

# worldark

FALL 2020 | HEIFER.ORG

®THE MAGAZINE OF HEIFER INTERNATIONAL

Special  
Technology Issue

HEIFER SENEGAL

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*Heifer Tech  
Across the Globe*



**HEIFER**  
INTERNATIONAL



## Your Gift Makes A Difference

Girls like Emmy (left) and Prudence (right) can go to school when you make a gift to Heifer.



# Help Girls Like Emmy and Prudence

Like far too many children around the world, sisters Emmy and Prudence used to go to sleep feeling the pain of hunger, not knowing when their next meal would be.

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Every time you give the gift of livestock through Heifer International, you provide a family with a steady source of income and you give a child a bright future, filled with hope. **And right now, any gift you give will be MATCHED – doubling your impact for children in need all over the world!**



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## Dear Determined Humanitarians,

I'm hoping this letter finds you well and healthy, and that you're adjusting to this new reality that has thrown us all in flux. The world we live in today looks far different than it did a year ago. The challenges we are all facing are different and greater. In a time of such overwhelming uncertainty, I take comfort in knowing that the clearest path forward is one we walk together.

In addition to the illnesses and deaths it causes directly, COVID-19 is laying grave obstacles before small-scale farmers and entrepreneurs in developing countries. Farmers are unable to tend or sell their crops, and small businesses struggle to keep doors open. While the economy sleeps and so many people around the world remain intermittently homebound, our work of ending hunger and poverty becomes all the more challenging. Be assured that with your partnership, Heifer International will not waver in our commitment to helping enterprising families around the world succeed.

In this issue of *World Ark*

magazine, we highlight the tools and technology we use every day to help more people faster, and with better results. You'll read about how solar power, a free and unlimited resource in Africa's arid Sahel, is being used in Senegal to drill life-giving boreholes that pump water to sustain gardens, livestock and households. And in Southern Senegal, where water is in great supply but know-how about good nutrition is not, Heifer project participants are working with nutritionists to formulate and produce a simple and inexpensive mixture of grains and legumes that keeps malnutrition at bay.

How do we help communities pursue tools and technologies that best suit their needs? Amy Smith, an engineer and founder of MIT D-Lab, is the expert in working with people around the world to develop collaborative approaches and practical solutions to global poverty, and she talks about that work in an interview in this issue. By dispatching an army of students from

the Massachusetts Institute of Technology across the globe, Smith brings the latest in technological expertise together with local people who know the communities' needs, resources and limitations.

This less-is-more approach that emphasizes simple and scalable solutions is the subject of the 1973 bestseller *Small is Beautiful*, a book that helped shape the career of Oscar Castañeda, Heifer's vice president for the Americas Program. In his essay in this issue, Castañeda explains how the quest for elegant, simple, appropriate technology forever changed the way development organizations, including Heifer International, work.

I hope you enjoy this issue, and that what you take from it is hope that solutions to current challenges can be found. I'm grateful for your partnership.

Yours for a better world,

Pierre U. Ferrari  
@HeiferCEO

With COVID-19 keeping us at home far more than usual, I've been making good use of my lap pool. I feel stronger and more awake, and I'm sleeping better. Whether it's baking bread from scratch or catching up on a long-neglected reading list, I hope you're finding healthy and soothing ways to weather these unprecedented times.





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Photos by Lacey West

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# DO YOU MATCH?



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## WE WANT TO HEAR FROM YOU!

Please send your comments to [worldark@heifer.org](mailto:worldark@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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*World Ark* is the educational, informational and outreach publication of Heifer International. Its purpose is to further Heifer's goals to end poverty and hunger while caring for the Earth and to raise awareness of the issues involved in this work throughout the world.

Heifer International is qualified as a charitable organization under Section 501(c)(3) of the Internal Revenue Code. Contributions to Heifer International are tax-deductible to the extent permitted by law.

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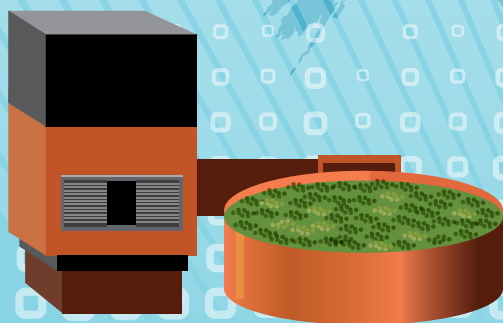
# HEIFER TECH ACROSS THE GLOBE

Sometimes the best solution to a farmer's problems is cutting edge and high tech, and sometimes it's a simple tool that's been around for generations. Heifer projects use all kinds of technologies — whatever is most appropriate to the context in which we're working.

Grass Roots Farmers' Cooperative, which is supported by Heifer USA, uses **blockchain technology** to let customers know exactly where their meat comes from and who raised it. Soon, coffee and chocolate farmers in Honduras will be doing the same.



Cardamom producers in Guatemala are using a **prototype dryer** that decreases the standard 50 hours needed to process the aromatic spice. Because of the time reduction, the amount of wood used also decreases.



**Drones** are helping farmers in Mexico plan and monitor their crops. Thanks to aerial surveillance, they can quickly detect pest infestations and address them before crops are lost.



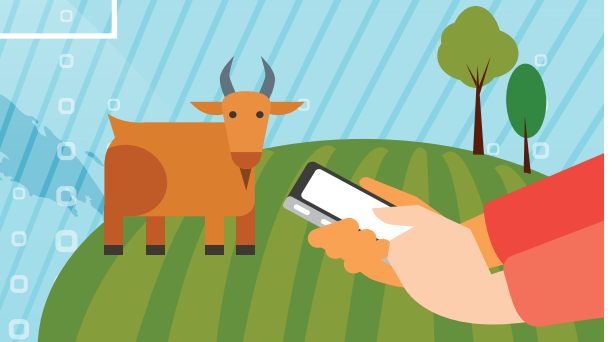
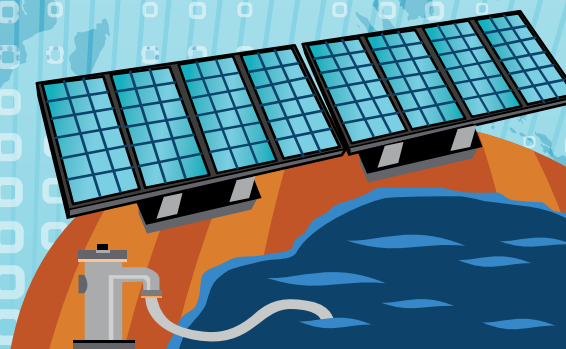
In Kenya and Uganda, farmers who don't have access to banks use **mobile money technology** on their cell phones as a convenient, secure and low-cost alternative.

Heifer Tanzania adopted the **kinengunengu**, a clever contraption for raising chickens. The two-room brooder is cheap and built from local resources. Newly hatched chicks are kept warm and snugly in a covered box, while older chicks get a bit more breathing room in an open box that still keeps them safe.



In densely populated Bangladesh, arable land is scarce and often flooded during monsoons. To feed their animals year-round, farmers are using a Heifer-designed technique for **growing fodder vertically**, drastically reducing the amount of land they need to keep their animals fed.

Much of Senegal is located in the harsh, dry Sahel. Heifer is harnessing **solar power** to dig wells that provide sustainable water sources.



Farmers in Nepal are selling their goats via a virtual collection center **mobile app** that increases both control over and ease of sales.



# Turn Off the Water Works with this Gardening Hack from the Igunga Eco-Village Project



PHOTOS BY PHILLIP DAVIS

By Bethany Ivie, *World Ark* writer

**IT'S NOT ALWAYS EASY** to quench your thirst in Igunga, Tanzania. It's even harder to water your garden. With an average rainfall of 21 inches per year, Igunga has earned its reputation as one of the driest districts in the country. But that doesn't stop students

of Jitegemee Primary School from cultivating something unheard of in this drought-prone area: a tree nursery. Using discarded plastic bottles and a little ingenuity, they have devised an earth-friendly method of irrigation to keep their saplings hydrated and

thriving, even when summer rains are nowhere to be found. You can use the same method at home to repurpose the plastic bottles in your recycling bin and keep your garden green — and your water bill low — in the warmest weather.

## WHAT YOU'LL NEED

- A plastic bottle (any size; the bigger the bottle, the longer it'll water)
- Something sharp (a small nail and a hammer or a thumb tack work well)
- Scissors or a serrated knife

## STEP 1 – WASH 'N' PEEL

Rinse the empty bottle with water and remove the label.

## STEP 2 – POKE

Using the sharp object of your choice, pierce the top of the bottlecap four to eight times. Keep in mind that the more holes you make, the faster the water will drain. Once pierced to your satisfaction, replace the cap on the bottle.

## NOTE

If the holes in the bottlecap are too small, your irrigator will be easily clogged and pretty ineffective. We suggest you start with the smallest nail you have and work up if needed.

## STEP 3 – TRIM

Using your scissors or serrated knife, remove the bottom inch of the bottle so that it is completely open.

## STEP 4 – SET UP

Using strong twine or string, tie the bottle (cap-side down) to the sapling or shrub that it is meant to quench. If you'd prefer to water your flowers or herbs, make several bottle irrigators and bury



**Left**  
Jitegemee Primary School student Frederick Joseph (12) fills a drip irrigator made from a recycled plastic bottle.

**Right**  
The average person in the U.S. uses a whopping 80 to 100 gallons of water a day. Handmade solutions like these drip irrigators can help you conserve water and keep your plants healthy.

at intervals (also cap-side down) in your flower bed. Note: If you choose to do this, you should only need to bury your bottles deep enough so that they can easily stand upright.

## STEP 5 – POUR YOUR PLANTS A REFRESHING DRINK

Pour water into the open end of the bottle. That's it. You've done it! Check the water levels in your irrigator daily and refill as needed. ■





PHOTOS COURTESY OF D-LAB



# Designs on Fighting Poverty

Interview by Jason Woods, *World Ark* editor

From an early age, Amy Smith felt she should use her skills to end poverty. With aptitude and passion for both engineering and international development, Smith committed her professional life to combining the two in a meaningful way.

In 2002, she founded D-Lab at the Massachusetts Institute of Technology, the university she attended for her undergraduate and graduate degrees. D-Lab works with people around the world to promote collaborative approaches and practical solutions to global poverty, and students learn to do the same through academics, research and field work. “We try to be a learning institution that works with humility and respect,” Smith said.

Smith’s list of honors includes a MacArthur Fellowship, *Time Magazine*’s 100 Most Influential People and *Business Week*’s World’s Most Influential Designers.

## WORLD ARK: Why did you start D-Lab?

**AMY SMITH:** My dad was a professor at MIT, and when I was 6, we moved to India for a year, where he helped set up the Birla Institute of Technology. And I think, as a young kid, I was struck by the difference of what kids there had access to and what I had access to, particularly when I came home. In one way or another, that impacted me a lot.

I always felt like I should be doing something to try to address the inequity in the

world. That’s probably what led me to join the Peace Corps after college. Then, for two years, I was a teacher at a small school in the middle of the Kalahari Desert. I enjoyed teaching, I continue to enjoy teaching, but I also love problem solving. My background is mechanical engineering, specifically engineering design.

So, I applied for graduate school, I got in, I went back, and I really wanted to learn and know enough so I would be the resource in the field. Almost all of my graduate career, I was a teaching



assistant. And I realized that the types of projects that are highly appropriate for small-scale income generation and labor saving, etc., are great vehicles for teaching design to undergraduates. Because they stress things that often get overlooked, and yet those things are really important, right? Things should be affordable, they should not break down, they should be understandable by the user. If you think about all the technologies that drive you crazy, it’s because they’re lacking in those things. And yet, our design classes do not stress them the same way.

Then what happened was I started teaching classes roughly under the framework of design for developing countries.

“Things should be affordable, they should not break down, they should be understandable by the user. If you think about all the technologies that drive you crazy, it’s because they’re lacking in those things.”

There was a student who was from Haiti, and he and other students from Haiti ... wanted to do something for Haiti, but they wanted to involve more of the MIT community. So they thought, wouldn’t it be great to do a class [that] looks at creating technologies that would be useful in Haiti. But as they said, how can you design something for Haiti if you’ve never been to Haiti? And if you know anything about Haiti, it’s particularly true for Haiti. I mean, it’s true for all places, but

Haiti is a highly complex place. They reached out to me, and this seemed like a great evolution for what I was doing. What we did was create a series of classes where in the fall, people learned about different technologies, about different sectors of development, different theories and practices of development, they learned Creole, they learned about the cultural context of Haiti. Then during January, we took the students to Haiti. We linked up with Peace Corps volunteers

**TOP**  
Students from D-Lab’s 2018 Design course show off their work.

**LEFT**  
Amy Smith and her students talk about appropriate technology and development.





**TOP**  
D-Lab students collaborate with community partners as part of a fieldwork-based course in Uganda in early 2020.

there, and the volunteers were our ambassadors in the community, and our students were technical advisors on the project.

People identified challenges while they were there, then during the spring, we had a design studio where they created solutions, and then in the summer, they were able to go back and implement them. And that to me was like, "Wow! If only I had been able to do that," right? And a lot of the students felt the same way.

The next year, we expanded beyond Haiti to include India and Brazil, as well. The first year, in a very pragmatic way, we called it The Haiti Class. And it didn't seem like it made much sense to call it The Haiti India Brazil Class, so we just started thinking of what might be a good name. MIT

has a couple of other things called, like, E-Lab, which is for entrepreneurship, G-Lab, which is the Global Lab. And I'm also a big Sesame Street fan, so, you know, "brought to you by the letter D" seemed to make sense, because "development, design, dissemination."

#### Can you tell me about some of the designs that have come out of D-Lab?

Our longest projects came out of the very first year in Haiti, which is our charcoal project. In Haiti there's a lot of trash and waste, and there were a lot of initiatives about turning that into [cooking] fuel, and one of the Peace Corps volunteers we visited had a press that took wastepaper and compressed it into these [briquettes]. It was a clunky machine that didn't work very well, and so

our students worked with him and they actually increased the output by about three times, which is pretty good. We brought the briquettes home, and they were terrible. They were very difficult to light, they produced a lot of smoke. Turns out that the wastepaper wasn't as readily available, so it wasn't really a great resource.

For other reasons, we had brought home bits and pieces of agricultural waste in order to carbonize it, but then we took that a bit further and were like, could we make charcoal from agricultural waste? We looked a lot at what was available, and sugarcane [waste] is a very plentiful resource, it's not really used for anything else. It accumulates at these

"Over the years, we developed a methodology that, using very low-cost resources, would allow you to convert agricultural waste to a cooking fuel."

small-scale sugar mills, so it's easy to sort of "harvest."

I had a group of students during that spring semester look at how you could create a methodology for producing charcoal from agricultural waste using a very low-cost resource. And there was one student in particular who became somewhat obsessed with the project, so he kept working on it for multiple years afterward. And, you know, we had issues with sort of huge

plumes of smoke coming out of the experiments we were doing in the parking lot, but we've now worked that out with the campus police and the Cambridge police.

Over the years, we developed a methodology that, using very low-cost resources, would allow you to convert agricultural waste to a cooking fuel. For people who cook with charcoal, a lot of that charcoal breaks in transport, so they just have this unusable dust in the bottom of

the bag. You can use the same tools and techniques for turning that into usable briquettes as well. For some people, 25 percent of their charcoal actually gets broken and is unusable, so even without converting agricultural waste, it's a really useful technology.

We looked at, could we invest in entrepreneurs who would want to do this at a different scale? We actually hired a biofuels person to work with us, and he focused specifically on what was called the Harvest Fuel Initiative, working with entrepreneurs in East Africa to create small- and medium-sized businesses out of this. And it's been exciting, too, because there was a woman who was

**MIDDLE**  
Amy Smith teaches her D-Lab students cost-effective ways to make charcoal on the MIT campus.

**RIGHT**  
In 2018, MIT D-Lab cosponsored a five-day event on sustainable charcoal briquette production in Naivasha, Kenya.







**TOP**  
Amy Smith (middle) oversees a session of the Inclusive Innovation course in 2019.

actually using a machine that first Peace Corps volunteer in Haiti was using and having a very small output, and then [we] worked with her to show her some of our alternative charcoal presses. She has gone through, I would say, three iterations of larger and larger scale machinery, and I think she's now able to make three tons of charcoal a day.

#### What are the toughest global poverty challenges you encounter in design work?

That's always a hard question to answer. Like, which is more important, education or health? Water or food? No, they all are. The thing that is challenging is the complex interplay of basic human rights and needs that makes it difficult for people on the edge to thrive.

And I believe that you have to acknowledge the complexity.

One of the reasons I love the work we do, in empowering people to be designers, is it means they identify the challenges that are most important to themselves, and they solve them. In many cases, when people have access to more income, they are able to address some of their other challenges. Is income generation the single biggest challenge? No, but it sometimes allows people to address others.

The challenge is that people are just so close to the edge of not having enough to survive that any little thing can push them in a really dangerous direction. So for me, it's that complexity that is the biggest challenge. It's why I think the design work we're doing

has the potential to be really impactful, because it allows people resilience and resources to navigate the complexity more effectively. And I think that's, fundamentally, a really important thing. And when external agencies are mandating solutions and trying to navigate other people's complexity, they often fall short.

#### You've said, "I emphasize training [D-Lab students] in a kind of empathy with the people in the field, an empathy that is built upon respect." How do you train for empathy, and why is that a key component of the curriculum?

If you are designing technologies for someone you don't respect, I don't think you're creating a good technology. Fundamentally, as human beings, we could do well to be both humble and respectful. I think MIT selects for students who have been told they are the smartest students in the world, they are told that while they're at MIT. And to a certain degree, they are led to believe that education and intelligence are the same thing. And I try very hard to break that open.

Another aspect is that I feel that I don't want my students to think that development workers look like me: white people with good educational backgrounds who are compassionate and care about things. I'm happy that they think some people doing development are that way, but the majority of people

"If you are designing technologies for someone you don't respect, I don't think you're creating a good technology."

making change in the world are citizens of a country doing things for other citizens of their country. So I try very hard to bring in exemplars of that, bringing in guest lecturers from Tanzania, from Guatemala, from India. And honestly, some of the best inventors I know are from those countries. And the thing is, my students are like, holy crap, that's amazing, I couldn't do that, and it's like, yes! And some of them don't even have a primary school education, although many do, but they certainly don't have a university education, and yet, brilliant, right? So that's part of it.

And then, I also just think that the idea of understanding context [is important]. I do remember the first trip [to Haiti], there was one particular student who I recall accompanying to the latrine for about the first four or five days until she felt comfortable going in by herself. It's dark, and I thought it was interesting because, depending on what time you go, there are different insects or creatures in the latrine. At some point, it's mostly spiders, at another time, it's cockroaches. Lizards come out at a different time, the flies are there during the day. There's a really interesting time study to

do, but you could imagine, that would freak you out, right? And so, you might think differently about putting screens on the vent hole of a latrine if you had to have that many flies around you while you're using a latrine.

#### You have such a storied career, with a number of prestigious awards for your work. What is the key message you hope people take from your accomplishments?

I think it's really important for people to find out the things that they care deeply about and to map their strengths onto

how they can do something to effect the change they want to see. And I have, countless times, advised students, for example, who are facing this conflict between, well, there's this research project that I could do, and it will provide my funding, but I'm not really as interested in it, and it will put me down a pathway where I will be doing work I'm not interested in for my entire career. And I counsel against that. I believe that I'm an exemplar of how it often works out. You will find opportunities. And if you put yourself in the right arena, opportunities will present themselves. But if you never enter that arena, you will never see those opportunities. So I would say follow your passions, do what you love. I encourage people to find that intersection. ■

**BOTTOM**  
MIT D-Lab students listen to their community partners in Bihar, India, during a fieldwork course in early 2020.





# Watch Us Work

Drought, malnutrition and restrictive gender roles challenge the women of rural Senegal every day. Heifer International is helping them ease their daily burdens by digging wells, improving diets and starting savings groups that help small businesses grow.

BY AUSTIN BAILEY,  
WORLD ARK EDITOR  
PHOTOS BY  
LACEY WEST

**LEFT**  
Girls haul well water to their homes in Linguere, Senegal.

**RIGHT**  
Women sort and clean beans and grains as part of a Heifer project that aims to improve nutrition and health for children.



**RAIN FALLS IN THE DRIEST PARTS OF SENEGAL** only sporadically over a few months of the year. For a handful of weeks from July to September, the crusty band of earth at the southern edge of the Sahara Desert comes to life. Cracked ground sprouts green shoots, bald baobab trees leaf out and farmers race to plant seeds in the fields.

By November, the ground is dry again. Sheep and goats nip at dwindling pools at the crenulated edges of red dirt basins. The temporarily green landscape fades back to brown and fields go lifeless. This feast-and-famine cycle shapes the rhythms of life in the Sahel, a hot and dusty region that reaches across northern Africa from the Atlantic to the Red Sea.

While the cosmopolitan coastal capital of Dakar offers up all the modern

conveniences, rural Senegal is less comfortable. That's especially true in the northern part of the country, which falls in the Sahel and goes desperately thirsty for the majority of the year. Any oasis you might find here is a man-made one. Or, in the case of the oasis at Younoufere, woman-made.

Heifer International has long worked in the Sahel, helping farmers survive in an increasingly harsh and dry environment. While local deforestation and overgrazing add to the problem, scientists now believe the real drivers of desertification in the Sahel are rising ocean temperatures and global greenhouse gas emissions. Changing weather patterns are sending more rain to eastern parts of the Sahel but keeping the western edge, including Senegal, drier than before.





pump water for paying customers from 8 a.m. to 8 p.m. daily. But inside the gates, the women take charge. In brightly patterned dresses and headwraps and with intricate tattoos on their hands and feet, the women tending this unexpected patch of fecundity make for a refreshing sight. Veils of mesh protect seedlings from the harsh sun, and dogs chase away hungry rabbits. Spiky trees planted along the garden's perimeter keep out nibbling goats and hair sheep. For now, only a few garden beds cluster around the well, but eventually pipes will carry water to eight other points within the fence, ultimately allowing the women to grow large quantities of produce year-round.

"We used to not have vegetables in the dry season. Now we have enough to sell," said Mariame Sow, president of the Younoufere women's group. She comes to the garden for a couple of hours most days. All jobs at the household level are the responsibility of women, and that includes fetching water and providing food, she explained. With the new garden and well, these responsibilities are far easier to meet.



**TOP LEFT**  
Fatimata Ba and many of the other women who tend the water pump and gardens in Younoufere wear intricate tattoos on their hands and feet.

**MIDDLE**  
Diarry Sow stands in front of one of the sleeping quarters on her family's compound in the Sahel region of Senegal.

**TOP RIGHT**  
Penda Sow stands in front of the solar panels that power the water pump at a community garden tended by the women of Younoufere.

**BOTTOM RIGHT**  
People bring donkey carts to collect water from the borehole in Younoufere.

## While counting on seasonal rains to water the crops was always a gamble, in recent years it's a predictably bad bet.

For the women of Younoufere, that changing weather pattern has real-life repercussions every day. While counting on seasonal rains to water the crops was always a gamble, in recent years it's a predictably bad bet. And the town well, a rusty and temperamental beast of a contraption at the mercy of an unreliable electricity supply, can no longer keep up with demand. Because fetching water is still considered a woman's job in rural Senegal, the scarcity of water became the women's problem. A federation of three women's groups in Younoufere initially asked

Heifer International for help digging deeper and broader watering holes. But a study revealed the water would quickly evaporate or sink into the ground.

So the women dreamed bigger. Heifer International and the federation of women's groups teamed up to bring in a solar-powered well-digging machine and to design a plan to maximize this new water source. A brand new solar-powered borehole flanked by gardens and watering troughs for livestock is the result.

This 5-acre gated oasis employs one male security guard who also helps







## Pressure on farmers to grow food for markets rather than home consumption means vegetables and protein often get left off the plate.

chatter in thick canopies. Baobab trees in the arid North remain naked and dormant most of the year, waiting for seasonal rains before leafing out. But in the South, edible fruit in velvety green pouches hangs from leafy baobab branches like Christmas ornaments.

The generous landscape of the South doesn't translate to a more bountiful economy, however. The Kolda and Kaffrine regions are among Senegal's poorest, and malnutrition levels are high. Heifer International is sharing goats, sheep and chickens with families here in hopes of improving diets and helping struggling households achieve living incomes, which is the amount they need to maintain a decent standard of living. In the Kolda region, a living income is the equivalent of about \$1.14 per person per day.

Focusing only on income isn't enough because more money doesn't automatically translate into healthier diets, said Lyna Manga, a nutritionist based in Heifer's Kolda office. Pressure on farmers to grow food for markets rather than home consumption means vegetables and protein often get left off the plate. "The typical diet is rice and millet. Almost their entire diet is this," she said. Rice, hamburgers and

inexpensive junk food are increasingly popular. All these foods fill bellies but provide very little in terms of nutrition.

"There are very few schools that teach nutrition," Manga said. "The food pyramid is not part of the curriculum, and people really don't know the basics. People just eat to survive, whatever they can get." Meals are typically served in a communal bowl, with vegetables and proteins in the middle and grains around the edges. Children are expected to eat only from the starch-heavy edges, leaving the most nutritious parts for the adults.

Heifer projects in the region incorporate classes on the basics of good nutrition in hopes of changing these habits. The projects are also helping moms combine common, readily available grains and legumes into a versatile and easy-to-prepare flour that's improving children's health, boosting their energy and putting them on a path to more opportunity.

In the rural community of Siinthiag Fodè, Heifer gave women sheep and training in how to raise the animals for sale. But learning how to provide better food for their children tops the priority



**TOP RIGHT**  
Women prepare a nutrient-rich porridge of grains and legumes in Siinthiag Fodè in the Kolda region of Senegal.

**BOTTOM RIGHT**  
Children flock to eat a porridge specially formulated to provide good health and energy.

The federation of women overseeing the garden includes three groups, each with 50 or more members. And the groups take turns, usually working together two hours a day or more to bring along plots of onions, hibiscus flowers, beans, okra, maize and watermelons. So far, crop yields are enough to save the women from having to buy vegetables but not enough to sell. They're already bringing in money from selling water, making enough to buy seeds and extend irrigation pipes to the far edges of the garden. They're also paying a fair wage to their full-time security guard and water pumper, whose long hours are dictated by the sunshine. "We pay him for seven days a week," Sow said. "He's there from 8 a.m. to 8 p.m. sometimes. Whenever the sun works, he works, because that's when the water can flow."

Optimistic about their quick success, Sow and other members of the women's federation still have plenty of worries. Malnutrition is common, healthy food

is difficult to grow even with a good well, and the burden of providing healthy meals to the family continues to fall on women's shoulders alone.

While they laughed when asked why the men don't help in the garden, they admitted their frustration is real. Many of their husbands spend their days walking their herds to a watering hole, then sitting in the shade and drinking tea.

They could do far more, said Dade Mama Sow, another group member. "The problem really needs to be addressed. The men are getting the benefits and not doing anything."

### THE MAGIC MIX

More than 100 miles and on the other side of Gambia from Senegal's dusty North, the balmy southern districts feel like a different country altogether. Tangled mangroves grow along the busy Casamance River, where fishermen in colorful handmade boats set nets. The air is thick with humidity, and monkeys

**TOP LEFT**  
Grinding and preparing the nutrient-dense flour for their children is a social event.

**BOTTOM LEFT**  
A versatile and healthy mixture made from locally grown grains and legumes is boosting children's health.





**“The food pyramid is not part of the curriculum and people really don’t know the basics. People just eat to survive, whatever they can get.”**

**Lyna Manga, Heifer nutritionist**

list at the project participants’ weekly meeting, held in a shady clearing under a mango tree. The straight rows of round thatched huts with dirt floors swept to a polish sit mostly empty as residents gather at the circular clearing on the edge of the neighborhood. Children and chickens play at the edges of the tight circle of women and a few men clustered on a woven mat for their weekly nutrition lesson.

Group leader Banna Mballo, 25 and the mother of two, went to school through 11th grade, but most of the residents of Siinthiag Fodè never got nearly that far, and many of them can’t read. So Mballo uses an oversized flipbook filled with illustrations and no words for her trainings.

She flips to the day’s lesson and holds up the book, then asks the group what they see: children playing, a child eating, palm oil, water, sweet potatoes. These are foods that yield energy, Mballo explained in Jola, the language commonly spoken in the region. “If children eat these foods, it’s like a battery for a flashlight. If a flashlight does not have a battery it will not shine.”

The next illustration shows meat, fish, milk, legumes and eggs. “If a child eats these, it is like building blocks. It will strengthen the child, and he will grow healthy,” she said.

The last illustration of the day shows piles of fruit and vegetables. “These foods protect the child. It’s like a key to a room. It protects the room,” Mballo said. “For a child to eat a balanced diet, he needs all three of these things: energy, building blocks and protection.”

With the lesson over, the women work together on a fresh batch of the seemingly magic mix that’s made a quick and significant difference in

the health of babies and children here. Circled around a tall, narrow basin, trios of women with long wooden dowels smash millet in a perfectly timed 1-2-3 polka rhythm, then flip it in shallow baskets to remove the chafe. Mixed with roasted peanuts, ground maize and other grains, this mixture keeps well and provides nutrients for children when fresh meat and vegetables aren’t on offer.

Monthly weigh-ins for children once caused worry for Ansatou Baldè, a rice farmer and mother of four whose children used to eat millet porridge and little else. Now, clean hair sheep in tidy pens hold the promise of income, and the magic grain and legume mix, which Baldè stirs together with salt, palm oil, baobab fruit and a dash of sugar, are helping the children put on weight. The three girls and one boy sleep better and have more energy, and they’re doing better in school. With good educations, Baldè thinks her children can help her maximize her farm’s potential.

“I send them to school so they can come back and help me do things I couldn’t do,” she said.



### A BOX WITH THREE LOCKS

The St. Peter Savings and Loan group meets every other Sunday afternoon in a breezy alley next to Marie Bassene’s bar. At every meeting, each member is expected to bring 200 West African CFA francs, the equivalent of about 35 cents, to go in the communal solidarity pot set aside for crises and celebrations. But members can also contribute up to 2,500 CFA (roughly \$4) per month to the loan fund from which all members can draw.

Many Heifer projects around the world incorporate savings groups like this one to ensure project participants can continue building their farms and businesses long into the future.

Most of the 35 member families of St. Peter are raising swine and growing gardens as part of a Heifer project, and they’re using the savings group to grow their operations. Members can borrow up to three times the amount

they have contributed to the fund, at an interest rate of 10 percent. So far, the group reports zero defaults.

Any money on hand lives in a lockbox with three locks, with the keys held by three different group members. Security is really not much of a concern though, since contributions get put to work quickly so there’s rarely much cash sitting idle. Members seeking a loan present their plans, then other members vote. Loans have ranged from 1,500 CFA (about \$2.50) to 70,000 CFA (\$115), all used to invest in animals, seeds or improved fodder. The goal is to ramp up productivity and income, then reinvest to grow more.

While members’ financial strengths are not the same, the goal is to make sure every member has an equal opportunity to invest and grow, group President Jon Bautiste said. “If we want to do something, everyone has a say. We don’t leave anyone behind.” ■

**TOP**  
Banna Mballo leads group members in the week’s lesson about nutrition.

**BOTTOM**  
Marie Bassene holds a ledger of her deposits with the St. Peter Savings and Loan group.



# 10 THINGS TO KNOW ABOUT SENEGAL



**1** Senegal is sometimes called the Gateway to Africa because its coastline is the farthest western point on the continent. A direct flight from the Atlanta airport to Senegal's capital city takes just over nine hours.



**3** Senegal's cosmopolitan capital, Dakar, is nicknamed the Paris of Africa. This high-tempo city teems with artists and musicians, and high fashion abounds on the streets. If you go, take something cute to wear.



**4** The baobab tree is a national symbol of Senegal and an integral part of the country's culture. The bark, pulp, leaves and fruit of these giant trees are used for ropes, food, medicine and animal fodder. The trees themselves serve as important meeting places, and the cavities that form inside the massive trunks have traditionally been used as graves for griots, renowned storytellers and poets.



**2** Senegal officially came under French control in 1895, although French traders and slavers had set up shop along the African coastline hundreds of years before. Senegalese soldiers fought for France in both world wars. Senegal declared independence from France in 1960, but French continues to be Senegal's official language.



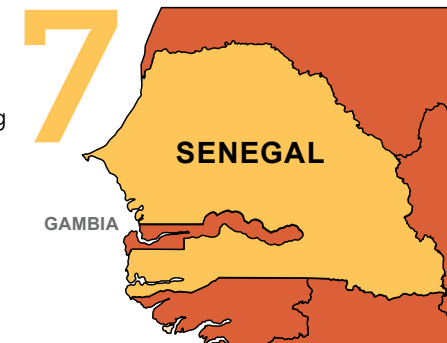
**5** While more than 90 percent of Senegalese people practice Islam, the country is quite tolerant to other traditions. The government recognizes both Muslim and Christian holidays.



**6**

Gorée Island, a 20-minute ferry ride from Dakar, is a UNESCO World Heritage site. From the 15th to the 19th century, it was the busiest slave-trading center on the African coast. Visitors today can tour the palatial ruins of the Portuguese, Dutch, French and English slave traders and the tiny, bleak cells where enslaved people were packed together without fresh air or light while awaiting passage to the Americas.

If the map of Senegal was a man with a mullet looking westward, his mouth would be Gambia, a sliver of a country that nearly bisects Senegal.



**9** Wolof is the largest ethnic group in Senegal, making up two-fifths of the population, and the Wolof language is the second most common in Senegal, after French. Wolof was historically a socially stratified culture with marriages confined within strict social and family groups. Wolof women are renowned for their intricate hairstyles, gold jewelry and billowing dresses.



**8**

The Fulani people, also called Fula or Fulbe, are spread throughout Western Africa, and about 3 million Fulani people live in Senegal. Traditionally pastoralists, many Fulani in Senegal still live a nomadic lifestyle, traveling with their herds of cattle, sheep and goats to find water and grazing land.



**10**

In Wolof, *teranga* is the word for hospitality and generosity of spirit that informs how guests are treated and resources are shared. The spirit of teranga is front and center during meals, when everyone generally shares from a communal bowl. Hands are always washed first, food is usually eaten with the fingers and good manners dictate that diners eat only from the part of the bowl right in front of them.



# GROWING SMARTER:



## HOW TECHNOLOGY IMPROVES YIELDS AND CHANGES LIVES

As we've become more aware of the finite nature of the Earth's resources, the way we understand farming has changed, too. With the right approaches, small-scale farmers can be just as efficient as their much larger counterparts while also taking care of the environment around them. Technologies both new and old can greatly improve small farms, and Heifer International is making sure farmers have access to those tools and the knowledge to use them.

STORY AND ART BY **LAUREN PUCHOWSKI**, *WORLD ARK* CONTRIBUTOR

**ALONG THE ROAD TO THE SMALL COMMUNITY OF SAN ISIDRO**, tucked into the lowlands of the Andes in Ecuador, there is little to see, just a windblown expanse of dusty brown. What was once rich cropland is now more like sand, almost unplantable, stripped of nutrients and humus by decades of farming and harsh pesticides, and vulnerable to drought and erosion from the wind. Desperate to find arable land, farmers here have begun venturing up into the green hills nearby, into the fragile ecosystem called the paramo. The paramo is the region's primary water source, and if it is destroyed, the already troubled area will fare far worse.

Behind a low yellow house in the village, however, is a vision of a different future. Slip through a dense line of trees and into another world: a lush tangle of foliage, fruit and blooms, bursting from their orderly rows like a vision of a farm in a fairytale. There is a whole farmers market worth of produce growing on this tiny plot, including blackberries, broccoli, cabbages, red onions, strawberries, shell corn, squash, tomatoes, fava beans, a local berry called goldenberry, tangy and juicy in its papery husk, and two kinds of local hanging fruits. There are animals, too: rabbits, guinea pigs, chickens and a pen with several piglets. Birds chirp merrily in the bushes, and the air, suddenly still, is sweet with the smell of rich soil and new growth. It

even feels warmer, somehow.

"It is about two or three degrees warmer," confirms Jofre Guaman, the young farmer who created this idyll over the last year and a half entirely of his own initiative, after receiving training in organic and sustainable farming techniques from Heifer. "That is because of the trees, which serve as a natural windbreak, and the plants." Don't be fooled, in other words, by the sheer poetry of the place — this is science. Each element of the garden serves a purpose, and the riotous bounty is underpinned by a thousand deliberate decisions, most of them cheap or free, which increase production, eliminate pests without chemical use and restore the soil.

### DON'T BE FOOLED BY THE SHEER POETRY OF THE PLACE: THIS IS SCIENCE.

The crops, for example, are planted in mutually beneficial pairs, like fava beans and shell corn, or peas and blackberry bushes. Companion crops, as these are known, grow better together than apart, protecting each other from pests and preventing depletion of the soil. Instead of using chemical fertilizers, Guaman, 20, makes his own organic formula by composting animal manure with ash and rice husks. The tree barrier prevents erosion and stops chemicals drifting

in from other farms, and clippings from the trees are used to enrich the soil. A simple irrigation system keeps conditions ideal for growth.

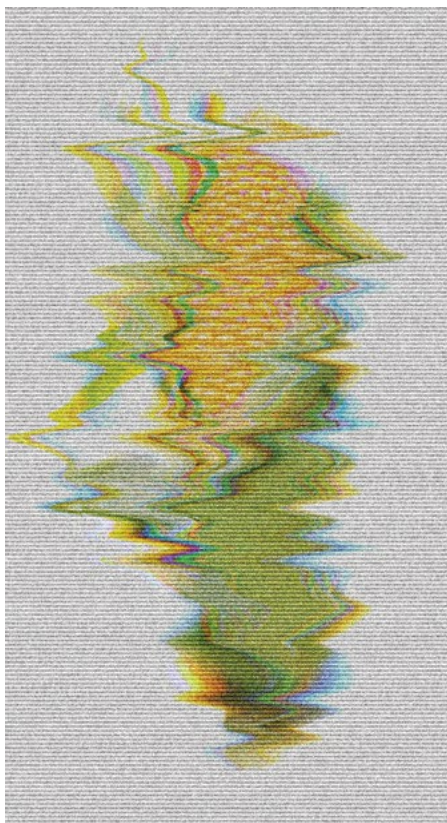
The result, after 18 months, is a sort of naturally reverse-engineered Eden, as fertile, biodiverse and productive as the most unspoiled swatch of heartland. The best indicator of this is the soil. "It keeps getting better and better," says Guaman. "Watch."

Crouching down, he reaches through the protective row of trees and grabs a handful of the soil outside the garden; with his other hand, he scoops up a fistful at his feet. Like a magician on a stage, he opens his hands: the soil from outside runs through his fingers like dust, while the soil from his garden has packed into a damp, dark ball.

Guaman grins. "This one is infertile," he says, motioning at the sandy soil. "This one," he says, holding up the other, "is alive."

Worldwide, the overwhelming majority of farms look a lot like Guaman's: small — under five acres — and family-run, often by the very poor. Small family farms produce as much as 80 percent of the world's food supply, especially in developing countries. And yet for most of the 20th century, bigger was considered better in agriculture. Large farms were thought to make the most economic sense. Producing more meant using more — more land, more water,





more chemicals. Technological advances focused on industrial farming. Small farms were considered virtually useless in the global economy, simply a way for poor people to grow enough food to survive.

But over time the thinking changed. We are far more aware now that land and water are finite resources, that industrial farming is not always sustainable and is, in fact, often damaging. We know that small farms, with the right approaches, can be just as efficient as large ones. A wave of new technology and innovations designed specifically for small farms means that they can produce more than ever.

We also know that small-scale farming can transform the lives of the poor. Where small-scale farming was once considered, as William Maloney notes in the World Bank's report *Harvesting Prosperity* (2020), to be "a deep pool of cheap labor" from which workers should escape as quickly as possible to more profitable economic sectors, like service or manufacturing, it is now understood as a key to the economic success of developing countries. Growth in agriculture reduces poverty more than growth in any other sector, precisely because so many of the poor are farmers. When innovation and technology increase the productivity of small farms, writes Maloney, farming becomes "a powerful driver of growth that raises people out of poverty and contributes to overall development."

So how can technology and innovation increase

productivity? It's tempting to imagine a single gizmo, cleverly designed, inexpensively made, that transforms small farms around the globe. But the reality is more complicated, because there are countless ways for small-scale farms to be inefficient.

## **GROWTH IN AGRICULTURE REDUCES POVERTY MORE THAN GROWTH IN ANY OTHER SECTOR, PRECISELY BECAUSE SO MANY OF THE POOR ARE FARMERS.**

A farmer might have plenty of land but no labor, or plentiful labor but only a little land. She might have rich soil on a remote hilltop far from the road, or she might have poor soil on a plot in town. (One study in Ethiopia found that the cost of transporting a sack of fertilizer from a distribution center to a farm, a distance of 10 kilometers, was equal to the cost of transporting it 1,000 kilometers, from the port to the distribution center.) She might have an infestation of pests, no irrigation or planting methods that she thinks are good but are actually bad, like putting too many seeds in one hole. Middlemen might control the market for her harvest and take her profits.

Instead, the future of innovation in agriculture looks more like Guaman's plot of land: crowded with a thousand different ideas, all of them intentional, resourceful



## **JOFRE GUAMAN**

The community of San Isidro is an especially fertile place for change. For generations, few opportunities and poor conditions for farming meant families here struggled, often sending their daughters as young as 12 to work as maids in Quito, the Ecuadorian capital. The soil was too poor to grow vegetables, and people ate only what they bought; as one resident noted, "just oats, noodles, rice." In 1994, Heifer began working with families in the area, teaching organic farming techniques and guinea pig raising. Participants embraced the new ideas, improving their diets and establishing small businesses, and they continued to Pass on the Gift long after the project ended.

Today, two new Heifer initiatives here are teaching techniques to mitigate climate change and preserve the paramo while working to establish new markets for organic produce where people can sell what they grow. Guaman hopes to build on the momentum that began years ago. "By improving the soil here in the lowlands," Guaman says, "we won't have to go to the paramo to farm. In the paramo area, there is virgin soil, but people are like pests and keep wearing out the soil. Agroecology is the solution."





and, most of all, smart. The biggest task becomes finding the solutions that will work for the problems, and the people, that you have.

Take, for example, Guatemala's cardamom crop, the world's biggest. Some 300,000 small-scale farmers in Guatemala grow almost two-thirds of the global supply. Known as "the grass that gives money," it requires almost no attention and sells for as much as \$4 per pound. But there are two big drawbacks to cardamom farming as it is traditionally practiced here. One is that cardamom is often a farmer's only crop; it is vulnerable to pests that can lower its value by as much as 70 percent, and a bad harvest can be devastating. The other drawback is the way it is processed, almost always in inefficient, polluting wood-fired dryers run by middlemen, who clear-cut 5,000 acres of wood for the twice-yearly harvest.

Heifer Guatemala saw the gross inefficiencies in the system, as well as the poverty and environmental damage it caused, and knew that farmers as well as the country would benefit from improvements. But Heifer is not a research institution, as Heifer Guatemala National Project Coordinator Larry Paul observes, and despite being largely agrarian, Guatemala does not have a robust agricultural research sector. "Research institutions here lack funds," Paul says. The United States provides some funding, "but their investment is mostly to fight poverty in the Western highlands," the region of Guatemala that borders Mexico and has the

heaviest immigration north.

It took a collaboration with several local and international organizations, as well as Texas A&M University, for the process to begin. Heifer Guatemala and other Guatemalan organizations identified the priorities: cleaner and more sustainable drying processes, pest prevention, better yields, improved marketability. Texas A&M studied the compounds in cardamom that could reduce diabetes (and perhaps create a new market). The group Engineers Without Borders designed a new industrial dryer that could be solar-powered, gas or electric, and that dried the cardamom on trays rather than in bulk, improving its quality. An inexpensive organic fertilizer and safe, effective pesticides were identified.

Heifer began working with hand-picked groups of what Paul calls "the best farmers, with the best land," who could serve as examples to the rest. There were successes: The organic fertilizer as much as doubled production with minimal investment, costing only \$20 per 1,000 square meters. And there were misses: The new, more efficient cardamom dryer cost \$16,000, about \$4,000 more than a traditional woodfired dryer, far out of reach for farmers and most middlemen, and the team calculated that implementation across the country would take 20 to 50 years.

Students at the Milwaukee School of Engineering, which has ties to Engineers Without Borders, volunteered to continue work on the dryer problem, ultimately designing an adaptation that improved

efficiency less dramatically but was much more affordable and could be rolled out more quickly. Based on the early positive results with the organic fertilizer, Heifer expanded its initial group to 6,000 farmers, with a target goal of 30,000. At the same time, they began to teach farmers about diversifying their farms with other spices like black pepper and allspice, to hedge against disaster if the cardamom failed.

### **SOME OF THE BEST TECHNOLOGY IS NOT HIGH-TECH AT ALL.**

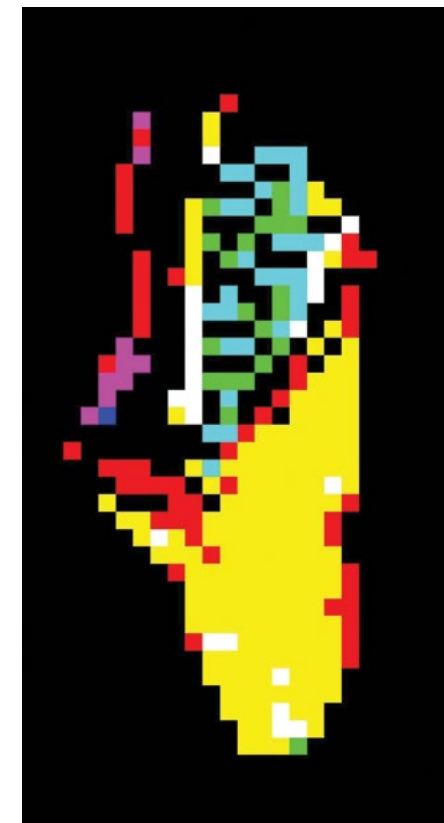
Like those fertilizers, some of the best technology is not high-tech at all. In Honduras, farmer Antonio Espinoza, 58, has been working with Heifer and government agencies to breed hardier beans for the national food bank. Among the methods that Heifer taught him is the simple strategy of burning a candle in a sealed silo of beans to remove the oxygen, which allows longer storage. And, as in many developing countries, the old-fashioned tool of radio is an effective way to reach farmers here; Espinoza has recently begun hosting a regional talk show, "El Zarzo" ("The Pantry"), in which he shares improved cultivation and production techniques that he has learned from Heifer.

But of course, the advent of digital technology, where available, has allowed dramatic strides. Even in developing countries many farmers have cell phones, which makes communication much easier.

Heifer's goat farmers in rural Nepal use text messaging to arrange sales and collection of their animals, saving a great deal of time and effort. Digital tech also facilitates an approach called "precision farming," in which farmers monitor data from their crops and livestock to make the best decisions about the use of their resources. The goat farmers have begun using an app called the Feeding Support Tool to calculate how much to feed their animals to keep them healthy while reducing production costs.

Digital tech also shows promise for improving the supply chain. Blockchain technology, a digital approach to record-keeping that makes the details of each transaction transparent to all parties, is being explored in Honduras Heifer projects to help eliminate gouging by middlemen and ensure fair prices for farmers.

There are also actual gizmos, like the Barsha pump used in Nepal, a simple wheel placed in a stream that harnesses the flow of water in a river to irrigate crops. And sometimes the best answer is a combination of several. Heifer Ecuador helped local farmers open a scaled-down version of an industrial dairy processing plant in a remote region in the highlands to help them control the sales of their product. A truck was deployed to collect milk from farmers but some lived on impassable roads. Miguelina Barerro, whose steep, narrow slice of farmland was one of the unreachable ones, availed herself of the best technology for that problem: a sturdy little burro, who nimbly scales the







## ANTONIO ESPINOZA

As a member of the Lenca indigenous group in Honduras, Antonio Espinoza has farming in his blood. “Agriculture is our tradition,” he says. “It is as if I am a kernel of corn, or a bean. How am I not going to believe in agriculture?” But like many Lencas, his father worked for a *padrone*, a landowner, in a system of indentured servitude. Growing up, Espinoza was witness to the bitter, often violent struggles between the farmers and the wealthy landowners who refused to relinquish their farms even when government reforms required it. Smart and hard-working, when Espinoza left school at age 10 to help support his family, he knew what he was giving up. “I dreamed of being able to study, to be a free farmer,” he says. “I did not want to be like my father — such a sacrificed life.”

For decades, their area was destabilized by the fighting, but in 2000, the farmers were awarded ownership of their land. The moment was as life-changing as they had hoped. “We began working our own land,” says Espinoza, “and it freed us.” The agrarian reforms created farmers’ groups to work communally, and Espinoza, who was productive and generous with what he knew, was often the leader. When Heifer began working with these groups in 2014, Espinoza took every opportunity to learn, as well as to teach as much as he could. “We preach about the multiplying of the loaves — it is the same with farming,” he says. “You plant one grain of corn, and it becomes a mountain of corn. How could we not teach other farmers?”

**ULTIMATELY, INNOVATION AND TECHNOLOGY ARE PERHAPS BEST THOUGHT OF AS AN APPROACH, RATHER THAN A PRODUCT. IN AGRICULTURE, IT IS AN APPROACH THAT ROUTINELY DELIVERS RESULTS.**

hill with her to meet the truck each morning, loaded with two brimming milk cans.

Ultimately, innovation and technology are perhaps best thought of as an approach, rather than a product. In agriculture, it is an approach that routinely delivers results. The regions that spend the least on agricultural research and development, like Africa and South Asia, have had the lowest agricultural growth in recent decades. In his World Bank report, Maloney says that the social returns, or the added value that is not directly financial, on research and development in agriculture average more than 40 percent. And yet private investors often aren’t interested in funding this kind of research because the profits are less likely to benefit them directly. The burden of funding rests with the government, which often, as in Guatemala, does not provide it.

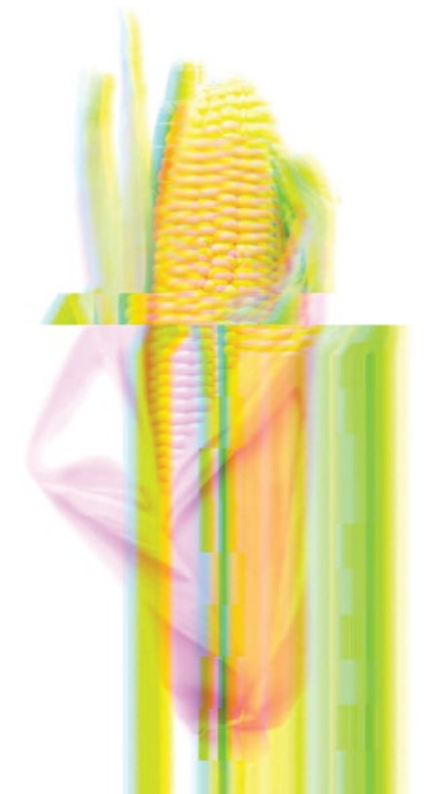
The result, in these countries, is a poverty of vision as well as of means. Jofre Guaman says that the techniques he used to create his farm are not widely taught in Ecuador, despite

their effectiveness. “What I hear from the engineers who are my teachers is that this is impossible to learn about here in Ecuador,” he says. “Only Heifer teaches it.” He intends to use his farm as a demonstration tool, to teach agroecology and organic farming to this community, as he sees how great the need is. “Many people do not appreciate what I am doing here,” he says.

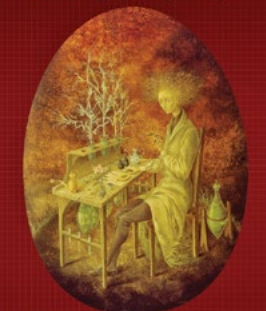
Viewed in this light, the struggles of small farms look less like a result of poverty than a symptom of neglect, an indication that countries aren’t investing in a potentially vast engine of growth — or in the people who could power it. Espinoza, 58, has long been a leader in his community (see sidebar), but he had few opportunities to learn after leaving school in the 4th grade to help his father in the fields. The biggest benefit of working with Heifer, he says, has been the knowledge that he can share with others. “I feel like I planted a tree and it is producing,” he says. “And it fills me with pride.”

Guaman, who did not have the grades to attend college, says that what he learned about farming from Heifer changed the course of his life. “To me, as a youth, it gave me knowledge that no university could give me,” he says. “I want to teach my people these ways.”

The work of a solitary farmer who, given the methods, grew a farm on barren land, is perhaps the best argument for innovation’s potential to strengthen both an industry and its people. “There was nothing here before,” says Guaman, waving a hand at his plants. “And now I am transforming it.” ■



### Harvesting Prosperity



Technology and Productivity Growth in Agriculture  
Keith Fugles, Mathur Gauram, Aparajita Gopal, and William F. Maloney  
WORLD BANK GROUP

For more about how innovation and technology can improve agriculture and economies, I recommend *Harvesting Prosperity: Technology and Productivity Growth in Agriculture*, published by the World Bank in 2019. It is available as a free PDF at [openknowledge.worldbank.org](https://openknowledge.worldbank.org).



# RESILIENT FARMERS WEATHER THE PANDEMIC, BUT UNPRECEDENTED CHALLENGES AWAIT

**WITH A BIT OF HELP, SMALL-SCALE FARMERS CAN PROTECT THEIR LIVELIHOODS AND FEED US THROUGH THE CRISIS**

**THERE WAS NO WAY FOR SMALL-SCALE FARMERS** and fishermen in Ecuador to anticipate the COVID-19 pandemic more than a year ago when they started diversifying the products they grew and mapping efficient paths to get them to hungry urban markets. But when the coronavirus hit this South American nation hard, these farmers found themselves well-prepared to keep homebound customers fed. Working with Heifer International, they created a whole new system on the fly, putting out catalogs of their offerings, adopting stringent sanitation practices on farms and in production facilities, and partnering with an app developer so urban customers could use smartphones to easily order fresh produce directly from rural farms.

"We are quite busy, working around the clock, preparing baskets filled with produce that will be delivered to people's

homes, and it's a hard task. We help farmers sell their produce, and we help supply the city with produce," said Nelson Pamar, the president of Pamar Chacrin, one of the farmer groups working with Heifer International as part of the *Future of Food* project.

Their business model looked quite different a few months ago when member farmers sold their produce in open-air marketplaces and fairs. "When the health emergency was announced, we no longer had anywhere to sell our food, and we were worried, but we didn't just cross our arms – immediately, we organized to deliver baskets containing grains and beans, vegetables, quinoa, and bok choy at our customers' homes," Pamar explained.

When urban transportation systems came to a standstill, farmers took to delivering food by bicycle. They also developed new and improved guidelines

on safe food handling during the pandemic and saw their new guidebook adopted by local governments throughout Ecuador.

This is the first time many customers are giving more than a second thought to the people who grow their food, said Rosa Rodriguez, country director for Heifer Ecuador. "This crisis showed us that food producers are first responders, just like doctors and nurses, because they guarantee people's health by delivering nutritious and safe food," she said.

"This crisis has meant that now small farmers and organic produce are valued," said Margarita Haro of the El Marco Agricultural Cooperative that's supplying fresh food to Conocoto and Sangolquí, some of Ecuador's fast-growing urban areas. "When we deliver our products, people tell us we are just as important as doctors who are working nonstop in hospitals

**"This crisis showed us that food producers are first responders, just like doctors and nurses, because they guarantee people's health by delivering nutritious and safe food."**

**– Rosa Rodriguez, country director for Heifer Ecuador**

while we deliver their food."

Helping small-scale farmers and business owners weather the unexpected is part of Heifer projects the world over, and we've seen their resilience on display over the years in the wake of earthquakes, typhoons and other natural disasters. The COVID-19 outbreak is again putting farmers' resilience to the test, forcing them to find creative ways to protect their livelihoods and the health of their communities. Project participants in Nepal proved up to the challenge in recent months, when men and women trained to provide vaccines and other basic care to animals kept working to keep livestock healthy while state-run and private veterinary clinics were closed. In Bangladesh, rural Heifer farmers worked collectively to sell bumper crops of fruits and vegetables to a wholesaler whose urban clients otherwise couldn't find fresh food.

In Honduras, Heifer-partnered coffee farmers and beekeepers are sharing food and supplies with 2,000 neighboring families in need. The care packages include disinfectants, hand sanitizers, rice, corn flour, sugar, oats, pasta, shortening, tomato paste and, of course, coffee and bottles of honey.

While we celebrate successes like these, Heifer International and other hunger relief organizations are scrambling to help the millions of people who haven't been as lucky.

And the suffering brought on by COVID-19 is expected to worsen, with food supply chain breakdowns and paralyzed economies compounding the misery. The number of people suffering from acute hunger is expected to nearly double by the end of 2020, going from 135 million to 265 million.

Hunger and poverty result from our global pandemic, but

**LEFT**

In Nepal, the Prativa Social Women Entrepreneur Cooperative acted quickly to keep their dairy operation going in the pandemic. The women secured special permits to deliver fodder and collect milk daily despite a nationwide lockdown.



PHOTO BY RABIN NIRPAULA, HEIFER NEPAL

they're also part of the cause. Close quarters and lack of access to good healthcare, sanitation and healthy food are a recipe for spreading disease. Reducing poverty worldwide could do much to reduce the spread of pandemics.

Watching the resilience of Heifer farmers and project participants pay off in the face of COVID-19 underscores the urgency of lending a hand up to more small-scale farmers and business owners the world over. Pandemics aren't going away — in fact, they are getting more frequent. COVID-19 is another in a series of dangerous infectious diseases that have spread far and wide in recent memory: Ebola, Zika, H1N1, SARS to name a few. The world's escalating interconnectedness through technology, ease of travel and increasing wealth means that infections can spread farther and more rapidly than ever. Plus, most countries in the world are woefully unprepared to deal with these events, as we are all seeing play out in our own lives today.

Recovery from this pandemic demands myriad fixes on multiple fronts. The good news is that we all have a straightforward role to play. Working together for the common good protects rich and poor, urban and rural, young and old. Our mission at Heifer International is to help small-scale farmers and food producers the world over build stability and scale up their production and distribution so that together, we can get through today's challenges and the challenges ahead. ■





# Transforming Heifer Ranch Into the Garden of Eden

By Annie Bergman Giattina, *World Ark* publisher

## WHENEVER SHE CAN, DONNA KILPATRICK RISES

before the sun and makes her way to the low-lying cattle pastures along the Fourche La Fave River at Heifer Ranch. It has become one of her favorite ways to start a day.

"I love to go down into the bottoms [to] check on the cattle and the land and watch the sun rise," Kilpatrick said. After 25

years of farming in places from Massachusetts to Ecuador, Kilpatrick knows a thing or two about the connections between a farmer and livestock, and livestock and the land.

Kilpatrick is putting that expertise to work as the manager and land steward of Heifer Ranch, a 1,200-acre working farm in Perryville, just 40 miles to

the west of Arkansas' state capital in Little Rock.

Once a place for visitors to learn about and experience a version of our global work, the Ranch keeps education at the core as Kilpatrick creates a living classroom for farmers learning about the symbiotic relationship between livestock and land. The work has put the Ranch at the heart of Heifer's programming



PHOTOS COURTESY OF HEIFER RANCH

**TOP LEFT**  
Donna Kilpatrick is the farm manager and ranch steward at Heifer Ranch.

**BOTTOM LEFT**  
An aerial view of Heifer Ranch, a 1,200-acre working farm located in Perryville, Arkansas.

**TOP RIGHT**  
One of Kilpatrick's favorite parts of the day is checking on the South Poll cattle near the Fourche La Fave River at the Ranch.



**"One of my biggest goals for the Ranch is that we become a diverse, robust, vibrant destination — a living, breathing, learning lab."** – Donna Kilpatrick, manager and ranch steward at Heifer Ranch

in the United States.

"One of my biggest goals for the Ranch is that we become a diverse, robust, vibrant destination — a living, breathing, learning lab," Kilpatrick said.

It's a big task, but one that is clearly already working.

**A Deeply Rooted History**  
Heifer's work in the United

States began just one year after inception. While groups of farmers dubbed the Seagoing Cowboys began escorting livestock overseas to a war-ravaged Europe, Heifer was also working more locally.

Heifer made two small shipments to Arkansas in 1945, according to historian Peggy Reiff Miller. That was followed by one shipment to the

Hampton Institute in Virginia in 1947, two to Kentucky in 1953 and 1954, and one to Ohio in 1955. One of the first full-fledged projects was a partnership with the Prentiss Institute, an African-American junior college and vocational school in Mississippi.

The work in the United States has shifted depending on need and circumstance. During





the 1990s, Heifer stepped in to help Navajo sheep farmers improve their commercial wool quality and diversify their herds. In the 2000s, we were in cities from Bend, Oregon, to Chicago, Illinois, developing urban gardens for immigrant communities and inner-city youth.

In 2014, Heifer began a transition of the work in the United States to align more closely to the work globally — with a focus on small-scale farmers. Grass Roots Farmers' Cooperative supports, trains and provides markets for small-scale farmers, many of whom are living in marginalized communities. The cooperative connects these farmers'

products to a national direct-to-consumer market.

In total, Heifer has had a presence in more than 30 states over the last 75 years. No matter the focus, the work in the United States has been about building community, increasing access to healthy foods and strengthening economic security. That holds true today.

While Heifer Ranch has only been part of U.S. programming for three years, its history is also rich and varied. The land was purchased in 1971 following a gift of 2,000 Angus cattle. At that time, the land was used as a holding and quarantine center for animals to be distributed around the world.

Though its purpose has morphed multiple times — serving as a breeding center then shifting to a learning center after we began sourcing animals locally to be better suited to particular climates and environments — the Ranch has always been integral to educating others on the work we do.

Today, Heifer Ranch is the main training ground for Heifer USA, where current and beginning small-scale farmers learn regenerative agriculture, a method Kilpatrick knows can heal the land while simultaneously providing a living wage. The Ranch is also integral to the cooperative's work, as it is a

supplier of pasture-raised cows, sheep, poultry and pigs.

"Our work of healing this land and training other farmers to do the same is just beginning," she said.

### Farming Innovation

Regenerative agriculture is a type of farming that heals degraded soils, improves ecosystem function and builds biodiversity. And it's just one component of Kilpatrick's

overall approach to holistic farming at the Ranch.

"Holistic management considers the entire ecosystem with an emphasis on water infiltration and retention, increased soil health and organic matter, increased wildlife habitat, and an increase in land productivity. The Ranch practices all these methods and is integrating more as we learn," she said.

Kilpatrick first learned how

to farm as an undergraduate at Warren Wilson College in Asheville, North Carolina.

"I worked on the farm crew for my work assignment and fell head over heels in love with farming," Kilpatrick said. "I spent any and every free moment that I had there, including fall, spring and summer breaks. I was the first female to be trained to operate the big tractors. I worked with the pigs and beef and did extensive field

**LEFT**  
Heifer Ranch raises cattle, chickens, turkeys, pigs and sheep on 1,200 acres in Perryville, Arkansas.

**RIGHT**  
Kilpatrick began farming while at Warren Wilson College in Asheville, North Carolina.







work while I was there.”

All these years later, she’s continuing that love of learning and training to become a Savory Institute Accredited Professional, or a trainer and implementer of holistic management practices. She and the other farmers at the Ranch are simultaneously turning Heifer Ranch into a Savory Hub, a site that offers

regional training, events, special projects, consulting and research, she said.

Savory is a global network of farms working to address issues like desertification of grasslands and climate change. Heifer Ranch will be an accredited hub by 2023.

With the Ranch already practicing holistic methods and conducting farmer training last

year, 700 current and aspiring farmers attended more than two dozen workshops and special events on topics including winter crop production, pastured poultry and forage management — it seemed like the natural next step.

“By becoming a hub, we become part of a network and community of innovative farms and ranches working through regenerative agriculture to reverse climate change,” Kilpatrick said. “The most important thing for me is that it’s a way to build relationships with some of the thought leaders within regenerative agriculture and have access to a distinguished network of peers and mentors.”

But becoming part of the Savory network isn’t the only innovative work happening at Heifer Ranch, Kilpatrick said. Kilpatrick and fellow farmers Christine Hernandez and Sean Pessarar use both high- and low-tech tools in their work, from soil testing



#### TOP LEFT

The Ranch offers classes and training to new and aspiring farmers on topics from pastured pork to regenerative agriculture methods.

#### BOTTOM

The pigs and chickens get to enjoy plenty of time on grass and in the sunshine at the Ranch.



for improved crop and forage production to drone technology to analyze pastures.

As for keeping tabs on the animals, there’s an app for that. Kilpatrick uses Herdly to keep records and track information on her herd of 35 South Poll cattle. Pessarar is designing several implements for two-wheel tractors to expedite harvesting and cultivation and is also developing seed-starting tools.

Blockchain technology is also part of the Ranch. The technology allows consumers to track their meat from farm to plate, and it’s just one of the ways Grass Roots is responding to consumer demands for transparency in the food system, Kilpatrick said.

While the Ranch has transformed its operations in just three years, Kilpatrick hopes this is just the

beginning of bigger and better things to come.

“What I see in five years is a Garden of Eden in terms of what we’re doing here. I want to go out with a spade and kick over the soil and it be just like chocolate cake. We will train hundreds or thousands more farmers with our new credentials. Healthy livestock, tons of birds in the air, clean water, healthy people ... just abundance, actually.” ■

#### TOP RIGHT

The Ranch also has a 3-acre organic garden.





# Fortune Favors the Innovators in Ecuador

By Molly Mitchell, *World Ark* writer



PHOTOS BY JOE TOBIASON

**DAMARIS ROBLES** picks an orange from just above her head, chops it in half and squeezes. A startling volume of orange juice cascades from the fruit in her hand. She pulls the same trick with a vibrant red cacao pod, and everyone gathered around her takes turns breathing in the heavenly aroma wafting up from the white fruit inside.

Robles, a Heifer project participant in Ecuador, credits her orchard's abundance and quality to her dedication to innovation and a mindset of continual learning. Through a process of constant experimentation, Robles formulated her own arsenal of organic insecticides, pesticides and fertilizers that enable her to run her cacao orchard 100 percent organically, severing her dependence on traditional chemical products. One of her personal inventions, an all-natural fertilizer she refers to as BIOL (shorthand for biological fertilizer, as opposed to chemical), won an innovation contest held by Heifer Ecuador in honor of their 25th anniversary. The contest focused on small-scale farmer technology, and about 70 Heifer farmers participated.



**LEFT**  
Damaris Robles, 32, in her cacao orchard in Sucumbio Province, Ecuador.

**TOP RIGHT**  
Heifer employee Alejandra Lozada breathes in the smell of an open cacao pod.

**BOTTOM RIGHT**  
Damaris Robles, demonstrating how she makes her natural fertilizer.

Robles received \$600 for her win and used the money to purchase a motorized scythe to make tending her cacao orchard more efficient.

**"This farm's [chocolate] is sought out. People love it, because – smell that baby, it smells great."**

– Damaris Robles, cacao farmer

Robles has been running an organic operation for two years now, and she feels that the switch is good for her product and profits as well as beneficial to the environment and public health. First of all, it saves money. "We're saving what we would be spending on chemicals. Chemicals are not cheap, and they harm people's health as well," Robles said. Even more importantly, the cacao is better than ever. "When we were using chemicals, we got small pods,"

Robles said. "When we use organic, we get big pods, and the color is different." Not only do her cacao trees produce bigger pods, the cacao itself is top-notch.

She uses her fertilizer on the other types of trees in the orchard as well, and it is to the organic fertilizer that she attributes her oranges' super-juiciness and her grapefruits' unusual sweetness. Keeping a diverse orchard is one of Robles' secrets to growing her flavorful, aromatic cacao. "We also have orange, grapefruit, and that gives the cacao flavor," she said. "If we cut down everything else, the cacao will have an uninteresting flavor." The presence of the other fruit trees in the cacao orchard influences the flavor of the cacao that grows there, and therefore the chocolate that will eventually come of it. "This farm's [chocolate] is sought out. People love it, because – smell that baby, it smells great. That's why

it's so prized," she said.

Her prize-winning fertilizer isn't the only trick up Robles' sleeve. She increased the volume of her harvest with another organic alternative. It is necessary to spray an herbicide around the bottoms of the trees to prevent other plants from choking the cacao plants, but when she used a traditional chemical herbicide, the pods at the bottom of the plant would die, too. Now that she uses her own organic formula, she is able to harvest an additional pound of cacao per tree. Multiplied by the hundreds of trees in her orchard, that's a significant uptick in production and income.







**TOP**  
Damariz Robles shows her organic insect traps.

"Chop and drop" is another way Robles fertilizes her orchard. When pruning cacao trees, either for better growth or culling pods that are sick with disease or fungus, rather than taking the organic "waste" material away, she simply leaves it on the ground where it falls — she chops it, and then lets it drop. The leaves, branches and pods break down and serve the same purpose as mulch — and it's free, organic and efficient.

Pests are always a problem for farms, and dealing with them without industrial chemical solutions is a huge challenge. Robles has a trick

for that, too. She created an organic bug trap. Insects are drawn inside a container filled with "pineapple rind, brown sugar and some little secrets I don't just tell everybody," Robles laughs. The insects can get in, but they can't get out.

"I seduce the moths," she said with a grin. "They fall in love, they come in, [and] it's fermented so they get drunk and fall into the water."

Robles works extraordinarily hard to make her organic orchard work. "I get up at 4 o'clock in the morning to make breakfast. I am the wife, the companion, the

workmate. I am all those things. I have meetings ... the triple workday of women. We get up at 4 o'clock in the morning, and we keep going. We have to do like that to live in the countryside," she said.

**"There's always something new to learn. Always."**

— Damaris Robles, cacao farmer

Robles is experimenting with new recipes all the time, and she uses material only from her farm. "We've done insecticide with garlic, with hot pepper. We tried step by step. We saw that we could make [it with] garlic and hot pepper. Then, we looked for barbasco — that they throw into the river to kill the fish — and then we looked for nettle because it's also a good insecticide. So we innovate, we try something new, and we see what gives us the best results. And then we teach other people who can also keep the cacao organically. Because, what's the point if we have money, but then death will follow us if no one else is pulling up their socks."

Robles' passion and curiosity is carrying her far, and she is teaching and learning new things all the time as part of Heifer's women farmers' co-op in her area. "You never finish learning," she said. "There's always something new to learn. Always. While you're alive, you can't say, 'I know all about that.' You say, 'Can I listen and learn something new?'" ■

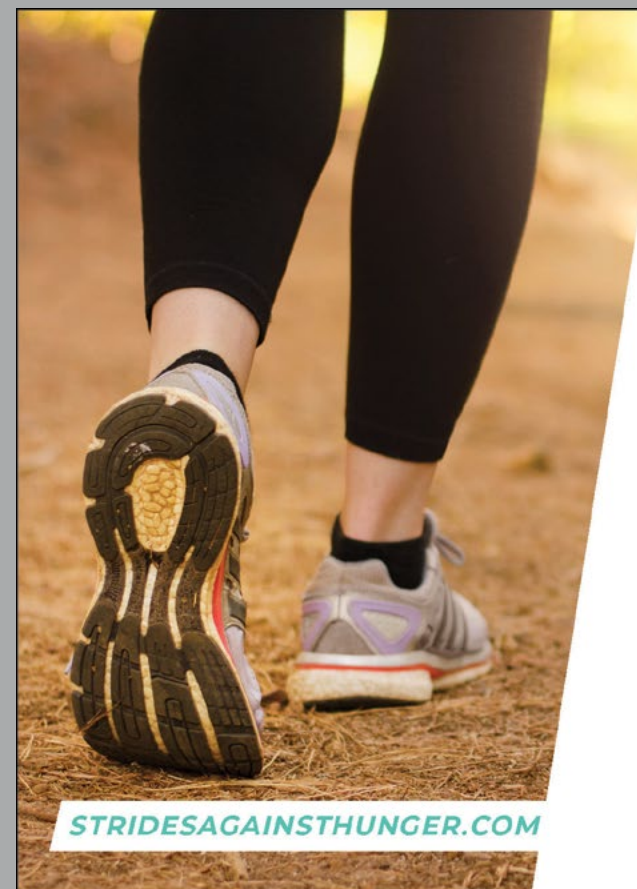


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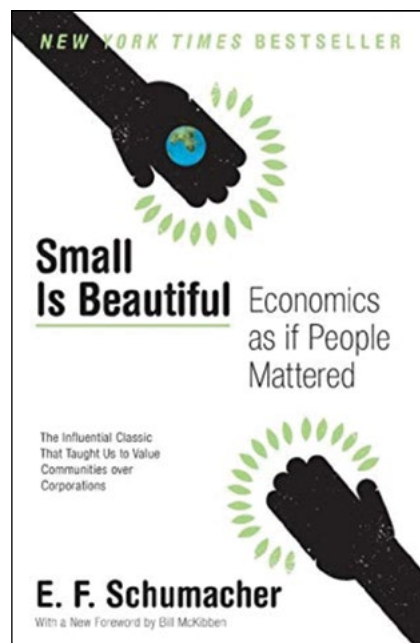






# Small is Still Beautiful: The Enduring Legacy of E.F. Schumacher

By Oscar Castañeda, senior vice president for the Americas Program



**Small is Beautiful: Economics as if People Mattered**  
By E.F. Schumacher  
Harper Perennial,  
Paperback \$16.99  
348 pages

In his time, people often called economist and writer E.F. Schumacher a crank. According to those who knew him, he actually adored the intended slight, saying “a crank is a piece of simple technology that creates revolutions.”

Schumacher’s 1973 book, *Small is Beautiful*, led to its own understated revolution, and paved the way for how many of us think about both environmentalism and development work today. Four years after the book’s publication, Schumacher, once a refugee from Nazi Germany, passed away after falling ill on a train to Zurich. In his obituary, The New York Times noted *Small is Beautiful* “became a world best seller and was translated into 15 languages.” A couple of decades later, The Times Literary Supplement named the book one of the 100 most influential since World War II.

In 348 pages, the book’s essays tackle topics ranging from the unsustainability of the modern economy to the perils of nuclear waste to

the importance of informal education. One of the most lasting lessons of *Small is Beautiful* is the idea that highly technological Western solutions to problems aren’t always the most practical or effective because they don’t account for people and their situations.

In fact, the full title of the book is *Small is Beautiful: Economics as if People Mattered*. Early on in my career as an agronomist in Guatemala, the book fell into my lap and changed the way I thought about development work. Fresh out of college, I was ready to implement the newest, most advanced technologies to make rural spaces more productive and turn places of poverty into places of wealth. But, as Schumacher wrote, “An ounce of practice is generally worth more than a ton of theory.” His book told me that top-of-the-line, high-tech solutions didn’t generally respond to the needs and realities of the poor communities where I was working. It turned out the most important tool for soil

PHOTO BY DAVE ANDERSON



**RIGHT**  
Oscar Castañeda (right) in conversation with a project participant in Ecuador.

and water conservation for the communities I worked with was the A-frame, a slope-measuring tool easily constructed from a few wooden poles.

“Any intelligent fool can make things bigger, more complex, and more violent,” Schumacher wrote. “It takes a touch of genius — and a lot of courage — to move in the opposite direction.” *Small is Beautiful* illustrates the importance of the simplest, most elegant solutions and popularized the idea of intermediate technology, something usually referred to now as appropriate technology.

Depending on how you pronounce the word, appropriate means both “suitable or proper in the circumstances” and “to take something for one’s own use,” and both of these meanings are essential to the ideology of appropriate technology. High-tech solutions are impressive, but they don’t always meet

**“ANY INTELLIGENT FOOL CAN MAKE THINGS BIGGER, MORE COMPLEX, AND MORE VIOLENT,” SCHUMACHER WROTE. “IT TAKES A TOUCH OF GENIUS — AND A LOT OF COURAGE — TO MOVE IN THE OPPOSITE DIRECTION.”**

the needs of farmers, and they’re not always realistic in terms of cost or upkeep. In poor, rural areas, it doesn’t make sense to use technology that needs to connect to an electrical grid to operate or that needs significant upkeep and maintenance.

When the two definitions of “appropriate” merge in relation to technology — when people take technology that suits their situation then make it their own — that’s fundamental to the work we do at Heifer International. The tools we use in our projects have the DNA of Schumacher’s ideas, from solar panels to

biogas to soil conservation. When our field technicians provide training or our farmers share with each other the ideas and techniques that have made them successful, those reflect the ethos of *Small is Beautiful*. At Heifer, we — like Schumacher — believe the best solutions are those that make the biggest difference, not necessarily those that are the most expensive.

Though published nearly five decades ago, the legacy of *Small is Beautiful* is as relevant today as it ever was. Partially because of its influence, development organizations adopted a different understanding of technology while recognizing the agency and knowledge that already exists in communities. Those organizations and others that put people first continue to follow Schumacher’s dreams to orient “science and technology toward the organic, the gentle, the elegant and beautiful.” ■





**IN PASTORALIST FULANI CULTURE**, women move the households and men move the animals. Diary Sow travels with her two children and members of her extended family in a caravan of six carts, all pulled by donkeys. Their husbands and older sons follow behind with roughly 400 sheep and goats. The family stays on the move in search of water and fresh grazing land, sleeping on mats on the ground and fashioning meals from the sacks of rice and beans that ride on one of their carts. There's little time for rest.

**"This type of life is very difficult," Diary Sow said. Would she ever try something different? "If we knew how, we would do it."**



PHOTOS BY LACEY WEST

**LEFT**  
Diary Sow and her baby.

**TOP RIGHT**  
Donkeys are the main form of transportation in rural Senegal.

**MIDDLE RIGHT**  
Mairam Ba brings a donkey cart to collect well water.

**BOTTOM RIGHT**  
Diouma Sow rests in an old tire repurposed as a baby chair. She and her family spend most of the year on the move, searching for water and grazing fields for their sheep and goats.

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