

WATER AND AGRICULTURE

Time for an ewe-turn on farming with indigenous sheep

A new study provides insights on how sheep farmers, especially smallholders in semi-arid regions, might better adapt to drought and save water without compromising meat production and quality. Matthew Hattingh reports.



Let's be honest. When you're enjoying a convivial *dop en tjop* with pals (your correspondent likes his beer cold and his lamb loin hot off the coals, medium-rare and lightly salted), it's unlikely conversation will turn to weighty topics like the country's water woes. But if you love lamb or mutton, perhaps it should.

Consider this: more than half of South Africa's 22 million sheep are farmed in arid and semi-arid areas. During 2017/18, the drought in the Western Cape forced farmers to slaughter more than 20% of the province's sheep, some 2.8 million animals. Looming climate change will only worsen the frequency and intensity of drought.

And it's a lot more serious than rising braai meat prices. Lack of water makes farming harder, causing hunger and slashing sheep

farmers' income. Smallholders keeping sheep on communal land in semi-arid parts of the country have it especially tough, and they feel the lack of good governance and investment in water infrastructure more keenly than commercial farmers, who can better mitigate drought's effects.

Might smarter farming (finding new sources of water and greater efficiency) improve the lot of producers, especially smallholders? What happens when not enough water is available? And how would restricting water supplies to sheep, especially indigenous breeds, affect meat production and quality?

A recently published Water Research Commission report looks at these and other questions.

Assaying water requirements and hydric stress tolerance of the South African indigenous sheep genetic resources for water and food security (WRC Report No. 2973/1/23) is the work of 11 researchers, mostly representing the Faculty of Agrisciences at Stellenbosch University, but also the universities of Cape Town and the North-West.

Meat scientist, Prof Cletos Mapiye and his co-authors found little research on the water requirements and stress tolerance of common sheep breeds in South Africa, and have pursued three main avenues of inquiry to correct this:

- Asking smallholder and emerging commercial sheep farmers how they perceive and deal with water scarcity;
- Determining the water requirements of common breeds and the quantity and quality of their meat; and
- Assessing how different breeds and their meat are affected by water restrictions.

The report starts by reviewing the sometimes inconclusive literature on sheep water requirements. It touches on techniques to better manage rangelands, and how providing sheep with shade or grazing them at night can pay off; and the potential water-saving benefits of adding succulents such as cactus to their diet or letting them eat fresh leaves of alien invasives, or water-rich agricultural byproducts, like grape pomace.

We will focus on the three main avenues here, but first, let's shine a little light on the real hero of this drama, *Ovis aries*, the small, timid ruminant we call the domestic sheep. Roughly speaking, sheep come in two types: fat- and thin-tailed. Fat-tailed, with their large tails and hindquarters, account for a quarter of the world's sheep, but nearly twice as much meat as thin-tailed

sheep. For the most part, fat-tailed sheep are the indigenous domestic sheep of Asia and later Africa, while the majority of thin-tailed breeds came to this continent in recent centuries, from Europe.

The South African herd includes European breeds and crossbreeds, such as the Merino and Dohne Merino; indigenous sheep like the Damara and Pedi; and composites, which draw on the bloodlines of indigenous and exotic animals. A good example of a composite is the Meatmaster, a fat-tailed hair sheep, first bred in the 1990s and recognised by government gazette, *nogal*, in 2009.

Indigenous and tropical breeds, the authors note, show greater resilience to water stress than their temperate counterparts, having adapted to environmental conditions. They can convert the fat in their tails and rumps into water to survive without drinking for up to a week. And by storing fat in their tails, breeds like the Damara can better dissipate heat from the rest of their lean and less-insulated bodies.

Other physiological reasons, including an ability to absorb water from their kidneys and large intestines, help tropical and indigenous sheep fare better when water is scarce. There are also behavioural mechanisms. Indigenous sheep forage when it's cool and lap up dew. When they're parched, they eat less, "which reduces heat production from fermentation, digestion and overall metabolism resulting in greater water conservation".

This might seem a convincing case for indigenous breeds, yet the report states that "most producers are hesitant to use indigenous tropical breeds for meat production because of their small frame



The study found that, in general, daily water restrictions up to 20% did not adversely influence growth, carcass and meat quality attributes of the common South African sheep breeds.



The study identified Meatmaster sheep as the ideal feedlot breed under water-scarce conditions.

sizes and slow growth rates". However, the report notes that although indigenous breeds yield smaller carcasses, they can be productive (a measure of the cost of feeding a sheep versus the price its meat fetches) compared with improved breeds – even in feedlot systems.

Feedlotting, Mapiye explained in an interview, involved keeping lambs (after weaning) in pens and feeding them a high-energy and high-protein diet of mostly maize and soybeans. This helped them reach slaughter weight far quicker than they would grazing. The result is a younger, more tender carcass which fetches a premium. Feedlots produce most of the lamb sold in South African shops and it's essentially the preserve of commercial agriculture. But Mapiye reckons feedlots, combined with the right breeds, could be a real option for smallholders, promising better prices at slaughter, while sparing farmers from having to sell when drought bites.

The report noted that as demand for meat continued to grow and as water scarcity escalated, "the adoption of indigenous and composite breeds or their crosses with temperate breeds has potential to support sheep production for resource-limited farmers".

So who are these farmers, what difficulties do they face and how do they deal with drought? Seeking answers, the researchers interviewed the heads of 252 households, emerging commercial sheep farmers in the arid Northern and Western Cape, and

smallholders in the semi-arid Eastern Cape. A structured questionnaire was used to develop a profile of the farmers' circumstances, the breeds they keep and how they manage these, especially as it relates to water.

Most of the farmers surveyed were men – 59% in the Eastern Cape and 86% in the other Cape provinces – and most (67%) identified livestock as their chief source of income. More than half were aged between 50 and 70 and either had primary or no formal education. According to the report, "All the farmers in the semi-arid ecozone were subsistence farmers on communal land, while those in the arid ecozone were commercially-oriented farmers on private land." Farms in the North and Western Cape tended to be considerably larger than those in the Eastern Cape – an average 1678-hectares compared with about 205ha.

Dorper (a long-established, local cross of the Dorset Horn and the Blackhead Persian sheep) was the most common and preferred breed in the arid regions (67%). This was followed by Meatmaster (15%), Merino (13%) and Damara (5%). In the semi-arid areas, nondescript crossbreds (27% of the respondents) were dominant, followed by Dorper (18%), Dohne Merino (17%), Merino (14%), Damara (9%), South African Mutton Merino (9%), Meatmaster (3%) and Dormer (3%). However, most respondents in the Eastern Cape preferred farming with Merinos (70%).

Cash income was the main reason given for keeping sheep by 80% of respondents. Other reasons varied, with smallholders

in the semi-arid regions more likely to keep sheep for manure, wool, festivities and cultural purposes. This included, said Mapiye, customary fines, *lobola* (bride price) and rituals around the initiation of young Xhosa men.

The survey found that extensive farming was the norm, but that farmers in the arid areas were far more likely to rotate their sheep among pasture, giving the vegetation time to recover, than their semi-arid counterparts, 95% of whom practised continuous grazing. The semi-arid smallholders also left their sheep to fend for themselves for water, posing a big problem when intermittent and seasonal streams dried up and man and beast competed for the same sources.

Adapted breeds such as Dorper and Meatmaster that were dominant on the commercially-oriented private farms in the arid regions have long, slim legs, which helped them to walk far for feed and water and to produce more lambs than the nondescript crosses and exotic breeds that dominated semi-arid arid smallholdings.

Sheep were entirely free to mate in the semi-arid regions, but less so in the arid regions. Uncontrolled mating is bad because inbreeding is more likely, leading to poor growth and reproductive rates. Moreover, lambs can be born in the wrong season – when grazing is scarce.

Meat marketing differed too. Arid-regions farmers were more commercially orientated and sold on auction, with the sheep going to the abattoir. Subsistence-oriented farmers in the semi-arid areas sold to local consumers and middlemen. These things had a direct bearing on farmers' incomes and how they perceived water scarcity.

Faced with water scarcity, most farmers in the arid regions explored alternative marketing channels and provided supplementary feeds, the survey found, whereas those in the semi-arid regions "withheld sales, reduced prices for live sheep and meat, and waited for the festive season". The Eastern Cape farmers cited a shortage of land, followed by a lack of capital, information, infrastructural and institutional support, as the main barriers to them putting measures in place to deal with water scarcity.

The second and third main avenues of inquiry covered in the report, which compared different breeds under feedlot conditions, involved two trials run at Stellenbosch University's Welgevallen Experimental farm, both over 42 days. The first compared the digestibility, water intake and growth, and meat quality of one exotic (Merino), two indigenous (Pedi and Damara) and three composite (Dohne Merino, Dorper and Meatmaster) breeds. The researchers also sought to establish the ratio of water and feed consumed to weight gained. Each animal was weighed daily, with tabs kept on water and feed consumption and samples analysed to learn how much of the nutrients from their feed ended up in their faeces, urine and meat.

After the sheep had been slaughtered and weighed, income-over-feed costs were calculated. Meat samples were subject to panel tasting by experts and in the lab, the researchers worked to quantify a host of quality attributes – including moisture

lost during cooking, intramuscular fatty acids composition, meat shelf-life, colour and toughness. The findings on this ran to more than 20 pages, but briefly: "Pedi, because of its smaller body size, had the lowest water and feed intake. The Damara had a comparable water balance to the three composite breeds, despite it and the Meatmaster having superior nutrient intake and digestibility. A similar trend was observed with average daily gain, which was greater for the Damara and Meatmaster than the other breeds."

When it came to income over feed costs, Dohne Merino led the field followed by Meatmaster, Merino, Dorper, Damara and Pedi. The authors noted the two indigenous sheep breeds had the lowest intramuscular fat content, "with the Pedi having a more desirable fatty acid profile compared to the other breeds".

"Minor and inconsistent breed effects were reported for meat shelf-life and sensory attributes. However, the Merinos had slightly more tender and juicier meat than other breeds."

The final avenue of inquiry compared the effects of different levels of water restriction – 0% (control), 10% and 20%. The study found that Meatmaster and Pedi had a lower daily water intake than Dohne Merino. However, Meatmaster and Dohne Merino had superior carcass weights, income-over-feed costs, and more tender meat than the other breeds. "In general, daily water restrictions up to 20% did not adversely influence growth, carcass and meat quality attributes of the common South African sheep breeds." The authors felt Meatmaster could be the "ideal feedlot breed under water-scarce conditions".

It was suggested that water-saving strategies should target farmers most in need, particularly less-educated women smallholders who were entirely reliant on income from extensively farmed non-adapted breeds in semi-arid regions. Mapiye said the report also highlighted the need for more research, policies and legislation to improve water supplies and monitoring, innovations in livestock farming, and the "capacity of stakeholders" to manage water resources for livestock.

More than just *tjops* to chew over at the next braai, then.



Dorper sheep are preferred in arid regions, such as the Karoo.