

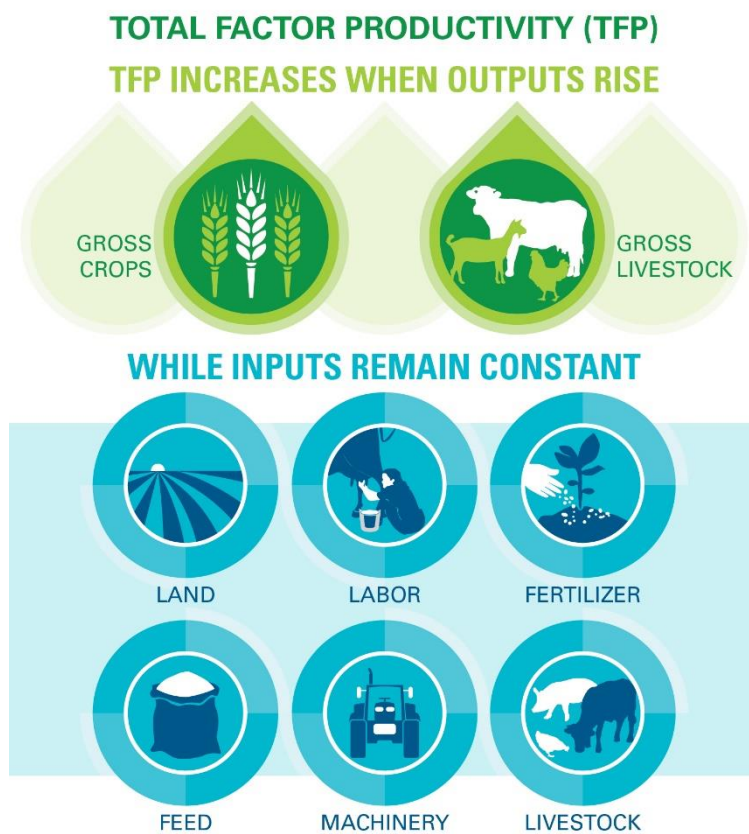
# Sustainable Agriculture Is Built on Productivity

There are multiple strategies for meeting the world's demand for affordable, safe and nutritious food and agriculture products.

- » **Land Expansion** — Expand the amount of land that is being cultivated to generate more output.
- » **Irrigation Extension**— Producers deploy or extend irrigation systems to protect land against drought and improve its productive capacity, which may permit multiple cropping seasons
- » **Input Intensification** — Producers increase applications of fertilizer, machinery, labor, seeds, herbicides or other inputs on cultivated land to grow more crops or raise more livestock.

These approaches need to be selected and managed with care to protect the resilience and sustainability of the land, water, human and capital resources that are the foundation of food and agriculture systems.

**Meeting demand in a way that reflects the needs of producers and consumers today, while safeguarding our future agricultural capacity is best achieved through agricultural productivity.**



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## What Is Agricultural Productivity?

Agriculture productivity rises when producers use technologies and production practices that result in more output from existing resources. This is measured by Total Factor Productivity (TFP).

To understand what TFP *is*, it is helpful to understand what it *is not*.

**TFP is different than output**, which measures the gross amount of crops or livestock produced, **and yield**, a measure of the amount of output per unit of production, usually land.

**TFP is a ratio that measures changes in how efficiently agricultural inputs** (land, labor, fertilizer, feed, machinery and livestock) **are transformed into outputs** (crop and livestock).

TFP increases when there is widespread adoption of innovations and practices that enable producers to increase crop and livestock output with the same amount (or less) inputs.

Measuring TFP, in addition to yields or output, **gives us insight into how efficiently and sustainably we are using our land, water, human and capital resources.**

## How Does Productivity Grow?

The substantial increase in U.S. pork productivity demonstrates how TFP works and the economic and environmental benefits of productivity growth.

Widespread adoption of innovative technologies and practices has increased pork output using the same amount (or less) land, labor, fertilizer, feed, machinery and livestock. Efficient use of these inputs has generated cost savings for producers and consumers and improvements in the environmental sustainability of the pork and animal feed value chains.



### Pork Productivity is in the Genes

Genetic researchers and veterinarians analyze hundreds of animal traits to select and pair pigs to breed descendants that are healthier, use less feed and produce more meat. Heritage breeds are cross-bred to create the best meat flavor and quality for consumers.



### Productivity from Seed to Feed

Productivity-enhancing crop technologies and practices reduce the amount of land, labor, machinery hours, fuel and fertilizer used to produce hog feed.

Alfalfa, corn and soybean seeds improved through biotechnology and conventional breeding become healthy crops that are pest-resistant and herbicide-tolerant. Best-practices for fertilizer management ensure that the right amount of the appropriate fertilizer is used at the right time and in the right place. Machinery equipped with precision systems, such as GPS, cover every inch of the field with precisely planted seeds and treat each plant with the nutrients and crop protection products needed. Precision systems also allow less productive land to be identified and set aside for conservation use, such as pollinator or wildlife habitat.



## Healthy Pigs are Productive Pigs

These crops are blended with nutrients to make hog feed that is healthier and easier to digest, resulting in fewer methane emissions during the digestive process. “Smart barns” provide consistent temperature, comfortable housing and readily available feed and water. With detailed data on the health and development of the herd, farmers can reduce energy use, save labor and protect pigs from disease.

## Growing Sustainable Pork

Extensive use of technological advances and improved practices in the feed and pork value chains means that today it only takes 5 breeding hogs to produce the same amount of pork that 8 hogs produced in 1959, a decrease of 38 percent.<sup>1</sup>

In just 25 years, the U.S. has gone from being a net importer to a net exporter of pork, shipping 26 percent of domestic pork production to more than 100 countries each year.<sup>2</sup> At the same time, the carbon footprint of U.S. pork production is just one-third of one percent of total U.S. greenhouse gas (GHG) emissions.<sup>3</sup>

Producers benefit from the cost savings generated by the efficient use of land, labor, fertilizer, feed, machinery and livestock in the pork and feed value chains. Consumers around the world enjoy high-quality, safe and affordable U.S. pork products.

## Endnotes

<sup>1</sup> Boyd, G. and R. Cady, “Camco Report: A 50-Year Comparison of the Carbon Footprint and Resources Use of the U.S. Swine Herd: 1959-2009,” May 22, 2012.

<sup>2</sup> USDA ERS [https://www.ers.usda.gov/webdocs/charts/83729/usporkeports\\_1\\_.png?v=42887](https://www.ers.usda.gov/webdocs/charts/83729/usporkeports_1_.png?v=42887).

<sup>3</sup> U.S. Greenhouse Gas Inventory 2011, U.S. Environmental Protection Agency (EPA), Chapter 6.  
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