



Pilar Nores Bodereau is the founder of Sembrando and a former first lady of Peru.

Peruvian Highlands, Fume-Free

IN THE ANDEAN HIGHLANDS OF PERU, A TYPICAL SINGLE-ROOM HOME WILL BURN APPROXIMATELY 3.6 tons of wood a year, not just for heating but for cooking indoors. Three billion people worldwide cook indoors over open fires with solid fuels. This use has a detrimental effect on human health. According to the World Health Organization (WHO), nearly two million people die annually from open-fire cooking, with women and young children the most affected. The hazards related to these practices include acute respiratory infections, insufficient weight at birth, and chronic obstructive pulmonary disease. Despite WHO estimates that cookstove smoke is one of the top five threats to public health in poor developing countries, the effects of exposure to it have received limited funding and research attention. The good news is that since the announcement last year of the Global Alliance for Clean Cookstoves [launched by the United Nations (UN) Foundation], coordinated efforts are successfully under way to support the use of clean cookstoves in the developing world.*

The alliance involves a wide scope of public and private partners, from international nonprofit organizations, academic institutions, corporate leaders, governments, and UN agencies to local community groups. It is critical to emphasize the impact of complementary local-level efforts, as evident in Peru. In Peru, 10 million people (about 30% of the population) live in the Andean highlands. They cook over open fires inside their homes of about 200 square feet with no windows, causing indoor air pollution at a rate 30 times higher than permitted by WHO. In these rural areas, about 60% of children suffer from chronic malnutrition mainly caused by poor hygiene (the lack of clean water) and relentless respiratory diseases. More than 40% of the women suffer from chronic obstructive lung diseases and/or from a cardiovascular disease, apparently related to their household work conditions. The Peruvian Andean population is highly dispersed over more than 70,000 small communities, many of which are remote, making the provision of basic services from the government impossible. There, traditional models of aid for development have failed to achieve their many objectives because they tackle each problem separately. A developmental program suitable for these rural areas needs to incorporate a comprehensive assessment of the problems and a multisectorial approach to the solutions.

Sembrando, an initiative of the private organization Instituto Trabajo y Familia (Work and Family Institute),[†] supports Andean communities to improve their productivity and social development, including a decrease in child mortality, the promotion of maternal health and gender equality, and environmental preservation—all UN Millennium Goals. Sembrando provides tools to diminish indoor air pollution and general contamination by helping the community build improved cookstoves, latrines, and family orchards for every household. It also offers extensive training at both the family and community levels, with special attention to pregnant women, helping them achieve empowerment and develop the abilities needed to overcome their own problems associated with underdevelopment.

Since 2006, Sembrando has served 92,000 families (approximately 500,000 people) in 2800 communities in the Andean region of Peru. Preliminary results show a substantial decrease in bronchopulmonary diseases and a clear increase in the height/weight ratio of children under 5 years old. Sembrando has also yielded positive results toward the reduction of extreme poverty and chronic malnutrition in the rural Andean context, using simple technology with immediate and low-cost results (U.S. \$200 per family). This has inspired the Peruvian government to start a campaign to build 500,000 clean cookstoves nationwide.

Strong local efforts such as Sembrando can be sustainable, helping to meet the Global Alliance goal of clean cookstoves in 100 million households by 2020, while improving the economic and social conditions of families that live in extreme poverty. — Pilar Nores Bodereau

10.1126/science.1212526

*<http://cleancookstoves.org/wp-content/uploads/2011/09/First-Year-Annual-Report.pdf>. [†]www.itfy.org.pe/en/sembrando/.



Downloaded from <http://www.sciencemag.org/> on November 19, 2017

Science

Peruvian Highlands, Fume-Free

Pilar Nores Bodereau

Science **334** (6053), 157.

DOI: 10.1126/science.1212526

ARTICLE TOOLS

<http://science.sciencemag.org/content/334/6053/157>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.