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# The constant gardeners

Confronting climate change and poverty, a new crop of city farmers comes of age in Africa.

By OnEarth magazine

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GREEN SLUM: Mohamed Abdullahi inspects corn at an organic farm in Nairobi's Kibera slum. The farm is a project of Kibera Youth Reform Group, which converted an old garbage dump into an organic oasis that now feeds 30 families. (Photo: ZUMA Press)

Our driver isn't at all happy about this. We are headed to Kibera, the notorious slum in the Kenyan capital of Nairobi, and Mary Njenga, our guide for the visit, has just suggested that maybe it would be a good idea for the men to stay behind in the car. People in Kibera can be pretty desperate, and you never know when one of them might pull a knife or a gun on you. "If it's just the women," Njenga says, "they'll know we've come to see the farmers."

We pull into an open area on the outskirts of the shantytown and, while stripping ourselves of watches and cell phones, make a plan to reconvene here in a couple of hours. (Antonio, the photographer, isn't about to hang back, but Peter, our driver, is visibly frantic about getting himself and his treasured Toyota out of here as fast as he can.) Njenga leads us down the wide dirt road that serves as the main drag of the "informal settlement," as these places are euphemistically known, and onto a narrow path that snakes among shacks fashioned out of mud, tin, and scraps of wood and cardboard. Children poke their heads out of makeshift doorways to call "How are you?" or "Mzungu!" (Swahili for white person), as we step gingerly over shallow gullies of sewage and under drying laundry and low-hanging electric wires. The place reeks of human feces.



Njenga knows this territory well. An environmental scientist and outspoken advocate for women (and with her shaved head and vow never to marry, the most outspoken Kenyan woman I've met), the 40-year-old has been coming here regularly for the past decade, helping the locals figure out sustainable strategies for feeding themselves and their families. Estimates vary as to how many people live in Kibera — some say half a million; others, a fraction of that — but either way, at just under one square mile, the slum is among the most densely populated places on earth. And the people here are

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hungry. In a recent study of Kibera's residents, more than 95 percent of those surveyed reported worrying at some point in the past 12 months that they would run out of food before finding money to buy more. (Nearly 20 percent said they'd gone a whole day and night without eating.) Unlike those who live in the country and have land for farming, city dwellers generally have to pay for their food, sometimes spending as much as 80 percent of their incomes to do so.

But as Njenga is happy to show me, they're finding new ways to cope. We meet up with Catherine Wangui, a friendly 25-year-old sporting a newsboy cap, who tells us how, about four years ago, representatives of the French nongovernmental organization [Solidarités Internationales](#), which does emergency relief and reconstruction work around the world, came here and distributed old flour sacks to some of the women. They explained how to fill them with soil and rocks before poking holes in the sides and pushing in seeds. Wangui, who grew up in Kibera, stops in front of three of these "vertical gardens" — four-foot-tall sacks plumped out with dirt and sprouting gangly tendrils of kale and spinach. Her 5-year-old daughter, Grace, who is playing nearby in a neat dress and braids, now gets fresh vegetables every day, says Wangui, who sells some of what she grows at a little wooden kiosk that she runs. Njenga also introduces us to people who, in spaces barely the size of closets, are raising chickens and profiting from them. Not that everyone is suddenly thriving; one young woman tells us how her garden sacks have enabled her to buy sugar and cooking oil, but hits me up nonetheless for some spare shillings — to the serious chagrin of Njenga.

Three years ago, for the first time in human history, the number of people living in cities worldwide [outnumbered those living in rural areas](#), and the United Nations projects that by 2050, up to 65 percent of the global population will be urbanized. The rate of urban migration is particularly high in sub-Saharan [Africa](#), where 15 million people abandon the countryside every year to move to the cities. Climate change will exacerbate the trend, as [extreme events](#) — like the [drought currently devastating the Horn of Africa](#) — become more frequent and more intense. Climate models predict that in the years to come, sub-Saharan Africa's arid and semiarid areas will increase by up to 350,000 square miles, an area equal to the size of the country of Nigeria. Longer, hotter dry periods and unpredictable rainfall already are making it harder for farmers to know when to sow and harvest their crops, and in this part of the world, where high-tech irrigation is all but unheard of, the challenge is especially acute. Less arable land — and fewer farmers — also means less food: the Intergovernmental Panel on Climate Change has estimated that yields from rain-fed agriculture here could be cut in half by 2020, and the Washington-based [International Food Policy Research Institute](#) predicts that, as a result of climate change, output of staple crops like cassava and wheat could plunge by as much as 22 percent by 2050.

Hungry people and crowded cities, of course, make a combustible mix. Think of Paris in 1789, or St. Petersburg in 1917. As recently as 2008, the skyrocketing cost of staple foods, fueled in part by speculation in agricultural commodities markets, led to riots in no fewer than 36 countries, 21 of them in Africa.

The good news is that urban gardens like Wangui's are making a difference. And, as I realized when I rounded a corner and crashed into 34 of the things, scrunched in tight between a concrete wall and a row of connected shanties, this isn't just some boutique trend. In Kibera — which the Kenyan government designated a "temporary residence" for Nubian (Sudanese) soldiers after World War I and which since has drawn hundreds of thousands of squatters from other ethnic groups — some 5,000 households currently are growing vertical gardens. (The average farming household maintains five or six of the sacks.)

And in cities across the developing world similar efforts are under way, with the poor making use of everything from used grain sacks to old tires for planting and cultivating micro-farms. The [United Nations Development Program](#) recently reported that an astonishing 800 million people worldwide are now engaged in urban agriculture, producing from 15 percent to 20 percent of the world's food. (Many of those people are in Asia, which has a long tradition of urban farming.) Under power lines, alongside highways, down the banks of rivers — wherever there's unclaimed dirt to be found — landless city dwellers are grabbing shovels and digging in. In sub-Saharan Africa alone, participation in urban farming has increased from 20 percent of the population two decades ago to nearly 70 percent today. By the year 2020, some 40 million Africans will be depending exclusively on food grown in cities.

Africa's cities haven't always welcomed farmers. A few days before meeting up with Njenga, Antonio and I spent an afternoon with a 56-year-old named Francis Wachira, who told us that a decade ago, when he said he wanted to grow food in the city, people looked at him as if he were crazy. Having moved to Nairobi to find work while in his twenties, Wachira spent 20 miserable years picking up the odd construction job and

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reselling fruit that he would buy from the central market. Finally, in 2002, though he owned no land of his own, he found an empty patch of dirt and started to plant. "Why are you farming in Nairobi?" the neighbors mocked. "Go back to the rural area."

There was prejudice at work here — people who take up farming in the city must be poor and uneducated, the thinking went — but there was also a perception that food produced in the polluted environment of a city was inherently unhealthy. (Given the water used for most urban crops, that perception wasn't entirely unfounded.) And because people like Wachira were farming on public land, without any permitting involved, it galled the authorities to no end.

Wachira ignored the mockery, and today the lanky father of three actually giggled as he led us through the neat rows of kale, eggplant, spinach, and other vegetables bursting from the 6,000-square-foot plot of land in the scruffy Makadara district, across town from Kibera. "I used to grow maize," he said, "but the city council said it was a security concern." The corn grows so high, apparently, that it makes an irresistible hiding spot for the city's legions of thieves. "You have everything here," Wachira continued as we surveyed the land adjacent to his two-room home. "You don't have to go to a kiosk." He stooped to pick some napier grass and lettuce. "For my goat," he smiled.

Motioning to a handful of young men washing a car several yards away, Wachira, who has the professional athlete's tic of referring to himself in the third person, led us to another patch of green. A few months earlier, he said, as the youths approached and greeted us politely one by one, he'd given them some manure and seeds and spent several afternoons teaching them to plant. Now they were out here every day, bent over their kale and sweet potatoes and snaking along a hose hooked up to the nearby public tap. "Before they started this," he said, "whenever you passed by, they were just asking for coins." Oscar Njoroge, the 32-year-old secretary of the group they've dubbed the All For One Youth Organization, didn't deny that the young men had been at loose ends. In the past few years, he said, 18 youths from the immediate area had died from drugs, AIDS, or tuberculosis. "Farming has really changed our lives," agreed Erastus Maina, a 23-year-old All-For-One in a yellow baseball cap. "Trust has come between us. And we are being respected."

Over in Kibera, I hear similar sentiments — about how the gardens have engendered a sense of trust among the women growing them, how they now carry soil and water for one another, and pool their money for things like pesticides. There's also talk about how people are healthier, in part because they eat more vegetables, but also because they've begun to grow a wider variety of them, including traditional ones like amaranth, spider plant, and African nightshade. Over the past several decades, such plants had fallen out of favor, especially in urban areas, replaced by the easier-to-grow and cheaper kale and cabbage. (The indigenous vegetables also were associated with poor, rural people and so were looked down upon by urban consumers.) Now, thanks to campaigns sponsored by Kenya's Ministry of Agriculture touting the nutritional benefits and drought resistance of these old vegetables, they are enjoying a renaissance throughout the country. Njenga has been working with women in Kibera to produce and sell seeds for the traditional greens, which more and more Kenyans are adopting in an effort to shield themselves from the effects of changing weather patterns.

These days Wachira attracts a small crowd to Makadara every Tuesday and Saturday, when men and women from around Nairobi pay 300 shillings apiece (about \$3) to sit on the skinny wood benches in his "training area," jotting down pointers for growing their own food. "You can see they are doing what Wachira is doing," he said later, pointing out patches of green amid the billboards and tumbledown shacks in the distance.

Back when he started in 2002, Wachira told us as we walked toward a tin-roofed structure by his house, he'd purchased a pair of rabbits. First the neighbors fell over themselves laughing — "Those animals are for country kids!" — then they got annoyed. "People were complaining all over," he recalled. They cursed the smell and accused him of engaging in witchcraft. He sold the bunnies, but a year later decided to give it another shot, learning to build better cages and to dry out their food to cut down on the urine. In 2006 he took an entrepreneurship course sponsored by his church. "Then my head opened. I decided Wachira is not supposed to have a shop," he said of the fruit stand he'd continued to maintain. "I am a farmer."

Today he keeps some 500 New Zealand whites, long-haired Angoras, and various other breeds of rabbit in this string of hutches piled three stories high. "There is one that can attack you," he said, opening the mesh doors to reveal endless bundles of fur, "but I know which one." The family enjoys rabbit for dinner once a week, he shouted over the traffic racing by just beyond the fence, and every three days he collects the manure, which he covers with dried grasses to make fertilizer for his vegetables. "The minister of agriculture knows what I'm doing here," Wachira said, reminding me that we were

standing on public land. "As much as they would like to demolish this and take the rabbits, it's not that easy. It's very political."

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In the busy Westlands neighborhood of Nairobi, an affable yellow lab named Kofi greets me at the green iron gate that marks the home of Diana Lee-Smith, arguably *the* authority on the politics of urban farming in Africa. "The thinking has always been that when you go to town you're supposed to modernize," she tells me over chai and cumin-flecked crackers on her rubber tree-shaded patio. "You're not supposed to be doing farming." A soft-spoken but opinionated Brit with silvery hair and, at the moment, a sling steadying her left arm ("these things happen after you get to be 70"), Lee-Smith came to Nairobi to teach in 1969, Ph.D. in architecture and development studies in hand. Soon after arriving, she met and married Davinda Lamba, a Kenyan of Indian descent. Based on their mutual interests in urban planning, environmentalism, and human rights, the two founded the [Mazingira Institute](#) in 1978 (*mazingira* is Swahili for environment).

They began looking into urban poverty and the fundamental right to food and later that year published a report showing that roughly a third of Kenyans were producing some kind of crop or raising livestock in towns. "People were quite astonished," Lee-Smith says. "The report was ridiculed by many as absurd." Research in other East African countries produced similar results, but still the authorities were dismissive. (Denial seems to be a theme: until recently, the official land-use map of the Nairobi City Council showed Kibera, home to as many as one-sixth of the city's residents, as a forest.) When they did finally acknowledge that urban farming was going on, municipal governments in Africa continued to discourage, if not downright prohibit, the practice. As the authors of a 2003 study in Cameroon put it, "urban agriculture has been playing hide-and-seek with urban management for a century."

In fact, city farming has a much longer history, says Lee-Smith, who, before her retirement in 2005, also spearheaded an organization called Urban Harvest, based at Mazingira. "It's been ironed out of urban thinking and planning" since the industrialization of Europe in the 19th century, she says, "when there was the idea that to be efficient you had to get hordes of workers in to run the machines while the rest stayed out in the rural areas and did the menial job of creating food." In a place like sub-Saharan Africa, though, where the lack of refrigeration and bad roads, among a host of other problems, means that more than a quarter of the food produced here — some 100 million tons annually — rots before it can be eaten, it makes obvious sense to grow things as close as possible to the people who are going to eat them.

And in an era of climate change, when already degraded soils are increasingly under siege — just as naturally occurring sources of such nutrients as rock phosphate are being depleted — it also makes sense to do something with the organic output. "Waste is a nutrient gold mine in urban areas," Lee-Smith says, "both domestic waste and human waste, and, as a minor theme, livestock waste." While Nairobi generates some 2,200 tons of solid waste a day, the cash-strapped municipality only collects 40 percent of it. In the past few years, with the help of Mary Njenga, who worked under Lee-Smith at Urban Harvest, local women's and youth groups have begun to band together to gather the trash on their own, transporting it to central areas for processing into compost. They earn a small fee from households who pay to have it taken away, and they sell the nutrient-rich by-product to local farmers, landscapers, and seedling nurseries. Lee-Smith tells the story of one Mazingira-trained farmer who grew up in the slum and now runs a [recycling](#) business, transporting compost to the countryside and educating elders there about using it for food production. "He's actually become quite well-off," she says with pride.

When it comes to irrigating their crops, most of these farmers don't have a choice. Not only are they working on public land, but their plots are generally in places where there are no functioning water or sewage systems. Residents of Kibera, for example, can buy clean water from one of the few municipal taps (each generally shared by about 100 households), but they pay as much as 10 times what those in legal neighborhoods do for the privilege. Not surprisingly, most resort to untreated wastewater for irrigation. Free and available year-round, it's also rich in plant nutrients, which means less money spent on fertilizer. There are likely heavy metals in it too, though — things like cadmium, chromium, and lead — not to mention pathogenic microorganisms like bacteria and viruses, as well as parasitic worms.

More than 10 percent of the global population regularly eats produce that has been irrigated with untreated wastewater, says Lee-Smith, adding that for centuries the practice was the norm. Back in 1868, Victor Hugo wrote that if it was returned to the land, the sewage of Paris "should suffice to nourish the world." Once pathogenic microbes were discovered in the 1880s, though, and people came to understand how

diseases were transmitted, developed nations clamped down with strict guidelines for wastewater use. Low-income countries adopted similar policies, despite the fact that they didn't have the resources to make them a reality. It wasn't until 2006, when the World Health Organization issued new *Guidelines for the Safe Use of Wastewater, Excreta and Greywater*, that the risks were evaluated alongside the health, social welfare, and environmental benefits of wastewater irrigation. The WHO guidelines were based largely on research carried out by the **International Water Management Institute (IWMI)**, headquartered in Accra, Ghana. Lee-Smith put me in touch with Philip Amoah, a young researcher there, and he offered to show me the city's wastewater farming in action.

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Navigating the Accra traffic is a trial — as in Nairobi, the infrastructure here lags frustratingly behind population growth — but eventually Amoah pulls up to a government-owned tract of land in the Dzorwulu neighborhood, where 100 or so farmers grow lettuce, cabbage, bell peppers, and scallions for the salads that have become a staple among street-food vendors in this seaside town. The green expanse is the size of two football fields. (If we shield our ears from the roar of the highway behind us and ignore the massive electrical plant on our left, we can almost imagine we're in the countryside.) We walk across a rickety bridge that spans a sewer choked with plastic bags and dirt-caked bottles and past a little open-air shed, where seven or eight men in long robes are praying on woven mats. Most of these farmers are Muslims from up north, Amoah explains, who left the countryside for better livelihoods in the city. "This phenomenon is intensified due to climate change," he says, "because now they are having more **floods** due to heavy rains within a short period of time. And they are having very long dry seasons. If the rainy season used to be five months, now it's three or four." In the past few years, so many families have abandoned the region just south of the Sahara known as the Sahel — they moved south to areas of greater rainfall in Ghana, Guinea, and Nigeria — that Nigerian police now turn people away at the border.

A recent survey found that only 13 percent of the 70 or so wastewater and fecal-sludge treatment plants in Ghana work as they were meant to, and that even if all functioned properly, less than 10 percent of the country's urban wastewater would be treated. To water their crops, these farmers use a combination of water from the Onyansa stream on our right, which catches graywater from the surrounding communities, and the even dirtier stuff from the sewer we've just crossed. In 1999, Amoah tells me, the municipal government in Accra banned the use of wastewater for farming, but most continued to use it anyway, occasionally at the cost of arrest. Given the numbers of people who continue to flock to Accra, though, and the fact that most aren't likely to find jobs there, the government eventually decided to compromise. A revision of the law, adapted with the help of IWMI and based on the recent WHO guidelines for cheap and practical ways to improve food safety despite the use of wastewater, is currently being evaluated by the city government.

In the meantime, farmers like Fuseini Bukari, a 45-year-old from northeast Ghana who looks like the pop star Seal, have begun implementing some of those low-tech measures on their own. They hold their watering cans closer to their crops, for example, and equip them with rosettes on the mouths to avoid splashing the often-contaminated dirt. When they get water from the pond they've dug to collect it, says Bukari, stepping onto a little wooden plank, they no longer walk into it so as not to stir up the disease-causing germs settled at the bottom. He lifts a plastic tarp off a two-foot-high mound. He's just learned how to safely compost poultry manure, and he's a few days into the six-week process. (Some 95 percent of Accra's 1,000 or so urban farmers rely on poultry droppings to fertilize their crops.) They store their vegetables in well-aerated baskets rather than in bags, he says, and some of them stop watering a few days before harvest so that any pathogens die off. "Now we are able to tell the public that even though we know there are risks," Bukari says, "we take measures. People from the rural areas come here to learn."

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The fog hangs low over the city on the morning we meet Mary Njenga at her office on the hilly campus of the University of Nairobi. In addition to teaching here, she is working on her Ph.D., focusing on charcoal production with an aim toward fighting climate change, protecting the forests, and — always paramount for her — bettering the lives of women. Growing up on a farm west of Nairobi, Njenga says, she began noticing how damage to the natural world rippled out into other problems. "I saw what was happening around us," she explains, recalling the trips she and her sisters would make into the forest to collect firewood. "Trees were being cut down. The river became scarcer, and there was a lot of conflict." Women had to walk farther to get wood, keeping them from more important pursuits, including earning money. Farming got

harder and harder, and locals abandoned the countryside for lives in the city. Njenga prevailed upon her father to send her away to school, where she woke up at 5:00 every morning to hit the books, and by the time she reached secondary school — the only one of 11 siblings to get that far — she had decided to focus on the environment.

City dwellers spend most of their money on food, but second to that is the fuel they need to cook it. In the process of feeding their families, says Njenga, whom an American colleague calls "one of the most driven women I've ever met," Kenyans go through two million tons of wood charcoal every year. Meeting that demand means the widespread destruction of the country's forests. Even more galling to Njenga is how much of the wood gets wasted. Nairobi goes through 770 tons of charcoal every day, but between its production and transport, fully one-tenth of that ends up as dust. Her plan is to recycle it, along with the 225 tons of sawdust wasted by Kenyan sawmills every year, into briquettes for cooking.

She walks us down a grassy hill to her open-air laboratory, where two male assistants are inventorying hundreds of three-inch-wide charcoal rings. Brown ones like giant bran-cereal O's are laid out on black tarps alongside black ones like miniature dumbbells. Njenga is testing the different combinations to determine which woods and binders emit the least carbon dioxide, as well as carbon monoxide and particulate matter, the culprits responsible for the indoor air pollution that plagues the developing world's cooks. She's also working with women in Kibera to make and sell briquettes that are three times cheaper than ordinary charcoal ones and yet burn nearly twice as long.

Among Njenga's numerous missions ("I want to be a renowned scientist," she declares) is to persuade policy makers to integrate not just farming and fuel policies but also waste management into urban development plans. An estimated 2.6 billion people in the developing world lack access to basic sanitation services, she explains; her Kibera women's groups also have begun selling small biodegradable bags designed to hold human waste (urea crystals inside kill off pathogens) that can be collected and eventually processed into fertilizer.

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Last month, [UN-HABITAT](#), the United Nations organization charged with promoting sustainable towns and cities, released a report titled *Cities and Climate Change*, in which it called for the mainstreaming of "urban agriculture in global climate change and food security agendas." And these days, thanks largely to the work of organizations like Urban Harvest, Mazingira, and IWMI, governments across Africa are putting in place policies that encourage farming and resource recovery in their cities. Kenya's 2009 national land policy has a section devoted to urban agriculture (which Njenga helped to write), and a draft of the country's first-ever national policy focused on city farming and animal husbandry is currently under review. Last year Ghana passed the continent's first national irrigation policy, which encourages the safe practices for wastewater irrigation that Amoah had told us about, and in the Ugandan capital, Kampala, the city council recently added a department of urban agriculture. Some municipalities have begun to grant tax exemptions to landowners who allow farmers to use vacant acreage, and a few are now including plots designated for agriculture in their land-use plans. Kenya recently introduced a system of loans for small urban-farming enterprises, and other cities have reduced tariffs for irrigation water and are providing incentives for composting and reusing household wastes.

"I think there's a bigger ideological battle going on now in the field of agriculture," Lee-Smith says, pointing to the 2008 report released by the [International Assessment of Agricultural Knowledge, Science and Technology for Development](#), a global consortium established by the World Bank and various U.N. organizations to assess the role of agriculture and make recommendations for the future. Widely acknowledged to be the most comprehensive analysis of world farming to date, the report called for a shift away from industrial agriculture and toward the small-scale farmer, wherever she might sow. "People have to change their idea of a sterile, futuristic city with no farmers," she says, into the idea of a city that integrates farming into all aspects of planning. "These things will change," she adds, "and I would be vastly entertained to sit around and watch it all happen."


Developing-world slums have a well-deserved reputation for being hells on earth, but it strikes me on this trip that in many ways these places are ahead of the game. People like the farmer Joel Salatin, the cantankerous hero of [Michael Pollan's](#) best-selling *The Omnivore's Dilemma*, are routinely held up as visionaries for the kind of complete-nutrient-cycle, sustainable-agriculture operations they run in the comfortable United States, but Africa's urban farmers are doing the same with far, far less. And with the earth's population expected to grow to 9.1 billion in 2050 — more than four billion of whom will live in countries chronically short of water — we'd probably be wise to pay






attention.

Our last night in Nairobi, Antonio and I join Francis Wachira for a rabbit dinner prepared by his 20-year-old son, George. Sitting in the family's cramped home, where a tablecloth draped on a string separates the "living room" from a sleeping area just big enough to accommodate his twentysomething daughters' bunk beds, we listen as he recounts his journey from impoverished construction worker to recent international traveler. A few months earlier, through an exchange arranged by Mazingira, Wachira and a handful of other African farmers had spent time in the United States with outfits like Denver's [GrowHaus](#), which distributes fresh produce in poor neighborhoods, and Will Allen's Milwaukee-based [Growing Power](#).

"I was in Denver for six years," he begins. "Six weeks," corrects his wife, a little wearily. She's heard this story before, as have I. But I'm not yet tired of listening to this man who'd never previously boarded an airplane talk about how he delivered a lecture at an American university that culminated with the crowd on its feet and chanting "Rabbit King! Rabbit King!" He's standing now, too, recounting the part where he explained the concept of the vertical gardens. The Americans had crowded around afterward, begging for more details. "They all wanted Wachira," he says with wonder, "to go over there and train them."

Jocelyn Zuckerman [wrote this article for OnEarth magazine](#), where she works as articles editor. She is also an adjunct professor at the Columbia University Graduate School of Journalism and has written for the New York Times Magazine, Parade and Plenty.


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**Toni Jurkiewicz (OrganicEcoBaby.com)**      12/01/2011 12:28 PM

This is a great Article, very long read. Anyway, I am from South Africa. And have been in many a Township, and the tribal people all grow their own crops on the hillsides by their kraals. Excuse my lack of knowledge, does the soil not break down any of the toxins that are found in human excrement? Why would animal feces be OK for fertilization then and not human? Is the "Western World" not becoming a little bit TOO Germaphobic? Us South Africans have lived from the land for a long time.... [More](#)

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**Allan Balliett**      11/29/2011 13:47 PM

I'm a farmer a biodynamic farmer in West Virginia. I've always thought it would be good work to spend a couple of months a year helping set up community gardens in Africa or other developing country.

I've never found a group that was interested in supporting American farmers in teaching/working in the third world.

Can someone point me in that direction?

Thanks