Water Use And Benefits of Marula Tree Crops

WRC World Food Day Dialogue

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Research teams

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Water Use

- Water is a serious problem in our countries because of climate change.
- There is limited enough of rainfall which leads to low production of food products.
- Marula tree depend on the environmental rainfall as there is no orchard for marula tree.
- There is no irrigation system attached to marula trees.
- Rain is need for marula trees which may assist for bearing fruit quality.

Marula trees…

- *Sclerocarya birrea* (A. Rich) Hochst. subsp. caffra (Sond.) Kokwaro (Marula), a member of the Anacardiaceae family.
- It is an example of an underutilized indigenous fruit tree species that grows naturally across large parts of sub-Saharan Africa.
- In South Africa, it is found in the tropical and subtropical regions in Limpopo, Mpumalanga, KwaZulu-Natal and parts of the North West Provinces.
- The economic value of Marula fruit and its by-products is well documented (Wynberg et al.,2002; Akinnifesi et al., 2006).

Marula trees…

- It is a great resource for alleviating poverty and diversifying rural livelihoods.
- Marula fruit are the major source of income for both rural and commercial entrepreneurs.
- Besides being eaten raw, the fruit can be processed into a range of products.
- These include liquors, juices, jams, jellies, perfumes, skin care products etc.
- Today, Marula products are marketed in over 160 countries highlighting the global significance of this tree species.

Marula trees…

- Despite the clear economic benefits, most Marula trees however, grow and are harvested in the wild unmanaged.
- Very little detailed research has been done on how Marula trees interact with the environment in their natural habitats (Dye et al., 2008).
- To some degree, this has contributed to its low levels of domestication and/or commercialization.
- Although Marula trees have been planted in backyard gardens or in farmer fields, available on a very small scale.
- There is need to increase the cultivated area to increase the footprint of this species on the country's economy.

Marula trees…

- Indigenous trees like Marula are known to thrive under harsh climatic conditions and in nutrient poor soils (Mabhaudhi et al., 2017; Nkosi et al., 2020).
- They can tolerate droughts; they are resistant to most pests and diseases that afflict exotic species.
- They also require limited management skills thereby bringing resource poor rural households into mainstream agriculture in line with government policies such as the National Development Plan 2030, the New Growth Path, and the United Nations' Sustainable Development Goals, especially goals number 1 to 3

Marula trees…

- On the postharvest side, there is need to expand the Marula product range, and to add value to the products in order to increase income.
- This is one of the goals of the Marula Processing Hubs whose goals are, among others, to support research on the beneficiation of Marula products.
- There is need to invent new innovative Marula-based products such as carbonated
- soft drinks and jam developing ways of storing and using Marula waste (e.g. skins and shells) which pose environmental pollution.
- The waste can, for example, be converted into stock feed long after the Marula season has ended etc.

Importance of marula

Table 1. Commercial Marula industry market channels (Mander et al., 2002; Shackleton et al., 2002)

Marula product	Responsible company	Current status
AMarula cream	Distell Pvt Ltd	The community trust and Distell own Marula pulping factory in Phalaborwa and distillation factory in Stellenbosch. AMarula cream is South Africa's biggest and most generally distributed alcoholic beverage marketed nationally and internationally in more than 160 countries
Juice	Mhala Development Centre	Marula juice produced in Thulamahashe, under the Mine Workers' Development Agency Marula Project. Pulping halted due to low productivity
Oil	Mhala Development Centre	Oil is traded to Body shop, an international environmentally conscious and fair-trade cosmetics retailer. The French company Aldiva S.A. is also involved in commercial development of the oil. Low productivity of oil
Beer	Rural communities	Traditional Marula beer produced by rural communities actively traded within producer communities
Marula kernels/traditional cooking oil	Mirma Kernel	Kernels are sold at informal and pension markets in South Africa and on a request basis from people's homes. Kernels and oil are traded locally and within the main towns in Namibia.

Table 1. Ethno-medical utilisation of Marula tree in selected African countries

Country of origin	Medicinal use	Part used	Application method
South Africa	Arthritis, cholera, dysentery, diarrhoea.	Stem, bark	Decoction oral take
	Fracture	Bark	-
	Anti-aging (body massage), moisturizing, soothing, therapeutic	Seeds	Soothing, therapeutic Seeds crush and boil seeds, skim off oil, then external application
	Asthma, diabetes mellitus, epilepsy, fever, toothache, urinary tract infections	Stem, bark	-
South Africa, East Africa	Malaria	Bark	Infused in brandy and used as both prophylactic and treatment
Botswana, South Africa	Influence gender of unborn child	Bark powdered	infusion made from male or female plant
South Africa, Swaziland	Arthritis, cramps, kidney pain, rheumatism, sciatic	Bark	Grounded, mixed with Schotia brachypetala and warm water to induce vomiting, in steam bath.

Table 2. Commercialised products and their key players.

Marula Sectors	Marula Fruit	Enterprise
Food & Drinks Marula Fruit, Pulp & Kernel	Juice	Natural Products (MNP)
	Beer, Jam, Fruit leathers, Jellies	Self-Initiatives and Community informal trading
	AMarula Pulp	Mirma/Distell JV, Phalaborwa, Limpopo
	AMarula Cream	Distell (Stellenbosch Winery)
Marula Fruit, Pulp, Kernel Oils/Cosmetics and Kernel-based	skin care products, soaps, shampoos	Marula manufacturing (Pty) LTD, Metista, African Botanics, Lonza Groups, LLC, ROK stars, PLC, ACURE Organic
Pharmaceuticals Herbal Meds (whole tree) Leaves, Bark, Kernel	Treatment for syphilis, leprosy, dysentery, hepatitis, rheumatism, gonorrhoea, diabetes, dysentery and malaria	Traditional healers, Household, community

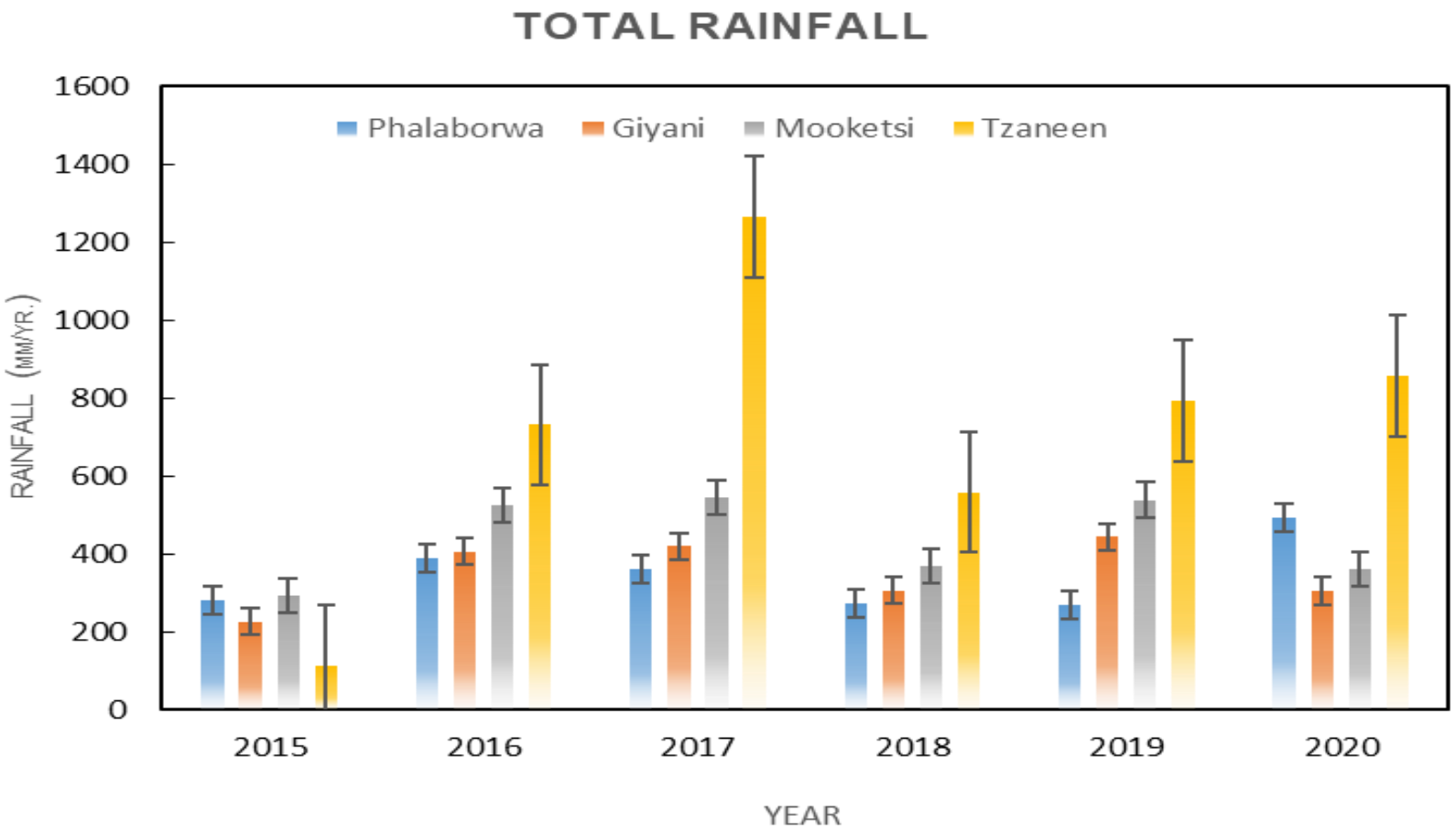

Fig. 1 Long-term rainfall patterns for districts within the Mopani region

Objectives…

- GENERAL AIM: To investigate the performance of marula trees in different agro-ecological
- To quantify the diurnal and seasonal water use patterns of marula trees in different agro-ecological regions;
- To establish how fruit growth, yield, and water productivity of marula differ between agro-ecological regions;
- To establish how the quality of marula fruit (physicochemical, phytochemical, and nutritional properties) vary with environmental conditions and to establish the safety of products like marula fruit juices and jams;

Objectives

- To investigate the preservation methods and livestock feeding value of marula fruit by-products, and
- To develop and characterize a marula fruit based carbonated soft drink.

Staff/ Student Capacity Development

- Student development: One (1) MSc student (MSc Agric Animal Science under the supervision of Dr. Mikasi.

Site selected and equipment

- Three study sites were identified in three agro-ecological zones representing low (<300 mm/yr.), medium (400 – 600 mm/yr.) and high rainfall (> 800 mm/yr.). This task will be completed by January-February 2021.
- The study will be conducted in the Limpopo and Mpumalanga Provinces where many communities rely on marula to supplement their incomes.
- Limpopo province – Phalaborwa and ZZ2 Natuurboedery Mooketsi.
- Mpumalanga province – Thulamashe
- Received some equipment and waiting for Sapflow equipment.

Future study

- Purchase of Eco physiological equipment namely automatic weather stations, soil moisture probes, data loggers, and HRM sap flow equipment. Some sensors will be bought before the end of Year 2, while other will be purchased in Years 2 and 3;
- Equipment installation at the first study site to be done around July/August depending on the availability of equipment- November 2021.
- Preparations for lab work to commence from December 2021.

Challenges and Conclusion

- Internal challenges when ordering equipment.
- Hoping to receive sap flow equipment as soon as possible and install them end of November 2021.
- Students will start collecting marula fruit around December 2021 and start with the laboratory analyses.

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Thank you