

What Can Africa Learn from China's Experience in Agricultural Development?

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Abstract: There has been a growing interest of China's rapid economic growth, particularly agriculture-led growth and poverty reduction. In fact, China and Africa have developed their agriculture under different historical conditions. China's agriculture-led growth and poverty reduction and small holder based agricultural development policy can provide useful experiences for Africa countries to develop their home-made agricultural development strategy to reduce poverty and at the same Africa countries should also take lessons from China's agricultural development process in order to make sure that this learning can be based on African context.

Key words: agriculture, China, Africa

1. Introduction

The importance of agriculture and its potential for development in Sub-Saharan Africa is widely acknowledged. Africa is comprised of a majority of "agriculture based countries", dependent on agriculture as a major component of their development trajectories (29 percent of GDP) and of the livelihoods of the bulk of its population (68 percent population in agriculture). For 'agriculture based countries", GDP growth generated in agriculture is at least twice as effective in reducing poverty as growth generated by other sectors (World Bank 2007). Since the 1980s, poverty levels have not changed in Sub-Saharan Africa and the incidence of poverty remains higher than 40 percent. Agricultural productivity in both land and labor terms in Sub-Saharan Africa has been stagnant since the 1970s., Over the last 40 years, Sub-Saharan Africa has become a net importer of agricultural commodities and staple food. The continent imported more than 15 percent of its basic consumption, at a cost of \$ 88billian in 2006 and \$119bilian in 2007 (Anseeuw 2011). Consequently, the literature on Africa, especially in the aftermath of the global recession of the 1970s, has been largely pessimistic, and despite some more nuanced assessment in recent years, "Agro-Afro-pessimism" continues to permeate the policy discourse (Oya 2011). In China, during almost the same period of time, and particularly from 1978-2009,

China's agriculture grew at an annual average rate of 4.5%, total grain output at 2.4% and population at 1.07%. Agriculture and total grain output consequently outpaced population growth, which enabled China to feed a population accounting for 20% of the world's total from its limited arable land (11% of the world's total) using water resources equivalent to 25% of the world average (Huang 2008). The steady growth in agriculture and rural economy has significantly accelerated China's modernization process (McMillan *et al.* 1989; Fan *et al.* 1999; World Bank 2001), and has been a most important contributor to reducing China's rural poverty (Ravallion *et al.* 2007; the World Bank 2007; Li *et al.* 2010).

Confronted with the long-standing challenge of promoting economic growth and reducing poverty, many Sub-Saharan African countries have developed agriculture-centered strategies to boost farm productivity to drive growth and raise rural incomes. Within this context, the experiences and lessons of agriculture-led growth and poverty reduction in China has naturally attracted the attention of Sub-Saharan Africa and the international community (CDSG 2011). One should be cautious in drawing on the experiences from China's growth and poverty reduction strategies more broadly, given the two very different contexts. China has been a unified country despite its cultural diversity and vast territory, while Africa is a continent of 54 countries with diversified social, economic and environmental conditions. However, as what China has learnt from very different countries such as Singapore, South Korea, Japan, Europe and the United State, Africa can certainly draw experiences on how smallholder-based agriculture in China has been developed to promote growth and poverty reduction, and at the same time to take the lessons on the range of problems associated with China's agricultural development - such as the emergence of a dualistic society with a strong urban-rural divide, unclear land rights for farmers and highly intensive farming leading to pollution and degradation of natural resources.

This paper neither intends to compare agricultural development between China and Africa, nor to analyze China's agricultural experiences, but to highlight some of the key conditions that enabled China to achieve its success in agricultural development and poverty reduction and to relate these where possible to the African context. This requires a clear account of the Chinese experience which, although unique in many ways still affords some interesting potential opportunities for sustainable agricultural development in many parts of Africa. After briefly discussing the historical conditions that both China and Africa inherited, the paper focuses on agricultural policy processes in China and Africa. In conclusion, there is a focus on small holder agriculture in both areas as this structural feature of the Chinese model has the most promise for African rural and agricultural development.

2. Historical conditions for agricultural development in China and Africa

Agriculture in China and Africa has been developed under different historical conditions. China started settled cultivation of rice in the Hemudu period around 7000

BC. Meanwhile, in the central plateau region of sub-Saharan Africa, settled agriculture also first appeared around 7000 BC (Lu 2000). These origins have had a profound influence on agricultural development in China and sub-Saharan Africa to the extent that rice and wheat, and sorghum and millet respectively, the original crops pioneered, remain the most important crops in the two regions to this day despite the fact that agricultural production across China and Africa has changed considerably. In 2007, for example, the harvest area of sorghum and millet in Sub-Saharan Africa was 21.65 percent and 22.72 percent respectively, while rice and wheat only accounted for 10.73 percent and 3.39 percent. In China, rice and wheat accounted for 33.70 percent and 27.39 percent at the same time, while sorghum and millet only accounted for 0.63 percent and 0.89 percent of total harvested area (Table 1).

Table 1 Crop structure in China and Sub-Saharan Africa in 2007(percentage area harvested)

	rice	wheat	Maize	Millet	Sorghum	Barley	others	Total
China	33.70	27.39	35.19	0.89	0.63	0.71	1.50	100
Sub-Saharan	10.73	3.39	35.44	22.72	21.65	1.61	4.46	100

Source: FAOSTAT

The development of traditional agricultural civilization in Africa was largely interrupted by colonizers who introduced cash crops in order to meet the domestic needs of the Western powers (Jiang 2008; Martin 1985). Today, African farm households plant over half of all cropped area in imported plant species, principally maize, cassava, groundnuts, bananas, cocoa, potatoes, sweet potatoes, tea and imported varieties of cotton and rice (Gabre-Madhin 2004). Although in many African countries, the agricultural structure mainly consists of staple crops and traditional cash crops for export, large areas were expanded into cash crop clusters, such as cotton in the Nile valley of Egypt and Sudan; cocoa, palm, coffee and rubber in the coastal basins of west Africa; peanuts and cotton in the inner regions of west Africa; lilac and sisal hemp in coastal East Africa and its neighboring islands; and tobacco and sugarcane in South Africa (Li *et al.* 2010).

However, despite the efforts made to shift the production structure into one that is less-dependent on the world market, cash crops are still the major source of export and foreign earnings as Table 2 indicates. The comparative advantage of traditional cash crop production in Africa has contributed significantly to the economy of many African countries. For instance, some places and certain crops have enjoyed production and income gains such as cocoa in West Africa. However, this traditional cash crop based production system has neither brought a fundamental change to Africa's agriculture nor its food security problem, largely due to declining prices and the growing competition in cash crop supply from elsewhere. Asia has become a strong competitor for Africa in traditional cash crops. For instance, in 1960, Africa's share of the world's growing area for cashew nuts was 63.4 percent and Asia was only 31.6 percent, while in 2004 Africa's share dropped to 27.1 percent and Asia's

share increased to 64.2 percent (FAOSTAT). The export decrease of coffee from Sub-Saharan Africa was mainly accompanied by the increase in Asia and Latin America which still remains the largest coffee exporters in the world market as Figure 1 indicates. Africa had two extended periods in the twentieth century for agricultural growth, one from the start of the century until 1929, the other from the late 1940s until the early 1970s, but in both periods strong demand for exports of tropical products was the driver, and both ended when primary commodity prices fell (Wiggins 2005). Neither African indigenous crops nor imported staple species contributed to the periodic growth record.

Table 2 Share of cash crops in total export in some African countries (%)

	Crops	1978	1995	2004
Malawi	Tobacco, peanut, tea, coffee, rubber	75.00	86.70	80.00
Burundi	Coffee	85.00	84.00	45.00
Uganda	Coffee, tea	95.00	82.50	41.00
Benin	Cotton, palm oil		63.30	75.00
Zade	Cotton	54.00	59.20	50.00

Source: data for 1978: (Africa Agricultural Geography); data for 1995: (Africa Natural Resources); data for 2004: FAOSTAT

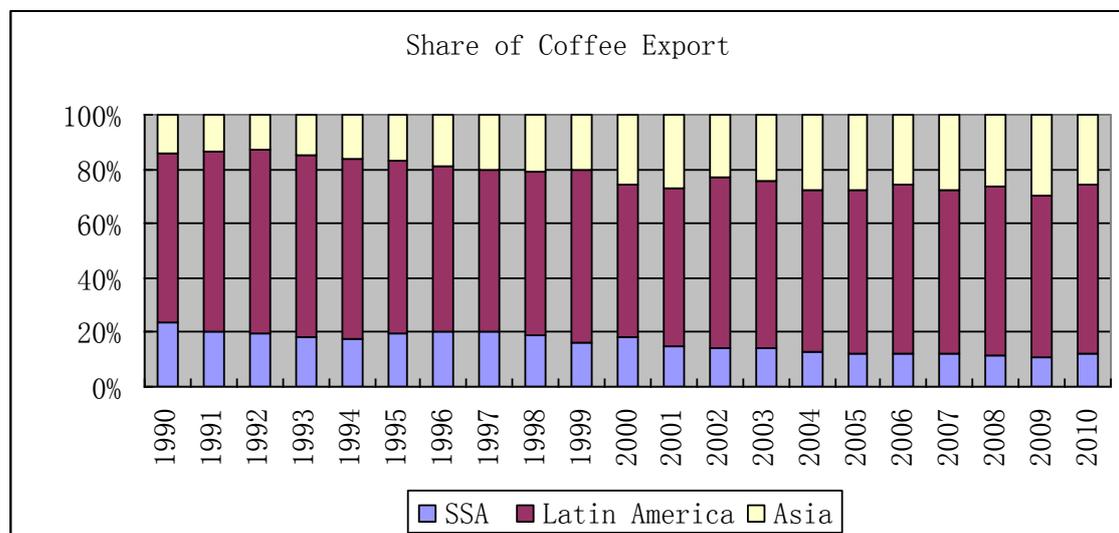


Figure 1 Share of Coffee Exports

Source: FAOSTAT

The new crops and technologies brought by colonialism enriched agricultural diversity in Africa; however the system introduced was not well integrated with local agricultural production systems. First, traditional cash crops were mainly produced in large plantations which had no linkage with small holders; second, for even food crops, innovation was mainly for commercial farms. For example, national agricultural research systems in Zimbabwe and Kenya launched the first maize-breeding

programs in Africa, in the 1930s and 1950s respectively, but in response to political pressure from large commercial farmers (Miracle 1966). The shift to smallholder production only started at independence although maize was introduced to Africa in the 1900s (Gabre-Madhin 2004). The dual agricultural structure of settler's large scale plantations and African small holders has been the main feature of this dual form of agriculture in most parts of Sub-Saharan Africa¹. In Zambia, for example, there are now about 3000 large modern farms, of which 1/3 are operated by Europeans, 1/3 by South Africans and 1/3 by Indians and Pakistanis; almost none of these large farms belong to local people². At the same time, the size of most of Zambia's small-scale land holders is only a few hectares (Li *et al.* 2010). As such, the relatively short colonial period of less than 100 years in Africa had a significant impact on production from the perspective of agricultural structure, but had little impact on small-scale agriculture. Small farms - the main units of African agricultural production - have maintained many very traditional forms of production, most with low productivity. For instance, the maize output per hectare on small farms in Zambia and Tanzania, is only 430 kg and 580 kg respectively, and the rice output per hectare of small farms in Liberia has reached only 1176 kg (Li *et al.* 2010); less than half of what China was able to achieve as long ago as the 18th Century.

The origin and evolution of Chinese agricultural structure has been continuously based on food crop production despite the many changes over time. This historical condition has had a series of impacts on current agricultural development in China. Firstly, in about 300 BC, China had an area of 5.64 million hectares of land producing grain, but by the early 20th Century this figure had risen to 81.20 million hectares, almost reaching the scale of the present day grain land area in China. Most of the arable land in use in China has been subjected to long-term cultivation, of which more than 85 percent of the area has been used for staple food crops. This has enabled Chinese smallholders to develop smallholder-based farming technology in an incremental way over a long period, and has provided a solid foundation for further agricultural development. Secondly, due to a steady increase of population over time in China, agriculture has been developed largely based on land-saving systems that focus on intensive farming such as poly-culture and inter-cropping. Thirdly, under a decreasing land/population ratio, agricultural technology has been developed towards land productivity improvements as Table 3 indicates. China's food crop yield already reached 2.75 t per hectare in the 18 century, which is even higher than present levels in Africa (Wu 1988).

¹ In both Zimbabwe and South Africa, a series of interventions favoured European farmers over African smallholders in markets for outputs as well as for land, labour, credit and other inputs (Kassier and Groenewald, 1990; Deininger and Binswanger, 1995). These policies contributed to the emergence of the dualistic structure of landholding and production that characterizes agriculture in Zimbabwe and South Africa today. In Zimbabwe, one million communal farm households occupy about half of the arable cropland, while the other half is farmed by 4500 large-scale commercial farmers, most of whom are white (Atkins and Thirtle, 1995; cited from Wiebe, 2001)

² This is from an estimation of the Ministry of Agriculture and Cooperatives in Zambia, where there is a very small number of large modern farms operated by Chinese, (less than 20).

Table 3 Grain crop production in China at different time

	Arable land (million ha)	Population (million)	Crop yield (t/ha)	Grain procession (kg/ capita)
BC 475-221	6.00	20	1.60	460
BC 202-AC 9	15.86	59.5	1.98	496
618-907	15.39	60	2.51	565
960-1127	30.60	125	2.31	524
1368-1644	31.80	125	2.59	561
1735-1795	63.33	271	2.75	546
1914-1918	95.33	430	1.84	348
1931-1936	98.00	520	1.97	315

Source: Wu, 1988 NB Hectares = ha.

Historically, the diversification of food sources such as banana and fruits in Africa reduced dependence on food crops on the one hand, and strongly impacted agricultural development in Africa on the other. First, the relatively weak dependency on land for food production has caused inefficiency in agricultural land use. Currently less than 30% of the potential arable land is under cultivation in Sub-Saharan Africa. In Zambia, for example, 58% of the land is suitable for cultivation, but only 14% of the land is utilized; and in Mozambique the cultivated land only accounts for one fifth of the total potential arable land area (Li *et al.* 2010). Secondly, long time extensive land use and less dependence on food crops have led to significant lags in the development of small holder based technology for productivity improvement; Third, relative short periods of staple crop farming with frequent political and economic disruptions, particularly after the 1970s, affected the course of smallholder-based productive food crop systems. Consequently, Sub-Saharan Africa faced the paradox of abundant land available and food insecurity. Consistent evolution of crop pattern in China enables smallholders to accumulate rice and wheat based farming technology and importantly to provide the base for modern technology innovation. While in Africa, technology change was mainly concentrated on cash crop and large commercial staple crop farms, but not smallholder system. This different pattern to some extent explains why the wheat and rice-based green revolution of the 1970s and 1980s 'bypassed Africa' (Baum *et. al.*, 1986), but happened in China. This historical learning process in China and Africa suggests that the countries with majority of small holders to develop their agriculture requires consistent small holder based agriculture structure that allows small holder to accumulate and improve farming practice based on their own context.

3. Agricultural policy in China and Africa

Agricultural growth in China after the end of the 1970s is well recognized. In fact, agriculture from the 1950s to the 1970s had also been significant despite the interruptions during the 1960s and 1970s due to natural disasters and political struggle. "Taking agriculture as the country's economic base" has always been a

central element of China's development strategy since the 1950s. Within this strategy, food crop production has been the priority and land reform the major policy implemented. Before 1950, landlords only comprised 10 percent of the rural population, but occupied 80 percent of the arable land (Deng 1984). The Land Reform Act of P.R. China was passed in 1950 to distribute arable land to all peasants in private ownership. Three million peasants were given land accounting for a total of 46.67 million hectares (Deng 1984). The land reform was also accompanied by a series of policies which saw the establishment of agricultural universities, the development of national and local research institutions and the development of agro-input industries. These initiatives led to a dramatic increase in agricultural production, particularly in food crops.

From 1949 to 1958, the output of food crops increased from 113.18 million tons to 197.65 million tons and average output of food crops per capita went from 208 kg to 299 kg in the same period. Although the Great Leap Forward Movement initiated in 1958 and the collectivization movement from the 1960s affected agricultural production negatively, (the grain crop production dropped from 197.65 million tons in 1958 to 154.41 million tons in 1962), even under the collective regime with no direct incentive for farmers, crop production began to increase again after 1963. Food crop output increased from 187.50 million tons in 1964 to 304.77 million tons in 1978 (NBSC 1999).

The steady increase in food crop production based on productivity improvements had been the result of a consistent agricultural development strategy in which, food crops were prioritized as the center of agricultural policy. Packaged measures such as irrigation development, enhancement of farmer-centered agricultural research and extension and agro-input industry development were consistently followed. The policy "irrigation is essential for agriculture" stimulated the expansion of irrigation areas from 16.3 percent in 1949 to 49.2 percent in 1980, as Table 4 shows. In fact, irrigation infrastructure in China had been mainly developed before the 1980s. This made China well positioned to adopt a technology package-led approach for using high-yielding varieties, fertilizers and irrigation despite the institutional constraints from the collective regime.

The agricultural development strategy and policy during that time period focused on mobilizing free labor to substitute capital through a series of institutional arrangements such as the agricultural collective movement. The effect of infrastructure development and the provision of agro-inputs such as fertilizer and technology and improved seeds significantly offset the negative impact of collectivization. Labor contributed 57 percent of the agricultural growth from 1952-1978 (Research Project Team of Soft Science Committee of Ministry of Agriculture 2000) State investments in research and extension as well as agro-industries was at the expense of farmers' income. The main objective of the strategy had been to extract the surplus from agriculture for industrial development

and at the same time secure a basic food supply. All these were achieved through the state led planning system. This policy maintained China's food security despite the famines at the beginning of the 1960s.

Table 4 Irrigation development from the 1950s'

	Total arable land (100million h)	Irrigated (100million h)	area Irrigation rate (%)
1949	97.88	15.92	16.3
1957	111.83	25.00	22.4
1965	103.59	32.03	30.9
1975	99.70	32.78	46.3
1980	96.84	48.88	49.2
2009	121.7*	59.26	48.7

*This data is from the Ministry of National Land and Resources, 2008.

Source: Ma Tianzheng and Zhang Xiangming, (Water Problem Forum) 2009; other 2009 data are from the China Statistical Year Book, 2010.

Meanwhile, it should also be noted that although this mono-agricultural strategy concentrating on food crops had maintained minimum food security, the rural and national economies had not been very well developed due to a distorted emphasis on heavy industry. This strategy mobilized capital accumulated from agriculture to heavy industry while farmers remained poor in farming under state control. This made China a "food secure poor country" in the world³ (Fei 1986).

Agriculture reform in China has gone through different stages after the end of the 1970s. Firstly, from 1978-1984, the major reform was to abolish the rural collective system via land reform moving from collective land management to the 'Household Responsibility System', a privately leased land use system. The major objective of the strategy was to boost the rural economy and increase farmers' income by relaxing the controls so that farmers could have incentives to produce more and production diversification could take place. Consequently, food crop production was greatly enhanced. Agricultural output grew at 7.7 percent annually. Total output of grain crop increased from 304 million tons in 1978 to 407 million tons in 1984 and average yield of grain crops increased to 3.6 tons per hectare in 1984; an increase of 42.8 percent compared to 1978 (Song 2008). Land reform contributed to 46.89 (almost 50%) percent of the agricultural growth in China (Lin 1992b); Secondly, from 1985-1991, the policy shifted to market reform and structural adjustment. The planning regime was still maintained for grain crop production to guarantee food supply through the state purchase system, and a quota system was introduced in 1985 in which any surplus from the quota was permitted to enter the free market, and at the same time, all other agricultural products were allowed to be sold freely. In 1986, the planned quota for

³ When Fei Xiaotong (1986) revisited Jiangcun in 1957, a village in Jiangsu Province, he found that the food production had increased by 60% compared with that in 1936. However, the villagers said they did not worry about eating any more, but they were lacked money to improve their living standard. Expenses on food and clothes took 60% of a three-persons-family's consumption.

grain was reduced. Meanwhile, the rural and agricultural economic structure had also changed. The share of crop production to agricultural GDP declined from 80 percent in 1978 to 63 percent in 1991 and the livestock share increased from 15.0 percent to 26.5 percent respectively (Song 2008). In 1984, the Chinese government issued a policy to promote rural industrial development. From 1984-1988, the number of Township and Village Rural Enterprises (TVE) had been increased from 6.05 million to 188.8 million and around 0.9 million rural people were employed by these enterprises (Song 2008). The rural enterprises absorbed both capital and labor from agriculture and opened the door for China's social and economic transformation. Thirdly, from 1992-1998, the reform focused on stabilizing the land contract system and extended from 15 to 30 years the land leasing right, At the same time the grain market system was developed by setting a protection price and grain strategic reserve, thus gradually releasing control of the grain market. Rural enterprises continued to grow at a high rate during this time period under different policy supports. The rural enterprise share of the total domestic production value reached 26.0 percent in 1998. It occupied over 43.4 percent of industry production value increase and employed 130 million rural people. The last stage, since 1999, has been a comprehensive reform of agriculture in China. In 2004, the grain market was completely relaxed and in 2006, the agricultural tax was exempted and different subsidies for farming were introduced. Despite the shift from the collective to the household-based production system since 1978, the mobilization of farm labor investment in agriculture has been significant. In 1986, the government issued a policy requesting 10-20 free labor-days per year capita, and the total labor-days input in agricultural irrigation infrastructure was more than 7 billion during 1991-2000, and from 1997-1998, the total investment in irrigation was 6.2 billion \$US with farmers' labor contributing 59.4 percent (Xu 2008).

The role of the state administrative capacity to develop and implement policy and policy learning process has been vital in achieving the performance. Since the 1950s, the Chinese Communist Party realized the valuable nature of the agricultural sector and considered it as a "public sector". It set up different forms of the party's agriculture and rural policy institutions, such as the Rural Work Department of the Chinese Communist Party's Central Committee in the 1950s for oversight, and proposed various kinds of agricultural development policies and strategies. This institution was organized at the provincial, district and county levels. Large numbers of the agricultural university and college graduates were sent to those departments as staff members.

"Field investigation" was encouraged for all staff to understand rural China and to make suitable policies as well as obtain feedback for adjusting policies. The Agricultural Work Office was established in the 1970s, and it became the Rural Policy Research Department of the Chinese Communist Party's Central Committee in the 1980s. It provided strong evidence from "Household Responsibility System" initiated from Anhui Province for high level decision makers, and ultimately scaled up nationwide. This department played a significant role in pro-market reforms, and

drafted the *Number One Document*⁴, which served as a consistent strategy and policy framework with guidelines for agricultural and rural development in China in the 1980s.

Within the Chinese Communist Party's Central Committee (CCPCC), the Leading Groups Office for Rural Work (LGORW) made all agricultural policies. It also acted as the coordination body, integrating different sector policies and continuing to develop the *Number One Document*. The document guided resource allocations for five years from 1982 to 1986 as well as for yearly budgeting adjustments. Parallel to the party's agricultural policy development process, the Government agricultural institutions have also developed. Within the Government system, the Agricultural Office at different levels in the 1970s and Agricultural Commissions in the 1980s acted mainly to execute strategies and policies.

Currently agricultural policy is coordinated by the LGORW and advised by various party and Government research bodies, such as the Policy Research Department of the Chinese Communist Party's Central Committee, the Research Department of the State Council, the Development Research Center of the State Council, and the Agricultural Policy Research Center of the Ministry of Agriculture. These are further supported by the research institutes outside the party and Government. The policy development and advisory network are fully financed by the Government and staffed by well-trained professionals to provide timely recommendations. Based on the policy development structure, any new policy usually needs to go through a series of consultations, including a wide range of consultations with farmers.

The effective approach China has adopted is "policy experimentation". During the rapid reform era from the beginning of the 1980s to the beginning of the 1990s, the central Government developed an internal policy learning process by setting up 10 Central Rural Reform Experimentation Tests. The tests were managed by the Rural Policy Research Department of the Central Party Committee during the 1980s. The policy measures to tackle major problems faced by agricultural reform at that time, such as land, markets, prices, production services, etc. were first tested in the experimental areas (Office of State Council 1987). Most policy proposals were largely based on this policy learning process from pilot sites. Relevance of this learning process to Africa has been widely taken (Revanlion, 2009).

The Government also takes responsibility for implementing strategies and policies. Different ministries related to agriculture usually develop their own sector plans for financing and other supports according to central strategies and policies. The sector plans are coordinated by the National Development and Reform Commission, in which the DG of Rural Economy coordinates all agricultural and related sector development plans under the overall direction of the Leading Group Office for Rural

⁴ A key policy document published annually often focusing on farmers, agricultural and rural areas. It is always as the first policy document issued by Chinese Communist Party Central Committee every year.

Work. The Ministry of Finance follows the plan to draft budgets, and then all plans and budgets are submitted to the People's Congress for final approval. Each province has its own similar structure for implementing national policy and also for developing its own policies and strategies according to their local context. This vertical structure from central to local and horizontal structure from different sector organizations forms China's agricultural policy and implementation system, ensuring that strategies and policies develop in a consistent, adjustable, and adaptive way.

The Government makes an effort to build individual capacity to train staff according to different functions. Almost all staff members within the system are college or university graduates. Overseas training and on-the-job training have enabled staff members to continue learning. All senior leaders, such as the vice governor of a provincial district and county senior officials, have to attend full-time training for agricultural development at a university or college for at least six months to one year. For each new strategy and policy to be implemented, nationwide training is organized for all who will be leading its implementation.

To successfully implement strategies and policies, the Government usually starts with an implementation demonstration pilot test. Experience and lessons learned from the pilot test are shared with all relevant officials to improve the implementation plan. In addition, implementing agricultural policies needs to motivate frontier workers to work with farmers in rural areas. Different awards have been created at different levels for those who perform successfully, and job promotion is also based on work experience at the grassroots level. A large number of senior leaders at all levels were promoted from the grassroots level, an incentive system that greatly motivates people. Successful implementation is also reinforced by party discipline that requires most of the staff who is members of the party to follow policy guidelines.

This comprehensive capacity that includes an institutional framework, political, social, and economic incentives, as well as strong professional qualifications for individuals helps develop and implement policies efficiently. A learning-by-doing approach for policy development and implementation ensures that policy is developed in a less risky way. Meanwhile, the system also enables policymakers to adopt local innovations for policy consideration. Thus, development of China's agriculture, as Deng Xiaoping⁵ said, 'first relies on the right policy development'.

The key experience of China's agricultural policy after the end of the 1970s has been largely an incremental learning process. Firstly, agricultural strategy and policy, despite the reform, has been consistent with previous policy in that agriculture is the base for the national economy and the grain crop is in the central component of agriculture for a secure food supply. Secondly, market reform for agricultural products

⁵ In Deng's talks with responsible persons on the Planning Commission, afterwards renamed as Commission of Development and Reform, he mentioned that agricultural development relied on policy first and on science and technology second. This took place on 26th July 1982 and put into order a 'ten years preparation for another ten years' on 14th October, 1982.

has never been radical, but based on the experiences and lessons gained from the policy experimentations in specific sites in various regions to bring a small scale of success into a larger scale of application. The grain market moving towards a free marketing system took more than 20 years to put all regulations and infrastructure in place, while at the same time controlling the price of fertilizer and other agro-inputs to be affordable for farmers. The state continued to provide public services such as research and extension. Thirdly, agricultural development has been well integrated with non-agricultural sector development through the encouragement of agricultural diversification and rural enterprise development. Overall, the state led, market driven and farmer-based model has been the central element in the success of Chinese agriculture.

African agriculture policy since the independence period has also gone through different stages from state building with planning regimes to state weakening with market forces, but most were largely influenced by external development interventions. From the 1960s to the 1970s, many newly independent African countries were influenced by socialist ideology and began to adopt state-led planning to secure food self-sufficiency. A series of measures such as land reform in some East African countries, to adjust agricultural structures from traditional cash crops to food crops and to develop agricultural research and extension systems were widely implemented. The Green Revolution in Asia in the 1970s was iconic and widely seen as a model for Africa: high-yielding varieties, fertilizer and irrigation, delivered through cooperatives etc, but success remained isolated and the 'Green Revolution' failed to take off in Africa⁶ (Scoones 2005). Two different models of agricultural development were introduced to Africa in the 1970s. The state-farm model was introduced by socialist states like the former Soviet Union and China to reach a scale of economy for technology adoption. However, the former Soviet model was mainly based on its labor shortage and strong support from its own agro-industry, while China's large farm model collapsed even in China. Almost none of China-aided modern farms in Africa were successful (Xu, 2011). The integrated rural development programmes (IRDPs) introduced by Western donors via provision of credit, education and health did not succeed either, except in a few short-lived cases, because these programmes were heavily dependent on high levels of government (and loan) support. When the programmes were disbanded or incorporated into local government or line ministries the impacts quickly faded (Scoones, 2005). Given the fact that to enhance food crop production requires costly input and institutional capacity that most of Sub-Saharan countries lacked, the food self-sufficiency programmes drafted by numerous African countries failed to succeed. Unlike China, on the one hand, most African countries did not have a strong state with well established administrative capacity at different levels to formulate the home-made strategy and policy, and to implement them and to be

⁶ Where similar investments were made in Africa, the Green Revolution indeed happened. Governments provided seeds, pesticides and chemical fertilizers at favourable prices or for free to improve the effectiveness of land utilization, to reclaim new farmland and encourage water conservancy facilities (Li, 2010). There are also concrete examples. The spurts in production took place in Zimbabwe before and after independence (Eicher, 1995), in Kenya from independence into the 1970s (Gabre-Mahdhin *et al*, 2003) in Ethiopia after the fall of Derg and in Nigeria after the banning of maize and rice imports. (cited from Jama & Pizarro, 2008)

able to organize farmers to provide their labor. The failure of Ujamaa with the efforts of collectivist agriculture in Tanzania (Ibhawoh *et al.* 2003; Boussard 2005) was a typical example in this regard. On the other hand, lack of capital constrained most African countries to develop their infrastructure and agro-industries. Under the constant challenge of a lack of state capacity and shortage of capital, technology based solutions such as farming system research approaches introduced by CGIAR* and sustainable agricultural projects to enhance indigenous crops introduced by bi-lateral organizations in many African countries did not change the situation. Some successful stories still face the challenge of scaling up in large areas for overall sustainable agricultural improvement of small holder production (Pretty *et al.* 2011). Within these many obstacles, limited agricultural extension service is one notable factor (Jama and Pizarro 2008). All these different approaches were not able to address the African small-holder's social and economic context because none of them could be well integrated into African rural life just as the collective system did not fit China's rural context.

From the 1980s and the 1990s, stagnation and deterioration of economic conditions in Africa were regarded as the result of inappropriate government policy intervention by neo-liberal thinkers. Structural Adjustment Programmes (SAPS) were aggressively promoted in Africa by the international financial institutions and development agencies to get the "state out" and bring the "market in". This saw Africa shift from 'state building' to "state collapse" during this stage. In contrast with China's steady incremental reform towards market liberalization for agriculture, the African liberalization of markets, privatization and restructuring of government institutions and removal of subsidies were radically undertaken under the 'conditionality' that concessional finance would only be available for compliant countries. This conditionality pushed most finance-strapped African countries to adopt the structural adjustment policy often with deep reluctance. The privatization and restructuring of government institutions created an immediate vacuum to provide services for farmers and the removal of farm input subsidies made the inputs no longer affordable for small holders. At the same time the objective of developing efficient state and market systems has not yet been achieved,, even up to this date. Research and extension services were reduced and the private sector was expected to fill the gap. Consequently, this policy led Africa's agriculture into stagnation or declining productivity during the 1980s. By the end of the 1980s it was readily apparent that the structural adjustment strategy was not delivering on its promises. This was confirmed in the World Bank's report, Sub-Saharan Africa: From Crisis to Sustainable Growth which acknowledged that prices were important, but only as a part of a generally 'enabling' environment of which the key feature was the mobilization of the private sector and the role of the state as an efficient infrastructural provider (Havnevik 2007).

Since the year 2000, the strategy and policy in African agricultural development went into another stage. There has been a growing concern about poverty and greater interest in poverty reduction being the core of development, while in the context of

Africa, agriculture must be the mechanism to meet this challenge. This new policy framework is well reflected in the global action such as MDGs⁷, regional ones such as the African Union's The Comprehensive Africa Agriculture Development Programme (CAADP), and individual country programme based on the poverty reduction strategy papers (PRSPs). At the same time, strengthening government capacity to support agriculture became the main element on the agenda of many donors. Africa's development is again subject to a new 'conditionality' that direct budget support is associated with the result of reviewed PRSPs. However, this new strategy has not seen successful either. For example for one of the fastest agricultural growing countries in Sub-Saharan Africa, Tanzania, its second poverty reduction strategy (MKUKUTA) sets a 10 percent growth rate by 2010; but did not achieve even a 5 percent growth rate. The structural adjustment programme appeared to have undermined the institutional capacity of most African countries to design and implement their own poverty reduction strategies. Despite the fact that the new conditionality is bound up with enhancing the role of the state, the context of the enhancing the state role is very much influenced by experiences from the West, rather than African perspectives or successful cases elsewhere. The role of the state, seen as one with a democratically elected government, and with accountability, under the partisan system, is unlikely to be able, to concentrate limited financial resources on agriculture. Much of Africa is still set to follow the agendas of donors and therefore to ensure accountability on the donors' side. This mutual accountability compromises African interests. The same consultants are available to trot out the same old lists of solutions and priorities; for some, the New Partnership of Africa's Development (NEPAD) with its long list of ambitious targets, risks repeating past mistakes (Moyo 2002). With the serious financial difficulties faced by most states in Sub-Saharan Africa, governments have to be busy with negotiations with donors rather than focusing on developing their own policies based on systemic consultation with all stakeholders. However, there is some evidence that the effective combination of certain local and sound state objectives with corresponding aid from donors is possible, as demonstrated by Malawi's input subsidy program (Juma 2011).

At the same time, Africa indeed achieved some individual successes in agricultural development. For example, through a combination of extension and marketing support, input deliveries and credit, governments in East and Southern Africa achieved a series of smallholder production surges lasting between 10 and 20 years (Gabre-Madhin et al 2004). With policy reform in rice milling and marketing, Malian rice production has more than tripled since 1985, growing by 9 percent over the last 20 years (Diarra, Staatz, Bingen, & Dembele 2000). Studies in eight African countries found evidence where farms or regions have achieved crop yields far above the national average (Jirstrom et al 2005). However, the challenge now is to scale up those activity-specific successes into sustained, system-wide improvements. Unlike

⁷ The eight Millennium Development Goals (MDGs) – which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015 – is a blueprint agreed to by all the world's countries and all the world's leading development institutions. They have galvanized unprecedented efforts to meet the needs of the world's poorest people. <http://www.un.org>

China's pro-smallholder agricultural policy and institutional capacity, most African countries lack a political environment in which smallholders can exert their influence while large scale farms have stronger lobbies in government. Even in those countries which have developed a strong pro-agriculture policy, poor delivery capacity has constrained policy implementation.

The key experience from China's agricultural development is a consistent policy that focuses on productivity-based staple crop-led agricultural development. Over time, despite the efforts made by many African countries for self-sufficiency in food crop production and knowing that staple-led agricultural growth can generate effective growth and poverty reduction, past growth in staple foods has typically arisen from land expansion and there seems to have been little attention given to the food sector or in changing established methods of production (Diao et al.2010). Various kinds of external supports did not help Africa effectively to develop its own home-made agricultural development process, and consequently Africa remained trapped in agricultural stagnation.

4. Small-holder agricultural production and productivity in China and Africa

China's agriculture is dominantly a small holder structure. In 2007, there were 255.22 million small-holder family farms operating 116.273 million hectares, accounting for 95.6 percent of total arable land in the country, while 1885 large state farms operate only 5.30 million hectares of arable land (China's Statistics Year Book, 2008). As Table 5 indicates, over 50 percent of Chinese small holders only have from 0.03-0.11 hectares of arable land per capita on average. The share of the farms with a size exceeding 0.67 hectare per capita is only 2.48 percent.

Table 5 Farm size distribution in China (N=7957)

	<0.03 Ha	0.03-0.067 Ha	0.067-0.11 Ha	0.11- 0.2 Ha	0.2 – 0.27 Ha	0.27 – 0.67 Ha	>0.67 Ha
No.of HH	1330	2084	2057	813	488	988	197
Ratio	16.71%	26.19%	25.85%	10.22%	6.13%	12.42%	2.48%

Data source: Investigation in 455 villages in China in 2005 by the authors.

The question is how smallholder livelihoods in China are maintained under such small scale conditions. First, productivity is achieved through an intensive family farming system. In most parts of China, multiple-cropping is widely practiced. Double-rice planting can be traced back to 3 BC, and double and triple-harvest within one year is used to maintain high output per unit of land. Ancient systems of integrated rice, fish and sometimes duck culture with closed water, energy and manure systems are still in evidence in China today and have been recognized by the Globally Important Agricultural Heritage Systems designation by FAO (Min Q, 2009). Even in Northern China, inter-cropping such as wheat-maize and maize-soybean combinations is widely applied. The cropping-index increased from 128% in 1949 to 158% in 1995.

Multiple-cropping systems make the best use of land and climatic resources and makes China's small holder agriculture viable. Second, crop-livestock mixed systems are common on Chinese small holdings. Livestock is raised in almost all small holder farms despite the different scales so that the source of household nutrients and incomes are diversified. Plus, animal manure can be collected as fertilizer to maintain soil fertility. As Table 6 shows, despite different eco-climate conditions, livelihood diversification is widely present in rural China. Third, small holder agriculture in China is very labor intensive to complete all field practices from land preparation, seedling, transplanting, weeding, fertilizing, irrigation, harvesting and processing, although currently, some of this work has been taken over by machines. For example, 1 hectare of rice farming requires 165 working days to complete all farming practices with no mechanization. With an average of 0.5 hectares of arable land for rice per labor in Chinese small holder family, one laborer only works 80 days per year. Farming therefore is over intensified and creates "hidden underemployment" (Huang 2010). This prohibits labor productivity improvements on the one hand, but on the other hand, land use is very much intensified through a series of labor intensive farming practices. This also partly explains why the diversified livelihood system is common, rural enterprises have been quickly developed and large rural labor mobility takes place to urban areas. Fourth, Chinese small holders widely use improved seed varieties and fertilizers. As Table 7 indicates, fertilizer, pesticides and improved seeds comprise the largest proportion of a farmers' investment. Fifth, settlement patterns and land use in rural China also contribute to agricultural development. Except in mountainous areas, villages are usually nucleated and arable land belonging to different small holders is relatively concentrated. This organized settlement pattern and land use helps the development of large scale commercial crop clusters such as maize clusters in Northern China and rice clusters in Southern China. Such cluster patterns favor the economic use of joint services such as irrigation, extension, harvesting and marketing services provided by the state. Currently, with an increasing labor movement out of agriculture, mechanization has gradually taken over much of the heavy farm work such as plowing, planting and harvesting. Mechanization is not normally done through individual family farms, but is provided by private services. Last, public goods provision for small-holders such as irrigation, improved seed, research and extension and agro-inputs are provided by the state. The seed and fertilizers have long been subsidized and provided by parastatal companies which previously were operated under the planning system and now operate as market institutions. Improved varieties are renewed every 6 years and almost 100 percent of small holders use improved seed. Thirty to forty percent of the increase in crop yield derives from using improved seed (Li *et al.* 2010). Chemical fertilizer contributed to agricultural growth, about 32.2 percent from 1978-1983, and increased to 53.71 percent from 1984-1987 (Lin 1992a). All these conditions make China's small holder agricultural productivity much higher than African small holders both in terms of land and labor productivity as Table 7 indicates. It should be also noticed that ongoing small holder's farming transformation into relative scaled production benefited from large state owned farms in terms of provision of mechanization and farm input application.

Table 6 Livelihood compositions of small holders in two villages in Southern and Northern China respectively

	Hengluo village in Guangxi, South China	Xianghe village in Gansu, North China
Arable land (Ha)	90.3 Ha	248 Ha
Irrigation land (Ha)	62 Ha	0
Forest land (Ha)	566 Ha	105 Ha
Main crops in village (Share of arable land, %)	Wheat: 0.79	Wheat: 11.43
	Paddy rice: 22.53	Potatoes: 59.90
	Sugarcane: 63.80	Maize, 14.87
	Maize: 11.93	Pease: 13.78
	Cassava: 1.06	
Livestock in village (number)	Ducks and chickens: 4176	Chickens: 602
	Pigs: 512	Pigs: 315
	Buffalo: 221	Sheep: 413
		Buffalo: 231
Population (number)	1380	600
Labor (number)	700	385
Off-farm labor (number)	500	150
Income per capita (yuan/year)	6876	5783
Agricultural income per capita (yuan/year)	1212	1718
Husbandry income per capita (yuan/year)	254	414
Off-farm income per capita (yuan/year)	4768	3149
Transfer income per capita (yuan/year)	642	502

Source: Village Survey taken by author in 2011

Table 7 The Comparison of Input-output Ratios for Maize Planting in China, Tanzania and Zambia

	Zambia ^a	Tanzania ^a	China ^a
Household	108	454	110
Population	756	1996	440
Average arable land (Ha/household)	3.64	1.19	0.4
Average maize area (Ha/household)	1.365	0.98	0.1
Fertilizer expenditure (USD/Ha)	1.776	0	266.3
Pesticide costs (USD/ Ha)	0.66	0.27	110.9
Seed costs (USD / Ha)	10.53	5.90	55.5
Hiring costs (USD / Ha)	1.62	18.87	11.1
Machinery costs (USD / Ha)	0	0	177.5
Herbicide costs (USD / Ha)	0	0	26.6

Irrigation costs (USD / Ha)	0	0	199.7
Total input(USD)	14.59	25.04	847.6
Output (kg/Ha)	430	580	6750
Output (USD/Ha)	86 (0.2)	133.4 (0.23)	1250(0.186)
Subsides (USD/Ha)	0	0	0
Labour productivity ^b	215	290	349
Land productivity ^c	430	580	6750

a: The village in Zambia is located in Chongwei district 45 km far from Lusaka. The total land area is 324 ha and maize, cotton, sweet potato and sunflowers are the main crops.

The village in Tanzania is located in Kilosa District 30 km far from Kilosa and has 454 households with a population 1996 people. Maize, rice, sunflower and sesame are the main crops.

The village in China is in the Guanzhong area of Shaanxi Province and has 110 households with a population of 440 people. The total land area is 660 acres (44 ha) and maize is grown on 25% of the land (11 ha). There are 40 people working outside for off-farm work all year around; 213 main members of the labor force, including 136 women.

b: Here the calculation of labour productivity refers to one labour unit producing maize within a year. Therefore the maize production for 30 households in Zambia within a year / the total number of labor force. Tanzania uses the same calculation. The data for China is based on the average of farmers in Village D, and takes the maize production for one year for the whole village /the total number in the labor force.

c: Here the land productivity is calculated according to maize production (kg / Ha).

Source: Village Surveys taken in Tanzania and Zambia by author in 2009

Despite the widely existing large commercial farms in Africa, over 72 percent of the total population lives in rural areas and 70 percent are engaged in agriculture (Moussa, 2002). Similar to China, small holders dominate Africa's agriculture although the average size of African small holdings is larger than that of Chinese small holdings. Different from the Chinese case, agricultural production of African small holders is extensive. Even under favorable climatic conditions in most Sub-Saharan Africa, multiple- cropping systems are rarely seen. For instance, in Liberia, with annual 5000 mm rain fall, triple-cropping systems could easily be developed. However, rice is only planted once a year. African livestock is usually based on grazing, and is somewhat disconnected from farming, thus animal manure cannot be collected to fertilize soil. Farming is often simply concentrated on few practices such as extensive land preparation, planting and harvesting. Taking rice production by small holders in Tanzania's main rice growing area as an example. As Table 8 indicates, rice is just directly planted and harvested; other practices such as seedling and transplanting were not mentioned by farmers. Low levels of crop yields pushes African small holders to expand the area cultivated and labor shortages appear due to lack of capital to use machinery. However, expansion of arable land has stagnated in recent years, indicating that land frontiers may have been reached. The result is mounting population pressure and declining farm size (Diao et al 2010). Even with land rich

conditions, most Sub-Saharan African countries have not developed labor-saving agricultural systems with their sufficient land endowments due to the property right regimes that constrain access to land, while in others, mechanical and animal draft innovations are limited by poor access to markets, and a too limited range of appropriate and affordable technologies for the farm conditions (Gordon, 2008)

Table 8 Percent of farmers who do different farming practices in a village in Mbeya Region Tanzania and a village in Hebei Province in China (%)

	A village in Tanzania	A village in China
Intensive land preparation	77 by labor and 23 by machine	100
Seedling	0	100
Transplanting	0	100
Broadcasting	100	0
Weeding	10	100
Fertilizing	17	100
Irrigating	0	100
Harvesting	100 by labor	85 by machine

Source: author's field study 2010

While land expansion has dominated past growth, there is an extensive literature identifying the potential for intensifying food crop production in Africa (Diao et al 2010). In fact, farm land from different small holders in rural Sub-Saharan Africa is usually dispersed across a relative large area and there are few with large irrigation schemes. This makes land preparation, joint labor use and mechanized harvesting more costly, and also increases transport costs. Unlike rural China, community- based irrigation facilities collecting rainfall or using water from small rivers are hardly seen in Sub-Saharan Africa. Lack of use of improved seed and fertilizer has been considered the major constraint for agricultural development in SSA. Fertilizer use in China increased from 158 kg/ hectare in 1980 to 323kg/hectare in 2002 while it only increased from 6.3 kg/hectare to 6.8 kg/hectare in SSA (Li *et al.* 2010). For example, it has been estimated that through providing fertilizers to farmers, it will be possible to achieve a sustained growth in production at the medium level on about 43% of the land; if the investment is increased and farmers can receive the appropriate training, 35% of Africa's arable land will have a higher potential for sustained agricultural development (Eswaran *et al.* 1997). However, fertilizer use is largely constrained by poor distribution and extremely high prices. For example, the price of urea in 2010 in Tanzania was almost \$US 500 per kg, while the world market price was around \$UD 200 per kg, and it was only \$US170 per kg in China (Li *et al.* 2010). The high fertilizer price is largely attributed to the dependence on fertilizer imports because the fertilizer trade is capital intensive for storing, distributing and marketing by private traders. Under the very high capital cost of fertilizers in most Sub-Saharan African countries, the extra cost is turned back to small-holders. Low adoption of improved seed follows a similar pattern while to gain the full effect of fertilizer and improved seed cultivation should be accompanied by irrigation. Because of the lack of irrigation, most small

holders in Africa lose their incentive to purchase fertilizers at high prices.

In sub-Saharan Africa, the total irrigation area is about 9 million hectares, accounting for only 5% of the total arable land area. Uganda, for example, has some of the richest water resources on the continent, but the arable land area with access to irrigation facilities only accounts for 0.1% of the total. Due to the lack of effective irrigation facilities, African agriculture is mainly based on rain-fed cultivation practices. The grain output is about 2.2 tons per hectare, only equivalent to 65% of the yield of irrigated land (Rosegrant *et al.* 2005). What is more, the cost of developing irrigated arable land in sub-Saharan Africa is very high. According to a research report of the FAO (1995), the cost of water resource development for medium and large irrigation facilities is \$8,300US per hectare in sub-Saharan Africa, plus the cost of related infrastructure construction, such as roads, housing, cable and public service facilities; the development cost for which is about another \$18,300 per hectare (Rosegrant *et al.* 2002).

5. Conclusions

Agriculture in China and Africa has been developed under different historical and political, social and economic conditions, and therefore while Africa should be cautious when reviewing the Chinese experience, there are some important universal lessons that could be useful in determining the future of some agricultural policies in African states. . In China, a consistent agriculture-centered development strategy and staple food crop-led agricultural development policy, honed through an incremental learning process, significantly shaped small holder agriculture. This is a lesson in itself as it speaks to the need for consistency of purpose and the trust required to invest in one's own traditional systems. Another lesson from China stems from the steady transformation towards a market system ensured by the provision of irrigation, improved seed, and fertilizer and market facilities provided by the state, which enabled small holders to access the services economically. In contrast, despite the consensus reached on the vital role of agricultural policy in Africa, most countries have not been able to develop their own consistent home-made strategy. Building a food-based agriculture takes time and must be accompanied by comprehensive support systems to assist new appropriate technologies to emerge. This includes re-investing in agricultural education, research institutes and experiment stations as well as a modern extension service. African perspectives on agricultural development have been largely interrupted by various external influences. As a result many well-intentioned support programs have not been well integrated with the African small holder' agricultural system, and at the same time, African countries have not been able to develop their own governmental capacity to provide the necessary support services for smallholders. The smallholders have become a victim of marketization and privatization. China's experience suggests that for the countries with a majority of small holdings, the development of agriculture requires consistent context based strategies. With a dominant staple crop rural structure, agricultural

development can be staple crop-led. Above all, market reform should be gradual so that smallholders will not be put into a “market trap” under market reform.

China’s agricultural development experiences also suggests that the effect of agricultural strategy and policy development depends on the state’s capacity to implement them on the one hand, and on the other hand, whether the policy is suitable for small holders and their social, economic and environmental conditions. China’s agricultural development policies have always focused on providing incentives to sustain the land-saving growth path, while in most of African countries, the constraints derived from land tenure and on service provision for developing either labor-saving or land-saving strategies have not been eliminated or reduced. Land tenure and lack of mechanization constrain relative land rich countries from transforming small holdings to commercial farms. It also largely accounts for the low adoption of improved seeds. In other words, policy issues can not be considered simply as technical problems such that efficiency problems can be solved by technocratic solutions. Nor has it been effective in Africa to try and produce more favourable agricultural environments by encouraging external interventions led by big objectives and big business. The most important consideration is how to put the real needs of small holders at the top of those big policies and plans.

This is not to suggest that large scale farming for cash crops and export materials should be stopped or stunted, but it is clear that this single structural track in agriculture is insufficient to earn investment capital for wider state development. It is also clear that food security will not be solved this way and thus rural poverty will persist. What might be learned from the China case is that both food-based systems and large scale agriculture can exist side by side and that many mutual benefits can be derived from their co-existence. A shift in emphasis towards sustaining and improving the food-based smallholder systems in Africa can be an inexpensive complement to the on-going cash crop economies. A symbiosis that fits the African reality needs to be configured and strongly maintained by State policy and programs. The state has a clear role to play. As in China, food systems are a public as well as a private good.

Nevertheless, Africa still should be very cautious about what to learn from China’s successful experience in agricultural development. For example, China’s long-standing food production-based agricultural policy has achieved national food security and increased food exports while farmers’ incomes have grown at a slower rate. China’s agricultural production system has featured ‘high input - high output’ production patterns that have made an important contribution to food security, but many have had irreversible impacts on the environment and natural resources. In a word, it is clear that Africa cannot copy China’s experience be it from the perspective of a national strategy or of small farm family operations. With diverse internal situations on the continent, in order to successfully learn from China’s experience in agricultural development, Africa should carefully identify and make adjustments to

China's experience in order to adapt to local and regional situations; just as China has done throughout its long history. Above all, African nations need to make their own agricultural plans and continue to develop the human and fiscal resources to implement them.

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