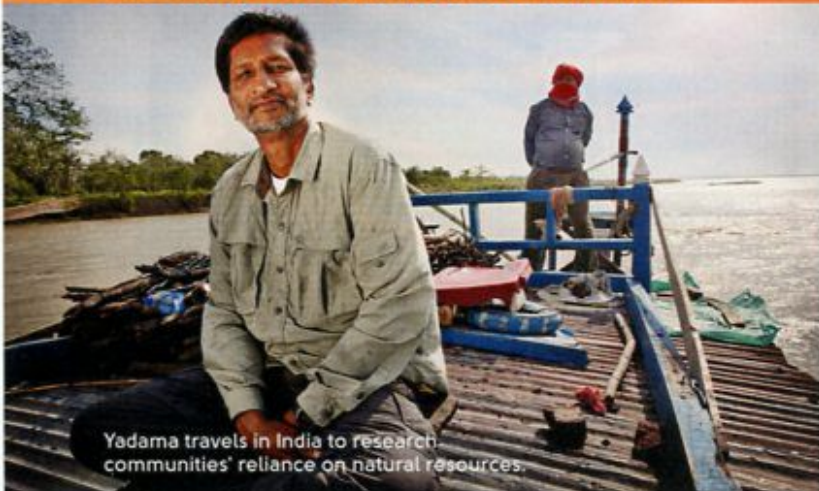




The Burning Question

Interview by Erik Hoffner, World Ark contributor



Yadama travels in India to research communities' reliance on natural resources.

Millions of women and girls in developing countries spend part of every day foraging for fuel to cook their families' meals. This effort to chop, collect and carry biomass for miles can take hours, cutting into the time they need for other chores like fetching water, caring for children, working the fields and herding animals. Cooking with open fires is also a huge health risk. Smoke inhalation contributes to millions of deaths every year.

Gautam Yadama is the author of *Fires, Fuel & the Fate of 3 Billion: The State of the Energy Impoverished*, a new book that takes a close look at this global problem. A professor and faculty scholar at Washington University's Institute for Public Health in St. Louis, his research focuses on the livelihoods of communities that are dependent on natural resources. He travels often to India to document the challenges and explore alternatives.



WORLD ARK: How dangerous is air pollution from cooking fires?

GAUTAM YADAMA: The 3 billion people dependent on wood, crop waste and dung for fuel—160 million households in India alone—burn about 2 tons per family each year. That's 730 million tons of biomass, which releases about a billion tons of carbon dioxide into the atmosphere. So you can see the effect on the climate. But inside the house, recent estimates are that 4.7 million people die each year from the smoke. That's one person every 16 seconds. Exposure to particulate matter from cooking fires leads to pneumonia and, as a result, premature deaths in children under the age of 5. Low birth weight, increased infant and

perinatal mortality, chronic bronchitis, chronic obstructive pulmonary disease, ischemic heart disease and acute respiratory infections are all health threats from exposure to cooking fires.

Are there other health-related issues?

In these communities, people often don't feel well due to chronic problems from household air pollution, which keeps them from plowing the fields or otherwise making a living off the land. We have a metric for this, called disability adjusted life years. DALYs give us an aggregate measure of years of loss of healthy life in a region, so we can picture the loss in people's productivity and contribution to society and the economy. If you look at the DALYs from household air pollution, the numbers are



A family on the river island of Majuli in India's Assam state cooks a meal in the traditional fashion.

PHOTOS BY MARK KATZMAN

devastating. Just for South Asia, including India, Nepal and Bangladesh, the DALYs attributable to household air pollution are something like 41.7 million life years, compared to about 2.5 million in Latin America. In India alone, the latest estimate is 31.4 million DALYs lost. The other major place for this problem is Sub-Saharan Africa, at about 26.2 million DALYs.

So there's an economic effect?

Because of the harm to health, to ecosystems and natural resources that the book amply illustrates, millions live at low levels of productivity, and that harms the overall economy of that nation and the region. Collectively, the environmental impacts of black soot and carbon emissions also affect the climate and impose limits on sustained long-term economic growth.

Why are women and girls bearing the burden?

Social norms dictate in many of these cultures that it's the woman's responsibility to provide for all the cooking needs. And no one questions it. A woman can't get up in the morning and say, "I'm not feeling well, why don't you do it?" No, they just go out and do

it, because that's their responsibility. Men, of course, have other responsibilities, but we know from studies that men in general have far fewer daily responsibilities, and many of these have to do with outside interactions with market systems and so on, while women go about work in the fields, collecting wood and such. These acts embedded in the social norms and daily rhythms accumulate to outcomes that become irreversible.

Your book is an unusual and beautiful partnership with a photographer who documents real peoples' stories. What is the project's goal?

Fires, Fuel & The Fate of 3 Billion portrays the complexity of the problem of energy and poverty. This is the context for understanding cook stoves, but also clean energy access by the poor. The book cautions against simplistic notions of development where technology becomes the solution for addressing all problems. Technological innovation combined with social innovations that recognize the realities of the very poor are important if we are to realize long-term development. The book argues that energy poverty is a complex story. It is a story of household poverty, and within it are multiple



A woman collects firewood in the Indian state of Orissa.

stories of women constrained by culture, of children—especially girls—sacrificed to meet daily household energy needs. It is a story of unsustainable lives, an unsustainable environment and negative ecosystem outcomes. Untangling this Gordian knot to understand how several billion remain energy impoverished is not an easy undertaking, but we stand to gain insight into possible energy interventions that could prove effective and truly sustainable. These insights could be useful in designing technologies and interventions to tackle clean and efficient energy access for the many, providing sufficient quantity at a low cost. This is the energy challenge of our times.

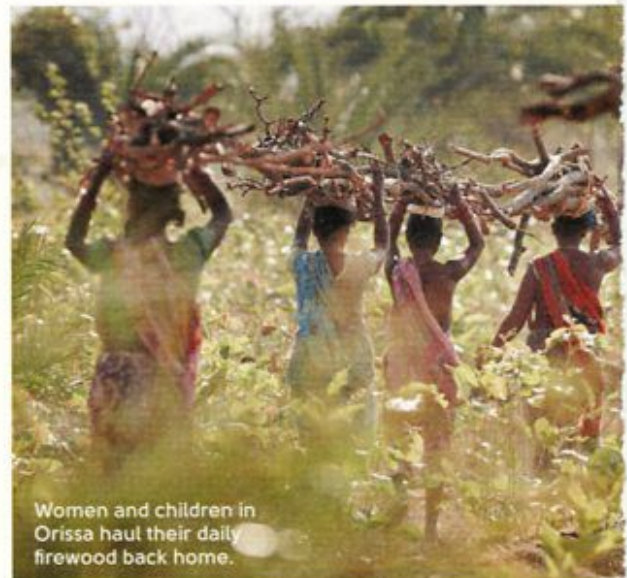
Can you give an example of the ripple effect you talk about in the book?

If agriculture takes a hit from some environmental factor, household income needs go up because farmers will have invested in something like seeds, and if they can't recoup that, the issue of harvesting wood for income comes up. A few years ago, I was in Andhra Pradesh in India during a severe drought. Their crops weren't growing, so what do you do then? You still have to make a living, to buy rice to eat. So women were collecting wood for up to five hours a day to sell in the local markets. And that affects forest biodiversity and structure, because when forests are denuded often what happens is new invasive species move in, taking over for more mature, original species.

This changes the structure of the forest over time and affects the way soil nutrients run off. In some cases, when grasses move in, there are more forest fires.

Do cultural values affect the adoption, or not, of clean cooking technologies like biogas?

I've noticed that biogas is very popular among women—they love it, and if they have enough cattle and water, there's plenty of gas, and it burns cleanly.



Women and children in Orissa haul their daily firewood back home.



But maintaining such a biogas system still falls on women, so let's say that a valve breaks so methane is not coming into the house. A woman may say to her husband, "Can I have 35 rupees to fix that?" and he may say, "I'll give it to you in a day or so." But she doesn't control the purse strings, and a day can become a week, and when they're not used, biogas systems begin to dry out, and the problem is no longer the valve. The system has to be opened up and cleaned out so the anaerobic digestion can be restarted. Which means more labor, possibly involving the husband, who may instead ask her to just pick up some wood while out herding the goats, and so they go back to the traditional stove. That's an example of a cultural aspect that can change something that was going well.

What about when women are more empowered, as with Heifer's programs?

The upside is that when women are able to make decisions, they can move things within their cultural contexts that could make these new systems work. Women are aspirational; they don't want to be breathing smoke all the time. When they have decision-making power, this improves their lives and their households.

In one community in Rajasthan, India, there's been upwards of 90 percent adoption of biogas

systems in the community. The women have been the champions of it and have advocated to their husbands, but a tipping point has also been reached among the men, who want to look prosperous to their peers. Having a wife out collecting wood starts to look bad.

Shifting out of wood collection makes available more time to engage in other income-earning activities. For girls, better health and less time helping collect wood also increases the probability of free time for education.

Are there other clean cooking techniques you've seen successfully adopted, like solar stoves or clean-burning biomass stoves?

A question that comes up a lot on the biomass stoves is, what's the metric? It's often unclear what emissions reductions they will produce. So there's a need for evidence. Calling a stove clean doesn't make it so. There are stoves in Africa that have been successful, but they also need to be maintained. What works for two years develops cracks and may be abandoned when it breaks. So we have to ask, what is the longevity of these stoves? When do you need to rebuild them? I have seen biogas work and some individual biomass stoves that burn clean. But with the latter, you also run into the problem of a household needing two or more burners because they're cooking multiple things at the same time, while these cleaner units have just one. So there are limits, and people often can't afford to buy two of them. As a single unit they work, but as a system they fail.

Why should the world keep working on this issue?

The downward impacts on the health of 3 billion poor, the 4 million premature deaths from exposure to harmful household air pollution and the effects on the climate have proximate impacts on the well-being of 45 percent of humanity, as well as on natural resources and the environmental and climate health of our planet. That's reason enough to care. ■

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Read more about the book at energyimpooverished.wustl.edu and learn about Heifer's work with biogas in Uganda on Page 22.

