"Many new industries could be enabled, such as textile manufacturing, but the main effects will be in e-commerce and spare parts." Ledgard envisages droneport staff talking customers through products on tablets, creating a virtual shop offering rapid delivery and even facilitating the sharing economy.

Africa has long been a favoured destination for Westerners with transformative visions but Ledgard's faith in drones is shared by the likes of Google (which spent $270m developing them in 2013) and Facebook. The social media giant says drones could have a greater impact than mobile phones. Its internet.org initiative is striving to connect the two thirds of the world who struggle to access the internet. In doing so, it could help help Africa fulfil those dizzying growth forecasts, which Deloitte explains with a virtuous circle of information flows, innovation, entrepreneurship, access to finance, labour enhancement, and increased productivity of labour and capital.

In July 2014, *internet.org* got off the ground, launching an app in Zambia (where only 15% of the population was online), facilitating free access to core internet sites. (The app is now available in 20 African countries.) Internet.org is working on a huge solar-powered prototype drone that could beam the internet to ground stations at 10 gigabyte-per-seconds.

Called Aquila, this prototype is designed to fly for three-month stretches at 60,000 to 90,000 feet – transcending weather and planes – and is due for imminent testing in the UK. Drones are well suited to the sudden shifts in connectivity demand characteristic of rural areas, something satellites, which are also more expensive, struggle with. Google also plans internet drone projects – Google Titan and SkyBender – along with Project Loon, its plan to swaddle the world in internet coverage through stratospheric balloons.

Ledgard thinks it highly likely Afrotech's drones will diversify beyond infrastructure, by, for example, providing big data to African decision-makers. A season's log of plant-health data can help farmers increase yields.

Such work is already underway in Tanzania and Uganda, where the *International Potato Centre (CIP)* is conducting trials with their national bureau of statistics. In sub-Saharan Africa, where small, dispersed plots make crop data tricky to gather, drone trials showed that officials had underestimated sweet potato planting by 50% in parts of eastern Uganda.

"If you lack information on specific crops, the crops suffer in terms of technical support, so it's about how we can influence policymakers on how budgets are allocated," says the CIP's Dieudonné Harahagazwe. "The drone can give us true information from small farmers, so we can support and advise accordingly."

The CIP drones also serve as crop doctors, spotting water and nutrient-stressed areas 10 days before farmers. "Photosynthetic activity decreases and affects the chlorophyll," says the *International Water Management Institute's (IWMI)* Salman Siddiqui. "The near-infrared sensor can detect this. If a crop is being attacked by insects, the whole area can be affected. If you can figure this out before it spreads with drones, you can save the whole area."

In similar vein, drones have proved invaluable in locating and counting livestock in the *UN Food and Agriculture Organisation's* trials to control foot and mouth disease in Keyna.

Drones can play a more active role. The CIP trial has deployed them for crop spraying. Ethiopia's Southern Tsetse Eradication project is to use them to release sterile male flies. Found in 39 African countries, tsetse flies transmit sleeping sickness in humans and a wasting disease in livestock. Some 200,000km2 of fertile Ethiopian land are off-limits due to tsetse infestation; a prototype drone system developed by Spanish company Embention spread sterile male flies over 100km2 per flight in tests. Trials in Ethiopia are planned in the coming months.

Drones also perform familiar surveillance duties. Nigeria, Africa's biggest crude oil producer, will use them to track thieves as it tries to clean up an industry where 5% of daily output – 100,000 barrels a day – was stolen in 2013.

In Guinea in 2014, drones joined the fight against blood diamonds. The *US Geological Survey*, *Department of State* and *Agency for International Development* mapped artisanal and small-scale mining (ASM). High-resolution cameras accurately charted active and non-active pits, sedimentary layers, extracted gravel, and changes in water colour, helping teams map remote, sometimes dangerous, sites in an hour, and return quickly and easily if so required.

Most drones are cheap to make and to fly. Afrotech expects the cost of a Redline drone to be comparable, say, to one of the more expensive Chinese motorbikes that are so popular in Africa. "It is entirely plausible to get to $1,500 or less for the airframe," says Ledgard. "We expect the brains of a Redline drone to cost less than $100."

This, he says, reflects "the collapse in the price of robotics guidance systems through the commodification of the smartphone industry and the convergence of many other technologies, such as batteries and improved motors, all of which together enable a powerfully cheap alternative."

All drone makers need to do now is convince the people and their governments. IWMI's Siddiqui says: "In developing countries, farmers still get together and share tractors, so they could pool drones too." A lot of field time was added to the blood diamond project as the team wanted to dispel drones' sinister connotations.

As regards governments, Africa's regulatory void can be irksome as well as liberating, and may not last. Since drones had never flown in Guinea, the US diamond team had to establish a process for obtaining authorisation, which ultimately involved signed consent from four ministers. Facebook expects regulatory headaches to delay Aquila longer than technical ones.

The *South African Civil Aviation Authority* introduced detailed but onerous regulations last June, but the Senegalese, Moroccan and Kenyan governments have effectively banned them.

Ledgard appears unperturbed by regulatory obstacles, only emphasising the need to separate "hobbyist and monitoring drones which are highly dispersed and more problematic legally" from "quiet, beautiful, bird-like cargo drones".

He hopes Africa's governments will seize the moment – not just in using drones but making them. "Most of the early drones will be made in China and Taiwan. Although the electronics will be commodified, they could be repaired and amended locally. We want Africa to take the lead, with significant government support, but there isn't a strong tradition of investing in technology. It could end up being outsourced to the Chinese."

"Rwanda is the test site," he says, "but countries like the Democratic Republic of Congo, Angola, South Sudan, Ethiopia, and Somalia are much more in need. We are pushing towards … a virtual railway line in the sky. Within a decade you are looking at 5% or more of African trade passing overhead on drones."