Mondstuk van die Suid-Afrikaanse aartappelbedryf • Mouthpiece of the South African potato industry

CHIPS

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SIRKEL-N-LANDGOED: GESONDE MOERE VIR VOLHOUBARE AARTAPPELPRODUKSIE

SATELLITE-DERIVED CROP GROWTH INDICES FOR MANAGEMENT OF POTATO CROPS

Alternatiewe kragbronne vir jou plaas

KZN small growers hold farmers' day

Limpopo-kultivarproef op Dendron, 2022

Count every drop and make every drop count

By Susan Marais

In coming years, the energy-water-food nexus will continue to suffocate the bottom line of potato and seed potato producers with a careless attitude towards their water management strategies.

Although several climate change models have indicated that the expected warmer, more arid climate that regions such as the Western Cape's Sandveld can expect towards 2050 will benefit potato producers, one inescapable reality remains: South Africa will remain a water scarce country, while its inhabitants' need for fresh, clean water will keep increasing.

In fact, water scarcity remains one of the planet's biggest problems of the 21st century, says Felix Reinders, a South African agricultural engineer and chairperson of the Food and Agriculture Organization of the United Nations' (UN) Global Framework on Water Scarcity in Agriculture. "Only 3% of all water is freshwater and of that 3% about two thirds are trapped at the North and South Poles. So, in effect we only have about 1% of the world's water that can be used by humanity, and this needs to be divided between irrigation (agriculture), households, industries and mining."

Local water usage

While water is of global concern, it should be especially close to South Africans' hearts, as the tip of Africa is regarded as the thirtieth driest country on earth, Reinders says. In South Africa, the average rainfall is about 495 mm/year. In volume terms this translates into 110 billion m^3/year and of that about 60 billion m^3 evaporates. This means that 50 billion m^3 of the rain will end up in our rivers and dams, as well as groundwater, as a result of rain or runoff. In total, about 32 billion m^3 is captured in the country's dams and is then distributed among the various industries.

"South Africans use about 18 billion m^3 of water in total per year. One might say it doesn't sound too bad, but we must remember our water is in places where there are no people or development. Therefore, we still need to make plans to move the water from where it is stored to where it must be used," Reinders says.

> Equipment should be tested using measuring instruments to establish how even the water is distributed and whether the system is operating at the correct pressure.

Reinders says population growth is compounding the problem. "If the production volumes trajectory from 1960 continues to 2050, we anticipate a deficit of between 50 and 65% of our global staple foods (such as maize, potatoes and rice)."

The reason for this growing gap is that water volumes and primary agricultural production cannot keep up with population growth. "Locally, South Africa expects that it won't be able to meet 17% of the population's water demand by 2030. While this is still seven years away, we've already tasted a little bit of this a few years ago during the Cape Town's day zero concerns."

The water-energy-food nexus

Water, energy and food are intertwined and interdependent, says Reinders. "If something happens to one, it has an impact on one or both of the others." For example, the impact of load shedding or power outages directly affects producers' ability to irrigate crops, which in turn has an impact on the crop's yield.

"To irrigate 1 mm of water takes about 2,5 kWh of energy [electricity] and at a cost of R2.50/kWh, it will cost R6.25/mm per hectare. For a 10 mm crop water requirement per day, it means R62.50/ha and for a 100 hectare irrigation system it is R6 250 per day. For a season in which the requirement is 600 mm the cost will be R375 000. In the case of diesel the cost will be five to seven times higher. This is precisely why South Africa's irrigation farmers are so meticulous in how they approach irrigation. Power has become the biggest expense."

Reinders says producers need to make full use of all available climatic data tools to optimise their irrigation strategy. "An irrigation system needs to be able to meet the peak water needs of the plants. South Africa is fortunate to have a computer program, SAPWAT (South African Procedure for Water Requirements), which can determine the peak crop water requirements of any crop."

While centre pivots are used with great success to irrigate potatoes, Reinders says efficiencies could be improved and losses can be limited significantly by lowering the sprinklers. (Photograph: Felix Reinders)

An agricultural engineer or designer uses this information to design a system that addresses the needs of a specific crop at a specific location. Normally an irrigation system is designed with the peak crop water requirements to irrigate 22 to 24 hours per day. "If you have energy problems (load shedding) for two or four or six hours, the producer won't be able to meet the needs of the crop for 10, 15 or 20% of the time."

From a yield perspective, a maize plant that does not receive 10% of its water requirements will have a yield loss of 20%. "In short, energy problems impact future yields."

Alternative energy

Does this mean solar panels and generators are the answer? "Not necessarily, apart from the capital layout, the operational cost of alternative energy such as a generator is five to seven times more than conventional power." Generators and solar panels can play a crucial role, but one should ensure that the basics are right," says Reinders. This will save producers unnecessary expenses.

Before producers consider alternative energy sources, they should first ensure that good planning has been done regarding the scheduling of irrigation. "This means that you should know [based on weather data] how much water your crop needs and when."

It could also be a good idea to make sure and get advice regarding the optimal functioning of your irrigation equipment. Equipment should be tested using measuring instruments to establish how even the water is distributed and whether the system is operating at the correct pressure.

However, running costs are what currently impacts on our producers. During the month of January, crops' water requirements skyrocketed due to heat waves and producers had to watch their crops wither, because they simply could not meet the plants' water requirements due to energy not being available. Reinders says while alternative plans are important, they should not be implemented hastily and carelessly.

Good management practices

As South Africa heads towards a drier agricultural cycle, Reinders says that good management practices need to be in place. "Rain cycles of so-called

wet years and dry years occur and vary between seven and eleven years. Risk analysis must be done to make the successful cultivation of potatoes sustainable over time."

It is critically important to make use of available technology such as weather information, groundwater sensors and determining the right amount of water to be applied evenly at the right time. As already mentioned, the irrigation system's functional performance must also be up to standard.

"Conservation tillage can help producers to successfully increase soil's infiltration capacity and retain water on the fields. In the Sandveld, centre pivots are used successfully to irrigate, but by lowering the sprinkler close to the canopy of the crop, losses are limited considerably," Reinders says, adding that drip irrigation is also successfully applied where the soil's lateral spreading ability is good. Drip irrigation, however, requires more managerial skills.

The future of irrigation

Reinders believes in future irrigation will be done with increasingly more precision. "Precision application will be achieved with the help of soil sensor monitoring."

Globally over 1,53 billion hectares of land are used for crop production. Of this only 300 million hectares are irrigated. The majority of the irrigated land utilises flood irrigation (80%), followed by 13% under sprinkler systems (pivot and sprinkler) and the remaining 7% are watered by micro systems (drip and micro spray).

"Currently, micro irrigation is the fastest growing method being used," says Reinders. In South Africa, 1.4 million hectares are irrigated. Here, 14% of the irrigated lands make use of a flood irrigation system, 31% are under sprinkler systems, a total of 26% are under micro systems (drip and micro spray) and 29% are irrigated using mechanised systems (pivot, lateral and travelling gun systems).

"Globally, the trend is towards mechanised and drip irrigation," says Reinders.

The water delivered and transferred to the Vaal River system will ensure water availability for domestic consumption, irrigation, industries and mining.

State of our dams

South Africa is a water scarce country – an irrefutable fact that won't change. Another fact that is set in stone is that primary water use (household use) takes precedence, so producers often have to stand second in line when it comes to water allocations. This begs the question: Shouldn't we simply build more dams?

"South Africans are really utilising our water very efficiently," says Reinders. "We currently have 4 500 dams with a combined carrying capacity of 32 billion m^3. Most dam sites have already been identified and dams have been built there. I'm not saying there isn't still opportunity for more dams, but there aren't many untapped possibilities."

Currently, a last amount of water for South Africa's domestic users is distributed by the Lesotho Highlands Water Project from the Katse and Mohale dams. Phase 1 of the scheme has been operational since 1997 and supplies water to the larger Gauteng region.

The second phase of this project focusses on the Polihali dam and pumping stations, to further supplement water from Lesotho to South Africa. The project will provide secure and sustainable water sources to the population living in the Gauteng region, covering five provinces (Gauteng, Free State, Mpumalanga, North West and Northern Cape) of South Africa with a combined population of 26 million and 60% of South Africa's economy.

Global water strategies

Water shortages is a growing international concern and is directly encapsulated by six of the 17 Sustainable Development Goals (SDGs) or Global Goals of the UN. The UN aims to achieve most of these goals by 2030 and believes that these goals are a shared blueprint for peace and prosperity for people and the planet, now and in the future.

The six goals that will be addressed if water scarcity is addressed are:

- SDG 1 – the eradication of poverty.
- SDG 2 – ensuring zero hunger.
- SDG 6 – clean drinking water and sanitation for all.
- SDG 13 – taking positive action with regard to climate.
- SDG 15 – life on land.
- SDG 17 – partnerships to help achieve the SDG goals.

The last goal has to do with issues such as creating awareness and working together to try and find alternative solutions, such as desalinisation, says Reinders. "About 97% of the planet's water is salty. This is a massive resource. Furthermore, we also need to work together to utilise freshwater runoff beneficially."

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