## LETTERS

### African Drought

Garrett Hardin (Letters, 15 Mar., p. 1284) states that bad years occur as a matter of course in Africa and therefore "[i]t is only prudent to define the carrying capacity as being well below any momentary maximum attainable in a good year." What is needed, he argues, is radical population control and prudent management; without population control, he says, the technological solutions listed by Jean Mayer (Editorial, 15 Feb., p. 707) to help Africans predict droughts and ride them out are "useless."

This is temperate zone science in which the "wisdom" of Western resource management is transferred inappropriately to the rest of the world. The tropics, indeed, are characterized by resource fluctuations. The economical way to exploit such environments is to track the fluctuations opportunistically, as traditional populations long have done (*1*). African pastoralists, for example, have habitually exploited forage variations by moving their herds to the good places each year and season, and they have developed various mechanisms of stock redistribution within the society to recover rapidly from a drought.

Population control must be exercised in Africa as anywhere in the world, but perhaps the most pragmatic solutions to the modern problems of African food production will lie in the direction of enabling people to carry out their management adaptations in a timely and efficient way. Obvious improvements along these lines are better transportation, the development of markets, and livestock and seed banks.

Better weather monitoring is also needed to enable a response to be made to drought as soon as it develops. Unlike Joseph in Egypt (Genesis 41), we will never be able to predict a drought 7 years before it begins. But the modern technology and traditional knowledge is already available to allow planners to emulate Joseph's program as Pharoah's overseer: to take advantage of production during times of plenty to tide the people through times of famine.

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#### References

1. S. Sandford, in *Desertification and Development: Dryland Ecology in Social Perspective*, B. Spooner and H. S. Mann, Eds. (Academic Press, London, 1982); R. T. Wilson, *Arid Environ.* 1, 327 (1978).

### Automobile Fuel Efficiency

In their article "Technological trends in automobiles" (10 Aug., p. 587), Emmett J. Horton and W. Dale Compton of the Ford Motor Company described automobiles with fuel economies "in excess of 100 miles per gallon (mpg) on the highway" as being potentially the " 'average' vehicle of the late 1990's." (One hundred mpg would correspond to 2.35 liters of fuel consumed per 100 kilometers). This is technically correct. Volkswagen and Volvo have already demonstrated attractive prototypes that achieve about 65 mpg on the Environmental Protection Agency's (EPA's) composite (55 percent urban and 45 percent highway) driving cycle and more than 70 mpg on the highway. These prototypes do not include such technologies as wide-range, continuously variable transmissions, or turbocompounded adiabatic diesels (*1*), which should allow further dramatic fuel efficiency improvements.

Tom Bull, A. Alic, and L. L. Jenny (Letters, 8 Mar., p. 1156) are also correct when they state that such "very fuel-efficient automobiles . . . may not appear until well into the 21st century." Indeed, at the current rate we will never get there. The trend toward improved fuel economy in new U.S. automobiles has been essentially stalled since 1981 (*2*), Ford and General Motors are not meeting the federally mandated Corporate Average Fuel Economy standard of 27.5 mpg for model year 1985, and these same companies are requesting (*3*) that the Department of Transportation lower the standards for subsequent years to 26 mpg. Currently, 26 mpg as measured by the EPA test used to monitor compliance with the standards corresponds to about 22 mpg for average on-the-road driving (*4*).

How then are the nation and the world to realize the enormous technological potential for automotive fuel savings? The only suggestion made in the Horton-Compton article and the letter by Bull *et al.* is that future increases in oil prices will eventually encourage further increases in automobile fuel economy. But, even with quite large increases in fuel prices, it is unlikely that "the invisible hand" of the market will result in the realization of more than a small fraction of the potential fuel savings (*5*).

According to auto manufacturers, new car buyers will only invest in fuel economy improvements that pay for themselves within the first 2 to 3 years of ownership—typically about 30,000 vehicle-miles. Over this distance, a fuel economy improvement from 14 mpg [the