

The Impact of Agriculture on African Civilization in the 21st Century

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Abstract

The *purpose* of this paper is to define the impact of agriculture on African Civilization in the 21st century. The *methodology* is based on an interdisciplinary big-picture view of the African Civilizations. The multifaceted layers of civilizations will be analyzed as interdependent with the agricultural development of African societies. Among the *findings* are: Sub-Saharan Africa falls short of meeting its agricultural needs. Only one of two individual Africans has access to clean and enough water. Energy and supply of electricity are woefully inadequate and unreliable. Agriculture as a foundation for development and modernization for Africa is too limited. Environmental degradation and poor methods of farming make it difficult for African societies to reduce poverty and maintain sustainable environment. *Practical implication*: In order to develop agriculture as an economic engine, it is critical for African societies to establish and adopt Integrated Infrastructure of Agriculture (IIA). Such a developmental scheme would focus on small-hold farms. This would be made interdependent to a broader scope of developmental task under requisite institutes to be known as the Institute for Agricultural Development (AIAD) and African Food and Agriculture Organization (AFAO). *Social implication*: Addressing the productive capacity for small farmers and setting in place progressive plans the implementation of modernized agricultural production, processing, and distribution are expressions of a recovering civilization. *Originality*: The evolution of agriculture in African Civilization will be analyzed from the particular small scale farm to the broad big picture of industrial method of farming and producing in the 21st century.

Introduction

For the last 6,000 years, agriculture has been the fundamental activity for mankind in the pursuit of poverty reduction and sustainable development. In the 21st century agriculture continues for 6,000 years to be fundamental. Today in the 21st century, the prevalence of subsistence farming is still evident as three of every four people in the developing nations live in rural areas.

The persistence of poverty is evident in the statistical reports showing 2.1 billion out of 7.4 billion of the world's population (2014 report) is living on less than \$2 a day. Furthermore, 880 million

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of the world's population subsists on less than \$1 a day mostly depending on rural farms with substandard farming methods. Agriculture is an engine for modernization, but farming alone will not be enough to effectively reduce poverty. It is an indispensable component for launching effective development strategies for which most developing countries must aspire to achieve. Effective agricultural policy is particularly important for Africa as 2/3rd of its labor force is dependent on agriculture. Agriculture accounts 65 percent of the labor force in Africa. Over 34 percent of African GDP is earned from agriculture while over 20 percent of business activities are involved in agriculture (UNEP-UNCTAD 2008).

African agriculture is currently at crossings. The looming calamity from climate change has compounded water shorter that had persisted as sources food deficiency. The prospects of developing manufacture and tourism are remote as institutional capacity and legal and political infrastructure in 48 of the 54 African states are poor and bordering on lawlessness. Where legal and political capacities are lacking, African agriculture has hope for healing Africa. Africa is naturally endowed with suitable soil, river and lake waterways, and fertile lands capable of feeding Africa many times over. Agriculture in the 21st century can transform sub-Sahara Africa into a force for economic growth. The task of feeding Africa's teeming populations can only be achieved through the application of structured and tailored scientific knowledge complemented with regional markets, and a new generation of entrepreneurial leaders dedicated to Africa's economic progress (Juma 2011).

Can Africa Feed Itself And The World?

In Sub-Saharan Africa agriculture is the basis for economic growth but only if productivity in smallholder farming will be higher. According to the World Bank's 2010th estimate, the value of African food markets is estimated at US\$ 323 billion. By the year 2030, it is estimated to amount to a US\$ 1 trillion agricultural output and growth opportunity. Since only 4 to 6 percent of the cultivated land is irrigated, the opportunity to grow is vast. Even if agricultural output is reached to the level of 50 percent increase, the likelihood of eliminating poverty via agricultural industrialization and balanced growth is more hopeful in agricultural growth than in any other economic activity (Figure 1). In Sub-Saharan countries 82 percent of the rural population lives on income from agriculture. Effective land use policies, prudent zoning, and orienting population and livestock distribution in manners that balance the effective employment of arid, semiarid, and wetlands can make agricultural activity in Africa as a base for flowering African Civilization. Agriculture has been largely successful in meeting the world's effective demand for food. Yet more than 800 million people (11 percent of the 2014 population) remain food insecure, and the future is uncertain. Some models predict that food process in global markets may reverse their long-term downward trend, creating rising uncertainties about food global security. The global challenges with respect to agriculture and food production are enormous.

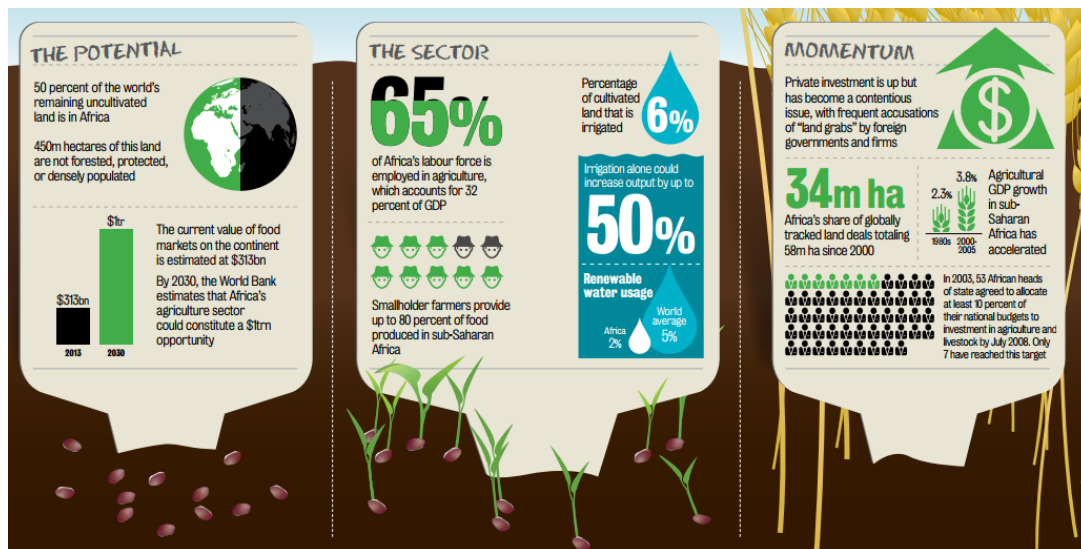


Figure 1: African agriculture has great potential. (World Bank, Land Matrix)

The impending climate change, environmental degradation, rising competition for land and water, higher energy prices are sources of global dilemma. Additionally, there is skepticism about the rate with which new technologies could be adopted and effectively used for their intended purpose with less disinvestment. With respect to Sub-Saharan Africa, if current trends are allowed to remain as derelict as they are, food imports are predicted to double by the year 2030 (Rosegrant et al 2006).

In this comparison we deal with three "countries;" China, India and Africa. The whole African Continent comparing its prospects for agricultural development will have to envision its production and input application capacity reaching that of India and China today. Africa's fragmented and directionless input applications, capacity to plan, implement, and evaluate policy programs make the challenge daunting and dismal. For example, the yield of cereals per hectare in developed nation is 5 tons. In Sub-Saharan Africa, the output is only 1 ton, which is five times lower (World Bank 2008:15). In China and India, investments in agricultural R&D tripled in 1986-2006. By contrast, in Sub-Saharan Africa investment in R&D increased just by 20 percent and declining in 24 out of 48 out African countries. These African countries are additionally disadvantaged due to their small size and inland locations. China, India, and Sub-Saharan Africa contain 48 countries.

There is still optimism about the likelihood of manpower utilization. Effective training and retaining can push Africa to a balanced modernization where cultural heritage and civilizational prides can be re-energized. Along this line, Africa can be an exporter of manufactured goods in manners that China was able to do so by insourcing outsourced manufactured goods from the industrialized countries. Africa's large manpower is under-utilized capital waiting to be captured into productive force. What is needed, as a plausible and pragmatic option, is concerted efforts to direct agriculture activities for output maximization. This can be done by supportive policies in the area of adequate water, energy, and fertilizer supply as well as prudent and people-centered

populist public policies. Populist public policies are effective catalysts for robust agricultural system. They normalize effective production, processing, regulation, and distribution practices.

Turning the Corner?

All is not lost for Africa. To be sure, it is incomprehensible so rich a continent can make into the headlines for its dismal poverty regardless of its vast richness a plenty of natural resources. Be that as it may, recent evidence suggests that Sub-Saharan Africa may be turning the corner. There are many local successes in food crop production. Kenyan farmers have effectively used fertilizers and technological innovation to increase their main crop yield of maize. Each year, the average Kenyan consumes 98 kilograms of maize, the staple of the Kenyan diet. Still they have a challenging task ahead of them in meeting the demand in maize consumption. Kenya normally has a deficit in maize, which is filled by informal cross-border trade from Uganda and Tanzania. The present deficit is so large that imports from the international market have been required. This problem has compounded the problem. The prices of maize in the Kenyan market are among the highest in sub-Saharan Africa. The poorest quarter of the population spends 28 percent of its income on maize. Even though making headways, the inefficiency in production and marketing in the maize subsector is not meeting the needs of the population. Increased productivity and efficient markets, in conjunction with rational government policies, can dramatically alter the economic contribution of the subsector. With proper reforms in place, the maize industry will become a key element in accelerating growth and reducing poverty.



Figure 2: Maize is the basic food in Kenya. (Photo: Kenya weeklypost.com)

Many farmers in Kenya refer to genetically modified (GM) maize delivered by the U.S. as the Trojan horse (Hand 2006). GMs are currently illegal in Kenya, although the U.S. continues to send modified maize to Kenya in the form of aid (Black 2004). Kenyans and other Africans, like Malawians and Zimbabweans, grind maize into flour before distributing it. Some activists have

said that the U.S. is purposefully sending GM food as aid to undercut the organic export market and cause Europe to start buying from the U.S.



Figure 3: Water can transform Africa from yellow to green and from hunger to fullness. (Photo: un.org)

Needless to say, Africa is known for its inability to carry on sustainable development and this inadequacy is at its lowest stage as sub-Saharan Africa is known for its inability to feed itself in addition to its corrupt political practices. Irrigation use is low and there are inefficiencies in the use of irrigation and water as well as land-use management. The irony can hardly be lost as there is an amazingly large amount of water resources the region possesses. The Republic of Congo, for example, has 142 times more annual renewable water available per capita than India, and 23 times more than the United States. Even drier countries have sufficient water. In fact, water users in SSA are only withdrawing on average 3% of available resources. Water availability in SSA is however extremely seasonal, and with the changing climate, variable and unpredictable. The problem in SSA is therefore not lack of water, but a lack of ability to manage it (Delaney 2012).

The household and its assets lie at the heart of the farm-power system in Africa. It is a major determinant of livelihood outcomes. The number of children a household has and the composition and group membership determine the availability of labor for farm work. Education, skills and employment outside the farm sector add value to a household. For example, tractor owners can increase their income by renting their farm implements in addition to utilizing their own tractors for cultivating their own farms. Agricultural holdings of tractor owners tend to be larger in size and better positioned to increase yield. They tend to have access to non-farm income or remittances, and most have at least secondary education complemented by formal employment experience outside the local community.



Figure 4: Three technologies of agriculture in SSA. (Photo: africaag.org)

According to the FAO, households using farm-power technologies other than a hoe gain considerable advantages in terms of area cultivated, crop diversity, yields, levels of drudgery, opportunities to redeploy family labor, and household food security. By contrast, those households who rely only on hoe cultivate 1 - 2 ha per year using draught animal power DAP. Households owning DAP cultivate 3 - 4 ha. While those who hire a tractor can cultivate about 8 hectares, a household owning its own tractors can cultivate more than 20 ha. Households relying on family labor for all their farming needs survive at the margin of subsistence. Households headed by women tend to be overrepresented among this group, partly as a result of the loss of assets typically associated with widowhood (FAO-2009).

Innovating Agriculture in Africa

University-Industry Linkages

Colleges and universities have spearheaded agricultural development in most of modernized economies in the West and in such countries as Japan and South Korea. The American land grant system facilitated American industrialization by boosting agricultural production and transitioning to metallurgy and specialized machinery. Sub-Saharan Africa with its colleges and universities can do the same. There are over 100 colleges and universities in sub-Saharan African

that could establish research parks. They can then provide innovative solutions for local farmers. Certain food companies which buy agricultural products and/or provide agricultural services could support research and development-oriented projects meeting the needs of local farming. Such R & D projects are practice in Nigeria, where Nestlé Corporation is popularizing farming of soybean with the help of the University of Agriculture Abeokuta (Juma 2011:55).

Wider Institutional Linkages

When the Nigerian Government wanted to revitalize the cultivation of cocoa, it established the Cocoa Research Institute of Nigeria (CRIN) and the National Cocoa Development Committee. In effect both institutions were able to develop genetically improved seeds which were able to produce 1.8 tons per hectare per year. Eventually the nationally owned Central Bank of Nigeria was authorized to provide loans for those farmers who could innovate their cocoa farming (Juma 2011:60).

Local Innovations Alliances

The specialists in life science with knowledge and skills practicing in related businesses and services in a given local or in nearby place should form an alliance to share successful results and experiences with its members. The help these members to communicate among themselves a newsletter and e-communication should be established. Although a face-to-face periodical meetings should be held to intensify sharing of knowledge and experience in a given local settings and to be aware what is going on in this agricultural field in other parts of a state, SSA, and the world.

Local Tacit Knowledge and Skills

Agriculture activities are known in Africa for several millennia and the memory of it is kept in practice of local farmers. This is so called tacit knowledge which is passing from generation to generation. This knowledge decides whether a given family or community can survive or vanish. Therefore, people with tested tacit knowledge should be supported by local government and community. This support may have different forms, like helping with providing good seeds, tools, credits, machinery, labor help, printed manuals, and right forms of communication.

Innovating Cluster for Local Agriculture (ICLA) in SSA

To successfully implement innovations in SSA's local agriculture one must create innovating clusters of innovating information, knowledge, wisdom & skills created and maintained in four linkages (described above) as the advising agricultural wisdom available for a local farmer, as it is illustrated in Figure 5. The ability to integrate all those clusters and provide smooth advising

for local farmers will be secured by the application of the Internet (and associated applications as websites, newsletters, e-mail, blogs, and so forth) and cell phones.

Needless to say, that the strength of that kind of advising lies in the comprehensiveness of the innovating clusters (ICLA) which deliver updated information, knowledge, wisdom and skills to the end-farmer who will apply that kind of world-class cognition in his/her small farm. The leadership in organizing and managing such a cluster should be provided by the University Industry Linkage with cooperation of local government.

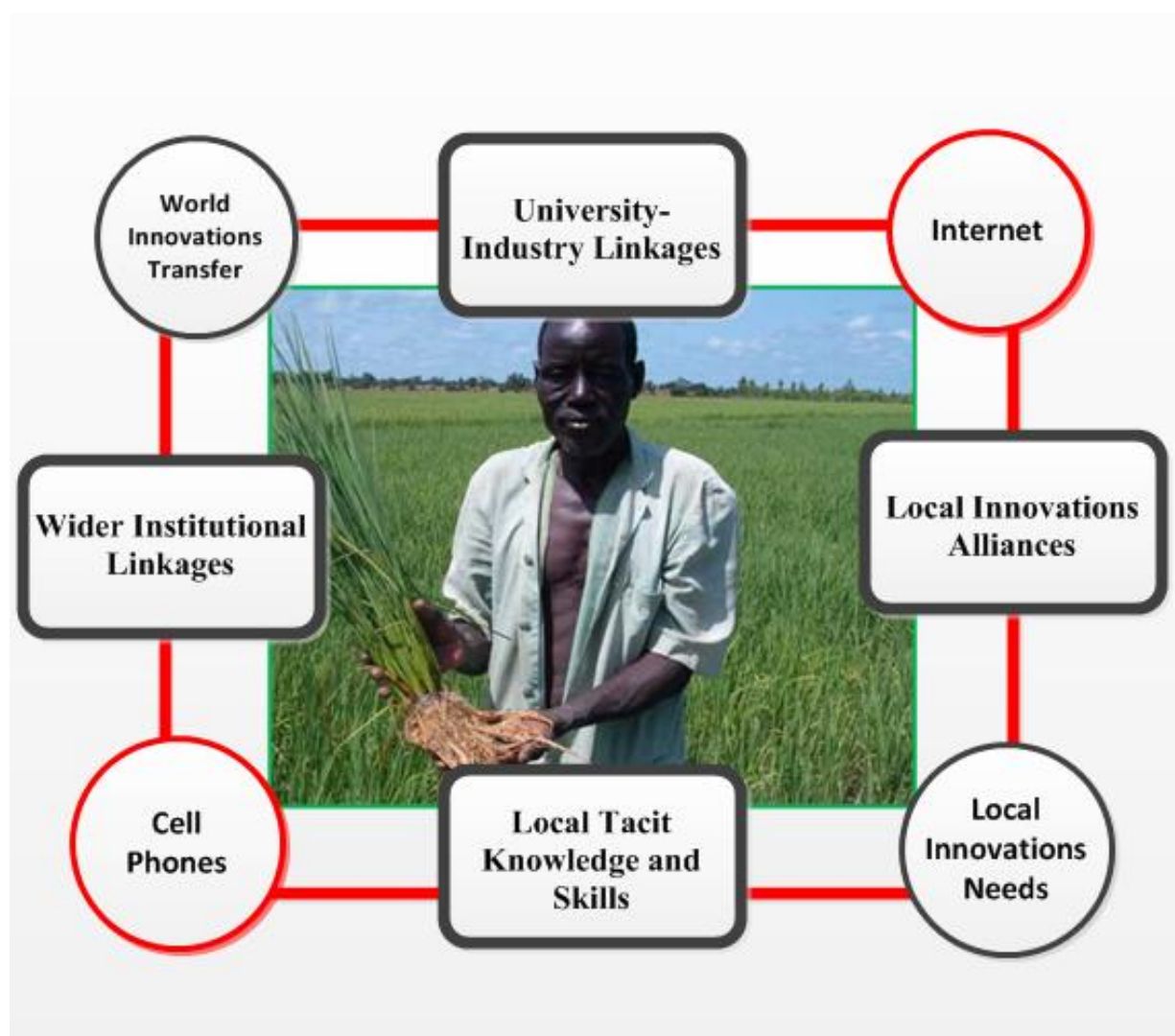


Figure 5. The Innovating Cluster for Local Agriculture in Sub-Saharan Africa

The Integrated Infrastructure of Agriculture in SSA

To make SSA's small farms more productive and innovating one must create the Integrated Infrastructure of Agriculture (IIA), as it is shown in Figure 6. Its ability is in its comprehensiveness and integration. So far many elements of this infrastructure are recognized by many authors, politicians, governments, and NGO(s). The problem is in their random and dispersed applications. Therefore, a local small farmer rarely gets the complete help and service to manage a farm in an innovative and rational manner.

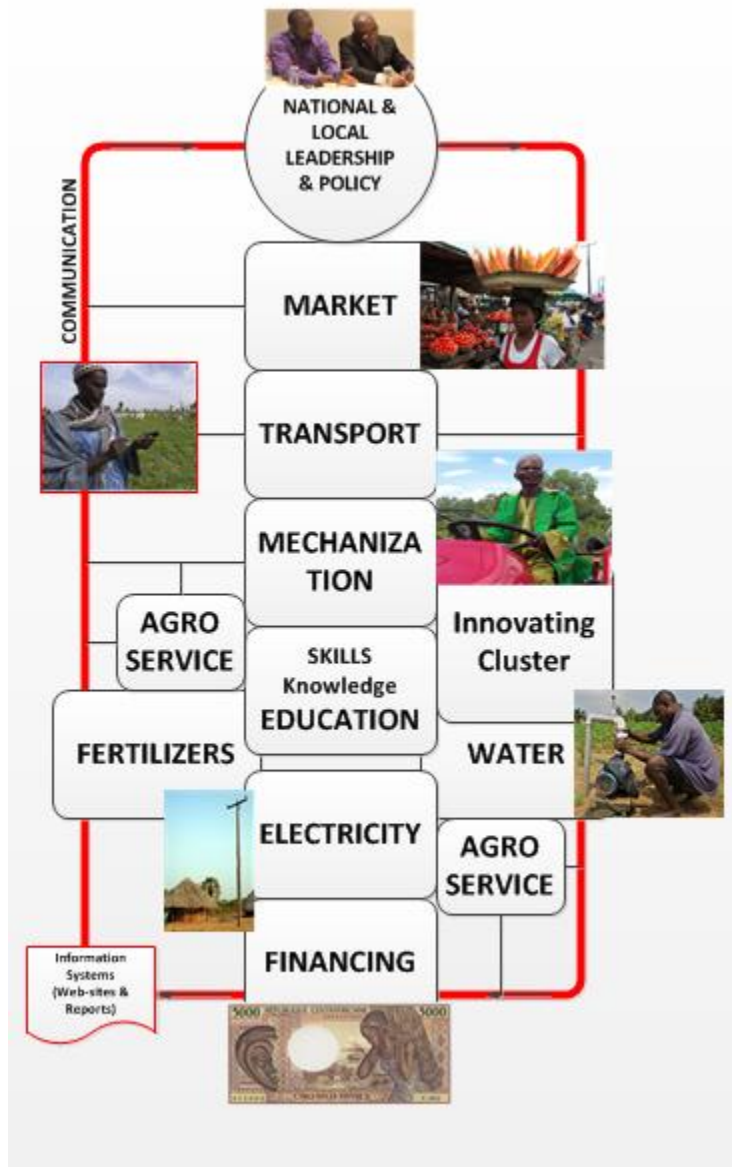


Figure 6. The Integrated Infrastructure of Agriculture (ICIA) in SSA.

There are several levels of importance of these infrastructural elements as it is categorized as follows:

1. Elementary Level:
 - a. Micro-credit¹⁰ for local farmers which will finance improvements of farms.
 - b. Electricity which allows for the application of power-controlled devices and machines as well as lighting for learning at schools and homes.
 - c. Water without which coherent farming is impossible.
2. Basic Level:
 - a. Education of farmer and his/her family to rationally live and manage a farm.
 - b. Agro service which can install (selling or renting) and maintain irrigation systems, powered equipment and so forth.
 - c. Delivery of fertilizers by Agro Service or other kind of services.
 - d. Installing cell phones and the Internet.
3. Intermediary Level:
 - a. Innovating Cluster for Local Agriculture which will provide up-today innovation solutions for local farmers.
 - b. Skillful application of mechanized systems in farming.
 - c. Other.
4. Complete Level
 - a. Bringing farmers to local markets (and eventually to national and international markets). It includes; places to trade goods, storage of goods, handling goods help, management of operations, wholesale and retail fees, prices and profits assessments and liberalization, market information systems, meeting the sanitary conditions, and so forth.
 - b. Improved local transportation to and from local markets, secured by local governments.
 - c. Other.

There are many good examples of such civilization infrastructure elements applied in business practice. For example, *TradeNet* in Ghana – allows farmers and other users for short message service (SMS) alerts for commodities and markets of their choice to buy or sell as soon as anyone on the network has submitted an offer on their mobile phone. Users can also request and receive real-time prices for more than 80 commodities from 400 markets across West Africa.

¹⁰ Microcredit is the extension of very small loans (microloans) to impoverished borrowers who typically lack collateral, steady employment and a verifiable credit history. It is designed not only to support entrepreneurship and alleviate poverty, but also in many cases to empower women and uplift entire communities by extension. In many communities, women lack the highly stable employment histories that traditional lenders tend to require. Many are illiterate, and therefore unable to complete paperwork required to get conventional loans. Microcredit is part of microfinance, which provides a wider range of financial services, especially savings accounts, to the poor. Modern microcredit is generally considered to have originated with the Grameen Bank founded in Bangladesh in 1983.

Individual can advertise their goods and offers on free website with their own Internet address, and farmer and trader group can set up Web sites to manage all these services for their members. The Ghana Agricultural Producers and Traders Organization is a major beneficiary of this network. It closed deals with trading organizations not only in Ghana but also in Burkina Faso, Mali and Nigeria. These deals involved purchasing tomatoes, onions, and potatoes without middlemen, reducing the transaction costs substantially (DeMaagd and Moore 2006).

This successful implementation of the IIA should be established first as demo and prototype projects which if successful will be so called show cases for others to learn and adopt in their local farms. The leadership in establishing such pilot projects should be provided by a local government and University Industry Linkages, since it will be a “cluster” of powerful world-class knowledge and local politics.

The IIA kind of civilization infrastructure supports smallholder farming, which is a small-scale farm operated by a household with limited hired labor. The record in world-wide application of this farming model is striking. Many countries tried to promote large-scale farming, believing that small-scale farming is inefficient, backward, and resistant to change. The results were unimpressive and sometimes disastrous.

State-led effort to intensify agricultural production in SSA, particularly in the colonial period, focused on large-scale farming, but they were not sustainable. In contrast, Asian countries that eventually decided to promote small-scale farming were able to launch the green revolution¹¹ (World Bank 2008).

There have been numerous attempts to introduce the successful concepts from the Mexican and Indian Green Revolution projects into Africa (Groniger 2009). These programs have generally been less successful. Reasons cited include widespread corruption, insecurity, a lack of infrastructure, and a general lack of will on the part of the governments. Yet environmental factors, such as the availability of water for irrigation, the high diversity in slope and soil types in one given area are also reasons why the Green Revolution is not so successful in Africa.

The overall goal for SSA’ agriculture is to secure sustained agricultural growth, reduce poverty, and improve food security. This goal is reflected in the Comprehensive Africa Agricultural Development Program (CAADP) of the New Partnership for Africa’s Development. Overall, CAADP’s goal is to eliminate hunger and reduce poverty through agriculture. To do this, African governments have agreed (during the African Union¹² Assembly in 2003) to increase public investment in agriculture by a minimum of 10 per cent of their national budgets (compared

¹¹ The Green Revolution refers to a series of research, and development, and technology transfer initiatives, occurring between the 1940s and the late 1960s, that increased agriculture production worldwide, particularly in the developing world, beginning most markedly in the late 1960s (Gaud 1968). The initiatives, led by Norman Borlaug, the “Father of the Green Revolution” credited with saving over a billion people from starvation, involved the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers.

¹² The African Union (AU) is a union consisting of 53 African states. The only all-African state that is not a member is Morocco. The AU was established on 26 May 2001 in Addis Ababa and launched on 9 July 2002 in South Africa to replace the Organization of African Unity (OAU). The most important decisions of the AU are made by the Assembly of the African Union, a semi-annual meeting of the heads of state and government of its member states. The AU’s secretariat, the African Union Commission, is based in Addis Ababa, Ethiopia.

with traditional 4 percent) and to raise agricultural productivity by at least 6 per cent per year. The CAADP Pillars are reflected in four key focus areas for agricultural improvement and investment. Each pillar is headed by a different pillar leader. These four key pillars are;

- ‘Sustainable Land and Water Management’
- ‘Market Access’
- ‘Food Supply and Hunger’
- ‘Agricultural Research’

Each pillar oversees various programs working to achieve CAADP’s goals. However, the approach to form an Integrated Civilization Infrastructure of Agriculture (ICIA) for smallholders-driven farming is more specific and comprehensive than these four pillars, since the ICIA addresses the issues at the level of a farm smallholders such as credit, electricity, education, and innovation access, technology-oriented service, mechanization, transportation to/from markets, markets management and local, national political leadership, and so forth.

Conclusion

In Sub-Saharan Africa every second individual nowadays has no access to clean water, electricity, and financial credits due to structural poverty, which determine its inability to live in the life sustainable environment. Hence, to reduce poverty and transform agriculture into an economic engine for 65 plus percent nationally employed in this activity in SSA, one must first build the Elementary Level of being in SSA, composed of access to financial credits, electricity and clean water. Having such a civilization foundation one must build next layers of agricultural development, such ones as; Basic Layer, Intermediary Level and Complete Layer, which together create the Integrated Infrastructure of Agriculture for smallholders of farms.

The regional politicians and university researchers should provide leadership in organizing local IIA(s), first as a demo and prototype project and later as show-cases and those successful ones should be adopted in other multiple locations.

The success of the agricultural renewal in SSA depends on the education level of small farmers and their families, which will used powered equipment and machinery and innovative agro-techniques. Therefore, money and technology is not only prerequisite of successful farming in SSA. In long-term and sustainable way, well-structured education with the goal of schooling for skills of managing innovative farms - should define the strategy of agricultural renewal and development.

To coordinate all efforts in agricultural development in 48 countries of Sub-Saharan Africa, one must create the SSA-wide - African Institute for Agricultural Development (AIAD) and the African Food & Agricultural Organization (AFAO)¹³ at the African Union’s African Union Commission to influence countries-oriented ministries and organizations as well as global-oriented organizations, such ones as UN, WB, IMF, TWO, G20, FAO, WHO, and other.

¹³ There is a regional office of FAO (UN’s agency with the headquarters in Rome, Italy) in Accra (Ghana) and sub-regional office for Central Africa in Libreville in Gabon. However, this kind of policy should be planned and executed from the level of African Union.

There is a good effort of international donors who provide some solutions, staff and funding to improve well-being in SSA. However, these efforts are dispersed; poorly coordinated and good intentions and ideas are very often lost. However, the functioning Global Donor Platform for Rural Development is the right organization to undertake the task of improving agriculture in SSA. In fact it supports the CAADP's goals. At the heart of its work and as an overarching priority, the Platform shares knowledge and raises awareness of the need to strengthen aid and development effectiveness in agricultural and rural development and to promote the role of agricultural and rural development in reducing poverty.

It seeks to continue making a substantial contribution to the achievement of the Millennium Developmental Goals¹⁴ (MDG) and to ensure that agricultural and rural development, food security and nutrition are adequately addressed in the construction of the post-2015 development agenda. This work is anchored in the commitments by donors and partners to implement the 2005 Paris Declaration on Aid Effectiveness, the 2008 Accra Agenda for Action, and the Busan Partnership for Effective Development Cooperation, and is linked to important international initiatives to monitor results. These highlight the need for country ownership, more and inclusive partnerships, achieving development results and openly accounting for them. Perhaps international donors are well organized, but perhaps their help is too broad and needs better focusing on pragmatic and short-term within long-terms objectives and goals, such as the proposed IIA for smallholders of farms supported by the AIAD which would create, share and transfer agriculture-oriented inventions. Needless, to say that right partner for donors' focused help could be the AFAO.

¹⁴ (1) To eradicate extreme poverty and hunger, (2) To achieve universal primary education, (3) To promote gender equality and empowering women, (4) To reduce child mortality rates. (5) To improve maternal health. (6) To combat HIV/AIDS, malaria, and other diseases. (7) To ensure environmental sustainability, (8) To develop a global partnership for development.

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