How the United States Benefits from Agricultural and Food Security Investments in Developing Countries: Technology Spillover Examples

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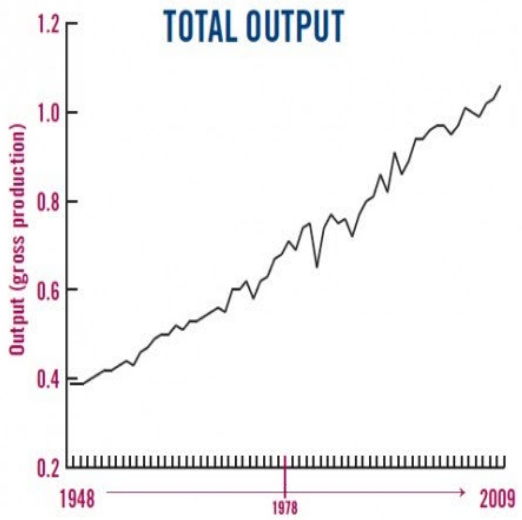
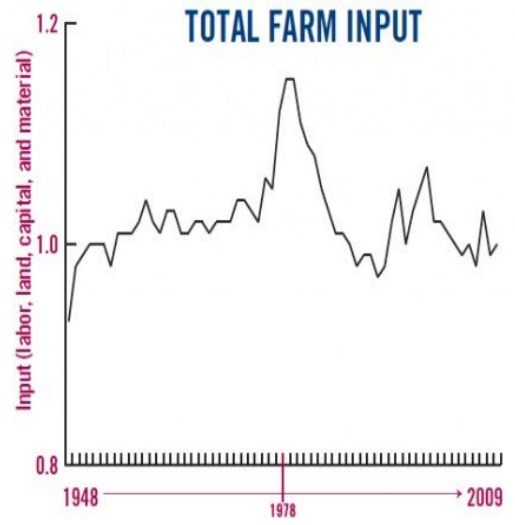
Benefits of Public Sector Investments in Agricultural Research

- Since the U.S. government began investing in agricultural research in the 19th century, American farmers have benefitted in terms of increased productivity and reduced production costs
  - Founding of U.S. Department of Agriculture (1862)
  - Establishing land-grant university system (Morrill Acts-1862, 1890)
  - Agricultural experiment stations (Hatch Act-1887)
  - Cooperative extension service (Smith-Lever-1914)
- Agricultural productivity has increased markedly, with aggregate U.S. agricultural output increasing by 268 percent from 1949 to 2007



SOURCE: http://www.ers.usda.gov/data-products/agricultural-productivity-in-the-us.aspx#28247 TABLE 1



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U.S. Investments in International Agricultural Research—Support of the CGIAR system

- **Early research on wheat and corn started by Mexican government in 1943—early funding from the Rockefeller Foundation**
  - Dr. Norman Borlaug, the 1970 Nobel Peace Winner, did his initial work on high-yielding wheat varieties at that institution in 1940s and 1950s
  - The International Maize and Wheat Center (CIMMYT) formally established in in Mexico in 1966
- **Broader CGIAR system established in 1971**
  - Now encompasses CIMMYT and 14 other international ag research centers around the world
  - In aggregate, every dollar the US provides to the CGIAR produces $17 in economic returns to US agriculture.

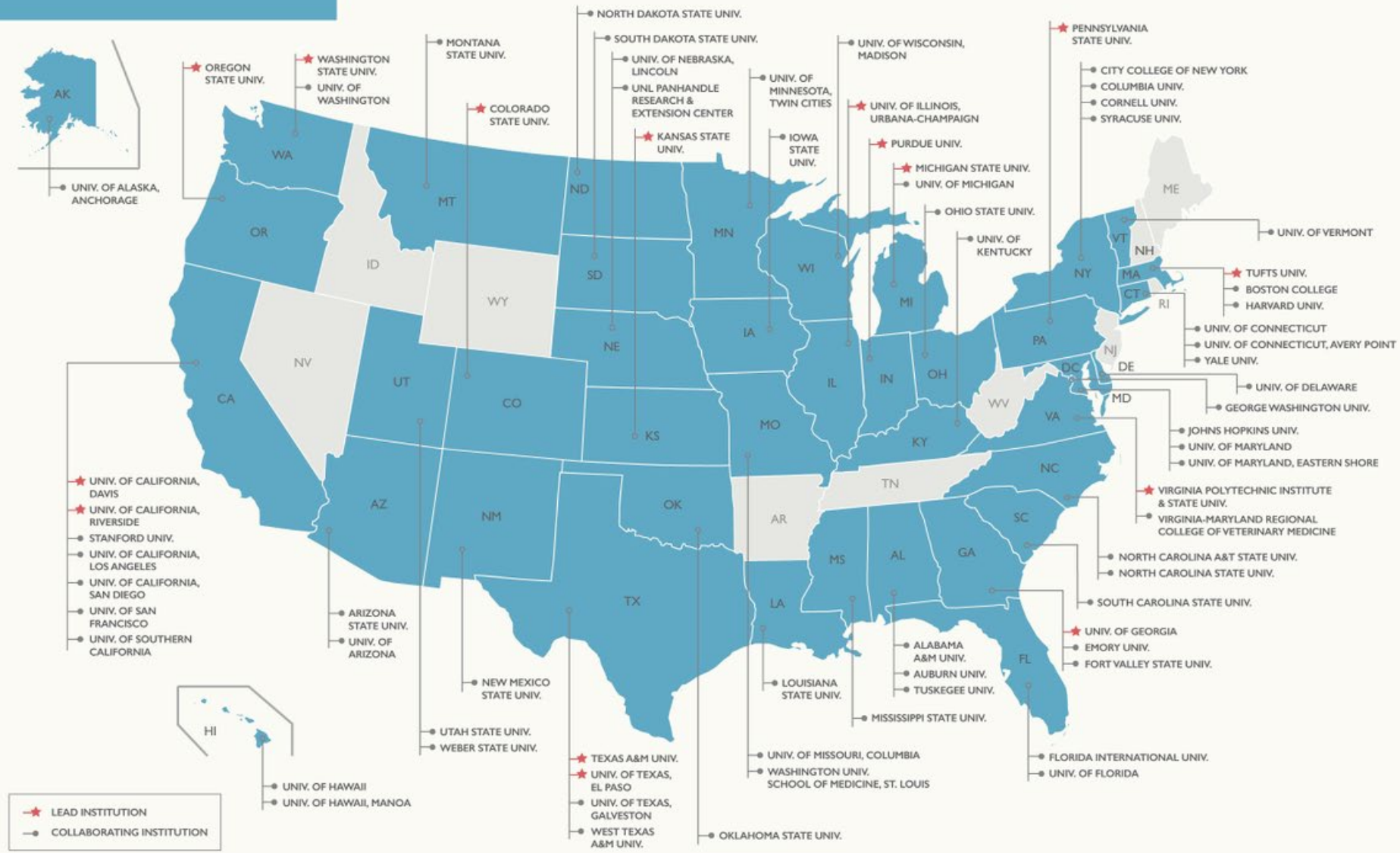
Number of CGIAR Research Centers **15**

U.S. Investments in International Agricultural Research—Support Through U.S. Universities

- **Between 1977 and 2012, the U.S. government provided support for international agricultural research through the Collaborative Research Support Programs (CRSP's)**
  - These programs were subject-matter specific (including areas such as Aquaculture, IPM practices, Soybeans, Wheat) and involved partnerships between U.S. universities, foreign universities, and NGO's
  - A key part of the program was the training of thousands of young foreign scientists who pursued advanced degrees in agricultural disciplines at U.S. universities.
- **In 2013, USAID established *Feed the Future* Innovation Labs, with the goal of developing science-based solutions to be scaled up by USAID to reduce global hunger, poverty, and undernutrition. There are now 24 such labs headquartered at 15 different universities.**

FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

FEED THE FUTURE WORKS WITH U.S. UNIVERSITIES TO FIGHT GLOBAL HUNGER



The Feed the Future initiative partners with universities throughout the world: This is a sampling of university partners located in the United States. For more information and updates, visit www.feedthefuture.gov or follow on Twitter @FeedtheFuture.

Spillover benefits to U.S. farmers: wheat and rice productivity research

- **Rice and wheat are cereal crops raised throughout the world, accounting for about 35 percent of all calories consumed in the world by humans.**
- **Measured in terms of improved yields and reduced input costs from the use of new varieties of wheat and rice, the return on U.S. investment in CIMMYT and IRRI (rice) research generated cumulative benefits to U.S. farmers estimated at $3.4 billion to $15.6 billion between 1960 and 1993.**
  - Each 100 dollars worth of benefit to the U.S. economy from higher productivity in wheat and rice cultivation cost taxpayers only two cents.

Spillover benefits to U.S. farmers: wheat and rice research

- A 2016 study estimated that, for wheat alone, the financial impact in the United States of CIMMYT research is $140 to $180 million annually, representing a benefit-cost ratio of between 32:1 and 40:1.

- Technology spillover is also important when it comes to tackling crop diseases. The economic impact of an “avoidance technology” can be estimated only by making assumptions about the likely transmission and spread of the disease or pest. Research on how to stop Ug99 wheat stem rust is being conducted at USDA’s Cereal Disease Lab in Minnesota.

  - The projected cost to the U.S. agricultural sector of the arrival of Ug99 wheat stem rust would range between $1.5 billion (for a one-year outbreak in North Dakota only due to human transmission) up to $9.8 billion (for a multiyear outbreak in several Great Plains states, with U.S. wheat assumed to be widely banned by export customers who do not yet have this problem in their countries).

Spillover benefits to U.S. farmers: peanut research

- **The peanut (aka the groundnut) is an important staple crop in Asia and Sub-Saharan Africa and is the fourth most important source of edible oil.**
  - Peanut research funded by USAID creates technologies and knowledge that increase the production, quality, and consumption of peanuts around the world, including in the United States.
  - This work was initiated under the Peanut CRSP run out of the University of Georgia, which still hosts the Feed the Future Innovation Lab for Peanuts today
- **Many new varieties developed by the USAID program have been released in the United States. Enhanced traits include:**
  - High oleic oil content (improves shelf life)
  - Fungal disease resistance

Spillover benefits to U.S. farmers: peanut research and aflatoxin

- **Research on aflatoxin, a deadly and costly threat to food safety in peanuts and other crops, has been a major focus of the FTF peanut program.**
- **Aflatoxin is a natural carcinogen found on peanuts and other agricultural crops, especially maize (corn).**
  - One such solution is a new peanut variety that is resistant to the mold that produces aflatoxin.
  - The program is also conducting research on management of insects and soil pests that exacerbate the production of aflatoxin-producing mold in the field is also relevant to U.S. peanut growers.
- **Other FTF labs are looking at different aspects of aflatoxin infection**
  - the Nutrition Lab conducting research into its impact on childhood development, and
  - the Post Harvest Loss lab studying how to keep aflatoxin from spreading in storage.

Additional examples of spillover benefits

- **Grain sorghum research**
  - Work at USAID-funded lab for sorghum developed varieties resistant to sugarcane aphid, which led in 2018 to the commercial release of 19 different lines of sorghum seed in the U.S. with that resistance built in.
  - Past research in this area generated benefits for US farmers estimated at $389 million for 1989 alone
- **Edible bean research**
  - USAID's long-term support of the bean breeding program has resulted in the development of 40 bean varieties now commercially grown in the United States, all with one or more parents from the program.

Concluding Remarks

- These are just a couple of examples of how U.S. farmers have benefitted from U.S. investment in international agricultural research.
- Spillover benefits from research on other crops and livestock can also be documented
- Additional benefits include the research training and hands-on experience provided to U.S. graduate students under these programs