

What Can Africa Learn From China’s Success in Agriculture?

Prof. Li Xiaoyun

Dean of College of Humanities and Development Studies, China Agricultural University

China’s fast growth in last 30 years has widely been considered as “miracle”. Furthermore, the extraordinary achievements of its agricultural sector in food security and livelihood improvement have drawn highly attention from international communities, especially those from developing world, the African countries in particular. It is impossible for Africa to replicate the so-called “China model”, given the huge variances in natural conditions, socioeconomic perquisites and cultural contexts. But we could still sketch the experiences and lessons from China, try to provide some comparative features for Africa, based on some commons like reform and adjustment since 1980s and even longer similar tradition of peasant agricultural economy.

1. Achievements of China’s Agricultural Development

China's biggest agricultural achievement is that with only 10% of global farmland and one fourth of the global average for water resources per capita China successfully fed its huge population, over one fifth of the world total population (Huang Jikun, 2008), getting rid of the worries and doubts on "can China feed itself". At the same time, nowadays, enjoying about 13% of global farmland, there are at least one fourth of the African continent’s grains are imported every year and one third of Africa’s population is dependant on grain aid (Yao Guimei, 2003). According to FAO, there are 25% of Africans living in malnutrition, and 44 countries of total 53 are struggling against food shortage.

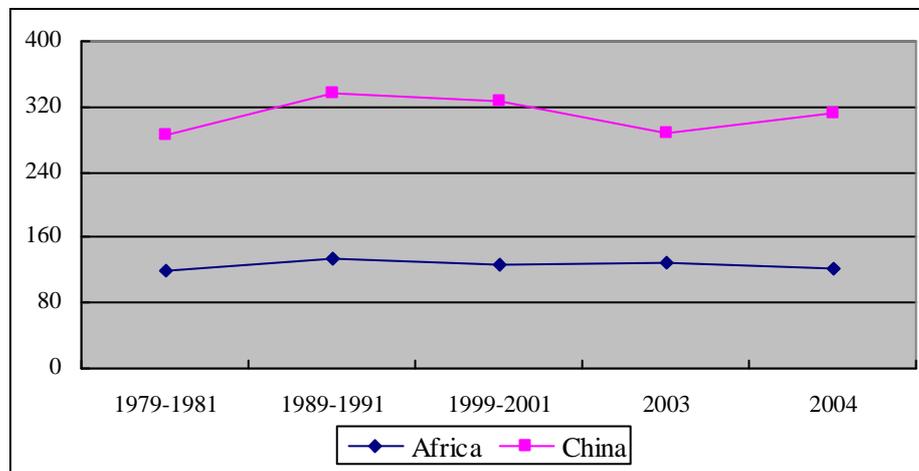


Figure1 Per Capita Grain Production for China and Africa (Unit: kg)

Source: FAOSTAT

Apart from food security, another great achievement of China’s agricultural sector is improving the nutrition levels of its people. There is a large difference between Chinese and African people’s food composition according to their agricultural production. Data for the production of all agricultural crops show that China’s output of key foodstuffs such as cereals, meat, vegetables, fruits and melons far exceeds that of the African continent. In 2004 for example, the total output of China’s cereals reached 413 million tons while that of Africa was only 126 million tons; the total

output of meat in China reached 74 million tons, whereas that of Africa was 11.6 million tons; China's total output of vegetables, fruits and melons reached 507 million tons, whereas that of Africa was 114 million tons. China's total output of cereals, meats, and vegetables, fruits and melons was respectively 3.27 times, 6.42 times and 4.44 times that of Africa. Considering China's population is 1.3 billion and Africa is 0.75 billion in 2004, there must be larger difference in occupancy volume of grain, meat, vegetable and fruit per capital.

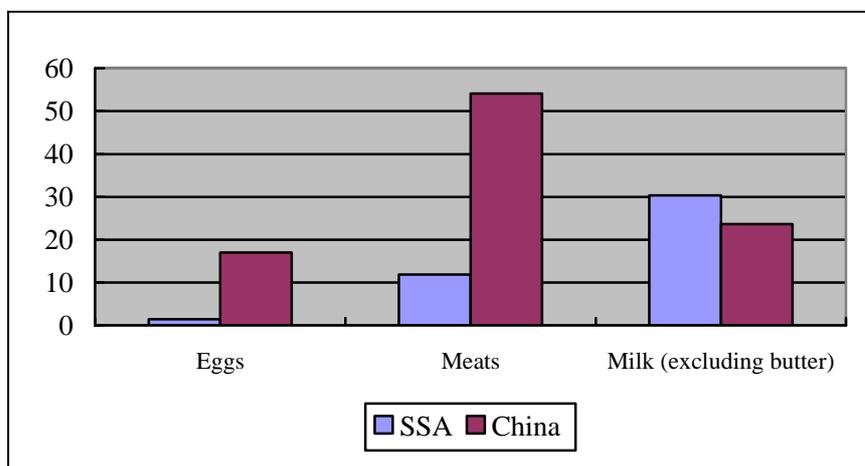


Figure 2 Per capita eggs, meat and milk share in China and SSA, 2005 (Unit: Kg/year)

Source: FAOSTAT

Under the strategic consideration of “Modernization and Industrialization”, China’s agricultural sector has been contributing a lot to other sectors, and to the whole economy. According to incomplete statistics, Chinese farmers contributed CNY600 billion for industrialization through the effect of the price scissors from 1953 to 1983. In the command-and-plan regime, rural labor’s costs were kept low or even zero to produce a capital surplus. Rural labor still provides important inputs to the construction of rural infrastructure even after the reform. Annual inputs of rural labor were 7.22 billion workdays from 1989-2000. Since the 1980s and particularly the 1990s, the agricultural sector and farmers have provided initial capital for industrialization through the “land scissors” by which the value of land is captured by the urban and industrial sector. Moreover, migrating farmers have become the main labor force in cities. It is estimated that each migrating farmer produces CNY 23,000 of GDP, which gives a figure of CNY5.7 trillion from all 200 million migrating farmers (Xu Hengjie, 2009). Agricultural development has made a remarkable contribution to the fast growth of China. In 1980, the percentage of GDP from value added in agriculture for China and Africa was similar. During the period from 1979 to 1981 agriculture accounted for 28.93% of China’s GDP and 25% of Africa’s GDP. Agriculture as a percentage of China’s GDP has reduced following economic reform, and was 10.77% by 2004. Africa, however, has seen a mild rise in the percentage of GDP coming from agriculture, and the overall figure is still over 25%.

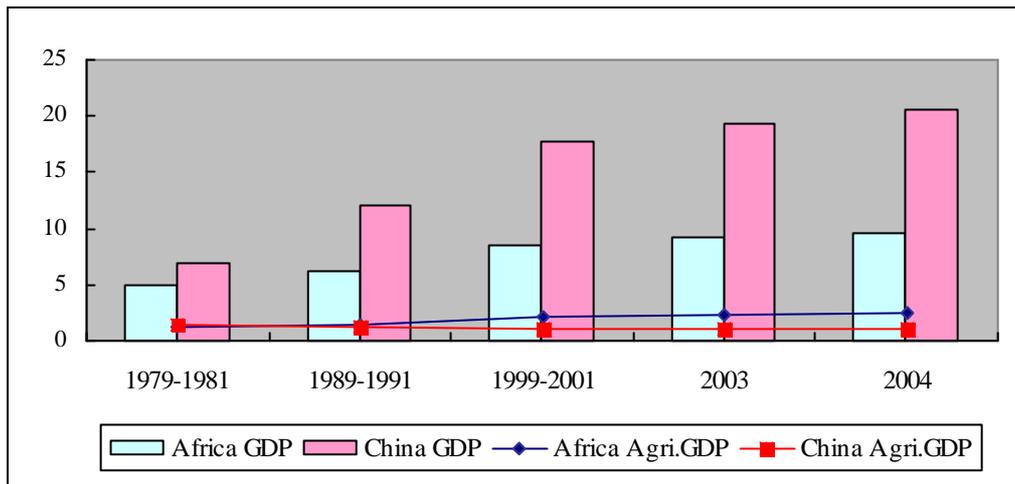


Figure 3 Agriculture's contribution to China and Africa (10 billion USD)

Source: FAOSTAT

Agricultural development has also contributed to poverty reduction in China. The poor in China has decreased from 835 million in 1981 to 208 million in 2005, and the poverty incidence in rural areas has also dropped from 94.08% to 26.11% (in PPP 2005 under poverty line of \$1.25 per day) (PovcalNet, World Bank). Farmers' living standards have improved dramatically, and rural social services have improved comprehensively. The success of China's poverty reduction is due to its fast and sustainable economic growth, which is pro-poor and mainly contributed by its agricultural contribution. From 1996 to 2004, every percent of agricultural growth contributed to 1.09% poverty incidence reduction, comparing with 0.51% and 0.87% resulting from 1% growth of the second and the third sector respectively (Wen Qiuliang, 2006). Meanwhile, in recent decades, the poor in Africa has increased from 168 million in 1981 to 298 million at present based on the \$1/day of consumption standard. Poverty incidence in Africa has not changed, at about 42% for decades.

As discussed above, sustainable agricultural development is the vital factor to realize industrialization and poverty reduction in developing countries of low industrialization levels. However, to achieve this goal, an effective market mechanism must be available for transforming the surplus produced by agricultural sector to capital necessary for industry growth. This is exactly why the whole economy of China could benefit from agricultural development. On the other hand, such mechanism has never taken place in most African countries while they barely witnessed comparable agricultural growth as China did. Removing market barriers and develop a supportive market environment are essential for African countries.

2. Key Factors of Successful Agricultural Development in China

We cannot attribute the achievements of agricultural sector in China solely to the famous market-oriented reform, which truly triggered rapid development. For the same reason, we cannot blame any reforms happened in Africa for the underdevelopment of agriculture, neither structural adjustment nor liberalization. Actually, the success of agricultural sector in China is rooted in its unique history and culture, benefit from its aggressive reforms in 1950s such as land reform and technology policies, and more importantly, result from the bottom-up reform in late 1980s. All the

policy of agriculture-based development, technology progress, household-based intensive cultivation, and sustaining foreign exchange and learning have tracks in historical development, combined with institutional creation, and obtain tremendous achievements.

2.1 Historical Heritage

The continuity of China's traditional agricultural civilization has given rise to a highly adaptable agricultural production system, production structure and set of cultivation methods. The pattern of China's agricultural development has been to increase land productivity by substituting capital input with land inputs and technology inputs. This intensive cultivation is still suited to the fundamental realities of modern China and is also the foundation of the prevailing small peasant economy within Chinese agriculture. The pioneering style of land development caused by China's long-term population pressure has resulted in enormous challenges for modern agriculture. The traditional agricultural civilization of Africa meanwhile was interrupted by the invasion from European states which meant that the agricultural production structure and patterns had to change to meet the demands of colonial economic systems. This created a dilemma whereby traditional small peasant economies focused on the planting of cereals on the African continent could no longer meet the requirements of food security, capital-intensive plantation operations focused on the production of cash crops, and could not effectively create employment opportunities. This situation has exerted strong influence on the development of African agriculture.

The "historical legacy" of China's agriculture is mainly reflected in two aspects of agricultural production: planting structure, which takes grain as the key; and intensive cultivation. On the planting structure, since 1978, China's sown area of grain decreased, but the sown area of grain is still two thirds of sown area of crop. Secondly, in China, agriculture production has always been relying on food crops planting, and the food crop varieties planted in China are just the same ones promoted in modern Green Revolution, which is largely benefited from technological improvements, mainly include improved seeds, fertilizer, irrigation, and pesticide. But in Africa, the main part of agriculture is cash crop, and food crop has lower proportion. The traditional small farmer economy focused on cereals planting in African continent cannot meet the requirements of food security. The improved seed planting structure, mainly local rhizomes and yam class, does not get benefit from Green Revolution. But, capital-intensive plantation operation focused on the production of cash crops cannot create employment opportunities effectively, and threaten food security and poverty reduction. On the cultivation pattern, China's traditional intensive cultivation is labor-intensive, through fully cultivating the potentials of land and increasing productivities unremittingly. The specific measures like reasonable cultivation, rotation, fertilizing and irrigation (where possible) for soil improvement and soil fertility maintenance have been widely adopted by small households, so a consistent farming system consist of continuous cropping, multiple cropping, intercropping and relay intercropping could be realized (Yin Falu and Xu Shu'an, 2004). One of the important experiences that China has had in land utilization is to relatively raise the cultivated area by enhancing the multiple-crop index, so as to enhance land utilization efficiency. Currently, multiple cropping is applied in one-third of existing arable land and two-thirds of cultivating areas. The multiple cropping indexes have soared from 128% in 1949 to 158%, or even 250% in some areas. The land utilization and agricultural comprehensive production capabilities have improved significantly (Zhang Baowen, 2004). In contrast, small farmers in most African countries such as Liberia, Tanzania and Zambia still rely on the natural environment and only

plant one-harvest crops.

2.2 Technology-based Intensive Cultivation Tradition

Comparatively, Africa has good land resource situation naturally. In 2004, the SSA region had 166.44 million hectares of farm land, which was far more than the 122.444 hectares of farm land in China; secondly, looking at per capita cultivable farmland, it stood at 0.25 hectares in the SSA region, which was less than 0.1 hectare in China.

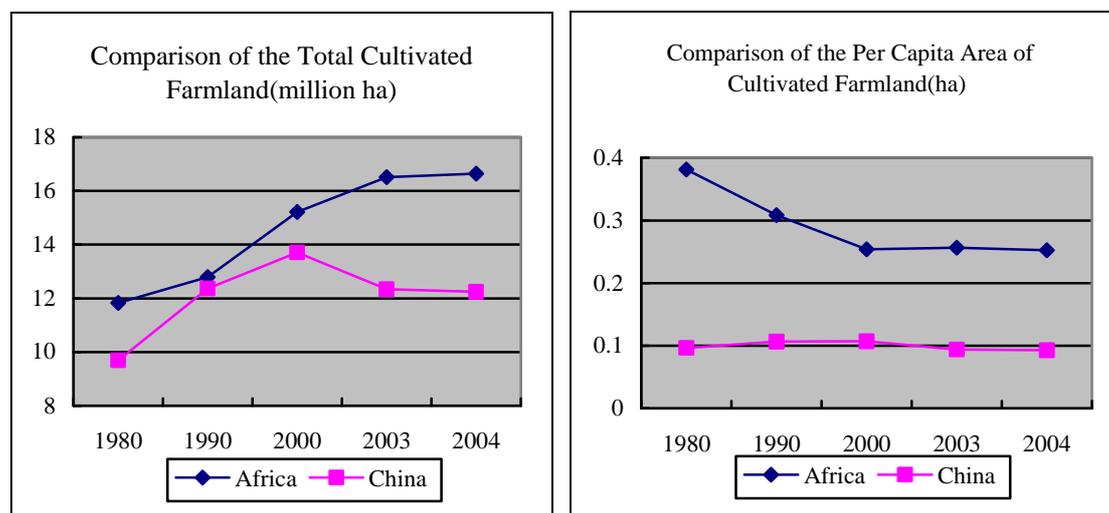


Figure 4 Comparison of the Total and Per capita Cultivated Farmland in China and SSA

Source: FAOSTAT

Given the limited natural resources, China chose its own agricultural development path which is combining modern technologies with traditional skills the peasants holding, in purpose of advancing the land productivity. Productivity growth data show that China's productivity levels for major agricultural crops doubled during the period from 1978 to 2007, and wheat under the category of grain crops registered the biggest growth in 2007 with production 2.49 times 1978 levels and per unit yield of cash crops such as coffee, seed cotton, tea and groundnut expanding at an even quicker pace. Among the main African agricultural crops, only wheat, tea and cocoa recorded clear output growth, and the growth in per unit yield of other agricultural crops was insignificant as compared with 1978. This also suggests that over the past 30 years, the difference in land productivity is the main reason for the divergence in the performance of China and Africa in agricultural development. Taking maize, rice and wheat as examples, the productivities of these three main staple food in Africa shows no significant improvement from 1978 to 2007. At the same time, the productivities increase 80%, 60% and 150% respectively in China. In 2005, the productivities in China are 3.01, 2.73 and 2.31 times comparing with those in Africa.

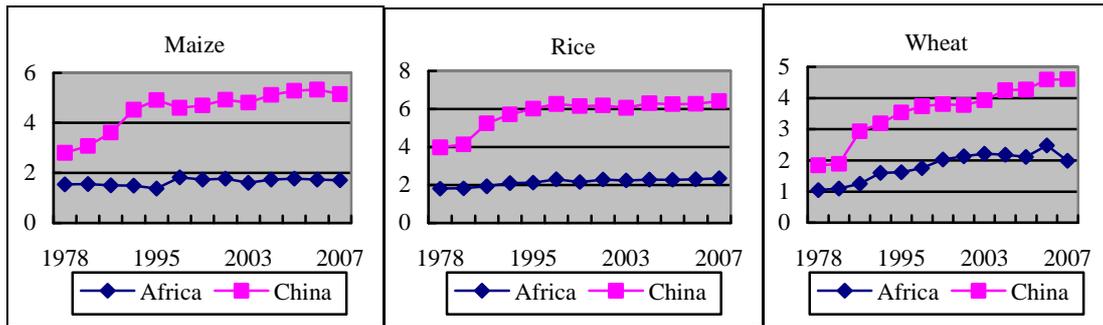


Figure 5 Productivities of main Staple food in China and Africa (tons/ha)

Source: FAOSTAT

The higher land productivities result from more inputs especially fertilizer and pesticide. Before the reform in 1980s, intensive input of labor is the main method to replace relatively scarce land resources and other high-cost modern physical inputs. Since 1980s, modern technology inputs, such like fertilizer, irrigation, etc., play a more important role in China's agricultural development. In the early stages of reform, the contribution made by capital and fertilizer increments reached 44.7% and 53.7% respectively between 1983 and 1987, both surpassing 20%, which was touched by the multiple cropping index increase. However, institutional innovation after reform further improved the efficiency of these inputs. In contrast, owing to financial weakness and the lack of macro development strategies, the agricultural inputs of African nations accounted for only 5% or so of their fiscal budgets. What's worse, such a low budget went to the export-oriented economic crops production rather than those playing key roles in foods security maintenance. As shown in the figures below, from 1980 to 2002, there is no significant change in the fertilizer application in Africa, which is lower than 30 kg/ha. In this period, the fertilizer application in China has nearly tripled, reaching roughly 300kg/ha.

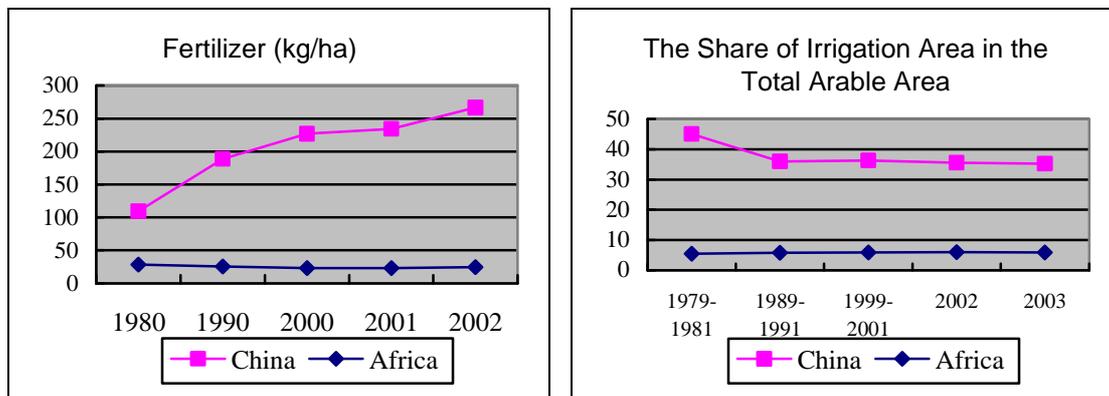


Figure6 Comparison of Modern Materials Input

Source: FAOSTAT

From the micro level of small farmer households, small rice farmers' land productivities in China and Liberia can illustrate this difference. In 2008, China's small farmers' rice land productivity reached 7023.00kg/ha, and in Liberia is 1176.15kg/ha. High inputs bring high productivity. Chinese small farmers' input in rice planting is 671.74USD/ha, and this number in Liberia is only 79.26USD/ha, with no inputs in improved seeds, irrigation and machine. And due to the increase in various subsidies in China, farmers can get 245.5 USD/ha as subsidy in that year in average.

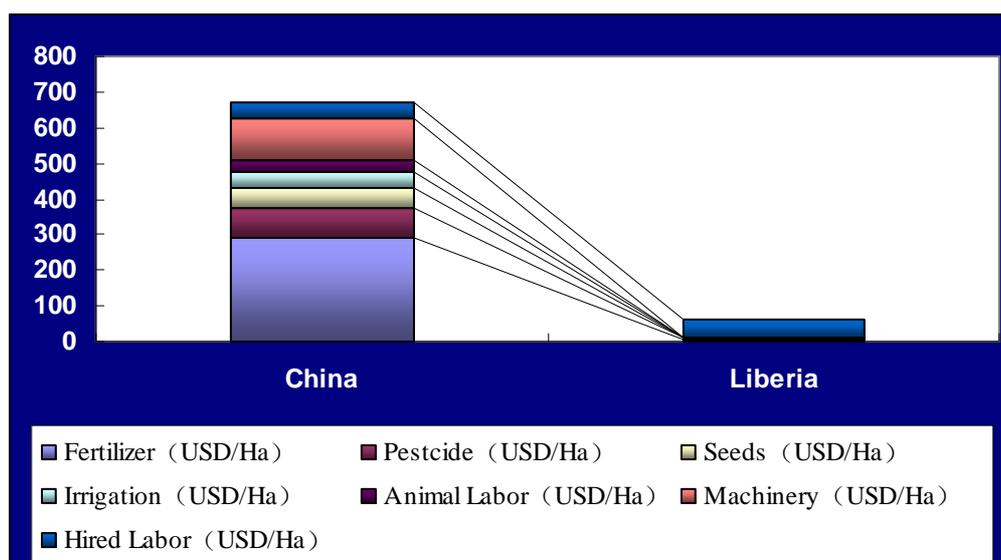


Figure 7 Inputs of Rice Planting in China and Liberia

Chinese government has provided financial support for the small farmers, to stimulate their input to farmlands. Since 2003, agricultural taxes and fees are being reformed which leads to the cancellation of agricultural tax. According to the State Administration of Taxation, the cancelling of agricultural taxation could release 125 billion tax burdens for the small farmers since 2006. In 2004, in Documents No.1 of the Central Government, the “two reductions and three subsidies” (reduction of agricultural taxes and taxes on special agricultural products except tobacco tax, direct subsidies, subsidies for growing superior grain cultivators and subsidies for purchasing large-scale farm machinery) are being implemented, which change the subsidies that were hidden in production and circulation field to the direct subsidies of farmers.

Table 1 Agriculture Subsidy Projects and Amount (Unit: 100 million RMB)

Projects	2003	2004	2005	2006	2007	2008
High Quality Seed Subsidy	3	28.5	38.7	41.5	51.9	120
Direct Grain Subsidy\	-	100	132	142	151	151
Agri. Machinery Purchase\	-	4.1	3	6	28	40
Comprehensive Agri. Materials	-	-	-	120	276	482

Source: sorted out according to data from websites of Ministry of Agriculture and Ministry of Finance

Besides the intensive use of land resources and adding inputs, China also has considerable capacity in use of light, heat, water, and fertilizer resources. China has developed an agricultural production structure that makes full use of land, light and temperature, through agricultural cultivation model, vertical cultivation model, green fertilizer, dry soil rice cultivation, deep tillage and mulching, all of which guaranteed the fertile structure of the soil (Sandrey, 2009). Generated from folk wisdom, ecological agriculture and garden agriculture also promote the best use of limited resources, and gradually form the economically and ecologically sustainable development momentum. In Africa, with relatively abundant rainfall and accumulated temperature, land productivity cannot effectively increase in a long time due to poor infrastructure and deficiency in other inputs. In addition, because of the lack of countries' regulation function and regional

coordination mechanism, agricultural production can not deal with natural disaster. Actually, some technologies have been extensively applied to the agricultural production in Africa, such as the intercrop model, which are still adopted in many places. However, there is no effective agricultural technology innovation system and agricultural extension system to improve and extend these technologies in Africa as that practiced in China.

China's experiences prove the small farmers could be modernized to advance land productivity and labor productivity. In Africa expanded farmland contributes much more than improved productivity. There is no doubt China's agriculture could be considered as exemplary, but the production model characterized by high input and high yield is questionable all the time. Excessive amount of fertilizer and pesticide application have become the main source of environment pollution. For Africa, with its abundant land holding and shortage of capital or labor force, advancing productivity through adding inputs and expanding its cultivated area should be promoted simultaneously.

2.3 The strategies and policies which relying on state intervention to ensure food production and their implementation

Sound policies are another important factor leading to successful agricultural development in China. Both the Chinese government and the governments in many African countries have adopted a development strategy prioritizing industrialization and urbanization, meanwhile agriculture is the foundation of national economy and responsible for providing surplus to this industrialization and urbanization process. What differs between China and African countries is that China has been focusing on the food security while ensuring the adequate primitive accumulation for industries, which remains to be the core of Chinese agricultural development policies. Specifically, China has set up a package of policy systems and relevant measures to ensure a food-production-oriented agricultural development in terms of land tenure, price policy, investment in science and technology, subsidies to agriculture, agricultural infrastructure and etc. In contrast, Africa merely takes agriculture as the capital source of industrialization and gives priority to export-oriented economic crop production, ignoring the food production and national food security. The absence of endogenous agricultural development strategies has led to a heavy reliance on external supports and a weak capacity of developing and implementing their own agricultural policies. The agricultural growth in Africa has sadly been in stagnation since decades.

To ensure the primitive accumulation flowing from agriculture to the industry and other sectors, the Chinese government encouraged the prevalence of price scissors through depreciating the price of agricultural produce and keeping the production cost low. It organized agricultural cooperative movement so that low-cost labor force could substitute other high-cost production factors. The planned economy also enabled the agricultural surplus to be invested directly into the industrial production bypassing the market. The country is gradually adjusting this orientation at present so that the rural area, the farmers and agriculture can benefit from the industrial and urban development. China is in a phase of integrated urban-rural development, subsidizing agriculture with the industrial profits. The high centralization of state power guarantees the consistency and continuity of the policy during this shift. In comparison with China, African countries were obtaining the necessary accumulation for industrialization mainly through economic crops and

exportation of agricultural products. However, this strategy has resulted in not food security and accumulation for industries, but economic downturns and unsteady societies in Africa accompanied with a number of other factors, for instance, inadequate foreign exchange to meet balance of payments, small farmer production and food crop production somehow ignored or elbowed out, inability to plan and control the value produced by export-oriented agricultural production, limited support to the industry, incompetence of mobilizing the people and organizing labor force needed to substitute high-cost productive factors, the failure of imitation of both western and Chinese approaches, inconsistency and interruption of development strategies due to the pressure from both the donor country and the local demands.

China has formed a full suite of agricultural administrative system down the ages for the sake of the implementation of agricultural development strategies and policies so that every level of the government and the villages can be easily informed and mobilized. Meanwhile, the agriculture education, research and extension system, which is led by the official departments and work as the thinking tank of the government, has been playing an important part in the cycle of developing, experimenting, implementing and feedbacks to policies. The effective policy-making, implementation and feeding backing system ensures that the agricultural strategies and policies in China could be continually rectified and adjusted until being accepted by massive farmers. In contrast, Africa has never had a hierarchical residential registration system or land tenure system, and the national government has limited control over the society and limited capability of mobilizing its people. As a relatively disadvantaged sector, agriculture could not find itself a fundamental place in the arrangement of government organizations. Agricultural policies can barely reach the scattered small farmers who actually produce the food crops, let alone the reform of strategic orientation and the adjustment of agricultural policies through self-reflection

Apparently, different policy effects can be identified in China and Africa where similar agricultural strategies have been implemented through different policies and specific measures. Agriculture in China has contributed a lot to the solution of food and clothes shortage as well as the establishment of industrial foundation within a short period of time. In this day and age, agriculture in China becomes a buffer to economic crisis and other emergency incidents besides its functioning to ensure food security. Although African countries have similar agricultural strategies compared with China, and although measures taken by and functions of the governments have been reformed more than once, the food security has never been realized and social problems occur repeatedly. Furthermore, constrained by the impotent internal power and the unreliable external conditions, African countries are incapable of providing more supports to agriculture, nor could they guarantee the implementation and supervision of the policies. Quite a few policies, particularly the supportive ones, are merely nominal and difficult to continue.

Undoubtedly, agricultural development strategies and policies in China and Africa have their respective lessons to be remembered. China has prioritized the development of the industry and urban areas since decades, which can be identified as one of the main causes of numerous social problems in its transition, especially the greater income disparity between urban and rural residents. China has emphasized the food security and promoted land productivity through a land tenure system which separates ownership and use rights and a residential registration system which creates a dual urban-rural reality. However, it has failed to cater to the actual benefits of the peasantry, which has resulted in the problem of surplus and floating labor force when the

productivity has reached certain level. Additionally, the high investment in agricultural production has given rise to severe ecological problems and the degradation of natural resources. Offsetting the negative impacts caused by the past policies requires huge economic and social costs. Similar to China, Africa sacrificed agriculture for urbanization and industrialization. Problems like floating population, internal colonization and waste resources occurred as well. However, African countries are kind of incompetent to solve these problems. Neither the market nor external forces will unravel the problems fundamentally. It is notable that Africa is endowed with natural resources and great potentials in agriculture. It may achieve the sustainability of agricultural production through effective policies to relocate resources and mobilize the society while learning from lessons and experiences of agricultural development in China.

Agricultural department, being one component in implementing agricultural strategies and policies, is one of the most important departments in government institutional setup from of old. Central Rural Working Leadership Group is responsible for planning on China's agricultural development. This leadership group involves the departments relating with agriculture. While different policies made by the Department of Policy and Law at Ministry of Agriculture, or by provincial Departments of Agriculture and municipal agricultural bureau, or even No. 1 Document in January, could be carried out quickly to the farmers in the village, through two systems of Communist Party and Government Administration. At village level, policies are transferred to the normal farmers through meetings of Party members, public announcement, villager meetings, villager congress meeting and other channels. There are trainings on important policies at village, county, municipality, provincial and central levels, and the policy implementation and feedback were guaranteed by surveys, interviews and other methods. This top-down administrative arrangement created the space for farmers' needs and voices being integrated into decision-making process. The significant example for this mechanism is Farmers Responsibility System's startup, which was transferred from local to central government, then disseminated from central government to all-around China.

Agriculture is the foundation of national economy, the development of which requires the co-manuever of departments of finance, agricultural means of production, and social security etc. China has chosen to bring agriculture into the Five Year Development Plan and supported it with budgetary appropriations out of public finance. The Department of Agriculture and Forestry, National Development and Reform Commission is in charge of the agricultural development, while the supportive departments under corresponding ministries are responsible for inter-sector coordination. For instance, Department of Rural Water Resources in Ministry of Water Resources is supposed to provide support to and references for farmland water conservancy construction; Agricultural Research Team under State Statistical Bureau provides effective information support to the solution of 'San-Nong'(agriculture, rural area and farmers) issues; Department of Agriculture in the Ministry of Finance deals with financial policies supporting farmers and participates in the design of agricultural development plan as well, and so forth. It is therefore evident that the institutional apparatus has been established in the corresponding parallel structure to tackle the issues concerning agriculture, countryside and peasants. Besides, there exist numerous research institutes affiliated to official agencies and studying agricultural policies, including some directly under the State Council, such as the Rural Department in Development and Research Center, Rural Division in the Research Office in State Council, and Rural Division

of the Central Research Office, and many other independent research institutes acting as think tanks, such as academies of social sciences, academies of agricultural sciences, and agricultural and forestry colleges in locality etc. Specialized talents equipped with technologies are therefore available in different administrative levels to contribute to the formation and implementation of agricultural policies.

2.4 State-led agricultural scientific and educational system, and agricultural extension system for small farmers

China's agricultural scientific research institutions are established at national, provincial and regional levels responsible for the development of agricultural technology related to the overall development of the nation to localization of new varieties and new technologies. The Chinese Government has always put “Agriculture Rejuvenation through Science and Education” as fundamental strategy for national development, with the support of related plans. A system involving development objectives, projects, measures, capital and human resource supplies has been established. The World Bank pointed out in the Development Report 2008 that during the past 20 years China's agricultural R&D investment almost doubled, whereas that of the SSA increased by only one-fifth, and about half of African countries' investments in agricultural research shrank. China's agricultural research funding mainly comes from its own. In contrast, the share of foreign aid in Africa is relatively high. Since the 1980s the donation of agricultural research funds has been increasing, In Eritrea and Niger, about three-fourths of the funding came from sponsors in 2000 (Beintema 2004).

Table2 Chinese and African Agricultural Research Investment Structure

	SSA	China	Developing Countries	Developed Countries	The World
Public Investment	97.7	71	91.6	44.8	62.7
Private Investment	2.3	29.0	8.4	55.2	37.3

Source: Chinese data: Pardey *et al*, 2006; Other data: Beintema *et al*, 2006

The other main aspect of China's experiences, which make the technology innovation directly benefit small farmers, are agricultural technology extension station system led by agricultural department. In China, the adoption rate of improved seeds in major food crops like wheat, rice, etc. has already reached 100%. However, in the whole SSA area, the planting areas of cassava and maize, which are the major food crops in SSA area, are respectively only 19% and 43% of the whole planting area. Besides, most African countries do not have an agricultural extension system, and mainly rely on international aids and became NGOs' and aid institutions' experimental field. In this case, small farmers won't effectively adopt new varieties and add input to land. As mentioned above, these modern elements inputs are high-level in China, but only slow growth in Africa. As FAO estimated, the consumption of fertilizer in SSA area in 2015 will only be 7kg/ha(only consider arable land), and this number is even lower than the number in China before reform. In Africa, if applying technological innovation to the minimum extent, such as providing farmers with fertilizer, then about 43% of land can reach a medium sustainable level. If the input can be strengthened, and farmers can be provided with training, then there will be 10 million square kilometers or 35% of lands that can reach a higher sustainable agricultural development

(Hari Eswaran, *et al.*, 1997).

In addition, China's traditional experiences provide good foundation to the use of modern technologies and inputs of modern elements. It is proved by the Chinese practice that small water conservancy could be an alternative within the limitations of capital. As it mainly depends on community cooperation and labor forces, the maintenance problem could be solved. Water harvesting in small reservoirs, for example, could also serve the purpose of irrigation. Terrace cropping on dry land, deep tillage and water preserving, no-tillage with mulch, and crop-green manure rotation could also meet the water needs of crops. And deep tillage on flat land could lift output by 30-40%. A 50-cubic-meter cistern could be a replacement of irrigation on dry land. The coverage rate of irrigation facilities in Africa is rather low, which is largely attributed to the high costs (around US\$5000-25000 per ha) (IFPRI, 2005). The production in some irrigated areas is unsatisfactory due to poor facility maintenance, low production factor input and the failure to obtain market resources. (Peacock, Ward, and Gambarelli 2007)

2.5 Actively learn from other countries and effectively get external support

In agricultural production field, China can effectively learn from the other countries and actively transfer the external support "for its own use" for two reasons. First of all, the introduced technology is adaptively promoted via national mobilization. Secondly, China views agriculture as the national foundation in history; the intensive production model determines the endogenous needs for technological breakthrough. Especially the rapid population outburst since Ming and Qing dynasties pressurized Chinese government of all regimes to constantly open doors to outside and make "foreign things serve China". In history, Africa is relatively closed and rich in natural resources. The land resources enable African countries to solve the food problem while the intensive farming level is very low and simply solve land problems through reclamation and migration. Africa was not pressed to learn from abroad. Africa's tribe-oriented tradition also restricts technology transfer and dissemination, while the dual structure of agricultural production left behind by colonial aggression further exacerbates the technology barrier. The western agricultural production system and technologies have been transplanted into Africa without any modification and become an extension and part of western economic system for a long run. These technologies have failed to be integrated into the small farmer production system in Africa. Furthermore, the tension between growing population and limited land in Africa has been insignificant. The exigent needs of promoting land productivity in China thus can not be found in Africa. It is not surprising that western agricultural technologies could not reinvent the traditional African agriculture.

China has turned to the western societies for more agricultural development experiences since 1980s, during which the advanced education, scientific research and extension systems in agriculture have been reinvented and a solid foundation built in accord with the international criteria. It should be noted that such a modern agricultural system with Chinese traits has been established through learning, introducing, adapting and renovating the experiences from the outside. Likewise, African countries has received international development assistance since 1950s, and learned from both the former Soviet Union and the western countries. They have also built relatively viable agricultural research and extension systems similar to both areas. However,

those systems concerning agricultural research, management and extension are not independent and controlled solely by Africa, but subject to external supportive mechanism. A successive agricultural development process therefore cannot be guaranteed, because the focus of the assistance agenda, which would be impacted by geographical political structure and atmosphere both internationally and domestically, has been changing in various phases. The effectiveness of learning from the outside world is consequently influenced.

3. How can China's agricultural development experiences be transferred and applied to African context through agricultural aid and Sino-Africa cooperation

In fact, China started exchange and cooperation in agricultural area with Africa since 1950s, through one-way free aid, enterprises participation, and full-around deepening. Sino-African agriculture cooperation has shown such features as multiple mechanism, broad content, wide coverage, and diverse forms. Other than bilateral aid and economic cooperation, China is applying actively the UN system's South-South cooperation mechanism and other multilateral mechanisms to extend agricultural assistance to Africa. China and Africa's agricultural cooperation concerns crop cultivation, fishery cooperation, technical cooperation, encouraging processing projects, agriculture infrastructure construction, personnel training and so on, and has spread across 44 countries in African continent. Agriculture cooperation has become an important part of China-Africa cooperation. From 1960 to 2006, China's agricultural assistance projects in Africa account for 1/5 of China's total aid projects in Africa (Bräutigam, etc., 2009).

3.1 The Changes of Agricultural Aid Models

The initial way of China's agricultural aids to Africa is helping African countries to build farms. Agricultural aids to Africa through farm model resulted from i) prevailing ideology in international development aid; ii) the needs of African countries after independence. The farm assistance to Africa accommodated the agricultural development path of African countries at that time and, and was a valuable lesson of China's agricultural development. Back then, the frontier cultivating and guarding farms, with the educated youth and troops as the main force under corps management, was an important force in China's agricultural development, and was primarily expected to tackle the inadequate agriculture investment problem by pooling human resources. This work pattern demanded extremely powerful government management capacity and mobilization capacity, and yielded very high management costs. After African countries got state independence, government lacked management capacity to mobilize the tribal society in pieces. Thus, in Africa, farms with required Chinese experts and financial assistance put in place often ran soundly and saw significantly increasing crops; once transferred to the recipient governments, the farms were likely to bump against operation and management issues. For example, unable to guarantee the 10 management staff salaries and repair fees of Afeifei rice farm, the Government of Ghana ultimately assigned the farm to 700-odd farmers and left China's aided tools for agricultural mechanization production infeasible (YUN Wenju, 2000). By late 1980s, a lot of aided farms found it hard to sustain and ended up in dissolution, announcing the farm construction assistance entirely relied on government forces did not achieve the desired target. In the course of foreign aid system reform, Chinese government encouraged and allowed some enterprises, especially state-owned enterprises, to join in foreign aid work. It is a new approach to aid African agriculture with joint venture or enterprises instead of pure farm assistance. Based on domestic experiences, China turned the technological and knowledge dissemination into an enterprise-based

system; this has transformed farms in Africa with favorable impacts. Joint ventures with aid recipient countries promote African agricultural development in a sustainable manner.

The farms, experimental stations and today's agricultural technology demonstration centers bear similar assistance mechanisms, and embody the valuable experience of China's agricultural development at different stages. They represent China's agricultural development strategy of substituting the scarce land, the core resource of agricultural production, with financial and technological resources, and can stimulate agricultural development with the general backup of China's state-dominating system, policy and financial capacity. But even so, China's public farms are unlikely to convert into market-oriented enterprises, and most test stations rely on scientific research institutions or enterprises to run smoothly. Now to copy this model to Africa, the previous lessons prove they cannot survive on the strength of the local government's administrative capacity. But these centers based on Chinese universities, agricultural academies and enterprises will have to be managed like an enterprise. The agricultural technology demonstration centers draw on these lessons, but it is very uncertain if these enterprises can maintain the operation of these centers after the cessation of government funds in the current policy, market and institutional environment of Africa. It is still a difficult problem to solve how to integrate non-profit and profit nature of the centers.

3.2 Agricultural Technology Extension and Popularization for Small Farmers through Agricultural Technology Demonstration Centers

Agricultural technology is one of the most important parts in China's successful agricultural development experiences. Deng Xiaoping has ever summarized China's agricultural experiences as technology and policy. China's scientific research policy and technology extension policy have the same political encouraging feature as the other policies. In China's special social-political system, it is easy to reach dispersed farmers. Since 1979, China started to help Africa to build agricultural technology experiment and extension station, which can export practical agricultural production technology through China's successful experiences in rapid technology extension and transformation into agricultural productivity. China's agricultural technology experimental station is a tache of China's mature agricultural technology popularization system; the technology model function of test stations could prevail through the national strong financial and administrative supporting ability quickly with experienced technicians to end-user farm households. However, most African countries have been devoid of an effective and systematic agricultural technology popularization framework till now, and lacked dissemination mechanism for the typical technology of agricultural technology demonstration stations, which made technology promotion impossible.

China is helping Africa to build agricultural technology center, aiming to build a demonstrative base for technology re-exploiting, adapting and adjusting in Africa, and this also adopt China's latest agricultural technology extension approaches. Market-oriented enterprise development is also a highlight and lessons learned from China's agricultural extension and diffusion in recent years. China's current agricultural technology research and marketing network is diversified, but enterprises are granted with strong fiscal and policy support from government to participate in agricultural extension and provide technology services still with public nature. Moreover, China's agricultural development has disclosed a differentiation trend. The farmers or agricultural

practitioners with purchasing powers are of a large scale. A large part of agricultural enterprises adopt diverse business models, and primarily sell agricultural means of production, e.g. fertilizers, pesticides, improved seeds, etc., to support the supply of agricultural technology service provision. Agricultural companies can be the solid power in agricultural technology service provision. In Africa, considering the lack of farmers' purchasing power and government's support, and dispersions of farmers, it's still needed to cooperate and coordinate with African countries, local governments, rural communities, and international and local NGOs.

4. Conclusions and Lessons for Africa

Agricultural sector is still the most vulnerable part in national economy, as there is the highest poverty incidence in rural area. Therefore, there is large potential to realize poverty reduction through increasing agricultural productivity. But African countries are still lack of related political promise to agricultural sector's needs. In China, putting food production as the top priority of agricultural development strategy and the whole nation's development agenda is embedded in every policy changes and reforms. Back to the early days of People's Republic of China, the agro-industry system, large scale infrastructure like water conservancy and roads, markets and storage facilities had been established on the basis of "poor and blank", with the help of limited support from international society. In Africa, agricultural development strategies and policies have reflected the interests of both African governments and international organizations. However, donor agendas and local strategies have not been well integrated; and local strategies could not be put into practice due to insufficient funds and weak implementation capabilities. That explains why a consistent strategic policy system could not be established when the general framework is heavily dependent on external development assistance. The Chinese experiences demonstrate that a strategic policy system will not work unless it fits with the basic situation in the country, and can be implemented with national resources and existing national capacity.

Due to interruption of agriculture development, in Africa there exists a dualistic agricultural production structure composed of a small farmer food production system which is relatively underdeveloped and barely autarkic, and an economic crop production system which is modern and relatively advanced. Modern management and techniques have not been successfully integrated into the small farmer production system. According to experiences in China, agricultural policies, investments as well as the extension and application of agricultural science and technologies should be geared towards the shifting smallholder systems ever-increasing productivity. On the other hand, the capital-intensive plantations occupy relatively small proportion of Africa's land resources, leaves abundant of arable land uncultivated. Food shortages could be greatly reduced through an increase in land utilization even if the production per unit remained the same. Because of the current low input level, the comparative benefits are quite high concerning the additional inputs to the land.

With a large population and limited land reserves, China has developed a technology system focusing on land productivity improvement. In this way, the labor force advantages can be made utmost use of. Africa is unable to form such a system due to capital and labor shortages, and in spite of a land resource advantages. Africa is deficient in both capital and labor comparing with its vast arable land area, lack of technologies substituting capital and land. China's agricultural technology system is not only labor-intensive and technology-intensive, but also is also high-input

and carbon intensive, which poses challenges for sustainable development. African agricultural technology systems are linked with low-input, low-carbon agriculture; this is a relatively favorable basis for future sustainable development of African agriculture.

China has built a complete diversified and multi-layer extension systems agricultural technology extension system including government agricultural technology extension agencies, non-government organizations and private sectors. Together with effective and stable funding from the state and modern agricultural technology transfer, China's agricultural technology extension ability has been significantly improved. Only a few African countries have national agricultural technology extension systems. Most countries' agricultural extension depends on international assistance, and is contained by their own economic capacities and infrastructure conditions, which has greatly affected the availability and coverage of agriculture technology extension.

It still needs to be careful when African countries learn China's agricultural development experiences. For instance, the agriculture policy, taking food crop production as the prerequisite, ensure food security and realize the increase of food crop production in a long period in China, but sacrificed increase of farmers' income. It is true that China has big achievement is agricultural development, but as the intensive usage of resources in the process of industrialization and urbanization, the agriculture environment gradually gets worse and development potential is limited. Africa obviously can not totally copy China's experiences whether in national strategy level or small farmers' household level. It needs to be pointed out that Africa is a continent consists of more than 50 countries, and China is a united country. When such a diversified continent is trying to learn from China successfully, the very first thing it should learn is selective introduction and adaptive application, just like China has been doing from one generation to another.

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