Toward a Holistic Program for Sustainable Agricultural Intensification in Sub-Saharan Africa

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Public spending on agriculture, 2012, Zambia

- FRA: 61%
- FISP: 30%
- Other: 9%

Source: Min. Finance Yellow book
Objectives:

1. How to move from a situation where ISPs are the cornerstone of agricultural development to a holistic program of sustainable productivity growth?

2. What would such a holistic program look like?

3. How to achieve it?
A few observations

1. Fallows declining in areas of high population density
2. Crop response to inorganic fertilizer low and declining over time
3. Highly variable crop response rates – even among farmers in same areas in same seasons
Variation in farmers’ efficiency of fertilizer use on maize, Agroecological Zone IIa, Zambia

Note: Zone IIa is a relatively high-potential zone suitable for intensive maize production.
Everyone agrees that inorganic fertilizer use must go up – why isn’t it happening?
Everyone agrees that inorganic fertilizer use must go up – why isn’t it happening?

- Low crop response rates to N
- Population growth
- Land pressures / incentives to intensify
- Reduced fallows / increased fertilizer use
- Deficiencies in SOC and micronutrients / acidification
Agricultural intensification

Agricultural output per hectare

Agricultural population density (person per sq km)

Africa

other

Ag output per hectare

Agricultural output per hectare (2005 int. dollars)
Agricultural intensification

Agricultural population density (person per sq km)

Cereal output per hectare

Africa

other

Cereal output per hectare ($/ha)

Argentina

Bangladesh

Benin

Bolivia

Bosnia and Herzegovina

Brazil

Bulgaria

Burkina Faso

Burundi

Cambodia

Chile

China

Colombia

Comoros

Croatia

Czechia

Denmark

Ecuador

Egypt

El Salvador

France

Germany

Greece

Guatemala

Honduras

Hong Kong

Hungary

India

Indonesia

Iran

Iraq

Ireland

Japan

Jordan

Kenya

Kosovo

Kuwait

Kyrgyzstan

Laos

Latvia

Lebanon

Lesotho

Liberia

Lithuania

Madagascar

Malawi

Malaysia

Mexico

Moldova

Mongolia

Morocco

Mauritania

Myanmar

Namibia

Nepal

Netherlands

New Zealand

Nicaragua

Niger

Nigeria

North Korea

Oman

Pakistan

Panama

Paraguay

Peru

Philippines

Poland

Portugal

Romania

Russian Federation

Rwanda

Senegal

Serbia

Somalia

South Africa

South Sudan

Spain

Sri Lanka

Sudan

Switzerland

Turkey

Ukraine

United Arab Emirates

United Kingdom

United States

Uzbekistan

Virgin Islands (U.S.)

Vietnam

Yemen

Zambia

Zimbabwe

Other
Cumulative distribution of average product of fertilizer used in Zambia (2004,2008)

Source: Burke, 2012
The importance of SOM
On left: Basal application on time

On right: Basal application 3 weeks late due to late FISP delivery

Photo: Dingiswayo Banda, 2014
Factors affecting N use efficiency

- Soil organic carbon
- Soil moisture – why N response on irrigated > rainfed fields
- Micronutrients
- pH (mainly basal)
- Management ability
- Timing of fertilizer application
- Timely and sufficient weed management
- Rotation of crops on a given plot
- Contours / ridging to prevent erosion on sloped fields

- Fixation with N
- ISPs need to be part of a more holistic approach so that N can get sufficiently high crop response
Focus on making inputs profitable → effective demand

**Profitable use** (main drivers):
- output price
- input prices
- crop response rates
Elements of a holistic strategy:

1. R&D (national ag research systems)
2. Extension programs / soil testing
3. Programs to help farmers restore soil quality
4. Conservation agricultural practices
5. Physical infrastructure
6. Reducing costs in input supply chains
7. More appropriate fertilizer use recommendations
• Extension workers:
  • Only as good as the agricultural training schools and universities that train them
  • A holistic approach requires better training of the people who train farmers
  • → long-term support for the agricultural education system
Public spending on agriculture, 2010

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Thank you