An Overview of Agricultural Mechanization in Sub Saharan Africa

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Outline of the Presentation

- Introduction: The Agric. Mechanization Process
- Recap on the Evolution of Mechanization in SSA
- Current Status of Agric. Mechanization in SSA
- Some Observations and Lessons from the Past Experience
- Concluding Comments

Presentation to the Nairobi Consultative Meeting on New Models for SAM in SSA - 1st December, 2016
The Agricultural Mechanization Process - 2

• The role of farm power in increasing agricultural productivity globally first hypothesized in 1965 by Prof. Giles:
  – Farm power with fertilizers, improved seeds [HYVs], irrigation and pesticides - are interdependent for growth in agricultural productivity and overall growth
  – Success of the GR of 1970s in Asia attributed mostly to use of HYVs; fertilizers and irrigation and the role of farm power not factored in

• Mechanization experience from USA & Europe during 1925 – 65:
  – According to Smith (2000) the tractor was the “Unsung Hero” of 20th Century USA economic growth – replaced 24 million draft animals during 1925 to 1955.
  – Similar developments occurred in Europe between 1945 and 1965 which were significantly assisted by the USA funded Marshall Plan

• At independence in 1960, the advent of mechanization in developing countries of Asia, Africa & LAC was then equated to ‘tractorization’ was taken for granted by most development experts & politicians
The Agric. Mechanization Process - 3

- Assumed use of tractors would become widespread through
  - Direct ownership of tractors by farmers
  - Or through hire services owned by the public or private sectors

- Asia had several centuries experience of using draft animal technology [DAT] and the farm power debate was on:
  - Replacement of draft animals in field operations
  - Increasing use of electrical/diesel pumps in irrigation
  - Post-harvest processing equipment – threshers etc.

- Sub Saharan Africa [SSA] situation was different:
  - Large parts of SSA tsetse infested – difficult to keep livestock except southern part or in pastoral areas - crop production dominated by cutlass and hand hoe cultivation
  - Debate was on whether SSA could leapfrog DAT stage and move directly to mechanical power e.g. tractors [Dummont, 1966; de Wilde, 1967; Kline et al 1969 & among others]
  - Political desire for rapid mechanization supported throughout SSA
Sources of power for primary land preparation in SSA

- **Central Africa**: 85% hand, 11% DAP, 4% tractors
- **Western Africa**: 70% hand, 22% DAP, 8% tractors
- **Southern Africa**: 54% hand, 21% DAP, 25% tractors
- **Eastern Africa**: 50% hand, 32% DAP, 17% tractors

Source: FAO 2001
Evolution of Agricultural Mechanization in SSA - 1

• History of agricultural mechanization from Colonial period


2. **1930- 45:** – *Expansion of DAT use* and introduction of cash crops – mostly perennial – coffee, sisal, tea and annual cotton with DAT.

3. **1945–60:** – *Four–wheel tractors introduced*:
   - Great Groundnut Scheme of 1945 to 51 – over 3 million acres mechanized production oilseeds in Tanganyika, Botswana; Ghana and Nigeria – FAILED
   - **Commercial farming by White settler farmers and African medium scale farmers:** Kenya; Zimbabwe; Zambia; Tanganyika; Malawi
     - Cultivation of cash crops and cereals; Subsidies provided
     - Swynerton Plan in Kenya – consolidated surveyed small farms of about 10ha in Kenya Highlands – mechanization important
     - Yoeman Farmers in parts of the colonies – medium commercial scale growing food and cash crops for the market
Evolution of Agricultural Mechanization in SSA

- Tractor numbers in SSA increased from 23,000 in 1950 to 47,000 by 1960 cf.
  - India had 9,000 in 1950 and 31,000 in 1960 and
  - South Africa had 48,000 in 1950 and 148,000 in 1960
  - China had 1400 in 1950 and 116 in 1964.

After independence – First phase 1960-85:

A lot of excitement during period 1960-85: to expand on Mechanization:

- Settlement scheme based on Kibbutz model in Israel established in Ghana; Tanzania; Nigeria; Uganda were established all over the continent with high mechanized inputs;
- Government tractor hire services [THS] established in many countries to offer services to small scale farmers
- Block Farms where fields were consolidated into larger blocks and mechanization services offered through cooperative tractor hire services
- Communal/socialist experiments in agricultural production in some countries e.g. Tanzania; Guinea; Ghana; Mozambique but not successful
Evolution of Agricultural Mechanization in SSA - 3

- Manufacturing of tractors and farm implements established in some countries e.g. Nigeria; Tanzania etc. mostly in assembling of SKD parts
- DAT promoted in some countries especially drier areas but also in the humid zones focusing on cultivation of cash crops – success limited to drier parts
- Impact of these early efforts of first quarter century after independence [1960-85] include:
  - No. of Tractors in use in SSA [excluding South Africa] increased from 47,000 in 1960 to 70,000 by 1970 and 112,000 by 1980 [cf. data for India for 1960, 1970 and 1980 were 31,000; 148,000 and 393,000 respectively]
  - Land preparation by tractors in SSA by 1985 remained low about 10% while DAT was used in about 15% and hand-hoe on 75%
  - Government operated tractor hire services [THS] failed although no of tractors under Government THS not more than 10% of total no. in use
  - Graveyards of broken down machinery had significant impact on thinking on mechanization in the development community e.g. *False Start in Africa* by French Sociologist Rene Dumont quite influential
Other issues on current status both +ve & -ve:

- Importation of 4WT has increased since 2005 in many SSA countries. Not clear whether replacing or adding on the 4WT numbers. Need for more accurate data on this.

- Importation of 2WT accelerated since 2005. A new power source use of which is not yet well researched documented

- Both 4WT and 2WT concentrated in a few regions in most countries with the same trend observed for DAT. All these power sources used primarily for tillage and transportation

- DAT has severe limitations in many countries – tsetse flies; lack of animal husbandry tradition; increasing demand for livestock products; maintenance load during off-season for feed, herding etc.

- Pan territorial & across country utilization of 4WT especially for tillage and also some harvesting equipment is increasing & will have +ve effect on sustainability of the business models for Tractor Hire Services [THS] and also harvesting equipment – but more data required

- Period when 4WT and 2WT can be used for land preparation at any one place limited to less than 40 days per rainy season – severely restricts utilization rates. Need for off-farm utilization [in transportation etc.] is critical for business viability & sustainability
Share of cultivated area under cereals and roots/tubers cultivation by region (2004)

- **West Africa**: 70% Cereal, 3% Roots and Tubers
- **Southern Africa**: 98% Cereal, 2% Roots and Tubers
- **Central Africa**: 67% Cereal, 33% Roots and Tubers
- **Eastern Africa**: 83% Cereal, 17% Roots and Tubers
- **North Africa**: 98% Cereal, 2% Roots and Tubers
- **LAC**: 93% Cereal, 7% Roots and Tubers
- **Asia**: 96% Cereal, 4% Roots and Tubers

*Source: FAOSTAT/IFPRI - 2014*
Estimated Average Tractor HP

Source: World Bank 2014b
Number of 4WT in use [2005]

Source: FAOSTAT
Importation of 4WT during 2000 - 2007

Number of 4WT imported during 2000-2007

Source: FAOSTAT
Presentation to the Nairobi Consultative Meeting on New Models for SAM in SSA - 1st December, 2016

Importation of 2WT

Number of 2WT imported during 2000-2007

Source: FAOSTAT
Tractor Use Intensity

Number of tractors per 1000 ha of land

Source: FAOSTAT
Ploughing Costs in Selected Countries

Cost of Plowing 1 ha (USD) - 2014

Source: FAOSTAT/IFPRI-2014
Concluding Remarks

• Need to view agricultural mechanization with a long term perspective especially on Farm Power issues:
  – Asia is largely moving out of animate power for primary land preparation;
  – Ethiopia has set a target of reducing DAP by 50% by 2035
  – Tanzania is setting out a process of getting rid of the hand hoe by 2035

• Need to learn from our past experience both successful and failed projects – too much repetition of past mistakes

• Need to learn from others especially where mechanization has occurred in recent past and from other countries in SSA

• Agricultural mechanization is critical to the future of agricultural development and food security in SSA

• Two concluding slides: from Fan & Pardey and UNFPA
### Accounting for Growth in Agricultural Output in China 1965 - 89

<table>
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<th>Factor</th>
<th>% Contribution to growth</th>
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<tr>
<td>Land</td>
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<tr>
<td>Irrigation</td>
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<tr>
<td>Labour</td>
<td>3.4</td>
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<tr>
<td>Power</td>
<td>11.8</td>
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<tr>
<td>Institutional change</td>
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<td>Fertilizer</td>
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<tr>
<td>Other factors</td>
<td>27.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: Fan & Pardey (1992)
Concluding Remarks

Population in Sub-Saharan Africa

Source: FAOSTAT
THANK YOU!