

Successful Mechanization of Smallholder Agriculture – Opportunities for Cooperation and Partnership between Africa and Japan



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Introduction

This is an auspicious and opportune time to put a spot light on Africa's economic relationship with Japan, and there are several good reasons to do so. As I am writing this article in the last week of May 2013, African leaders are meeting in Kyoto with their Japanese counterparts to discuss existing and economic ties. Over the decades, Japan has maintained a friendly economic relationship with Africa and African countries. The works of Japan's international development agencies and organisations such as JICA and Sasakawa Africa Foundation are widely recognized for their efforts in promoting scientific cooperation and trade, and the adoption of modern agricultural technology in many African countries. The anniversary of the 80th anniversary of Shin-Norinsha Co. Ltd, a truly global and formidable key role player in agricultural mechanization machinery appropriate for countries in Asia, Africa and Latin, is also a time to celebrate and recognise the critical

role of agricultural engineering and mechanization in sustainable agricultural and economic development.

Surprisingly, the African continent (the least developed region of the world) and Japan (a modernized, developed and industrialized economy) have a lot in common, at least historically, when it comes to the challenges of agricultural development. Many researchers and observers alike have blamed the predominance of small-scale agriculture as a major obstacle to the introduction of modern agricultural technologies such as mechanization into African agriculture. While it is true that smallholder agriculture in Africa needs to be transformed into industrial agribusinesses in efforts to tackle widespread poverty and rampant food insecurity, the Japanese experience in transforming its smallholder agriculture into knowledge intensive mechanized enterprises is of particular interest to Africa. Until the 1970s, Japan's agriculture was dominated by small-scale family farms, often less than 2 ha per household. Through

a combination of targeted and favourable agricultural development policies coupled with investments in new knowledge and technological innovation, the yield of staple crops (mainly rice, wheat and barley) and overall productivity of land and farming inputs increased dramatically. Consequently, rural agricultural Japan was mainstreamed into the national economy. By the 1970s into the 1980s, through widespread adoption of mechanization and other improved agricultural technologies, drudgery was removed from farming and all operations could be completed on time and more efficiently, thereby allowing more members of rural farming families to take up more financially lucrative off-farm employment in the urban areas.

Smallholder Agricultural Mechanization in Japan – A Success Story

The fascinating and remarkable success of the modernization of its smallholder family farms is a true reflection of the major changes undergone by Japan agriculture during the past half-century, with

the biggest change occurring in efficiency of operations. The development, adaptation and application of new scientific and technological innovations have made Japanese agriculture among the most productive in the world. Mechanization and automation, widespread use of agrichemicals such as pesticides and fertilizers, novel environmental and soil management practices, and industrialization of agriculture have made it possible to achieve high crop yields and increase production at small, intermediate and large scale farms. From an African perspective, the successful and profitable mechanisation of small scale agriculture in Japan, especially rice paddy, is particular interest given the predominance of smallholder agriculture in Africa.

A look at the state of agriculture and economic development in Sub-Saharan Africa (SSA) paints strikingly different pathway and outcome. The region still accounts for the majority of global underdevelopment statistics: from food insecurity and malnutrition to infant mortality, from high incidence of infectious diseases and death due to malaria and HIV/AIDS to low human development index and widespread poverty. The majority of Africans still live in rural areas practising agriculture for their livelihood. While agriculture remains the main source of employment and income for the majority of people in SSA and the region accounts for over 60 % of global uncultivated agricultural land, it also records the lowest crop yield and productivity compared to other parts of the world. This is particularly unsurprising given that, to date, African agriculture has barely benefited from the modern technological innovations that have turned agricultural productivity around in upward trend in Japan and other developed countries.

Although many researchers and

development experts have deplored the state of African smallholder farmers and the prevalence of poverty among them, and offered various reasons for this situation, the truth of the matter is that they have remained agriculturally undeveloped while the rest of the economy have transformed in some measures in response to the changing socio-economic aspirations of the people. Some development practitioners have talked about the apparent high output per input of smallholder farmers compared with large scale industrial farmers, and the unique and wonderful values of smallholder farmers as repositories of indigenous agricultural knowledge. Be these as they may, these values do not offer much help to the rural resource-poor farmer confronted with the complex problems of climate change, global competition, rapidly declining soil fertility, new and emerging pests and diseases, high incidence of postharvest food losses, rising urbanisation and impacts on farm labour scarcity, and public concerns about environmental protection and resource conservation.

The successful mechanization of its agriculture –including small, intermediate and large farms– is arguably one of the most internationally recognised stories of Japanese agriculture and industrial revolution which occurred during the past 50 years. This occasion of the 80th anniversary of Shin-Norinsha Co. Ltd., the parent company of Farm Machinery Industrial Research Corporation –publisher of *Agricultural Mechanization in Asia, Africa and Latin America (AMA)*– is an opportune moment to acknowledge and celebrate both the success of Japanese agricultural mechanization endeavour and the company in particular. While researching, producing and marketing a wide range of innovative machinery to support agricultural mechanization in Japan

and around the world, the publication and global circulation of *AMA* provided a unique and special international forum for the dissemination and promotion of novel ideas and technologies on agricultural mechanization. Latest information on the status and trends in agricultural machinery in Japan and the regular and incisive editorials of Mr Yoshisuke Kishisda (*AMA* Chief Editor) always provide much needed fact, inspiration and hope for researchers and practitioners of agricultural mechanization for sustainable agricultural development.

Agricultural Mechanization for Food Security in Africa –Opportunities for Cooperation and Partnership

As we celebrate these successes and usher in another half century of continuing success for Shin-Norinsha Co. Ltd and *AMA*, it is also time to reflect on the opportunities that lie ahead for collaboration and partnership between Japan and Africa in the areas of agricultural mechanization for sustainable economic development. So much has been talked about Africa's abundant natural resources –especially agricultural land and fresh water – which need to be sustainably exploited to achieve food security and reduce poverty in the continent. In contrast to the not-long-ago view of Africa as a hopeless dark continent, there is now widespread global optimism and recognition among the private sector and governments around the world of Africa as the “rising continent”, which offers tremendous high rates of return in investment and which also has the potential to feed the growing world population. Similarly, African leaders expound the philosophy and vision of the “African Renaissance”, a continent that is open for business. In support of this vision of a new Africa and new agriculture, African

leaders have committed to invest at least 10 % of their country GDPs to agriculture development. During the past decade, millions of dollars have been invested by global food chains and foreign governments to bring hundreds of thousands of new agricultural land into production in Africa. Surely, these new large scale agriculture enterprises will not depend on the same simple hand tools employed by millions of smallholder farmers. Successful agricultural intensification and cultivation of new large areas will require investments in new knowledge and technological innovations, including agricultural machinery.

While the new optimism about Africa and African agriculture by both the public and private sectors are most welcome, I should hasten to add that like other continents (and countries) that have already gone through this path, Africa's economic development and related efforts to reduce poverty will remain a mirage if agriculture remains undeveloped and does not undergo major structural and technological reform. The mechanization of agriculture **at all levels** –while not the panacea for all challenges limiting the realisation of Africa's green revolution– must be viewed and implemented as a necessary condition for success. As Africa's predominantly rural farming population age fast and urban population continues to grown unabated with the potential to exceed rural population in many countries in the next decade, a new and bold approach is needed to address the

looming agricultural labour shortages and decline in food production. Related to these also is the need to create employment opportunities in the new agriculture for the millions of educated but unemployed African youth. Africa needs to create new jobs for it burgeoning youth population. The development and promotion of knowledge intensive agriculture, which includes appropriate use of modern agricultural machinery to remove drudgery and enhance productivity, is certainly part of the solution.

It is estimated that the global agricultural machinery industry generated more than US\$ 56 billion in 2010, and the market is projected to grow at about 8 % annually through 2015 to reach almost US\$ 81 billion. With rising global population, mainly in SSA and other least developed regions, it is also expected that economic growth and rising disposable income will require major increases in food production to meet future demand. Rising disposable incomes and improvements in living standards are known to heighten demand for protein-rich foods and spur the need for more and new agricultural food products.

To increase food production to meet future demand in Africa and around the world, it will be necessary to reduce postharvest food losses and waste, intensify production on existing land and to cultivate additional agricultural land, especially in SSA where most of global uncultivated farm land exists. Both last two approaches to increasing food production will require investment in new agricultural machinery, including tractors.

A brief look at the status of agricultural machinery and irrigation technology in Africa reveals the huge deficit and tremendous potential that lies ahead. Analysis show that the number of tractors (per 1000 ha) is lowest in Africa (28) compared to the average (241) in nine developing countries in other regions (**Table 1**). Like the time of our forbears centuries back, the human muscle remains the main source of power in African agriculture, accounting for over 65 %. While other developing regions have invested in the application of improved engine (tractor) power to promote and accelerate agricultural development, the increase in tractor numbers in Africa between 1961 and 2000 was

Table 2 Growth in numbers of tractor in Africa and other developing regions (1961-2000)

Region	Increase (%)
Sub-Saharan Africa	28
Latin America and Caribbean	469
Asia	500
North Africa and Near East	1350

Source: FAO, 2004, Agricultural Mechanization in sub-Saharan Africa.

Table 1 Status of agricultural mechanization and cereal yield in Africa compared to other developing regions

	Power source (%)			Tractors (per 1000 ha)	Irrigation (% of arable land)	Fertilizer use (kg/ha)	Region cereal yield (kg/ha)
	Engine	Animal	Hand				
Africa/SSA	10 ^k	25 ^k	65 ^k	28 [*]	5 [*]	13 [*]	1040 [*]
Average of selected countries	50 ^{**}	25 ^{**}	25 ^{**}	241 [#]	38 [#]	208 [#]	3348 [#]

^kSSA; ^{*}Africa less Egypt and Mauritius; [#]Bangladesh, Brazil, China, India, Pakistan, Philippines, Republic of Korea, Thailand, Viet Nam; ^{**}3 other developing regions –Asia, Near East and North Africa, Latin America and Caribbean. Sources: World Bank, World Development Indicators, 2007 (Table 32); FAO, 2005, World Agriculture, Towards 2015/2030 (Table 4.16).

only 28 % compared with 500 % in Asia (Table 2). The cocktail of inadequate and inefficient farm power and machinery sources with the lack or very limited use of yield- and productivity-enhancing inputs such as fertilizer and irrigation contribute to the low crop yield prevalent in many parts of Sub Saharan Africa (Table 1). Given the huge deficit in agricultural machinery application in African agriculture, it is expected that the agricultural machinery market growth in Africa and other developing countries will make up for slowing growth in developed countries in the years ahead.

Africa and Japan have a lot to gain from cooperation and partnership in the ongoing Africa's green revolution journey. This includes bilateral activities on specific issues addressing the policy frameworks for developing a lucrative agricultural industry that employs modern technology to create new value in agricultural products and services as well as provide employment opportunities. African bureaucrats will benefit from deeper understanding of Japanese experiences on key policy initiatives such as those which supported agricultural mechanization, development of the machinery industry, and the widely acclaimed national agricultural cooperative network which enabled farmers to access market for their products. SSA is still the only predominantly agricultural region which lacks functional and robust agricultural machinery testing centres, where the performance of technological innovations in agricultural mechanisation can be rigorously evaluated and standards can be established based on scientific evidence.

novation system, which includes agricultural mechanization and agro-processing as important elements, is needed to ensure the development of new knowledge to address the multi-faceted challenges facing agriculture in Africa and globally. African countries and Japan as well as their private sectors and professional associations should deepen and strengthen their engagements and dialogue to identify and implement joint projects of mutual interest to promote the development and adoption of technological innovations to improve agricultural productivity and value chains in an ever increasingly climate sensitive and environmental sustainable world. The recently formed African Network of Agricultural Engineers (AfroAgEng) provides a timely platform for dialogue and networking with similar agricultural engineering associations and other engineers in Japan during this exciting time in Africa. Let us cooperate in partnership to advance agricultural mechanization and related agricultural engineering technologies as instruments to banish poverty and hunger and promote sustainable economic development in Africa.

As we celebrate the global success and impact of Shin-Norinsha Co. Ltd on agricultural mechanization against the backdrop of Japan's remarkable achievement of successfully transforming its traditional small scale family farms to usher in a modern, diversified industrialised country, may we also toast Africa's green revolution in our life time with some credit to the cooperation and partnership between Africa and Japan.

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Conclusion

The development and promotion of an agricultural technological in-