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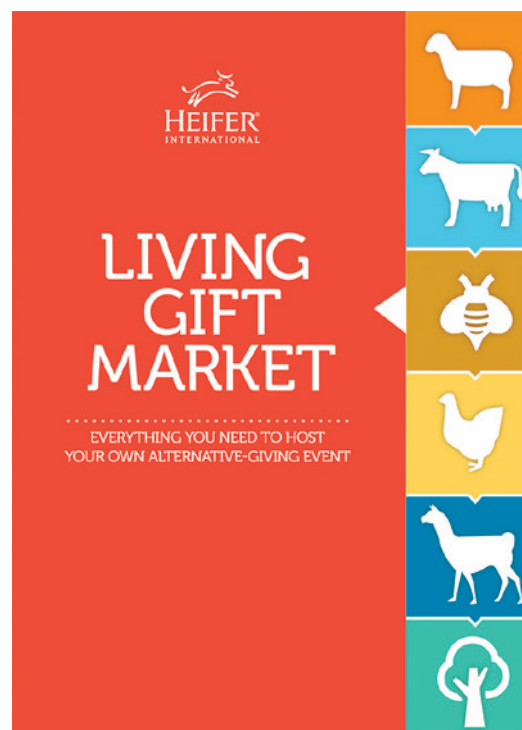
The most neglected
of the neglected
tropical diseases?


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A TIME TO GIVE

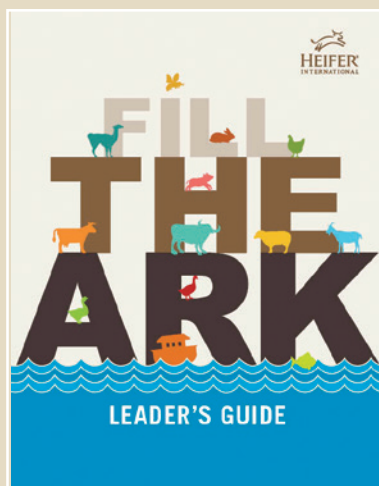
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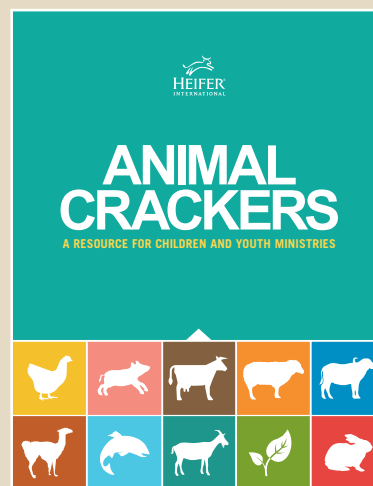
LIVING GIFT MARKET

Host an event that allows your congregation to purchase “living gifts” like goats, bees and cows through Heifer International that help feed hungry families.



FILL THE ARK

Challenge your congregation to help end hunger when you “Give Up to Give Back” with this daily missions-giving calendar — the perfect program for the Lenten season.



ANIMAL CRACKERS

Through simple Sunday School lessons, Animal Crackers is designed to help students feel connected to the global family.

Dear Fellow Activists,

When you think of a strong leader, who do you picture? A businessman? A politician? A teacher? A poor, female farmer?

When visiting communities where Heifer International works, I've witnessed the extraordinary phenomenon of leaders emerging from the shadows. Some people simply are natural leaders. Given the space, training and safety to do so, they rise up.

Whenever I visit our projects, I make a point of going to communities where Heifer hasn't yet begun to work. Before a project starts, we must first make sure there is openness to our model and to putting in the hard work it requires. It takes a great deal of work from both Heifer International and the project participants themselves to pull these families free of poverty. We often find people who not only have the will to do the work but also the will to lead.

I remember going to a prospective community and meeting a group of people in a schoolhouse. Men and women all piled in, but men did all the talking. One woman in particular caught my notice, hiding in the corner behind her daughters. There was something about her, but she didn't say a word. She kept her veil up and stayed in the shadows.

Fast forward one year, and we've been working with the community for about nine months. The woman I'd noticed hiding in the corner is

now the leader. Before the meeting begins, she directs all the male project participants in the room to go. "We don't need you here right now. Go away. This is going to be the women talking to the president and CEO of Heifer. We have things to say to him, and we'll talk to you later. Please leave." There she was with her two daughters, and she was the leader of the group. It was incredible. This woman just dominated, and it was fantastic.

Leadership development is part of every project we do. We know that without strong local leaders, our work will fail to make a long-lasting difference. Leaders carry our work into the future.

In this issue of *World Ark*, you'll read the story of Panna Devi from India. Amid our work to help break down the centuries-old limitations imposed by caste and gender, Panna Devi's dormant leadership qualities emerged and thrived. A member of the untouchable caste, she once cleaned up human waste for a living. But now she runs a shop, leads a self-help group and packs her savings account with proceeds from her fruitful goat-raising operation. I hope you enjoy her story and pass it on to someone in need of inspiration. Yours for a better world,



Pierre U. Ferrari

Characteristics Essential to Good Leadership:



TECHNICAL
COMPETENCE

KNOWLEDGE
& EXPERTISE



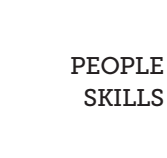
CONCEPTUAL
SKILLS



STRATEGIC
THINKING



PROVEN
RESULTS



PEOPLE
SKILLS



GOOD
JUDGMENT



CHARISMA

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Enjoy a unique convergence of cultural food and entertainment from Southeast Asia and the American South at Beyond Hunger: West Meets East, brought to you by NBC Universal. This celebration of our common humanity will showcase diverse cultures and Heifer's solutions to global poverty.

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UNITED STATES.**



**3 P.M. – 6:30 P.M. | OCTOBER 1, 2017
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#BEYONDHUNGERWEST





COVER

Panna Devi's hard work and knack for leadership helped her shrug off the limitations imposed on rural Indian women of lower castes. Now, she's helping other women to realize their potential, too.

Top photo: Rajasthani women typically wear veils, a holdover from Islamic rule.

Cover photo by Geoff Oliver Bugbee

12 The Very Image of Dignity
Longtime Heifer International photographer Geoff Oliver Bugbee snaps images that illuminate both the struggle and the dignity of our project participants. Here, he shares his expertise and discusses a few of his favorite photos.



16 A Way out of Misery in India
The caste system holds firm in rural India, where women of lower social status are too often trapped in lives of struggle and hopelessness. Heifer projects in Rajasthan are helping women unearth their potential to lead and thrive.



34 Microbes, Our Hidden Helpers
Put the ick factor aside, because we couldn't live without those microorganisms teeming on our skin and inside our bodies. These hidden helpers play vital roles for animal and plant life, too.





MACHO NO MAS

The machismo culture that infects most of Nicaragua has no hold at Guillermo Castro's house. The mother of six is used to taking charge and has no trouble managing both family and farm. "Sometimes men have no idea how to handle finances. Sometimes women are better at that," son Carlos Vargas said.

This seemingly obvious, common-sense attitude is actually quite rare in rural Nicaragua, where traditional gender roles often keep women from claiming overt positions of authority. Heifer International and its partners have a clever work-around: By giving gifts of livestock and training directly to women, Heifer empowers women with confidence, leadership skills and the raw materials they need to build a sturdy economic base for their families.

The strategy is working. Heifer Nicaragua Director Wilson Castillo said, "I've seen more women taking power with their wives are coming around as women begin making money. I have seen a lot of changes in the lives of the beneficiaries," Castillo said. "Men and women are sharing the work of the house, and wives are less stressed."

MACHO NO MAS

What a novel way you've found to empower the lives of Nicaraguan women by giving them gifts of livestock and teaching them how to care for their animals!

Machismo is, in my opinion, a toxic disorder that rages throughout much of Latin America. As a naturalized American citizen, born and raised in Mexico, I witnessed firsthand the destruction wreaked on society by that misguided masculinity.

Under that accursed structure, the more children a man can sire (with several women, of course), the more macho he regards himself. It matters little to him whether he can support his numerous offspring. And heaven help his wife if she dares to reproach him!

The tragic results of such conditions are all too evident: Poverty, hunger, vice, illiteracy and violence.

Thank you, Heifer International, for helping to lessen the abomination of machismo in Latin America.

DAVID QUINTERO
Monrovia, California

In our previous issue of *World Ark* magazine, we asked about climate change. "Farmers around the world are already feeling the effects of climate change. Are you? Has climate change altered your life yet? If so, how?" Here are some of the responses.

It seems to me, it is time to get to the source of climate change and stop learning how to "live with it." Overpopulation is the lead cause of global warming. Why do people continue to put themselves and others into an unnecessarily stressful situation? Having one or two children and adopting the rest would go a long way in destroying the effects of climate change and bring blessings to our whole planet, people and animals alike.

JACKIE LEONARD-DIMMICK
Atherton, California

Pine beetle infestation in Colorado is devastating our forests. Healthy trees can shake it off but drought- and heat-stressed trees can't. The longer warm season means the pine beetle can lay two broods instead of one, overwhelming

Q&A FALL

India's caste system is criticized for confining people inside economic and social borders that are hard to breach. But some say Western countries, including the United States, are mired in social stratification systems of their own. What do you think?

LINDA GARNER
From Facebook

We want to hear from you!

Please send your comments to worldark@list.heifer.org. Include your name, city, and a telephone number or email address. Letters may be edited for length and clarity, and may be published online as well as in print. Because of the volume of mail we receive, we cannot respond to all letters.



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Since 1944, Heifer has helped 31 million families, directly and indirectly, move toward greater self-reliance through the gift of livestock and training in environmentally sound agriculture.

Heifer International is a member of InterAction, the largest alliance of U.S.-based international development and humanitarian non-governmental

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Mrs. Linda's

Autumn Apple Cake

CAKE INGREDIENTS



2
eggs



4 cups
chopped
apples



3 cups
flour



2 cups
sugar



2 tsp.
baking
soda



1 cup nuts
and/or
raisins



1/2 tsp.
salt



2 tsp.
vanilla
extract



1 cup
vegetable
oil

GLAZE INGREDIENTS



1 cup sugar



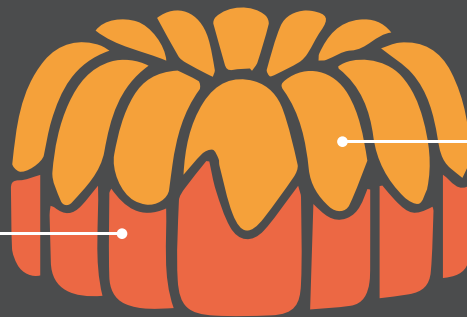
1/2 cup
evaporated milk



1/2 cup
melted butter



2 tsp.
rum extract



Cake Directions

Preheat oven to 350 degrees.

Mix chopped apples and sugar and let sit for 30 minutes. Add the rest of the ingredients and stir until well mixed. Pour batter into a bundt pan that has been greased and floured. Bake for 1 hour and 15 minutes.

Glaze Directions

Mix sugar, butter and evaporated milk over low heat until sugar is dissolved.

Add 2 teaspoons rum extract. Mix well, then pour over your cooled apple cake.





How to Save Seeds

By Molly Fincher, *World Ark* writer

If your garden was perfect this season, why not save seeds so you can recreate it next year?

1 CHOOSE WISELY

Open-pollinated plants are pollinated by natural means, such as wind or insects. Heirlooms are open-pollinated varieties cultivated and passed down through generations. If you make sure your open-pollinated vegetables are only pollinated by the same variety, they will produce offspring with the same characteristics as the parent plants. Seeds from hybrid varieties don't hold up so well. Hybrid varieties produce offspring that is less vigorous and has characteristics of the hybrid's parent plants, rather than the hybrid itself.

Beginner seed savers will want to start with annual plants. Biannual plants like carrots and onions don't flower until their second season. Tomatoes, peppers, lettuce, beans and peas are good choices.

2 HARVEST

Seeds won't be viable unless you wait for the fruit to ripen before harvesting. But ripe for eating isn't the same as ripe for seed harvesting. When you harvest dry-fruited crops, like beans or peas, let the pods ripen on the plant until they are dry and the seeds rattle inside. Then harvest the pods and let them dry for about two weeks before storing.

Wet-fruited crops, like tomatoes



PHOTO BY CHRISTIAN DEVIRES

and squash, are typically ready when they've passed the point of reaching their full color and are overripe for eating. Wait until your peppers have started to shrivel, your cucumbers are fully yellow or your squash's skin has hardened.

3 DRY AND STORE

Once you harvest your seeds, it's time to clean, dry and store them. For plants with pods, simply let the pods dry on the plant as long as possible, then continue to let them air-dry for a few weeks after gathering them.

For wet-fruited seeds, break open the fruit and remove the seeds, then wash the flesh and membrane off with running water before setting them out on paper towels or a screen to dry. For vegetables whose seeds are coated in a gel-like substance, like tomatoes and cucumbers, you will need to remove the gel by fermentation. Place the seed-and-

gel blob into a waterproof container and add an equal amount of water to your concoction. Leave in a warm spot out of direct sunlight for about five days until the good seeds drop to the bottom and the bad seeds and other undesirable gunk rise to the top. Then you can rinse the good seeds thoroughly and dry them as you do other types of seeds.

You can test to see if a seed is sufficiently dry by squeezing one with pliers. If it feels spongy, it needs more time to dry. If it is dry enough, it will be brittle and break apart. It will probably take several weeks for them to completely dry out.

Once your seeds are dry, store them in a dark, dry and cool place. Ideally you should use your saved seeds within the year, but if you store them in an airtight container in the refrigerator or freezer, they can last for several years. Be sure to label your seeds with the name, variety and date you collected them!



The Magic of Sheep Sweat

By Molly Fincher, *World Ark* writer

Would you rather grow wool instead of hair or sweat wax? Thankfully, our barnyard sheep friends do both of those things for us. We all know about how useful wool is for cozy sweaters and warm blankets, but did you know we use the waxy substance that sheep sweat for all kinds of things, too?

It's called lanolin, from Latin *lāna*, "wool," and *oleum*, "oil." In nature, lanolin's waxy nature helps waterproof sheep's wool and otherwise protects their wool and skin from the elements. Humans find it extraordinarily useful, too. We extract it from shorn wool and use it all the time for its moisturizing and water- and dirt-repellant properties. Chances are you have used wool grease often without realizing it.

Here are a few ways you may already be using lanolin:

- Cosmetics
- Moisturizers
- Shaving cream
- Beard/mustache wax
- Rust-proof coatings for industrial equipment
- Coatings for propellers and other boat surfaces to prevent barnacles
- To soften baseball gloves
- As lubricant for brass instrument tuning slides
- For leather care, like saddle soap



PHOTO BY RUSSELL POWELL



PHOTO BY CHRISTIAN DEVRIES

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More than 16,000 companies across the country match employees' donations to Heifer International. To double the impact of your gift, all you have to do is follow the steps on the right.

1



Go to heifer.org/WAMatching

2



Type in your company's name
and select your employer

3



Follow the instructions

or



Call 888.5HUNGER (888.548.6437)
and talk to one of our representatives



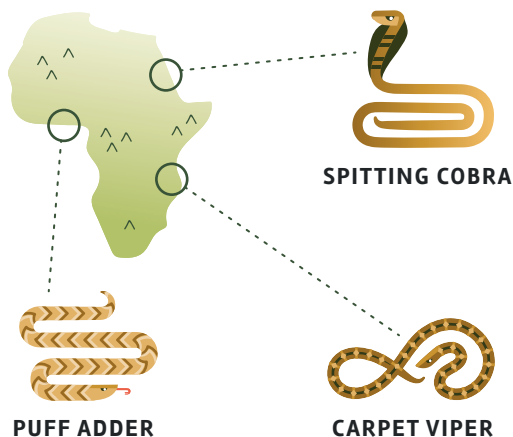
SNAKE — BITES

The most neglected of the neglected tropical diseases?

A handful of species are responsible for most snakebite deaths.

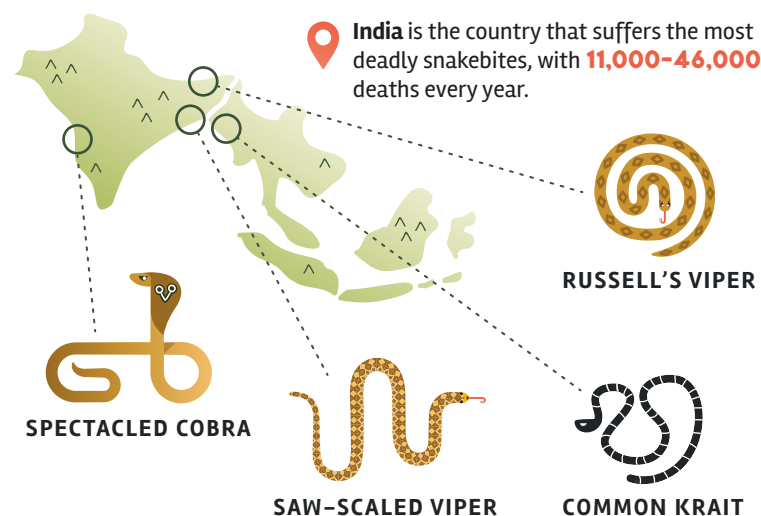
These aren't the world's most venomous snakes, but they are the snakes that are most likely to come in contact with humans and strike when threatened.

IN AFRICA



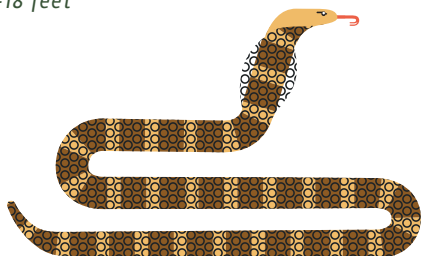
The country with the highest per capita death rate from snakebites is **Nigeria**, with **14 PER 100,000** people.

IN INDIA AND SOUTHEAST ASIA

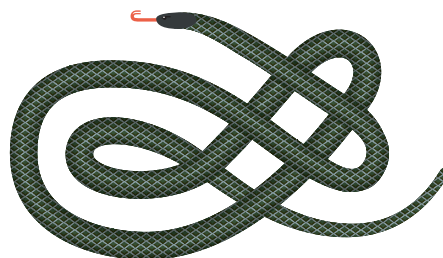


India is the country that suffers the most deadly snakebites, with **11,000–46,000** deaths every year.

LONGEST VENOMOUS SNAKE
KING COBRA
14–18 feet



FASTEST SNAKE
BLACK MAMBA
14–15 feet



- When confronted, they can raise up to **one-third of their bodies** off the ground while moving forward to attack.
- In a single bite, a king cobra can inject enough neurotoxin to kill **20 people—or an elephant**.

- They are **highly aggressive** when threatened.
- Black mambas can move up to **12.5 miles per hour**, which is more or less in line with a human's sprint speed.



5

million people are bitten each year leading to 100,000 – 200,000 deaths.

400,000

people suffer amputations, disfigurement or permanent disability due to snakebites annually.

More people die from snakebites annually than from all these tropical diseases combined:

**CHOLERA - DENGUE FEVER
CHAGAS DISEASE - LEISHMANIASIS
YELLOW FEVER**

And yet, snakebite deaths are a largely ignored global public health crisis.

Who is the most at risk?

Poor rural farmers and displaced populations suffer most from snakebites because...



...they are more likely to come in contact with snakes.



...they lack access to immediate and/or appropriate medical care.

Children are especially at risk because...



...they are smaller and less likely to scare a snake away.

VENOMS

Different snake venoms produce different effects on the human body.

Potential effects include:



Severe hemorrhaging



Necrosis of skin and muscle



Paralysis



Kidney failure



ANTIVENOMS

Antivenoms have been used effectively for more than a century. But sometimes, they are hard to get. **Why?**



Low priority for governments



Not lucrative enough for pharmaceutical companies



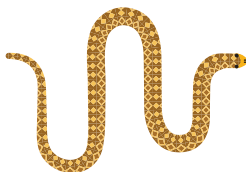
Too expensive for the population



DEADLIEST SNAKE

SAW-SCALE VIPER

3 feet



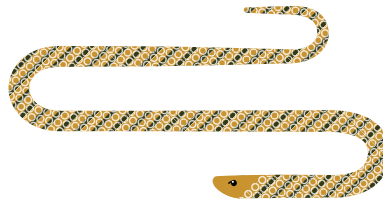
- These kill more people than any other snake.
- Small but **aggressive**, these vipers top out at 3 feet.
- Its venom causes **massive bleeding** and **destroys flesh tissue**.



MOST VENOMOUS SNAKE

INLAND TAIPAN

6 feet



- It's also known as "**fierce snake**."
- One provides enough venom to kill **100 people**.
- Luckily, inland taipan bites are rare.



HIGHEST CONCENTRATION OF VENOMOUS SNAKES



ILHA DA QUEIMADA GRANDE

Brazil



KOMODO ISLAND

Indonesia

This distinction is claimed by both islands. In each place, you might find **one venomous snake per m²** (roughly 10 ft²).



This photo, snapped in Bolivia, is one of Bugbee's favorites.



THE VERY IMAGE OF DIGNITY

It is our privilege to count Geoff Oliver Bugbee among the many talented photographers who travel to Heifer projects around the world to document the lives of our project participants. Our aim is to convey not only the adversity faced by the families with whom we work, but also their strength and dignity.

Bugbee has covered Heifer International projects for World Ark and Heifer's direct mail division in Rwanda, Uganda, Cameroon, Zambia, Haiti, Nepal, Honduras, Sierra Leone, Bolivia, Albania, Kosovo, Poland, Slovakia and India – including the photos from India featured in this issue. Here, he shares with us his expertise on the unique challenges of humanitarian photography, some of his most rewarding experiences and advice for photographers who would follow in his footsteps.

Interview by Molly Fincher, *World Ark* writer

World Ark: Why have you chosen to focus so much of your career on humanitarian photography?

Geoff Oliver Bugbee: I'm drawn to the common thread that runs through all people, the essence of what unites us. When I was really young, I spent a lot of time looking at pictures made by the socially concerned photographers of the 1940s and '50s, particularly the work of Margaret Bourke-White, Gordon Parks and W. Eugene Smith. As I delved further into Smith's extensive photo essays for LIFE — especially "Country Doctor," mercury poisoning in Minamata, Japan, and Albert Schweitzer's leprosy work in French Equatorial Africa — I was hooked on

the medium and the role photography could fulfill as witness. Smith's images conveyed so much strength, yet exhibited an undercurrent of real human vulnerability. His pictures were the first to connect to my heart, and I wanted to understand why. Over time, I grew to understand the camera's potential as a proactive tool — an instrument to express one's voice and also confront perceived truths. The challenge to craft multi-image stories as one single body of work strongly appealed to me. The dots really started to connect during a months-long passage through India. That was sort of the road test for me, when I heard the calling within to follow in the tradition of social documentary photography. Twenty

years later, I'm still walking down that road.

How do you go about capturing photos that convey both the need and the dignity of your subjects?

It's hard to put that into words. A photograph can illustrate so many different things, depending on who's doing the looking. In terms of the process of making pictures, from my own experience people usually reveal themselves if I stay present and genuinely connect with them. People often need time to adjust to your presence and understand who you are. Eye contact usually engenders an understanding of what I'm there to do. Then comes the ineffable territory of composing



Bugbee captured this portrait of strength in Nepal.



frames, reacting to expression, capturing gesture as it naturally unfolds. The aim is to respond to what's happening in the moment rather than directly influence it. Somewhere in that zone, the telling images can be found.

What is the biggest challenge when you take on projects like this? What is the most rewarding aspect?

The universal paradox is that you must be very patient, but there is never enough time. Moments reveal themselves when you stick around and develop relationships, when a place really gets into your bones. It'll show in your photographs. My work in the international humanitarian world is usually on-the-fly because of budget constraints or deadlines for visual output. As the photographer, you have to spot opportunities quickly, know what you need to capture, and be able turn on a dime and respond. When all goes according to plan, the visual story unfolds and you find what you're after. Even so, most rewarding of all are the pictures that resonate and have lasting visual impact or appeal, yet I have only a faint recollection of how, or even why, I made them. Those are the images I consider profound gifts.

What is your favorite photo you've taken for Heifer, and why?

Choosing one frame, not so easy.

While reporting for a *World Ark* story on llama and alpaca projects in Bolivia, we pursued a sidebar on health, nutrition and proper nourishment for children. In a schoolyard teeming with children at play, I roamed into the middle of



This picture from Sierra Leone suggests the power of hope.

a lively volleyball match and captured a moment of action just before the ball hit me squarely in the lens.

A woman walks through trellised rows of bean plants in a former refugee camp in Port Loko, Sierra Leone. Marie Kabba was a widow and member of the Kamuyu Women's Development Organization gardening collective. Heifer had pinpointed this location to improve livelihood conditions and establish animal projects. In the local Krio language, *kamuyu* means perseverance — an apropos name considering the scores of women in the region who had lost their husbands and were victimized by the war. By banding together as a group, they were able to realize higher yields in their food production and gain vocational skills. After taking notes for the article, I followed in Marie's footsteps for a while and made this image. It tells its own story through symmetry and vibrance. It has a quiet strength to it.

From a cover story on women's

empowerment in rural Nepal: Ganga holds up one of her favorite goats while beaming a smile worth a thousand words. After enduring years of abuse and ostracism from her own husband and immediate family, Ganga took the opportunity afforded by a Heifer project and turned the tables — and her life — around in a dramatic way. She went on to inspire like-minded women in her village and soon became the leading breadwinner in her family. When I took this picture, she was excitedly telling us all about her homespun entrepreneurial efforts. Her proudest accomplishment? Being able to finally afford to send her daughters to school.

What advice do you have for aspiring photographers, or anyone who travels in developing countries, when it comes to documenting the experience?

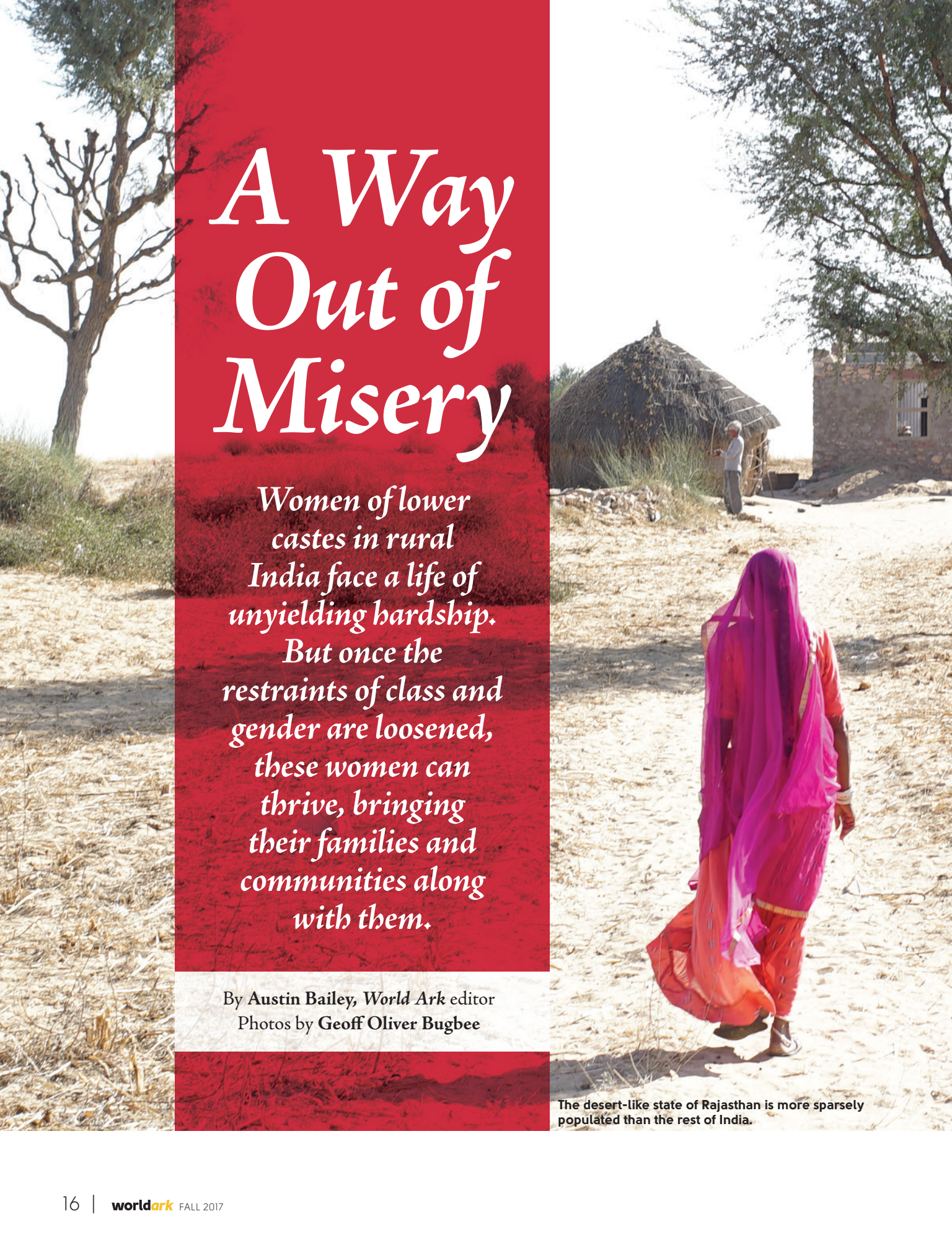
Worry less about your gear, travel lighter than you think you should,

trust your instincts and enjoy the experience. It's an absolute privilege to be given the opportunity to travel halfway around the globe. More so, to be counted on to bring back visuals that try to depict the intimate moments of other people's lives: how they cope with hardship, endure and even thrive in the face of adversity. Once the recognition hits home that we are indeed one human family, it will show in your photographs. ■



PHOTO COURTESY OF GEOFF BUGBEE

Follow Geoff's travels on Instagram—
[@geoffoliverbug9](#)
www.geoffoliverbugbee.com



A Way Out of Misery

Women of lower castes in rural India face a life of unyielding hardship.

But once the restraints of class and gender are loosened, these women can thrive, bringing their families and communities along with them.

By Austin Bailey, World Ark editor
Photos by Geoff Oliver Bugbee

The desert-like state of Rajasthan is more sparsely populated than the rest of India.





Smart, hard work is paying off for Panna Devi.

JHARELI, INDIA — Panna Devi arrived in the world doubly unlucky, and her prospects only got worse from there. Birthright as a member of the untouchable Harijan caste sentenced her to a lifetime of the work no one else wanted, sweltering over brick-baking kilns and cleaning up human waste. And because she was a girl in India's rural desert state of Rajasthan, she was married off at age 16 to a man she had no say in choosing and no right to refuse.

The bonds of caste and gender are loosening in India's booming cities but hold tight in Panna Devi's village of Jhareli and in the rest of rural India. Prescribed at birth and virtually inescapable, these bonds steer rural women

especially to futures devoid of opportunity. As it was for all girls in India's sandy northwest district, Panna Devi's path was fixed and well-worn by generations of women. Her journey, though, would be harder than most.

Now 48 years old, Panna Devi can point to a bad debt incurred shortly after getting married as the source of 25 years of intractable struggle. With both of his parents dead, the responsibility fell to Panna's husband, Ramuran Ji, to pay for his sister's wedding. With no cash on hand, Ramuran Ji borrowed money and went into bonded labor to work off the debt. What he expected to be a two-year obligation stretched to 25 years, with the lenders charging

The bonds of caste and gender are loosening in India's booming cities but hold tight in Panna Devi's village of Jhareli, and in the rest of rural India.

extreme interest rates and refusing to acknowledge the debt had been paid many times over.

All the while, Panna Devi baked bricks for money and cleaned houses for members of higher castes in exchange for food. The work, because it



Camels are more common than cars in this rural part of India.



The job of goat tending falls to women.



Subpar housing like this is common.

required her to clear human waste, lowered her status even among people in her own caste. So when Panna Devi learned that a new women's self-help group was starting up, she was eager to grab on to an opportunity for more dignified work.

"I thought this could be a way out of misery," she said.

THE VIEW FINALLY CHANGES

While a few small cities bustle in this scrubby northwestern region of India, most of Rajasthan is claimed by the desert. Panna's village, a collection of mud-walled houses, some with metal roofs and some with grass, looks no different than it did decades ago. Camel-drawn carts share the road with the occasional car, but most people travel on foot. Besides goats, the only creatures

that seem to thrive are peacocks, which roam as comfortably around people as pigeons in a city park.

Men here tend to dress in light-colored western-style clothes or the simple *dhoti*, a cloth that's wrapped around the hips with one end tucked between the legs to resemble baggy, knee-length pants. The wardrobe for women, however, is far less practical. Women in this Hindu region are invariably shrouded in the magenta or red mesh veils called *ghoongats*, a holdover from Islamic rule centuries ago. While purdah, the Islamic practice of strict separation of the sexes, is a relic of the past, women still lack the freedom men here enjoy. Most women in Rajasthan shy away from strange men and remain covered by their *ghoongats* when in public. In Naguar, the city closest

What's in a Name?

India is an enormous country, rippling with contrasting customs. Naming conventions vary greatly and can be based on religion, caste, horoscope and region of birth.



All Rajasthani women are goddesses, and they are titled accordingly. The "Devi" that follows Rajasthani women's first names is an honorific, or a form of address indicating respect.

"Devi" is the Sanskrit word for "goddess."

Women of lower castes used to use "Dasi," meaning "servant," instead. Today, the "Devi" title is democratized and used by women of all castes.

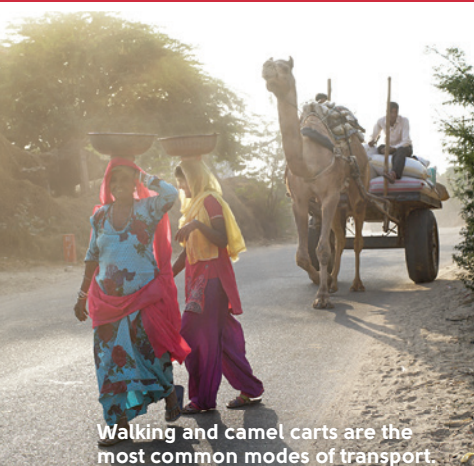


"Ji" is the honorific commonly used for men in the region.



Peacocks, the national bird of India, are at home in Rajasthan's desert.

Rajasthan, in India's northwest corner, is a particularly prickly state. It shares a tense border with its western neighbor Pakistan, and much of the state is blanketed in the inhospitable sands of the Thar Desert.



Walking and camel carts are the most common modes of transport.



Women here tend to remain covered around strangers.

Women in this Hindu region are invariably shrouded in the magenta or red mesh veils called ghongats, a holdover from Islamic rule centuries ago.

to Panna Devi's village, men on motorbikes and on foot remain in the streets after dark, but women are expected to go inside as soon as the sun goes down.

Panna Devi chafed under these centuries-old strictures that smothered her entrepreneurial drive and helped to keep her penniless and homebound. Membership in the Heifer-sponsored self-help group, Panna Devi knew, would help

her cultivate a different future. Heifer brought training and other resources to group members to help them better care for their goats. Panna Devi had only one goat then, but it thrived with better nutrition and was able to reproduce. Bolstered by her success, Panna Devi dared to pursue a project she'd been planning in her head for years.

Each month, all members of the self-help group threw a few





Panna Devi tends to her shop.

rupees into a revolving loan fund, and Panna Devi was among the first borrowers. After 25 years beholden to money lenders, she was nervous about incurring new debt but confident in her business plan. She used the money to set up a small shop in a wooden shed painted blue and elevated on stilts to sit a couple of feet above the sand. She stocked her shop with tobacco, candy, vegetables and grains, and

officially opened for business.

Each morning before sunrise she unlocked her shop and waited, but customers wouldn't come. People in higher castes refused to buy from her because they didn't want to eat food Panna had touched. Even members of her own caste shunned her because she had been a manual scavenger, the euphemism for someone who cleans out human waste from

buckets or latrines in households that have no toilets. For many years, Panna Devi fed herself, her husband and her son with food she earned in exchange for this illegal work. The practice was outlawed in 1993, and the Indian government is slowly providing money to install toilets in all homes. But the government funds are rolling out over time, and many rural households still lack bathrooms.



Ramuran Ji, husband of Panna Devi, helps care for the animals and household.



Azolla, a water plant, boosts goat health and productivity.

*“I will
do it and
show it.”*

Panna Devi



Business is good at Panna Devi's shop.



The shop accepts cash or grain for payment.

A DIFFERENT ROUTE

As her shop languished, Panna Devi continued snatching up all the trainings Heifer offered, learning how to supplement her goats' diet and boost their milk production with a water plant called azolla, which grows effortlessly in a cement basin. And she completed a course qualifying her to become a community animal health worker. This was the training that saved her.

Undeterred by the slow start for her shop, Panna Devi jumped into her work as an animal caretaker, using it as an opportunity to showcase her competence and work ethic. “I will do it and show it,” she said. “I will show everyone how it is done.”

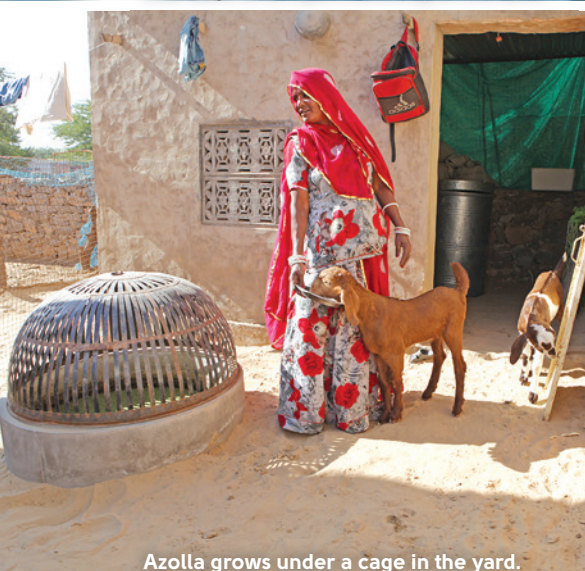
To keep their flocks up-to-date on vaccinations and otherwise healthy, the people of Jhareli called on Panna Devi. And under her care, the goats

thrived like they never had. Admiration and appreciation for this hard-working woman grew. Crowned in newfound respect and gratitude, Panna Devi saw business at her shop pick up.

Now, two stone benches flank the shop, and business is steady. Bags of potato chips swoop across the doorframe like a garland, and packs of bindis, the sticker-like decorative dots Indian women wear on their foreheads, hang



Installing a water cistern saves hours a day that used to be spent walking to the well.



Azolla grows under a cage in the yard.

like streamers from the ceiling. Payments of either cash or grain are accepted, and Panna Devi banks her stores of millet and rice in huge barrels warehoused in a new shed in her yard.

Profits from the shop, along with money earned from caring for other people's goats and selling her own, paid for an in-ground water tank that saves Panna Devi from making the half-hour trek to a well multiple times a day. She also saves herself the long walks she used to take to

graze her goats because she has the means to hire the job out.

PASSING ON THE GIFT

What does Panna Devi do with the time she saves now that she doesn't have to fetch water or graze her own goats? She works. Panna Devi thrives on working and fills her schedule with as much of it as she can. "I have work for all day now!" she said, listing off her packed daily routine that includes running the shop, tending animals, leading

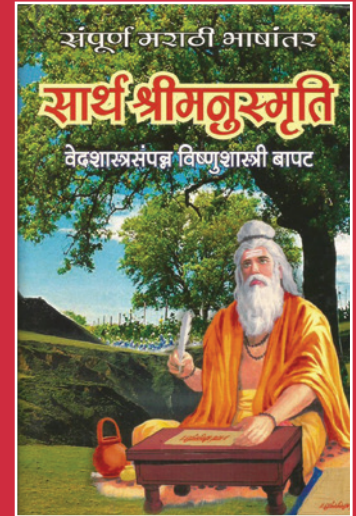
CASTE IN STONE

In India's cities, economic momentum and a growing middle class are chipping away at the confines of caste.

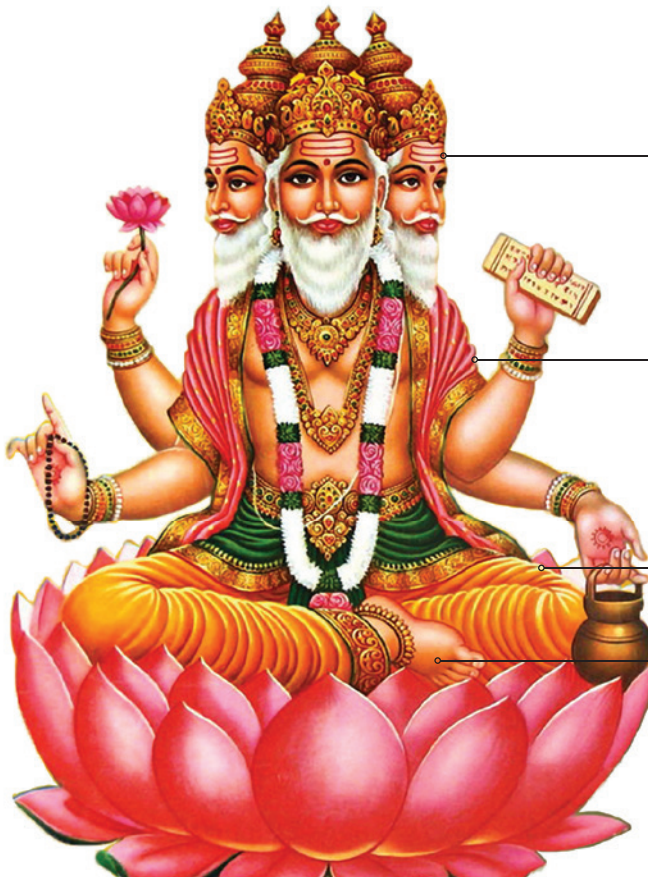
In rural areas, however, caste designations still prescribe where people live, whom they marry and what careers they pursue.

Based on Hindu law, the tenets of the caste system are laid out in the *Manusmriti*, a book written around 1,000 BC.

The bonds of caste are immutable. Inherited from your parents, you can never slip your caste designation regardless of changes in education, wealth or other circumstances.



BRAHMA: THE FOUR-FACED CREATOR GOD, EMBODIES INDIA'S CASTE SYSTEM.



BRAHMINS, the highest class, are represented by his heads. Brahmins were traditionally priests and teachers.

Brahma's arms represent **KSHATRIYAS**, the warrior and ruler class.

VAISHYAS, tapped for work as farmers and traders, are represented by Brahma's legs.

Brahma's feet represent **SHUDRAS**, the laborer caste.

DALITS, also known as untouchables, are not represented by Brahma.



Self-help group members help each other with daily chores.



Women use their veils to filter water.



Kitchen gardens make for a more nutritious diet.


WHY GIVE GOATS TO VEGETARIANS?



India is a largely Hindu country, and the Western perception is that practicing Hindus are all vegetarians. So what is Heifer International, an organization that promotes animal-based protein, even doing there?

In fact, not all Hindus are vegetarian. Only about 40 percent are, so the demand for meat exists in most of the country. But vegetarianism is pervasive in Panna Devi's home state of Rajasthan. Most families here drink goat milk daily but shun goat meat.

The market for goats is strong in surrounding regions, especially among Muslims who celebrate the holiday of Eid with feasting that often includes goat meat. Heifer-supported self-help groups in Rajasthan are tapping into this market and routinely sell their goats to buyers who transport them to the United Arab Emirates and other Middle Eastern countries.

A small, light-colored goat is standing in a field with some green plants and a white fence in the background.

her self-help group and helping to start other women's groups in her village.

Her disciplined bookkeeping shows that Panna Devi brings in 35,000 to 40,000 rupees per month (about \$600) in sales from both her shop and her goats, and she saves 6,000 of that, nearly the equivalent of \$100. These savings provide her with something she never had before: financial security.

The income translates into a more comfortable life. Her house, which she shares with her

husband and the handicapped son she adopted when her sister was unable to care for him, is much larger than it used to be. Shored up with sturdy mud walls, the airy house offers respite from desert heat. Panna Devi's son has physical handicaps that keep him from doing much work, but Panna Devi's multiple money-making endeavors mean she can care for him, his wife and their daughter.

Panna Devi's generosity washes over beyond just her family. Every day, she meets

with her own self-help group or with other women hoping to start their own group. A master number-cruncher, Panna Devi helps people open bank accounts and arrange to sell their goats for good prices. And having spent decades in desperate poverty herself, Panna Devi is quick and proud to ease others' burdens. The woman whose husband was once trapped in indentured servitude is now known as a *sethani*, a respected community member who will step in to give money to people in need. ■

Clever is Her Name



Buddhi Devi snuggles her adorable baby goats.



The animals thrive thanks to excellent care and diet.

“There were no dreams, just eating and sleeping.”

... Buddhi Devi

NOSARIA, INDIA — Buddhi Devi considers her daughter-in-law, who’s hiding in the kitchen with her veil over her face while strangers visit in the yard. The young woman will come around eventually, Buddhi Devi assures us. Most parents in this rural section of India raise their daughters to be meek and servile, so the deprogramming takes a while.

When Buddhi Devi came here to the desert village of Nosaria as a young bride, she, too, felt powerless and easily intimidated. This is difficult to picture. Buddhi Devi has the self-assurance and charisma of a natural-born politician, so much so that it’s hard to imagine her as a timid homebody.

But she was different then, she explained. “In that time if you had come here, I would be under

my veil, unable to speak.” In those early years of her marriage, she worked hard in the fields for the two rainy months of the year. She spent the other 10 months mostly alone in her small home, cooking and caring for her three children while her husband worked as a day laborer. The home was smaller than it is now because there was no money for improvements. The livestock shed they had back then was flimsy, dirty and occupied by only two goats at a time. Looking from her yard across the sandy fields, she could make out a few nearby houses, but she didn’t know any of her neighbors.

“There were no dreams,” she remembers. “Just eating and sleeping.”

Five years ago, though, Buddhi Devi changed course. She joined Baba Veertija, a Heifer-supported

women’s group that aimed to help members improve their goat-raising operations. Buddhi Devi, whose name aptly means “clever” in Hindi, showed up for every training she could and soon became a community animal health worker.

Leaving the house to make calls on farmers who needed vaccinations or other health services for their animals was tough at first. Being poor her whole life left Buddhi Devi shy and insecure, and she was nervous to talk to people she barely knew. But she had a new set of skills and a head full of know-how going for her. “I had things to share. That gave me confidence,” she said.

She earned money caring for animals, and she invested her earnings into her own goat operation. With the mortality rates



Grandson Pawan, 3, will have a better life thanks to his grandmother's work.

*"I had things to share.
That gave me confidence."*

... Buddhi Devi

of her goats way down thanks to better nutrition and hygiene, she was able to amp up her operation considerably and in one year sold 60 goats.

Buddhi Devi also tapped into the group's savings to take out a loan to grow fodder and vegetables and to install a water tank at her house that saves her the hours a day it took to fetch enough water for the animals and her family.

Of a lower caste and used to being shunned, discounted or simply ignored by higher-

caste women, Buddhi Devi was nervous once again when she took on a leadership role in the self-help group. She was used to everyday humiliations, like not being able to drink water or tea with members of higher castes and being made to wait outside their houses when she came to care for the animals because they didn't want to let her in. Buddhi Devi found, however, that her success suddenly made her quite popular. All group members began sitting together at meetings, rather



A truck delivers water now, saving countless walks to the well.





Chatararam Ji is delighted at his wife's success.

“Husbands, you should let your wife go out of the house. She can do anything.”
... Chatararam Ji

than dividing themselves into their usual hierarchical groupings. And all the members deferred to Buddhi Devi's expertise.

“What I say, they follow,” she said of the group members from upper castes. “Before, I was following what they say.”

As the group grows and the producers have more goats and vegetables to sell, the work becomes easier for everyone because buyers seek them out. Business is so strong lately that Buddhi Devi keeps a cellphone tucked into her bra strap so she doesn't miss any orders. Customers are calling from as

far as Jaipur, the capital city of Rajasthan state, 150 miles away. The need for more goat and vegetable producers is so high that when a potential member's husband is reluctant to let his wife sign on, Buddhi Devi goes to the family's home and makes her case. More often than not, she's successful.

Buddhi Devi's work supports her entire family, and she plans to use savings to help her son start his own shop. Her husband, Chatararam Ji, works alongside his wife to care for the animals and to keep the household running during the many hours



Pawan drinks goat yogurt flavored with cumin.

Buddhi Devi spends arranging sales, administering vaccines, and taking care of the other jobs that come along with raising and selling goats.

The dramatic change in their lives was a surprise at first, Chatararam Ji said, but a welcome one. “I was not expecting that she could do this work. Now, I'm confident,” he said. In fact, he said more women should ditch their traditional role of sticking close to home. The whole family will be better off, he said.

“Husbands, you should let your wife go out of the house,” he said. “She can do anything.” ■

RED CHILI GARLIC CHUTNEY



Mathania chilis are a regional specialty.

Maybe it's not so surprising that Buddhi Devi is such a dynamo. Anyone who eats this red chili garlic chutney every day is bound to have a little spice! Buddhi Devi adds this chutney to cooked vegetables or uses it as a dipping sauce for chappatis, an unleavened Indian flatbread.

This chutney is made with mathania, a mild red chili that's quite difficult to find in stores in the United States. But you can order it online.

INGREDIENTS

3 red mathania chilis

5 cloves of garlic

salt

enough water to make a paste

Buddhi Devi makes this using a pestle-like tool called a *sil* to grind the ingredients together on stone slab called a *batta*. (Pro-tip: a food processor works just as well.)

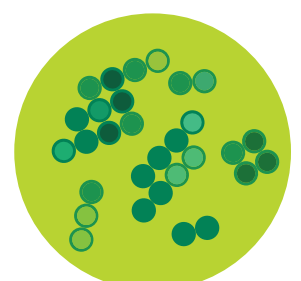
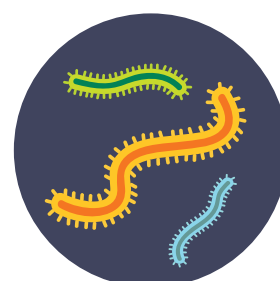
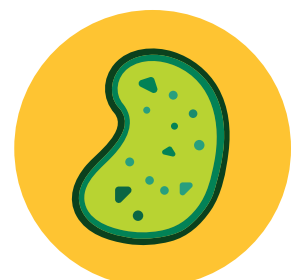
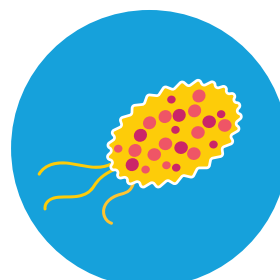
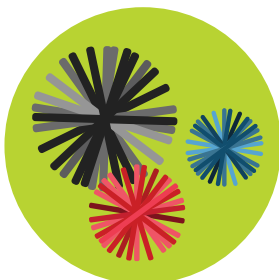
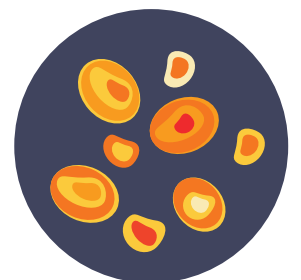
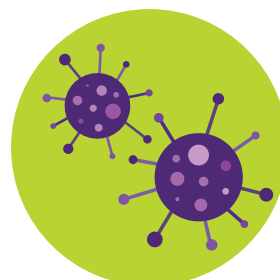
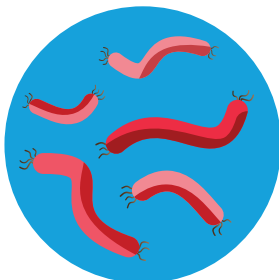
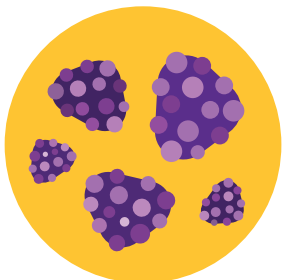
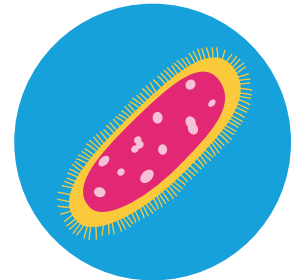
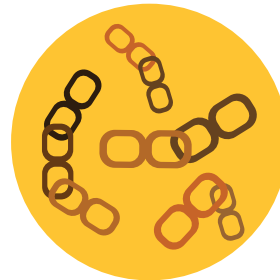


Buddhi Devi makes this chutney daily.



Water is added until ingredients make a paste.

OUR HIDDEN



N HELPERS

**IN HEIFER'S PROJECTS AROUND THE WORLD,
IT'S ACTUALLY THE TINIEST ORGANISMS THAT
HELP FAMILIES MOVE TOWARD HEALTH.**

By **Ragan Sutterfield**, *World Ark* contributor

Your skin is crawling. Don't feel it? The organisms there, the menagerie of microbes that call your body home, are measured in microns. They are beyond the scope of your nerve ends, as native as your own cells, and yet they are ever present, working in symbiosis to make your skin healthy. Inside there are even more, flora and fauna, plant and animal both. Your lungs host fungi necessary to your respiration; your intestines are a chattering mass of bacteria and viruses and all manner of the microscopic life. When they are in balance, a teeming healthy ecosystem, they enable you to live a healthy life. They are part of "the hidden half of nature."

This hidden world is as vital and varied as the trees and grasses, birds and mammals and reptiles we think of as life on Earth. For good health and good food, they are necessary partners even if we often ignore or are ignorant of their presence.

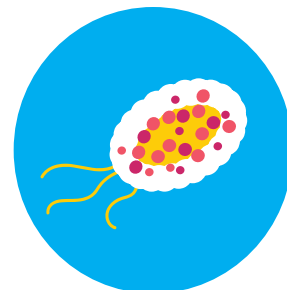
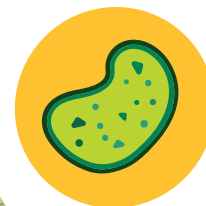
In a typical Heifer project site, we may have goats and a kitchen garden, composting piles and a biogas stove, all key elements to enabling a family to move beyond hunger. Yet none of these elements would work without billions of hidden partners. So let's give these microbes their due.

For insight into the invisible world of microbes, we turned to an expert husband-wife team. David Montgomery is a geologist at the University of Washington and author of the new book *Growing a Revolution: Bringing Our Soil Back to Life*. Biologist Anne Biklé co-authored with her husband *The Hidden Half of Nature*. Together they helped us gain insight into the wonderful, hidden world that science is only now beginning to understand.

**This hidden world is
as vital and varied
as the trees and
grasses, birds and
mammals and reptiles
we think of as life
on the Earth.**

COMPOST PILE

In a compost pile, nitrogen sources such as vegetable scraps and manure mix with carbon sources such as dried leaves, woodchips and straw. Together these carbohydrate-rich materials provide a feast for bacteria. Turning a compost pile encourages varieties of aerobic bacteria to quickly break organic matter into bioavailable materials, which are components that plant roots can soak up as nutrients.



The ecosystem below ground is every bit as complex as what is happening above ground.

GARDEN

In all natural systems, organic matter falls to the ground and decomposes to become food for plants. "Organic matter is carbohydrate-based, and that is food for someone," Biklé said. "Those microbes end up pooping out what they don't digest, and that becomes a meal for someone else." A mulch layer in a garden helps to feed the various microorganisms that then feed plants the nutrients they need.

There is a whole web of life in the soil, from arthropods that shred organic matter into smaller pieces to the mycorrhizal fungi that digest carbon. Bacteria do everything from bringing nutrients to soil roots to emitting electrochemical pulses that draw plant roots deeper into the soil. Predatory nematodes and protozoa eat bacteria and then metabolize them into more food for plants. "The ecosystem below ground is every bit as complex as what is happening above ground," Montgomery said.

Digging or tilling in the garden is like a tornado coming through and ripping apart a city. Instead, gardeners are advised to mulch heavily rather than tilling. When there is a strong community of soil life with ample organic matter, the carbon structure of the soil becomes loose, more porous and more fertile.





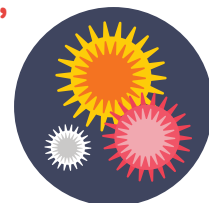
PEOPLE

From the moment we are born, the human body acquires the microbes that will give it healthy life. When a mother nurses her child she is giving her child both microbes and milk. A newborn baby doesn't so much live off the milk of her mother as she does the metabolites of the microbes that digest the milk. As Anne Biklé puts it, "Most moms wouldn't want to hear it, but really breast milk is feeding lactobacilli, and babies are living off of microbial poo."

The gut is the place where the majority of the body's bacteria live. The majority live in large intestines, but microbes are involved throughout digestion. Biklé and Montgomery say that we should think of our gut as the soil of our body: "Everything happening in that human soil is affecting everything in our bodies." It is from the gut that our life is nourished, and microbes are the key processors and delivery agents for that nourishment.

Scientists are only beginning to understand all of the diverse functions of these bacteria, but it is becoming clear that they even affect our mental health. "Gut biota directly and indirectly make serotonin, which then travels to the brain," Biklé said. She likens serotonin to the gas in the engine of a car. It is the primary chemical that enables brain processes to work properly. For human and soil health, Biklé and Montgomery recommend fibrous organic matter. "When it comes to the microbiome, mulch your soil inside and out."

It is from the gut that our life is nourished, and microbes are the key processors and delivery agents for that nourishment.



BIOGAS

While compost piles make use of primarily aerobic bacteria (organisms needing oxygen for respiration), biogas units are powered by anaerobic bacteria. Many of these bacteria are "methanogenic," which means that as a byproduct of their digestion they release methane gas. Swampy areas are often filled with anaerobic bacteria working beneath the mud to digest plant material. That is why methane is often called "swamp gas."

Some Heifer project participants tap into the magic of anaerobic bacteria by using livestock manure to produce biogas. The anaerobic fermentation of the manure produces a gas that can power clean-burning cookstoves and lightbulbs.



LIVESTOCK

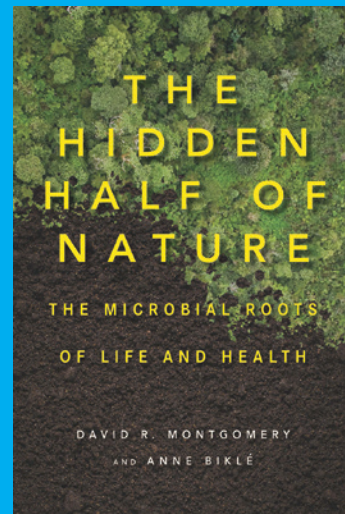
Ruminant animals like goats have four chambers in their stomachs that allow them to break down vegetable matter the human gut is ill-equipped to process. Like humans, goats are aided in their digestion by a host of microbes. When it comes to microbes, function is more important than individual species since bacteria can swap genes with one another and quickly become new varieties when the situation demands it. In a study of goat rumens, scientists isolated 44 different varieties of bacteria that aid goats in fermenting and breaking down organic matter.

Goats are helpful in a farm system not only for their ability to turn plant matter into meat and milk for human use, but also for their manure. "Ruminants are accelerators of the cycle of breaking down organic matter for the soil," Montgomery explained. Goat manure readily becomes food for plants, nurturing them more quickly than the longer processes of decomposition that normally feed soil. In a way, a goat is like a walking composter. ■



A goat is like
a walking
composter.

LEARN MORE ABOUT THE WORK OF ANNE BIKLÉ AND DAVID MONTGOMERY AT DIG2GROW.COM OR ON TWITTER @DIG2GROW.



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Until the River

Reviewed by Jason Woods, *World Ark* senior editor

The availability of water is one of our most pressing global issues, but the intricacies of the problem are often hard to parse. In *Where the Water Goes: Life and Death Along the Colorado River*, author David Owen examines the water issues that are both unique to the Colorado River water system and all-too-common worldwide.

The Colorado River and its tributaries touch seven states and supply water to 36 million people from Denver to Los Angeles. The river irrigates about 6 million acres of farmland and supports \$26 billion worth of recreational activities a year.

water, too, provided there's enough. If there's not enough, claims take precedence over others based on when they were made.

Groundwater in the watershed of the Colorado and its tributaries, on the other hand, is regulated by the Rule of Capture, which says landowners can use as much water as they want from wells on their land, even if doing so dries up neighboring wells.

Adding to the complexity is the allocation of the river's water by state, decided by the 1922 Colorado River Compact. Negotiating the compact took several decades and "required the

Owen writes, "if everyone used all the water they have a legal right to use, there would be much less than no water left."

Despite the importance of the Colorado River to western states, Owen writes, "If you picked any high school civics class in the country and gave its students a year to gather information and think, they could almost certainly come up with an approach to western water use that would be more rational than the arcane patchwork we have currently."

A large part of that patchwork is determined by the doctrine of prior appropriation. Basically, proximity to the water doesn't matter; the first person who makes "beneficial use" of water is entitled to use that water, for that purpose, for the rest of time. Other people can use the

involvement of Congress, the National Guard, the Supreme Court, and Henry Kissinger." Unfortunately, the final shares of water were based on some of the wettest years on record, and no contingencies were made for regular fluctuations or changes to the environment.

Now, because of these and other factors, Owen writes, "if everyone used all the water they have a legal right to use, there would be much less than no water left."

Residents of northwestern Mexico know the possibility all too well. By the time the Colorado River reaches Mexico, it's now just a trickle, where it used to sustain a vibrant ecosystem.



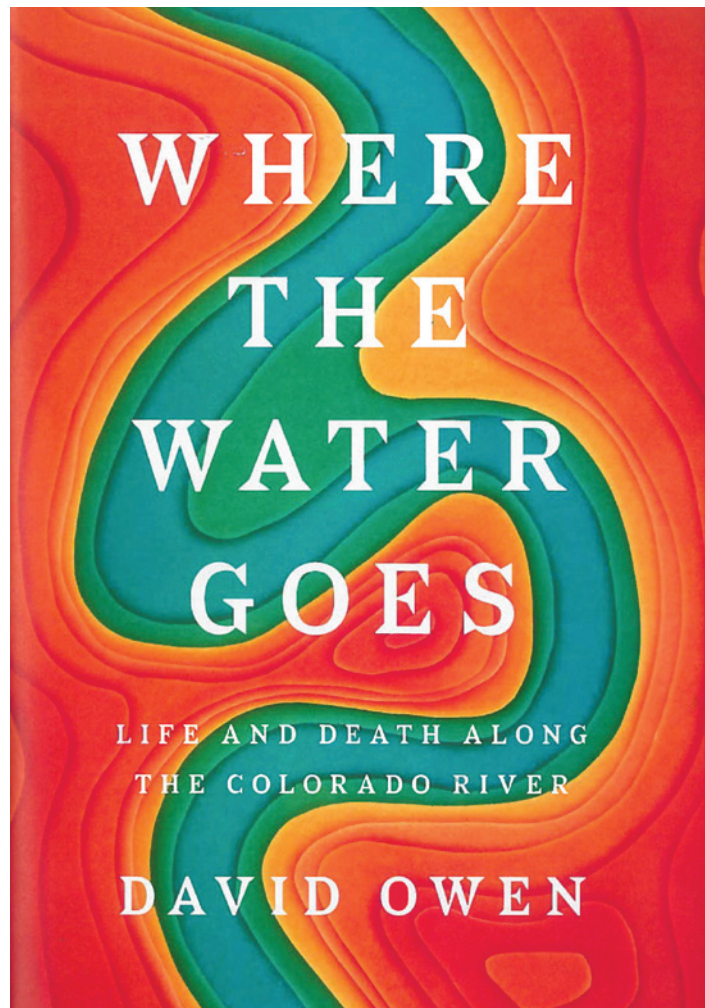
Runs Dry

Using a litany of examples, Owen illustrates that there are no easy fixes when it comes to the issues plaguing the Colorado. “Every new solution creates additional problems and that tinkering with even small elements in the river’s vast network of beneficiaries can upset dozens of others,” he writes.

One particularly tricky example is the Salton Sea, a lake with a surface area of 350 square miles that was the result of a huge Colorado River engineering miscalculation in 1905. As a byproduct of decades of human activity, it is much saltier than the Pacific Ocean and contains a significant concentration of harmful substances.

The Salton Sea is now drying up. It might seem like its conservation shouldn’t be a priority with so many competing environmental issues along the Colorado, but it’s not that simple. The Salton Sea is the largest lake in California, and it has turned into one of the state’s few major wetlands, sustaining a large number of bird species. And if the lake’s shoreline continues to recede, the human population will suffer, as contaminants left in the lakebed are carried off into the wind, causing serious respiratory illnesses.

In the end, Owen doesn’t have many solutions, just a clear view of the complex web of issues affecting water usage along the Colorado River. Hopefully, a clearer picture of the missteps and complications of the past will help us move forward more deftly with our future water usage.



Where the Water Goes: Life and Death Along the Colorado River

By David Owen, Hardcover, \$28; 285 pages



READ TO FEED

Long Island Lutheran Day School's 4th and 5th graders recently donated to Heifer International through the Read to Feed program. Maddelena Reno was one of the top fundraisers in her class.

What was your favorite book?

The book I enjoyed reading the most was a book called Wonder by Rael J. Palacio. The book was about a child that didn't fit in with his other classmates at school because of a deformity in his face. It was such an interesting story that had so many twists and turns. At the end of the book, it taught you the lesson that you shouldn't judge people based on what they look like.

What did you like most about Read to Feed?

I liked participating in the Read to Feed program because it was amazing to be able to raise money for people who don't have a lot of food, jobs and clothing. Also, I was happy that I got the chance to read a lot because the book was fun and interesting.

How does it feel to know that you helped change the world?

I feel proud of myself that I can help change the world. Being in a Christian school, I know that God is with everyone and cares for each person. The animals and irrigation pump we were able to give helps to get people vegetables, milk, water and more. We should remember the verse John 3:16 ("For God so loved the world that he gave His only son, that whoever believes in him will not perish but have eternal life").

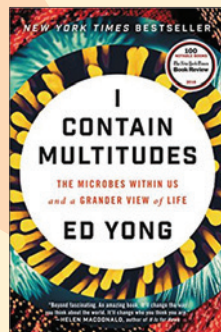
MADDELENA RENO

5th grade
Long Island Lutheran Day School
East Northport, New York

LEARN MORE AT READTOFEED.ORG

THREE FAVORITES ON: MICROBES

It's sometimes hard to wrap our minds around it, but there's a world of microscopic organisms that are key to the health of everything from the soil to our own bodies. Here are a few books that will walk you through the fascinating world of microbes.

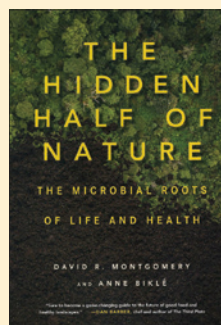
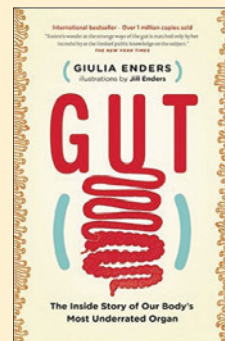


*I Contain Multitudes:
The Microbes Within
Us and a Grand View of Life*

By Ed Yong

*Gut: The Inside Story
of Our Body's Most
Underrated Organ*

By Giulia Enders



*The Hidden Half of
Nature: The Microbial
Roots of Life and
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**By David R.
Montgomery and
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Innovative Ideas Leading

By Jason Woods, *World Ark* senior editor



(Above) A bowl of harvested cardamom pods sits on the ground in Alta Verapaz, Guatemala.

Cardamom is the third-most expensive spice in the world, and Guatemala exports more of it than any other country. But in the highlands of the Central American country, the farmers who depend on the crop receive only a small fraction of its final worth.

Normally, farmers sell to *coyotes*,

or middlemen, for less than 30 cents a pound. The *coyotes* then sell the cardamom to drying facility managers for a higher price. At the drying facilities, cardamom is heated in large vats for two days, then the price is marked up again and sold to exporters. Globally, the commodity sells for \$5 or \$6 per pound; by the time it reaches stores in places like the

United States, the price can be \$20 or \$30 per pound.

Since 2013, Heifer International Guatemala has been connecting cooperatives of cardamom farmers to domestic and international buyers, cutting out the *coyotes*. They have also helped develop natural methods to deter thrips, small insects that persistently damage cardamom



the Way in Guatemala



(Top left) Elvira Pec Beb stands in front of her cardamom plants with three of her children. (Top right) A farmer holds out cardamom pods. (Left) Gustavo Hernandez, Heifer Guatemala director.

crops. And to diversify farmers' income sources, Heifer Guatemala has helped them cultivate other high-value crops like cinnamon, cloves and pepper.

In the future, the Heifer Guatemala staff hopes that the cooperatives can expand the scope of their businesses. Cardamom has been linked to a wide variety of health benefits, from freshening breath to improving cardiovascular health. Heifer Guatemala is working with Dr. Luis Cisneros-Zevallos of Texas A&M University's Department of Horticultural Sciences to study a couple of those claims — specifically, cardamom's effect on inflammation and diabetes. The hope is that the results of the investigation will increase the value and marketability of cardamom to the food, health

and cosmetic industries, and then cooperatives can take advantage of the boost.

Heifer Guatemala is also helping innovate a solution to one of the biggest technical problems with the cardamom industry. The drying process is fueled by firewood, and lots of it, which leads to significant deforestation.

Guatemala has 4,500 mostly inefficient drying facilities. Each uses an average of five acres of trees a year. "We are a highly forest-covered country that produces a lot of cardamom, but to dehydrate and export the cardamom, we have to cut



(Top) Cardamom pods sit in a vat at a drying facility. (Right) A freshly harvested cardamom pod sits on a tablecloth.

down the forest," Hernandez said. "It's a suicide, right?"

Heifer Guatemala is working on developing a drying process that is more efficient. Usually, uncovered vats that dry the cardamom are heated by firewood from below, and much of the heat escapes through evaporation. The Guatemala team is looking into a version that covers the vat and heats from both the top and bottom, making the most of the energy used. This method also leads to a more uniform heating process and a better quality of dried cardamom. The improved drying process is powered using combustible fuel instead of wood to lessen the



impact on the forest, and the process takes less time to complete. The new drying operation also has a byproduct: cardamom-infused water, which Heifer Guatemala is exploring ways to use and market.

"There's a large gap in cardamom research, development and innovation," said Gustavo Hernandez, Heifer Guatemala country director. But Hernandez and his team are working to change that.



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PHOTO BY PHILLIP DAVIS

Harvester Eduardo Almeida Cevallos shows Dylan Lauren what fresh cacao fruit looks like.

"I've been to dozens of candy and chocolate factories, but I have never seen anything as interesting as this!"

Dylan Lauren , owner of Dylan's Candy Bar

Candy store magnate Dylan Lauren knows a thing or two about chocolate, but a trip to the cacao forests in Ecuador was an eye opener. Lauren got to see the production of chocolate, from picking to fermentation to processing. Knowing all the time and work that goes into chocolate makes it all the sweeter, and Lauren is dedicated to making sure cacao farmers can sustain both the health of their forests and the economic needs of their families and communities.



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