

The foundations of sustainable farming

The agricultural sector is built on plants and animal life, but the industry can still affect the environment in ways that contribute to the ill effects of climate change. According to data published in a 2022 report from McKinsey & Company, agriculture accounts for nearly one-quarter of global emissions, and was identified as the industry that contributes the most to exceeding planetary boundaries. Sustainable farming practices can help reduce that impact.

Even though there is growing consumer demand for more environmentally friendly products, farmers in the United States are lagging behind when it comes to adopting sustainable practices, even though they are aware of them. McKinsey reports that 90 percent of U.S. farmers have an understanding of sustainable farming, but adoption of these practices remains low. Here's a look at some of the sustainable farming practices and what the agricultural sector can do to foster a better planet.

Regenerative techniques
Healthy soil often equates to a healthy planet. The cornerstone of sustainability lies in the soil. The soil serves as a carbon sink and a water filtration system. By avoiding traditional "tilling" farming, farmers can maintain the soil structure. This will reduce erosion and keep carbon

sequestered in the ground. Farmers can plant cover crops like rye or clover in the off-season to prevent soil erosion, suppress weeds and increase the organic matter of the soil. Diversifying species planted in fields will break pest cycles and naturally replenish soil nutrients over time. This can reduce the need for chemical fertilizers and pesticides.

Efficient irrigation

Global water scarcity continues to be a concern, and sustainable farms will prioritize water stewardship. In utilizing drip irrigation, which delivers water directly to a plant's roots, farmers can reduce evaporation and runoff when compared to overhead sprinklers. Collecting and storing rainwater runoff for use during drought can minimize the strain on local aquifers.

Biological pest controls

Farmers can rely on the use of integrated pest management strategies to offset chemical pesticide use. By introducing natural predators, farmers can control certain pest populations. For example, ladybugs can reduce aphids on plants. Relying on traps to collect pests also can slow pest outbreaks and reduce reliance on chemicals.

Creating fertilizers

Farmers can use the waste produced on their farms by turning it into valu-



able fertilizer. According to the USDA, biochar is a black carbon produced from biomass sources like wood chips, plant residues, manure, and other agricultural waste in a low-oxygen environment through a process known as pyrolysis. This material can be used as a soil amendment to improve water retention, nutrient

uptake and fertility. Chicken litter, bone meal, blood meal, and compost tea are examples of farm waste-derived products that can be used as fertilizers.

Sustainable farming is a step toward the future that protects the land without compromising output.

5 challenges facing modern farmers

Agriculture is a building block of nations. The United States Department of Agriculture reports 22.1 million full-and part-time jobs were related to the agricultural and food sectors in 2022, representing 10.4 percent of total U.S. employment. Statistics Canada reports agriculture in Canada employed around 280,000 people as of 2023.

Today's farmers face a convergence of environmental, social and economic pressures. Each of these pressures has the potential to threaten the stability of the global food supply. The following are five notable challenges facing modern farmers.

1. Extreme weather: Climate change has moved from a theory to a current reality for many farmers. Growing seasons have become much less predictable as frost dates and heat waves have shifted when plants can be sowed and harvested. Farmers also are increasingly dealing with too much or too little water, each of which can destroy crops.

2. Financial squeeze: Farmers are increasingly facing economic pressures. The price of fuel, seeds and fertilizers has become highly volatile. The American Farm Bureau Foundation says fertilizer prices in 2025 climbed high again as global trade shifted, energy costs rose and geopolitical risks reshaped supply. Farming requires massive capital investments tied to machinery and land. High interest rates can make it difficult for farmers to pay the debt required to stay operational. In addition, farmers typically have little control over the market price of their products, leaving them vulnerable to global trade wars.

3. Labor shortages: Finding and retaining agricultural labor is a big crisis. The average age of farmers globally is rising, says the International Labour Organisation and the American Farm Bureau Foundation. In the U.S. and the European Union, the average farmer is nearly 60 years old. The AFBF reports that, despite increased wages, nearly 50 percent of farmers struggle to find enough workers to harvest seasonal crops.

4. Sustainability transitions: Compliance costs are high for the farmers who have opted to transition to more sustainable farming practices. Transitioning to Net Zero agriculture requires significant capital, according to the World Economic Forum. The WEF estimates there is a multi-trillion dollar investment gap to move global agriculture toward sustainable practices. And while regenerative farming improves soil health, the initial transition period can produce yield variations that threaten the livelihoods of small farmers.

5. Digital divide: The Organisation for Economic Co-operation and Development has raised concerns that small-scale farmers lack the infrastructure like high-speed internet necessary to use tools designed to increase efficiency. Plus, groups like the National Farmers Union have testified that software locks on farming equipment create dependency on manufacturers that can strip farmers of their independence.

Modern farmers face various challenges that have persisted for ages and also newer problems tied to the modern, increasingly technology-based world.