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The Lugar *Center*

COVID-19 | Conflict Prevention | Exports | Sustainable Growth | Healthy Diet



IN THE POST-COVID-19 WORLD, STRONG U.S. INVESTMENT IN AGRICULTURAL RESEARCH WILL BE MORE IMPORTANT THAN EVER

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In addition to bringing untimely deaths to more than 150,000 people across the globe and serious illness to countless survivors, the COVID-19 pandemic has upended economies and trading relations around the world. Many countries are banning foreign travelers and prohibiting the export of essential products.

The crisis has exposed global supply chains that are longer and more complicated than many citizens and policymakers had realized. All this has come amid a general slowdown in trade prompted by tariff wars, which have hit American farm exports particularly hard.

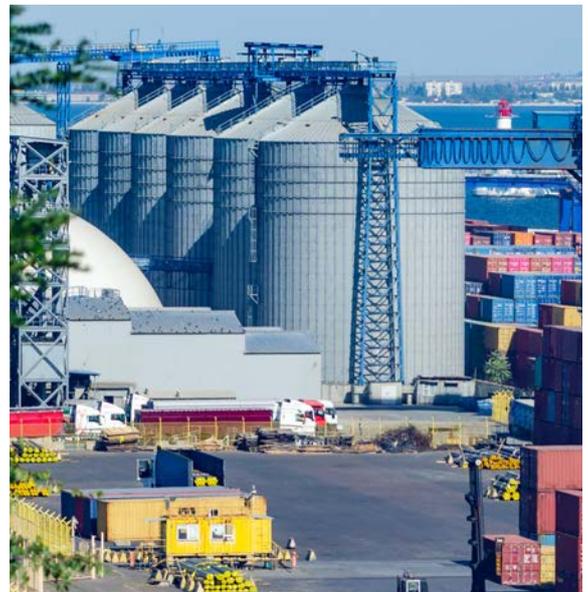
No one knows just when the world will get back to normal. More importantly, no one can predict just what the new normal will look like, including for the farm economy. But some experts fear that one consequence may be a rise in xenophobia and nationalism. That could lead attempts by more countries to implement export

bans or try import substitution, that is, replacing foreign imports with domestic production, reversing the globalization trend of recent decades. President Trump's top advisors, for instance, have already said the crisis shows the United States is too dependent on China for medicines and medical supplies. While such protectionist policies might initially be directed to essential or strategic goods, history shows that the definition of what's "essential" can expand quickly under domestic pressure.

If such protectionist and nationalist policies do take hold after the pandemic wanes, America's mighty agricultural export machine could be affected. In a climate of increasing hostility to trade, some countries may decide they are too dependent on the United States for food and feed. That would be a shortsighted view. America's long investment in agriculture science has allowed it to export inexpensive, high quality farm products to countries that can't afford to grow these items themselves. And we have exported our agricultural science and technology to help developing countries improve their own farm output. With many poor economies likely to be devastated by the pandemic, this is a not a time for American agriculture to retreat from the world. Rather, it can be an engine of global recovery.

The Facts

The U.S. agriculture sector plays a critical role in the national and global economy. Exports of U.S. agricultural goods totaled \$137 billion in 2019[1]. Sustained public investment in agricultural sciences has the potential to multiply this figure both directly and indirectly. Returns from the \$69.3 billion invested by private and public sources worldwide in annual agricultural science are significant: it is estimated that every dollar spent on agriculture reaps \$32 in returns[2].



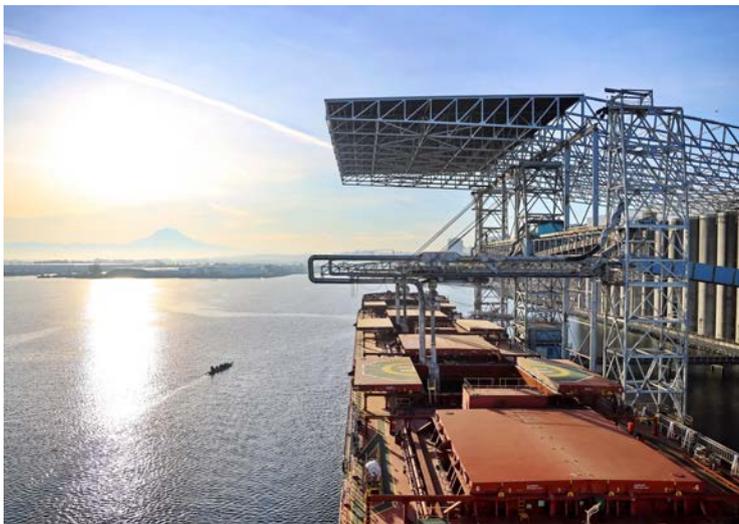
Grain Transit Storage Facility

[1] Statista. "Total value of U.S. agricultural exports from 2012 to 2019 (in billion U.S. dollars)." Statista.com, 2019.

<https://www.statista.com/statistics/220767/total-value-of-us-agricultural-exports-since-2000>

[2] <https://www.nature.com/news/agricultural-rd-is-on-the-move-1.20571>. Hurley, Terrance M., Philip G. Pardey, and Xudong Rao. "Are Agricultural R&D Returns Declining an Development Dependent?" Milwaukee, WI: Agricultural & Applied Economics Association, 2016.

In addition to increasing the yield of agricultural products which can then be exported, U.S. investment in public agriculture research benefits producers and consumers in the global market by helping to greatly reduce worldwide hunger through boosts in agricultural yields, reducing environmental impacts, preventing conflict, protecting U.S. products, promoting fresh and nutritious food, and improving health for sustainable global economic growth.



Port of Tacoma Deep Water Grain Transfer Facility

Research and development in agriculture, nutrition, and food systems advance U.S. economic and security interests. Agriculture R&D can be a keystone tool for global economic recovery, both in the United States and in developing countries. Technological breakthroughs will increasingly be the key to addressing food shortages and malnutrition throughout the world as multiple challenges test

traditional production systems. Even before the pandemic, the population and economic potential of the developing world were swelling, climate change was impacting harvests, and renewed skepticism of globalization had increased trade protectionism. The United States has both the economic opportunity and a moral obligation to increase investment in agricultural sciences to meet the challenge of providing nutritious sustenance for a global population forecast to reach nearly 10 billion by 2050[1]. By investing in activities that promote economic growth here and abroad, we can continue to lead the post-COVID-19 world in working to eliminate hunger, malnutrition, and severe poverty, which in turn contributes to political and economic resilience, increased trading relationships, and a more stable, prosperous, and peaceful world. The time for investment is now.

[1] www.thechicagocouncil.org/sites/default/files/2013_Advancing_Global_Food_Security%283%29.pdf

Boosting Yield and Economic Benefits

New breakthroughs in agricultural science can both minimize inputs—water, fertilizer, and pesticides—and maximize outputs—nutritious crops that are more resistant to pests and diseases, providing more nutritious food, increasing profit for farmers, and invigorating rural communities. The United Nations Food and Agriculture Organization last year estimated that some 842 million people, about 10% of the global population, were chronically hungry. [1] And early projections of the impact of COVID-19 on these numbers are extremely concerning. Farmers throughout the developed and developing world have the potential to dramatically shrink this figure by adopting current and necessary future technologies that allow for the production of more food and food of a higher nutritious quality.

"The U.S. can Continue to Lead"

The past successes of agricultural science have contributed to fueling economies in all corners of the globe into the 21st century. The “Green Revolution” of the 20th century, wherein agricultural science became widespread and adopted in many parts of the developing world, saw remarkable and continuing results that have enabled more of the developing world to feed itself and to participate in agricultural trade. It is estimated that the production of cereal crops has tripled over the last 50 years with an increase of cultivated land of only 30% [1]. Cumulatively, farmers in developing countries saw a financial gain of \$58.15 billion from 1996-2012 - 49.9% of global farm income for this period[2]. Since 1980, global trade in agriculture and food products increased in value more than sevenfold[3]. With strategic investment, the United States can continue to lead the world in agricultural productivity.

[1] www.ncbi.nlm.nih.gov/pmc/articles/PMC3411969/

[2] www.ncbi.nlm.nih.gov/pmc/articles/PMC5033197/

[3] <https://www.thechicagocouncil.org/publication/growing-markets-growing-incomes-leveraging-trade-facilitation-farmers>

U.S. leadership in the agricultural biotechnology sector can have an especially positive impact in sub-Saharan Africa and is critical to avoid malnourishment and food shortages in several countries. While many African countries maintain biotechnology projects and programs, many forego biotechnology research which can produce resistance to drought, pests, and diseases and significantly boost output.



Alfalfa Hay Exports

While the United States continues to be an advocate for biotechnology as a safe and effective way to increase farm incomes and development more generally, Europe has taken a more skeptical stance. Already, many African nations have taken similar policy stances, echoing European opinion rather than scientific fact[1]. The loss of U.S. influence in this scientific space would mean not only fewer strategic opportunities for the United States but also massive losses in opportunity costs - economic, social, and human - for Africa. On the other hand, the wider adoption of agricultural science in sub-Saharan Africa, coupled with explosive population growth, has the potential to turn Africa into an economic powerhouse[2].

Reducing Environmental Impact



Corn Plant in Drought Conditions

With advances and adoption of scientific research, yield improvements can be accomplished with less strain on the soil and the environment. Climate change and desertification continue to alter agricultural zones worldwide[3], and the global stock of arable land has flat-lined or even declined[4]. Agricultural science can relieve many of the stresses placed on these lands by lessening the use of pesticides and

[1] www.brookings.edu/wp-content/uploads/2016/07/06-foresight-african-agriculture-juma-gordon-1.pdf

[2] web.wellesley.edu/PublicAffairs/Releases/2008/020108.html

[3] ec.europa.eu/environment/integration/research/newsalert/pdf/climate_change_to_shift_global_spread_quality_agricultural_land_403na1_en.pdf

[4] www.fao.org/3/a-y4252e.pdf

fertilizers harmful to ecosystems, decreasing dependency on scarce water resources, and reducing pollutants. For example, in 2012, scientists developed a strain of black-eyed peas to protect against a pest that costs Nigerian farmers \$500 million in imported pesticides annually[1]. Wider adoption of this strain of pea would greatly reduce African countries' dependence on imported pesticides and cut down on overhead costs and environmental impacts, thus making their products more competitive on the regional and global market. Local communities both in the U.S. and in other agriculture producing countries may benefit from having both enhanced environmental conditions and productive yields that boost trade opportunities.

Preventing Conflict

Hungry people are desperate people. Food price spikes and resultant shortages sparked large riots and protests in Africa and the Middle East in 2007-2008, leaving tens of thousands of people dead from clashes and civil war[2]. Even localized conflicts can have outside impacts and set back the progress of developing economies by decades[3].

Civil strife has ramifications for the developed world as well. In addition to directly impacting people's lives in multiple ways, conflict interrupts economic activity and trade, further exacerbating a lack of resources in the conflict-ridden region. Prolonged famine can lead to further conflict, as in Yemen, where food has been a key recruiting tool for extremist groups[4]. In addition, displacement caused by conflict can lead to large refugee populations seeking asylum in developed nations. In a globalized world conflict is rarely confined to a single country's borders.



Venezuela Protestor: "There's No Food"

The disruption of developing economies by the pandemic calls for more engagement, not less. Global food security promoted through U.S. agriculture research and trade can build resilience in the face of conditions that may otherwise foment conflict, and countries that are more integrated into international trade systems are less likely to suffer from both civil and inter-state conflict[5]. By expanding trade opportunities for U.S. businesses, not only

[1] www.brookings.edu/wp-content/uploads/2016/07/06-foresight-african-agriculture-juma-gordon-1.pdf

[2] www.thechicagocouncil.org/sites/default/files/2013_Advancing_Global_Food_Security%283%29.pdf

[3] www.sipri.org/commentary/blog/2015/consequences-internal-armed-conflict-development-part-1

[4] youtu.be/sUpJdLaQg9E

[5] www.gsb.stanford.edu/insights/matthew-o-jackson-can-trade-prevent-war

will the U.S. economy grow, but also developing economies will increase in size and resilience, improving prospects of national security in the process.

Food security plays a key role in preventing conflicts. As a major agricultural exporter, the United States is uniquely situated to promote global stability by increasing its trade footprint, powered by agricultural science that helps to support plentiful harvests and high-quality foodstuffs in demand the world over.

Protecting U.S. Exports

Agricultural science helps to protect U.S. exports and imports from disease, sustaining trade relationships and facilitating economic exchange at the global level, as well as preventing the spread of diseases into the United States that could devastate the agricultural sector. Pests and diseases have the potential to severely impact the U.S. agriculture industry. Even minor blights can cost millions of dollars: if U.S. wheat production were to suffer even a minor outbreak of the common infection wheat blast, affecting only 5% of the crop, up to \$405



Fall Army Worm

million could be lost overnight[1]. As we have seen in the case of the coronavirus, insufficient research and planning for an attack by disease on our food supply could be catastrophic.

Public investments in agricultural sciences have already produced significant advances in disease treatment and prevention and continue to help the U.S. stay ahead of emerging threats to agriculture on a global level[2]. For example, the fall armyworm has been a persistent problem in the United States since the 18th century.

Now that armyworm has spread to Africa, the United States Department of Agriculture and the U.S. Agency for International Development are poised to build on and adapt the U.S. solutions with partner countries in the African context. In doing so, trade opportunities for U.S. products can continue to grow, maintaining the United States as a top food exporter, while at the same time allowing it to continue to import high-quality foods from countries with growing economies. Conversely, some diseases currently exist only outside of the U.S., and U.S. research funding is critical to prevent them from impacting U.S. crops and animals.

[1] www.gsb.stanford.edu/insights/matthew-o-jackson-can-trade-prevent-war

[2] Statista. "Total U.S. wheat production value from 2000 to 2017 (in 1,000 U.S. dollars)." Statista.com (New York). <https://www.statista.com/statistics/190362/total-us-wheat-production-value-from-2000>

It also allows the U.S. to partner with countries experiencing disease outbreaks such as the deadly African Swine Fever which has recently moved from sub-Saharan Africa to some Asian countries including China, South Korea, and Vietnam. There is neither treatment nor a vaccine for African Swine Fever; the only way to stop its spread is to cull the herd which would undoubtedly result in severe economic and trade impacts.[1]

Promoting Fresh and Varied Diets

Since 19th-century scientist Louis Pasteur discovered that milk, if heated, could keep much longer than if left raw, agriculture and food science has consistently made advances to improve food safety and long-term storage, as crops produced in one part of the world can now cross oceans to new markets. Agriculture R&D continues to make progress to preserve nutritious food for longer through natural means. For example, one group of researchers at Georgia State University is refining an all-natural method for blocking decomposition signaling between fruits, preventing the process of rot from beginning[2]. The economic potential of this and similar discoveries and advances in food preservation science would be a boon to the United States and other agricultural exporters.

Improving the quality of agricultural products also has the potential to decrease food waste. Worldwide, between 30-40% of all food grown is wasted or never consumed, even as millions worldwide continue to go hungry[3]. In the United States alone consumers waste almost a pound of food per person per day[4]. High-quality foods that retain their nutritional value while being stored for long periods of time could help ensure that good food is consumed with as little waste as possible in both the developing and



Fresh Food Waste

developed world, while also allowing for the shipment of perishable products over long distances with less risk of spoilage. The development of safer and more efficient food supply systems will benefit producers, consumers, and the environment by decreasing costs and waste.

[1] www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/swine-disease-information/african-swine-fever

[2] www.liebertpub.com/doi/pdf/10.1089/ind.2014.0016

[3] www.biotech-now.org/food-and-agriculture/2016/05/food-waste-can-biotech-play-a-role

[4] www.ars.usda.gov/news-events/news/research-news/2018/food-waste-resonates-beyond-the-trash-bin



Genetically Engineered Vitamin A Golden Rice

To address this plight, agriculture scientists in the United States and abroad continue to refine bio-fortified fruits and vegetables, such as golden rice, orange-fleshed sweet potato and bio-fortified cassava which provide necessary quantities of key nutrients[3]. Healthier diets mean stronger citizens which in turn can lead to healthier economies.

Undernutrition is a persistent health concern for impoverished, developing, and developed countries[1]. Caloric intake is important, but the right types of foods that provide a crucial mix of vitamins, minerals, and other nutrients are even more essential. A lack of high-quality and diverse food can cause lifelong growth problems, such as stunting in children, and result in long-term effects impacting their intellectual development and therefore their ability to achieve their full, productivity capabilities, and thus their entire lives[2].



Cassava Harvesting

[1]apps.who.int/iris/bitstream/handle/10665/277440/WHO-NMH-NHD-18.10-eng.pdf?ua=1

[2]www.biofortified.org/2012/08/orange-sweet-potato/

[3]www.biofortified.org/2012/08/orange-sweet-potato/

The Time for Investment is Now

The post-COVID-19 world remains unknown, but from a policy perspective there are two dangers. One, that the United States turns inward. The other, that the government tightens its belt and scrimps on the important public investment needed for future growth. With regard to agriculture, each would be unwise. The United States has been an historical leader in agriculture research that has benefited U.S. farmers and people across the globe. The unprecedented spending to provide emergency economic relief in the pandemic should not dissuade policymakers from maintaining the much smaller sums needed for long-term investment in agriculture. Continued U.S. leadership through taxpayer-funded research, including public-private research partnerships, will be critical to promoting economic recovery and meeting the food demands of a global population of nearly 10 billion by 2050.

The Lugar Center is an independent 501(c)(3) nonprofit organization located in Washington, D.C. Its affiliations with a number of prominent universities provide it with access to cutting edge research and analysis. The Center maintains a staff of senior policy experts who lead and coordinate collaborative engagement in the policy communities that form the basis of the Center's work. The Center advocates for evidence-based approaches and policy options to build a more stable and prosperous world.