

ASTI IN RETROSPECT 05

The Allocation of Research Resources

This year marks the 20th anniversary of the inception of ASTI. During this time, governments, donors, and international organizations have used ASTI's evidence to guide agricultural research investment and policy decisions, to assess areas of underinvestment, to identify capacity gaps and training needs, and to demonstrate the returns to agricultural research investment. This series of notes marks this important milestone by focusing on—and updating—some of the key advancements and insights ASTI data have enabled in the past 20 years. This note focuses on the allocation of agricultural research resources, in terms of financial investment and researchers' time, to different commodities and lines of research.

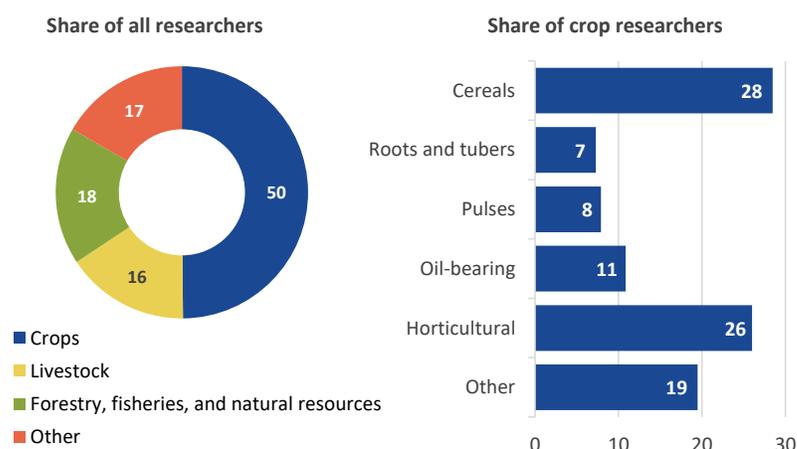
KEY ADVANCEMENT

The allocation of scarce resources among various lines of agricultural research is a significant policy decision, which—among other factors—affects whether and to what extent research delivers its intended results and has lasting impact. For these reasons, detailed information on the allocation of full-time equivalent (FTE) researchers across specific areas of focus were included in ASTI's data collection activities.^{1,2}

RESULTING INSIGHTS

Crop research is the dominant commodity group in most of the world's countries (Figure 1). As of the mid-2010s, half of all agricultural researchers in a sample of 83 developing countries for which detailed data were available conducted crop research; 16 percent of researchers were working on livestock issues (including veterinary medicine); and 18 percent of researchers focused on research related to forestry, fisheries, and natural resources. The remaining researchers were working in such areas as socioeconomics, agricultural engineering, and onfarm postharvest activities. As of mid-2010s, cereals and horticultural crops were the two most researched crops, accounting for 28 and 26 percent, respectively, of the time spent on crop research. The data reveal substantial national and regional differences (see overleaf for details).

1. Focus of agricultural research by commodity, mid-2010s (%)

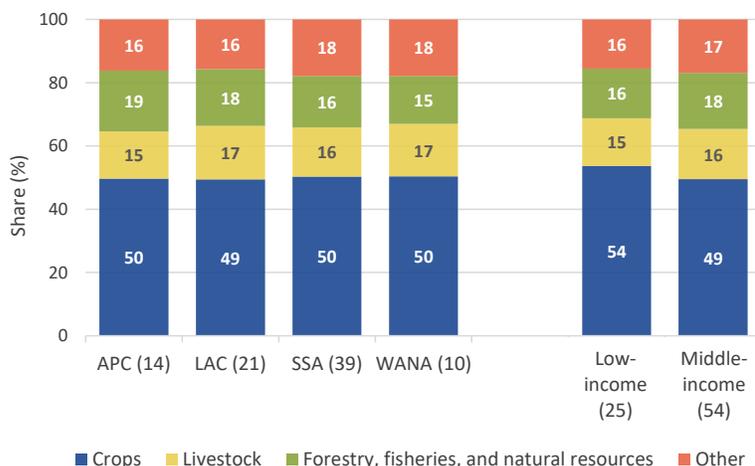


Note: Data are based on a sample of 83 developing countries for which data were available.

TOO MUCH EMPHASIS ON STAPLE CROPS?

There appears to be a common perception that funding for agricultural research has been heavily biased toward staple crops, including maize, rice, and wheat. While it is important that food systems diversify beyond productivity gains to include factors like nutrition and nutrition security, ASTI evidence has dispelled the notion that staple crops are the dominant focus of agricultural research. Evidence shows that many national agricultural research systems have a broad focus on a wide variety of both staple and nonstaple crops, as well as many other important areas, such as livestock, natural resources, and socioeconomics.

2. Area of research focus by region, national income level, and commodity group, mid-2010s (%)



Notes: APC = Asia–Pacific, LAC = Latin America and the Caribbean, SSA = Africa south of the Sahara, and WANA = West Asia and North Africa. Figures in parentheses indicate the number of countries in each category.

OVERVIEW

A balanced research portfolio, allocating sufficient resources across the areas of highest priority, is a fundamental aspect of ensuring that research outcomes have lasting positive impacts—both in increasing agricultural productivity and in reducing poverty. But governments and agricultural research agencies, especially in small countries, are often severely challenged by the limited resources they have available.

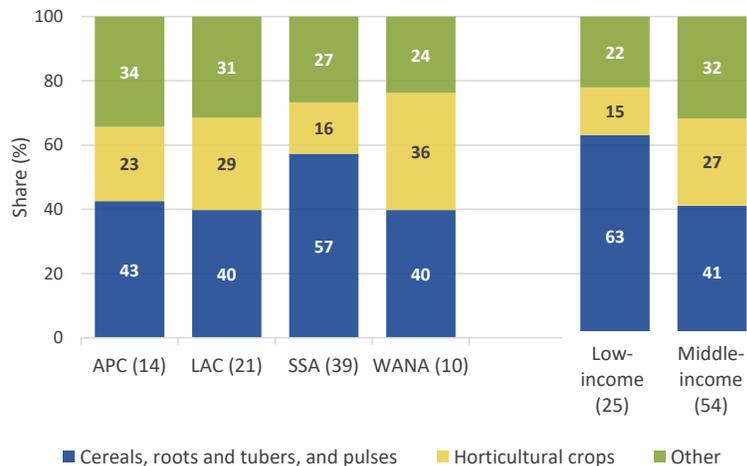
THE ALLOCATION OF RESEARCHERS’ TIME ACROSS COMMODITY GROUPS

As of the mid-2010s, on average, national agricultural research systems (NARSs) across the regions of the developing world allocated equal amounts of researchers’ time to crop- and noncrop-related issues (Figure 2). Overall, agricultural researchers in low-income countries focused more of their time on crop research than on other commodity areas.

Data revealed important differences across countries. In Botswana, for example, a higher proportion of agricultural researchers’ time was allocated to livestock-related issues than to crop-related issues (48 percent compared with 33 percent, respectively). Similarly, in Mauritania, fisheries research receives relatively more attention (42 percent), and in Indonesia forestry research is an important area of focus (30 percent).

NARSs in Africa south of the Sahara (SSA) allocate more resources to staple crops, defined here to include cereals, roots and tubers, and pulses (Figure 3). Research in other developing regions tends to focus more on nonstaple crops. This is in part because countries in the other regions are generally more developed than those in SSA. In fact, the sample’s 25 low-income countries allocated an average of 63 percent of their agricultural researchers’ time to

3. Area of crop focus by region, national income level, and type of crop, mid-2010s (%)

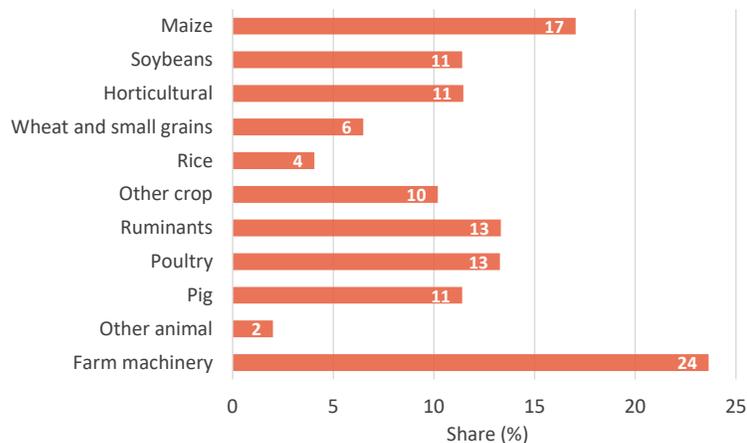


staple crops. This compares with 41 percent for the sample’s 54 middle-income countries.

On average, the most researched crops included cereal crops (28 percent) and horticultural crops (26 percent). Roots and tubers were the most important group of crops being researched in the Sahel countries of West and Central Africa, and rice was the most researched crop in Southeast Asia. This is not surprising given the importance of these crops as staple foods in most countries in the respective subregions. Many NARSs in West Asia and North Africa (WANA), as well as tropical countries in Latin America and the Caribbean (LAC) and SSA allocated considerable shares of their research resources to fruit and vegetables. In a number of countries, a significant proportion of crop research is dedicated to nonfood crops. Export crops are important in several countries, which is reflected in the relatively high shares of “other crops.” Examples include coffee in Colombia, cocoa and sugar in Ecuador, cotton and cocoa in Côte d’Ivoire, sugar in Mauritius, tea and oil palm in Sri Lanka, and tobacco in Zimbabwe.

Private research appears to be concentrated on a relatively small number of commodities (Figure 4). Fuglie (2016) found that, globally, maize and soybeans are by far the most intensively researched crops by the private sector, followed by fruit and vegetables, wheat, poultry, rice, pigs, cotton, oilseed, sugar crops, and aquaculture. In contrast, commodities such as cassava, yams, sweet potatoes, bananas and plantains, coffee, and cocoa—which are economically important in many low- and middle-income countries, particularly in Africa—do not receive much attention from these global performers of private agricultural research. For this reason, there remains a crucial role for national government research agencies, universities, commodity boards, and CGIAR centers. And this is especially the case in areas where incentives for private research are low.

4. Commodity focus of private for-profit firms involved in agricultural research, 2014 (%)



Source: Calculated from total agricultural R&D spending levels provided by Fuglie (2016), excluding food industry research spending.

CONGRUENCE BETWEEN THE ALLOCATION OF RESOURCES TO RESEARCH AND COMMODITY PRODUCTION VALUES

It can be useful to compare the allocation of financial resources or researchers' time across major agricultural subsectors or key crops with their corresponding contribution to the value of agricultural production. This is known as the congruence or parity model. For example, if the value of rice output were twice that of maize, then congruence would be achieved if research on rice were to receive twice as much funding (or, say, employ twice as many scientists) as research on maize. If research spending or scientist shares are congruent with the corresponding value of output for a particular commodity—measuring the share of researchers per commodity to

the corresponding share of output—then the congruency ratio for that commodity would be 1.0.

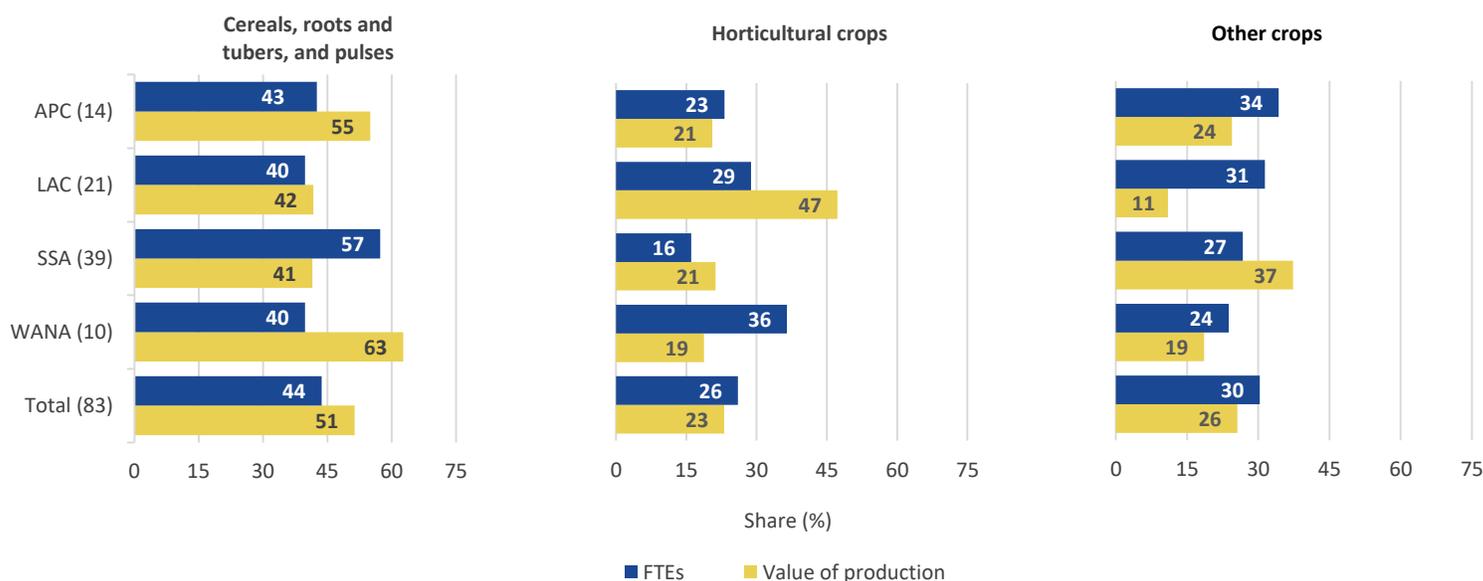
In SSA, the average share of research into staple crops was low based on the total value of crop production, implying that staple crops receive a comparatively higher level of research attention in this region (Figure 5). For Asia and the Pacific (APC) and WANA, the situation was reversed: less time was allocated to staple crops relative to their crop production value. Horticultural crops were comparatively under-researched in LAC and, to a lesser extent, SSA, whereas in WANA they receive comparatively more attention.

CONCLUDING COMMENTS

The allocation of resources across different lines of agricultural research is a key policy decision, not least due to constraints in the availability of financial and human resources, and the need to utilize these resources as efficiently and effectively as possible. It is also important for ensuring that the allocation of resources aligns with the strategic priorities of the country in question. Allocations of agricultural research investment differ markedly across countries. For some, self-sufficiency in staple crop production takes priority, whereas for others, developing new value chains and increasing agricultural exports are the principal goals. Such policy decisions also have impacts on future agricultural growth patterns.

ASTI evidence shows that agricultural research continues to be extremely fragmented in many countries, with most focusing on a large number of subsectors, such as crops, livestock, forestry, fisheries, and natural resources. Crops have remained the dominant subsector, but most countries focus their agricultural research efforts across a wide range of crops.

5. Congruence of crop groups by region, mid-2010s (%)



Note: Data in parentheses indicate the number of countries in each regional category.

2001

KEY MARKERS OF ASTI'S EVOLUTION

- ✓ ASTI was established as a CGIAR public good in early 2001, led by IFPRI and the former International Service for International Agricultural Research.
- ✓ In those earlier years, ASTI undertook the somewhat daunting task of developing key indicators and statistical methods in alignment with international standards; initiating data-collection activities on an ad hoc, project-driven basis; and forging fledging relationships with potential national partners. And with the creation of its website, ASTI became one of the CGIAR's first sources of open-access data.
- ✓ With consistent funding from the Bill & Melinda Gates Foundation and numerous other supporters, ASTI matured to become a more holistic program, focusing not only on data collection, but also on building its partners' capacity, expanding its analysis and outreach activities, developing a suite of innovative online data tools, and contributing to influential global and regional initiatives and reports.
- ✓ Supplementary funding facilitated the expansion of geographic coverage, the initiation of more in-depth studies, and greater focus on increasing the capacity of ASTI's extensive network of national partners.

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

AUTHOR'S REFLECTIONS ON 20 YEARS

Twenty years ago—with email still relatively rare and Internet access very limited in developing countries—the only way to get information was to send (and resend) letters, faxes, and telexes, and to visit (and revisit) research institutes in person. Then came the fastidious work of manually entering the data into computer files. Thankfully, much has changed. Greater Internet access paved the way for ASTI to make its data freely available online, becoming one of the CGIAR's first open-access data sources. Technological advancements not only allowed collecting, processing, and sharing data to be done effectively, but also facilitated the development of creative solutions for accessing, presenting, and analyzing data. Fruitful partnerships became possible across national, regional, and international boundaries. Importantly, sustainable funding from the Bill & Melinda Gates Foundation and numerous other donors facilitated the expansion and capacity building of ASTI's network, collaboration with partners to undertake more in-depth analyses of the data's implications, and greater outreach to disseminate the resulting findings.

2012

2013

2014

2015

2016

2017

2018

2019

2020

RELEVANT RESOURCES

ASTI. 2019. "ASTI database." International Food Policy Research Institute, Washington, DC.

Beintema, N., and G. Stads. 2017. *A Comprehensive Overview of Investments and Human Resource Capacity in African Agricultural Research*. ASTI Synthesis Report. Washington, DC: International Food Policy Research Institute.

Fuglie, K. 2016. "The Growing Role of the Private Sector in Agricultural Research and Development World-Wide." *Global Food Security* 10: 29–38.

Pingali, P. 2015. "Agricultural Policy and Nutrition Outcomes: Getting Beyond the Preoccupation with Staple Grains." *Food Security* 7: 583–591.

Ruane, J., ed. 2019. *Proceedings of the International Symposium on Agricultural Innovation for Family Farmers: Unlocking the Potential of Agricultural Innovation to Achieve the Sustainable Development Goals*. Rome: Food and Agricultural Organization of the United Nations.

Stads, G., A. Nin Pratt, N. Omot, and N. Thi Pham. 2020. *Agricultural Research in Southeast Asia: A Cross-Country Analysis of Resource Allocation, Performance, and Productivity Impact*. ASTI Synthesis Report. Bangkok: Asia-Pacific Association of Agricultural Research Institutions and Washington, DC: International Food Policy Research Institute (forthcoming).

NOTES ON DATA

1. The underlying data presented in this note can be downloaded, by country and available year, via the [Data Tool](#) at ASTI's website.
2. ASTI's research allocation calculations are based on shares of time agricultural researchers spend on research (in full-time equivalents or FTEs). This method considers the proportion of time researchers spend on research compared with other nonresearch activities. University employees, for example, spend the bulk of their time on teaching, administration, and student supervision rather than on research. As a result, four faculty members estimated to spend 25 percent of their time on research would individually represent 0.25 FTEs and collectively be counted as 1.0 FTE.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

A world free of hunger and malnutrition

IFPRI IS A CGIAR RESEARCH CENTER

1201 Eye Street, NW, Washington, DC 20005 USA | T. +1-202-862-5600 | F. +1-202-862-5606 | Email: ifpri@cgiar.org | www.ifpri.org | www.ifpri.info

Nienke Beintema is the former head of ASTI. This series of notes has been prepared as an ASTI output and has not been peer reviewed; any opinions are those of the author and do not necessarily reflect the policies or opinions of IFPRI. The author acknowledges the Bill & Melinda Gates Foundation and the CGIAR Research Program on Policies, Institutions, and Markets for their generous support of ASTI and, in particular, this series of notes. She also thanks Mary Jane Banks who provided excellent editorial and graphic design support in the preparation of this series.

Copyright 2020 International Food Policy Research Institute. Sections of this document may be reproduced without the express permission of, but with acknowledgment to, IFPRI. This publication is licensed for use under a Creative Commons Attribution 4.0 International License (CC BY 4.0). To view this license, visit <https://creativecommons.org/licenses/by/4.0>.