

## Constraints to Agricultural Mechanization in Sub-Saharan Africa

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### Abstract

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*The global food consumption is expected to double by the year 2050 and this calls for an increase in the world food production. The situation is even more challenging for sub-Sahara Africa where there will be more rapid population growth (from 770 million in 2005 to between 1.5 and 2 billion in 2050). However, unlike other developing countries in Asia, the level of agricultural mechanization in Sub-Sahara Africa is still very low and is faced with a number of constraints. It is important for the attention of governments and other institutions to be drawn to these for immediate intervention to be taken. The objective of this paper was to identify some of the factors responsible for the present abysmally low level of agricultural mechanization in the Sub-Saharan Africa and proposed the way out of the doldrums within the shortest possible time. The identified factors which constitute main constraints to agricultural mechanization in most Sub-Saharan African countries include lack of adequately trained personnel with the required technical expertise, low level of research and extension activities on appropriate technologies for land preparation, crop harvesting and post-harvest operations; unfavorable and inconsistent government policies and interventions which work at cross purposes with agricultural mechanization.*

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**Key words:** food, constraints, mechanization, Sub-Saharan Africa, food security.

### Introduction

Sub-Saharan Africa is endowed with abundant natural resources for agricultural production. There are, however, many challenges confronting the exploitation of this huge potential. According to FAO (2003), although there are large tracts of land with varying degrees of agricultural potential in sub-Saharan Africa there the people who would exploit it for agriculture lack access to appropriate technology for production and postharvest practices. The Guinea Savannah area in the region, for instance which has a very good agro-ecological condition for successful agricultural production, has only

10% of its rich potential tapped (FAO, 2009). Qiang, (2013) stated that about \$4 billion per year is lost due to lack of structures and equipment for storing postharvest grains in Sub-Saharan Africa. Some of these challenges confronting the agricultural sector in the Sub-region make productivity stagnant.

Unlike experiences in other developing continents such as Asia and Latin America, where scientific and technological inputs has led to improvement, farmers in Africa still depend on rudimentary tools for most farm operations. Presently, about 80% of farmers in Sub-Saharan Africa rely heavily on the

use of hand tools to cultivate arable lands and less than 10% employ the use of tractor and other machine services (Sims et al, 2012). Most smallholder farmers only manage 0.2-2 hectare per cropping season (FAO, 2005). The hoe is a common handtool used most for tillage and planting activities which is often inefficient and causes delays and limitation in carrying out important primary operations. The drudgery associated with farming and its eventual low returns makes the business unattractive to the youth causing them to leave rural farming communities to urban centres with only the old and frail men and women in the business. It is therefore obvious that the working force on the farm is decreasing at an alarming rate. In the face of this, FAO/UNIDO (2008), has projected a rapid population increase from 70 million in 2005 to between 1.5 and 2 billion by the 2050. This must therefore be a wake-up call for governments and policy makers in Sub-Saharan Africa to put in appropriate agricultural mechanization measures to ensure all-year-round food production.

Agricultural mechanization aims at addressing the problem of reducing drudgery associated with farming while maximizing output. It embraces the manufacture, distribution and operation of all types of tools, implements, machines and equipment for agricultural land development, farm production, and crop harvesting and primary processing (FAO, 1995). Developmental trends among developed and even other developing countries such as Japan, China and India show clearly that there exist a strong correlation between economic growth and mechanization (Clarke and Bishop, 2002). As a result, some of these countries have been able to address most of their food problems resulting in positive growth of

their economies. On the other hand, countries which have not shown significant progress in mechanization have, especially in sub-Saharan Africa, have a significant number of their citizens wallowing in deep poverty and extreme hunger.

### **History of Agricultural Mechanization in Sub-Saharan Africa**

Agriculture has been the source of man's livelihood since the beginning of time. Although farming using basic tools like the hoe and cutlass was the first step in ancient time in the sub-region, actual records about efforts to promote agricultural mechanization could be traced to the early days of colonization by European masters especially in the early 1900s. On the European settler farms, a combination of hand tool and draught animals were used as sources of power on their farms. Most of these farms were located in Eastern and Southern part of the continent. Although the use of draught animals for various day-to-day activities dates back to 2000 BC in Ethiopia, using such animals for ploughing purposes was introduced in Ethiopia and other North African countries in the early 1920s. Animal traction is now one of the main sources of power in small holder agriculture in the region, contributing up to 40% of the total power use in some countries such as Botswana (Pawlak et al, 2002).

Tractors were introduced from the 1940s onwards in Ghana and other West African countries. They were first used in commercial, white settlers' farms, but they spread quickly through tractor hire schemes for small farmers, initially promoted by aid agencies, donor countries and tractor manufacturers before the drive was taken up by governments. Government policies which support the use of tractors on the

farms were initiated around this period leading to the establishment of various mechanization schemes in the 1960s. After gaining independence, many governments continued to promote the use of tractors in an effort to increase both food and cash crop production in order to ensure self-sufficiency, produce raw material for local industries and increase foreign currency reserve (FAO, 2005; Amponsah et al, 2012).

Beyond 1960s, there have been heated debates among experts (mainly-economists, sociologists and agricultural engineers) about the negative consequences of mechanization in causing land degradation and displacement of labour. This has led to the stagnation of efforts by farmers to accept the concept and benefit from it. Advocates of mechanization have also asserted that mechanical technologies

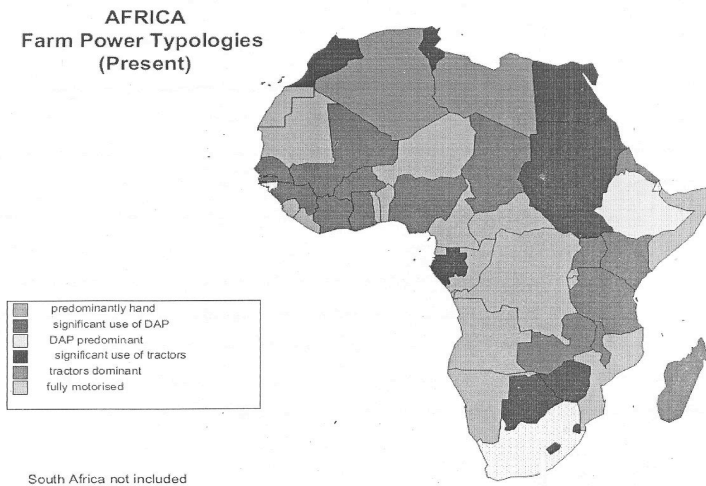
had failed in developing countries because of poor planning. Although there have been some attempts by countries such as Botswana, Nigeria, Ghana and Rwanda to develop working documents to incorporate science and technology into agriculture but the impact of such policies are yet to be felt. Table 1 compares the three main sources of power for agricultural production in this region and that of other developing areas of the world. Figure 1 also gives a pictorial view of the dominance of the use of such power options in various countries across the continent. The present situational analysis leaves a lot to be desired. Apart from Egypt, Tunisia, Morocco and South Africa, the level of mechanization is very low in all other parts of the continent which puts the future food security in much danger in the face of rapid loss of agricultural lands and labour.

**Table 1:** Sources of Farm power in Sub-Saharan Africa and other developing countries

Region	Hand	Animal	Engine
Sub-Saharan Africa	65	25	10
Other Developing Countries*	25	25	50

\* Asia, Latin America, Near East and North Africa, Caribbean

Source: FAO, (2005)



**Figure 1:** The level of Agricultural Mechanization in Africa  
(Source: Clarke and Bishop, 2002)

## Major Constraints Confronting Agricultural Mechanization

### 1. Lack of training and technical expertise in farm machinery

Unlike other developing countries like China and India which give much attention to the training of skilled personnel in the area of agricultural machinery, the situation is entirely different in Sub-Saharan Africa. As far back as 1930, the Chinese government, for example, sponsored 30 of her citizens to travel to the United States to be trained in the area of agricultural machinery development and operation. These individuals eventually came back to China to establish various Departments with special focus on the design, development, management and operation of farm machines (Xiang, 2013). Subsequent governments continued in this direction and now the country is becoming world leader in mechanization. It is interesting to note that even though China is the most populous country in the world with over 1.3 billion people, it is still food sufficient. This is largely as a result of availability of skilled personnel in agricultural mechanization.

The Rwandan government developed an agricultural mechanization strategy but the programme had to be halted because of the unavailability of agricultural machinery experts to spearhead it (MAARR, 2010).

As indicated above, we are nowhere near the strides made by China in this perspective. Table 2 below shows the number of University and Polytechnic Institutions in the sub-region having Departments with expertise in Agricultural Engineering. It is important to mention that even though countries like Nigeria and Ghana seem to have quite a number of institutions offering agricultural programmes, most of them have shifted focus from the discipline of designing, building and testing local machines which is the foundation of the Agricultural Engineering profession. In Ghana, for example, out of the six institutions identified, only two offers graduate and postgraduate degrees with emphasis on machine design and mechanization. More so, there is a general downsize in the intake of students into these programmes.

**Table 2:** Number of Tertiary Institution Agricultural Engineering

Country	Number of Institutions
Nigeria	16
Ghana	6
Kenya	3
Zimbabwe	3
South Africa	2
Malawi	1
Tanzania	1
Zambia	1
DR Congo	1
Sierra Leone	1
South Sudan	1
Ethiopia	1

Source: (O'Denell, 2010, [www.aet-africa.org](http://www.aet-africa.org))

Field expertise is lacking and this results in high operational costs, making investment in mechanization expensive and less attractive. Most tractors owners in Africa have no training in the area of agricultural mechanization and as a result do not use any systematic approach in selecting the machines. In addition, many of the operators and mechanics who handle agricultural machinery are not well trained and this leads to poor quality of work and expensive breakdowns of machines, leading to costly repairs and reduced economic lifespan of the machinery. Aikins and Okyere, (2012) found out in their research that more than 96.7% of the operators and farm machines are in one of the farming areas (Ejura) in Ghana where mechanization is often practiced. The situation is not different from other areas of focus of this paper.

## **2. Low research and extension in mechanization and development of agricultural machines**

Due to inadequate scientific and technical research effort in the area of mechanization, the hand hoe is still regarded as the main tillage and crop production tool and about 80% of farmers rely on it (Sims et al, 2012). Indeed, the real condition on ground makes it challenging to undertake such projects because of general lack of financial and institutional supports. Individuals who take such paths to innovate and improve upon technology available to farmers are left on their own, making most of them give up pursuing such research directions when faced with difficulties.

All over Sub-Saharan Africa, there is very little to talk about in terms of agricultural mechanization technology research and development. And even in areas where there are such breakthroughs,

the technology is often not introduced to farmers for use. There are a number of such which are sitting in the workshops and laboratories of Universities, Polytechnics and research institutes without popularization. The link between technology development and transfer in this respect is therefore very much needed and government institutions and the private sector should take interest in the work of such researchers in order to encourage them and help bring others on board.

## **3. Unfavourable Government Policies and Interventions**

The prices of agricultural machinery have risen sharply in the last 20 years, making it unaffordable for the majority of farmers (Ansu-gyeabour, 2004). Although taxes are removed on the importation of farm machinery in most countries in the sub-region, the massive devaluation of the currency and high inflation rates in these countries coupled with unavailability of laws and policies favourable to farmers so they could have easy access to soft loans and be able to purchase farm machines and equipment make it difficult for mechanization programmes to succeed in the sub-region (Candia et. al, 2011). Erratic fuel prices and the importation of substandard tools and implements or machinery is also a major concern to tractor owners and operators. There is need for urgent intervention of governments to develop policies that favour the successful development of agricultural mechanization so as to ensure food security for the citizenry.

## **The Way Forward**

Farming systems in SSA face a variety of mechanization constraints, which are

complex and interlinked. The main constraints noted in crop production include lack of trained and technical expertise, low level of research and extension of technology coupled with unfavorable government policies and interventions. There is need to influence policy makers at local, state, national, regional and global levels to develop policies and programs that support sustainable agricultural mechanization taking a cue from China, India, Korea and other developing countries. In this direction more agricultural mechanization courses should be introduced into institutions to train people who will be able to develop appropriate technologies for adoption by local farmers. Farmers should therefore, be trained on the application of these technologies because it will result in the strengthening of linkages between farmers, entrepreneurs and researchers. These steps, if taken critically, will help reduce or overcome some of the mechanization constraints facing the Sub-Saharan African region of the continent.

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