Paradigm Shifts and the Development of Agricultural Mechanization in Sub Saharan Africa: A Case Study of Farm Power

By

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Introduction

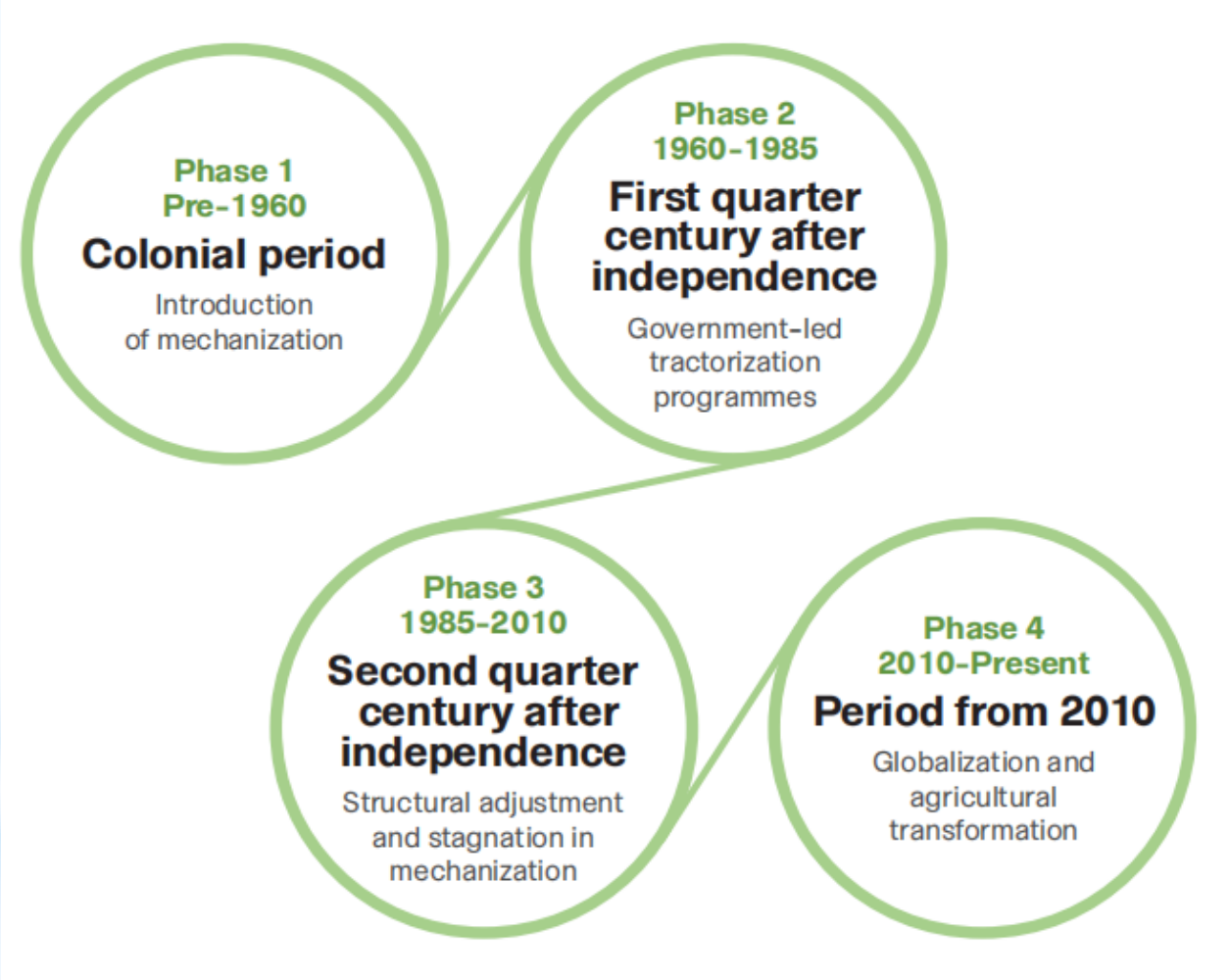
- The development of agriculture in SSA using higher levels of farm power has had a chequered history over the 7 decades from 1945- 2015.

- Agric. mechanization is widely supported in SSA by farmers, national leaders and politicians.

- It has, however, been a controversial issue in some circles especially with some external experts and commentators.

- The objective of this essay/presentation is to provide a summary review of the paradigm shifts which have occurred in relation to ***the role of farm power in SSA agriculture over the period 1945-2015.***

Evolution of Agric. Mechanization in SSA



The Ten Elements of F-SAMA

The ten elements are:

A. UNDER THE COMMERCIAL SUSTAINABILITY PILLAR:

i. ***Element 1:*** Boosting farm power through appropriate technologies and innovative business models.

ii. ***Element 2:*** Promoting innovative financing mechanisms for agricultural mechanization.

iii. ***Element 3:*** Building sustainable systems for manufacture and distribution of agricultural mechanization inputs.

iv. ***Element 4:*** Sustainable mechanization across agri-food value chains

v. ***Element 5:*** Innovative systems for sustainable technology development and transfer.

B. UNDER THE ENVIRONMENTAL SUSTAINABILITY PILLAR:

i. ***Element 6:*** Sustainable transformation of land preparation and crop/animal husbandry practices

C. UNDER SOCIO-ECONOMIC SUSTAINABILITY

i. ***Element 7:*** Social sustainability and the roles of small-scale farmers, women and youth

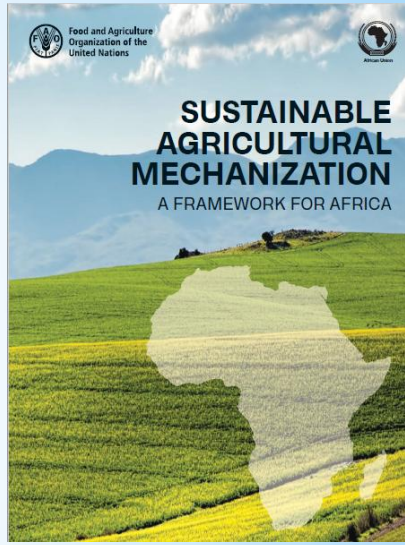
ii. ***Element 8:*** Human resources development and capacity building for SAMA

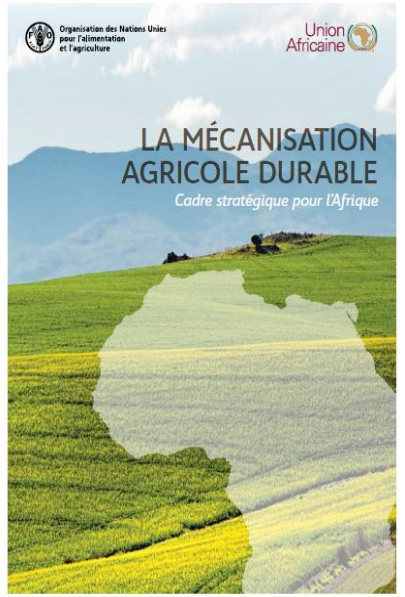
D. OVERARCHING ELEMENTS FOR SAMA:

i. ***Element 9:*** Need for a long-term vision: Policy and strategy issues.

ii. ***Element 10:*** Creating sustainable institutions for regional cooperation and networking.

[from pg. 82-83 of FAO & AUC, 2018].





Element 1: Boosting farm power through appropriate technologies and innovative business models

- The role of **farm power** in increasing agricultural productivity globally was first hypothesized in 1965 by Prof. Giles:
  - ***Farm power with fertilizers, high yielding varieties[HYVs] - improved seeds, irrigation and pesticides - are interdependent for growth in agricultural productivity and overall growth***
- First study to systematically link use of farm power with increased yields of the green revolution [GR] of 1960s
  - *Success of the GR of 1970s in Asia attributed mostly to use of HYVs; fertilizers and irrigation and the contribution of farm power not factored in.*
- Mechanization experience from USA & Europe during 1925 – 65 supported the Giles Hypothesis:
  - According to Smith(2000) the tractor was the "*Unsung Hero*" of 20th Century USA economic and agricultural 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's, the advent of mechanization in developing countries of Asia, Africa & LAC which was then equated to 'tractorization' was taken for granted by most development experts & politicians***

First Paradigm

- The **mechanization paradigm** of the 1950s & 60s did postulate that the provision of farm power, for field operations like land preparation, would be through mechanical technologies like tractors, without necessarily evolving through a transitional stage of using draft animals.

- **For SSA countries, this was seen then [in 1950s and early 1960s] as a feasible option given:**
  - *the land abundance status of many countries and the difficulties of finding alternative sources of farm power,*
  - *low population made the hand tool technology not a viable option and prevalence of the tsetse fly making use of draft animals difficult in large areas.*

- **The development programs of most countries in SSA in the 1950s & 1960s** crafted by the departing colonial authorities with assistance of major multilateral development agencies like the FAO, World Bank etc **were based on this paradigm.**

First Paradigm – Cont…

- **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 arid areas 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

Concerns on the First Paradigm

From mid 1960s, there were, however, **concerns raised by several influential experts and organizations** on the ***impact and efficacy of the tractorization paradigm*** in mechanization programs in the developing countries. These included:

* The intermediate technology movement which advocated for a more evolutionary approach through the so called intermediate or appropriate technologies;

* The International Labour Organization [ILO] whose concern was the effect of the use of tractors had on employment of rural labourers;

* The environmental movement by several groups was concerned with the impact of tractorization on the environment.

* Socio-economic concerns related to equity-fate of peasants e.tc.

The 1975 Rome Consultation & Consensus

- A global **expert consultation** was convened by FAO and OECD in Rome in February 1975 to resolve the issues involved.

- The consultation recommended **selective or appropriate mechanization**, which combines ***hand tool, animal and mechanically powered agricultural implements and equipment suited to the physical, cultural, economic, and technological environment of the country concerned.***

- A consensus was also reached on the manpower requirements for mechanization and the need to treat farm power as an input in agricultural production just like fertilizers, seeds etc.

- FAO was requested to develop guidelines to help member countries in developing their ***agricultural mechanization strategies [AMS].***

- The AMS guidelines were developed by FAO through wide consultation and released in 1981 which has been implemented by several countries since then.

New Paradigm 1985

* A new paradigm was proposed in 1987, specifically linking the development of agricultural mechanization in SSA to the evolution of the farming systems as they intensify from shifting cultivation to more permanent production systems.

* This paradigm attributed the lack of progress in mechanization in SSA to, *inter alia* the public sector dominated tractorization programs of the 1960s & 70s (Pingali *et al., 1987)*.

* A study published by the World Bank in 1987 recommended a shift of assistance from tractors to draft animal power [DAP].

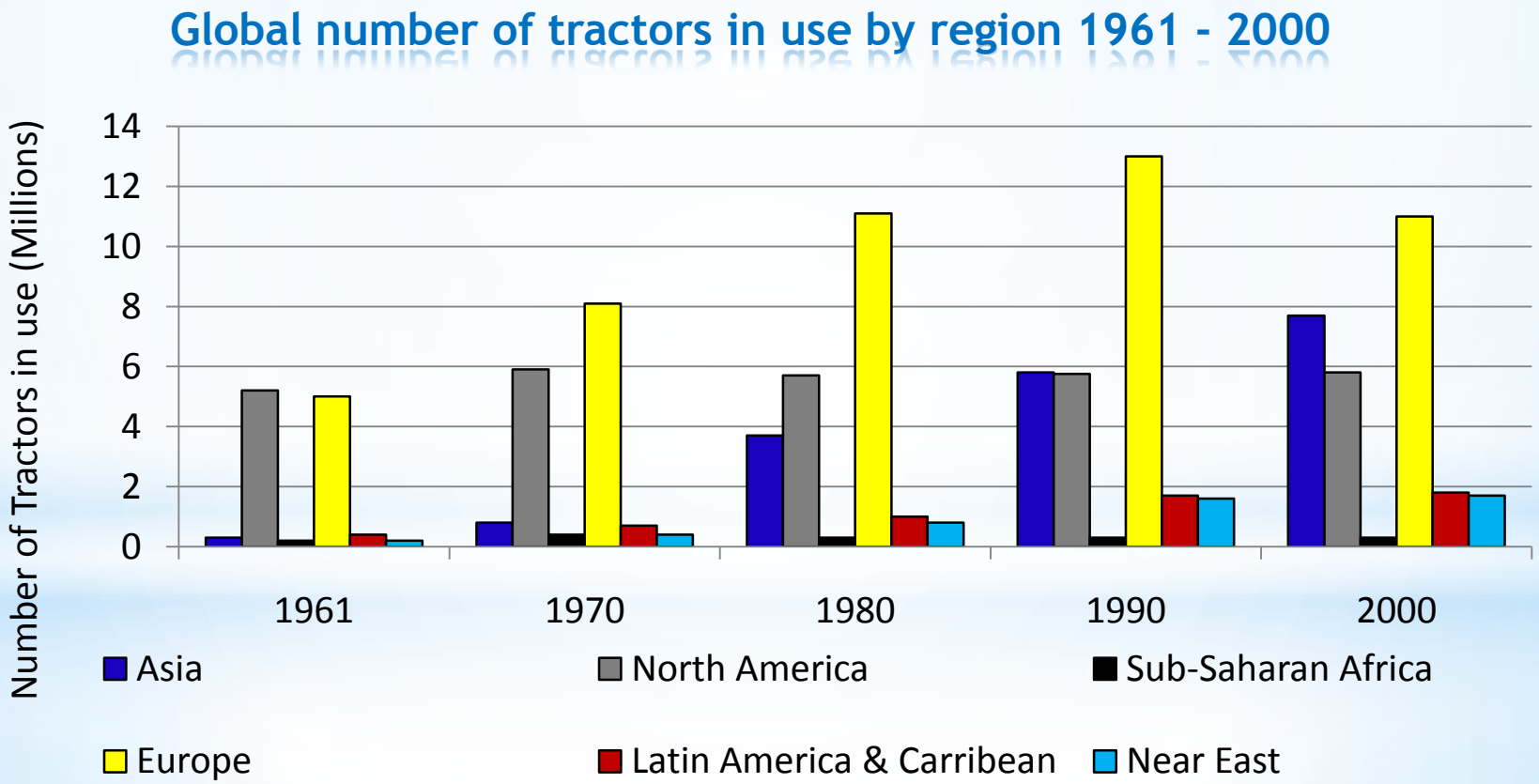
* There followed then a wave of relatively well funded DAP programs and networks throughout SSA implemented for much of 1990s.

* However, by 2005 it became apparent that the DAP programs and networks were not the panacea to the mechanization problem in SSA while tractor imports had significantly declined in all countries.

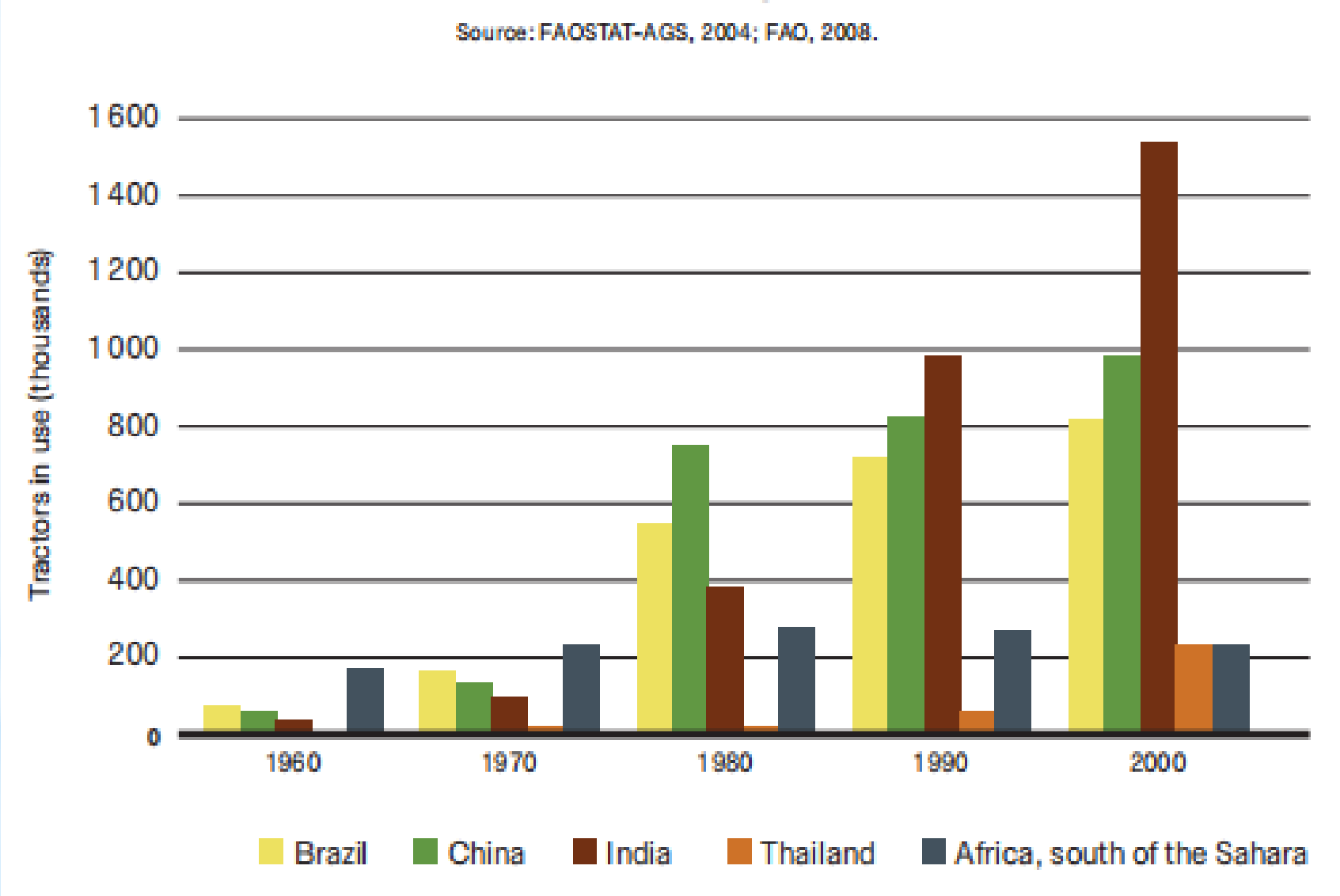
* The new paradigm and policies implemented there after had significant impact on the use of tractors during 1985 – 2015 in SSA as compared to other developing regions of the world.

OUTCOME OF PARADIGM SHIFTS

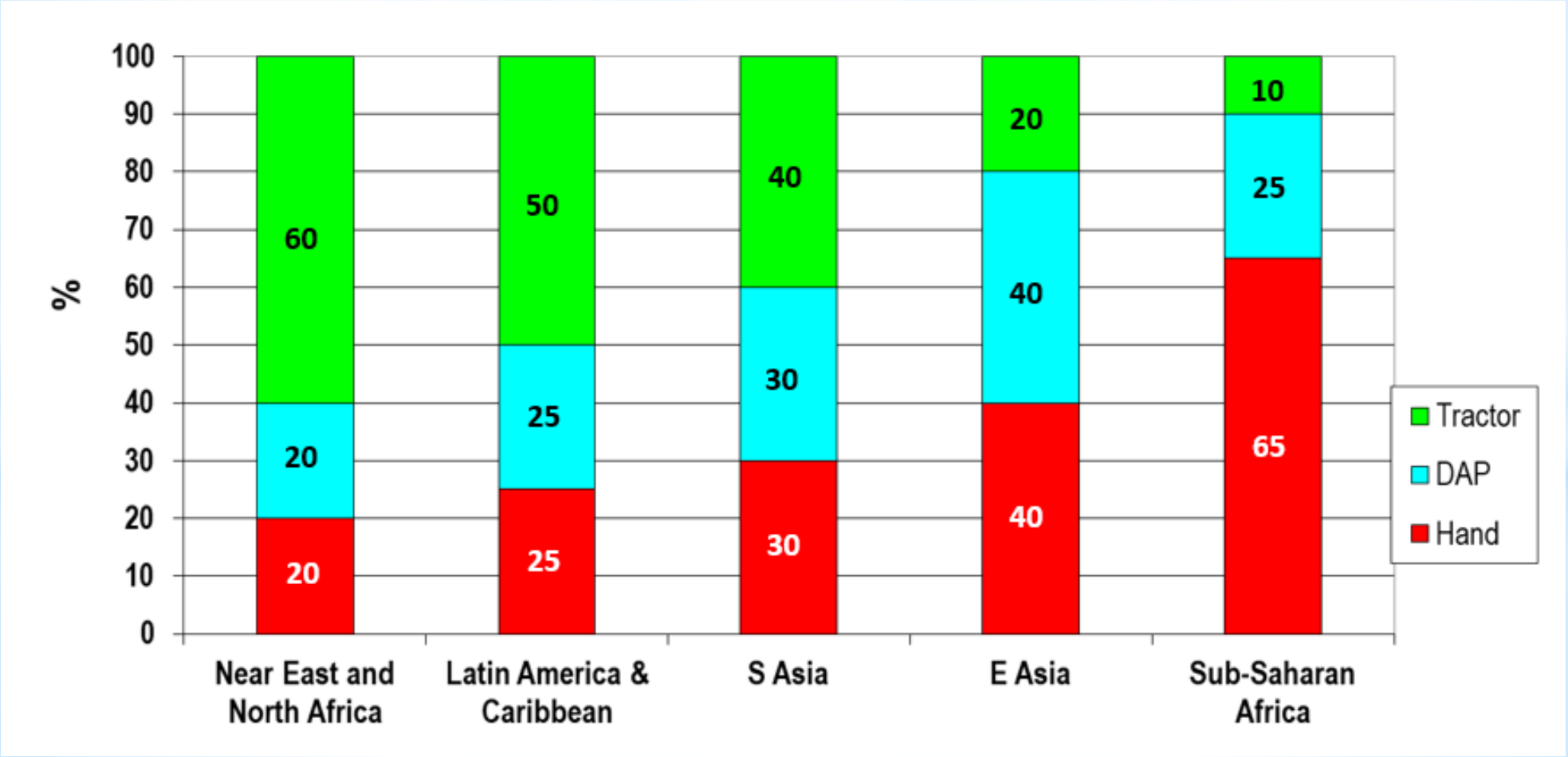
- ***OUTCOME - Different scenarios at the turn of 21st century resulting from the different paths followed during last quarter of 20th century [FAO, 2008]***
- ***Massive decline in tractor use in SSA cf. other regions.***



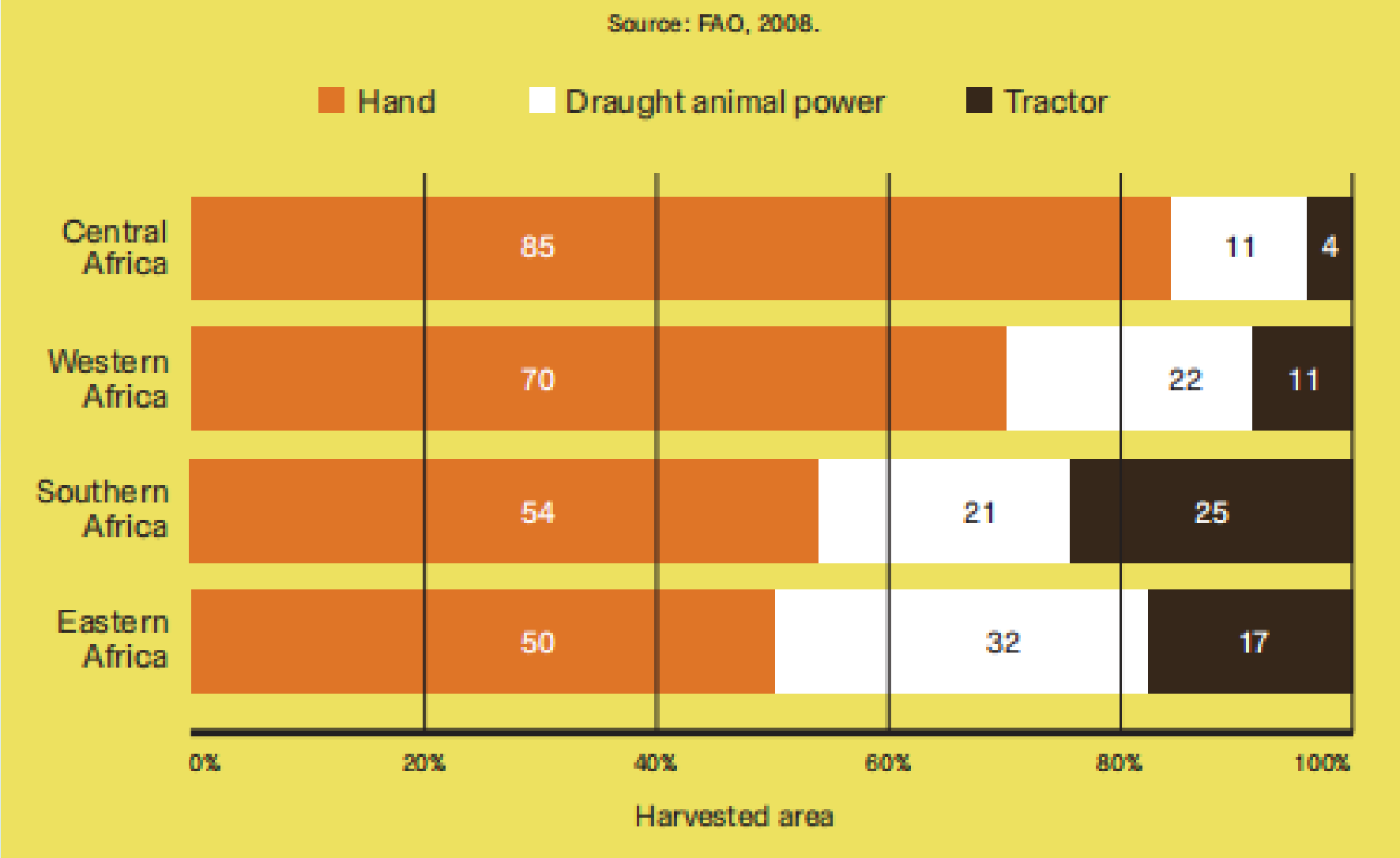
Tractor numbers used in SSA cf. other countries (1950-1990)



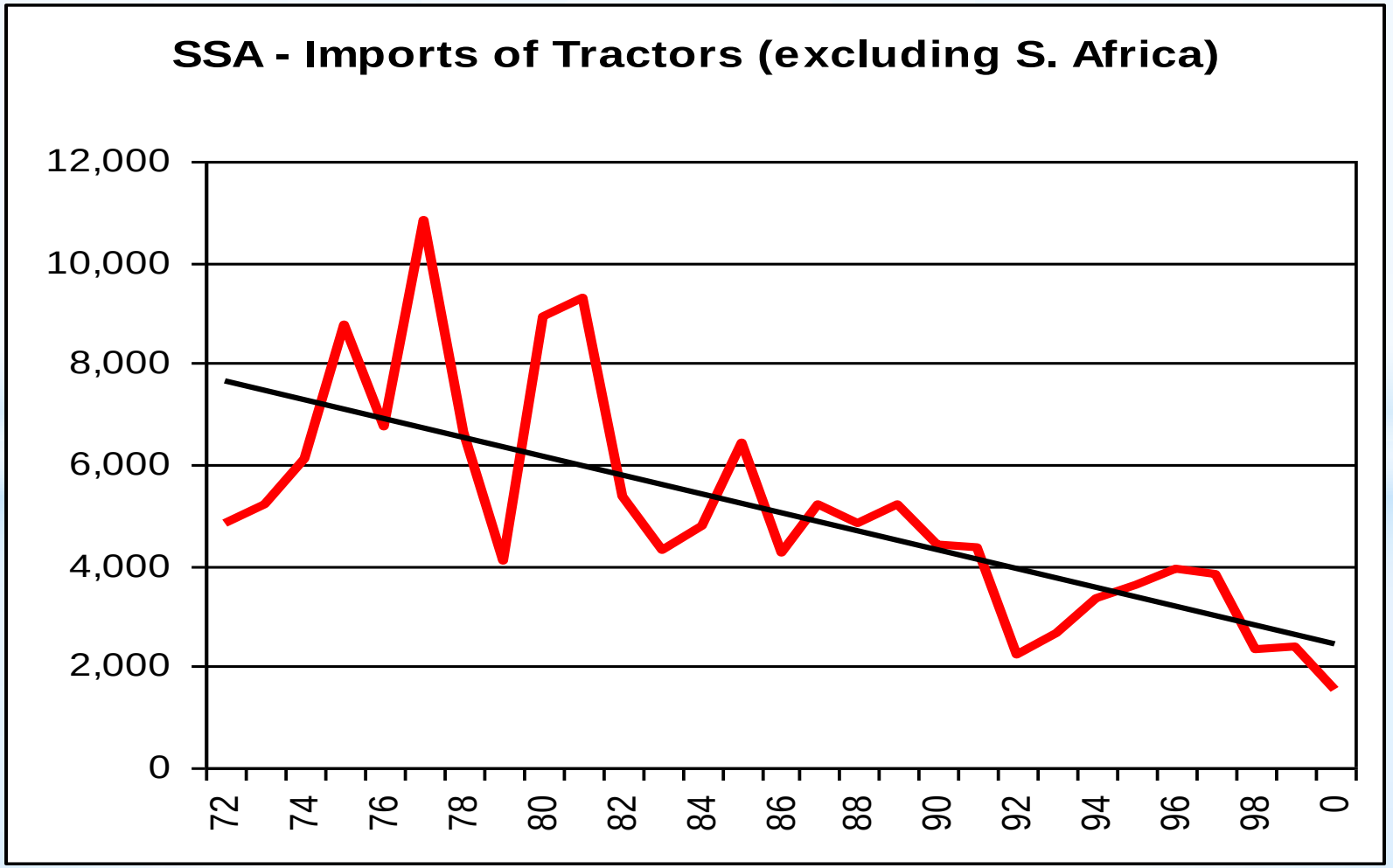
Proportion of Land Cultivated by Different Sources of Farm Power - 1998



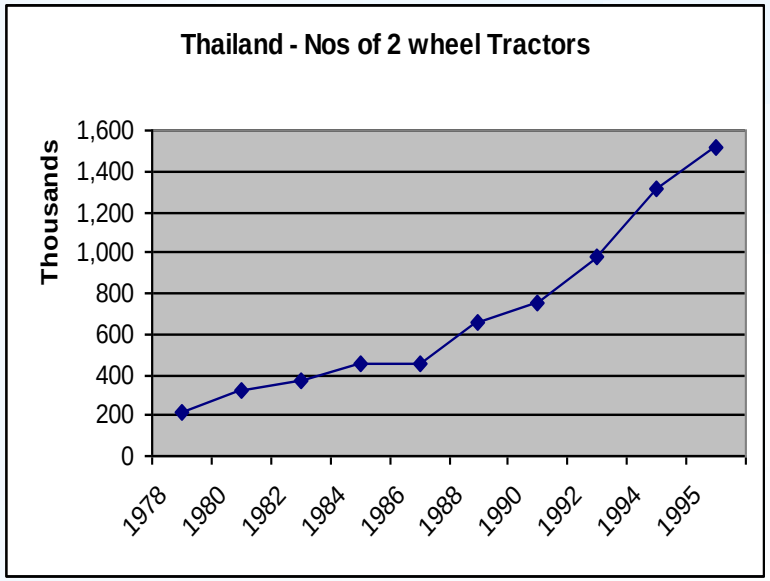
Primary land preparation in Africa (2006)

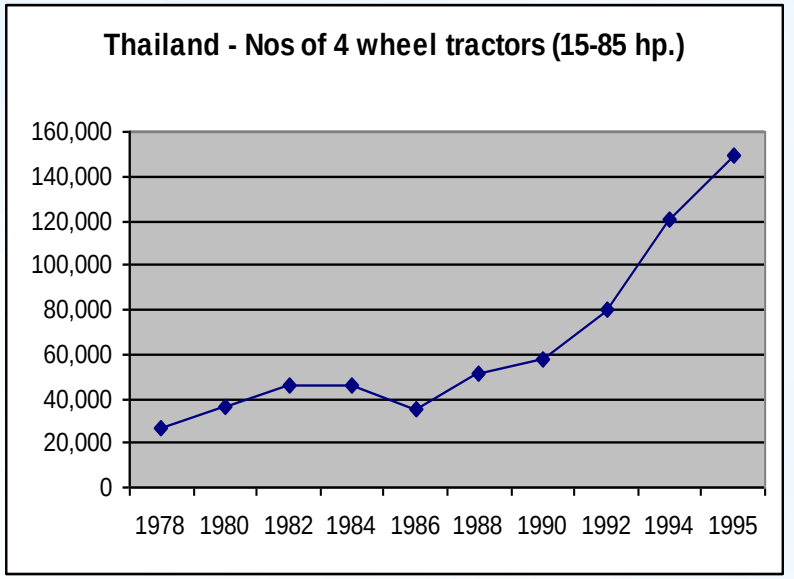


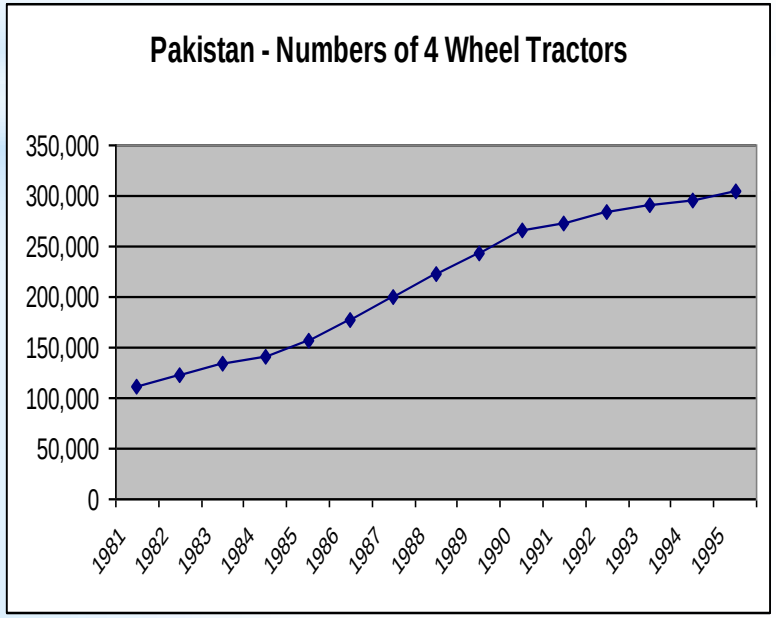
Imports of Tractors in SSA Countries [FAO/AGST2008]

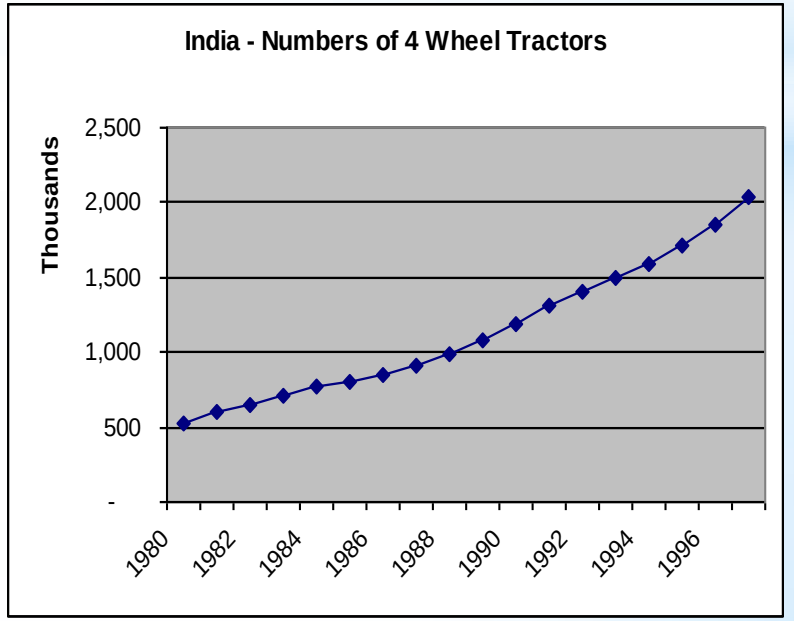


Tractors in use in different Asian Countries [FAO/AGST-2008]









Boosting farm power

A re-examination of the whole process of agricultural mechanization development commenced in 2008 and culminated with the approval by AUC in 2018 through the ***Framework for Sustainable Agricultural Mechanization in Africa (F-SAMA)*** with its ten priority elements.

The First priority element being, **Boosting farm power** through appropriate technologies and innovative business models which emphasizes:

- Countries in Africa are at **different stages** of development with regard to use of farm power, therefore, you can not have blanket prescriptions to the farm power problems.
- The key objective of the Framework should be to **increase farm power availability** to all farmers be they small, medium or large scale.
- To **significantly reduce the use of hand tools** specifically to reduce drudgery in farming in SSA.
- The increase in availability of farm power could be through **farmer's ownership** of machines or by **mechanization hire service providers.**

OTHER ISSUES ON PARADIGMS ON FARM POWER

- ***Environmental Issues and Farm Power***
  - *enhanced adoption of conservation techniques requires sustainable provision of minimum levels of farm power.*
  - *Tackling the farm power constraint is therefore critical for environmental sustainability.*

- ***Small and Large Tractors Paradigm***
  - *This should be based on fundamental principles of soil mechanics and engineering to decide on what type of tractors and implements are suitable for SSA as recommended in the F-SAMA document [AUC/FAO, 2018].*

- ***Institutions and organizations for boosting Farm Power in SSA***
  - *Need to strengthen the divisions of Agricultural Mechanization and Engineering services*
  - *Consider sub-regional and reginal mechanisms e.g. R&D and sub-reginal Franchises for manufacturing and trading.*

- ***Farm Power & Sustainability Issues***
  - *Facilitate commercial provision mechanization services through viable enterprises.*
  - *Migratory provision services within countries and across countries may be necessary.*

Conclusions

- Need to invest more in human resources development and knowledge generation on Agri-Mechanization issues in SSA (e.g. MSc. & PhD dissertations).
- Need to consider sub-regional market to attain economies of scale and scope given the current small national markets.
- Environmental concerns are critical but the farm power problem has to be tackled first e.g. farm implements are critical to the environment.
- Need to invest in regional mechanisms information exchange and learning from each other- to support AfricanMechanize platform.
- **SSA has to succeed in provision of farm power through sustainable mechanization hire services to all its farmers (SSFs, MSFs & LSFs)**

END

THANK YOU