

International

Rebooting food: Finding ways to feed the future

Scientists battling a global time-bomb

VIENNA: Banana trees that fit in a test tube. Burgers made without a cow in sight. Fish farmed in the desert. Robots picking fruit. Welcome to the brave new world of food, where scientists are battling a global time-bomb of climate change, water scarcity, population growth and soaring obesity rates to find new ways to feed the future. With one in nine people already short of enough food to lead a healthy, active life, supporters pushing for a Second Green Revolution argue without major changes hunger will become one of the biggest threats to national security and human health.

To tackle this looming crisis, scientists and agricultural experts are looking to the future - and back to the past - to find innovative ways to produce food. But they admit getting billions of farmers globally - and consumers - to change will be a battle. Bruce Campbell, director of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) - a global network of scientists - said agriculture had to change to meet global goals on climate change and ending poverty and hunger.

"You need a revolution in the agriculture and food system within the next decade because without it, we're never going to achieve any of the really important (global) goals that we've set," Campbell told the Thomson Reuters Foundation. A visit to a series of white, low-rise United Nations-backed laboratories 35 km outside Austria's ornate capital Vienna provides a glimpse into the food of tomorrow's world. Here, in laboratories and greenhouses packed with genetic sequencing machines, robotic equipment and plants and insects of all sizes, scientists are using nuclear technology to stop insects reproducing and to spur disease-resistant banana trees.

Sub-Saharan Africa has for decades struggled to control bloodsucking tsetse flies that kill more than 3 million cattle and other livestock each year. Meanwhile in Southeast Asia and Australia, the fungal disease fusarium wilt threatens to wipe out bananas, a global favourite rich in micronutrients. But the labs, set up by the UN Food and Agriculture Organization (FAO) and the International Atomic Energy Agency (IAEA), have helped Senegal almost eradicate tsetse flies in one area and created bananas that can stand up to pest threats. "Under climate challenge ... we face many challenges in agricultural production. One of the major issues is more and emerging diseases for plants and animals, and insects," said Qu Liang, director of the joint FAO/IAEA division.

Burgers to drones

Scientists are also working on other innovations - from gene editing of crops and lab-grown meat, to sensors on drones and tractors - that could help to reboot the world's food system and fundamentally change how food is grown, distributed and eaten. But technology is only part of the answer, experts caution. Finding sustainable ways to overcome escalating challenges will require everything from delving into culture and tradition to rethinking subsidies and politics around food, they say.

However almost everyone agrees that change is needed. "Our agri food system is at a critical stage. It must be re-shaped," Shenggen Fan, director general of the Washington-based International Food Policy Research Institute (IFPRI) said. Food monopolizes a huge share of scarce resources, Fan said, and numbers bear this out. Crops take up 11

percent of the land surface, livestock grazing covers 26 percent of ice-free land, and farming accounts for about 70 percent of all water used, according to the Organization for Economic Co-operation and Development (OECD).

Livestock generate more greenhouse gas emissions than transport, according to the FAO, accounting for about 14.5 percent of world emissions. Faced with growing climate concerns, many people - including billionaire philanthropist Bill Gates - are pushing for a Second Green Revolution to develop crops that can be grown in droughts and resist new pests and diseases. The first Green Revolution, which peaked in the 1960s, dramatically boosted harvests in poor parts of the world by introducing high-yielding seeds, fertilizers and irrigation which helped stave off famine in hungry parts of the world.

But the industrial farming era it spurred has failed both consumers and the environment, critics say, by leading to a food system that cripples the environment, contributes to climate change, and concentrates wealth in multi-national companies. "We live in a changing world and we are limited in resources, in terms of land, water, fertilizer," said Ivan Ingelbrecht, head of the plant breeding and genetics laboratory in Vienna. "So having sustainable food production systems is very important," he said, holding a test tube containing a miniature banana tree in his hand.

Hungrier world

One problem, experts say, is that agricultural practices can be hard to change. Nearly 2.5 billion people are involved in small-scale farming, managing about 500 million small farms, according to the International Fund for Agricultural Development (IFAD). "Agriculture has kind of been stuck for the last 500 years," said Andy Jarvis, research director at the Colombia-based International Centre for Tropical Agriculture (CIAT). Machinery and better crop varieties have made agriculture more productive but fundamental problems remain, from reliance on heavy manual labour to difficulties managing pests and diseases, he added. The world's population, meanwhile, has grown both in size and bulk, with no signs of the upward trend abating.

Of the world's 7.6 billion people - a population projected to reach 9.8 billion by 2050 - about 815 million people go hungry daily while 2 billion are overweight or obese, sending health costs soaring. Among them is Yatzri Martinez, aged six from Mexico City, who weighs 38 kg (84 pounds), loves spaghetti and fast-food snacks, and comes from a family plagued by type 2 diabetes. Salvador Villalpando, a specialist doctor who treats her at a child obesity clinic at the Federico Gomez Children's Hospital in Mexico, one of the world's fattest nations, said keeping people from becoming obese is the aim.

"When you get to treat obesity, you're one day too late," he said. Mexico is not alone. Adult obesity rates are increasing in all of the United Nation's 193 member states, including in sub-Saharan Africa and South Asia where the focus for decades was eradicating hunger. Globally, about 40 percent of adults



VIENNA: Ivan Ingelbrecht, head of the plant breeding and genetics laboratory, holds a miniature plant in a conical flask at the joint FAO/IAEA laboratories outside Vienna. —Reuters

are overweight and 13 percent obese, says the World Health Organization (WHO), with the surge in obesity in the last three decades presenting a major public health epidemic in both poor and rich nations.

Growing demand for meat and dairy as countries become wealthier is also placing a heavier demand on world food systems, driving climate change as land is stripped of forests and ploughed. The volume of food transported around the world also is exacerbating global warming. However, calls to use more pesticides and fertilizers to get more food from the same land are based on wrong assumptions, said Emile Frison of the International Panel of Experts on Sustainable Food Systems (IPES-Food).

He said there is already enough food available to feed the planet today and in 2050 - but it's in the wrong places or wasted. Globally, one third of all food produced - worth nearly \$1 trillion a year - is binned or wasted, according to the FAO. "It's a matter of access, of waste, of consumption models that are unsustainable. Recommending a technology fix approach is certainly going in the wrong direction," Frison told the Thomson Reuters Foundation.

Hi-tech solutions

James Rogers, CEO of Apeel Sciences, a California-based start-up company, agrees the planet is producing more than enough calories to feed everyone. But he believes technology can help resolve some key issues, particularly food waste. His company produces a plant-based coating that comes in powder form and, when applied with water, can double the shelf life of fruit and vegetables without refrigeration so farmers in remote areas can get them to market without spoilage. The coating is being tested on mangoes in Kenya and cassava in Nigeria, funded by the Bill & Melinda Gates Foundation.

Technology is also helping meet the growing demand for meat, without more emission-producing livestock. The ideas harken back to predictions former British Prime Minister Winston Churchill made in a 1931 essay. "Fifty years hence we shall escape the absurdity of growing a whole chicken in order to eat the breast or wing by growing these parts separately under a suitable medium," he wrote. Impossible Foods and Beyond Meat, companies that produce high-tech burgers that taste like the real thing but contain only plants, are winning investment from backers as diverse as Gates and Tyson Foods, the largest US meat processor.

Memphis Meats, meanwhile, is growing meat from animal cells in laboratories, something advocates call 'clean meat' because it is better for the environment. Its backers include Virgin Group boss Richard Branson. Such alternative meats offer "a far more efficient way" to feed demand for tasty protein while cutting environmental damage, said Bruce Friedrich, executive director of The Good Food Institute (GFI), which supports alternative meat companies and lobbies on their behalf. "Plant-based meat and clean meat would be cheaper, more efficient, and would not have bacteria or drug residue contamination. They would be better in every conceivable way," Friedrich told the Thomson Reuters Foundation.

Widening divide?

To grow enough food despite increasing water scarcity - agriculture today sucks up about 70 percent of global freshwater used each year - farmers are also looking to technology. By tweaking a gene found in all plants, for instance, a team of international scientists have tricked tobacco plants into partially closing their stomata, microscopic pores in the leaf that let water evaporate. The plants grew with a quarter less water and little impact on harvests, said Steven Long, a crop sciences professor at Britain's Lancaster University. Researchers hope the tweak will work as well in cowpea and soybean, main sources of protein in developing countries, and in rice, a major staple food. —Reuters



Welcome to the brave new world of food