

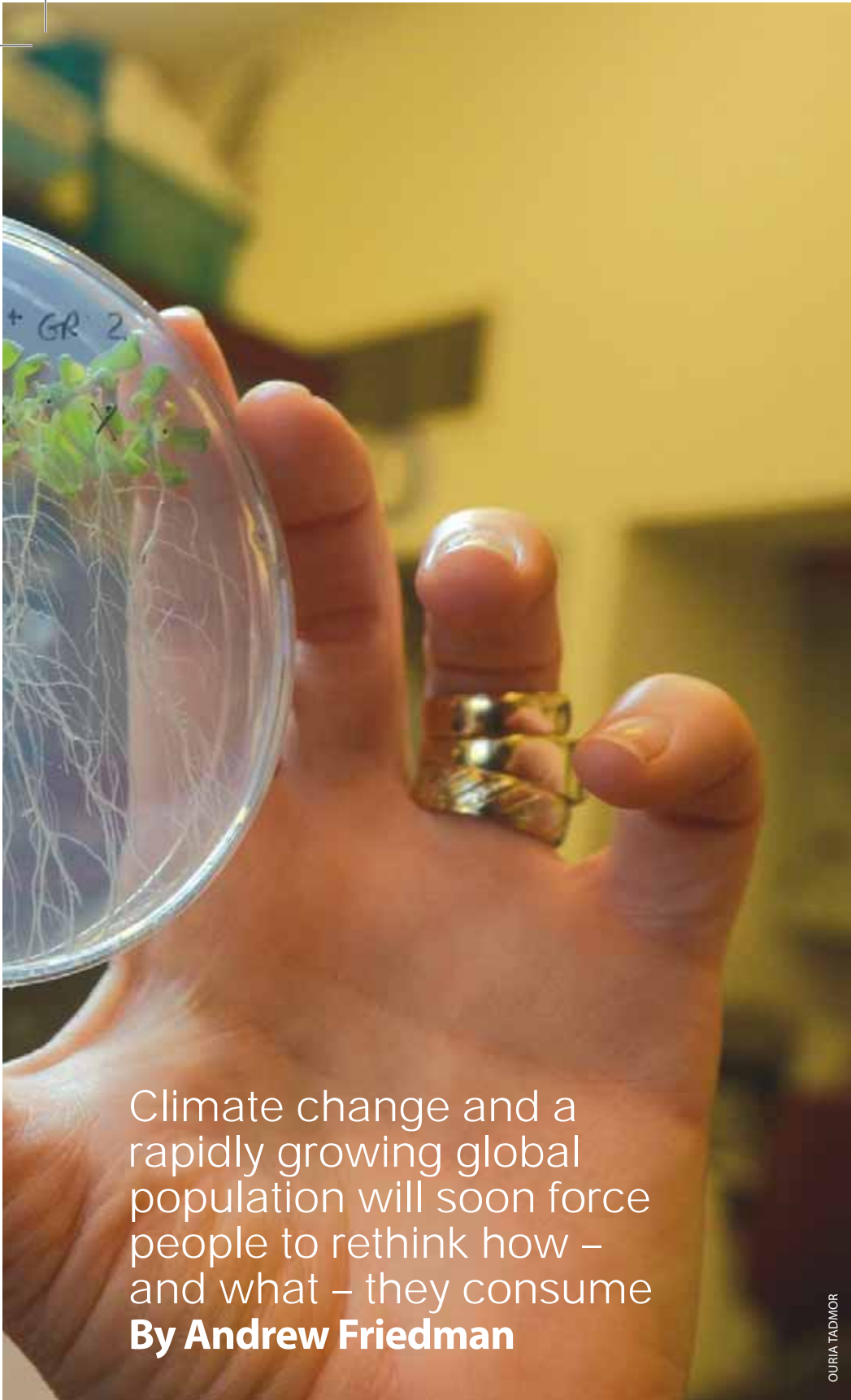


Feeding the world

Israel, 2050. The country bears little resemblance to what it once was. Since the turn of the century, annual rainfall has plummeted, with just seven of the past 50 winters defined as “rainy” or

“very rainy.” In the south, the Negev Desert has crept ever northward, and the once-green areas of Beit Shemesh and Ashkelon are now a solid shade of brown year round. It has been two decades since the coastal and

mountain aquifers were in use, and Lake Kinneret hasn’t been considered “full” since 2003. Even in the lush Galilee, large swaths of greenery have faded due to the chronic lack of rain.



Climate change and a rapidly growing global population will soon force people to rethink how – and what – they consume
By Andrew Friedman

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Dr. Hinanit Koltai oversees a series of experiments at the Volcani Center to increase both plant yield and durability

impact on the international food trade. While the changes haven't destroyed America's farming industry, the US is no longer able to export food. Closer to home, Israeli farms still produce enough to feed the more than 11 million citizens of Israel, but not the nine million Palestinians of the West Bank and Gaza Strip. For a while, from 2020-2035, Turkey picked up some of the slack, providing food aid to the Palestinians as well as Lebanon, Syria and Jordan, but a series of massive fires and winter floods brought that country's agriculture sector to its knees.

SOUNDS IMPOSSIBLE? Perhaps. Then again, perhaps not. Scientists at Israel's Agricultural Research Organization (ARO), the research division of the Ministry of Agriculture, located at Beit Dagan near Ben-Gurion Airport, say climate change, overpopulation and Western consumption habits will combine to create a food crisis in the coming decades. In short, a hotter, drier world will produce less food and an exploding global population – expected to hit 9 billion by mid-century – will make those food resources a precious commodity.

According to Dr. Sonny Ramaswamy, director of the National Institute of Food and Agriculture, a branch of the United States Department of Agriculture, Western governments and research agencies are trying now to plan for the coming crisis, focusing on a combination of scientific intervention in nature and rethinking Western habits of consumption.

"I'd say that for the next five to ten years, we won't have to worry about feeding the world," Ramaswamy tells *The Jerusalem Report*. "Current agriculture patterns and technologies will allow us to continue producing enough food to feed everybody on the planet over the next decade, but it's not going to continue indefinitely. Our current methods of production, transportation, cooling and storage will not be sufficient in another 20 or 30 years."

Speaking at a conference entitled "Increasing Future Food Production: Challenges and Opportunities for the New

Israel is not the only country to experience such drastic changes, and the shifting weather patterns worldwide have wreaked havoc with the world's food supply. In the United States, the freak hurricanes that pummeled

the American heartland in 2027, 2031, 2037 and 2045 caused massive flooding, and mid-winter ice storms have become a near annual occurrence.

The weather patterns have also had an

Israel

Era” at ARO, Ramaswamy said the exploding global population will have a double impact: There will be more mouths to feed than ever before, and human communities will encroach on formerly agricultural lands. This process will be exacerbated around the world. Arid and semi-arid countries such as Israel will have to contend with a further depletion of already scarce water resources. Other countries will have to deal with other weather-related challenges that will limit agricultural output.

RAMASWAMY URGES world governments to focus on two main areas to deal with the impending crisis: science and infrastructure. He says agricultural scientists must focus their research on achieving maximum “crop per drop,” and Western consumers should rethink their purchasing habits.

“We have been blessed over the past 75 years by a type of economic prosperity that is almost unprecedented in human history. Of course, that is something to be thankful for, but there is a down side to it as well. Our societies are extremely wasteful. Our supermarkets encourage us to buy in bulk, but that means people buy more than they need and eventually throw out the extra. As a result, about half the food that is purchased in the United States is thrown in the garbage without being consumed. The day is coming when we will not be able to be so carefree about waste.”

In a spotless lab at the Volcani Center, as the ARO is popularly known, Dr. Hinanit Koltai, a researcher at the ARO’s Department of Ornamental Horticulture, oversees a series of experiments to increase both plant yield and durability. As she examines an olive tree sapling she’s injected with hormone treatment, she says the treatment allows her to control when the tree will flower, and also help create a genetically stronger tree that will cope well with Israel’s changing climate.

“There is no question that the climate around us is getting drier,” she tells The Report. “The challenge we face is how to adapt existing agricultural products to the changing environment. The main bulk of my research focuses on water use – I’m creating strains of fruit trees that will use a fraction of the water to produce superior produce to the indigenous species, let’s say olives, that we currently have,” she says.

“Furthermore, by controlling and treating the saplings and combining genes from a variety of plants, we can create genetically strong trees that are resistant not only to

drought conditions, but also to harmful pests and bugs.”

Dr. Uri Kushnir, Koltai’s colleague and head of the Volcani Center’s wheat research and development lab, concurs. While the Torah may say that man shall not live by bread alone, Kushnir says the commercial development of wheat over the past century has wreaked havoc on mankind’s staple food.

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“I call it the ‘browning of the green revolution,’” he tells The Report with a smile. “The modern, high-yield strain of cultivated wheat consists of relatively few genotypes, as opposed to traditional wheat species that contained a rich variety of genotypes. That has led to an erosion of the wheat gene pool, which in turn has led to two major problems. Today’s wheat plants are very susceptible to new germs and diseases that are cropping up as climates change, and we have reached a performance plateau. With the methods and materials we’ve got today, there is really no way to boost performance. Global wheat production is really pretty much maxed out.”

TO ILLUSTRATE the current state of wheat vulnerability, Kushnir points to three areas of the Middle East that historically led people to refer to the region as the “fertile crescent”: Iran, Turkey and Egypt. All three, he says, have had flourishing wheat industries in past, as well as climates that turned once-fertile areas arid, and once-temperate climates that have seen temperature swings in both directions.

Kushnir says Israel is a prime laboratory for wheat research because disparate climates lend themselves to a wide variety of wheat species – more than 20 species grow wild throughout the country. By focusing on the genetic makeup of as many species as possible, researchers have isolated the individual genes that make strong species strong and weak species weak, and have created a new gene pool that can withstand diseases such as yellow rust, a variety of fungus that is at least as prolific as the majority of wheat species currently in wide use.

Kushnir resolutely dismisses any suggestion that genetically modulated



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products are unsafe, stating unequivocally that the modulated products pose no health risks to the general public, and in fact stronger, higher-yielding agricultural products will be essential to ensuring food security in Israel and abroad for generations to come.

Walking through a maze of refrigerators and laboratory experiments measuring optimal storage, Dr. Amnon Lichter, chairman of Volcani’s Department of Postharvest Science stresses that Western scientists and political leaders must encourage the developing world to invest in the infrastructure that will cut waste and ensure that food makes it from the field to the table intact. But, he says, there is only so much the West can do.

“Our lab developed an appliance to rinse fresh produce,” says Lichter. “We found that spraying the freshly picked crops with room temperature water, brushing and drying them helped extend shelf life for peppers, melon, mango, avocado, corn, many citrus fruits, sweet potato and some strains of tomato. It’s a terrific invention, but all we can do once we’ve created it is push developing countries to invest in the technology. Our rinser is used by farmers in New Zealand, Holland, Morocco, Egypt, Nigeria and Indonesia, but there are so many other countries that could



A technician readies seeds for storage at the Volcani Institute seed gene bank. The facility holds seed samples of all of Israel's flora at -20 degrees centigrade

benefit from it.”

Lichter says one of his other research interests focuses on using plant pathology to retard the ripening process for high-loss fruits, such as strawberries and bananas, so farmers can pick the fruit early and sell when it is ready to eat. That calls for applying a variety of molds and germs to the fruit to see what effect they have.

That sounds scary, and indeed it can be, but not always. “Take the *E. coli* bacteria, for example. Yes, some strains of the bacteria are harmful, like *E. coli* O157:H7. But other strains of it can be used to extend the useful lives of many fruits and vegetables, so we are working to see how to best adapt and use those organisms,” Lichter says.

Ultimately, there seems to be a consensus that while science has a critical role to play in ensuring food security for future generations, Western norms will have to change in order to ensure food availability for all. While developing countries must build postharvest infrastructure – cooling and transportation facilities, for example – it is up to Western countries to battle overconsumption and waste.

One obstacle to meeting that challenge will be simple economics. Currently, economies of scale dictate that supermarket chains

in developed countries offer two-for-one specials and discounted bulk purchases for cheaper prices than individual purchases. Thus, customers are “forced” to overbuy because it is cheaper than the alternative of purchasing exact amounts needed for consumption.

THAT PROBLEM appears to be easier to tackle in Israel than in some Western markets, because the supermarket culture in Israel is still somewhat new. As recently as the late 1980s, many Israelis did the majority of their shopping at outdoor markets such as Mahane Yehuda in Jerusalem and Tel Aviv’s Carmel Market. Because produce there is not packaged, customers doing their weekly shopping are more likely to consider what they will need for that week and buy accordingly. It is no coincidence that the expansion of supermarket shopping over the past two decades has led to a similar expansion of waste.

And some experts believe that the business community, like it or not, will eventually be forced to deal with this issue, just like the general population.

Marina Montedoro, the vice chairwoman of JPI-FACCE, a European Commission program dedicated to meeting the challenges

of global agriculture, food security and climate change, says political strategies must be developed on local, national and international levels to encourage what she calls “responsible consumption.” This effort, she maintains, must be multidisciplinary, involving policy makers, the business community and farmers, as well as the demand chain. “We need a mix of policies but if we don’t educate consumers to buy more intelligently and to consume healthily, there is no way we can win this battle.”

Ultimately, Montedoro says there is another factor that will play a major role in the fight to curtail waste in the West: obesity. With nearly half of all Americans overweight or obese, and rising obesity rates in Europe, Israel and other developed countries, she says the economics of health care will eventually force governments to rein in spending in the private sector.

“Of course, I think everyone would prefer to encourage people to change their habits in a positive way, to make good choices for the benefit of the whole world. But the current situation is unsustainable in the long run, and governments are going to eventually be forced to deal with this crisis one way or another. Our goal is to try and make sure they do it before it is too late.” ■