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CONTENTS

1. A Word from the Editor
2. An Overview of the Development of the Irri-Drop Report Framework for Assessing Irrigation Scheme Performance in South Africa
3. Visit by Gambian Officials to ARC-NRE-AE
4. Visit by Tompi Seleka Agricultural College to ARC-NRE-AE
5. Knowledge Exchange Day: Sharing Information on the Field Performance of Agri-mats
6. Participation in the Eastern Cape Department of Agriculture Irrigation Scheme Revival Programme Launch
7. ARC-NRE-AE Conducted In-house Training on Tractor-Implement Operation and Maintenance
8. New Publication Published by ARC-NRE-AE
9. ARC-NRE Exhibited at the NAMPO 2026 Harvest Day

Newsletter of the
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A word from the Editor …

Greetings to you our dear readers.

Welcome to the 16th edition of our external newsletter, Agring Bulletin. We take this opportunity to thank you all for reading our newsletter, which appears twice per annum. We strive to keep publishing articles with information that you will always find helpful in this era where clean energy resources and high efficiency in water use are topical.

Best regards
Dr Macdex Mutema

Dr Macdex Mutema
Editor (Snr. Research Engineer)

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** Dr Idan Chiyanzu (Snr. Researcher)*
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An overview on the development of the Irri-Drop Report Framework for assessing irrigation scheme performance in South Africa

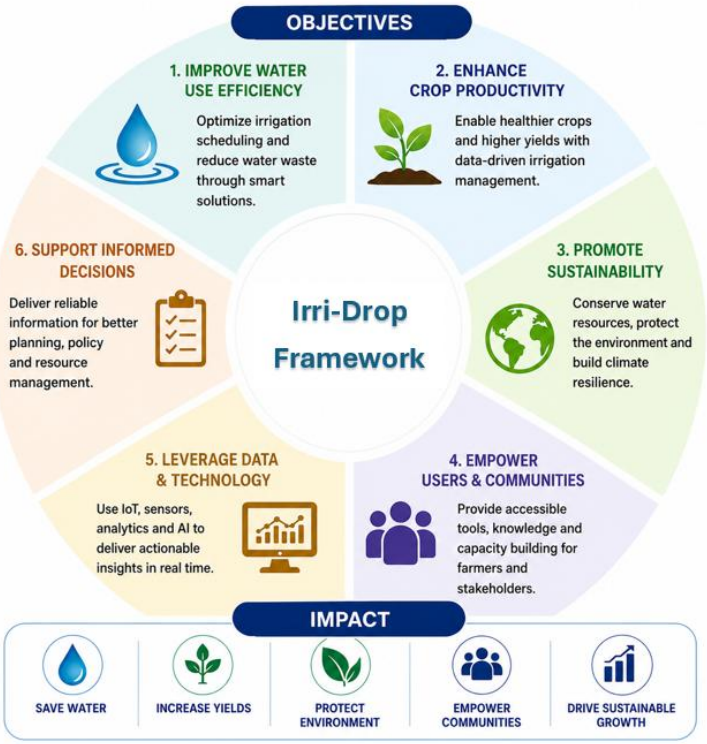
– by Mr Fanie Vorster, Dr Macdex Mutema, Dr Khumbulani Dhavu, Dr Calvin Sambo and Ms Sandisiwe Mahlamvu

Introduction

The Agricultural Research Council-Natural Resources & Engineering (ARC-NRE), the division of Irrigation and Agricultural Infrastructure Engineering (IrAIEng), is implementing a project funded by the Water Research Commission (WRC) entitled "*Development of the Irri-Drop Report framework for regulating irrigation scheme performance in South Africa*." The four-year project is implemented in partnership with public-sector and private-sector stakeholders, as well as an academic institution.

The partnership consists of the Department of Water & Sanitation (DWS), NB Systems, and the University of KwaZulu-Natal (UKZN). The project builds on the success of a previous collaborative project, funded by the WRC and implemented by IrAIEng, that aimed to conceptualize the Irri-Drop Report. Therefore, the current project aims to develop a comprehensive framework for assessing and reporting water use performance in irrigation schemes in South Africa.

The objectives of the Irri-Drop Report align with national policies, regulations, and standards aimed at improving water-use performance in irrigation schemes. The purpose of the Irri-Drop Report will be similar to that of the No-Drop and Green-Drop used to assess water and wastewater management in South African municipalities.



Objectives and expected impact of the Irri-Drop Report framework

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The Irri-Drop Report framework consists of nine (9) interconnected and interactive components that assess water-use performance in irrigation schemes to realize its objectives and expected impact. Each component can be used to assess different aspects of the irrigation scheme that affect water-use performance and generate its own index. Combined, the indices of the 9 components compute an Irri-Drop index. These computed indices are key to identifying risks that compromise water-use performance in the irrigation scheme which allows for targeted investments in corrective interventions. The Irri-Drop components are listed and explained in summary below.

a. Water Balance Report

The water conveyance efficiency of the irrigation water infrastructure is quantified by comparing the volume of water released into the irrigation scheme and the volume delivered to users. The Water Administration System (WAS), which is widely used in irrigation schemes, forms the basis of this component. Losses are revealed and can be used to identify infrastructure upgrades, operational improvements, and management interventions. This report also provides data for other assessment criteria, including the Maintenance Planning Report, Condition Assessment Report, Budgeting Report, and Water Management Planning Report.

b. On-Farm Water Management Practices Report

The component aims to ensure good water management practices on irrigation farms. Farm water use should be guided by conservation practices that improve productivity and water-use efficiency. The farms are assessed for the use of modern and appropriate methods for determining crop water requirements, irrigation scheduling, measuring water, and monitoring soil moisture content.

c. Water Quality Management Report

The objective of the component is to protect downstream water bodies from pollution caused by return flows from irrigated areas. The water quality of the return flow must comply with applicable standards, such as the Water Quality Standards for Agriculture.

d. Water Management Planning Report

The component aims to improve water use efficiency in the water supply-use value chain, including the return flows. It provides the information necessary to plan improvements to water management on the irrigation schemes. Water conservation measures practiced at the irrigation scheme are assessed against the recommended Water conservation and demand management measures for use in the agricultural sector.

e. Maintenance Planning Report

This component assesses whether the various water infrastructure elements in the scheme are maintained and in optimal operating condition, thereby reducing water losses and preventing service interruptions. The compliance of maintenance practices with legislative and regulatory requirements is assessed, as is the extent to which maintenance practices are proactive (e.g., use of prioritized maintenance schedules, contingency planning) vs. reactive (emergency responses to breakdowns). The component is implemented by auditing and complementing existing maintenance structures in irrigation schemes.

f. Condition Assessment Report

With this component, the water infrastructure and related equipment are assessed physically. This is done through inspection and scoring of the condition. The outcome of this assessment feeds into other assessment criteria, e.g., the Maintenance Planning Report, because infrastructure condition influences the measure and frequency of maintenance.

g. Technical Competency Report

The component aims to ensure that the irrigation scheme has the relevant capacity and skills available (staff or contractors) to implement Water Conservation Demand Management (WCDM) strategies in a coordinated manner. The component will verify the individual team member responsibilities in the organizational organogram and other available information, e.g., related vacant positions. The technical competencies of the structured teams on the organogram are assessed by, e.g., checking how well-defined the positions and job descriptions are, and checking the team members' qualifications, experience, and courses attended.

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h. Budgeting Report

The budget assessment will evaluate whether the available financial resources are adequate and whether the allocations are appropriate for implementing the planned activities that support and improve the efficient use of water. Existing budget allocations, planned expenditures versus available financial resources, cost breakdowns of planned activities, and financial risks will be evaluated.

i. Credibility and Regulation Enforcement Report

The readiness of an irrigation scheme to implement quality control strategies that will ensure the credibility of the data collected, analyzed, and reported is assessed. It also assesses how capable the irrigation scheme is of strengthening local water resource regulations to improve water supply and use efficiency. As well as the measure in which these regulations are enforced and aligned with national legislation.

Stakeholder participation in developing the Irri-Drop Report framework

The project is stakeholder-participation-driven, with extensive national consultations. The relevant stakeholders in the irrigation sector value chain inform the development of the Irri-Drop Report framework. Therefore, the involvement of stakeholders from the irrigation sector across South Africa is crucial for the objective development of the Irri-Drop components that can be deployed independently and/or jointly to assess the water-use performance of irrigation schemes.

Stakeholders willing to participate in the development of specific components are encouraged to accept invitations to workshops where the factors and subfactors, including attributes contributing to the assessments, are identified and weighted. Stakeholder consensus on the component factors and their relative contributions is important for bias reduction in the development process and to enhance buy-in and inclusion of all stakeholders in the irrigation sector value chain. This will ensure the development of an Irri-Drop Report framework that is widely accepted and practical to implement for assessing the water-use performance of irrigation schemes. A wide range of stakeholders and experts are required to participate in the upcoming workshops.

Should you require more information about the process of developing the Irri-Drop Report framework and/or are interested in participating in the upcoming national consultation workshops, please contact:

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Visit by Gambia officials to ARC-NRE-AE

– by Dr Khumbulani Dhavu

Three officials from Gambia visited the ARC-NRE Agricultural Engineering campus on 19 May 2026. They also joined the Introductory to Irrigation Design Course presented by the South African Irrigation Institute (SABI) at the Agricultural Engineering Campus from 18 – 22 May 2026.

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Photo right from left to right: Mr Demba Camara, Dr Khumbulani Dhavu (ARC), Mr Abdouke Bah, Dr Mphekgo Maila (ARC) and Mr Lamin Bayo

Visit by Tompi Seleka Agricultural College to ARC-NRE-AE

– by Dr Macdex Mutema

Three officials from the Topi Seleka Agricultural College in Limpopo visited the ARC-NRE Agricultural Engineering Campus on 19 May 2026. The purpose of their visit was to explore opportunities for possible collaborations with the ARC-NRE and for bringing their students for exposure visits. The visit started with a meeting in the boardroom where both institutions exchanged information about their activities and identification of common areas of interest and possible collaborations. The boardroom meeting was followed by a tour of the research facilities at the ARC-NRE-AE. During this visit by Tompi Seleka Agricultural College, the ARC-NRE-AE was represented by Dr Macdex Mutema, Dr Sipho Sibanda, Dr Khumbulani Dhavu, Dr Tingmin Yu, Ms Sandisiwe Mahlamvu, Mr Milton Petersen and Mr Karabo L Moreme.

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From left to right: Dr Tingmin Yu (ARC), Mr Milton Petersen (ARC), Ms Vutlhari Manyike, Dr Khumbulani Dhavu (ARC), Ms Mahlatse Motlanthi, Ms Sandisiwe Mahlamvu (ARC), Mr Winter Swana, Dr Sipho Sibanda (ARC), Dr Macdex Mutema (ARC) and Mr Karabo Moreme (ARC)

Dr Tingmin Yu explaining the activities of the mechanisation workshop to the officials

Mr Milton Petersen explaining the irrigation laboratory to the officials

Dr Idan Chiyanzu explaining the renewable energy laboratory to the officials

Knowledge Exchange Day: Sharing information on the field performance of Agri-mats

– by Ms Sandisiwe Mahlamvu, Dr Macdex Mutema, Ms Manoshi Mothapo and Dr Khumbulani Dhavu

The ARC-NRE Agricultural Engineering team in collaboration with the Limpopo Department of Agriculture and Rural Development (LDARD) hosted a farmer's day themed "Sorghum Production under Agri-mats" for smallholder farmers in Mphanama and GaRadingwana Village, Sekhukhune District, Limpopo province. Under the project entitled "Water saving options for Climate Smart crop production in semi-arid landscapes of Gauteng and Limpopo provinces" which is funded by DoA. The Knowledge Exchange Day was held on the 21st of May 2026 and the event was graced by a total of 120 farmers and 11 officials (LDARD and ARC).

The aim of this event was to provide an opportunity for both communities to learn about the agri-mats and how they have performed under the management of farmers. Mr Phasha presented on the topic "Short term impact of agri-mat on sorghum yield and selected soil properties in semi-arid landscape of Limpopo province" and Dr Breedt educated the farmers about the pest and diseases that affect sorghum. Lastly, Ms Makananisi and Mr Modiba delivered a talk on climate change and the safe use of agrochemicals. The farmers responded positively to the mulching technique and expressed optimism about its potential to improve crop production and water conservation in their communities

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Small scale farmers at the field.

Farmers listening to the presentations.

Participation in the Eastern Cape Department of Agriculture Irrigation Scheme Revival Programme Launch

- by Dr Calvin Sambo and Dr Khumbulani Dhavu

The Eastern Cape Department of Agriculture (ECDoA) launched the irrigation scheme revival programme on the 27th of January 2026 at the Zanyokwe Irrigation Scheme (ZIS) in the Eastern Cape. The R19,5 million programme was officially launched by the MEC for Agriculture, Hon. Nonceba Kontsiwe, with support from the Deputy Minister of Agriculture and the Mayor.

The programme aims to reduce poverty, create jobs, and boost agricultural production and the economy in the Eastern Cape. The first phase of the programme will support vegetable, grain, and fodder production, covering 1,528 ha, with the ultimate long-term objective of revitalizing 10,000 ha of irrigation schemes in the province.

The launch was attended by stakeholders involved in all aspects of the agricultural value chain, including industry, farmer organisations, and research/academia. Dr. Calvin Sambo, supported by Dr. Khumbulani Dhavu, attended the launch to honour an invitation to demonstrate the irrigation scheduling tools (ISTs) and their benefits for improving water-use efficiency in smallholder irrigation schemes. Furthermore, to raise awareness about the project (Promotion of the Adoption of Irrigation Scheduling Tools), which is in its early implementation phase in the Eastern Cape province.

The project is funded by the national Department of Agriculture (DoA) through the Directorate of Water Use and Irrigation Development (D: WUID) under the ARC/DoA Service Level Agreement (SLA). The project aims to promote the adoption of ISTs in smallholder irrigation schemes. It targets 167 smallholder farmers, who will be trained and provided with a package of ISTs to monitor soil moisture and nutrient management, informing their irrigation and nutrient replenishment to improve water-use efficiency and soil health, thereby boosting agricultural production. The knock-on effect of adopting the ISTs is that, with reduced water use, smallholder farmers save on pumping costs and labour due to lower irrigation frequency.

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The launch was a success, and farmers supported the programme to revitalise 10,000 ha of irrigation schemes in the Eastern Cape. In her keynote address, the MEC indicated that the programme will ensure increased agricultural productivity and food supply, improved knowledge and skills in sustainable farming practices, strengthened community bonds through collaborative efforts, enhanced awareness of global food security issues, enhanced visibility of the Eastern Cape's commitment to revitalisation programme, food security and farmer support and strengthened partnerships between government, private sector, and communities.

The implementation of the IST project in the province closely aligns with the objectives of the revival programme. It will go a long way toward helping farmers manage their water use and soil nutrients, contributing to improved agricultural production, and reducing input costs (fuel, electricity, and labour) and conserving water.

The Zanyokwe Irrigation Scheme near Keiskammahoek in the Eastern Cape, which forms part of a provincial drive to revitalise irrigation infrastructure and expand agricultural production

The Mayor is giving an address on the district's commitment to investing in the revitalization of irrigation schemes and support of the revival programme

ARC-NRE-AE conducted in house training on tractor-implement operation and maintenance

– by Dr Tingmin Yu

The Agricultural Mechanisation, Agro-Processing and Renewable Energy Division of the ARC-Natural Resources and Engineering (ARC-NRE) hosted a two-day training course on tractor and implement operation and calibration for ARC officials on 2–3 June 2026 at the Agricultural Engineering Campus. The primary objective of the training was to strengthen capacity building and facilitate knowledge and experience transfer within the division. The programme combined safety instruction with practical demonstrations, focusing on the safe and effective operation of tractors and agricultural implements.

On the first day, participants received training on tractor safety, operational procedures, and best practices when working with various implements. Fundamental principles of tractor and implement maintenance and servicing were also covered. To reinforce the learning experience, participants were given the opportunity to operate a tractor and slasher in the field, allowing them to gain valuable hands-on experience.

The second day focused on the technical setup, maintenance, operation, and calibration of key agricultural implements, with particular emphasis on no-till planters and sprayers. Participants were guided through the correct calibration procedures to ensure optimal field performance, efficiency, and accuracy during agricultural operations.

A total of 32 ARC staff members attended the training course. Among them were seven colleagues from the Britz Farm who actively participated throughout the programme. In addition, a young graduate from the local community joined the training and demonstrated a keen interest in agricultural mechanisation and farming technologies.

Feedback received from participants indicated that the knowledge and practical skills gained during the training will contribute significantly to their project activities, mechanisation support services, and farming operations.

The training highlighted the importance of continuous skills development within the organisation, and participants recommended that similar training programmes be conducted on a regular basis to further strengthen technical capacity across ARC.

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Introduction to tractor and performance

Dr Tingmin Yu explaining the maintenance and hitching principles of planters

Practical operation in-field

Group photo of training attendees

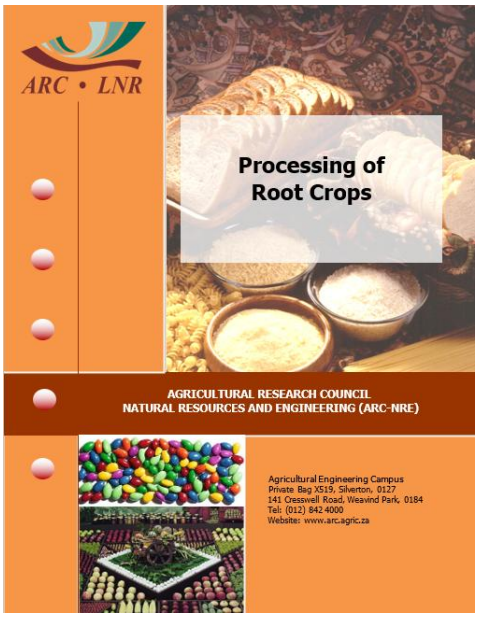
New publication published by ARC-NRE-AE

– by Ms Theresa Siebert

Processing of Root Crops – Revised Edition

Authored by Ms Theresa Siebert

Published 1 May 2026



A root crop vegetable is defined as any edible plant part which grows underground and is harvested for human consumption. While the name may, wrongly, indicate that all these vegetables are roots, this naming system is primarily used as a culinary and agricultural term, it includes several types of botanical structures used by plants to store energy in the form of carbohydrates and starches.

Root crop vegetables are grouped based on the specific underground part that is eaten:

- True taproots refer to the primary central root that grows vertically, such as carrots, parsnips and turnips.
- Tubers are swollen underground structures used for nutrient storage. Cassava and sweet potatoes are enlarged lateral root tubers.
- Bulbs are modified underground leaves or buds arranged in tight layers, for example onions and garlic.
- Rhizomes are underground stems that grow horizontally such as ginger.

Processes covered in this publication include:

- Frozen asparagus: asparagus spears are frozen whole by rapid freezing to ensure maximum preservation of colour and texture.
- Dehydrated beetroot pieces are air-dried or puff-dried slices, dice, or strips that can be used in dry soups, spaghetti, pizza sauces, and casserole dishes.
- Carrot juice is extracted from carrot puree. It is served as a beverage and often blended with other fruit or vegetable juices.
- Dehydrated onion products include onion rings, flakes, and powder. These are very popular flavouring agents and finds applications in dry soup and sauce mixes, canned products, home cooking and even pet products.
- Frozen potato hash browns are made from grated potato that is blended with complementary ingredients. The mixture is shaped and fried prior to freezing and packaging.
- Sweet potato chips are blanched sweet potato slices that are fried in hot vegetable oil.
- Canned turnips: When harvested at under 40mm in size, turnips can be canned.
- Tapioca is a starch-based product that is extracted from cassava root. It is mainly used as a thickening, binding, or texturing agent in culinary and industrial applications.

Tapioca

Grated beetroot

Asparagus dish

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ARC-NRE exhibited at the Nampo 2026 Harvest Day

– by Ms Elmarie Stoltz & Ms Sharon Mfanta

The Agricultural Research Council (ARC) participates annually in the NAMPO Harvest Day through a comprehensive corporate exhibition held in Bothaville each May. As one of the ARC's flagship stakeholder engagement events, NAMPO showcases the organisation's continued contribution to the grain industry in South Africa and its commitment to addressing food and nutrition security. The 58th NAMPO Harvest Day was held from 12–15 May 2026. The ARC-Natural Resources and Engineering (ARC-NRE) Division, represented by the Soil, Climate and Water (SCW) and Agricultural Engineering (AE) campuses, participated alongside the other ARC campuses. The exhibition strengthened media and stakeholder relations, while the ARC-NRE-SCW campus showcased its Agroecology project and conducted interviews with key stakeholders. Implemented in partnership with the Department of Agriculture, the project promotes a holistic and sustainable approach to improved farming practices.

The 2026 Grain SA NAMPO Harvest Day featured over 910 exhibitors showcasing more than 4 000 agricultural products.

Visitors to the 4-day exhibitions were as follows:

- Day 1 (Tuesday): 15,886 visitors.
- Day 2 (Wednesday): 24,579 visitors (A record-breaking single-day attendance driven by a massive Toyota Hilux world-record attempt).
- Day 3 & 4 (Thursday & Friday): The remaining visitors, with exact daily breakdowns unreleased, rounded out the 81,822 total for the week.

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ARC-NRE AE and SCW exhibition at Nampo
From left: Elmarie Stoltz, Dr Kobus Anderson and Sharon Mfanta

Dr Kobus Anderson and Prof Sue Walker from ARC-NRE SCW explaining Agroecology to learners at the ARC-NRE exhibition stand

Zikhona Buyeye and Siboniso Nkambule talking to a visitor at the ARC-NRE-AE exhibition stand

Elmarie Stoltz explaining wind energy to a child at the ARC-NRE-AE exhibition