ensure and enable that by 2030 at least 30% of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognising indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognising and respecting the rights of indigenous peoples and local communities, including over their traditional territories."

For more information see:

- **Financing a New Vision for Biodiversity** https://www.wwf.org.za/our_research/publications/?55882/g20-financing-a-new-vision
- **Whole-of-society approach to Biodiversity Conservation** https://wwfafrica.awsassets.panda.org/downloads/g20_national-biodiversity-strategic-plan_digital-new.pdf

WWF South Africa

WWF South Africa is a national office that is part of the WWF network. We are a local NGO that for 50 years has worked towards the aim of inspiring all South Africans to live in harmony with nature, for the benefit of our country and the well-being of all our people.

WWF stands for the World Wide Fund for Nature

Using Cover Crop technologies to enhance biodiversity

Patrick N Rakau
ARC-AP

Cover crops are planted primarily to manage soil fertility, soil quality, water, weeds, pests, diseases, and biodiversity. The use of cover crops is complementary within the context of an agroecosystem, which is aimed to be a circular, food and fibre producing ecological system managed and largely shaped by humans. Cover crops refer to any plant population established to benefit the soil, whether in rotation with cash crops or between the rows of orchards or vines.

Cover crop biodiversity refers to the variety of plants grown together to improve soil health, increase beneficial organisms, and support wildlife. Diverse cover crop mixes enhance biodiversity by providing different food sources and habitats for beneficial insects and microbes, which leads to a more robust and resilient soil ecosystem. This can improve nutrient cycling, pest control, and soil structure, and is especially beneficial in simplified landscapes where local plant diversity is lacking.

Benefits of using cover crop mixtures

Cover crops enhance soil conservation, and these practices lead to healthier soil, potentially higher crop yields, and reduced input costs, supporting long-term agricultural sustainability. Specifically, cover crops can lead to:

- Increased root volume and penetration through the soil from the cover crop breaks up the soil layers.
- Some cover crops support pest management by attracting beneficial insects that can prey on invertebrate pests, and they can also foster diverse microbial communities that can suppress soil pests and diseases through mechanisms such as competition and by promoting plant resistance.
- Cover crops can increase nutrient efficiency through reduced soil erosion (less soil organic matter and soil nutrient losses in the topsoil).
- They provide a high percentage of ground cover to slow down the velocity of rainfall before it contacts the soil surface and significantly reduce runoff thereby preventing water erosion.
- Cover crops improve soil health, fertility, and biological activity by improving the structure of the soil, decomposing, increasing the amount of organic matter.
- The roots and organic matter provide food for beneficial soil microbes, creating a healthy soil ecosystem.
- The roots of cover crops penetrate and loosen the soil, improving aeration and reducing compaction.
- Cover crops can provide food and habitat for a variety of beneficial insects such as ladybugs and wildlife, contributing to a more diverse and balanced ecosystem. Which help control pests like aphids, reducing reliance on pesticides.
- Cover crops enhance soil structure, which



Cover crop planted at Matsheremane Primary Cooperative farm, in Sekororo village, Limpopo Province. The farm produce vegetables inside the green house and after they have harvested their cash crops (Green beans, pepper and tomatoes), we planted winter cover crop mixtures (grasses, broadleaves and legumes) to improve soil health and break-up pests or larva growing stages that affect their cash crops.

improves water infiltration and helps the soil retain moisture, reducing runoff and drought stress.

- By increasing soil organic matter and improving overall soil health, cover crops can contribute to carbon sequestration and make the farming system more resilient to extreme weather conditions.
- They can reduce the weeds in your field. They stifle weed growth by competing for essential resources like water and nutrients. Cover crops are scavengers of residual nitrogen (N), converting N to proteins (enzymes, hormones, amino acids).

Cover Crop to provide animal feeds during the dry winter and early spring

Using cover crops for animal feed offers a range of benefits, from boosting farm profitability and reducing costs to improving soil health and enhancing climate resilience. This practice allows farmers to integrate livestock into their cropping systems, making productive use of fields that would otherwise lie fallow:

- Many cover crops, including oats, rye, and forage radishes, provide high-quality, digestible nutrients that support good animal performance.
- Planting a multi-species mix of cover crops, such as a combination of grasses, legumes,



Trial planted in 2024 at Mr Nhlapo Farm Kwa-Zulu Natal Province and Mirriavhavha Farm, Venda, Limpopo Province. Mr Nhlapo trial was planted in June 2024 after harvesting his maize for silage. The winter cover crop mixture (75% grasses: Stooling rye and Oats, 20% broad leaves: Radish and 5% legume: Vetch) planted provided feed for his dairy cattle in the months of September to November 2024. He recorded high milk production per cow when compared to previous year during the same period. In June 2025, the same winter cover crop mixture was planted at Mirriavhavha farm (Photo C) also to provide feed for livestock in August and September 2025.

and brassicas, can provide a more diverse and nutritionally balanced diet for animals.

- Different cover crops offer varying nutrient profiles, protein content, and fibre levels.
- Legume cover crops like clovers and vetch can fix nitrogen, boosting the protein content of the forage. This high-protein forage can be used to balance the high-fibre content of other feeds, like corn stover.
- Grazing multi-species cover crops can support excellent weight gain in livestock, such as an average of 1.2 kg per animal per day in cattle.

Cover Crop to provide cover between trees

Cover crops grown between trees enhance soil health, conserve water, suppress weeds, and provide a natural habitat for beneficial insects, ultimately improving the overall health and productivity of the orchard system. These plants bind soil to prevent erosion, increase organic matter to improve soil structure, and fix nitrogen, leading to a reduction in the need for fertilizers. By fostering healthy soil, cover crops promote a more sustainable and resilient environment for the trees. Cover crop roots physically bind the soil, preventing loss from wind and water, especially between the trees in an orchard. Leguminous cover crops fix atmospheric nitrogen, making it available for the trees, and other cover crops can help



The macadamia field at Mirriavhavha integrated with winter cover crops mixture (75% grasses: Stooling rye and Oats, 20% broad leaves: Radish and 5% legume: Vetch) between the rows.

regulate and cycle nutrients, reducing the need for synthetic fertilizers. Cover crops can absorb excess nutrients that might otherwise leach away, making them available for the trees when they are desired.

Thus, cover crops are plants cultivated primarily to enhance soil fertility, structure, and overall ecosystem health within agricultural systems. They play a vital role in improving soil quality, managing water resources, controlling weeds, pests, and diseases, and fostering biodiversity. The use of diverse cover crop mixtures supports soil conservation by minimizing erosion, improving infiltration, enhancing organic matter, and boosting nutrient cycling. These crops also help manage pests by attracting beneficial organisms and suppressing weeds through competition for light, water, and nutrients. Additionally, they serve as a sustainable source of high-quality animal feed during winter and early spring, improving livestock nutrition, promoting weight gain, and integrating crop-livestock systems. When grown between trees in orchards, cover crops prevent erosion, increase organic matter, enhance soil biology, and regulate nutrient availability, thus reducing fertilizer dependence. They also promote biodiversity, improve water management, and contribute to climate resilience by sequestering carbon and enhancing soil health.

Overall, cover crops represent a multifaceted, sustainable agricultural practice that enhances both environmental and economic outcomes. By improving soil fertility, structure, and biodiversity while reducing erosion, nutrient loss, and dependence on chemical inputs, they foster long-term soil productivity and ecosystem balance. Their integration into farming systems not only supports sustainable crop production but also enhances livestock feed availability and climate resilience, making cover cropping a key strategy for achieving sustainable and regenerative agriculture. Therefore, using cover crop technologies is most efficient biological system to enhance biodiversity.

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Agricultural mechanisation practices and implements used to promote water conservation



by Dr Tingmin Yu and Mr Johan van Biljon:
ARC-Natural Resources and Engineering

Conservation tillage can be defined as the tillage methodology practised to preventing the soil from degrading and most importantly to conserve the soil moisture content.

The soil structure must be kept in a good condition by practising minimum soil disturbance. Furthermore, it is important to keep the soil moist to the benefit of the growing plants by keeping the soil covered (away from sunlight).

Practicing minimum tillage left the topsoil covered by plant leaves from the previous season, therefore keep the soil cool and wet.

There are various implements available to be

used to practise minimum tillage or so-called conservation agriculture activities.

MULCHING IMPLEMENTS

The purpose of mulching implements is to reduce evaporation of soil moisture by spreading organic material on top of the soil.

The following mulching implements are used:

- **Mulching applicator:** is used to evenly spread organic material over the field.
- **Straw chopper & spreader** are used to chop crop residues and spread them as mulch.

CONSERVATION TILLAGE IMPLEMENTS

Tillage implements purpose is to loosen the soil for better water infiltration. It will also

break a hard pan due to ploughing or other activities.

The following implements is an example of such implements:

- **Chisel plough** – The chisel plough is used to break compact layers and leaving residues on the surface.
- **Subsoiler (Ripper)** – This implement is used to break hardpan layers to improve water infiltration.
- **Offset disc** – Is used to loosen the topsoil and sometimes used for seedbed preparation. (to plant without ploughing)
- **Rotavator** – used to prepare the soil for planting (without ploughing). It can also mix the crop residue into the soil to reduce surface evaporation.

CONTOUR AND TERRACING (LAND LEVELLING) IMPLEMENTS

Contours are important on hilly areas to capture rain run-off water and therefore improve water infiltration. Land levelling is important when doing flood irrigation to prevent water run-off and improve water infiltration.

The following implements are used:

- **Agricultural contour ridgers:** These implements are designed to create ridges and furrows, especially in fields where crops are planted on slopes. The ridges help to slow down water runoff, preventing soil erosion and allowing for better water infiltration into the soil.
- **Laser land leveller** – This implement is used to do precise land levelling to ensure even water filtration.
- **Scrapers and levellers** – These are basic implements to do land levelling.
- **Dam scoop** – This is a basic implement to do land levelling

WATER HARVESTING AND FURROW EQUIPMENT

These type of implements or equipment assist in water storage near the root zones of the crops. These implements will usually make a furrow or ridge to divert the rainwater to a specific area.

The following implements are used for water harvesting:

- **Ridger or furrow maker** – channels water

into furrows and keep the root zone moist.

- **Happie plough** – This implement is used on grazing land to recondition the grass by making small dam patches.
- **Broad bed and furrow planter** – Create raised beds and furrows that enhance water infiltration

COVER CROP SEEDERS AND PLANTERS

The purpose of cover crop or so-called conservation agriculture planters are planting on the top covered mulch or crop with minimum opening of the mulch, in other words, planting without ploughing.

The following type of planters are used:

- **Zero Till planters** – Plants seeds without much soil disturbance, helping retain soil moisture.
- **Direct planters** – Sows seeds among previous crop residues for moisture conservation.

CONCLUSION

- Practising minimum-till or no-till limit moisture loss through evaporation.
- Every time you plow or harrow, you break up the soil structure and allow moisture to escape.
- Leaves plant residue on the surface – this forms a natural mulch to limit evaporation.
- Planting in rows following the natural slope of the land (across the slope), will reduce rainwater run-off.
- Contour banks or “water stops” on sloping land will increase moisture infiltration.
- When practising fluid irrigation, land levelling will increase, even moisture infiltration.
- Use controlled traffic (drive on the same tracks) to prevent soil compaction
- Avoid heavy equipment on wet ground.
- Compaction prevents water from penetrating the soil — it then flows away on top.
- The use of implements that create micro-ponds, ridges or ditches between rows slow down runoff and help rainwater to seep into the soil.
- The use of minimum tillage implements will increase moisture retention in the soil resulting in healthy crops.

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Harnessing the Six-Legged Mini-Livestock: The Yellow Mealworm in Poultry Diets

Dr L Selaledi,
ARC-Animal Production

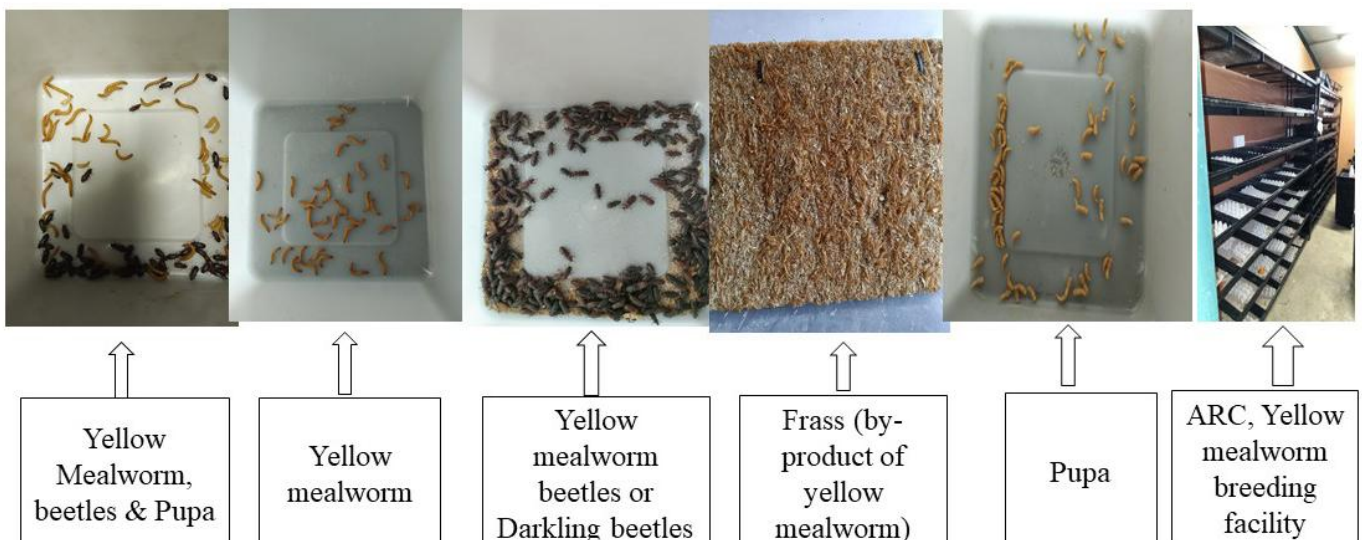
The insect farming industry is emerging as a revolutionary force in agriculture, offering sustainable solutions for future food security. Paving the way in South Africa, the ARC-Animal Production has established a dedicated facility to explore the potential of the yellow mealworm. This insect shows immense promise as a protein-rich supplement for monogastric animals like poultry. With a single female beetle capable of laying 250-500 eggs in her lifetime, these insects are prolific breeders. The resulting larvae are not only a powerhouse of nutrition—packed with protein, fats, and essential minerals like magnesium,

phosphorus, and zinc—but they also produce a valuable by-product, known as frass, which serves as an excellent biofertilizer or a potential feed ingredient.

The Yellow Mealworm: A Nutritional Powerhouse

Climate change and drought are shrinking our supply of protein-rich crops, making them scarcer and less nutritious. The yellow mealworm is the larval stage of the darkling beetle. While already a popular protein source for pets like birds and reptiles, its application in large-scale agriculture is gaining momentum. Embarking on mealworm farming

Different pictures of yellow mealworm (beetles, larvae, pupa and frass)



is surprisingly accessible. The initial stock of beetles or larvae can often be sourced from pet stores. The core requirements are simple:

- **Substrate:** Wheat bran serves as their primary food and bedding.
- **Hydration:** A small piece of vegetable, such as a carrot or potato slice, provides all the moisture they need.
- **Housing:** An unused container or tray in a spare room is sufficient to begin.

While an ideal environment is around 26°C with 60% relative humidity, mealworms are resilient and can be cultivated successfully without sophisticated climate control systems. The primary value of mealworms lies in their exceptional nutritional profile. Dried mealworm larvae contain up to 46% protein, while the fresh larvae offer about 20%. This high-quality protein makes them an excellent supplement for broilers, layers, and indigenous chickens. Crucially, they have the potential to partially replace soybean meal in poultry diets, which could reduce reliance on traditional and often more expensive protein sources. The farming process yields a valuable by-product: frass (insect excrement). This substance is an organic, slow-release fertilizer, rich in nitrogen, phosphorus, and potassium, making it ideal for enriching gardens and vegetable plots.

Establishing a small-scale mealworm farm requires minimal capital, utilizing unused spaces and containers. As prolific breeders, these insects efficiently convert low-value organic materials into high-value protein, suitable for both pets and livestock—and even for human consumption in some countries. For those in South Africa looking to commercialize yellow mealworms as a protein supplement, it is important to note that while specific insect farming legislation is still developing, registration with the Department of Agriculture is required.

For further technical information on yellow mealworm farming, you can contact **Dr. Letlhogonolo Selaledi** at the ARC-API at selaledil@arc.agric.za, Or Dr Bulelani Mazizi or Dr Pulane Sebothoma

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South Africa's land is being reshaped – and it's not by farmers

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South Africa's land is changing hands — but not in the way many people might think. New research using data from the Land Matrix Initiative shows that most large-scale land acquisitions in the country are no longer for farming. Instead, they're being driven by renewable energy projects, industrial developments, and, increasingly, carbon markets.

The rise of non-agricultural land deals
For decades, debates about land in South Africa have focused on agriculture, food security, and land reform. But that picture is

changing fast. Of the 98 verified large-scale land deals analysed across all nine provinces, only about one in five were for agriculture. Two-thirds were linked to renewable energy, and another 13% to forestry.

Since 2000, more than one million hectares have changed hands through such deals. While farming once dominated these transactions, renewable energy and industrial projects are now taking the lead. This mirrors a broader global trend. As the world races to cut carbon emissions, countries and corporations are investing



heavily in renewable energy infrastructure and carbon offset schemes. Across Africa, land is increasingly valued not for growing food, but for generating clean energy or storing carbon. Carbon markets: the new frontier

A new player is transforming the land market — carbon trading. Through carbon credits, companies buy the right to offset their emissions by funding projects that capture or store carbon, such as reforestation or soil restoration.

This growing demand is reshaping land use across the continent. In low-emission countries like South Africa, large tracts of land are being earmarked for carbon projects. While such investments could bring revenue and development opportunities, they also raise questions about who benefits — and who might lose access to the land. Community resistance keeps some deals in check

The study found that most land deals are successful for investors: 92% of negotiations were finalised, and nearly 80% of projects are already operational.

Yet community resistance remains a powerful counterforce. In places where local people challenge investors or assert land rights, the size of land deals tends to shrink. This shows that while investors wield significant influence, rural communities still hold meaningful power in shaping outcomes.

Such tensions are not new. Across the developing world, large-scale land deals often spark conflicts when residents feel excluded from decision-making or fear losing access to resources. In South Africa, where land remains a deeply emotive issue, this tension between investment and social justice is particularly pronounced.

A shift in land use priorities

The shift toward renewable energy and industrial use signals a fundamental change in how South Africa's land is valued. Land is no longer seen only as a means of producing food, but as an asset in the transition to a greener economy.

This raises important policy questions. How

can the country meet its energy and climate goals without undermining food security or rural livelihoods? How can communities share in the benefits of new land investments? Without strong governance, there's a risk that large-scale deals — even for green projects — could replicate the inequalities of the past. Balancing growth, energy, and food To manage this evolving landscape, South Africa needs a new approach to land governance. Strengthening land tenure security is vital to protect communities from displacement and ensure that all deals are negotiated transparently.

Accessible and fair systems to resolve disputes can help prevent conflicts from escalating. Meanwhile, land-use planning and fiscal tools — such as differentiated land taxes or incentives — can ensure that large industrial and energy projects contribute fairly to local development.

Policymakers will also need to recognise the broader implications of these changes. Renewable energy projects can help meet national climate goals and attract foreign investment, but they should not come at the expense of food production or the livelihoods of smallholder farmers.

Looking ahead

Large-scale land acquisitions in South Africa are likely to continue, but they will look very different from the “land grabs” that followed the 2008 food crisis. The new wave of deals is being driven by renewable energy companies, carbon offset investors, and industrial developers rather than traditional agribusiness.

This transformation could bring opportunities for growth and sustainability — but only if managed wisely. A balanced approach is essential: one that promotes investment and clean energy while safeguarding food security, social stability, and environmental health. As South Africa navigates its transition to a low-carbon future, its land will increasingly become the stage on which these competing priorities play out. The challenge now is to ensure that this new era of land use benefits not only investors and industries, but also the people and communities who depend on the land itself.

Wildfires are set to become commonplace

Here is how World Cup rugby star and farmer Kwagga Smith prepares for fire season

The Council for Scientific and Industrial Research (CSIR) reports that the increasing urbanisation of South Africa's rapidly growing population is a significant factor impacting the risk of wildfires. They explain: "More and more people, assets and infrastructure are placed on the boundary or interface between developed land and fire-prone

vegetation – what we call the wildland-urban interface (WUI) – where they are exposed to wildfires." They go on to say that the combination of climate and vegetation characteristics that favour fires, and growing human exposure, results in significant wildfire risk across the country, especially in the southern and eastern parts.





“Unfortunately, the situation will not improve because climate change will result in more frequent and extended high fire danger periods and, therefore, an increased likelihood of severe fires,” they further add, advising that the best option is to reduce fire risks and keep them as low as possible.

Kwagga Smith a world-cup winning rugby player, is also a farmer in one of the highest fire-risk areas in our country. “The Dullstroom area has experienced some devastating fires and as a farmer, you need to be prepared at all times. Drawing from his personal experience, he shares valuable advice on fire prevention and safety. These are his five top tips for BEING PREPARED for fire season:

Burn fire breaks

Start this process in summer rather than waiting until after the first frost. Burn the tracer lines so that it's easy to burn the breaks after the frost kills the grass in winter. Apply glyphosate using sprayers to create a 1m wide strip along the fence line and another 1m strip about 20m into the farm. Once this grass dies off, burn it. Then wait for the frost, which will kill the grass in the 20m strip between the tracer lines. After the frost, burn this area. This final burned strip becomes your firebreak.

Skill up, Gear up

A fire break will not stop a fire though; it's there to give you space to work from. Back burning, beating or some other form of firefighting, will still be necessary to stop a fire from spreading. It is, thus, essential that everyone is skilled and equipped to be able to manage fires.

Invest wisely

When you're facing a raging inferno, any money saved from buying inferior equipment can quickly become a costly mistake. Rather invest in quality machinery that will perform reliably when it is needed most.

Be ready

Before fire season, service and test all necessary equipment. Make sure pumps and leaf blowers are easily accessible, chainsaws are sharp, tractors are fuelled, fire beaters are intact, and your 'bakkie-sakkie' is full. This will ensure that everything you need is ready and on standby. In the case of an emergency, preparedness can make all the difference.

Share the Responsibility

Fire defence shouldn't rely on a single person. It's crucial that multiple people know who to call and what to do in an emergency. Ensure that several individuals can take charge if you are not around, thereby creating a more robust fire response system.

“My dad always said “Goedkoop is duurkoop” – “Penny wise, pound foolish”. That's why our family invests in Husqvarna's sprayers, chainsaws, blowers and pumps to ensure we have quality, reliable equipment on hand in the event of a fire. You never know when you will need it and being prepared can make all the difference,” concludes Kwagga.

For more information about Husqvarna's range of products and support, please visit www.husqvarna.com/za/



From the Wild to the Aisles: Will Indigenous Leafy Vegetables Ever Reach Supermarket Shelves?

Mishal Trevor Morepje

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As a consumer or health-conscious citizen walking through the fresh produce section of a supermarket, you are greeted by neat and appetising displays of spinach, lettuce, kale, and cabbage. However, you are left wondering why you rarely see indigenous leafy greens like Spider plant (*Cleome gynandra*), Pigweed (*Corchorus olitorius*), or Citron melon (*Citrullus lanatus*). These indigenous vegetables are long known and loved in most

South African homes, cultures, and traditional cuisines, and yet, despite their nutritional value and resilience to harsh climates, they remain absent from formal markets.

I recently travelled to the Tubatse–Fetakgomo Local Municipality in the Sekhukhune District of Limpopo to speak directly with the farmers who know these crops best. The field trip was undertaken to get an understanding of why such promising indigenous vegetables are still



underutilised, and what limits the commercial success of indigenous vegetables. The farmers' insights revealed a striking contradiction, as these leafy vegetables are abundant in many communities yet almost invisible in the marketplace. The leafy vegetables grow without any effort as weeds in home gardens and unused fields, making it easy for consumers to harvest these vegetables instead of buying. Thus, the crops' natural availability and commonality have created a sense of oversupply, reinforcing the perception that they have little economic value.

Another significant challenge is the absence of formal seed systems. Farmers cannot easily obtain certified seeds for crops such as Spider plant and frequently rely on saving seeds from previous harvests, a practice that is gradually disappearing. Large-scale cultivation remains difficult in the absence of organised seed supply chains. Farmers also complained about limited access to information and technical support as few have reliable information about production techniques, market prospects, or post-harvest management. Extension officers rarely provide assistance on these vegetables, as most training programmes still prioritise conventional crops such as maize, tomatoes, and cabbage.

The good thing is that not all hope is lost, as many farmers have adapted clever ways to deal with the seasonal nature of these vegetables. Since most thrive during the rainy months and disappear with the dry season, preservation has become a key survival strategy. Sun-drying is the most common preservation technique used by farmers, with some describing how they boil and rinse pigweed or citron melon leaves before spreading them out on mats or rooftops to dry for a week or two. Once dried, the leaves can be stored and rehydrated for cooking, a practice that has helped rural families for generations. Listening to these stories made me wonder: what would it take to see these vegetables proudly displayed alongside spinach and lettuce in our supermarkets? The answer lies somewhere between policy support, value chain development, and changing consumer attitudes.

A growing global movement celebrates local, climate-resilient, and nutrient-dense foods, in

which South Africa has every reason to be a part. Farmers could finally see economic value in what was once dismissed as "wild weeds" if supermarkets could embrace these leafy gems. More importantly, consumers would gain access to affordable, healthy greens rooted in their own heritage. Thus, perhaps the real question is not whether underutilised leafy vegetables will make it to supermarket shelves but when we will start valuing what we have had all along.

In conclusion, several changes are needed for indigenous leafy vegetables to reach supermarket shelves. For starters, farmers require access to dependable seed systems as well as improved research and extension support to guide production, harvesting, and storage. Second, small-scale processing and packaging can help extend shelf life and generate revenue. At the same time, consumers must rediscover crops like spider plant, pigweed, and jute mallow as nutritious and proud local foods. Thirdly, cooking shows, festivals, and school programmes can help shift perceptions. Therefore, with stronger policy support through research funding and inclusion in public food schemes, these vegetables can move confidently from the wild to the Aisles of supermarkets.

Acknowledgement

This article and its recommendations are drawn from my experience working with the Agricultural Research Council (ARC) of South Africa under the Centre of Excellence (CoE) initiative titled "Broadening the Food Base for Food System Resilience", which seeks to promote neglected, indigenous, and underutilised crops, insects, and animals which used to form part of South Africans' food systems." I serve as a Research Assistant in this project while pursuing my Doctor of Philosophy (PhD) in Agricultural Extension and Rural Resource Management at the University of KwaZulu-Natal (UKZN) with a thesis in progress titled "Agricultural Extension Services as Determinants of Market Integration of Underutilized Leafy Vegetables in Sekhukhune District, Limpopo Province". My work is conducted under the supervision of Dr Siphe Zantsi at the ARC, and Prof. Oladimeji Idowu Oladele and Prof. Mjabuliseni Ngidi are my academic supervisors at the UKZN.

Shaping South Africa's weather & climate services - together for agriculture

Dr Sarah Roffe

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Natural Resources and Engineering (NRE)

One small decision, such as when to plant, spray, or move livestock, can make or break a farming season. With both climate change and natural climate variability increasingly shaping conditions across South Africa, these kinds of decisions increasingly depend on reliable weather and climate information.

Across the country, most farmers, extension officers, and agricultural planners already use

forecasts and early warnings to guide their work and decisions. But how accessible are these services? Which ones are people using, and what kind of information do they still need?

These are questions driving our research at the Agricultural Research Council (ARC) in the Agrometeorology Division, and they formed the basis of a recent study published in [*Environmental Development*](#). In that study, we





Figure 1: QR code linking to the national questionnaire on weather and climate service needs in agriculture.

examined how weather- and climate-sensitive sectors (e.g., agriculture and food security, human health, and water resources) across South Africa access, use, and value weather and climate information.

The current article takes a closer look at the agricultural and food security sector responses, highlighting what's working well, where the gaps remain, and how we can shape South Africa's weather and climate services together for agriculture. In essence, weather and climate services turn raw weather/climate data into usable products, including forecasts, early warnings, historical trends and climate

projections, to support better decisions, from this week to future seasons.

The national questionnaire that informed the study remains open through this [link](#) or the QR code below (Figure 1). Continued participation from those working in agriculture and its supporting sectors will help us refine and expand these services to better meet agricultural needs.

So far, there have been 42 responses from across South Africa's agricultural landscape, including farmers, extension officers, policymakers, and researchers. Though modest in number, these early responses provide valuable insight into how weather and climate services are used and where they can improve. Each additional response to this questionnaire helps build a clearer picture of what is working, what is missing, and how services can better support agricultural decision-making from farm to national level.

What the agricultural sector responses say about weather and climate risks

Respondents identified drought and reduced rainfall, heavy/extreme rainfall and flooding, and increased temperatures and extreme temperatures, as the most pressing risks affecting agricultural activities. Strong winds, wildfires, and other natural disasters also featured prominently. None of these risks are new, but together they highlight why reliable and readily available weather and climate

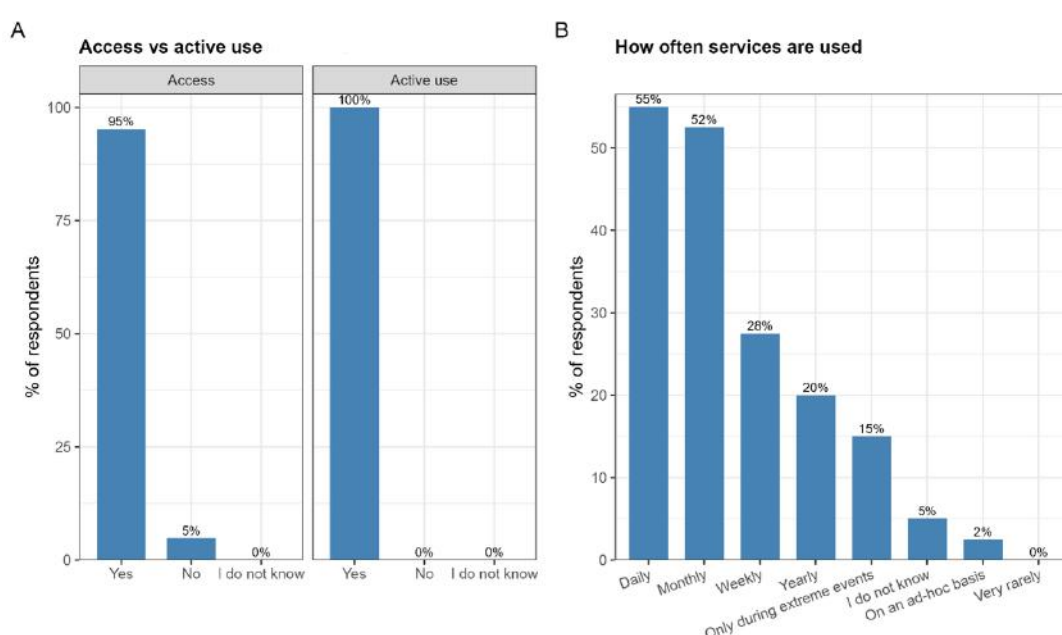


Figure 2: (a) Access and use of weather and climate services; (b) Frequency of use among respondents.

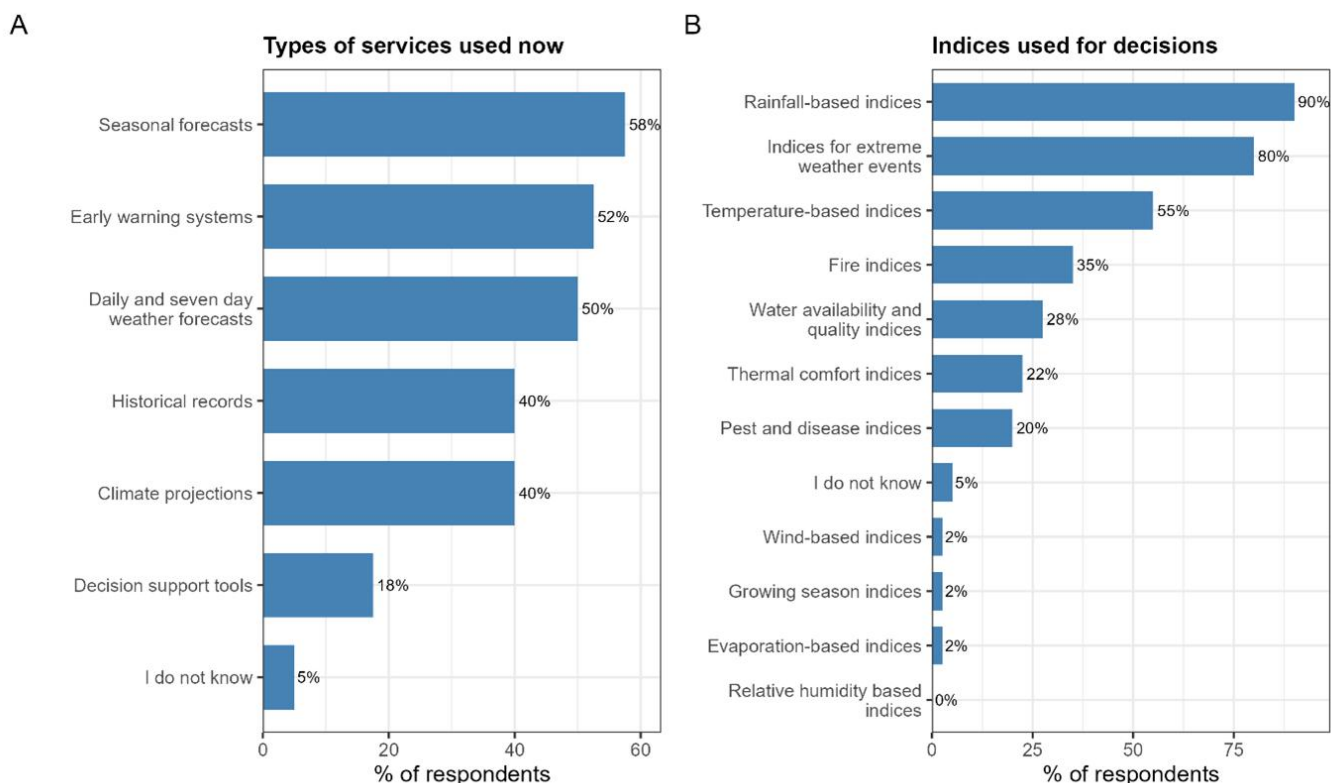


Figure 3: (a) Commonly used weather and climate services; (b) Indices most valued by agricultural stakeholders.

services, from daily forecasts to seasonal outlooks, lie at the heart of agricultural risk management and decision-making.

How weather and climate services are used

Almost everyone in our agricultural sample reported both accessing and using weather and climate services (Figure 2a). Most use these services daily for operational decisions, while others rely on weekly or monthly updates for planning (Figure 2b). Internet-based access via computers or smartphones dominates, though radio and extension service updates remain vital in some areas and for specific user groups.

Stakeholders reported using a wide range of weather and climate services. The most common were forward-looking products, such as seasonal forecasts, early warning systems, and daily and seven-day weather forecasts (Figure 3a). When asked about the types of information that can be most useful for agricultural decisions, rainfall-based indices (e.g., number of rain days, and indices for the start and end of the rainy season) topped the list, followed by indices for extreme weather events (e.g., number of heatwave days, and

heavy rainfall events), and temperature-based indices (e.g., number of warm and cool days; Figure 3b).

Why users choose certain weather and climate services and providers

Three main uses stood out for this question, such that respondents noted these services are used to inform planning or decision-making, for risk management, and for development of adaptation and mitigation plans.

When choosing a particular service provider, users valued not just accuracy and relevance, but also the supplier's reputation and affordability. Those supplier preferences dovetail with the benefits people said they're getting from the services, such that many noted that weather and climate services support their operational decisions, promote climate change adaptation, and help reduce risks. In short, when information is timely, local, and simple to interpret, it moves quickly from screen to field.

Barriers to access and use

Key constraints include internet connectivity issues, energy supply issues, and insufficient localisation in terms of spatial resolution of

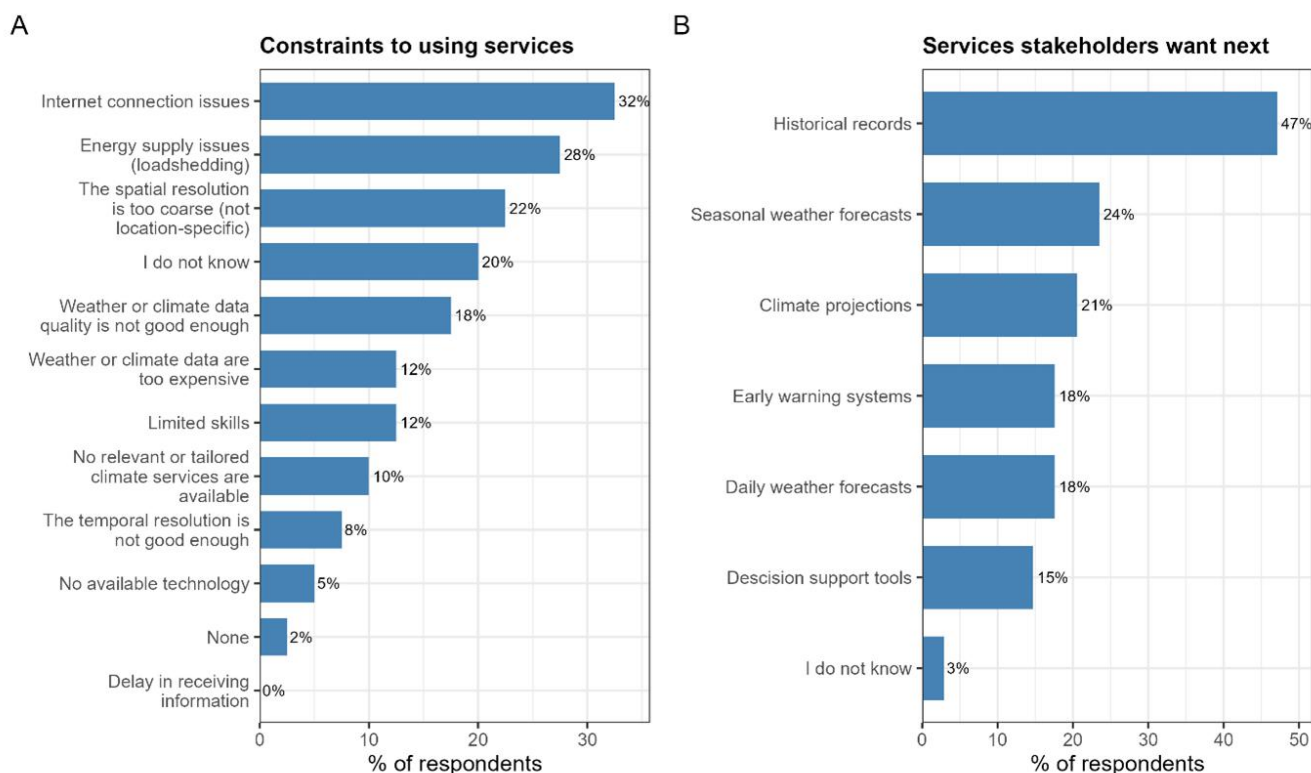


Figure 4: (a) Reported constraints in using weather and climate services; (b) Stakeholders' priorities for future services.

information. Concerns about data quality, cost, and a lack of technical skills were also common. Some respondents felt existing products were not sufficiently tailored to their needs, a reminder that even the best science loses value if it is inaccessible or overly technical.

What users want next

Looking ahead, respondents expressed clear preferences for access to historical data, future climate projections, and more seasonal forecasts (Figure 4b), all in formats that are visual, local, easy to interpret. Mobile apps and web-based portals were the most requested platforms, followed by email or perhaps even WhatsApp updates. The common thread across all requests is usability, such that tools must be practical for farm and advisory work.

Co-development: building services together

Building better weather and climate services is about more than improving models or adding weather stations. It is about co-development, designing with users so that information arrives in the right format, at the right time, and at the right scale.

Our team at the ARC and our partners are using these insights to shape the next

generation of agricultural tools, from mobile-first interfaces to clearer messaging around seasonal outlooks and indices. Therefore, every additional response we receive to the above-mentioned questionnaire helps us prioritise features, test formats, and anchor services in the daily decisions that matter. If you work in agriculture, whether on the farm, in extension, research, or policy, we invite you to share your views. Access the questionnaire via the [link](#) or QR code in Figure 1 and help shape how South Africa's weather and climate services evolve. Together, we can turn forecasts into confident decisions for every farm, every advisory office, and every season ahead.

Acknowledgments

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Is biosekuriteit Suid-Afrika se swakste skakel in landbou?

Die verspreiding van bek-en-kloueer na van die land se grootste voerkrale vroeër vanjaar het weereens 'n sistemiese uitdaging blootgelê – een wat dreig om ons boere uit wêreldmarkte te sluit. Daneel Rossouw, Hoof van Verkope by Nedbank Landbou, sê sterker biosekuriteitsmaatreëls is noodsaaklik as Suid-Afrika se veesektor sy volle potensiaal in die wêreldvleismark wil bereik.

Diereproduksie is die grootste subsektor in Suid-Afrikaanse landbou en is verantwoordelik vir meer as die helfte van die bedryf se totale waarde. Dit dra duisende kommersiële en opkomende boere, asook miljoene werksgeleenthede regdeur die waardeketting – van die voerkraal en slagpale tot vervoer, kleinhandel en uitvoere.

Hoewel plaaslike aanvraag steeds 'n aansienlike deel van veeverbruik uitmaak, het swak ekonomiese groei werklike bestebare inkomste laat stagneer. Daarom bied uitvoermarkte, ondanks toenemende risiko's en veranderings in wêreldhandel, 'n ideale geleentheid vir groei.

Die herhalende uitbreek van dieresiektes belemmer vooruitgang. Bek-en-kloueer, voëlgriep en varkpes het al almal tot 'n verbod op handel gelei, wat miljarde rande se uitvoerinkomste gekos het. Wanneer lande soos Saoedi-Arabië, Sjina of die EU hul markte sluit, verloor Suid-Afrika nie net verkope nie, maar ook geloofwaardigheid. Kopers draai vinnig na mededingers soos Brasilië, Australië of Namibië wat konstante, siektevrye voorraad kan waarborg. En dit neem jare om sulke verhoudings te herstel – indien herstel enigsins moontlik is.

Wat dit des te meer frustrerend maak, is dat Suid-Afrika alles het wat nodig is om 'n wêreldleier in vleisproduksie te wees: bees-, skaap-, vark- en hoendervleis van 'n hoë gehalte met uitstekende smaak. Die aanvraag is daar, veral in die Midde-Ooste en Asië, waar proteïenverbruik aan die toeneem is, maar sonder betroubare biosekuriteit en naspeurbaarheid bly hierdie gulde geleentheid buite bereik.

Dit gaan nie net oor uitvoermarkte nie. Plaaslik is vleisverbruik per persoon bestendig en sal na verwagting groei, maar dieresiektes

lei tot geweldige hoë koste regdeur die waardeketting. Boere dra die koste van inenting en inperking; die regering dek uitbrekingsbeheer en vergoedingskoste; die verbod op dierebeweging ontwig verkope aan voerkrale en slagpale; en uitbrake soos voëlgriep wis groot getalle pluimvee uit, wat boere dan ten duurste weer moet aankoop. Verbruikers betaal meer weens minder voorraad, en bestaansboere – wat nie die kapasiteit het om verliese te absorbeer of toegang tot aanlyn veilings het nie – word dikwels gedwing tot noodverkope of afleggings.

Die probleem lê nie by boere se kundigheid nie, maar by 'n gefragmenteerde en onderbefondsde dieregesondheidstelsel. Dieretoesig, inenting en naspeurbaarheid is wisselvallig; samewerking tussen die regering en die bedryf is inkonsekwent; noodreaksie kom dikwels te laat; en gapings in die stelsel laat siektes vinniger versprei as wat behoort te gebeur, wat 'n verbod op uitvoere en duur beheermaatreëls onvermydelik maak.

Daar is lig aan die einde van die tunnel. Ondanks hierdie uitdagings is daar tog tekens van vordering. Tydens die [Nasionale Biosekuriteitberaad](#) in Junie het rolspelers uit die regering, die akademie en die landboubedryf hulle tot 'n 5-jaar biosekuriteitsstrategie verbind. Voorstelle sluit nuwe wetgewing, afdwingbare reëls, 'n plaas-tot-verbruiker-naspeurbaarheidstelsel, en beter samewerking tussen sektore in.

Die samewerking tydens die onlangse uitbraak van bek-en-klouseer was ook bemoedigend. Die Departement van Landbou en Vennote in die bedryf het vinnig opgetree om voerkrale te isoleer en die diere in te ent. Nog 'n positiewe aspek is die navorsing deur die RMIS (Rooivleisbedryfsdienste), wat bevestig het dat die variante van bek-en-klouseer in Suid-Afrika van die dodelike variante elders in die wêreld verskil. Dit help om uitvoerrisiko's in perspektief te stel en vertroue in internasionale markte te herstel.

Hierdie momentum is wel bemoedigend, maar tog broos. Volgehoue toewyding, behoorlik befondsde implementering van

strategieë, en strukturele hervorming is noodsaaklik. Nuwe entstofinfrastruktuur, wetgewing oor naspeurbaarheid wat aan internasionale standaarde voldoen, en sterker vennootskappe tussen die openbare en private sektor moet deel wees van die plan vorentoe. Gedeelde verantwoordelikheid regdeur die waardeketting, van die plaas tot by die verbruiker, is uiters belangrik.

Die sakewêreld moet ook inspring. Landbou lê Nedbank na aan die hart, en as leier in die bedryf borg die bank verskeie landbou-inisiatiewe. Hierdie borgskappe, hoewel simbolies, beklemtoon Nedbank se toewyding om produsente te bemagtig, bedryfsweerbaarheid te versterk, platforms vir dialoog te skep, en sterker biosekuriteitsnorme te bevorder.

Ons borgskappe sluit die MPO (Melkprodusente-organisasie) se rentmeesterskaptoekennings, wat volhoubaarheid en beste praktyke in die suiwelbedryf bevorder, asook die MPO Wes-Kaap algemene jaarvergadering en die RPO-kongres (Rooivleisprodusente-organisasie), wat by NAMPO Kaap 2025 gehou is, in.

Tydens die RPO-kongres het produsente die waarde van naspeurbaarheidstelsels beklemtoon – nie net vir uitvoervereistes nie, maar ook as vroeë waarskuwingstelsels om siektes te beheer. Naspeurbaarheid beteken beter inkomste, doeltreffender produksie, en hoër gehalte produkte wat goeie pryse behaal. Grootskaalse implementering kan die impak van uitbrekings verminder, maar weens die onsekerheid oor waar die diere hulle bevind, moet groot gebiede tans afgesluit word.

Dit is nou die tyd om te reageer. Die lewensbestaan van duisende mense, nasionale voedselsekuriteit, en die toekoms van Suid-Afrika se uitvoer van diereprodukte hang af van die vermoë om hierdie krisis in volhoubare voortuitgang te omskep. Tensy biosekuriteit en naspeurbaarheid nasionale prioriteite word, sal die bedryf onder druk bly en die risiko loop om toegang tot kritieke uitvoer- en groeigeleenthede mis te loop, wat die voordele vir boere en landelike gemeenskappe beperk.

Rural women, heritage and food security:

An essential combination in agriculture

Dr Tribute J. Mboweni

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Smallholder farmers produce 80% of Africa's agricultural production, making them substantial contributors to food systems in the continent. According to Statistics South Africa (Stats SA), there are more than two million household farmers, in contrast to 35 000 commercial farmers. Most of these household heads are women in rural areas who farm to feed their families and sometimes sell the remainder of their produce

in their communities and in local markets to generate an income.

Although the Bill of Rights affirms women's right to own land, women still face challenges when it comes to accessing land. Women in rural areas in particular, have limited access to land due to customary values which grant women access to land through a relationship with a husband or a male relative. This is still



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the case in parts of Mpumalanga, for example, where women can use household land to produce crops, but cannot necessarily own, control or inherit the land in their own right.

Rural women's access to land is not only gendered, but it is also influenced by class and power. This is evident in how women who are more educated and influential can use their skills and privilege to access land. Despite these challenges, which impact the livelihoods of their households negatively, rural women continue on as smallholder farmers, often being at the forefront of the production, processing, preservation and preparation of indigenous crops in order to address issues of food insecurity within their households and generating an income through the sale of these crops in the face of the high unemployment rate in South Africa.

Food insecurity

Despite being a leading exporter in the African continent, South Africa still faces high levels of household food insecurity, where one in five households is food insecure. This is

owed to the high levels of unemployment and lack of income, which leads to a lack of access to food - let alone nutritious food - for many households. To address the challenge of food insecurity, rural women often devise strategies as part of community groups. For example, women form cooperative groups to grow and sell chickens and plant crops which they sell in their communities to earn an income which they use to buy food and maintain their households. Additionally, rural women use the land they have access to as individuals at the household level to produce indigenous plants which they consume within their households and sell to generate income. These rural women use indigenous knowledge and practices passed down from their elders. These Indigenous Knowledge Systems (IKS) are an important part of our cultural heritage, not only because they help us reflect on our cultural identities as Africans, but also because they help address the challenge of food insecurity that modern society is faced with while also highlighting the significant role played by women in addressing this challenge.

Cultural heritage: indigenous crops and practices in modern society

While it is true that South African indigenous crops have high nutritional value, they are often neglected and underutilised compared to other crops, especially in urban areas. This is largely attributed to the marginalisation of indigenous crops such as sorghum (*Sorghum bicolor*) and taro (*Colocasia esculenta*) amongst others, in the commercial market and in modern society's food system, which relies on specific crops that have been imported, grown in large numbers and popularised as staple foods. Maize (*Zea mays*), a crop that has its origins in south America, is an example of these imported crops. Given the challenges South Africa faces in terms of food insecurity, indigenous crops offer an opportunity to diversify and expand the food system and add nutritional value in the country and in households that are struggling with food insecurity.

Indigenous crops are not only nutritious, but they are also versatile and can therefore be prepared in various ways. After harvesting, crops can be pounded, ground, fermented, sun dried, preserved for storage and used later. These processing, preparation and preservation practices are often practiced by elderly women who learnt them from their elders. Unfortunately, this knowledge is not being transferred to the youth because of lack of interest and the movement of youth from rural areas to urban areas for study and

economic purposes, the consequence of which is detachment from their rural homes and practices.

This highlights the important role that rural women play in promoting cultural heritage, indigenous knowledge and cultural practices in modern society through their production of underutilised indigenous crops, as well as the potential of indigenous crops to contribute to the food system. Despite the gendered challenges that rural smallholder farmers, who are mostly women, face in accessing resources, they remain the primary players in the production and use of underutilised indigenous crops which have the potential to contribute significantly towards solving our current food insecurity challenges.

There is an urgent need to draw on the indigenous knowledge of rural women to advocate for programmes that create awareness about indigenous crops and their products in urban areas with the aim to promote the mainstreaming of these products. Additionally, policy makers and other stakeholders need to formulate policies, strategies and implementation plans that are aimed at creating an environment that is supportive of the production, processing and marketing of underutilised indigenous crops, and create an environment where market access is possible for these crops.

Photos by Stephen Ouma



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ARC-Small Grain Scientist Flies the Flag High in Canada

Anelisa Gusha

The Agricultural Research Council – Small Grain is celebrating one of its own after Dr Tarekegn Terefe displayed South Africa's expertise on wheat diseases at the 17th International Cereal Rusts and Powdery Mildews Conference (ICRPMC), recently held in Canada.

The global event attracted 208 researchers from 21 countries, with over 70 oral presentations and nearly 90 posters sharing the latest developments in cereal disease research. For Dr Terefe, the meeting was both an honour and an opportunity.

"The conference gave me the opportunity to represent ARC-SG on an international platform and present my research findings to the global scientific community," he said.

"I presented a poster entitled '*A decade of wheat leaf rust surveillance reveals seven new races of Puccinia triticina in South Africa,*' which highlights the ongoing national rust surveillance project at ARC-SG. For me, it was about increasing the visibility of our work and showing that South Africa is an active contributor to global wheat disease research."

He was accompanied by his long-time collaborator Prof Willem Boshoff from the University of the Free State (UFS) and two of his co-supervised students, Ms Isabella du Toit and Ms Amy Coetzer. Both students presented posters on stripe rust, further underlining the strong research pipeline being built between ARC-SG and UFS.

While his own presentation was a highlight, Dr Terefe said the real value lay in the



connections and conversations.

“Attending the conference allowed networking which opened doors for critical collaborations,” he explained.

“A key highlight of my participation was my engagement with the Director of the global Wheat Disease Early Warning Advisory System (DEWAS) and his team members. During our discussions, I requested that South Africa be included in the global wheat disease early warning system. They accepted my request and committed to initiating follow-up steps.”

That breakthrough means South Africa could soon be part of an international disease warning system that integrates field surveillance, pathogen diagnostics, and forecasting models to detect threats before they become outbreaks.

“This engagement positions our institute to join a highly impactful, internationally coordinated surveillance system,” Dr Terefe said.

“It will strengthen ARC-SG’s rust surveillance programme and our contribution to global management of small grain diseases.”

For him, the inclusion of South Africa into DEWAS would be a game-changer: “I will continue communicating with the relevant personnel to finalise the process of expanding the DEWAS model to include South Africa and get help on the use of the required apps. This will give us the tools to respond faster, and it will connect us with scientists around the world working towards the same goal.”

Beyond DEWAS, Dr Terefe left the conference buzzing with new ideas. “One of the most exciting presentations was on MARPLE diagnostics,” he said. “This is a portable, rapid genomics platform that enables rust race identification within 48 hours. Traditionally, virulence analysis could take weeks. Imagine the difference being able to know what you are dealing with in just two days. It would allow breeders and pathologists to react much faster.”

He was equally intrigued by the integration of satellite technology in disease detection.

“The potential application of very high-resolution satellite imagery for early detection of rust outbreaks was also highlighted,” he noted.

“This means you can spot disease stress in wheat fields before symptoms are visible to the naked eye. That kind of foresight could transform how we monitor and respond to plant diseases.”

Another topic that struck him was the first detection of wheat blast in Uruguay.

“This was significant,” Dr Terefe explained. “Wheat blast is a destructive fungal disease first reported in Brazil in 1985. It has since spread to Bolivia, Paraguay, and Argentina but Uruguay had never reported it until the 2023 season. It shows how diseases do not respect borders, and why global collaboration is so essential.”

Reflecting on the experience, Dr Terefe said the conference reaffirmed the importance of collaboration, innovation, and vigilance in agriculture.

“For me, the key takeaway is that no country can fight crop diseases alone,” he said. “Whether it is using mobile tools like MARPLE, harnessing satellites, or joining global platforms like DEWAS, the future of plant health lies in working together. The change we need in agriculture depends on collaboration, and I am proud that ARC-SG is part of that global conversation.”

As South Africa strengthens its role in global cereal disease research, Dr Terefe’s trip to Canada stands as a reminder of the country’s growing influence. His work, and that of his collaborators and students, positions ARC-SG not only as a leader in local food security but also as a valuable partner in safeguarding the world’s wheat.

South African delegates who participated in the 17th International Cereal Rusts and Powdery Mildews Conference in Canada; Left to right: Isabella du Toit and Amy Coetzer (Dr Terefe’s co-supervised students), Prof Willem Boshoff (collaborator from UFS), and Dr Terefe.

Ultimate Pork Fillet with all the Trimmings

Ina Paarman

A complete 'Wow' with all our tasters. A special pork fillet recipe with family appeal at an affordable price tag. Two or three chicken breasts can be substitutes for the pork.

Serves: 2 - 3

You Will Need:

600 g - 800 g pork fillet
2 - 3 x sachets Ina Paarman's Cajun Flavour Bombs
2 T - 3 T (30 ml - 45 ml) oil

To Serve

cooked jasmine rice, warm
pickled cucumber (see recipe)
chopped tomato
3 T (45 ml) roasted salted peanuts, roughly chopped
2 - 4 spring onions, finely sliced
1 red chilli, finely chopped (optional)
fresh lime wedges (optional)
Ina Paarman's Lime & Coriander Dressing
fresh coriander leaves to serve (optional)

Method:

Cut the fillet in half across, then cut each length in half again, lengthways. You will now have 4 pieces.

Mix the Flavour Bombs with the oil.

In a hot skillet, add 2 T (30 ml) oil to coat the base of the pan.

Pan-fry the pork fillets until just done.

Add the Cajun Flavour Bombs mixture, turn, and baste until done.

Remove from the pan and pour all leftover sauce over the pork fillet. Rest for 5 minutes.

Slice the pork into half moons and serve with the rice, pickled cucumber, tomato, peanuts, spring onions, chilli, and lime wedges.

Spoon some of the pickling liquid from the cucumber over the salad ingredients and drizzle with a little Lime & Coriander Dressing.



Pickled Cucumber with Soy & Sesame

Ina Paarman

An addictive pickling liquid. Can be re-cycled once more with fresh cucumber.

Makes 1 x 400 g Jar

You Will Need:

- 1 x English cucumber, thinly sliced
- 1 t (5 ml) Ina Paarman's Vegetable Spice

Dressing

- 1 t (5 ml) Ina Paarman's Chilli & Garlic Seasoning
- 1 t (5 ml) sugar
- 1 T (15 ml) soy sauce
- 1 T (15 ml) cider vinegar or rice vinegar
- ½ t (2,5 ml) toasted sesame oil
- 1 T (15 ml) sesame seeds (optional garnish)

Method:

Season the sliced cucumber with Vegetable Spice, drain in a sieve or colander. Place all the ingredients, except the cucumber and sesame garnish, in a screw-top jar and stir well to combine.

Add the sliced cucumber and stir and shake to coat all over.

Allow to pickle for at least 30 minutes before serving, or cover and refrigerate to pickle overnight for 3 days.

Serve cold or at room temperature.



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