



SOUTH AFRICA

FOOD RISK DOWNSTREAM OF THE MPUMALANGA DRakensBERG WATER SOURCE AREA

WATER QUALITY AND FOOD RISK

Mpumalanga provides 13% of South Africa's agricultural produce, including vegetables, citrus, subtropical fruit and sugarcane. In this hot and recently drought-hit region, most crops are irrigated with raw water from rivers such as the Crocodile and Sabie.

WHAT IS THE WATER QUALITY PROBLEM IN MPUMALANGA?

For many years, farmers have voiced concern over the high levels of faecal pollution in the Crocodile and Sabie River catchments. *Escherichia coli* (*E. coli*) is an indicator of faecal contamination.

A 2020/21 WWF study found that 40% of all water quality monitoring points in the Sabie River, and 30% in the Crocodile River, consistently show *E. coli* levels above 1 000 cfu/100 ml.

These high *E. coli* levels make this water unsafe for irrigating crops unless precautions are taken or treatment methods applied.

WHAT ARE THE RISKS?

If water with high *E. coli* levels is left untreated and used to irrigate crops and people eat the contaminated food, such as raw vegetables, they can get severely ill. A typical symptom of foodborne disease is diarrhoea. In parts of South Africa – including Mpumalanga – diarrhoea is a leading cause of death, especially among infants.

WHAT ARE THE CAUSES?

The health risk arises from a continued lack of access to improved sanitation for some residents, a lack of maintenance of sanitation infrastructure and inadequate functioning of wastewater treatment facilities.

WHAT IS THE ISSUE THAT MUST BE ADDRESSED?

In addition to ineffective wastewater treatment plants, it is critical to address good governance and the effective management of high-lying water source areas – and the downstream river systems – for our national water security, as well as food and water safety for local industries and communities. Good water quality is vital to both human health and the economy.

HOW IS *E. COLI* MEASURED?

Faecal pollution is measured by looking at *E. coli* concentrations in a consistent volume of source water.

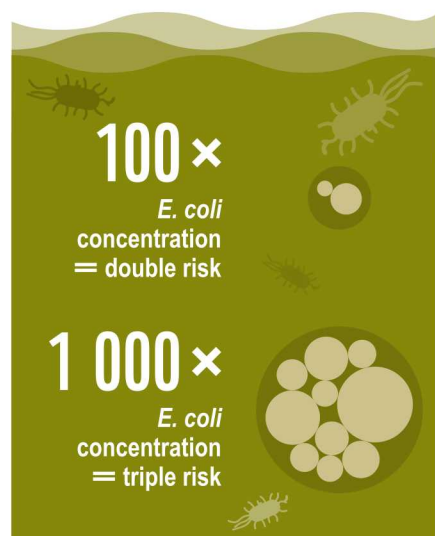
E. coli is a bacterium that lives in the lower intestines and faeces of both animals and humans. It is measured in "colony-forming units" (cfu) to estimate the number of bacteria cells in a sample.

The South African Water Quality Guidelines stipulate that irrigation water with *E. coli* levels exceeding 1 000 cfu/100 ml of water poses a health risk if this water comes into contact with fruit and vegetables. In contrast, drinking water quality must be less than 1 cfu/100 ml.

WHO IS MOST AT RISK?

Commercial farming in the area tends to focus on orchards (citrus and subtropical fruit), as well as sugarcane and macadamia nuts. Farmers apply water treatment methods purposely to avoid health risks to consumers and to remain in line with certification standards like GlobalG.A.P., which ensure good agricultural practices.

Smallholders and subsistence farmers have less of a financial buffer to implement water treatment methods, thus are more exposed to health risks. These farmers also cultivate a lot of leafy green vegetables and green beans, which are the most at-risk crops.



WWF STUDY

Objective: In response to the water quality concerns in the rivers downstream of the Mpumalanga Drakensberg Water Source Area, WWF conducted a desktop study in 2020/21 to assess the water quality in the Crocodile and Sabie River catchments and the associated economic implications and health risks polluted water holds for irrigated food crops and local communities.

With Woolworths as the funder, the focus was on the effect of faecal pollution on food crops in this subtropical region. Other partners included SANParks, the managing agency for Kruger National Park, as well as the local catchment management agency and irrigation boards, which represent the government and farmers.

Approach: The study combined three datasets. The first was water quality data from the government-mandated agency – Inkomati-Usuthu Catchment Management Agency (IUCMA) – who do monthly *E. coli* concentration measurements, taken at 120 specified points in the catchments. The second was land-cover maps, which indicate crop types and irrigation. The final dataset was StatsSA demographic data.

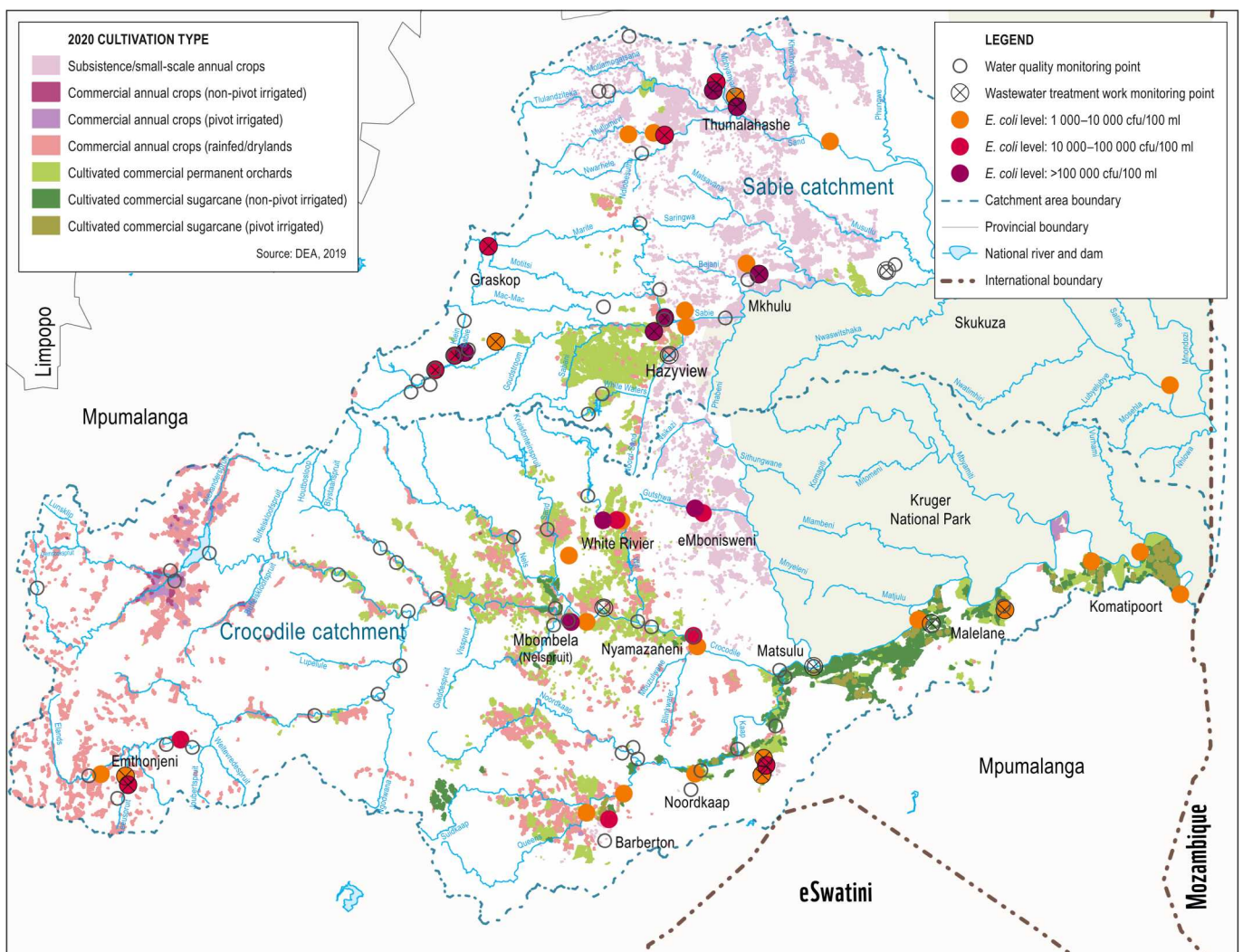
The data was combined to overlay irrigated agriculture and maximum *E. coli* pollution levels at each water quality monitoring point, and demographic information to capture where commercial, smallholder and subsistence farming are common. To determine the risk of pollution over time, an 80th percentile analysis was done. This showed monitoring points that consistently registered *E. coli* pollution above 1 000 cfu/100 ml.

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The source of both the Crocodile and the Sabie rivers are in the Mpumalanga Drakensberg Water Source Area – one of South Africa's strategic water-producing landscapes. Both rivers flow through the Kruger National Park and supply water to wildlife and ecosystems. Also forming part of the larger Incomati River Basin, the Crocodile and Sabie rivers flow into the Incomati River system that then reaches the sea at the Mozambican coast. Being part of an international river basin implies international obligations of stewardship, as legally formulated for this basin in the Interim Inco-Maputo Agreement.



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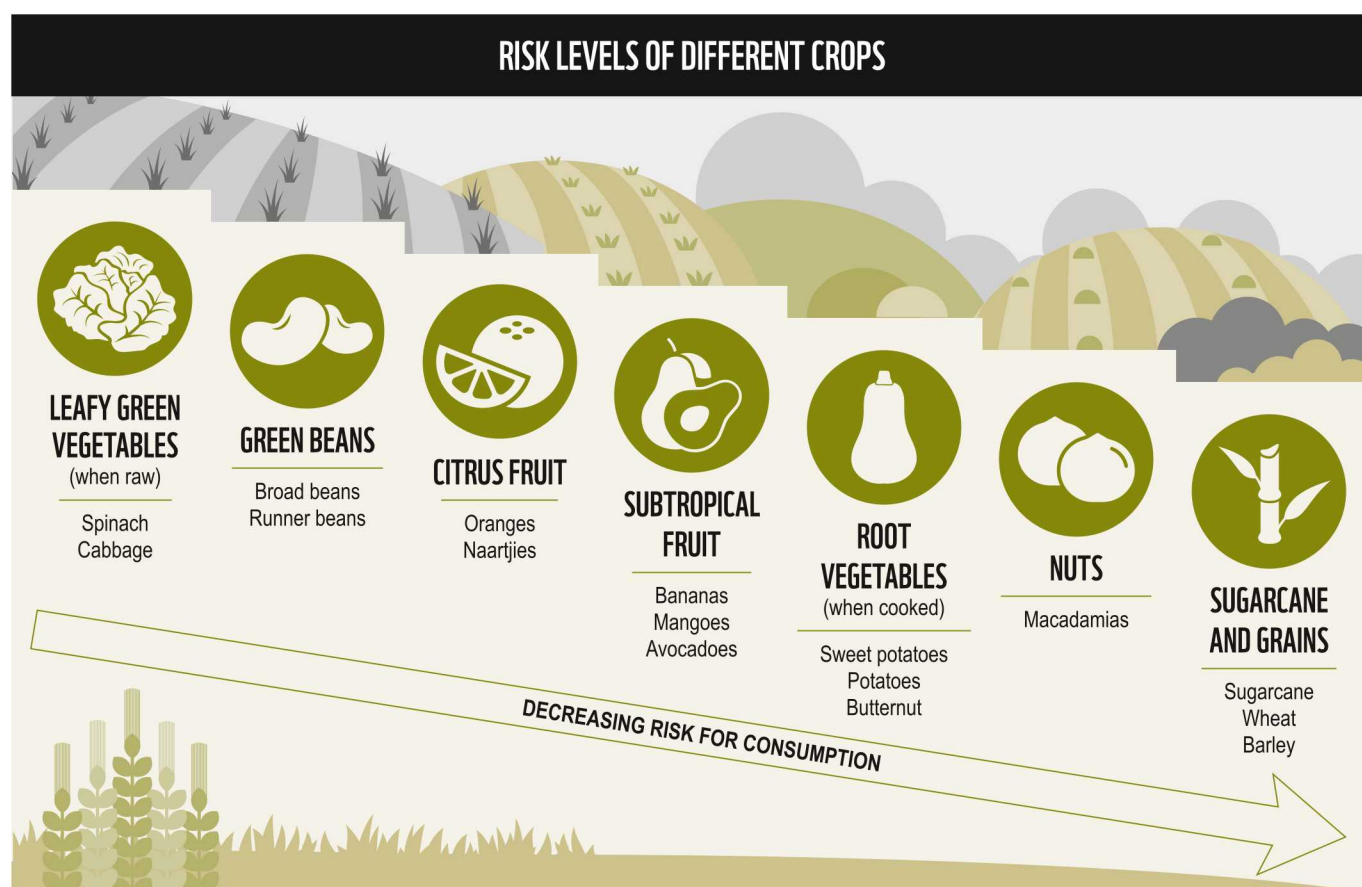
RECOMMENDATIONS

1 Embed equity in addressing water and sanitation issues

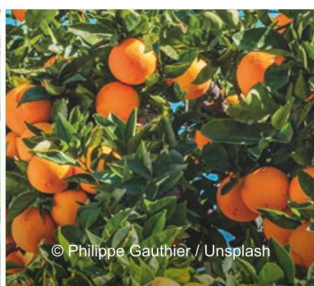
While there is ample evidence that there is a serious performance problem at all wastewater treatment plants, the problem is more widespread. Equally, urgent attention must be given to providing – and maintaining – adequate sanitation infrastructure. There is also a need to alert and train extension officers in the landscape to assist subsistence farmers in taking safety precautions when using potentially contaminated water for their crops.

2 Consider crop choice

Green leafy vegetables and green beans are particularly at risk from faecal pollution. These would require boiling or cooking before eating. Nuts, subtropical fruit and citrus are more resilient because they have peels or shells and hang high enough not to be sprayed and contaminated by drip or microjet irrigation. If farmers cannot avoid planting high-risk crops, precautionary water treatment measures should be in place.



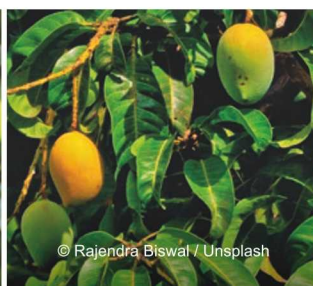
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3 Invest in safe farming techniques

With economic costs, farmers can apply targeted farming practices to reduce the risk of *E. coli* exposure. It starts with selecting irrigation equipment. Drip and microjet irrigation are the safest, whereas flood and overhead irrigation are the riskiest. Other good farming practices include pre-treating irrigation water (e.g. in holding dams or through chlorination), using groundwater to irrigate close to harvesting, and washing the crop with clean water post-harvest.

COST ESTIMATES FOR A FEW WATER TREATMENT ACTIVITIES



Additional
maintenance cost
R24 000
YEAR
for each
water intake point



Additional
chlorination cost
R64 800
YEAR
for each
water intake point



Minimum
treatment cost
R13 200
YEAR
for each
hectare

- Added maintenance costs arise when algae clog the irrigation equipment. Algae grow prolifically in the nutrient-rich conditions created by faecal pollution. Frequent filter replacements are needed to avoid the clogging of fine irrigation nozzles.
- Material costs of additional chlorination (excluding labour costs).
- If water can be treated, this is a minimum cost estimate for the treatment of all irrigation water to potable water quality.

This work was completed in close collaboration with



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AND WASTE



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4 Better awareness and data mean better risk management

Better information sharing about specific pollution events could help farmers to decide when to irrigate to avoid faecal contamination. The platform could be as simple as a WhatsApp group. This information sharing will require openness from the municipalities and operators of wastewater treatment works. Several areas in the Crocodile and Sabie River catchments would also benefit from added monitoring, while others could pool their monitoring data. Awareness-raising opportunities include training extension officers in the landscape so that they can inform farmers about appropriate safety precautions when having to use contaminated water. They could also assist subsistence farmers. Other awareness-raising opportunities with the departments of health and education can be explored.

5 Initiate collective water stewardship and collaboration

Faecal pollution, including its risks for the food production sector in the Crocodile and Sabie catchments, is an issue that will not be solved by one or two entities alone. While mandated institutions should continually be held accountable for providing the water and sanitation services they are responsible for, more immediate action is required from other sectors in parallel. This includes stakeholders in the health sector, in agriculture, in commercial and subsistence farming and in business. Ultimately, these actions should support the responsible institutions to fulfil their mandates.

A key recommendation is to form a community-private-public partnership for the area, focused on pragmatic collective-action projects to help fund and implement relevant solutions. These could include investment in ecological infrastructure, such as creating artificial wetlands which can filter out contaminants and improve water downstream. Citizen science initiatives with upstream communities could focus on awareness-raising and education campaigns and encourage participatory action on river pollution. WWF calls upon interested and affected partners and businesses to help grow resilience and action – to counter the risks of faecal water pollution together.

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