SUSTAINABLE POVERTY REDUCTION: THE MARKET AND ECONOMICS OF EMERGING BIOECONOMIES IN SUB SAHARAN AFRICA.

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Rural Transformation and Urbanization
Agriculture for Development Conference
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ALBERT EINSTEIN (1879-1955) - QUOTES

- We cannot solve our problems with the same thinking we used when we created them.
- Insanity: doing the same thing over and over again and expecting different results
- Anyone who has never made a mistake has never tried anything new.
THE CHALLENGE IN SSA?

- Implementation of costly but ineffective programmes
  - Disregarding evidence in decision making
  - Limited commitment to try out alternative policies
Agriculture is critical for:
- Employment
- Economic development
- Food & nutrition security

Needs to be inclusive

MEGA TRENDS

Rapid population growth

Rising land scarcity

Labor force exit from farming

Rise of ‘investor farmers’ / changing farm sizes

Rapid urbanization and rising incomes

Large-scale capital intensive investments

Ap and food system transformation (submarkets - processing etc.)

See Traub and Jayne, 2016

Creates opportunities as well as challenges for smallholder farmers
AFRICA’S RAPID POPULATION GROWTH

![Bar chart showing population growth in Sub-Saharan Africa and the Rest of the World from 2015 to 2100.](chart.png)

- **Billions of people**
  - **2015**
    - Rest of world: 6.1
    - Sub-Saharan Africa: 0.92
  - **2050**
    - Rest of world: 7.2
    - Sub-Saharan Africa: 2.1
  - **2100**
    - Rest of world: 6.8
    - Sub-Saharan Africa: 3.8

**Legend**:
- Blue: Rest of world
- Red: Sub-Saharan Africa
HIGH POVERTY RATES IN SSA

Population below poverty line (%)

Rural Zambia Poverty Rates

Source: GRZ's Central Statistical Office and RALS 2012 and 2015

Source: The World Bank - 2015
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**CLIMATE CHANGE THREAT**

- **Problem Solution**
  - Climate Smart Agriculture (CSA)
    - Improving efficiency of water and nutrient use
    - Use of diverse varieties and breeds
    - Integrated pest management
    - Integrated crop, livestock and agroforestry systems
    - Improved grassland management

- **Agriculture principal contributor to greenhouse emissions**
  - Crop and animal production and other associated land use and cover changes, releases roughly 10-12 Gt CO$_2$ equivalents per year, about 24% of total global emissions
  - Africa’s agricultural emissions are approximately 15% of agricultural global emissions

*(Tubiello et al., 2014)*
Woodfuel and timber demand increasing in Africa. 76-90% of the household energy budget is woodfuel, and as a source of revenue

Increased electricity shortages due to inadequate investments in renewable energy sources further exacerbates the situation

The increase in demand for African hardwoods (e.g. African teak, Mukula tree)

Farm expansion, human settlements, road constructions, mining expansions and urbanization

- Insecure or poorly defined land tenure
- Weak forest governance systems

Source: Global Forest Watch

*Note: Pink shaded areas represents areas with >30% tree cover loss.

<table>
<thead>
<tr>
<th>Forested Area ('000 ha)</th>
<th>2010</th>
<th>2030</th>
<th>% Change (2010-2030)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>674,000</td>
<td>646,000</td>
<td>-4.2</td>
</tr>
<tr>
<td>Asia</td>
<td>593,000</td>
<td>604,000</td>
<td>1.9</td>
</tr>
<tr>
<td>Europe</td>
<td>1,005,000</td>
<td>1,039,000</td>
<td>3.4</td>
</tr>
</tbody>
</table>
To uphold Maputo declaration of allocating at least 10% of public expenditure to agriculture

To sustain annual agricultural GDP growth of at least 6%

To end hunger and cut poverty in half by 2025

To accelerate agricultural growth by doubling current agricultural productivity levels by 2025

To halve post-harvest losses by the year 2025

To triple agricultural intra-African trade by 2025

To eliminate child under-nutrition by bringing down stunting to 10% and underweight to 5% by 2025

Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods
Hindrances to change and growth:

- Not so progressive agricultural policies
- Low productivity
- Land degradation
- Education and skills of the majority of farmers
- Failure to fully embrace new technology
- Price Volatility
- Trade barriers
- Climate Change, etc.

- Some countries surpassed the CAADP target of 6 percent (Angola, Kenya, Lesotho, Rwanda Swaziland, Togo, and Malawi)
- Witnessed increases in labor and land productivity


Source: Africa Agriculture Status Report, 2016
**POST HARVEST LOSSES**

- FAO predicts that about 1.3 billion tonnes of food are globally wasted or lost per year (Gustavasson, et al. 2011).


- Equivalent to 48 million people’s annual caloric requirement and greater than the food aid to SSA over 10 years
- Grain PHL - Malawi (1%) and Uganda (6%)
- Fruits & Vegetables - up to 35%

Aulakh and Regmi, 2013
**Energy Access in SSA**

**Sources of Electricity Production**
(% of total production 2014)

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>Sub-Saharan Africa</th>
<th>Middle East &amp; North Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal (COAL)</td>
<td>51.4</td>
<td>8.6</td>
</tr>
<tr>
<td>Natural Gas (NATURAL GAS)</td>
<td>64.1</td>
<td>4.3</td>
</tr>
<tr>
<td>Oil (OIL)</td>
<td>28.8</td>
<td>21.2</td>
</tr>
<tr>
<td>Hydro (HYDROPOWER)</td>
<td>2.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Renewables</td>
<td>1.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Nuclear Power</td>
<td>3.0</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Access to Electricity**
- 37.4% - Sub-Saharan Africa
- 97.0% - Middle East and North Africa

**Electricity Production (Billion Kilowatt hours)**
- 467.4 - Sub-Saharan Africa
- 1379.6 - Middle East and North Africa

**Energy Initiatives**
- Sustainable Energy Fund for Africa
- Power Africa
- **African-EU Renewable Energy Fund (AREF)** invests into small hydro, wind, geothermal, solar, natural gas and biomass projects across Sub-Saharan Africa, excluding South Africa

**Source:** World Bank (2014)
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DIVERSIFIED BIOECONOMIES: CROPS

Niger
Millet, Sorghum, Cassava, Maize, Cowpea, Groundnuts

Mali
Millet, Rice, Maize, Sorghum, Cowpea, Soybeans, Groundnuts

Liberia
Rice, Cassava, Yams, Maize

Sierra Leone
Rice, Cassava, Yams, Groundnuts, Maize

Burkina Faso
Sorghum, Millet, Maize, Rice, Cowpea, Soybeans, Groundnuts

Ghana
Rice, Cassava, Maize, Sorghum, Cassava, Sweet Potatoes

Nigeria
Maize, Rice, Sorghum, Millet, Cassava, Yam, Groundnuts, Soybeans, Cowpea

Rwanda
Sorghum, Potatoes, Maize, Beans, Wheat, Soybeans

Uganda
Banana, Cassava, Potatoes, Maize, Millet, Rice, Sorghum, Beans

Ethiopia
Teff, Maize, Wheat, Barley, Sorghum, Millet, Oats

Kenya
Maize, Wheat, Rice, Beans, Sorghum, Cassava, Sweet Potatoes, Millet, Cowpea, Chick Peas, Pigeon

Tanzania
Maize, Rice, Wheat, Cassava, Beans, Sorghum, Pigeon Peas

Malawi
Maize, Beans, Potatoes, Cassava, Sorghum, Pigeon Pea

Mozambique
Cassava, Maize, Groundnuts, Sweet Potatoes, Soybeans

Zambia
Maize, Sorghum, Rice, Groundnuts, Beans, Pigeon Peas

Source: AGRA, 2013.
ZAMBIA: RAINFALL, SOIL AND CROP SUITABILITY BY AGRO-ECOLOGICAL REGION

Lots of Opportunities for Inclusive Agricultural Development and Growth
Large-scale Farmers
Medium-scale [20-100ha]
Smallholder Category
Smallholder Category B [2-5 ha]
Smallholder Category A [0-2 ha]

18<3000 6.9% 20.7% 72.4%
1.52 million household
Approx. 9.6 million people

Example: Farm Structure in Zambia

- Millions of small family farms, about 80% of all farms in SSA are less than 2ha (Lowder, Skoet, & Raney, 2016)
- They are the continent’s main source of food, employment, and income (AGRA, 2016 - Africa Agriculture Status Report 2016)
- Not a homogenous group but cultivate small parcels, majority remain poor, malnourished and less educated
- Increasingly becoming more vulnerable to a host of challenges as follows:
  - Land constrained
  - Low productivity
  - High post harvest losses
  - Limited input and output markets
  - Unpredictable weather (climate change)
  - Unpredictable agricultural policies
  - Liquidity constraints and limited access to credit
  - High transport costs
  - Rampant land degradation
  - Weak public agricultural research & extension programmes
  - Volatile prices
Bio-economy or KBBE refers to the knowledge-based production and utilization of biological resources, innovative biological processes and principles to sustainably provide goods and services across all economic sectors (Morris and Virgin, 2017).

- KBBE provide a promising avenue to reconcile agricultural productivity growth and sustainable management of natural resources to address the adverse effects of climate change and reduce poverty. BUT….
  - Minimal uptake of innovations
  - Promoted by externally driven projects/programmes; no bio-economy strategy (exception South Africa)
WHY UPTAKE IS PROBLEMATIC?

- Care about immediate consumption and benefits (long-term natural resource benefits not too important)
- E.g. Low uptake of Conservation Agriculture, and Agroforestry
- Deforestation and charcoal consumption

- Only South Africa has a bio-economy strategy
- Namibia, Nigeria, Mali, Tanzania, Kenya, Uganda, Mozambique and Mauritius have bio-economy related strategies (Germany Bio-economy Council, 2014)
- The rest of the continent does not have explicit bio-economy strategies

The majority of rural households are both producers and consumers

Innovations ignore local traditional knowledge and practices

Innovations seen as foreign-led not incorporated into local public budget

Low education and literacy levels of smallholder farmers (less than secondary school education)

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The introduction of Genetically Modified (GM) crops to agricultural biotechnology has been a great achievement to the bio-economy, and at the same time brought a lot of controversy (Morris, 2014).

Burkina Faso began field trials for Bt cotton in 2003 (Vitale et al., 2008) and as at 2013, it was growing Bt cotton on a commercial basis (James, 2013).

In Egypt, Bt maize has been banned due to safety concerns (ISAAA, 2016).

South Africa started cultivating GM crops in 1996 and by 2013, expanded to 2.36 million (Bennett, 2016). As at 2016, South Africa cultivated 2.66 million hectares of GM crops (ISAAA, 2016) that include soya beans, cotton and maize.

Sudan has been cultivating Bt cotton since 2012 starting with 20,000Ha to 120,600Ha as at 2016 (ISAAA, 2016).

On adoption of GM maize, female farmers adopted because of reduced weeding time while their male counterparts adopted because of the higher yield potential (Gouse et al., 2016).

A GM crop for maize was introduced but was rejected on health grounds.
SKEPTICISM ABOUT GMOS

"Simply because my people are hungry, that is no justification to give them poison, to give them genetically modified food that is intrinsically dangerous to their health."

Levy Mwanawasa, 3rd President of Zambia
It has been endorsed as an appropriate adaptation and mitigation action for African agriculture.

The evidence on adoption and productivity in SSA is mixed and evidence on livelihood impacts limited (Ngoma, 2016).

CA covers about 1% of arable cropland in Africa (Jat et al., 2014)

The marginal productivity gains – when realizable – are marginal (Ngoma et al., 2015; Jaleta et al., 2016) and sometimes only occur after 2-3 seasons (Thierfelder et al., 2015)

Source: Author’s illustration based on Giller et al., (2015).
GETTING MORE FOR FARMERS TO MARKET

Improved farm productivity – closing the high yield gap across all commodities and across African countries

Increasing market share, especially for food crops – including through reducing harvest and postharvest losses.

Optimising income generation through better access to remunerative markets

• Promoting sustainable uptake of available technology
• Expansion/improvement in extension service delivery
• Manage inputs and price shocks
• Foster access by means of innovative financing systems
• Improving producer incentives by addressing challenges and risks in output markets
  • WRS, Value addition, collective marketing, Insurance, market-friendly quality and quantity assurance systems
ACHIEVING SUSTAINABLE POVERTY REDUCTION

Institutional options

Technological options

Strategies for managing emerging bioeconomies for sustainable poverty reduction

Policy Options
Technological Options

- Improved Inputs (seed, fertilizer)
- Agroforestry
- Biotechnology
- Agro processing and value addition
- Irrigation
- Mobile Banking
- ICT use in Farming
- Extension
- Mechanization

Long term investment
- Make business case for promotion and adoption
- Build local capacity for sustainability
Policy Options

- Increased Public Sector investments into key agricultural sector drivers
- Promote Value Chain Financing to increase financial inclusion of smallholder farmers
- Embrace private sector-led agricultural marketing and trade regimes (Local and regional trade)
- Ensure stable and predictable policies
- Policies that promote modernization of the agricultural sector
- Promote the 4Ps (People, Private, Public Partnership)
- Multi-sectoral approach
- Inclusive growth policies (no-one left behind) (Urban and Rural poor, Small, Medium and Large Scale Strategy)

**Do not ignore the political economy of some innovations**

Usually opposing forces
**RETURNS OF INVESTMENT IN POVERTY REDUCTION: EVIDENCE FROM ASIA AND AFRICA**

Much research evidence documents high returns to investment in:

- 1. R & D: (Alston, Grilliches, Mellor)
- 2. Education: turns information into knowledge (Johnston)
- 3. Extension systems: farm management (Evenson)
- 4. Infrastructure: road, rail, port, and communications (Antle)
- 5. Investments in health (Binswanger)

<table>
<thead>
<tr>
<th>Investment Category</th>
<th>China</th>
<th>India</th>
<th>Thailand</th>
<th>Vietnam</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural R&amp;D</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Roads</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Education (Agricultural Extension Services)</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

REDUCING PRICE VOLATILITY TO INCREASE HOUSEHOLD INCOMES

Zambia: Maize Market + Ad-hoc Policies

Ethiopia: Inter-year price variations

Source: SAGIS, AMIC

Source: Calculation based on FAO FPMA

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CHALLENGES OF MARKET INTEGRATION AND REGIONAL TRADE

- Inadequate production capacity to generate exportable surpluses of commodities
- Low agricultural productivity
- Limited soft and hard infrastructure (high transportation cost)
  - Limited irrigation systems (dependence almost exclusively on rain-fed farming systems)
  - Total investment in irrigation is 4% of crop area in SSA
- Poor infrastructure
- Ad hoc agricultural policies
  - Non-tariff barriers and export/import bans
  - Political economy of trade
- Institutional deficiencies, insecurity, and conflicts

Effectiveness of Regional Blocs? E.g. SADC, COMESA, ECOWAS?

Openness to regional trade
- Access to expanded market for products
- Consumers access to a wide range of products and services
- Diversification into higher-value production
- Reduced price volatility

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Access to finance is critical for agricultural transformation:

- The shift from subsistence-oriented agriculture to commercial agriculture will require financial resources at all levels of the agricultural value chain but…..
  - Less than one percent of commercial lending in Africa goes to agriculture (Salami, Kamara, & Brixiova, 2010).

Smallholders lack acceptable collateral

High Interest rates

- Range between 30-50% because smallholder farmer is considered too risky

Low repayment rates

- Non-performing loans in the agriculture sector exceed 37% (IFC, 2015).
Institutional Options

- Securing tenure of land
- Recognizing, modernizing and up scaling Indigenous Knowledge and Technologies
- Building a critical mass of well trained young African researchers for sustainability
- Developing, nurturing and supporting a domestically funded research and science agenda for Africa
- Capacity building through education and skills training of public technical staff, youth and farmers
Incorporated on 5 October 2011 under the Companies Act of Laws of Zambia as a private company limited by guarantee with a local Board of Directors drawn from Public and Private Sector.

- Indigenous Agricultural Policy Think-tank
- Serves both Public and Private Sector

**OUR VISION**
A Zambia free of hunger, malnutrition and poverty through sustainable agricultural transformation

**MISSION**
To provide evidence-based policy solutions through high quality research and outreach services for the transformation of Zambia’s agricultural sector to achieve sustainable broad-based pro-poor growth

**VALUES**
- **Integrity**: in how the Institute conducts itself
- **Dedication**: to achieving the Vision and Mission
- **Excellence**: In the quality of work
- **Accountability**: in the actions and results delivered
- **Sensitivity**: to the needs of the poor in the agricultural sector

Indaba Agricultural Policy Research Institute
CORE OPERATIONAL ACTIVITIES

To generate and integrate research findings into national, regional, and international policy strategies to promote sustainable agricultural growth as a means to cut hunger and poverty in Zambia;

To conduct, encourage, and support evidence-based policy dialogue in Zambia or elsewhere into all aspects of agriculture;

To support the development and strengthening of capacity for policy research, analysis and outreach of public and private institutions in Zambia.
IAPRI THEMATIC AREAS

1. Agricultural Markets and Trade
2. Agricultural Diversification
3. Agriculture, Food Security and Nutrition
4. Climate Change and Natural Resources Management
5. Gender and Youth in Agriculture

2.1 Public Policy and Spending
2.2 Technology and Smallholder Productivity
Great appreciation to the Embassy of Sweden and USAID/Zambia mission for long-term financial support to IAPRI

Thank You