

International



The future of the cow

Bridging the dairy divide

ELDORET AND MERCED

What has four stomachs and could change the world?

THE AVERAGE dairy cow in America produces 30 litres of milk a day; a cow in Africa, only 1.6. This 19-fold difference—call it the dairy divide—has enormous consequences. Closing even some of it would ease poverty, help children grow up better nourished, reduce emissions of greenhouse gases and perhaps even make civil wars less likely. The good news is that cows can become more productive, thanks to the spread of technologies old and new. But unhelpful traditions—and climate change itself—make it harder.

In rich countries, cows are unfashionable. The health-conscious are shunning red meat and switching to plant-based milk. The environmentally conscious fret, correctly, that cattle account for 7% of man-made greenhouse-gas emissions—far more than any other kind of livestock. And techno-optimists have predicted, since the first lab-grown beef was unveiled in 2013, that cruelty-free cultured meat will replace

the sort sliced from slaughtered animals as soon as it is cheap and tasty enough.

Perhaps that day will come. But for now cows are growing more important, not less so. The UN's Food and Agriculture Organisation (FAO) expects global beef consumption to increase by 11% by 2033, and milk consumption to rise by 17%, as the human population grows and more people can afford more animal protein.

Farmers face two challenges. First, to meet growing demand for bovine bounty, even as hotter, less predictable weather makes their job harder in many regions. Second, to stop their cows from belching so much planet-cooking methane.

In the first area there has been impressive, albeit uneven progress (see chart on

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next page). In India, home of the world's largest herd, selective breeding and better husbandry increased the milk yield per cow from 3.8 litres a day in 2013 to 5.3 in 2022. The global rise was more modest: from 6.4 to 7.4 litres. Cattle in poor countries remain far behind their rich-world peers, which means "the opportunity for catch-up growth is enormous," says Dominik Wisser of the FAO.

Bovine emissions, alas, keep rising. Farmers have few incentives to abate them. Governments are loth to impose rules that might inflate food prices, consumers are wary of methane-curbing feed additives such as Bovaer and it is harder to monitor emissions from cows than, say, power stations, since there are 1.5bn of them and their owners are often nomadic.

Still, raising productivity—which farmers have every incentive to do—leads to lower emissions per glass of milk. One cow producing ten litres a day emits much less methane than two producing five each, notes Sonja Leitner of the International Livestock Research Institute (ILRI) in Nairobi. The FAO looked at 11 ways to cut bovine emissions: raising productivity would be the key, ahead of tinkering with cows' genes and diets.

The first steps are laughably low-tech. Alfred Kering, a smallholder near Eldoret in Kenya, raised each of his cows' daily out- ▶▶

put from one litre to eight simply by reducing their number. He used to keep as many cattle as he could because among his people, the Kalenjin, a man is judged by the size of his herd. The trouble was, he didn't have enough land to feed all ten of them properly. An agricultural extension officer suggested he sell some. Now he has only three, but they are well-fed and produce more than twice as much milk as the ten did. He sells the surplus and is visibly less poor. His children are better fed and get sick less often, he says; and he no longer struggles to pay the school fees.

The next step to raise productivity—selective breeding—is more sophisticated. One cannot simply take a high-yielding American cow, drop it in Africa and expect it to thrive. The heat and bugs would surely kill it. Farmers need hybrids that are good milkers, but also resilient to local conditions. One snag is that smallholders like Mr Kering typically keep no records of the bloodline of their cows. Some just hire the neighbour's bull when they need them impregnated, which fosters inbreeding and unhealthy offspring. Others have tried to create better hybrids, but are hampered by not knowing what they had to begin with.

So since 2016 scientists at Africa Asia Dairy Genetic Gains (AADGG), a project run by ILRI and backed by the Gates Foundation, have been gathering data on cow genetics and productivity in developing countries. They have plucked hairs from 15,000 cows in Ethiopia, Kenya and Tanzania, and used the DNA to build a database of bovine genomes.

In addition, AADGG works with a mobile app that lets farmers collect and relay data about each cow's milk, health, location and so on. It then uses models to predict which genetic combinations might work best in specific places. At first it was hard to persuade smallholders to share information—many thought it would be used to make them pay tax. But eventually, working with a firm called iCow, AADGG accustomed farmers to receiving advice digitally. Those enrolled in the project in Tanzania saw productivity rise by 50%.

Gradually, know-how is spreading. Daniel Kemboi, another Kalenjin farmer, says he finds the right bull semen by googling it. He browses a website that lets him select traits, from higher milk yield to greater heat tolerance. His yield has risen from 12-15 litres per cow five years ago to 26. He has also built a cowshed for shade from soaring temperatures—a problem all local farmers complain about. He says he now makes ten times as much money as he did when he drove a truck as a young man.

Nationally, productivity per Kenyan dairy cow rose from 1.8 litres in 2013 to 2.3 in 2022. This is higher than the African average, but far short of what farmers in the AADGG project have shown is possible. It is

also far short of what locals need. Some 35% of Kenyans are undernourished. Extra protein and iron, essential for brain development, would come in handy for them—and indeed for the 22% of the world's children under five who are stunted for lack of good food. A study by Beliyou Haile and Derek Headey of the International Food Policy Research Institute in Washington found that an increase in milk consumption in a country was associated with a large reduction in stunting, even after controlling for income.

The pressure to adapt is especially intense among nomadic herders. "We used to move from place to place, following the rain," recalls Daniel Sinkeet, a 59-year-old Maasai herdsman from southern Kenya. An intense drought in 2021-23 made him realise his way of life was not sustainable.

When the local pasture dried up, he tried to save his cows the traditional way—by driving them on a 200km trek to find fresh grass and water, moving at night to avoid the heat. Many died of thirst or disease. He had to sell others, at dismal prices, to buy feed for the survivors. His herd shrank from 300 head to 200.

If droughts grow more severe, conflicts between herders and sedentary farmers could proliferate. In good years pastoralists graze their cows on marginal land until farmers have harvested their crops. Then, with the farmers' permission, they let their cows eat the stubble and pay the farmers in cash and cow dung. But when the rains fail, herders are forced to move before the harvest is in, and their cows often destroy unharvested crops. This can spark fights, which may escalate into ethnic conflict. A study by Eoin McGuirk of Tufts University and Nathan Nunn of Harvard found that drought in pastoral areas explained "a sizeable proportion" of conflicts in Africa between 1989 and 2018, including civil wars.

Mr Sinkeet has reluctantly concluded that the solution is to settle down. Instead of letting his cows wander far and wide, he now brings most of their food to them. He grows maize, alfalfa and Napier grass, and

feeds it to them in troughs. It is a psychological wrench for him, as a proud Maasai man, to stop roaming. But if herders' productivity rises and they become more stationary, one of the big causes of war in Africa could eventually fade.

Smallholders struggling to feed their kids seldom think much about their contribution to global warming. But ILRI is helping some countries come up with better estimates of bovine emissions, with a view to cutting them one day. In one experiment in Nairobi, cows are put in a metal box called a respiration chamber with instruments to measure how much methane they burp. Researchers are testing whether varying their diet with locally available legumes makes them produce more and emit less.

Man's best frenemy

Even rich countries do little to curb livestock emissions. A partial exception is the state of California, which has a target of reducing methane emissions to 40% below 2013 levels by 2030, and has crafted rules and subsidies to encourage farmers to do their bit. One technique is to capture the methane and sell it as fuel (which is less damaging than letting it float away).

"That's just poop," says Simon Vander Woude, a dairy farmer near Merced, near Sacramento, pointing to a duct filled with a thick brown liquid. Streams of water flush the dung from his 3,200 cows into a pit under a tarp. It is an anaerobic digester, a contraption that uses bacteria to break down biological waste into methane. Walking on the gas-filled tarp feels like jumping on a bulbous trampoline. The biogas is refined and sold. Before 2017, there were fewer than 20 digesters in California; today at least 149 are in operation or under construction. Private companies offer to build and maintain digesters for a cut of the state subsidy and of the proceeds from selling the gas.

Mr Vander Woude's digester cost \$4m, but is now making a return. And there are other promising techniques. Studies suggest that adding red seaweed to cattle feed can suppress methane emissions, though estimates of how much vary wildly.

STgenetics, a Texan firm, sells a tool to help farmers breed cows that make more milk while eating—and thus emitting—less. Pablo Ross, the firm's chief scientific officer, says "there is still a lot of work to do" to persuade farmers that this will save them money (on feed) without sacrificing other traits they want.

If cow burps and farts were taxed in a way that reflected their baleful effect on the climate, farmers would have an incentive to curb them, and consumers to cut back on emission-heavy foods. In June Denmark's government said it would slap a levy on emissions from livestock. So far, it is the only one. ■

