FOOD POLICY INDICATORS: TRACKING CHANGE

Decision makers and policy analysts need solid evidence and timely information to develop and implement effective food policies. The International Food Policy Research Institute (IFPRI) develops and shares global public goods—including datasets, indicators, and indexes—as part of its mission to provide research-based policy solutions that sustainably reduce poverty and end hunger and malnutrition. This information can be used to gauge the impact of policy changes and the progress made on specific aspects of development.

This section provides updates on data generated by IFPRI research and illustrations of key trends. Indicators include investments in agricultural research, public spending on agriculture, capacity for food policy research, agricultural total factor productivity, and a hunger index at the country level, as well as projections for agricultural production, food consumption, and risk of hunger to 2030 and 2050. All indicators are available online with an interactive display of the data.

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Agricultural Science and Technology Indicators (ASTI)

Policy makers recognize that increased investment in agricultural research is key to increasing agricultural productivity. Despite this, many low- and middle-income countries struggle with capacity and funding constraints in their agricultural research systems.

Agricultural Science and Technology Indicators (ASTI), led by the International Food Policy Research Institute (IFPRI), within the portfolio of the CGIAR Research Program on Policies, Institutions, and Markets, works with national, regional, and international partners to collect time series data on the funding, human resource capacity, and outputs of agricultural research in low- and middle-income countries. Based on this information, ASTI produces analysis, capacity-building tools, and outreach products to help facilitate policies for effective and efficient agricultural research.

TRENDS IN CAPACITY AND INVESTMENT

Global investment in agricultural research, once heavily weighted toward the developed world, shifted dramatically in recent years toward the developing world. Whereas spending growth in high-income countries as a group has stalled since the turn of the millennium, the developing world has accelerated its agricultural research investments at a rapid pace, driven by high growth rates in China and India (Table 1).

Agricultural research spending and capacity in Latin America and the Caribbean and in Asia have grown rapidly since 2000, but considerable differences remain across countries. Brazil's world-class research infrastructure and outputs contrast sharply with the lagging infrastructure, investment levels, and capacity in many Central American and Caribbean island nations. China accounts for most of the agricultural research spending growth in Asia, with India and Indonesia close behind. But underinvestment in countries such as Cambodia, Lao PDR, and Pakistan impedes their ability to respond to the threats to food security associated with widespread poverty, rapid population growth, climate change, and environmental degradation.

Although agricultural research spending and human resource capacity in Africa south of the Sahara have grown considerably, this growth has been uneven and trends are driven by large countries such as Ethiopia, Nigeria, and South Africa. Furthermore, many countries are overly dependent on volatile and unsustainable donor funds. The region is dealing with serious challenges on the human capacity side: long-term recruitment restrictions have left many research agencies with aging pools of researchers.

Female scientists remain severely underrepresented in agricultural research, despite their unique position to address the pressing challenges of African farmers, the majority of whom are women. ASTI's Women in African Agricultural Research Data Portal—developed in partnership with African Women for Agricultural Research and Development (AWARD) and released in 2017—features detailed sex-disaggregated data on human resources in agricultural research, as well as graphic tools for country comparisons and analysis that allow researchers and policy makers to set priorities, establish benchmarks, and monitor progress over time. These data are currently for African countries, with plans to expand to other ASTI countries in the future. Such information is needed to understand the underlying obstacles faced by women agricultural researchers, and how to overcome them.

The West Asia and North Africa region has made valuable progress in agricultural research investment since the 2008 global food crisis, but inadequate systems, funding, and human resource capacity—coupled with a lack of political stability—hamper food security. Many national agricultural research institutes need to improve pay, working conditions, and incentives to compete with universities and attract, retain, and motivate well-qualified researchers.

In all regions, the imminent retirement of highly experienced agricultural researchers without adequate plans for their replacement creates concern about the quality of future research outputs.

INDICATORS

"Agricultural research" includes government, higher education, and nonprofit agencies, but excludes the private for-profit sector. Total agricultural research spending includes salaries, operating and program costs, and capital investments for all agencies (excluding the private for-profit sector) involved in agricultural research in a country. Expenditures are adjusted for inflation and expressed in 2011 prices. Purchasing power parities (PPPs) measure the relative purchasing power of currencies across countries by eliminating national differences in pricing levels for a wide range of goods. PPPs are relatively stable over time, whereas exchange rates fluctuate considerably. In addition to looking at absolute levels of agricultural research investment and capacity, another way of comparing commitment to agricultural research is to measure research intensity—that is, total agricultural research spending as a percentage of agricultural output (AgGDP).

"Total agricultural researchers" (excluding the private for-profit sector) are reported in full-time equivalents (FTEs) to account for the proportion of time researchers actually spend on research activities. A critical mass of qualified agricultural researchers is crucial for implementing a viable research agenda, for effectively communicating with stakeholders, and in securing external funding. Therefore, it is important to look at the share of PhD-qualified researchers. Gender balance in agricultural research is important, given that women researchers offer different insights and perspectives that can help research agencies more effectively address the unique and pressing challenges of female farmers. Age imbalances among research staff should be minimized. Having too many researchers approaching retirement age can jeopardize the continuity of future research.

Research involves unavoidable time lags from the point when investments are made until tangible benefits are attained; in the interim, long-term, stable funding is required. The volatility coefficient measures the volatility of agricultural research spending by applying the standard deviation formula to average one-year logarithmic growth of agricultural research spending over a certain period. A value of 0 indicates "no volatility"; countries with values between 0 and 0.1 are classified as having "low volatility"; countries with values between 0.1 and 0.2 are considered to have "moderate volatility"; and countries with values above 0.2 fall into the "high volatility" category.

MORE INFORMATION

Only a fraction of the available ASTI indicators is presented here. The ASTI website offers additional indicators, including national-level time series data on researcher capacity by qualification level, age bracket, discipline mix, and commodity, as well as a detailed breakdown of agricultural research investment. Interactive pages on the ASTI website allow users to access country-level time series data, make cross-country comparisons, create graphs, and download country datasets. The country pages also feature recent ASTI factsheets, other country-level publications, and detailed institutional information on agencies involved in agricultural research. The interactive benchmarking tool on the ASTI website is a convenient map-based instrument allowing users to make cross-country comparisons and rankings based on a wide set of financial and human resource indicators. The detailed ASTI datasets are available in an easy-to-use data download tool. Detailed information on definitions, methodology, and calculation procedures are available at www.asti.cgiar.org.

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TABLE 1 Agricultural Science and Technology Indicators

Countries by region	Year	Agricultural research spending				Agricultural researchers (FTEs)				
		2011 PPP dollars (million)	2011 US dollars (million)	as a share of AgGDP	Volatility	Total	Government share (%)	Female share (%)	PhD-qualified share (%)	Older than 50 share (%)
AFRICA SOUTH OF THE SAHARA										
Benin	2014	23.2	10.5	0.38	0.16	170.4	56.9	13.3	48.1	61.2
Botswana	2014	21.3	11.7	2.92	0.14	137.8	72.7	33.0	22.5	18.5
Burkina Faso	2014	48.5	21.9	1.01	0.31	310.8	88.6	19.3[a]	52.5	39.1
Burundi	2014	13.1	4.4	0.46	0.18	141.4	59.1	16.8	20.0	21.5
Cabo Verde	2014	2.3	1.4	0.95	na	22.3	94.4	38.2	11.2	59.6
Cameroon	2014	45.9	22.1	0.34	na	240.1	80.7	20.9	40.8	34.0
Central African Rep.	2011	3.4	1.9	0.16	na	134.0	70.7	19.4	14.0	47.2
Chad	2014	12.5	6.6	0.09	na	90.7	89.2	5.8	19.4	22.4
Congo, Dem. Rep.	2014	36.5	20.7	0.34	na	512.8	63.0	9.8	16.6	29.3
Congo, Rep.	2014	5.8	3.5	0.44	0.12	104.2	70.4	18.5	36.4	58.5
Côte d'Ivoire	2014	82.1	39.7	0.53	0.14	253.2	62.1	16.9	71.3	36.3
Eritrea	2011	2.9	1.1	0.30	na	116.8	67.1	6.8	10.8	19.9
Ethiopia	2014	127.3	37.1	0.24	0.18	2,768.5	89.7	10.2	7.2	4.8
Gabon	2011	1.2	0.8	0.11	0.43	48.8	72.3	23.0	22.1	25.0
Gambia	2014	5.1	1.7	0.80	0.25	60.4	81.9	6.8	13.1	32.5
Ghana	2014	197.4	91.3	0.99	0.14	575.0	70.9	21.9	40.8	38.4
Guinea	2014	7.7	2.9	0.30	0.29	258.7	86.9	7.4	15.3	51.2
Guinea-Bissau	2011	0.2	0.1	0.02	na	9.0	100.0	–	–	66.7
Kenya	2014	274.1	105.8	0.79	0.08	1,178.5	66.9	29.2	35.9	47.2
Lesotho	2014	2.4	1.3	0.94	na	45.6	78.9	48.0	12.1	15.1
Liberia	2011	6.7	3.5	0.51	na	45.1	71.0	20.4	10.6	24.6
Madgascar	2014	10.3	3.4	0.13	0.15	204.8	75.3	33.6	46.3	66.5
Malawi	2014	28.1	13.7	0.53	0.21	158.3	55.5	20.5	32.8	na
Mali	2014	37.9	16.9	0.38	0.20	285.7	83.7	11.6[b]	51.6	75.3[b]
Mauritania	2014	15.6	6.4	0.49	0.33	86.0	87.5	13.8	17.2	2.6
Mauritius	2014	35.2	19.5	5.89	0.12	152.9	72.8	40.4	14.1	36.4
Mozambique	2014	29.3	16.2	0.36	na	308.4	78.8	35.1	11.2	20.9
Namibia	2014	38.8	24.9	3.09	0.23	99.7	70.0	44.0	13.8	22.2
Niger	2014	14.5	6.8	0.23	0.12	182.2	77.7	14.9	40.1	35.3
Nigeria	2014	433.5	209.5	0.22	0.15	2,975.5	na	29.4[b]	23.7[b]	21.7[b]
Rwanda	2014	39.6	17.2	0.67	na	169.3	61.4	22.7	14.2	13.2
Senegal	2014	51.3	25.7	1.15	0.18	124.4	71.5	22.5[b]	71.7	48.3[b]
Sierra Leone	2014	15.3	5.5	0.24	0.40	123.7	88.1	20.2[b]	13.7	24.8[b]
South Africa	2014	417.4	274.4	2.78	0.08	811.3	76.5	na	na	na
Swaziland	2014	6.9	3.7	0.93	na	27.4	26.1	29.8	46.6	45.9
Tanzania	2014	103.9	34.5	0.29	0.29	857.7	70.3	32.1	23.8	26.7
Togo	2014	6.9	3.1	0.17	0.28	125.1	66.1	6.4	36.7	36.1
Uganda	2014	152.5	50.4	0.97	0.17	477.9	57.2	25.8	34.1	22.2
Zambia	2014	26.9	13.2	0.51	0.17	245.6	76.7	28.5[a]	14.1	18.1
Zimbabwe	2014	43.4	21.9	1.44	0.31	208.7	57.5	31.0	17.6	15.8

Table 1 continued

Countries by region	Year	Agricultural research spending				Agricultural researchers (FTEs)				
		2011 PPP dollars (million)	2011 US dollars (million)	as a share of AgGDP	Volatility	Total	Government share (%)	Female share (%)	PhD-qualified share (%)	Older than 50 share (%)
ASIA										
Bangladesh	2012	250.6	78.2	0.37	0.13	2,121.0	78.0	12.4	35.3	28.8
Cambodia	2010	22.4	7.4	0.18	na	284.4	55.1	21.9	5.9	4.0
China	2013	9,366.2	5,081.5	0.62	0.09	na	na	na	na	na
India	2014	3,298.4	1,067.8	0.30	0.05	12,746.6	38.7	18.3	73.2	32.8
Lao PDR	2010	na	na	na	na	227.2	84.1	na	6.5	21.8
Malaysia	2010	592.3	282.5	0.99	na	1,609.4	84.1	49.2	24.9	29.3
Nepal	2012	53.4	17.8	0.28	0.20	403.4	85.8	12.5	14.8	43.0
Pakistan	2012	332.5	93.7	0.18	0.09	3,678.3	85.5	10.8	20.7	27.6
Sri Lanka	2009	61.8	21.6	0.34	na	618.8	88.5	46.9	24.2	na
Viet Nam	2010	136.0	44.5	0.18	na	3,744.2	74.4	na	17.8	na
LATIN AMERICA AND THE CARIBBEAN										
Antigua and Barbuda	2012	1.0	0.7	2.98	na	7.5	93.3	27.2	31.6	47.4
Argentina	2013	732.1	474.7	1.29	0.13	5,824.5	50.2	45.2	20.8	38.7
Barbados	2012	1.3	1.3	2.01	na	9.9	70.7	na	na	na
Belize	2012	2.3	1.3	0.66	na	12.6	35.7	23.0	1.6	23.3
Bolivia	2013	58.9	25.0	0.93	na	190.3	28.0	17.7	11.0	33.3
Brazil	2013	2,704.0	2,377.9	1.82	0.06	5,869.4	71.3	37.1	72.5	44.4
Chile	2013	186.4	134.1	1.65	0.08	715.7	66.7	33.3	36.8	29.2
Colombia	2013	253.7	159.5	0.79	0.13	1,102.9	40.3	36.1	22.5	25.5
Costa Rica	2012	37.1	25.5	1.06	0.04	241.5	25.9	34.3	14.0	53.1
Dominica	2012	0.2	0.1	0.18	na	3.0	–	33.3	33.3	66.7
Dominican Rep.	2012	20.3	10.3	0.30	na	199.6	75.5	24.2	10.3	44.5
Ecuador	2013	27.3	14.4	0.18	na	149.4	72.6	17.3[a]	9.6	23.4[a]
El Salvador	2006	6.6	0.4	0.15	na	76.9	78.0	na	na	na
Grenada	2012	0.4	0.3	0.71	na	1.8	83.3	na	na	na
Guatemala	2012	15.6	7.3	0.14	0.09	141.8	54.3	20.0	9.6	41.5
Honduras	2012	7.5	3.9	0.17	0.09	87.6	24.3	13.6	5.7	34.1
Jamaica	2012	11.8	7.4	0.89	na	62.1	66.2	47.2	21.6	na
Mexico	2013	710.4	438.8	1.05	0.05	3,967.4	38.7	25.3	47.5	54.8
Nicaragua	2012	17.5	7.0	0.38	na	131.5	60.9	29.7	8.8	35.8
Panama	2012	15.5	8.5	0.74	0.08	133.0	87.8	17.7	7.5	56.1
Paraguay	2013	26.8	14.2	0.26	0.28	209.5	57.8	37.2	5.4	28.1[b]
Peru	2013	83.4	46.1	0.35	na	339.1	34.3	27.2	13.1	52.9
St. Kitts and Nevis	2012	0.8	0.5	5.13	na	4.5	2.2	82.2	4.4	41.1
St. Lucia	2012	0.3	0.2	0.63	na	2.2	–	9.1	–	50.0
St. Vincent and the Grenadines	2012	0.7	0.5	1.07	na	2.5	80.0	na	na	na
Trinidad and Tobago	2012	18.0	11.0	7.82	na	83.0	58.1	43.3	22.7	25.7[b]
Uruguay	2013	77.4	61.3	1.40	0.11	371.9	50.9	40.5	26.1	36.3
Venezuela	2013	86.2	54.5	0.31	na	503.1	83.1	48.2	16.3	39.9

Table 1 continued

Countries by region	Year	Agricultural research spending				Agricultural researchers (FTEs)				
		2011 PPP dollars (million)	2011 US dollars (million)	as a share of AgGDP	Volatility	Total	Government share (%)	Female share (%)	PhD-qualified share (%)	Older than 50 share (%)
WEST ASIA AND NORTH AFRICA										
Algeria	2012	91.6	38.3	0.21	na	593.4	69.8	51.3	23.0	37.5[b]
Egypt	2012	528.4	144.7	0.44	na	8,419.7	86.1	36.3	67.6	na
Jordan	2012	36.2	15.0	1.84	na	272.3	72.5	18.3	35.5	39.7
Lebanon	2012	38.2	21.3	0.95	na	209.2	58.4	48.2	44.6	13.0
Morocco	2012	147.3	442.3	0.49	na	556.3	72.4	23.3	40.0	39.0
Oman	2012	110.0	2.6	6.51	na	243.6	91.5	31.1	25.5	10.1
Sudan	2012	57.3	26.3	0.14	0.19	932.8	72.9	na	36.9	20.3[b]
Tunisia	2012	63.0	97.1	0.64	na	541.6	80.0	32.7	61.8	38.3
Turkey	2012	537.3	376.7	0.51	na	3,009.4	60.4	32.5	41.6	11.1
Yemen	2012	38.7	13.7	0.56	na	526.7	78.7	7.1	28.7	27.0

Notes: na = not available. PPP = purchasing power parity. AgGDP = agricultural gross domestic product. (-) = zero. FTE = full-time equivalent.

Table only includes countries where ASTI has conducted survey rounds since 2002 with the exception of China, for which data were estimated based on statistical yearbook data published by the Chinese Ministry of Science and Technology. Agricultural research includes government, higher education, and nonprofit agencies, but excludes the private for-profit sector.

a = data exclude the nonprofit sector. b = data exclude the higher education sector.

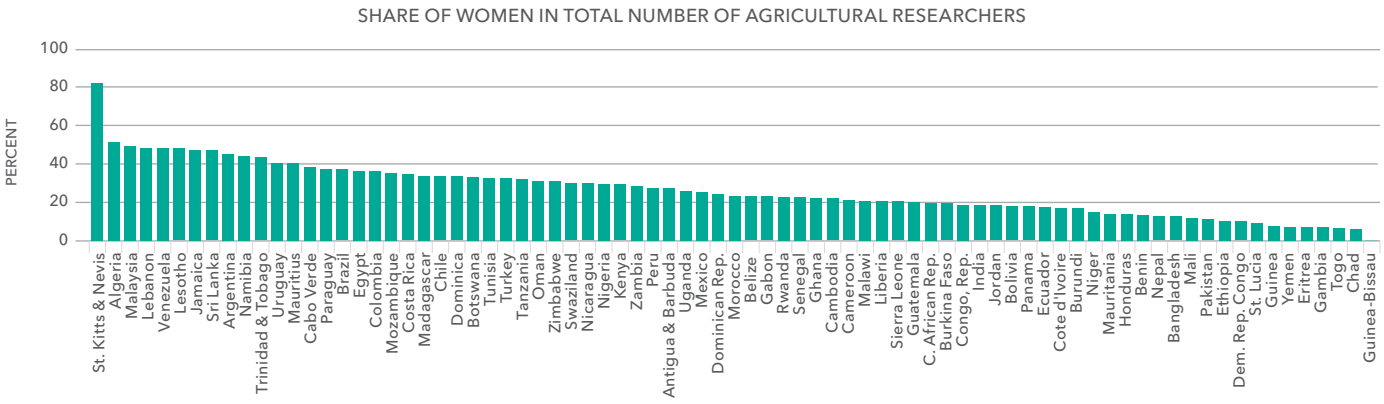
ASTI

AGRICULTURAL SCIENCE AND TECHNOLOGY INDICATORS

Trend 1

WOMEN ARE PLAYING A GROWING ROLE IN AGRICULTURAL SCIENCES

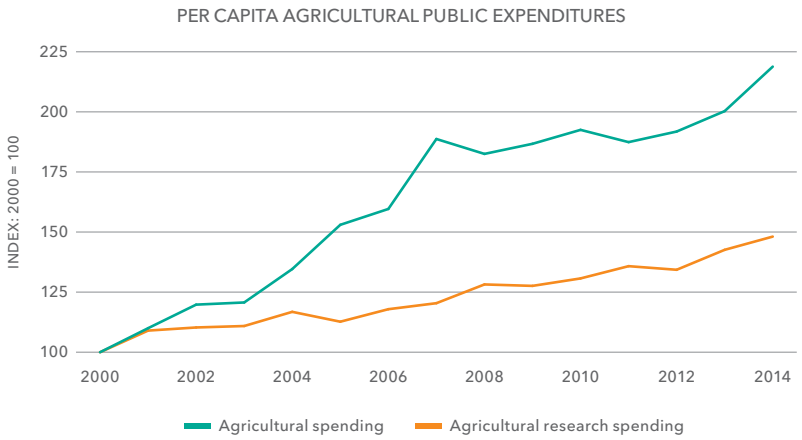
The number of women agricultural researchers rose in both absolute and relative terms between 2008 and 2014; however, the share varies widely across countries. Fewer women than men are trained, recruited, and employed in the agricultural sciences. Where they are employed, women researchers are often young and less likely to have postgraduate qualifications than their male colleagues.



Trend 2

SPENDING ON RESEARCH IN AFRICA LAGS BEHIND AGRICULTURAL SPENDING INCREASES

Countries in Africa south of the Sahara have made progress in honoring regionwide commitments to support agriculture, as outlined in the Comprehensive Africa Agriculture Development Programme (CAADP). However, many African countries are overlooking research in favor of spending on other agricultural areas such as farm support, subsidies, and irrigation—slowing progress toward sustainable development.



Source: Data on agricultural spending are from ReSAKSS (www.resakss.org); data on agricultural research spending are from ASTI and various secondary sources.

Note: Agricultural spending only includes funds derived from national governments; agricultural research spending includes funds derived from governments, donors, development banks, producer organizations, and revenues generated internally by research agencies.

Statistics on Public Expenditures for Economic Development (SPEED)

The Statistics on Public Expenditures for Economic Development (SPEED) database is a resource of the International Food Policy Research Institute (IFPRI) that contains information on agricultural and other sectoral public expenditures in 147 countries from 1980 to 2014 (see Table 2).

Policy makers, researchers, and other stakeholders can use this robust database to examine both historical trends and the allocation of government resources across sectors. It also allows for comparisons with other countries within a region or at a similar level of development. Because the SPEED database covers many countries for a long time period, it allows analysts of government spending to examine national policy priorities, as reflected in the allocation of public expenditures, and track development goals and the cost-effectiveness of public spending both within and across countries. In addition to the dataset in the form of spreadsheets, SPEED includes user-friendly tools that enable stakeholders to generate charts and geographic expenditure-maps using menu-driven options.

Indicators reported include total agricultural expenditure, agricultural spending per capita, and the ratio of agricultural spending to agricultural gross domestic product (GDP) for the period 1980 to 2014. IFPRI researchers have compiled data from multiple sources, including the International Monetary Fund, World Bank, United Nations, and national governments, and conducted extensive data checks and adjustments to ensure consistent spending measurements over time that are free of exchange-rate fluctuations and currency denomination changes.

DOWNLOAD DATA
https://doi.org/10.7910/DVN/INZ3QK

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TABLE 2 Agricultural public expenditure for economic development, by country

Region/country	Agricultural expenditure (billions 2011 constant US dollars)			Agricultural expenditure (billions 2011 PPP dollars)			Per capita agricultural expenditure (2011 constant US dollars)			Per capita agricultural expenditure (2011 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014
EAST ASIA AND PACIFIC																		
China	12.62	15.56	204.86	23.26	28.68	377.61	12.90	12.67	149.60	23.78	23.36	275.74	10.93	4.74	23.56	12.20	8.43	9.34
Fiji[a]	0.03	0.03	0.01	0.06	0.05	0.02	55.05	40.01	15.24	94.70	68.83	26.22	8.90	6.86	3.31	7.24	4.01	1.24
Indonesia	3.72	5.76		9.04	14.01		25.12	29.12		61.08	70.82		9.98	8.36		10.27	9.43	
Malaysia	1.15	1.44	1.72	2.41	3.02	3.60	83.12	69.48	57.45	174.30	145.69	120.46	10.20	8.34	5.59	8.75	5.10	2.47
Mongolia[b]		0.02	0.08		0.04	0.18		6.78	26.74		15.97	63.01		1.26	5.71		2.12	1.76
Myanmar[d]	0.29	0.19	0.24	1.00	0.64	0.81	8.51	4.23	4.59	28.98	14.38	15.61	8.02	2.66	1.17	23.57	14.90	6.26
Papua New Guinea	0.11	0.08		0.15	0.11		35.73	17.58		45.57	22.42		7.97	3.26		8.46	3.97	
Philippines	0.63	1.27	2.42	1.54	3.09	5.86	13.36	18.23	24.36	32.41	44.23	59.10	3.34	5.93	7.84	6.06	6.90	5.69
Singapore	0.03	0.04	0.12	0.04	0.06	0.18	12.41	11.89	22.69	17.51	16.77	32.01	5.47	24.78	123.89	0.44	0.24	0.25
Thailand	1.24	4.01	5.33	3.06	9.88	13.13	26.17	67.60	78.64	64.51	166.62	193.85	7.56	19.49	12.32	9.67	11.30	6.50
Tonga	0.00	0.00	0.01	0.01	0.00	0.01	52.53	8.67	52.67	62.53	10.31	62.68	6.13	1.23	7.29	9.97	0.80	3.13
Vanuatu	0.00	0.00		0.00	0.00		14.97	22.79		13.33	20.29		2.55	2.67		2.96	3.13	
Viet Nam[b]		0.79	1.50		2.41	4.57		10.50	16.56		32.09	50.63		6.15	5.33		8.20	8.37

Table 2 continued

Region/country	Agricultural expenditure (billions 2011 constant US dollars)			Agricultural expenditure (billions 2011 PPP dollars)			Per capita agricultural expenditure (2011 constant US dollars)			Per capita agricultural expenditure (2011 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014
SOUTH ASIA																		
Afghanistan[a]			0.25			0.69			8.30			22.36			4.56			1.81
Bangladesh[a]	0.29	0.36	1.79	0.93	1.14	5.74	3.56	3.01	11.41	11.39	9.66	36.54	2.97	2.74	8.30	13.02	4.93	11.08
Bhutan	0.01	0.04	0.07	0.04	0.11	0.20	34.88	78.80	96.09	96.56	218.17	266.06	19.53	23.98	21.91	31.86	19.69	13.18
India[a]	2.57	5.07	20.95	7.93	15.65	64.71	3.68	5.27	16.37	11.37	16.29	50.58	2.63	3.14	5.94	7.18	5.26	5.97
Maldives[c]	0.00	0.02	0.01	0.00	0.04	0.01	14.76	91.06	18.88	25.28	155.94	32.33	6.99	46.24	7.17	8.84	12.07	0.74
Nepal	0.10	0.14	0.44	0.31	0.43	1.31	6.84	6.62	15.51	20.56	19.89	46.62	3.93	3.96	6.83	16.39	9.64	10.98
Pakistan	0.15	0.09	0.95	0.52	0.33	3.38	1.86	0.76	5.15	6.61	2.68	18.25	0.98	0.31	1.66	2.13	0.46	1.90
Sri Lanka	0.29	0.39	0.77	0.84	1.11	2.20	19.50	21.35	37.31	55.78	61.07	106.73	9.44	8.69	10.77	5.77	5.28	5.74
EUROPE AND CENTRAL ASIA																		
Albania		0.07	0.07		0.15	0.15		21.81	23.60		47.37	51.26		2.15	2.56		3.95	1.74
Azerbaijan		0.20	0.64		0.45	1.40		26.27	66.30		57.56	145.27		6.68	16.54		8.01	2.45
Belarus		0.41	1.54		1.07	4.04		39.88	161.63		105.00	425.57		12.56	31.59		5.96	6.04
Bulgaria[a]		0.03	0.51		0.05	1.03		3.16	70.84		6.36	142.61		0.55	19.28		0.25	2.37
Georgia			0.12			0.24			30.72			60.32			9.41			2.50
Kazakhstan			1.52			2.77			87.34			159.72			16.43			3.43
Kyrgyzstan		0.03			0.08			6.36			16.54			2.41			3.54	
Latvia[a]		0.14	0.15		0.20	0.21		58.16	74.97		82.09	105.82		12.76	16.41		2.83	1.35
Lithuania		1.45	0.43		2.27	0.67		398.62	147.31		625.40	231.11		68.61	28.68		29.69	2.56
Moldova		0.02	0.11		0.05	0.22		5.14	25.93		10.89	54.98		1.69	10.34		1.38	3.33
Russian Federation		0.43	14.29		0.73	24.21		2.92	99.64		4.95	168.79		0.62	20.26		0.15	1.08
Serbia[b]			0.50			0.97			68.97			134.98			14.33			2.30
Ukraine			0.59			1.37			13.16			30.52			4.57			0.76
MIDDLE EAST AND NORTH AFRICA																		
Algeria[c]		0.85	3.00		2.03	7.17		29.41	81.64		70.34	195.22		7.62	18.48		2.42	3.68
Bahrain[c]	0.02	0.02	0.02	0.03	0.03	0.04	41.71	29.88	18.18	74.41	53.31	32.43	18.58	17.04	28.36	0.63	0.54	0.31
Egypt	1.10	1.47		4.02	5.36		25.37	23.52		92.63	85.89		12.78	8.43		5.14	4.39	
Iran	2.27	2.43		5.17	5.55		58.61	40.37		133.61	92.02		10.17	6.67		3.36	4.22	
Jordan	0.03	0.18	0.07	0.08	0.44	0.16	13.85	41.99	9.07	33.52	101.62	21.94	8.08	37.73	6.45	0.98	4.46	0.69
Kuwait[a]	0.02	0.24	0.38	0.03	0.39	0.62	12.27	147.66	106.70	19.68	236.93	171.22	13.33	70.59	64.98	0.10	0.59	0.61
Lebanon[b]		0.03	0.03		0.05	0.05		9.36	5.68		16.82	10.21		2.58	1.83		0.40	0.24
Morocco	0.59	0.58		1.29	1.28		29.29	21.41		64.43	47.11		10.61	8.67		6.80	4.21	
Palestine, State of[b]			0.02			0.01			5.49			2.51			4.56			0.73
Oman[a]	0.10	0.25	0.19	0.19	0.49	0.39	84.01	112.43	49.75	168.63	225.65	99.86	24.24	20.17	20.83	1.85	1.56	0.57
Syrian Arab Republic	0.45	0.77		1.01	1.71		50.54	53.82		112.32	119.61		12.00	9.02		5.04	10.24	
Tunisia[b]	0.56	0.56	0.74	1.33	1.34	1.76	88.03	61.69	67.92	209.29	146.67	161.47	34.71	25.19	17.08	15.63	8.17	4.16
Turkey	0.58	0.68	10.25	0.98	1.15	17.31	13.25	11.63	132.26	22.38	19.63	223.35	1.52	1.52	16.95	2.08	1.03	3.22
United Arab Emirates[a]	0.09	0.08	0.09	0.13	0.12	0.13	87.88	35.01	9.98	126.85	50.53	14.41	14.01	2.78	3.40	0.83	0.67	0.09
Yemen		0.05			0.13			3.10			8.74			1.86			1.68	
LATIN AMERICA AND THE CARIBBEAN																		
Argentina	0.30	0.26		0.47	0.40		10.73	7.37		16.55	11.37		2.19	1.87		0.65	0.58	
Bahamas[d]	0.01	0.02	0.01	0.01	0.02	0.02	45.81	55.87	41.49	48.25	58.86	43.71	11.45	7.47	8.88	1.45	1.67	0.97
Barbados	0.03	0.03		0.03	0.03		106.40	113.90		105.52	112.95		12.77	28.30		3.20	2.80	

Table 2 continued

Region/country	Agricultural expenditure (billions 2011 constant US dollars)			Agricultural expenditure (billions 2011 PPP dollars)			Per capita agricultural expenditure (2011 constant US dollars)			Per capita agricultural expenditure (2011 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014
Belize	0.01	0.01		0.02	0.02		79.20	42.87		137.75	74.58		12.96	6.96			4.61	
Bolivia	0.05	0.01		0.12	0.01		9.28	0.83		21.84	1.95		2.61	0.32		3.33	0.35	
Brazil		16.41	11.30		18.66	12.85		100.81	54.82		114.63	62.34		21.12	8.68		5.70	1.71
Chile	0.29	0.27	1.08	0.40	0.37	1.50	25.62	18.71	60.95	35.61	26.00	84.70	9.16	4.26	12.65	1.77	1.18	1.65
Colombia[a]	0.22	0.40	0.00	0.35	0.64	0.00	7.93	10.70	0.03	12.62	17.02	0.04	1.40	2.21	0.01	2.00	1.77	2.10
Costa Rica	0.08	0.14	0.20	0.12	0.21	0.29	34.06	40.80	42.50	49.68	59.51	61.97	5.24	5.65	8.75	3.38	3.15	1.42
Dominican Rep.	0.28	0.22		0.55	0.43		48.50	27.65		95.34	54.35		11.93	8.66		16.71	7.83	
Ecuador[a]			0.32			0.61			20.44			38.85			4.23			1.40
El Salvador[a]	0.01	0.04	0.06	0.02	0.07	0.12	2.59	6.68	9.57	5.15	13.28	19.02	0.36	1.73	2.41	5.80	1.69	0.98
Grenada		0.01			0.02			126.82			192.04			31.37			9.65	
Guatemala	0.22	0.07	2.16	0.46	0.16	4.64	30.24	7.11	134.86	64.94	15.26	289.55	6.95	1.82	37.51	7.88	2.72	29.32
Jamaica		0.09	0.10		0.14	0.15		35.55	34.83		56.42	55.28		7.89	11.28		2.13	2.06
Mexico[d]	8.53	3.42	5.67	13.81	5.54	9.18	123.03	36.26	47.81	199.20	58.72	77.41	20.68	9.77	15.71	14.56	3.36	2.32
Panama[a]	0.13	0.05	0.12	0.23	0.09	0.21	64.62	18.07	30.49	118.07	33.02	55.71	17.62	5.04	9.62	5.29	1.64	1.35
Paraguay	0.04			0.07			11.46			21.56			1.56			3.47		
Peru			0.34			0.62			11.09			20.08			2.62			1.25
St. Vincent and Grenadines	0.00	0.00		0.00	0.01		22.05	35.42		35.20	56.54		9.38	8.74		3.81	3.46	
Trinidad and Tobago[b]	0.18	0.12	0.19	0.29	0.20	0.30	166.27	98.70	138.46	270.62	160.64	225.36	68.72	66.01	181.53	5.10	4.49	2.18
Uruguay	0.07	0.08		0.08	0.10		22.78	25.66		28.79	32.43		2.25	3.63		2.08	1.04	
AFRICA SOUTH OF THE SAHARA																		
Angola		0.14	0.46		0.19	0.63		10.37	18.93		14.26	26.03		5.34	6.70		1.74	0.86
Benin		0.06	0.15		0.12	0.32		9.21	13.80		20.30	30.42		6.33	7.57		7.26	7.97
Botswana	0.08	0.17	0.28	0.14	0.30	0.50	75.64	105.58	125.02	137.41	191.80	227.13	29.17	46.66	68.93	9.71	5.96	4.15
Burkina Faso	0.20	0.39	0.29	0.45	0.86	0.64	29.81	38.67	16.43	65.83	85.41	36.28	19.10	30.21	7.06	31.37	45.68	9.39
Burundi[a]		0.02	0.02		0.05	0.06		2.53	1.95		7.49	5.78		3.71	2.14		5.10	2.79
Cameroon	0.04	0.07		0.07	0.15		4.02	5.17		8.34	10.74		1.19	2.21		2.22	4.16	
Cabo Verde[b]		0.00	0.03		0.00	0.05		5.50	66.95		8.98	109.29		1.84	21.06			4.93
Central African Republic[b]	0.04	0.03	0.01	0.07	0.05	0.01	16.06	7.60	1.45	29.61	14.01	2.67	5.41	3.99	0.73		9.94	1.69
Congo, Rep.		0.01			0.01			3.31			5.40			1.07			0.34	
Côte d'Ivoire	0.17	0.17	0.35	0.35	0.35	0.73	20.69	11.79	15.89	42.78	24.38	32.86	3.76	3.46	4.64	2.60	3.56	4.79
Democratic Rep. of Congo		0.00			0.00			0.04			0.07			0.02			0.18	
Equatorial Guinea		0.01			0.01			16.16			25.89			2.31				
Ethiopia[c]		0.16	0.30		0.54	1.04		2.76	3.37		9.48	11.57		3.23	2.41		9.72	3.90
Gambia	0.01			0.02			12.94			38.36			9.25			17.13		
Ghana	0.09	0.03	0.06	0.19	0.06	0.13	8.11	1.53	2.24	17.52	3.32	4.84	1.76	0.51	0.59	12.21	0.73	2.08
Guinea-Bissau[a]		0.00	0.00		0.00	0.00		0.11	0.70		0.23	1.51		0.03	0.26		1.19	0.88
Kenya[a]	0.20	0.31	0.43	0.53	0.79	1.10	12.55	11.16	9.76	32.50	28.90	25.27	5.41	5.15	3.48	8.28	7.00	4.11
Lesotho[b]	0.02	0.09	0.05	0.04	0.17	0.10	17.39	51.25	25.93	32.18	94.86	47.99	12.29	54.22	30.30	8.02	12.41	3.15
Liberia[b]	0.02	0.00	0.01	0.04	0.01	0.02	11.25	1.91	2.20	21.77	3.69	4.26	10.62	3.35	0.85	5.02	2.76	1.97
Madagascar[c]		0.07	0.02		0.20	0.05		4.95	0.70		14.89	2.11		3.48	0.59		6.10	1.59
Malawi	0.06	0.06	0.00	0.13	0.12	0.01	10.27	5.98	0.19	21.08	12.28	0.39	3.75	4.94	0.13	10.15	8.85	15.66

Table 2 continued

Region/country	Agricultural expenditure (billions 2011 constant US dollars)			Agricultural expenditure (billions 2011 PPP dollars)			Per capita agricultural expenditure (2011 constant US dollars)			Per capita agricultural expenditure (2011 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014
Mali[a]	0.03	0.20	0.24	0.07	0.46	0.55	4.49	21.12	14.73	10.08	47.40	33.07	1.85	11.75	6.54	7.05	17.28	9.71
Mauritius	0.04	0.07	0.08	0.08	0.13	0.14	45.89	63.04	63.10	82.64	113.53	113.63	17.02	14.87	24.16	6.87	5.86	2.48
Mozambique[a]			0.37			0.67			13.99			25.37			10.20			6.85
Namibia[c]		0.12	0.33		0.19	0.51		74.03	145.76		115.26	226.97		16.00	31.96		6.04	6.92
Niger	0.08	0.07	0.36	0.17	0.16	0.76	13.42	7.92	18.70	28.64	16.90	39.90	5.46	6.35	12.15	14.17	13.17	12.30
Nigeria	0.44	0.28	0.20	0.92	0.58	0.41	6.02	2.56	1.10	12.53	5.34	2.30	2.66	0.79	0.20	2.92	3.60	0.80
Rwanda[b]			0.13			0.29			11.76			27.08			5.46			7.09
Senegal	0.05	0.07	0.41	0.11	0.14	0.82	9.52	8.03	28.12	19.02	16.04	56.16	6.31	5.34	18.98	4.04	5.23	8.52
Seychelles		0.01	0.01		0.01	0.01		68.69	65.97		127.12	122.08		17.50	23.03		1.99	1.62
Sierra Leone		0.00			0.01			0.99			2.77			0.42			1.57	
South Africa		0.35	0.78		0.53	1.18		8.36	14.43		12.72	21.95		3.91	7.90		0.51	1.05
Sudan																		
Swaziland[b]	0.04	0.03	0.06	0.07	0.06	0.10	66.73	36.08	45.33	124.22	67.17	84.39	15.11	10.66	18.24	12.98	5.68	4.23
Togo	0.06	0.03	0.07	0.14	0.07	0.16	23.18	7.46	10.05	50.85	16.37	22.05	10.50	3.66	4.03	6.99	6.13	5.84
Uganda	0.01	0.01	0.18	0.03	0.03	0.54	0.73	0.52	4.73	2.21	1.56	14.31	0.64	0.40	2.95	6.71	1.87	4.50
United Rep. of Tanzania	0.15	0.14		0.45	0.41		7.96	4.65		23.95	13.99		8.38	2.99		10.90	8.55	
Zambia[c]	0.63	0.06	0.29	1.29	0.12	0.59	106.70	6.11	20.15	218.07	12.48	41.18	73.83	4.40	12.65	22.81	2.80	7.27
HIGH-INCOME EUROPEAN COUNTRIES																		
Austria	4.90	3.94	1.79	4.22	3.39	1.54	645.19	494.19	210.50	555.54	425.52	181.25	50.86	58.78	32.98	2.51	2.32	0.78
Belgium	1.09	0.65	0.24	0.94	0.56	0.21	111.07	64.27	21.34	95.14	55.05	18.28	16.74	13.11	7.12	0.88	0.33	0.08
Croatia[c]		0.23	0.91		0.32	1.29		49.73	211.78		70.36	299.64		9.26	36.50		2.50	3.99
Cyprus	0.16	0.24	0.18	0.17	0.25	0.18	316.96	366.53	200.49	328.38	379.73	207.71	26.92	32.38	34.28	15.06	4.61	1.50
Czech Republic		4.08	0.95		5.39	1.26		394.53	90.54		521.09	119.58		68.61	17.07		5.27	0.98
Denmark	1.10	0.55	0.60	0.77	0.39	0.43	213.89	105.39	106.69	151.13	74.46	75.38	13.92	7.12	12.80	0.91	0.35	0.31
Estonia		0.07	0.12		0.10	0.17		48.87	94.43		67.07	129.59		11.95	16.26		1.47	1.28
Finland	7.74	8.33	2.28	6.13	6.60	1.81	1,619.33	1,630.69	416.59	1,283.31	1,292.32	330.14	68.35	124.67	35.18	10.74	7.75	1.48
France		10.35	5.92		8.82	5.04		172.70	89.20		147.13	76.00		19.62	13.63		0.89	0.36
Germany	3.53	17.93	7.30	3.24	16.45	6.70	45.22	219.74	90.55	41.48	201.58	83.07	8.79	62.86	30.93	0.49	1.09	0.43
Greece	3.71	3.05	0.44	3.81	3.13	0.45	385.55	286.29	39.92	396.11	294.13	41.02	18.49	18.56	4.98	5.30	3.11	0.34
Hungary		1.89	0.89		3.04	1.43		182.43	90.02		293.84	144.99		27.31	16.31		3.51	1.23
Iceland	0.27	0.21	0.14	0.23	0.18	0.12	1,179.75	774.04	434.90	1,015.17	666.06	374.23	40.70	25.19	17.14	12.44	7.22	1.99
Ireland		1.20	1.03		1.04	0.89		330.13	219.43		285.40	189.70		19.17	27.99		2.71	1.04
Italy	10.26	9.17	6.65	9.60	8.58	6.23	182.13	160.46	111.30	170.43	150.15	104.15	12.38	15.57	15.72	1.10	0.89	0.60
Luxembourg	0.15	0.18	0.21	0.12	0.15	0.17	402.60	447.66	379.95	323.78	360.01	305.56	49.06	59.54	125.85	2.16	1.44	0.79
Malta	0.01	0.01	0.04	0.02	0.02	0.05	45.92	33.30	103.55	57.90	41.99	130.57	13.66	8.35	35.84	3.77	0.53	0.94
Netherlands	2.80	2.02	1.41	2.43	1.75	1.22	198.51	130.46	83.48	171.99	113.04	72.33	18.39	10.52	9.60	1.05	0.60	0.34
Norway	7.83	5.28	3.02	4.88	3.30	1.89	1,917.85	1,211.61	587.34	1,196.32	755.78	366.37	94.68	57.67	38.18	7.16	2.99	1.25
Poland		2.69	2.19		4.37	3.55		69.79	56.63		113.14	91.81		21.02	14.94		2.68	0.92
Portugal		1.73	0.90		2.01	1.05		171.65	86.81		199.29	100.80		19.03	18.93		2.14	0.74
Romania	3.89	2.81	1.61	7.45	5.38	3.08	172.00	122.22	81.69	329.50	234.13	156.49	24.63	12.78	17.07	7.42	6.77	2.32
Slovakia			0.34			0.47			62.12			86.18			8.16			0.78
Slovenia		0.50	0.22		0.57	0.25		251.00	107.59		286.45	122.79		42.69	22.97		3.61	0.88
Spain	7.18	6.28	5.80	7.34	6.42	5.93	190.42	157.88	125.37	194.58	161.33	128.11	16.12	16.34	17.49	3.36	1.43	0.90

Table 2 continued

Region/country	Agricultural expenditure (billions 2011 constant US dollars)			Agricultural expenditure (billions 2011 PPP dollars)			Per capita agricultural expenditure (2011 constant US dollars)			Per capita agricultural expenditure (2011 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014	1980	1995	2014
Sweden	4.74	2.51	0.93	3.48	1.84	0.68	570.68	284.08	96.20	418.57	208.36	70.56	41.83	27.39	13.15	2.87	1.06	0.31
Switzerland[a]	10.95	14.93	6.01	6.79	9.26	3.72	1,737.45	2,128.37	739.84	1,077.05	1,319.39	458.63	107.58	195.59	121.80	4.87	9.24	2.46
United Kingdom	6.71	1.66	3.66	5.99	1.48	3.27	119.37	28.69	56.94	106.48	25.60	50.79	32.40	6.50	21.82	1.19	0.22	0.30
OTHER HIGH-INCOME COUNTRIES																		
Australia	2.30	3.03	4.27	1.48	1.94	2.74	156.40	167.00	180.68	100.34	107.14	115.92	7.11	9.79	11.25	1.78	1.24	0.72
Canada	3.15	4.77		2.51	3.81		128.39	162.91		102.46	130.01		9.77	14.98		2.20	1.93	
Israel	0.90	0.86		0.81	0.78		239.87	161.84		217.57	146.80		26.53	35.89		1.97	1.49	
Japan	19.22	13.47	7.17	14.27	10.00	5.33	165.78	108.17	56.55	123.13	80.34	42.00	18.18	14.78	9.91	3.49	1.69	0.60
New Zealand[b]	1.57	0.37	1.03	1.34	0.31	0.88	498.75	100.48	231.90	424.87	85.59	197.55	19.88	5.14	10.71	5.42	1.06	1.32
Rep. of Korea[b]	1.39	8.39	14.60	1.80	10.88	18.94	37.11	187.82	294.36	48.12	243.58	381.74	4.99	27.28	53.14	5.59	10.02	3.53
United States	20.40	13.26	23.18	20.40	13.26	23.18	88.87	49.81	72.57	88.87	49.81	72.57	15.56	10.52	11.32	1.48	0.64	0.70

Note: PPP (purchasing power parity) dollars measure the relative purchasing power of currencies across countries by eliminating national differences in pricing levels for a wide range of goods and services.

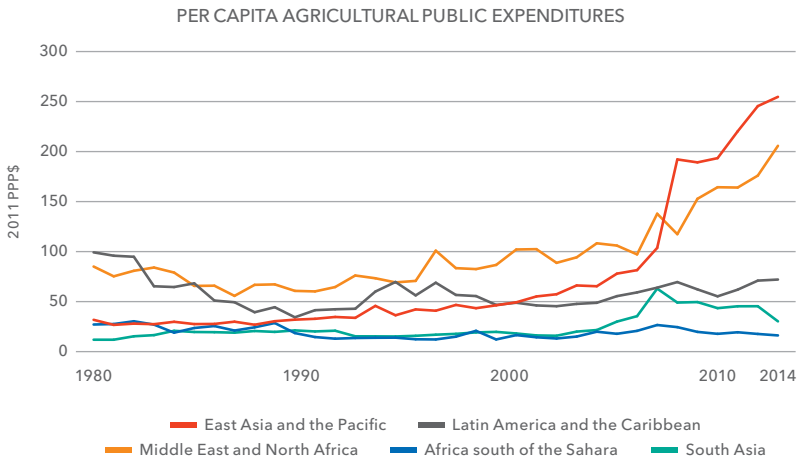
a = last year of data available is 2013; b = last year of data available is 2012; c = last year of data available is 2014; d = last year of data available is 2010.

SPEED

STATISTICS ON PUBLIC EXPENDITURES FOR ECONOMIC DEVELOPMENT

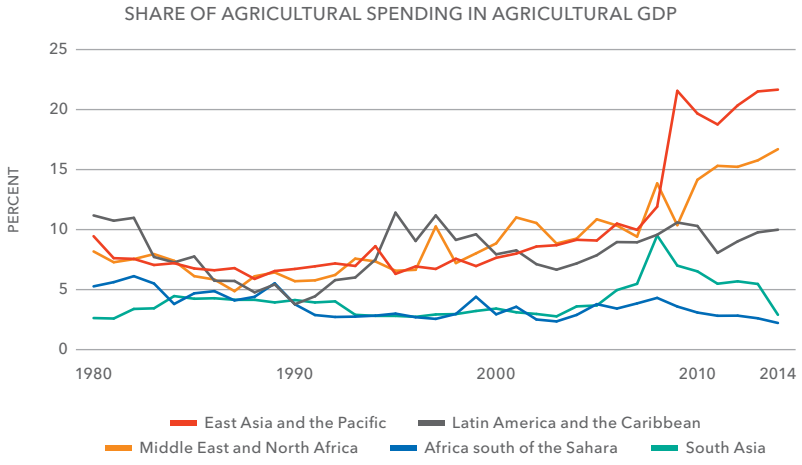
Trend 1
REGIONAL DIVERGENCE MARKS AGRICULTURAL SUPPORT

Per capita agricultural public spending has increased most rapidly in East Asia and the Pacific, especially following the 2008/09 food crisis. Spending in the Middle East and North Africa has also risen. But for the rest of the world, stagnation in agricultural spending has marked the last 35 years, leaving per capita levels in 2014 close to 1980 levels.



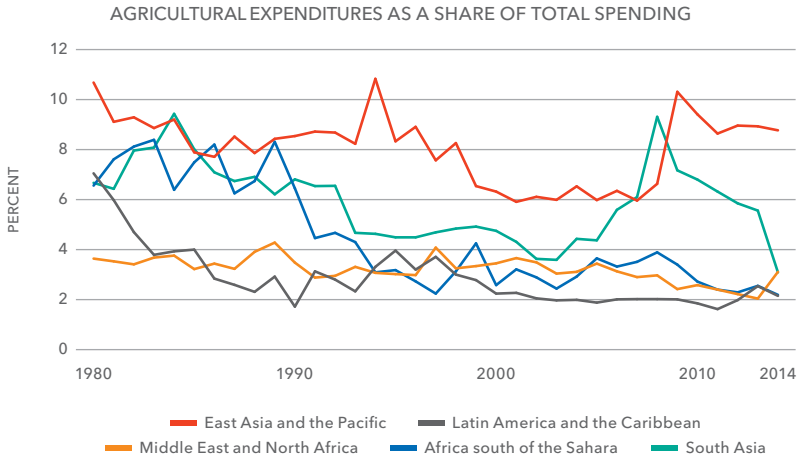
Trend 2
DIVERGENCE IS NOT EXPLAINED BY AGRICULTURAL GROWTH

Growth in agricultural gross domestic product (GDP) does not explain the divergence in public spending. East Asia and the Pacific and the Middle East and North Africa both increased spending relative to the size of their agricultural economies; the other regions have shown volatility in spending ratios, but no long-term increase in comparison with agricultural GDP.



Trend 3
A RISING TIDE LIFTS ALL BOATS, BUT NOT EQUALLY

Agricultural spending in the East Asia and Pacific region appears to be rising with overall public spending, though not as fast as aggregate spending. In fact, the ratio of agricultural to total expenditures fell for much of the period in all regions, with the largest drops in Africa south of the Sahara and Latin America and the Caribbean.



Global Hunger Index (GHI)

The Global Hunger Index (GHI) provides a comprehensive measure of hunger at the global level and by country. It allows for tracking progress and setbacks in addressing hunger and malnutrition over time and for assessing the drivers of these changes. The GHI is designed to raise awareness and understanding of regional and country differences in the struggle against hunger and to trigger action to reduce hunger around the world.

UNDERSTANDING GHI SCORES

GHI scores reflect the multidimensional nature of hunger by combining four standardized indicators into one index number that falls within the range 0–100:

1. Percentage of the population that is undernourished
2. Percentage of children under five who suffer from wasting (low weight-for-height)
3. Percentage of children under five who suffer from stunting (low height-for-age)
4. Percentage of children who die before the age of five (child mortality)

Higher scores indicate greater hunger—the lower the score, the better a country's situation (Figure 1). GHI scores above 20 are considered "serious"; scores greater than 35 are "alarming"; and scores exceeding 50 are "extremely alarming."

TRENDS IN GLOBAL HUNGER

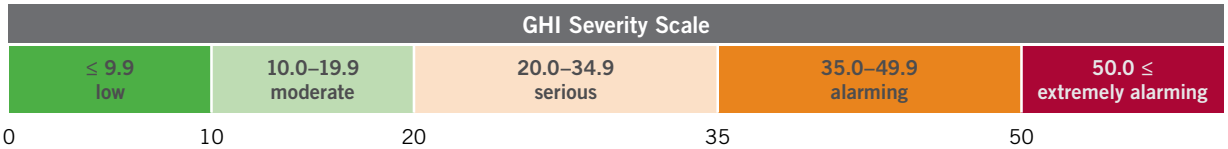
The 2017 Global Hunger Index (GHI) indicates that worldwide levels of hunger and undernutrition have declined over the long term: At 21.8 on a scale of 100, the average GHI score for 2017 is 27 percent lower than the 2000 score (29.9). This improvement reflects the reductions since 2000 in each of the four GHI indicators—the prevalence of undernourishment, child stunting (low height-for-age), child wasting (low weight-for-height), and child mortality.

Despite these improvements, a number of factors, including deep and persistent inequalities, undermine efforts to end hunger and undernutrition worldwide. As a result, even as the average global hunger level has declined, certain regions of the world still struggle with hunger more than others, disadvantaged populations experience hunger more acutely than their better-off neighbors, and isolated and war-torn areas are ravaged by famine.

At the regional level, South Asia and Africa south of the Sahara have the highest 2017 GHI scores—30.9 and 29.4, respectively, indicating serious levels of hunger. The GHI scores, and therefore the hunger levels, for East and Southeast Asia, the Near East and North Africa, Latin America and the Caribbean, and Eastern Europe and the Commonwealth of Independent States are considered low or moderate, ranging from 7.8 to 12.8 points. Within each region in the low range, however, are also countries with serious or alarming GHI scores, including Tajikistan in Central Asia, which is part of the Commonwealth of Independent States; Guatemala and Haiti in Latin America and the Caribbean; and Iraq and Yemen in the Near East and North Africa region. Seven of 14 countries in East and Southeast Asia have serious scores, though the low score of highly populous China improves the regional average.

From the 2000 GHI to the 2017 GHI, the scores of 14 countries improved by 50 percent or more; those of 72 countries dropped by between 25 and 49.9 percent; and those of 27 countries fell by less than 25 percent. Only the Central African Republic showed no progress; its 2017 and 2000 GHI scores are the same.

FIGURE 1 GHI severity scale according to GHI score



Eight countries suffer from extremely alarming or alarming levels of hunger. Except for Yemen, all are in Africa south of the Sahara: Central African Republic, Chad, Liberia, Madagascar, Sierra Leone, Sudan, and Zambia. Due to incomplete data, 2017 GHI scores could not be calculated for 13 countries. Nine of these—Burundi, Comoros, Democratic Republic of the Congo, Eritrea, Libya, Papua New Guinea, Somalia, South Sudan, and Syria—are classified in the 2017 GHI report as "cause for significant concern" based on available data and reports from international organizations that specialize in hunger and malnutrition.

DOWNLOAD DATA
http://dx.doi.org/10.7910/DVN/ZTCWYQ

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TABLE 3 Global Hunger Index scores (various years), ranked by 2017 country scores

Rank[a]	Country	1992	2000	2008	2017
2017 GHI scores less than 5, collectively ranked 1–14[b]	Belarus	--	<5	<5	<5
	Bosnia and Herzegovina	--	9.8	7.0	<5
	Chile	5.9	<5	<5	<5
	Croatia	--	6.2	<5	<5
	Cuba	10.5	5.3	<5	<5
	Estonia	--	6.2	<5	<5
	Kuwait	20.0	<5	<5	<5
	Latvia	--	6.7	<5	<5
	Lithuania	--	5.9	<5	<5
	Montenegro	--	--	5.2	<5
	Slovak Republic	--	8.0	6.4	<5
	Turkey	14.3	10.4	5.6	<5
	Ukraine	--	13.7	<5	<5
	Uruguay	9.7	7.7	6.4	<5
15	Romania	9.3	8.7	6.0	5.2
16	Costa Rica	7.5	6.2	5.0	5.3
16	Macedonia, FYR	--	7.7	6.4	5.3
18	Argentina	7.0	6.6	5.8	5.4
18	Brazil	15.9	11.7	5.4	5.4
18	Bulgaria	7.9	8.2	7.6	5.4
21	Kazakhstan	--	11.3	10.9	5.8
22	Russian Federation	--	10.5	6.8	6.2
23	Mexico	14.0	10.8	8.4	6.5
24	Serbia	--	--	7.2	6.6
25	Jordan	13.4	10.3	6.5	6.7
26	Trinidad and Tobago	14.5	11.7	10.4	6.9
27	Saudi Arabia	14.3	12.5	11.2	7.1
28	Tunisia	15.4	10.7	8.0	7.4
29	China	25.9	15.8	11.2	7.5
30	Iran	17.5	13.6	8.7	7.6
30	Moldova	--	16.3	13.3	7.6
32	Armenia	--	18.4	11.4	7.7
32	Georgia	--	14.7	8.3	7.7
34	Colombia	14.6	11.3	9.4	8.0
34	Jamaica	12.0	8.4	7.6	8.0
36	Fiji	11.5	9.8	9.1	8.1
36	Lebanon	11.4	9.0	8.2	8.1
38	Peru	28.7	20.9	15.3	8.7
39	Panama	19.9	20.0	14.1	9.2
40	Kyrgyzstan	--	19.7	13.4	9.3
41	Algeria	17.5	15.6	11.3	9.5
42	Azerbaijan	--	27.5	15.3	9.6
43	Suriname	17.0	16.0	11.4	9.9
44	Malaysia	19.8	15.5	13.7	10.2
44	Morocco	18.7	15.7	12.0	10.2
46	Thailand	25.8	18.1	12.0	10.6
47	Paraguay	16.7	14.1	12.1	11.0
48	Albania	20.8	21.6	16.5	11.1
48	El Salvador	19.5	16.2	12.7	11.1
50	Oman	20.8	13.7	10.2	11.3
51	Dominican Republic	23.8	18.4	15.4	11.6
52	Turkmenistan	--	21.9	16.5	12.2
53	Venezuela	15.2	15.2	9.3	13.0
54	Uzbekistan	--	23.8	16.1	13.1
55	South Africa	18.5	18.8	16.6	13.2
56	Mauritius	17.4	15.9	14.3	13.3
57	Mongolia	37.5	31.7	18.1	13.4
58	Nicaragua	36.1	24.7	18.2	13.6
59	Guyana	22.3	17.9	17.0	13.7
60	Gabon	24.2	20.7	17.4	13.8
61	Honduras	25.9	20.6	17.0	14.3
62	Ecuador	22.3	20.5	16.4	14.4
63	Egypt	20.1	16.4	16.6	14.7
64	Viet Nam	40.2	28.6	21.6	16.0

Table 3 continued

Rank[a]	Country	1992	2000	2008	2017
65	Ghana	41.9	29.2	21.9	16.2
66	Bolivia	36.7	30.3	23.9	17.2
67	Senegal	37.5	37.3	23.7	18.4
68	Philippines	30.5	25.9	20.2	20.0
69	Guatemala	28.5	27.4	22.2	20.7
70	Kenya	39.1	37.6	29.6	21.0
71	Swaziland	24.0	29.9	30.7	21.2
72	Indonesia	35.0	25.5	28.3	22.0
72	Nepal	42.5	36.8	28.9	22.0
74	Cameroon	40.0	39.6	29.5	22.1
75	Cambodia	45.8	43.6	27.1	22.2
76	Togo	45.8	39.0	28.3	22.5
77	Myanmar	55.6	43.6	30.1	22.6
78	Iraq	21.8	26.5	25.7	22.9
79	Gambia	35.2	27.5	23.8	23.2
80	Lesotho	26.5	33.2	28.4	24.1
81	Benin	44.5	37.5	31.7	24.4
81	Botswana	33.8	33.0	30.7	24.4
83	Mauritania	39.4	33.6	23.7	25.2
84	Nigeria	48.8	41.0	33.7	25.5
84	Sri Lanka	31.6	26.8	24.2	25.5
86	Congo, Rep.	39.1	36.0	31.6	25.6
87	Namibia	35.4	30.8	30.9	25.7
88	Bangladesh	53.6	37.6	32.2	26.5
88	Côte d'Ivoire	32.9	32.6	35.1	26.5
90	Malawi	58.2	44.6	31.5	27.2
91	Lao PDR	52.3	48.1	33.4	27.5
92	Burkina Faso	47.0	47.9	36.4	27.6
93	Korea, DPR	31.9	40.3	30.7	28.2
94	Guinea	46.5	44.0	33.4	28.6
94	Mali	51.4	44.2	35.1	28.6
96	Tajikistan	--	41.8	32.6	28.7
97	Tanzania	42.9	42.4	33.0	28.8
98	Mozambique	63.6	48.7	37.5	30.5
99	Guinea-Bissau	44.5	43.1	31.4	30.6
100	Djibouti	60.3	46.7	35.1	31.4
100	India	46.2	38.2	35.6	31.4
100	Rwanda	53.3	56.3	36.2	31.4
103	Uganda	41.2	39.2	33.3	32.0
104	Ethiopia	--	56.0	40.2	32.3
105	Angola	65.8	57.5	39.7	32.5
106	Pakistan	42.7	38.2	34.7	32.6
107	Afghanistan	50.2	52.7	37.9	33.3
108	Zimbabwe	35.8	40.9	34.5	33.8
109	Haiti	51.6	42.7	42.6	34.2
110	Timor-Leste	--	--	46.8	34.3
111	Niger	66.2	52.6	37.0	34.5
112	Liberia	51.2	48.2	38.9	35.3
113	Sudan	--	--	--	35.5
114	Yemen	43.5	43.4	36.2	36.1
115	Zambia	48.5	52.3	45.0	38.2
116	Madagascar	43.9	43.6	36.8	38.3
117	Sierra Leone	57.2	54.7	44.5	38.5
118	Chad	62.5	51.9	50.9	43.5
119	Central African Republic	52.2	50.9	47.0	50.9

Notes: (--) = data are not available or not presented. Some countries, such as the post-Soviet states prior to 1991, did not exist in their present borders in the given year or reference period.

a = ranked according to 2017 GHI scores. Countries that have identical 2017 scores are given the same ranking (for example, Argentina, Brazil, and Bulgaria are each ranked 18th). The following countries could not be included because of lack of data: Bahrain, Bhutan, Burundi, the Comoros, the Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Libya, Papua New Guinea, Qatar, Somalia, South Sudan, and the Syrian Arab Republic. The rankings in this table cannot be compared with the rankings from previous GHI reports because different countries are included in the ranking each year based on data availability, data used to calculate the scores are continuously revised, and the methodology is subject to change between reports.

b = the 14 countries with 2017 GHI scores of less than 5 are not assigned individual ranks, but rather are collectively ranked 1-14. Differences between their scores are minimal.

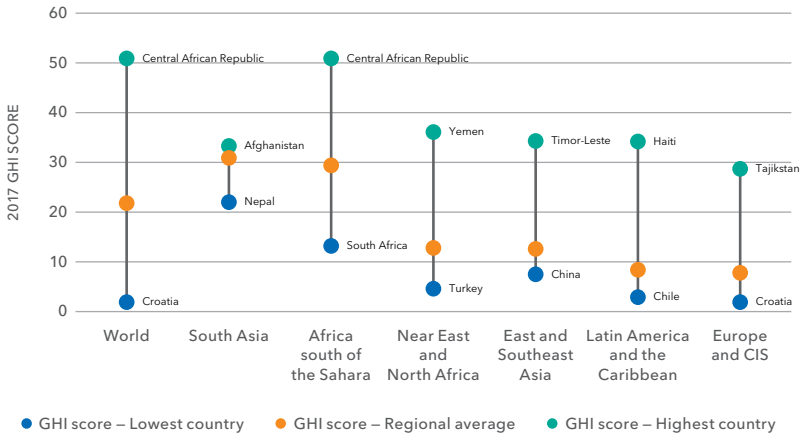
GHI

GLOBAL HUNGER INDEX

Trend 1
VAST INEQUALITY IS FOUND WITHIN REGIONS

Inequality in hunger and undernutrition exists at all levels: between the major regions of the world, within these regions, and within the countries themselves. There are sizable gaps between the countries with the highest and lowest GHI scores in each region of the world. The greatest ranges of GHI scores are found in Africa south of the Sahara, the Near East and North Africa, and Latin America and the Caribbean.

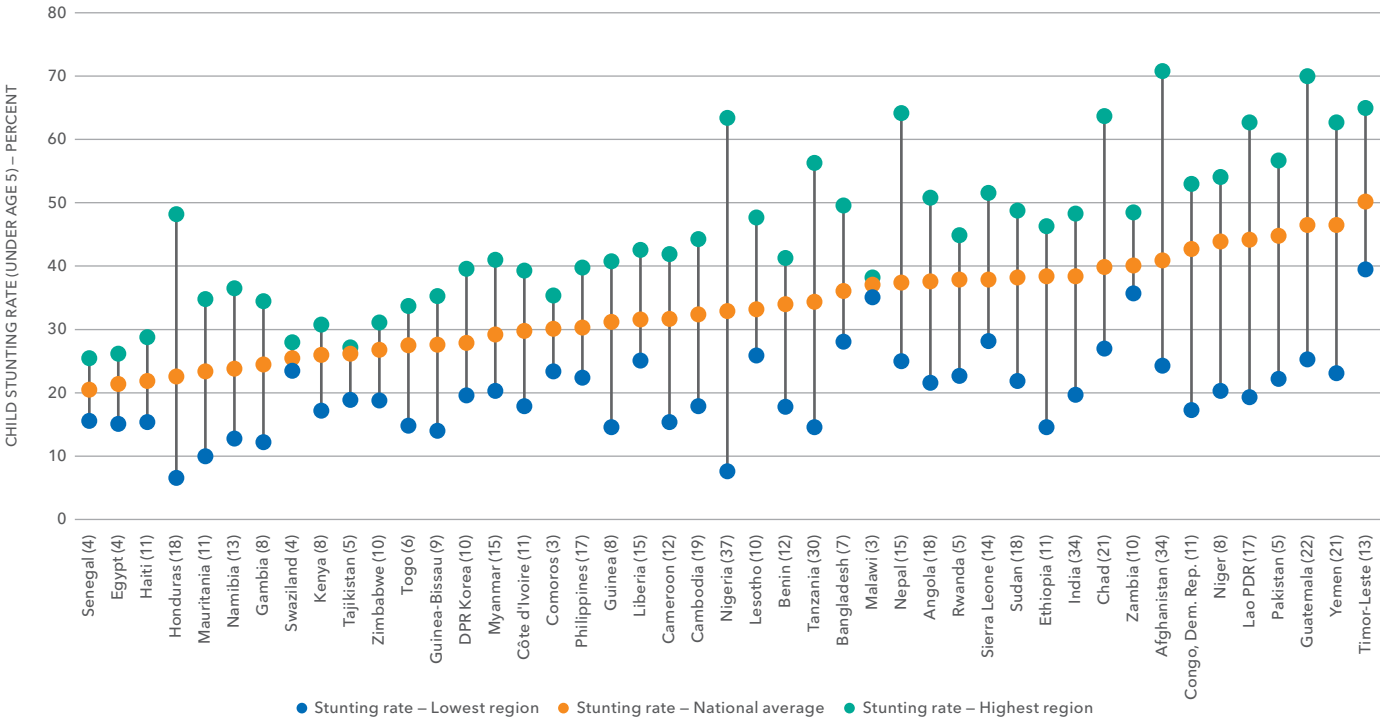
GLOBAL AND REGIONAL RANGE OF GHI SCORES



Trend 2
CHILDREN'S UNDERNUTRITION VARIES WIDELY WITHIN COUNTRIES

An examination of subnational-level data on child stunting (an indicator of chronic undernutrition) reveals wide disparities within countries. These differences in hunger and nutrition profiles mean that, in most countries, a one-size-fits-all approach to tackling hunger and undernutrition is unlikely to yield the best results.

SUBNATIONAL INEQUALITY OF CHILD STUNTING



Note: (#) indicates the number of regions in each country. Countries included are those with subnational data available for 2012–2016, with average stunting levels over 20 percent.

Food Policy Research Capacity Indicators (FPRCI)

Food policy research plays a crucial role in guiding the agricultural development of countries. To achieve food security goals, countries need to strengthen their capacity to conduct food policy research. Strong local policy research institutions help in shaping an evidence-based policy-making process. Measuring national capacity for food policy research is important for identifying capacity gaps in food policy research and guiding allocation of resources to fill those gaps.

Food policy research capacity is defined as any socioeconomic or policy-related research capacity in the area of food, agriculture, or natural resources. To measure this capacity, the International Food Policy Research Institute (IFPRI) developed a set of indicators of the quantity and quality of policy research at the country level.

INDICATORS

IFPRI created a database for food policy research capacity in 2010, and has continued to expand and refine it. The data presented in Table 4 are currently collected for 33 countries; data for Myanmar were added in 2017. A consistent methodology is followed to enable comparison of values across time and countries. The database was most recently updated with numbers for 2017.

"Analysts/researchers" is a head count of professionals employed at local organizations whose work involves food policy research or analysis. To introduce some uniformity, IFPRI also presents a modified quantification of the head count: "full-time equivalent analysts/researchers with PhD equivalent." To obtain an indicator of per capita food policy research capacity, this research capacity is then divided by the country's rural population ("full-time equivalent researchers per million rural residents"). This helps to illustrate the impact of local food policy research in a country. This indicator was last updated in 2015.

The quality of a country's food policy research capacity is estimated by tallying the number of relevant international publications in peer-reviewed journals over a five-year period. IFPRI views this as a reflection of the local enabling environment for food policy research. This indicator allows for comparison across countries, as it ensures an internationally accepted standard of quality for publications. The final indicator ("publications per full-time equivalent researcher") is derived by dividing the number of international publications by the number of full-time equivalent researchers with a PhD, providing a measure of productivity.

TRENDS IN FOOD POLICY RESEARCH

Overall food policy research capacity across all countries did not change from last year's level, but countries and regions had different experiences. For instance, Colombia has seen a steady decline in the number of food policy research publications since 2011, while other countries like Bangladesh, Ghana, and Nepal saw an increase.

All countries in Africa except Swaziland saw a slight increase in food policy research capacity as measured by the number of publications. Most Asian countries did not show a dramatic change in publications except for Bangladesh and Nepal which achieved steady increases. In Latin America, apart from Colombia and Guatemala, all countries experienced either a slight increase or no change in the number of publications.

IFPRI will continue to update and expand this database to include additional countries to better facilitate cross-country comparisons. This will also facilitate identification of the minimum food policy research capacity threshold for a country. It is hoped that such data will aid in informing national policy makers of the importance of investing in local food policy research capacity. Lastly, this data will provide donors with a framework for prioritizing investments to strengthen food policy research capacity across as well as within countries.

DOWNLOAD DATA
http://dx.doi.org/10.7910/DVN/LR6CQC

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TABLE 4 Food policy research capacity indicators, 2011–2017

Country	Analysts/researchers (head count) in 2015	Full-time equivalent analysts/researchers with PhD in 2015	International publications produced from 2011–2017	Full-time equivalent analysts/researchers with PhD per million rural population in 2015	Publications per full-time equivalent researchers with PhD
Afghanistan	43	3.0	5	0.131	1.681
Bangladesh	66	22.9	101	0.217	4.410
Benin	38	4.3	29	0.732	6.744
Burundi	39	5.1	3	0.570	0.585
China*	2,000	1,332.5	1,564	2.096	1.174
Colombia	85	6.5	29	0.553	4.496
Ethiopia	141	30.4	28	0.397	0.921
Ghana	153	23.3	77	1.903	3.305
Guatemala	45	11.9	3	1.559	0.252
Honduras	33	6.1	5	1.628	0.816
Indonesia	146	42.4	21	0.355	0.496
Kenya	155	31.6	77	0.947	2.437
Laos	9	1.8	8	0.407	4.571
Liberia	34	3.1	2	1.402	0.650
Madagascar	187	11.5	11	0.760	0.954
Malawi	68	18.2	28	1.321	1.541
Mali	60	10.1	5	1.066	0.498
Mozambique	37	3.3	13	0.188	3.910
Myanmar	97	46.5	7	1.309	0.151
Nepal	27	3.7	14	0.160	3.836
Niger	29	8.8	5	0.605	0.567
Nigeria	349	77.4	44	0.827	0.568
Peru	54	7.2	21	1.068	2.937
Rwanda	64	5.5	8	0.639	1.455
Senegal	71	9.3	16	1.156	1.720
South Africa	198	50.3	257	2.623	5.107
Swaziland	32	2.9	1	2.900	0.351
Tanzania	91	20.8	36	0.604	1.735
Togo	81	6.8	5	1.641	0.733
Uganda	34	10.9	28	0.344	2.563
Viet Nam	175	32.5	13	0.536	0.400
Zambia	29	5.3	18	0.608	3.396
Zimbabwe	42	8.9	16	0.931	1.803

Notes: * = "International publications produced" for China are from 2009–2017.

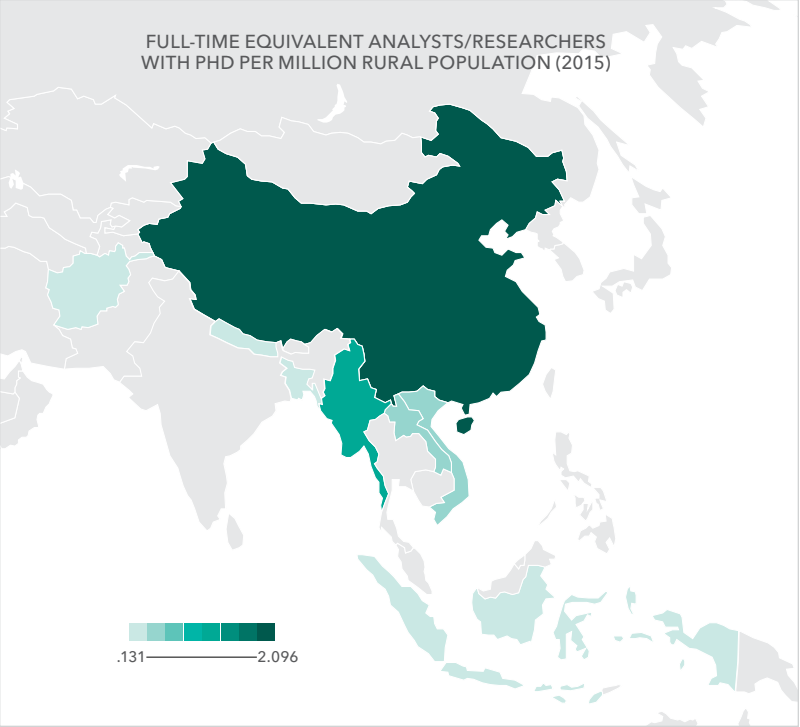
FPRCI

FOOD POLICY RESEARCH CAPACITY INDICATORS

Trend 1

RESEARCH CAPACITY IS UNEVEN WITHIN DEVELOPING REGIONS

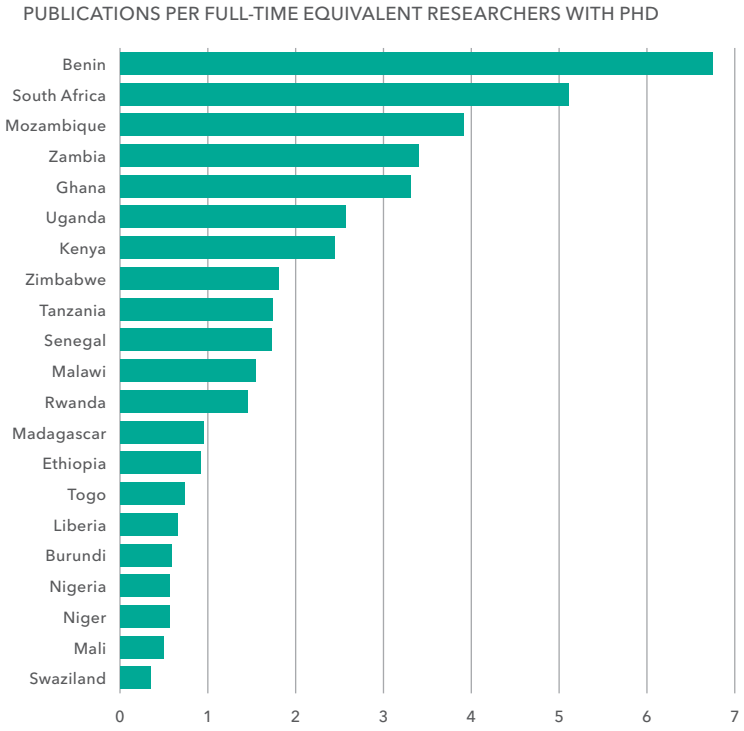
Food policy research capacity—measured in terms of full-time equivalent researchers with a PhD per million rural people—varies greatly across and within developing regions. Economic development levels explain capacity differences only in part. In Asia, China and Myanmar have a relatively high ratio of food policy researchers to rural people compared to Afghanistan, Bangladesh, Indonesia, Lao PDR, Nepal, and Viet Nam, which have less than 1 researcher per million rural people. Despite consistent decreases in rural population, Bangladesh, Lao PDR, and Indonesia show relatively low capacity compared to Myanmar, where the rural population is increasing.



Trend 2

NUMBER OF PUBLICATIONS PER RESEARCHER IS RISING IN AFRICA, BUT WITH WIDE VARIATION

The number of international publications produced per researcher has increased for all African countries, excepting Swaziland. But across the continent, the number of publications per researcher varies widely. For some countries—including Ghana, Malawi, and South Africa—this measure correlates with the number of researchers per million rural people. Other countries produce relatively more publications, despite low researcher-to-population ratios.



Agricultural Total Factor Productivity (TFP)

Increasing the efficiency of agricultural production—getting more output from the same amount of resources—is critical for improving food security. To measure the efficiency of agricultural systems, we use total factor productivity (TFP). TFP is an indicator of how efficiently agricultural land, labor, capital, and materials (agricultural inputs) are used to produce a country's crops and livestock (agricultural output)—it is calculated as the ratio of total agricultural output to total production inputs. When more output is produced from a constant amount of resources, meaning that resources are being used more efficiently, TFP increases. Measures of land and labor productivity—partial factor productivity (PFP) measures—are calculated as the ratio of total output to total agricultural area (land productivity) and to the number of economically active persons in agriculture (labor productivity). Because PFP measures are easy to estimate, they are often used to measure agricultural production performance. These measures normally show higher rates of growth than TFP, because growth in land and labor productivity can result not only from increases in TFP but also from a more intensive use of other inputs (such as fertilizer or machinery). Indicators of both TFP and PFP contribute to the understanding of agricultural systems needed for policy and investment decisions by allowing for comparisons across time and across countries and regions.

TRENDS IN PRODUCTIVITY

Table 5 presents estimates of TFP and land and labor productivity measures for developing countries and regions for three periods between 1991 and 2014 using the most recent data on outputs and inputs from the Economic Research Service of the United States Department of Agriculture (ERS-USDA), an internationally consistent and comparable dataset on production and input quantities built using data from the FAOSTAT database of the Food and Agriculture Organization of the United Nations (FAO), supplemented with data from national statistical sources.[1]

Data on TFP for 2001–2010 show a strong performance of Latin America and the Caribbean, despite the global crisis of 2008–2009, which explains the slowdown observed in TFP growth in other regions. Asia and the Pacific and the Middle East and North Africa show signs of recovery in recent years (2011–2014), while Africa south of the Sahara continues to show sluggish growth, and TFP growth rates in Latin America and the Caribbean in recent years drop to only half of the values observed in 2001–2010, a result largely explained by poor performance of Brazil's agriculture sector in the last four years.

DATA AND METHODOLOGY

The output values from the ERS-USDA dataset used to estimate TFP are gross agricultural outputs. Inputs are agricultural land, in hectares of "rainfed cropland equivalents," measured as the sum of rainfed cropland (weight equals 1.00), irrigated cropland (weight varies from 1.00 to 3.00 depending on region), and permanent pasture (weight varies from 0.02 to 0.09 depending on region); a measure of labor is approximated using the number of economically active persons in agriculture; fertilizer is expressed in tons of fertilizer nutrients used; total stock of farm machinery is measured as the number of "40-CV tractor equivalents"; total livestock capital on farms is in "cattle equivalents," calculated using FAO estimates of animal stocks on farms, with species weighted by their respective size (nondairy cattle taking a weight of 1.00). Finally, total animal feed from crops and crop processing residues is measured in dry-matter equivalents.

Land and labor productivity measures for the regions (such as Africa south of the Sahara) reflect a weighted average of individual country productivity measures using average outputs (1991–2014) of each country as weights. TFP is calculated using a growth accounting approach. This approach defines TFP as the ratio of an output index and an input index. As input prices are not available, input shadow prices were obtained for each country and year by estimating the parameters of distance functions through linear programming.

DOWNLOAD DATA
http://dx.doi.org/10.7910/DVN/IDOCML

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TABLE 5 Average annual growth of agricultural output and total factor productivity (TFP), and levels of land and labor productivity, various years

Country/region	Land productivity (in constant 2004–2006 US dollars)				Labor productivity (in constant 2004–2006 US dollars)				Output growth (%)			TFP growth (%)		
	1990	2000	2010	2014	1990	2000	2010	2014	1991–2000	2001–2010	2010–2014	1991–2000	2001–2010	2010–2014
AFRICA SOUTH OF THE SAHARA	198	255	321	332	1,326	1,597	1,885	2,105	3.3	3.8	2.9	2.1	0.8	0.2
Angola	15	24	62	65	252	315	604	566	4.9	9.8	1.3	1.0	3.8	-2.3
Benin	472	580	649	709	780	1,107	1,224	1,562	6.0	2.5	6.9	2.0	0.1	4.0
Botswana	9	8	11	12	1,071	724	906	924	-0.8	3.3	1.6	-1.0	2.1	2.2
Burkina Faso	111	146	196	222	297	296	388	378	2.8	6.0	2.6	-0.5	1.4	0.4
Burundi	528	602	673	701	406	342	299	274	-0.5	2.2	0.2	-0.4	-0.5	-1.0
Cameroon	434	533	659	722	713	841	1,398	1,562	3.1	5.7	3.2	0.8	3.8	1.8
Cape Verde	256	436	546	643	816	1,267	1,471	1,499	4.4	0.6	-1.2	3.7	1.4	1.6
Central African Rep.	147	196	230	234	526	667	759	758	3.6	1.9	0.8	1.5	0.4	-0.9
Chad	18	24	41	40	446	462	674	606	3.0	6.1	-1.2	-0.4	2.6	-2.2
Comoros	593	578	557	528	409	384	332	300	1.7	1.0	0.0	-2.4	-0.8	-1.3
Congo	20	27	40	43	466	546	776	810	2.7	4.2	1.7	0.7	0.4	0.4
Congo, Dem. Rep	180	159	163	169	493	347	296	289	-1.5	0.3	1.2	-0.1	-1.2	-1.6
Côte d'Ivoire	208	291	295	314	1,520	1,946	2,262	2,692	3.5	0.9	4.4	0.9	0.0	0.0
Equatorial Guinea	161	182	237	255	363	278	265	258	0.1	1.6	1.6	-1.4	0.8	0.9
Ethiopia, former	99	145	250	286	255	218	300	315	1.8	6.4	3.9	2.1	3.0	-1.1
Gabon	41	52	59	62	949	1,227	1,522	1,540	2.3	1.3	1.5	0.7	1.1	0.4
Gambia	129	228	267	214	233	288	295	160	4.8	3.2	-12.0	1.4	-0.3	-10.6
Ghana	178	313	450	524	567	905	1,114	1,194	7.5	4.6	4.1	4.5	0.5	2.4
Guinea	82	114	145	154	415	431	505	503	3.8	3.4	2.2	-0.9	-0.3	-0.3
Guinea-Bissau	114	137	196	204	450	523	661	649	3.2	3.9	1.6	0.4	2.1	1.2
Kenya	158	176	284	286	513	417	560	532	1.1	5.1	0.8	0.1	2.5	-1.5
Lesotho	56	58	63	62	436	393	420	397	0.1	0.9	-0.5	-0.3	0.4	1.4
Liberia	108	154	155	163	457	528	440	427	4.0	0.4	1.0	0.5	-1.5	0.4
Madagascar	70	66	91	90	610	491	496	429	0.5	3.3	-0.5	0.4	0.8	0.4
Malawi	243	404	536	514	302	491	620	531	6.3	4.6	-1.1	3.7	0.5	-3.8
Mali	44	51	95	101	822	885	1,345	1,347	2.6	6.7	2.5	1.3	3.5	0.5
Mauritania	9	10	12	14	767	676	631	639	1.5	2.2	2.9	-1.0	-0.7	1.9
Mauritius	2,528	2,749	3,369	3,642	3,174	3,952	5,554	6,227	0.3	0.4	-0.6	-1.3	1.0	0.9
Mozambique	24	34	60	55	221	230	343	281	3.5	6.2	-2.5	-0.3	2.0	-5.4
Namibia	10	10	11	11	1,689	1,529	1,614	1,599	0.4	0.6	0.5	-1.9	1.5	0.6
Niger	35	51	74	77	500	545	793	711	4.2	7.1	0.9	1.6	2.9	-1.9
Nigeria	291	388	505	494	1,244	1,607	1,709	1,762	5.0	2.6	2.7	3.0	-0.6	1.1
Rwanda	599	669	1,037	947	459	420	535	481	0.7	5.2	0.0	0.7	1.7	-2.9
Réunion (France)	2,085	3,191	3,212	3,207	8,487	16,644	30,233	45,042	2.0	0.9	-0.2	1.6	0.6	3.3
Sao Tome and Principe	268	513	595	686	512	932	802	798	7.2	1.1	2.6	5.0	-0.9	0.5
Senegal	111	147	198	178	374	397	428	314	3.0	3.4	-4.6	0.3	0.3	-4.5
Sierra Leone	147	121	287	331	400	316	829	921	-2.9	11.9	3.7	0.1	4.9	2.1
Somalia	33	33	38	40	816	707	654	630	-0.1	1.3	1.6	2.1	-1.0	4.0
South Africa	96	111	136	146	5,713	7,315	10,927	13,005	1.6	2.0	1.7	5.2	1.8	1.1
Sudan, former	32	55	95	120	732	1,107	1,168	1,417	6.4	2.3	6.4	3.7	-1.0	-0.3

Table 5 continued

Country/region	Land productivity (in constant 2004–2006 US dollars)				Labor productivity (in constant 2004–2006 US dollars)				Output growth (%)			TFP growth (%)		
	1990	2000	2010	2014	1990	2000	2010	2014	1991–2000	2001–2010	2010–2014	1991–2000	2001–2010	2010–2014
Swaziland	220	205	250	263	1,958	1,672	2,161	2,355	-1.0	1.9	1.8	-1.3	2.5	0.4
Tanzania	139	140	214	262	374	324	469	579	1.1	5.9	8.0	-0.5	-0.6	1.6
Togo	222	266	322	307	512	566	651	690	2.7	3.3	3.4	1.5	0.1	-1.1
Uganda	382	433	454	434	584	588	517	421	2.5	1.6	-2.3	0.0	-0.8	-1.4
Zambia	39	42	85	93	339	330	579	573	1.6	7.6	2.6	1.8	4.8	-6.2
Zimbabwe	127	146	108	101	551	637	499	458	2.8	-2.5	0.3	1.2	-0.8	-5.5
LATIN AMERICA AND THE CARIBBEAN	268	340	467	509	5,833	7,955	12,346	14,235	3.1	3.5	2.4	1.3	2.2	1.1
Argentina	190	251	286	301	16,647	22,168	29,996	32,713	2.9	2.7	1.5	-0.2	0.7	0.4
Belize	725	1,043	1,067	1,094	5,076	6,474	5,403	5,147	5.3	0.8	1.1	2.3	-1.2	-1.3
Bolivia	48	65	93	110	1,388	1,508	1,720	1,883	3.6	3.7	4.4	0.5	-0.6	2.3
Brazil	253	341	514	548	4,341	6,692	12,709	15,596	3.8	4.6	2.4	1.4	3.1	0.6
Chile	279	411	515	528	4,736	6,443	8,395	8,745	3.4	2.7	0.7	0.5	2.7	0.8
Colombia	216	255	311	333	2,907	3,184	3,728	4,353	1.6	1.4	3.1	1.4	1.2	1.9
Costa Rica	707	1,234	1,580	1,769	5,292	6,946	8,925	10,266	3.3	2.4	2.7	2.3	2.1	1.1
Cuba	694	567	442	519	5,594	5,060	4,865	6,049	-2.3	-2.6	3.3	1.3	-1.5	1.8
Dominican Republic	630	753	1,180	1,286	2,563	3,438	6,133	7,149	1.7	4.0	1.7	1.8	2.6	3.3
Ecuador	410	616	868	1,125	2,922	4,047	5,112	4,983	4.3	2.7	-0.8	1.4	1.0	-1.5
El Salvador	599	676	733	729	1,287	1,529	1,898	2,054	1.8	1.0	0.9	0.5	1.0	1.6
French Guiana (France)	875	952	818	822	1,671	1,990	1,657	2,096	1.7	-1.0	5.9	1.3	-0.5	6.0
Guatemala	469	634	1,155	1,438	1,355	1,903	2,227	2,438	3.4	4.8	4.4	1.4	2.1	4.0
Guyana	105	186	213	280	3,138	5,675	6,733	9,236	5.6	1.2	6.9	3.2	-0.5	5.1
Haiti	582	555	717	879	521	475	596	689	0.1	3.6	4.7	-1.6	2.3	5.2
Honduras	355	442	616	675	1,747	1,762	2,983	3,302	1.0	4.3	2.3	0.5	2.5	2.9
Jamaica	1,031	1,123	1,225	1,270	1,785	2,170	2,530	2,738	0.9	0.1	0.9	-0.2	1.9	2.2
Lesser Antilles	1,904	2,006	1,568	1,666	3,790	4,149	3,588	3,659	-0.6	-2.4	-0.1	-0.6	-1.2	3.0
Mexico	216	278	341	378	2,640	3,346	4,495	5,231	2.6	2.1	2.6	2.1	2.0	2.5
Nicaragua	162	207	297	325	1,667	2,713	4,226	4,897	4.9	3.4	2.5	3.3	2.6	2.2
Panama	383	373	408	445	3,202	3,101	3,556	3,984	0.2	1.1	2.1	-1.8	0.2	2.6
Paraguay	156	143	245	278	4,638	4,066	6,253	6,988	0.8	5.8	3.9	-3.8	2.0	0.2
Peru	156	256	369	412	1,223	1,760	2,383	2,639	5.5	4.0	3.1	2.1	2.0	1.4
Suriname	1,343	1,062	1,741	1,711	4,076	3,116	4,132	4,574	-2.3	3.8	2.5	-1.0	3.5	4.2
Uruguay	146	191	280	303	11,776	14,487	21,725	23,943	2.7	3.5	2.0	0.7	1.3	0.4
Venezuela	196	263	294	319	4,914	6,986	8,761	10,211	2.8	1.1	2.0	2.8	-0.1	1.6
ASIA AND PACIFIC	611	847	1,156	1,278	984	1,150	1,749	2,183	3.7	3.5	2.7	1.5	1.3	1.5
Afghanistan	54	67	92	99	823	628	640	630	2.0	3.2	1.8	2.8	-1.4	0.5
Armenia	560	466	541	739	2,523	1,089	2,053	3,147	-1.5	4.2	7.0	4.9	2.8	4.5
Azerbaijan	558	334	528	586	2,058	1,050	1,521	1,653	-4.0	4.6	2.6	4.4	-0.7	0.0
Bangladesh	1,073	1,633	2,396	2,648	355	473	679	753	3.2	3.7	2.1	-0.3	0.9	0.7
Bhutan	229	200	273	279	650	626	460	427	0.2	2.9	0.8	0.2	1.7	-0.9
Cambodia	275	396	688	812	411	478	744	822	4.3	6.9	4.1	2.3	1.6	-0.2
China	433	691	970	1,058	582	1,053	1,922	2,593	5.2	3.5	2.4	2.5	1.2	1.7

Table 5 continued

Country/region	Land productivity (in constant 2004–2006 US dollars)				Labor productivity (in constant 2004–2006 US dollars)				Output growth (%)			TFP growth (%)		
	1990	2000	2010	2014	1990	2000	2010	2014	1991–2000	2001–2010	2010–2014	1991–2000	2001–2010	2010–2014
Fiji	608	542	441	476	2,150	1,857	1,487	1,579	-0.7	-2.1	1.9	-1.3	-2.3	1.4
India	719	930	1,292	1,488	624	710	873	968	2.6	3.2	3.5	0.5	1.2	2.7
Indonesia	670	808	1,078	1,190	726	804	1,205	1,356	2.3	4.5	3.1	0.0	1.8	0.5
Kazakhstan	52	26	36	42	6,803	2,905	3,361	5,679	-7.2	3.1	4.2	5.2	0.6	1.5
Korea, DPR	1,532	1,294	1,416	1,536	1,065	995	1,231	1,376	-1.6	1.4	1.6	3.5	1.2	2.0
Kyrgyzstan	152	161	177	184	2,786	1,841	2,692	2,665	0.8	0.9	0.7	6.0	0.4	0.0
Laos	428	641	823	1,126	472	612	748	979	4.9	4.6	9.5	2.7	-1.1	2.5
Malaysia	1,100	1,404	1,872	1,960	3,894	5,329	8,923	10,533	2.7	3.5	2.4	0.9	1.6	0.4
Micronesia	392	380	371	387	681	625	631	661	-0.9	-0.4	0.7	-0.8	-1.6	0.1
Mongolia	7	7	7	9	3,827	3,991	3,457	4,650	0.1	-2.3	6.3	4.2	-3.1	-2.2
Myanmar	596	976	1,673	1,593	401	572	1,031	954	5.3	6.9	-1.0	1.8	4.4	-7.8
Nepal	704	910	1,238	1,514	463	469	473	530	2.8	2.8	5.0	0.4	1.6	-1.1
Pakistan	595	807	1,057	1,145	1,398	1,584	1,517	1,580	3.5	2.3	2.7	1.1	0.5	0.7
Papua New Guinea	1,908	2,176	2,243	2,374	1,178	1,268	1,265	1,232	2.7	2.0	1.4	0.9	-0.5	0.1
Philippines	1,150	1,389	1,706	1,800	1,175	1,252	1,538	1,632	2.0	2.8	2.0	0.1	1.7	-0.1
Solomon Islands	945	1,104	1,064	1,122	706	705	769	753	2.7	3.1	1.6	1.1	0.5	0.1
Sri Lanka	900	996	1,154	1,072	589	644	756	733	1.1	2.6	-0.7	-1.1	1.3	-2.8
Tajikistan	313	173	320	402	1,687	697	1,035	1,250	-5.8	6.6	5.6	2.0	1.4	5.6
Thailand	844	1,268	1,470	1,598	856	1,268	1,670	2,016	3.3	2.1	3.3	1.1	0.9	2.7
Timor Leste	339	321	395	357	433	455	435	372	0.0	3.1	-2.0	-1.3	-0.6	-3.3
Turkey	677	784	942	1,044	2,600	3,504	4,593	5,292	1.7	1.5	2.3	0.9	1.9	-1.3
Turkmenistan	40	54	81	85	2,663	2,107	2,477	2,435	1.1	3.6	1.1	0.8	0.2	2.5
Uzbekistan	259	254	431	534	2,351	2,248	3,683	4,046	-0.5	5.0	5.4	2.5	1.2	2.0
Vanuatu	453	348	419	399	2,296	1,843	2,060	1,915	-1.2	2.5	-1.2	-2.0	0.2	-1.1
Viet Nam	1,590	2,137	2,679	3,017	459	704	960	1,058	5.6	4.3	3.2	-0.6	1.5	2.0
MIDDLE EAST AND NORTH AFRICA	1,232	1,724	1,940	2,149	2,908	3,765	4,468	4,765	3.5	3.2	1.2	1.7	1.2	1.6
Algeria	74	94	164	210	1,438	1,334	2,045	2,561	2.8	5.9	6.2	2.2	3.3	2.4
Djibouti	21	26	25	26	145	180	162	156	4.1	0.4	0.9	3.4	-2.5	0.5
Egypt	4,179	5,234	5,997	6,469	1,719	2,780	3,456	3,887	4.4	2.5	2.4	1.6	0.8	2.0
Iran	217	303	560	569	2,568	3,272	3,955	3,947	3.5	3.1	0.1	2.0	0.5	2.3
Iraq	332	316	348	364	4,833	4,901	6,711	8,420	-1.6	0.9	4.2	0.3	-0.7	2.7
Jordan	554	741	1,261	1,238	5,760	6,769	10,623	11,160	3.2	4.7	1.0	1.0	3.7	-2.2
Lebanon	1,762	2,082	1,834	1,797	16,654	30,209	40,469	45,468	1.5	-0.5	0.2	-1.6	-0.9	-1.4
Libya	53	66	77	79	6,557	10,004	17,671	22,554	2.2	1.5	0.7	3.1	-0.7	7.1
Morocco	167	170	305	310	1,557	1,552	3,066	3,299	0.3	5.6	1.0	-0.9	4.3	-0.8
Syria	272	408	448	327	3,803	4,888	4,426	3,364	4.2	1.1	-7.9	1.8	-0.5	-1.1
Tunisia	282	303	363	369	3,771	3,787	4,472	4,528	1.7	2.3	0.5	-0.6	1.0	-0.2
Yemen	33	48	79	79	583	603	848	837	3.8	5.0	0.0	2.1	1.9	-0.8

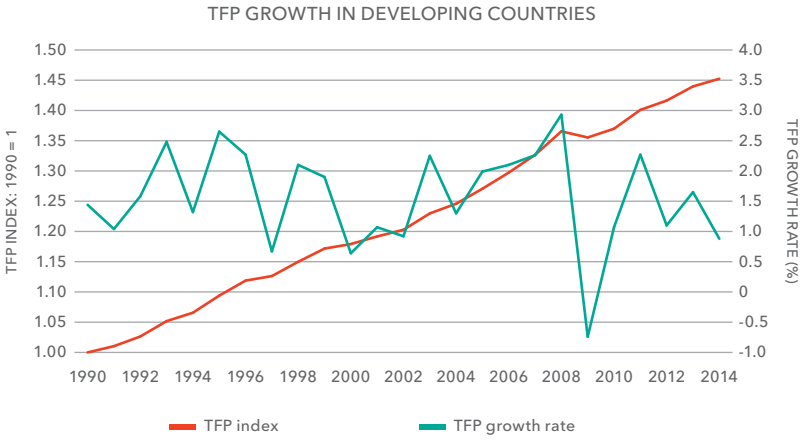
Note: Land productivity is agricultural gross production per hectare of agricultural land; labor productivity is agricultural gross production per economically active person in agriculture.

TFP

AGRICULTURAL TOTAL FACTOR PRODUCTIVITY

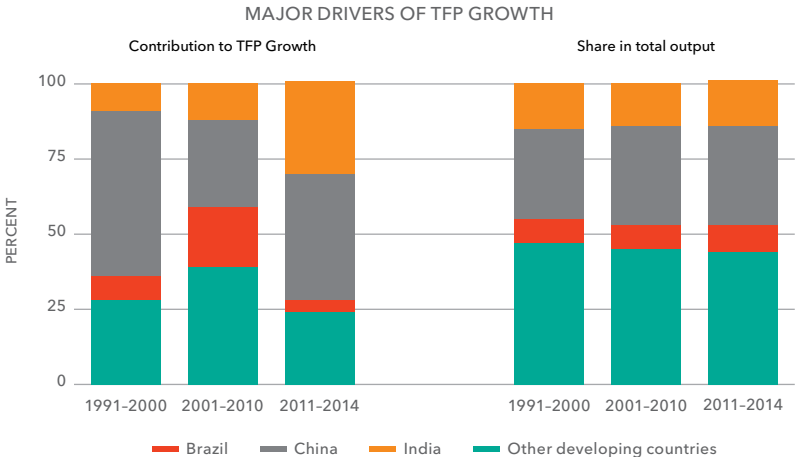
Trend 1
SUSTAINED TFP GROWTH IN DEVELOPING COUNTRIES

Between 1990 and 2014, total factor productivity (TFP) in developing countries increased by 45 percent, representing an average annual growth rate of 1.6 percent. The fastest growth was observed in 1991–2000, when the growth rate averaged 1.7 percent. Between 2001 and 2008, growth in TFP accelerated from 1.2 percent to almost 3.0 percent (average growth of 1.85 percent), but the negative impact of the global economic crisis of 2008–2009 slowed TFP growth to 1.5 percent on average between 2011 and 2014.



Trend 2
CHINA, BRAZIL, AND INDIA ARE THE DRIVERS OF TFP GROWTH

TFP growth in developing countries has been driven by growth in Brazil, China, and India. Together, these countries produced on average about 50 percent of all agricultural output in developing countries in 1991–2014, but contributed 70 percent of total TFP growth. China has been the major driver of global agricultural TFP (55 and 42 percent of TFP growth in 1991–2000 and 2011–2014, respectively). The contribution of Brazil and India to global TFP growth increased after policy reforms in the 1990s and early 2000s. Brazil was a major driver of TFP growth in the 2000s (20 percent), while 31 percent of TFP growth in 2011–2014 is explained by TFP growth in India.



Projections of Food Production, Consumption, and Hunger

INTERNATIONAL MODEL FOR POLICY ANALYSIS OF AGRICULTURAL COMMODITIES AND TRADE (IMPACT)

Policy makers, analysts, and civil society face increasing challenges to reducing hunger and improving food security in a sustainable way. Modeling alternative future scenarios and assessing their outcomes can help inform their choices. The International Food Policy Research Institute's IMPACT model is an integrated system of linked economic, climate, water, and crop models that allows for exploration of such scenarios.

METHODOLOGY

At IMPACT's core is a partial equilibrium, multimarket economic model that simulates national and international agricultural markets. Links to climate, water, and crop models support the integrated study of changing environmental, biophysical, and socioeconomic trends, allowing for in-depth analysis of a variety of critical issues of interest to policy makers at national, regional, and global levels. IMPACT benefits from close interactions with scientists at all 15 CGIAR research centers through the Global Futures and Strategic Foresight (GFSF) program, and with other leading global economic modeling efforts around the world through the Agricultural Model Intercomparison and Improvement Project (AgMIP).

The tables on the following pages summarize results from the latest IMPACT projections to 2030 and 2050. Results are shown for production, consumption, and trade of major food commodity groups, as well as for the population at risk of hunger, by region and for selected countries. Results are shown for two "baseline" scenarios—one considers the impacts of climate change, while the other assumes no climate change (for comparison). Results for additional countries can be found at the IMPACT website.

KEY FINDINGS FROM THE LATEST IMPACT PROJECTIONS

The baseline projections from IMPACT indicate that global food production will grow by about 60 percent over 2010 levels by 2050 in the context of climate change—10 percentage points less than would be the case without climate change (Table 6). Production will grow more rapidly in developing countries, particularly in Africa. Even with population growth and climate change, per capita consumption (assumed equivalent to per capita availability) is projected to increase by 9 percent globally to more than 3,000 kilocalories per day. But differences in access to food within and between countries mean that nearly 500 million people will remain at risk of hunger. In Africa south of the Sahara, an additional 38 million people are projected to be at risk of hunger in 2050 as a result of climate change—25 percent more than would be at risk in the absence of climate change.

Despite the impacts of climate change, meat production is projected to grow by 66 percent globally by 2050, and by 78 percent in developing countries. Per capita consumption levels in developing countries, however, will remain under half of those in developed countries (Table 7). Production of fruits and vegetables, pulses, and oilseeds will grow even more rapidly, by more than 80 percent globally and more than doubling in some regions. Per capita consumption of fruits and vegetables in developing countries is projected to surpass that of developed countries by 2050, with important benefits for nutrition and health. Production of cereals and roots and tubers will grow more slowly, by around 40 percent globally but roughly doubling in Africa south of the Sahara. Developing countries as a group will become larger net importers of food from developed countries.

In addition to the indicators presented here, IMPACT also explores changes in prices, land and water use, greenhouse gas emissions, and other socioeconomic and environmental indicators. For example, prices are projected to rise by about 50 percent for most food commodity groups by 2050 when the impacts of climate change are considered—about double the increase projected in the absence of climate change. Selected results from alternative strategies are presented following Table 7.

MORE INFORMATION

More information on these results, and on the results of alternative scenarios exploring different population, income, policy, investment, and technology pathways, can be found online (see box). Results for all 158 countries and regions modeled are available as well as information on IMPACT, the GFSF program, and recent publications. Tables 6 and 7 present baseline data that will be updated in the coming year.

VISIT ONLINE
IFPRI IMPACT: https://www.ifpri.org/program/impact-model
Global Futures and Strategic Foresight: http://globalfutures.cgiar.org/
IMPACT documentation: http://www.ifpri.org/publication/international-model-policy-analysis-agricultural-commodities-and-trade-impact-model-0

CONTACT
IMPACT (IFPRI-Impact-Model@cgiar.org)

TABLE 6 IMPACT projections of food production, consumption, and hunger to 2050, with and without climate change

	Aggregate food production (index, 2010 = 1.00)					Per capita food consumption (KCAL per capita per day)					Hunger (millions of people at risk)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
WORLD	**1.00**	**1.37**	**1.69**	**1.33**	**1.60**	**2795**	**3032**	**3191**	**2982**	**3079**	**838.1**	**528.2**	**405.8**	**592.3**	**476.9**
Developing countries	1.00	1.42	1.76	1.39	1.71	2683	2961	3137	2909	3020	823.3	513.3	392.2	576.7	461.1
Developed countries	1.00	1.24	1.47	1.15	1.29	3384	3439	3513	3406	3435	14.8	14.9	13.6	15.7	15.8
ASIA AND PACIFIC	**1.00**	**1.37**	**1.64**	**1.36**	**1.63**	**2656**	**3003**	**3185**	**2954**	**3072**	**539.8**	**249.8**	**181.8**	**280.9**	**204.6**
East Asia	**1.00**	**1.23**	**1.35**	**1.26**	**1.41**	**3009**	**3509**	**3628**	**3459**	**3516**	**187.2**	**59.2**	**54.7**	**60.3**	**56.8**
China	1.00	1.23	1.34	1.26	1.40	3044	3604	3733	3552	3616	173.4	44.8	41.0	44.7	41.0
Japan	1.00	1.24	1.52	1.31	1.69	2770	2787	2842	2757	2773	2.3	2.0	1.2	2.3	1.9
Korea, Rep.	1.00	1.25	1.43	1.26	1.44	3139	3347	3429	3310	3347	0.6	0.4	0.4	0.4	0.4
South Asia	**1.00**	**1.57**	**2.05**	**1.50**	**1.91**	**2361**	**2669**	**2959**	**2623**	**2848**	**268.5**	**138.3**	**87.7**	**161.6**	**97.0**
Afghanistan	1.00	1.33	1.73	1.35	1.77	2149	2239	2452	2206	2349	7.0	9.4	7.9	10.1	10.4
Bangladesh	1.00	1.41	1.63	1.33	1.46	2426	2714	2911	2653	2781	26.0	11.3	6.9	14.8	8.7
India	1.00	1.63	2.16	1.56	2.01	2354	2697	2998	2651	2883	189.7	73.9	45.0	90.5	44.9
Nepal	1.00	1.33	1.60	1.37	1.71	2425	2695	3186	2625	3028	2.7	2.0	0.8	2.4	1.5
Pakistan	1.00	1.33	1.63	1.27	1.50	2379	2540	2862	2514	2787	37.6	38.0	24.4	39.9	28.0
Southeast Asia and Pacific	**1.00**	**1.48**	**1.89**	**1.46**	**1.84**	**2551**	**2852**	**3051**	**2796**	**2931**	**84.1**	**52.3**	**39.4**	**58.9**	**50.8**
Indonesia	1.00	1.62	2.02	1.63	2.05	2540	2990	3281	2910	3110	32.4	12.9	7.2	15.3	11.1
Malaysia	1.00	1.83	2.95	1.79	2.84	2838	3173	3462	3143	3384	0.9	0.8	0.9	0.8	0.9
Myanmar	1.00	1.35	1.55	1.34	1.53	2169	2473	2592	2420	2487	10.5	6.5	4.8	7.2	6.0
Philippines	1.00	1.33	1.68	1.31	1.65	2503	2641	2777	2602	2691	12.1	12.2	11.0	13.2	13.1
Thailand	1.00	1.18	1.26	1.12	1.14	2742	3012	3183	2975	3103	6.2	3.1	1.8	3.5	2.3
Viet Nam	1.00	1.25	1.36	1.20	1.24	2512	2710	2828	2654	2712	12.9	9.5	7.2	10.8	9.7
AFRICA AND MIDDLE EAST	**1.00**	**1.60**	**2.24**	**1.55**	**2.11**	**2623**	**2795**	**3002**	**2735**	**2873**	**238.7**	**229.8**	**185.0**	**258.7**	**227.1**
Africa south of the Sahara	**1.00**	**1.65**	**2.37**	**1.57**	**2.17**	**2358**	**2587**	**2853**	**2518**	**2713**	**209.5**	**195.7**	**150.5**	**223.0**	**188.7**
Congo, Dem. Rep.	1.00	1.72	2.49	1.67	2.38	1943	2392	2998	2325	2848	37.6	20.3	6.6	25.2	6.6
Ethiopia	1.00	1.65	2.45	1.66	2.48	2066	2307	2614	2266	2533	32.7	32.3	22.5	34.7	26.5
Kenya	1.00	1.76	3.12	1.79	3.14	2133	2395	2708	2300	2524	10.2	8.9	5.0	10.8	8.2
Nigeria	1.00	1.62	2.31	1.56	2.16	2751	2943	3136	2866	2984	9.7	8.5	11.6	10.6	11.6

Table 6 continued

	Aggregate food production (index, 2010 = 1.00)					Per capita food consumption (KCAL per capita per day)					Hunger (millions of people at risk)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
South Africa	1.00	1.50	1.87	1.49	1.80	2962	3229	3397	3157	3258	1.9	1.5	1.6	1.5	1.6
Sudan	1.00	1.74	2.47	1.44	1.76	2329	2465	2714	2431	2635	11.4	12.7	9.0	13.7	10.9
Tanzania, United Rep.	1.00	1.64	2.42	1.56	2.22	2178	2396	2602	2309	2439	15.6	17.8	17.8	20.4	23.0
Uganda	1.00	1.89	3.05	1.77	2.71	2391	2585	2796	2520	2667	8.5	10.4	11.3	11.8	13.8
Middle East and North Africa	**1.00**	**1.51**	**2.01**	**1.50**	**2.00**	**3125**	**3250**	**3377**	**3208**	**3275**	**29.3**	**34.2**	**34.5**	**35.7**	**38.4**
Algeria	1.00	1.54	2.02	1.42	1.71	2977	3098	3163	3061	3071	1.9	1.9	1.9	2.0	2.2
Egypt	1.00	1.47	1.96	1.43	1.91	3395	3580	3783	3520	3645	1.6	2.2	2.5	2.2	2.5
Iran	1.00	1.48	1.96	1.52	2.06	3079	3109	3228	3067	3126	4.7	5.2	4.4	5.7	5.3
Iraq	1.00	1.77	3.16	1.75	3.09	2342	2651	2773	2618	2685	7.8	7.5	8.5	7.9	9.6
Morocco	1.00	1.61	2.27	1.42	1.82	3287	3592	3856	3553	3755	1.7	1.9	2.0	1.9	2.0
Saudi Arabia	1.00	1.76	2.74	1.76	2.71	2936	3055	3128	3020	3046	1.3	1.4	1.5	1.5	1.8
Turkey	1.00	1.40	1.60	1.44	1.70	3596	3661	3698	3620	3597	1.8	2.2	2.4	2.2	2.4
THE AMERICAS	**1.00**	**1.37**	**1.69**	**1.27**	**1.48**	**3188**	**3290**	**3392**	**3244**	**3297**	**42.5**	**35.7**	**27.7**	**39.3**	**32.7**
Latin America and the Caribbean	**1.00**	**1.46**	**1.83**	**1.42**	**1.72**	**2878**	**3036**	**3184**	**2985**	**3081**	**39.5**	**32.1**	**24.0**	**35.8**	**28.7**
Argentina	1.00	1.42	1.75	1.42	1.74	3171	3327	3426	3297	3354	0.7	0.6	0.7	0.6	0.7
Brazil	1.00	1.52	1.95	1.41	1.66	3142	3336	3492	3292	3398	3.7	3.2	3.1	3.2	3.1
Colombia	1.00	1.44	1.75	1.52	1.96	2645	2804	2957	2759	2868	5.0	3.9	2.7	4.5	3.6
Mexico	1.00	1.35	1.62	1.31	1.54	3040	3134	3240	3054	3096	5.3	5.4	5.3	6.1	6.1
Peru	1.00	1.46	1.78	1.71	2.44	2472	2752	2886	2700	2782	3.6	2.0	1.4	2.3	1.8
Venezuela	1.00	1.41	1.76	1.30	1.50	2536	2626	2763	2579	2669	1.4	1.3	0.7	1.6	1.2
North America	**1.00**	**1.29**	**1.58**	**1.15**	**1.29**	**3714**	**3725**	**3735**	**3689**	**3654**	**3.0**	**3.6**	**3.7**	**3.6**	**4.0**
EUROPE AND FORMER SOVIET UNION	**1.00**	**1.18**	**1.33**	**1.14**	**1.26**	**3275**	**3390**	**3491**	**3359**	**3414**	**17.1**	**13.0**	**11.4**	**13.4**	**12.5**
Former Soviet Union	**1.00**	**1.26**	**1.42**	**1.20**	**1.36**	**3092**	**3321**	**3423**	**3288**	**3338**	**9.7**	**5.9**	**5.2**	**6.2**	**5.5**
Russia	1.00	1.26	1.44	1.23	1.44	3227	3450	3532	3417	3452	1.8	1.2	1.1	1.2	1.2
Ukraine	1.00	1.21	1.31	1.11	1.18	3201	3434	3581	3400	3499	0.6	0.4	0.3	0.4	0.3
Uzbekistan	1.00	1.28	1.49	1.27	1.45	2563	2849	3024	2820	2935	2.4	0.8	0.8	0.9	0.8
Europe	**1.00**	**1.15**	**1.28**	**1.11**	**1.21**	**3370**	**3424**	**3523**	**3395**	**3450**	**7.4**	**7.0**	**6.2**	**7.3**	**6.9**

Notes: World and regional figures include other regions and countries not reported separately. Aggregate food production is an index, by weight, of cereals, meats, fruits and vegetables, oilseeds, pulses, and roots and tubers (which are reported separately in Table 7). Per capita food consumption is a projection of daily dietary energy supply. Estimates of the number of people at risk of hunger are based on a quadratic specification of the relationship between national-level calorie supply and the share of population that is undernourished as defined by the FAO. Values reported for 2010 are calibrated model results. Projections for 2030 and 2050 assume changes in population and income as reflected in the Intergovernmental Panel on Climate Change's (IPCC) Shared Socioeconomic Pathway 2. Climate change impacts are simulated using the IPCC's Representative Concentration Pathway 8.5 and the HadGEM general circulation model. Further documentation is available at www.ifpri.org/program/impact-model.

Source: IFPRI (International Food Policy Research Institute), IMPACT Model version 3.3, October 2016.

TABLE 7 IMPACT projections of production, consumption, and net trade to 2050 by commodity group with and without climate change

	Total production (million metric tons)					Per capita food consumption (kg per capita per year)					Net trade (million metric tons)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
CEREALS															
World	**2,155**	**2,746**	**3,235**	**2,621**	**2,990**	**143.5**	**146.7**	**148.3**	**143.4**	**140.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	1,390	1,826	2,154	1,802	2,109	148.7	151.6	153.0	148.0	144.5	−86.6	−124.0	−224.3	−61.5	−96.2
Developed countries	765	920	1,081	819	882	116.3	118.3	120.4	116.7	115.3	86.6	124.0	224.3	61.5	96.2
Asia and Pacific	**859**	**1,067**	**1,195**	**1,047**	**1,165**	**148.7**	**152.1**	**154.3**	**148.9**	**146.0**	**−39.7**	**−69.7**	**−129.4**	**−28.8**	**−6.4**
East Asia	393	451	479	464	511	145.2	148.2	147.3	145.4	140.0	−43.3	−63.3	−74.5	−6.4	65.6
South Asia	279	384	454	362	415	148.5	150.7	154.1	147.5	145.8	−5.1	−8.3	−52.7	−22.1	−67.0
Southeast Asia and Pacific	187	232	262	221	239	158.1	164.6	167.6	159.9	157.4	8.6	1.9	−2.2	−0.3	−5.0
Africa and Middle East	**229**	**337**	**428**	**328**	**409**	**149.3**	**151.0**	**151.5**	**146.7**	**142.4**	**−91.5**	**−157.6**	**−261.3**	**−153.1**	**−239.2**
Africa south of the Sahara	114	184	254	179	239	121.8	129.3	134.4	124.2	124.6	−32.2	−63.5	−119.9	−58.0	−103.0
West	49	79	110	75	99	143.5	152.4	155.3	146.9	144.8	−13.7	−29.8	−60.3	−29.1	−56.9
Central	7	12	18	12	17	59.3	65.4	68.9	62.4	63.0	−3.1	−6.3	−11.8	−5.9	−10.5
East	39	65	91	64	91	115.7	125.6	134.1	119.7	123.1	−8.7	−17.1	−31.9	−13.7	−21.8
Southern	13	18	21	19	23	182.8	194.8	201.5	187.5	187.3	−3.5	−7.1	−12.5	−4.6	−7.2
Middle East and North Africa	114	153	174	149	170	201.4	198.3	194.4	195.8	187.2	−59.3	−94.1	−141.4	−95.2	−136.2
North Africa	42	55	62	49	50	204.7	202.5	198.7	199.6	191.0	−30.6	−46.4	−68.5	−49.9	−72.8
Middle East	56	73	77	73	78	183.0	179.3	176.2	177.3	169.7	−33.5	−59.1	−93.5	−59.3	−91.8
The Americas	**600**	**817**	**1,033**	**713**	**806**	**120.6**	**121.7**	**121.5**	**118.8**	**115.1**	**100.8**	**189.9**	**312.3**	**132.9**	**128.1**
Latin America and the Caribbean	164	245	322	236	294	128.0	129.6	129.8	126.0	122.7	−23.4	−18.4	−5.8	−18.1	−64.2
Caribbean	2	2	3	2	3	103.7	104.9	105.3	102.4	99.9	−5.6	−7.3	−9.1	−6.9	−8.0
Central America	38	52	66	51	64	156.9	156.6	155.2	150.2	143.9	−23.4	−28.3	−29.0	−25.0	−25.5
South America	125	191	254	182	227	118.7	120.5	120.9	118.1	115.5	5.6	17.2	32.3	13.8	−30.7
North America	436	572	711	478	511	108.2	108.3	107.8	106.5	102.6	124.3	208.3	318.1	151.0	192.2
Europe and former Soviet Union	**467**	**525**	**579**	**532**	**611**	**135.9**	**140.6**	**144.2**	**139.1**	**138.8**	**30.4**	**37.4**	**78.4**	**49.0**	**117.5**
Former Soviet Union	156	206	244	217	272	162.1	170.8	174.5	169.3	168.7	21.5	62.3	101.5	77.4	137.9
Europe	311	319	334	315	339	122.3	125.5	129.6	124.1	124.5	8.9	−24.9	−23.1	−28.4	−20.4
MEATS															
World	**274**	**381**	**460**	**380**	**455**	**39.4**	**45.6**	**49.5**	**45.4**	**49.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	174	254	312	253	309	30.5	37.7	41.9	37.5	41.5	−3.6	−14.4	−21.5	−14.4	−20.7
Developed countries	100	127	148	127	146	86.5	91.1	95.8	90.7	95.0	3.6	14.4	21.5	14.4	20.7
Asia and Pacific	**109**	**150**	**166**	**149**	**165**	**30.3**	**39.6**	**43.3**	**39.4**	**42.9**	**−7.0**	**−25.3**	**−34.7**	**−25.6**	**−34.5**
East Asia	79	99	93	98	91	56.5	76.3	81.3	75.9	80.6	−9.2	−22.5	−25.6	−22.9	−26.1
South Asia	10	19	31	19	31	6.0	10.7	17.8	10.6	17.6	0.2	−2.9	−11.4	−2.8	−11.0
Southeast Asia and Pacific	20	32	43	32	43	28.8	41.6	49.6	41.5	49.4	2.0	0.1	2.3	0.2	2.5

Table 7 continued

	Total production (million metric tons)					Per capita food consumption (kg per capita per year)					Net trade (million metric tons)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
Africa and Middle East	**22**	**40**	**66**	**40**	**65**	**18.3**	**23.7**	**31.3**	**23.6**	**31.0**	**−2.7**	**−6.1**	**−12.9**	**−6.0**	**−12.5**
Africa south of the Sahara	11	20	35	20	35	13.0	18.1	26.8	18.1	26.6	−0.4	−3.6	−13.5	−3.5	−13.1
West	3	6	11	6	11	10.2	16.2	26.6	16.1	26.3	−0.3	−1.9	−7.3	−1.9	−7.1
Central	1	1	2	1	2	9.1	12.2	17.0	12.1	16.8	−0.4	−1.0	−2.1	−1.0	−2.0
East	3	6	10	6	10	10.3	14.4	22.5	14.3	22.2	−0.0	−1.1	−4.9	−1.1	−4.7
Southern	2	4	5	4	5	45.2	61.0	73.3	60.8	72.7	−0.2	−0.1	−0.1	−0.1	−0.1
Middle East and North Africa	11	20	31	19	31	28.3	36.0	42.4	35.8	42.0	−2.3	−2.5	0.7	−2.5	0.5
North Africa	5	10	17	10	17	22.6	32.0	42.9	31.9	42.7	0.0	0.3	2.0	0.3	2.0
Middle East	5	10	15	10	15	31.0	38.4	43.4	38.3	43.1	−2.0	−3.0	−2.3	−3.0	−2.4
The Americas	**89**	**127**	**158**	**127**	**156**	**82.2**	**88.0**	**93.0**	**87.5**	**92.1**	**11.5**	**29.1**	**44.5**	**29.0**	**43.8**
Latin America and the Caribbean	44	67	85	66	84	61.4	69.9	76.6	69.4	75.6	7.2	16.7	25.9	16.7	26.0
Caribbean	1	2	2	2	2	34.5	43.3	52.4	43.0	51.6	−0.1	−0.2	−0.0	−0.1	0.0
Central America	7	10	13	10	13	51.0	58.4	65.8	58.0	64.9	−0.9	−0.9	−0.8	−0.8	−0.6
South America	36	55	69	54	69	68.1	76.9	83.2	76.5	82.2	8.2	17.7	26.7	17.7	26.6
North America	45	61	73	60	72	117.6	119.0	120.2	118.6	119.3	4.4	12.5	18.7	12.3	17.8
Europe and former Soviet Union	**54**	**64**	**69**	**64**	**69**	**67.5**	**72.0**	**76.3**	**71.6**	**75.5**	**−1.8**	**2.3**	**3.0**	**2.6**	**3.3**
Former Soviet Union	10	12	14	12	13	46.0	55.3	59.5	55.0	59.0	−3.0	−3.3	−3.2	−3.3	−3.2
Europe	44	52	56	52	56	78.6	80.3	84.4	79.8	83.5	1.2	5.6	6.2	5.9	6.4
FRUITS AND VEGETABLES															
World	**1,592**	**2,334**	**3,044**	**2,297**	**2,945**	**196.2**	**240.0**	**284.7**	**236.2**	**275.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	1,304	1,952	2,554	1,925	2,476	191.2	239.7	290.6	235.9	281.2	15.1	−20.1	−90.5	−15.5	−81.8
Developed countries	288	383	490	373	470	222.8	241.4	248.6	237.8	241.2	−15.1	20.1	90.5	15.5	81.8
Asia and Pacific	**868**	**1,259**	**1,586**	**1,262**	**1,583**	**209.7**	**278.7**	**358.7**	**274.4**	**347.4**	**−44.8**	**−141.4**	**−279.9**	**−116.1**	**−222.7**
East Asia	609	800	938	823	992	351.0	432.7	430.1	427.1	419.4	−20.4	−5.4	192.7	28.1	265.6
South Asia	158	318	467	302	417	104.7	197.7	366.8	194.1	354.2	−29.7	−127.5	−466.1	−136.1	−483.4
Southeast Asia and Pacific	101	141	181	138	174	134.0	176.0	205.1	172.4	196.5	5.3	−8.5	−6.6	−8.2	−4.9
Africa and Middle East	**251**	**436**	**661**	**423**	**623**	**155.9**	**171.4**	**190.1**	**168.5**	**183.5**	**1.9**	**33.1**	**77.8**	**26.4**	**60.3**
Africa south of the Sahara	101	188	301	174	261	95.4	119.7	150.0	117.2	143.9	−1.0	−9.3	−34.1	−19.2	−60.1
West	40	74	118	70	106	117.2	145.3	174.4	142.4	167.9	0.3	−3.5	−14.8	−6.0	−22.1
Central	10	17	27	16	22	66.0	82.4	103.1	80.2	97.7	0.1	−1.3	−4.4	−2.5	−7.5
East	36	70	121	65	107	82.2	105.5	138.5	103.2	132.4	−1.2	−5.4	−12.9	−8.1	−20.3
Southern	9	15	21	14	17	76.2	89.2	98.3	87.4	94.3	2.9	6.4	10.1	5.2	7.2
Middle East and North Africa	150	248	361	249	362	270.2	284.3	290.5	280.6	282.9	3.0	42.4	111.9	45.6	120.4
North Africa	57	99	149	90	126	228.9	250.1	270.3	246.7	262.9	0.0	16.5	44.1	8.3	24.4
Middle East	73	121	176	126	189	246.8	263.1	269.3	259.7	262.2	−0.1	12.0	39.2	18.4	56.3

Table 7 continued

	Total production (million metric tons)					Per capita food consumption (kg per capita per year)					Net trade (million metric tons)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
The Americas	**255**	**351**	**447**	**338**	**422**	**187.0**	**212.1**	**226.7**	**208.4**	**218.7**	**49.2**	**74.6**	**123.8**	**67.4**	**110.9**
Latin America and the Caribbean	164	236	299	225	273	159.6	182.9	202.9	179.7	195.7	46.3	76.3	108.3	67.4	88.7
Caribbean	12	15	18	14	15	192.6	218.7	245.0	216.2	239.1	2.3	3.4	4.6	2.0	1.9
Central America	46	59	67	55	59	165.5	180.0	196.8	176.7	189.5	15.4	18.6	18.1	15.2	11.5
South America	107	162	214	156	199	154.2	181.0	202.0	177.8	194.8	28.7	54.3	85.7	50.2	75.3
North America	91	114	147	114	149	233.6	262.4	265.9	257.7	256.7	2.9	−1.7	15.4	0.0	22.2
Europe and former Soviet Union	**218**	**289**	**351**	**274**	**317**	**209.2**	**230.9**	**241.8**	**227.8**	**235.3**	**−6.3**	**33.7**	**78.4**	**22.3**	**51.5**
Former Soviet Union	62	81	95	79	90	181.6	223.0	239.5	219.9	232.6	0.1	5.0	14.0	3.9	11.1
Europe	156	208	255	195	227	223.5	234.8	242.9	231.7	236.7	−6.4	28.7	64.4	18.3	40.4
OILSEEDS															
World	**673**	**1,033**	**1,293**	**1,017**	**1,257**	**6.8**	**8.2**	**7.8**	**7.9**	**7.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	525	842	1,079	833	1,057	7.0	8.6	8.2	8.3	7.6	−3.0	−8.5	−11.5	−7.4	−9.6
Developed countries	148	191	214	184	200	5.6	5.9	5.9	5.6	5.5	3.0	8.5	11.5	7.4	9.6
Asia and Pacific	**322**	**536**	**713**	**534**	**707**	**8.1**	**10.4**	**9.5**	**10.0**	**9.0**	**−35.4**	**−59.6**	**−69.9**	**−56.0**	**−62.1**
East Asia	49	63	68	64	70	10.9	15.9	15.1	15.4	14.4	−44.3	−62.8	−66.7	−59.2	−59.5
South Asia	41	52	57	51	52	3.6	4.5	4.3	4.4	4.0	0.5	−4.5	−9.7	−4.7	−9.9
Southeast Asia and Pacific	231	421	589	420	586	13.1	14.7	14.6	14.3	13.9	8.4	7.7	6.4	8.0	7.2
Africa and Middle East	**61**	**101**	**126**	**98**	**119**	**5.5**	**6.4**	**7.2**	**6.1**	**6.5**	**−6.1**	**−8.8**	**−13.5**	**−8.1**	**−11.5**
Africa south of the Sahara	53	90	113	87	105	5.9	6.8	7.7	6.5	7.0	0.2	−1.2	−4.6	−1.0	−3.9
West	43	74	94	72	88	8.1	9.3	10.1	8.8	9.2	0.3	−0.5	−2.7	−0.4	−2.5
Central	4	6	8	6	7	9.0	10.0	10.6	9.4	9.5	0.1	0.1	0.1	0.2	0.4
East	4	6	7	6	7	3.7	4.4	5.3	4.2	4.8	0.1	−0.3	−1.3	−0.2	−0.9
Southern	1	1	2	1	1	1.9	2.1	2.1	2.0	2.0	−0.2	−0.3	−0.3	−0.2	−0.2
Middle East and North Africa	9	12	14	12	14	4.7	5.5	6.0	5.3	5.5	−6.3	−7.6	−8.8	−7.0	−7.6
North Africa	4	6	7	5	6	4.6	5.3	5.7	5.1	5.3	−1.5	−1.8	−2.2	−1.7	−2.1
Middle East	5	7	8	7	8	5.4	6.1	6.4	5.9	5.9	−3.9	−5.0	−6.0	−4.6	−5.1
The Americas	**235**	**323**	**371**	**314**	**350**	**6.8**	**6.7**	**6.5**	**6.4**	**6.0**	**58.7**	**83.7**	**97.5**	**78.1**	**85.2**
Latin America and the Caribbean	126	184	215	180	206	6.6	6.4	6.0	6.1	5.5	27.2	46.3	56.6	43.5	49.6
Caribbean	1	1	1	1	1	7.8	8.0	7.8	7.7	7.3	−0.3	−0.3	−0.4	−0.3	−0.4
Central America	6	9	10	8	9	3.2	3.1	3.1	3.0	2.9	−5.5	−6.0	−6.5	−5.7	−5.9
South America	119	174	204	170	196	7.9	7.7	7.1	7.3	6.4	33.0	52.6	63.5	49.5	55.8
North America	110	139	155	134	144	7.1	7.2	7.2	7.0	6.7	31.5	37.3	40.8	34.6	35.6
Europe and former Soviet Union	**55**	**72**	**83**	**71**	**81**	**2.6**	**2.7**	**2.9**	**2.6**	**2.7**	**−17.2**	**−15.3**	**−14.1**	**−14.0**	**−11.6**
Former Soviet Union	14	19	22	19	23	1.1	1.2	1.2	1.2	1.2	−0.4	0.5	1.4	0.7	1.8
Europe	40	53	60	52	58	3.3	3.5	3.6	3.3	3.4	−16.8	−15.8	−15.4	−14.7	−13.4

Table 7 continued

	Total production (million metric tons)					Per capita food consumption (kg per capita per year)					Net trade (million metric tons)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
PULSES															
World	**66**	**94**	**121**	**92**	**118**	**6.2**	**7.5**	**8.9**	**7.5**	**8.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	52	74	97	72	91	6.7	8.2	9.8	8.1	9.6	−2.8	−6.5	−9.9	−7.6	−12.8
Developed countries	14	19	24	20	26	3.5	3.8	4.0	3.8	4.0	2.8	6.5	9.9	7.6	12.8
Asia and Pacific	**28**	**37**	**44**	**36**	**42**	**5.2**	**6.2**	**7.3**	**6.2**	**7.2**	**−0.5**	**−3.3**	**−5.2**	**−3.1**	**−5.2**
East Asia	6	8	11	8	12	1.5	1.9	2.1	1.9	2.1	0.5	1.8	4.7	2.3	5.6
South Asia	16	21	24	20	23	9.4	10.6	11.7	10.5	11.5	−2.9	−6.1	−10.1	−6.2	−10.6
Southeast Asia and Pacific	7	8	8	8	8	3.1	3.6	3.9	3.5	3.8	1.9	1.0	0.2	0.8	−0.3
Africa and Middle East	**16**	**25**	**35**	**23**	**32**	**9.7**	**11.3**	**13.4**	**11.2**	**13.1**	**−1.9**	**−5.6**	**−11.6**	**−6.5**	**−13.5**
Africa south of the Sahara	12	19	28	19	27	10.4	12.3	14.7	12.1	14.4	−0.9	−4.0	−9.4	−4.0	−9.2
West	5	9	16	9	14	8.5	9.8	11.6	9.6	11.1	0.3	0.1	−0.3	0.0	−0.6
Central	1	2	2	2	2	6.7	7.4	8.7	7.3	8.4	−0.1	−0.2	−0.3	−0.2	−0.2
East	5	7	9	7	10	15.3	18.2	22.0	18.0	21.6	−0.7	−3.3	−7.9	−3.2	−7.5
Southern	0	0	0	0	0	3.8	4.2	4.5	4.1	4.4	−0.1	−0.1	−0.0	−0.1	0.0
Middle East and North Africa	4	6	7	5	5	8.2	9.2	10.0	9.2	10.0	−1.0	−1.7	−2.3	−2.5	−4.3
North Africa	1	2	2	1	2	8.2	9.7	11.4	9.8	11.5	−1.1	−1.8	−2.6	−2.1	−3.2
Middle East	2	3	4	3	3	7.9	8.5	8.9	8.6	9.0	−0.2	−0.5	−0.8	−0.9	−1.7
The Americas	**14**	**21**	**28**	**21**	**30**	**8.9**	**9.7**	**10.4**	**9.7**	**10.3**	**3.2**	**7.2**	**12.5**	**8.0**	**14.4**
Latin America and the Caribbean	7	11	16	11	15	11.4	12.6	13.8	12.5	13.6	−0.7	1.1	4.4	0.7	3.1
Caribbean	0	0	1	0	1	12.4	13.4	14.8	13.3	14.6	−0.2	−0.2	−0.0	−0.2	−0.1
Central America	2	3	4	3	3	12.5	13.6	15.2	13.6	15.0	−0.4	−0.2	0.0	−0.4	−0.4
South America	5	8	12	7	11	10.8	12.1	13.1	12.0	12.9	−0.0	1.5	4.4	1.2	3.6
North America	7	10	12	11	15	4.6	4.8	4.9	4.8	4.9	3.8	6.0	8.0	7.3	11.4
Europe and former Soviet Union	**8**	**11**	**14**	**11**	**14**	**2.6**	**2.7**	**2.8**	**2.7**	**2.8**	**−0.8**	**1.7**	**4.4**	**1.6**	**4.3**
Former Soviet Union	3	4	5	4	5	1.5	1.6	1.6	1.6	1.6	0.4	1.3	2.4	1.3	2.5
Europe	5	7	9	7	8	3.1	3.3	3.4	3.3	3.4	−1.2	0.5	2.0	0.3	1.8
ROOTS AND TUBERS															
World	**780**	**1,006**	**1,185**	**963**	**1,103**	**65.0**	**70.5**	**73.4**	**67.8**	**69.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Developing countries	682	897	1,068	858	997	65.8	72.4	75.7	69.5	71.1	5.6	−0.6	−5.4	−0.8	−1.0
Developed countries	97	109	118	105	106	61.2	59.8	59.3	57.5	56.0	−5.6	0.6	5.4	0.8	1.0
Asia and Pacific	**298**	**351**	**365**	**356**	**380**	**46.9**	**50.9**	**49.5**	**48.4**	**45.8**	**−4.9**	**−23.4**	**−18.8**	**1.2**	**28.2**
East Asia	181	201	185	201	182	71.4	76.3	73.5	72.9	68.7	−18.5	−14.2	−0.1	−3.3	12.2
South Asia	50	75	103	79	120	27.3	35.7	38.0	33.1	34.1	−6.2	−24.2	−30.6	−12.4	1.2
Southeast Asia and Pacific	67	76	77	76	78	37.5	39.4	39.9	38.6	38.6	19.9	15.0	11.9	16.9	14.8

Table 7 continued

	Total production (million metric tons)					Per capita food consumption (kg per capita per year)					Net trade (million metric tons)				
		Without climate change		With climate change			Without climate change		With climate change			Without climate change		With climate change	
	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050	2010	2030	2050	2030	2050
Africa and Middle East	**245**	**377**	**524**	**362**	**486**	**109.3**	**117.3**	**123.1**	**113.9**	**117.0**	**−1.8**	**−13.0**	**−31.6**	**−16.6**	**−39.8**
Africa south of the Sahara	224	349	490	333	450	146.4	152.7	156.1	149.1	149.2	−1.1	−11.0	−29.0	−17.9	−43.3
West	133	207	297	201	281	197.5	199.0	198.8	194.9	191.1	1.5	−4.3	−11.7	−4.2	−10.2
Central	37	59	80	56	72	172.5	170.6	166.7	167.1	159.9	1.0	2.6	−2.2	0.1	−8.2
East	50	78	107	71	91	129.6	138.5	142.0	134.6	134.4	−3.2	−9.4	−15.3	−13.9	−24.6
Southern	3	4	5	4	5	36.8	37.7	38.7	36.6	37.1	−0.0	0.7	1.3	0.9	1.3
Middle East and North Africa	21	28	34	29	36	39.0	39.9	40.5	37.0	36.3	−0.8	−2.1	−2.6	1.3	3.5
North Africa	9	14	18	15	20	33.7	38.3	42.1	35.7	37.9	−0.1	0.2	−0.3	2.0	4.0
Middle East	10	13	15	14	15	35.8	32.6	30.9	30.4	27.8	−0.7	−0.7	−1.4	0.7	0.5
The Americas	**86**	**112**	**130**	**110**	**127**	**55.7**	**54.5**	**53.0**	**52.3**	**49.9**	**−0.3**	**10.2**	**19.1**	**14.3**	**26.6**
Latin America and the Caribbean	60	82	97	83	99	51.1	49.9	47.9	48.3	45.6	0.2	11.5	20.4	16.2	29.8
Caribbean	3	5	7	5	6	61.4	59.0	56.6	58.2	55.1	0.1	1.7	3.5	1.3	2.6
Central America	3	5	7	5	6	17.4	18.5	19.9	17.5	18.2	−0.2	0.2	0.8	0.2	0.4
South America	53	72	83	74	87	63.6	62.1	59.3	60.2	56.6	0.3	9.6	16.1	14.7	26.8
North America	26	29	33	27	28	63.3	62.5	61.5	59.3	56.9	−0.4	−1.4	−1.3	−1.9	−3.2
Europe and former Soviet Union	**150**	**166**	**166**	**134**	**111**	**89.0**	**86.5**	**85.3**	**83.4**	**80.8**	**7.0**	**26.3**	**31.3**	**1.1**	**−15.1**
Former Soviet Union	82	89	84	63	42	115.3	112.1	109.6	107.2	102.7	8.5	18.7	18.3	−4.1	−19.5
Europe	68	77	82	72	69	75.3	73.8	73.6	71.5	70.3	−1.5	7.7	13.0	5.2	4.4

Notes: World and regional figures include other regions and countries not reported separately. Total production is aggregated across irrigated and rain-fed systems at the national level and aligned with years as reported in FAOSTAT. Per capita food consumption is based on food availability at the national level. Net trade includes negative and positive numbers indicating that a region is a net importer or exporter, respectively, and balances to zero at the global level. Cereals include barley, millet, rice, sorghum, wheat, and aggregated other cereals. Meats include beef, pork, poultry, and sheep and goats. Fruits and vegetables include banana, plantain, aggregated temperate fruits, aggregated tropical fruits, and aggregated vegetables. Oilseeds include groundnuts, rapeseed, soybean, sunflower, and aggregated other oilseeds. Pulses include beans, chickpeas, cowpeas, lentils, pigeonpeas, and aggregated other pulses. Roots and tubers include cassava, potato, sweet potato, yams, and aggregated other roots and tubers. Values reported for 2010 are calibrated model results. Projections for 2030 and 2050 assume changes in population and income as reflected in the Intergovernmental Panel on Climate Change's (IPCC) Shared Socioeconomic Pathway 2. Climate change impacts are simulated using the IPCC's Representative Concentration Pathway 8.5 and the HadGEM general circulation model. Further documentation is available at www.ifpri.org/program/impact-model.

Source: IFPRI (International Food Policy Research Institute), IMPACT Model version 3.3, October 2016.

IMPACT

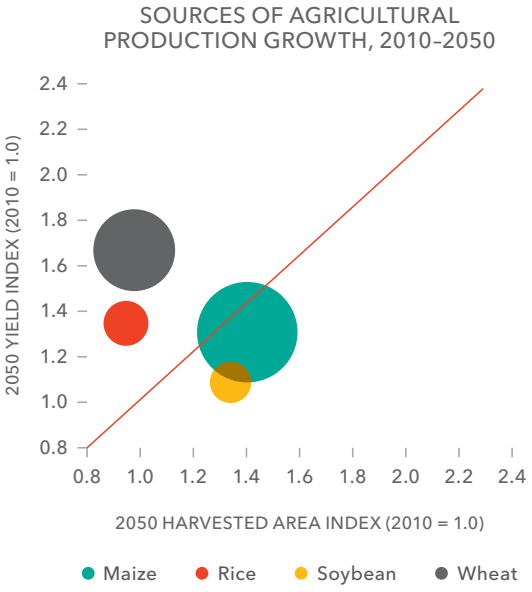
PROJECTIONS OF FOOD PRODUCTION, CONSUMPTION, AND HUNGER

Trend 1

SOURCES OF GROWTH ARE PROJECTED TO VARY FOR FOOD AND FEED CROPS

Demand and supply for major crops are projected to continue increasing through midcentury, but sources of growth will vary. For crops consumed directly as food, such as rice and wheat, rising demand will be met primarily through yield increases ranging from 30 to 60 percent by 2050, while area devoted to those crops will remain roughly constant at the global level. By contrast, demand for feed crops, such as maize and soybean, will require expansion of harvested area by about 40 percent. Total global supply of these four major crops is projected to expand by over 1.3 trillion metric tons, dominated by maize and wheat.

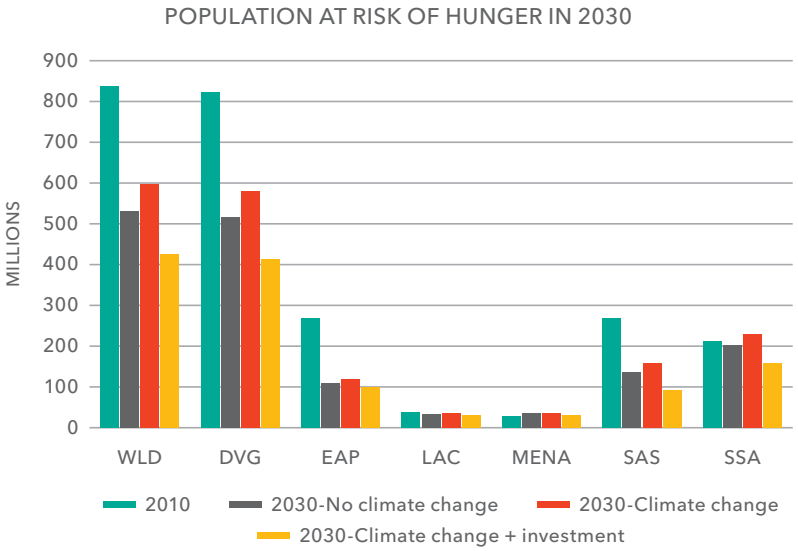
Note: Graphic shows indexed values for changes in yield and area harvested from 2010 to 2050. The circle sizes are scaled to show the relative increase in total global supply for each crop from 2010 to 2050, in million metric tons. The center of each circle is aligned with the indexed values for growth in area harvested and yield for each crop from 2010 to 2050. Projections are from the "Comprehensive" investment scenario modeled in Rosegrant et al. (2017), which posits a relatively optimistic but feasible expansion in R&D investments in yield growth, irrigation and water use, and value-chain efficiency in developing countries.



Trend 2

INCREASED INVESTMENT CAN REDUCE HUNGER, DESPITE SETBACKS DUE TO CLIMATE CHANGE

IMPACT model projections indicate that the Sustainable Development Goal of eliminating hunger will not be achieved by 2030 globally, but important progress is being made. Climate change hinders progress, but key investments in the agriculture sector can more than overcome the negative effects. With increased investments to enhance agricultural productivity, water use, and value-chain efficiency, most regions of the world can reduce the share of the population at risk of hunger in 2030 to below 5 percent. But persistent challenges will keep the hungry population in Africa south of the Sahara at about 12 percent.



Note: WLD = World; DVG = Developing countries; EAP = East Asia and Pacific; LAC = Latin America and Caribbean; MENA = Middle East and North Africa; SAS = South Asia; SSA = Africa south of the Sahara. "Climate Change" shows one realization of future climate change for the Representative Concentration Pathway 8.5 modeled by the HadGEM general circulation model. "Climate Change + Investment" is a scenario with increased investments in agriculture sector R&D, as modeled in the "Comprehensive" scenario from Rosegrant et al. (2017).

Source: M. Rosegrant et al. "Quantitative Foresight Modeling to Inform the CGIAR Research Portfolio," project report for USAID, International Food Policy Research Institute, Washington DC, 2017.