

WORLDVIEW EDITORIAL

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WORLDVIEW

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Arts & Letters

LETTER FROM NJÓOBÉEN MBATAAR, Page 13
Scientist Patrick Gonzalez stopped by his Peace Corps site during a survey of the Sahel's astonishing arboreal losses and places the blame on global warming.

LETTER FROM CANGE, Page 17
Author Tracy Kidder writes in his book, *Mountains Beyond Mountains*, about Dr. Paul Farmer and his grassroots clinic prescription for the world's poor. Join Farmer and Kidder on a thought-provoking day's hike to see a patient in Haiti.

GALLERY, Page 30
Anyone who says Asians don't do portraiture has not seen the Arthur S. Freer Gallery's new exhibition, *Facing East: Portraits from Asia*, on Washington's National Mall.

LETTER FROM PYONGYANG, Page 33
Looking back on his public career, Ambassador Tony Hall recounts his travels to the Hermit Kingdom and some surprising pleas made by North Korean leaders for negotiations that fell on deaf ears in the Clinton administration.

LETTER FROM YABAOLU, Page 38
Peter Hessler's dispatches from Beijing recount his budding friendship with a fearless trader, an ethnic Uighur who decided freedom of opportunity lies in the United States.

FICTION, Page 49
Wounded combatants become house guests in Julio Ramon Ribeyro's short story, *Dying Soldiers*.

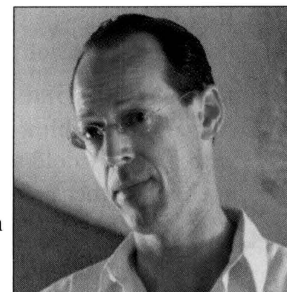
ITINERARY, Page 54
World Wildlife Fund-U.S. expert Eric Dinerstein remembers how hard it was to cross into Nepal on his first assignment.

LETTER FROM NGAMILAND, Page 63
James Workman reports from Botswana on the conflict between elephants and villagers and how orphans from each community are being introduced on friendly, if unequal, terms.

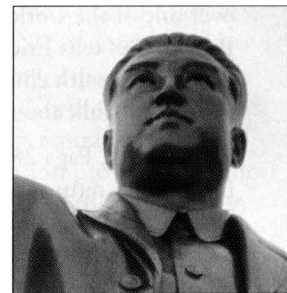
COVER

Dr. Paul Farmer makes housecalls in the mountains of Haiti. Photograph by Gilles Peress courtesy of Magnum Photos.

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Gilles Peress/Magnum



Chien-Chi Chang/Magnum

END OF TREES

Global warming comes to Njóobéen Mbataar and the Sahel

by Patrick Gonzalez

Dawda Jóob, a farmer in the Wolof village of Njóobéen Mbataar, Senegal, told me 13 years ago, “When I was young, so many jujube trees grew in my father’s back field that, when the fruits fell, we would rake them up into big piles for the entire family to enjoy. Since then, almost all of those trees have died.” He was talking about the 1950s as we sat in the compound his family had shared with me as a Peace Corps volunteer. Our compound was a small plot of the red sand of the Sahel, a tropical savanna that stretches across Africa from Senegal to Eritrea.

“*Déem, mbép, dakkar, xël mbap, yir...*” added Séex Ley, Dawda’s cousin and a locally respected caretaker of those trees. Séex Ley listed the species that were disappearing—some had already vanished—from the lands around Njóobéen Mbataar in his lifetime. The village had lost trees that provided nutritious fruits, traditional medicines and dense termite-resistant wood for huts. These losses threatened their livelihoods and the ability of these families to survive. Séex and the people of Njóobéen Mbataar now cope with the impact in their village of the global phenomena of climate change and desertification.

Climate change and desertification have reduced rainfall in the 20th century as much as 30 percent across the Sahel and raised temperatures up to 1 degree Celsius. These changes have contributed to the deaths of productive tree species

that require moist conditions, giving way to less productive, thorny species adapted to arid conditions. Consequently, the vast ecological zones of the Sahel, Sudan, and Guinea have shifted southward to more humid areas toward the Equator.

These startling environmental changes originate in the polluting gases of power plants, automobiles, and the deforestation that cause global warming. The world’s 6.5 billion people now pump into the Earth’s atmosphere twice the amount of carbon dioxide, the main global warming gas, than the world’s forests and oceans can



naturally absorb. The remaining carbon dioxide stays in the atmosphere and traps the sun’s heat in a phenomenon known as the Greenhouse Effect. Atmospheric carbon dioxide concentrations have now risen to their highest level in the past 650,000 years, raising temperatures that gradually melt glaciers, raise sea levels, increase the frequency of severe hurricanes, and drastically shift global vegetation, such as in the Sahel. Temperature and rainfall determine the distribution of

vegetation around the world. Global warming is shifting vegetation zones toward or away from the Equator and up mountain slopes because global temperatures generally decrease from South to North and from lower to higher elevations and rainfall generally increases from North to South. If global warming pollution continues at current rates, temperatures across the Sahel could increase 2 to 6 degrees Celsius by 2100 A.D., while rainfall could decrease by 50 percent.

Desertification is a global environmental phenomenon of land degradation in arid regions,

Statistical tests reveal that climate factors, not population density or other human factors, best explain the observed changes in vegetation.

Both climate and human factors—global warming, deforestation, and agricultural expansion—cause desertification. Desertification reduces agricultural yields over a large part of Senegal, particularly for millet, a staple from which the Wolof make *cere*, a form of cous-cous. Desertification led to the drought between 1968 and 1973, which claimed the lives of a quarter of a million people in the Sahel.

The cycle of lower rainfall and land degradation starts when climate change warms ocean temperatures, increases rainfall over the oceans, and reduces the amount of rain in the Sahel. The drop in rainfall, intensified by deforestation, causes desertification. Desertification reduces vegetative cover. Dead vegetation releases carbon dioxide into the atmosphere, warms the ocean, and reduces Sahel rainfall. The loss of vegetation that once provided the moisture that created rain in the Sahel leads to an even greater decrease in rainfall. The cycle continues.

In 1993 and 1994, I hiked 1,900 kilometers across Senegal to conduct scientific research on the impact of climate change and desertification. People in 135 villages echoed Dawda Jóob's recollections of a

formerly rich countryside that has dried up. "Cashew trees were numerous," recalled an old woman. "When I was a child, at lunch time they would call you, and you'd say 'I'm full.'" Another said, "In those times, if you entered the countryside, you would quickly have firewood. When you go out today, you won't have anything." When you carry water on your head to the fields, she added, you can barely find shade in which you could set it down.

"Trees would do like this," another said as she gestured the expanse of a forest. "Clearing a field then, we used to go two days and not finish. Today, when you work just one day you clear more than enough, the wind blowing away the uprooted weeds."

Analysis of forest inventories of the region's 126 tree species and systematic surveys of the recollections of 270 elders showed that the number of tree species in the Senegal Sahel fell by 33 percent between 1945 and 1993. Analysis of aerial photos from 1954 and 1989 confirmed that the density of mature trees declined at the same rate. These results showed that the Sahel, Sudan, and Guinean ecological zones shifted 25 to 30 kilometers south toward areas of higher rainfall. Statistical tests reveal that climate factors, not population density or other human factors, best explain the observed changes in vegetation.

Climate change and desertification now threaten the most valued tree species among the Wolof and Fulbe ethnic groups: *dakkar* (*Tamarindus indica*), which provides vitamin-rich tamarind fruits, shade, and the traditional space for villages to gather for prayer on Islamic feast days; *déem* (*Zizyphus mauritiana*) which yields sweet jujube fruits; *mbép* (*Sterculia setigera*) which gives women their most favored emulsifying ingredient for cous-cous; *yir* (*Prosopis africana*) which yields poles for hut construction of such high density that they last more than 60 years.

All of these species are declining

in Senegal. Continued research in Mauritania, Mali, Burkina Faso, Niger, and Chad has confirmed tree species have declined by as much as 57 percent between 1960 and 2000. In Tamaka, Niger, where tree species have declined by 35 percent, Hausa residents say that, after the rainy season, their ponds dry up four months earlier than they did forty years ago. Around Akar, in eastern Chad, where the number of tree species has declined by 47 percent, the villagers say the loss of trees has caused a decline in agricultural yields.

Sahelian farmers are adapting to the changing climate by resurrecting natural resource management practices that were common before subsidized export agriculture. In northern Senegal, Wolof farmers have returned to the natural regeneration of local tree species by selecting small field trees to nurse to maturity, protecting them, and pruning their branches to promote straight and rapid growth. These young trees germinate in the field and are better able to survive drought and browsing livestock to become strong adult trees. Wolof farmers have restored the traditional *tookër*, a field at the village perimeter where live fencing protects new young tree stock from foraging livestock. Some farmers have adapted to *tookër* by planting grain crops and vegetables that now replace manioc, which requires the higher rainfall of the past.

Many development projects have encouraged vast plantations of exotic species that are difficult to water and to protect in the harsh environment. Across the Sahel, however, villages have adopted *niim* (*Azadirachta indica*), a tree species from India that has now become naturalized in parts of Africa. Niim trees now mark the place in many villages where residents gather for daily prayers, watering the tree as they perform ablutions. *Niim* provides deep shade and a supply of small poles for fences and huts.

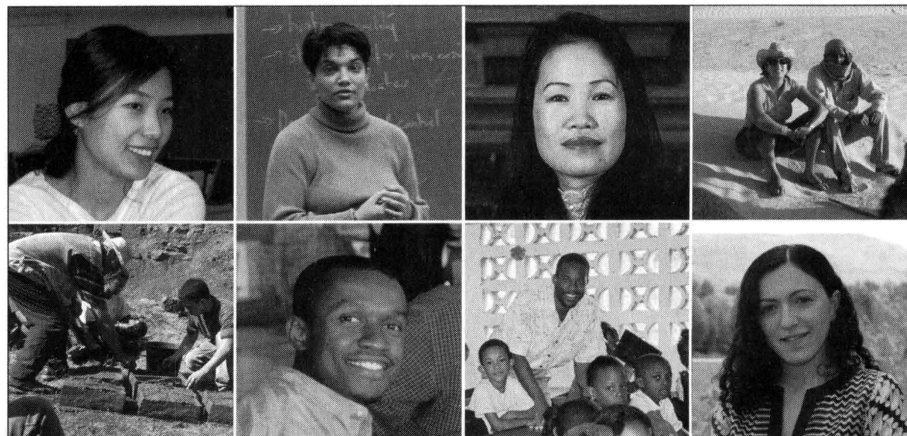
Peace Corps and other international development agencies have successfully promoted fuel-efficient wood stoves. In Senegal, a modest number of households have fashioned *ban ak suuf* cooking stoves out of local clay and straw. This stove is a horseshoe-shaped

hearth that wraps around a kettle to channel heat more efficiently than an open fire. Several projects have also trained local blacksmiths to make a portable charcoal stove called the *sakkana* for urban households.

The people who live in Njóobéen Mbataar and other Senegal villages suffer the consequences of greenhouse gas emissions produced an ocean away. The United States is responsible for a disproportionate share of global warming: five percent of the world's population emits 17 percent of the world's greenhouse gases, according to the World Resources Institute. This situation arises from the inefficiency of energy use in the United States. Indeed, each American uses nearly twice as much energy as a person in France, Japan, Switzerland or other countries with a high standard of material comfort.

Those of us living in the United States and other industrialized countries can improve our energy efficiency by riding on public transit or walking instead of driving a car. In using these transportation alternatives, a car driver in the United States can reduce his or her personal greenhouse gas emissions by more than three tons per year, based on average automobile use. Those three tons of greenhouse gas emissions exceed the natural absorptive capacity of, for example, the trees on 10 hectares of land in the Sahel. We can mitigate climate change and reduce the negative impacts on Wolof farmers, other people around the world, and ourselves.

When my wife and I visited Njóobéen Mbataar a few months ago, the village was finishing the harvest and preparing for another long and hot dry season. As my wife and I walked out to the fields, I asked a young niece of Séex Ley about a cashew tree that had grown in an aunt's field. Adults and children used to wait all year for the shiny and sweet cashew apples from that tree. After a long pause of thought, she said she didn't know whether the tree was still alive or not. ■



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