Agriculture, Nutrition and Health in International Development

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How does agriculture contribute to this?
And this?

Agriculture, nutrition and health are linked through diverse mechanisms, with many effect modifiers

Example of a causal framework with selected confounders and effect modifiers

For government policies and programs, we can think in terms of interventions and outcomes

A Typology of Interventions and Outcomes in Agriculture, Nutrition and Health


Agriculture, Nutrition and Health in International Development

A lot of data
(on just a few aspects of this huge and diverse topic)

- Global trends
  - The end of scarcity?
  - The search for just-right nutrition
- Regional trends
  - Malnutrition as a disease of poverty
  - Africa fell into extreme poverty recently, and is now emerging
    - Trends are closely tied to demographic change,
    - worsened by Africa’s delayed green revolution
Global trends: The end of food scarcity? Did we beat Malthus?

![Real agricultural prices have fallen since 1900, even as world population growth accelerated](chart)


Undernutrition has long been the world’s leading cause of disease and disability

![Percent of disability-adjusted life years lost, by risk factor (1990)](chart)

Globally, we are now Goldilocks, facing too little and too much, looking for just-right nutrition

Percent of disability-adjusted life years lost, by risk factor (2010)


Obesity rates are rising everywhere

Note: AFR=Africa, AMR=Americas, SEAR=SE Asia, EUR=Europe, EMR=Eastern Medit., WPR=Western Pacific
But Africa is still far from food abundance

Food supply and real income by region, 1990-2010

Africa has the least food, because it is the poorest.


Nutritional status is closely correlated with income

Mean height-for-age and per-capita income in 2011
(sized in proportion to country's total number of children under 5)

The race is run in two directions at once
Land and Labor Productivity by Region, 1961–2011

Notes: Diagonal lines show a given level of land area per agricultural worker, labeled along the top and right axis. Output is total estimated value of 192 crop and livestock commodities. Land is harvested and permanently pastured area, and labor is the total number of economically active workers in agriculture. MENA is Middle East and North Africa. Source: Alston, Julian M., and Philip G. Pardey. 2014. “Agriculture in the Global Economy.” Journal of Economic Perspectives, 28(1): 121-46. Online at http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.28.1.121.

Malnutrition as a disease of poverty

… and at each income level, children are slightly taller now

Malnutrition as a disease of poverty inside households

Mean height-for-age z scores relative to WHO standards, by region (1-59 months)
- WPRO: Cambodia, Mongolia (2005)
- AFRO: Thirty countries (1994-2006)

By 24 months of age, much of the damage is done


Higher-income countries have lower prevalence of stunting and wasting

Income growth is most correlated with wasting where wasting is most prevalent

Higher average income is associated with lower wasting where it is most widespread

Income vs. child wasting

Higher average income is associated with lower poverty at all levels on poverty

Income vs. household poverty


Higher income generally improves diet quality as well as quantity

Share of calories from animal sources, total food supply and income, 1961-2009

Total calories available rise from under 2000 to over 3500 per person/day

Animal-sourced foods rise from about 5% to about 40% of calories

Higher income also buys sanitation and clean water (among other things)

Access to sanitation, improved water and income, 1990-2010


Sanitation may be especially important

*Lack of sanitation + dense population = what diseases?*

Note: Observations are nationally representative country totals from 130 DHS surveys in 65 countries, 1990-2010, with circles are proportional to population.

Africa’s impoverishment is relatively recent and is already receding

Since 2000, African poverty has declined as it did earlier in Asia

In the 1980s & ’90s, Africa became the world’s most impoverished region

There are limited data and wide variation but many signs of improvement

Source: Calculated from World Bank (2011), PovcalNet (http://iresearch.worldbank.org/PovcalNet/), updated 11 April 2011. Estimates are based on over 700 household surveys from more than 120 countries, and refer to per-capita expenditure at purchasing-power parity prices for 2005.

Source: Author’s calculation from World Bank (2011), PovcalNet (http://iresearch.worldbank.org/PovcalNet/), updated 11 April 2011. Estimates are based on over 700 household surveys from more than 120 countries, and refer to per-capita expenditure at purchasing-power parity prices for 2005.
Despite the recent turnaround, Africa is the last frontier of ultra poverty (<$0.625/day)

Africa now has 1/8th of the world’s people, but 2/3rds of the ultra-poor
Africa has almost all of the world’s food crises and emergencies


Africa’s burden of disease appears still to be principally infectious, rather than NCDs

Percentage of total Disability-Adjusted Life-Years lost attributable to non-communicable diseases (NCDs), 2010

Africa’s burden of disease appears still to be principally mortality, rather than disability

Percentage of total Disability-Adjusted Life-Years (DALYs) due to years lived with disability, 2010


Undernutrition has begun to improve in some African countries

National trends in prevalence of underweight children (0-5 years)
Selected countries with repeated national surveys

Undernutrition levels and trends vary widely across Africa

National trends in prevalence of underweight children (0-5 years)
Selected countries with repeated national surveys

In Asia, where undernutrition was worst, we’ve seen >20 years of improvement

National trends in prevalence of underweight children (0-5 years)
Selected countries with repeated national surveys

An underlying cause of Africa’s impoverishment has been its child-survival baby boom, roughly 20 years behind Asia’s.

A related cause of Africa’s impoverishment is fast, sustained rural population growth.
The rural population stops growing and farm sizes can rise when urbanization employs all new workers

...in Africa that won’t happen until the 2050s

Population by principal residence, 1950-2050


Africa’s continued rising rural population is in sharp contrast to the rest of the world

Population by principal residence, 1950-2050

How many people work on each farm?

Farm family and hired workers per farm, latest census (1996-2003)

<table>
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<tr>
<th>Workers per farm</th>
<th>Senegal</th>
<th>Family Members</th>
<th>Hired Workers</th>
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<th>Hectares per farm</th>
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</table>

Source: Calculated from FAO (2010), World Census of Agriculture, Main Results and Metadata by Country (1960-2005). Rome: FAO.

Note: Countries shown are, from left to right: China, Cape Verde, Japan, Yemen, Lao P.D.R., Philippines, Pakistan, Senegal, Greece, Morocco, French Guiana, Algeria, Portugal, Netherlands, Belgium, Ireland, Austria, Germany, France, Denmark, Luxembourg, Venezuela, Finland, Brazil, Chile, Sweden, Uruguay.

Africa’s burst of rural population growth drove a sharp fall in land per farmer

Land available per farm household (hectares)


Africa’s rural population grew during a period of worldwide slowdown in agricultural R&D

Africa’s green revolution did eventually arrive, roughly 20 years behind Asia’s

Africa’s green revolution has finally taken hold

USDA estimates of average cereal grain yields (mt/ha), 1961-2013

Source: Calculated from USDA, PS&D data (www.fas.usda.gov/psdonline), downloaded 2 August 2013. Results shown are each region’s total production per harvested area in barley, corn, millet, mixed grains, oats, rice, rye, sorghum and wheat.

What else might influence diet quality?

Association between diet diversity (# of items) and household characteristics in the China Health and Nutrition Survey (CHNS).


Note: Coefficients not shown for age, sex, education, marriage and timing of survey.
U.S. aid for agriculture has just begun to recover after being sharply cut in 1980-99

Global aid trends have been similar to the U.S. trends, magnified times four

The wake-up of external aid for agriculture has been led by the Gates Foundation

Top 15 donors' foreign aid commitments to African agriculture, 2005-2008

<table>
<thead>
<tr>
<th>Rank</th>
<th>2005</th>
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</tr>
</tbody>
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Note: Exact amounts for BMGF have been obscured because methodology differs from that used by the DAC. Source: P. Pingali, G. Traxler and T. Nguyen (2011), “Changing Trends in the Demand and Supply of Aid for Agriculture Development and the Quest for Coordination.” Annual Meetings of the AAEA, July 24–26, 2011.

Many African governments are now focusing more on agriculture

Domestic public expenditure on agriculture in selected countries (% of total domestic expenditure)

Legend

- % agriculture in total domestic public expenditure in latest available year
- % agriculture in total domestic public expenditure in 2003

CAADP target

1. Source: ReSAKSS, 2010, CEPA analysis
   - No data available after 2006 for some countries including Ghana, Rwanda and Sierra Leone
   - Similarly, no 2003 data available for some countries including Mozambique, Liberia, Angola and Burundi

Agriculture is one of the many factors contributing to global nutrition trends


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In conclusion, from all the data
(on a few aspects of this huge topic)

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  - The search for just-right nutrition
- Regional trends
  - Malnutrition as a disease of poverty
  - Africa fell into extreme poverty recently, and is now emerging
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...and external aid can help!