COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH

GAP REPORT® GLOBAL AGRICULTURAL PRODUCTIVITY REPORT®

THE CASE FOR PRODUCTIVITY:

Invigorating agricultural systems for the twenty-first century

Accelerating global agricultural productivity growth at all scales of production is *imperative* to meet the needs of consumers and address threats to human and environmental well-being.

During the next 30 years the world's population will grow larger and more prosperous.

Demand will soar for food and agricultural goods, including meat, dairy, fruits, vegetables, timber, oilseeds for cooking and industrial uses, and biomass for energy, heat, and cooking.

At the same time, the natural resource base and ecosystems that support agricultural production are under stress from climate change, soil degradation, and poor water management.

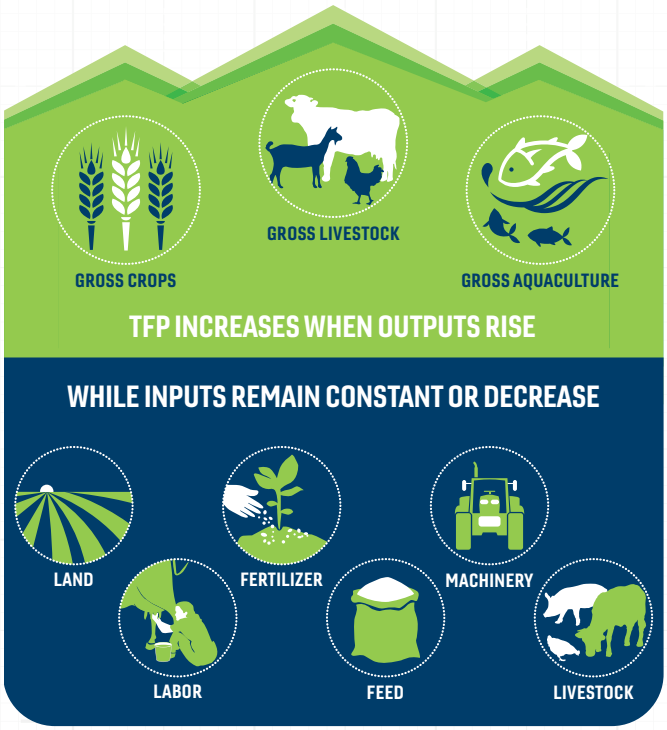
Poverty, food insecurity, and malnutrition remain stubbornly high, condemning hundreds of millions of people to ill health and unfulfilled potential.

Innovative agricultural technologies and improved practices, combined with attention to biodiversity, drive productivity growth at all scales of production.

What is agricultural productivity?

In agriculture, productivity is measured as Total Factor Productivity or TFP. An increase in TFP growth indicates that more crops, livestock, and aquaculture products were produced with the same amount (or less) land, labor, fertilizer, machinery, feed, and livestock.

TFP grows when producers increase output using improved technologies and practices, such as advanced seed varieties, precision mechanization, efficient nutrient and water management techniques, and improved animal care practices. Using agricultural inputs efficiently to generate more output reduces agriculture's environmental impact and lowers costs for producers and consumers.



INCREASING PRODUCTIVITY
IS ABOUT MORE THAN SCALE

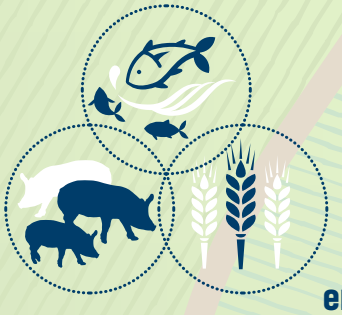
Traditionally, high-income countries with large-scale farms and connections to global markets are the most efficient. Yet productivity growth is possible at all scales of production.

PRODUCTIVITY GROWTH AROUND THE WORLD

Using the latest improvements in precision agriculture and data analytics, in combination with high yielding, herbicide-tolerant crops, a large-scale farmer in BRAZIL can produce soy for the global market without cutting down forests to increase output.

With healthier feed and improved housing, a small-scale dairy farmer selling to local markets in KENYA can increase milk output using fewer animals and generating less methane emissions.

By cultivating mangos with drip irrigation, a farmer in INDIA can harvest a robust crop using less land and water.



Integrating pig, feed crop, and aquaculture production enables a small-scale farmer in VIETNAM to sustainably increase output and diversify income sources.

WHAT HAPPENS IF WE DON'T PRIORITIZE **PRODUCTIVITY GROWTH?**

TFP needs to increase by an average of 1.73 percent each year to sustainably meet consumer needs in 2050, but the world is not keeping pace with this target.

WITHOUT **PRODUCTIVITY GROWTH**

36% of the world's land is used for agriculture.[1]

90% of the earth's soils could be degraded by erosion by 2050.[2]

Forests and biodiverse areas will be destroyed for planting or pasture.

$2T (USD) in economic losses and 4 million deaths are attributed to diet-related diseases each year.[3]

Low-income households will not be able to afford fruits and vegetables, complicating their ability to eat a healthy, diverse diet.[4]

Climate change has slowed agricultural productivity growth by **21%** since 1961.[5]

Low-income countries will need to import more agricultural products, leading to higher food prices.

Small-scale farmers, particularly women, will need to manage a heavy labor burden, chronic poverty, and food insecurity.

37% of methane emissions from human-influenced activity come from cattle and other ruminants.[6]

20 million more dairy cattle and buffalo will be needed in India alone to meet domestic demand.[7]

WITHOUT **EFFICIENT IRRIGATION**

70% of the world's water is used for agriculture;

40% of irrigation water is lost due to inefficient irrigation.[8]

Water sources will be depleted, making prime agricultural land unusable.

A CALL TO ACTION

Strategic policies, investments, and partnerships support and accelerate productivity growth.

INVEST
in public agricultural R&D and extension systems

Public-sector agricultural R&D and extension systems, generate innovation and information that farmers of all scales need to sustainably increase productivity and resilience.

EMBRACE
science- and information-based technologies and practices

Science- and information-based technologies and practices enable producers of all scales to increase output, control costs, and manage risk.

IMPROVE
infrastructure and market access for agricultural inputs and outputs

Access to markets for agricultural inputs, outputs, and services supports economic growth, diminishes waste and loss, and reduces costs for producers and consumers.

CULTIVATE
partnerships for sustainable agriculture and improved nutrition

Public-private-producer partnerships support sustainable, equitable agricultural development, reduce poverty, and improve human health.

EXPAND
and improve regional and global trade

Forward-looking trade agreements facilitate the cost-effective movement of agricultural inputs, products, and services to the people who need them.

REDUCE
post-harvest loss and food waste

Reducing loss and waste increases the availability and affordability of nutritious food and decreases the pressure on land and water resources.

SUPPORTING PARTNERS

BAYER · CORTEVA agriscience · JOHN DEERE · Mosaic · Smithfield Good food. Responsibly. · VT College of Agriculture and Life Sciences Virginia Tech

CONSULTATIVE PARTNERS

- ACDI/VOCA
- Farm Foundation
- HarvestPlus
- IICA
- International Potato Center (CIP)
- New Markets Lab
- Purdue Center for Global Food Security
- Sasakawa Africa Association
- S.M. Sehgal Foundation
- Supporters of Agricultural Research Foundation
- Tanager
- Daugherty Water for Food Global Institute at the University of Nebraska

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ENDNOTES

1 Food and Agriculture Organization. (2018). *Agricultural land (% of land area).* https:/data.worldbank.org/indicator/AG.LND.AGRI.ZS

2 Food and Agriculture Organization. (2019). *Global Symposium on Soil Erosion: Key messages.* https:/perma.cc/MS98-ACVH

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5 Ortiz-Bobea, A., Ault, T. R., Carrillo, C. M., Chambers, R. G., & Lobell, D. B. (2021). Anthropogenic climate change has slowed global agricultural productivity growth. Nature Climate Change, 11(4), 306–312. https:/doi.org/10.1038/s41558-021-01000-1

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For more on agricultural productivity, see globalagriculturalproductivity.org.