

High Heat

The world will feel different in 2100, when average temperatures will have risen by several degrees. Every kind of landscape that humans inhabit will be affected: urban, suburban, rural; mountains, plains, coasts. More of the developing world will acquire life-changing modern comforts. "You'll have near-universal saturation of air-conditioning" in warm climes by 2100, says economist Lucas Davis of the University of California, Berkeley. By powering those devices, though, we'll be contributing to global warming. If we can't find ways to turn down the heat, we'll find ways to adapt to it.

DEGREES OF SEPARATION

The annual mean air temperature of a city can be 4° to 11°F warmer than surrounding rural areas during the day, and 4° to 9°F warmer at night. Vegetation-rich green roofs can mitigate this urban heat-island effect, lowering the temperature by more than 5°F on the hottest days; plants also help manage excess storm water.



Reflective "cool roofs" can block up to 65 percent of the sun's radiation.

Urban forestry helps: Shade trees can lower surface temperatures of walls and buildings by more than 23°F.

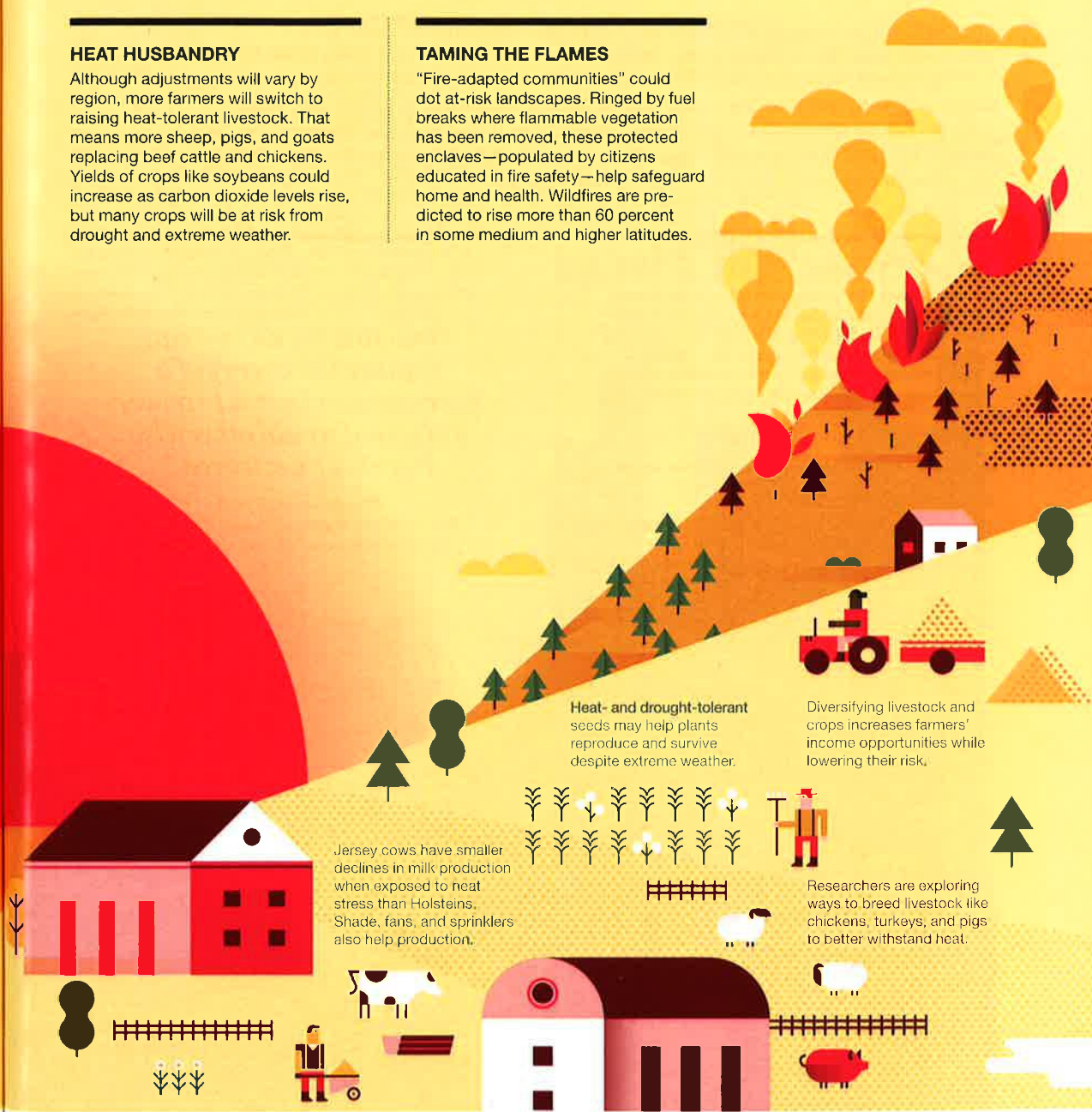
Reflective and permeable pavements lower surface summer temperatures, which can reach 108°F.

HEAT HUSBANDRY

Although adjustments will vary by region, more farmers will switch to raising heat-tolerant livestock. That means more sheep, pigs, and goats replacing beef cattle and chickens. Yields of crops like soybeans could increase as carbon dioxide levels rise, but many crops will be at risk from drought and extreme weather.

TAMING THE FLAMES

"Fire-adapted communities" could dot at-risk landscapes. Ringed by fuel breaks where flammable vegetation has been removed, these protected enclaves—populated by citizens educated in fire safety—help safeguard home and health. Wildfires are predicted to rise more than 60 percent in some medium and higher latitudes.



Jersey cows have smaller declines in milk production when exposed to heat stress than Holsteins. Shade, fans, and sprinklers also help production.

Heat- and drought-tolerant seeds may help plants reproduce and survive despite extreme weather.

Diversifying livestock and crops increases farmers' income opportunities while lowering their risk.

Researchers are exploring ways to breed livestock like chickens, turkeys, and pigs to better withstand heat.



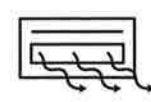
Vegetation can lower surface temperatures by up to 40°F, with shade and evapotranspiration.



If average temperatures rise 21°F, half the population could face unlivable conditions.



To adapt to higher temperatures, developing countries must spend \$75 billion to \$100 billion annually until 2050. Mitigation costs are projected to be \$140 billion to \$175 billion a year for the next 15 years.



India's potential demand for cooling is 14 times as great as the U.S. demand.



Year-round benefit: Evergreens planted on the north side of buildings block winds, lower heating bills.



Californians will endure an average of 40 to 53 extreme heat days by 2050, and 40 to 99 days by 2099. The historical average is four a year.