Agriculture in Africa: Potentials and Possibilities
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Abstract

Agriculture in Africa has been mired with a myriad of challenges ranging from internal to external. For instance, many scholars question whether African governments have invested enough in funding the agricultural project for research, inputs, financing, rural infrastructure, marketing and distribution in a nutshell from the farm to the plate. Several scholars, reconnaissance the external environment structure of the world trading system that is skewed considerably in the disfavor of the African small holder farmer. This article was a critical analysis of the challenges of small scale agriculture in Africa it synthesizes multiple scholarly articles to identify and categorize the major constraints faced by the small holder farmer and puts forward strategies that may be implemented to improve productivity and increase inclusiveness. The study commences with a brief history of Indigenous agriculture, colonial era agriculture and modern day agriculture paradigm shifts. Finally SWOT and TOWS frameworks were used to map strategies that may improve African agriculture.

Keywords: Small-scale agriculture, value chain, SWOT, TOWS

List of Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>AGRA</td>
<td>Alliance for a Green Revolution in Africa</td>
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<td>AU</td>
<td>African Union</td>
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<td>AWARD</td>
<td>African Women in Research and Development</td>
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<td>CAADP</td>
<td>Comprehensive Africa Agriculture Development Program</td>
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<td>CFTA</td>
<td>Continental Free Trade Area</td>
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<td>COMESA</td>
<td>Common Market for Eastern and Southern Africa</td>
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<td>COP</td>
<td>Conference on Parties</td>
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<td>CSO</td>
<td>Civil Society Organization</td>
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<td>EAC</td>
<td>East African Community</td>
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<td>EAP</td>
<td>East, Asia and Pacific</td>
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<td>ECA</td>
<td>Europe and Central Asia</td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>FTA</td>
<td>Free Trade Area</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>LAC</td>
<td>Latin America and Caribbean</td>
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<td>MENA</td>
<td>Middle East and North Africa</td>
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Introduction

Sub-Saharan Africa agriculture steady decline

Although Sub-Saharan Africa is endowed with the largest agricultural land area compared to all the other developing regions approx. 10M Sq.km, while East Asia and Pacific (then after EAP) 7.5M Sq.km; Europe and Central Asia (then after ECA) 4.3M Sq.km; Latin America and Caribbean (then after LAC) 6.8M Sq.km; Middle East and North Africa(MENA) 2M Sq.km it had currently cultivated as of 2012 only 40% of this land mass while 60% of its land mass remains uncultivated see figure 1-Agricultural land area(% of land area) and figure 2- Agriculture land in Sq. km (World Bank, 2015). The African farmer used a hand hoe and was dependent on rain fed agriculture with minimal modernization hitherto dwindled productivity and yields. Africa had to import its food from elsewhere to bridge the food insufficiency gap. The food insufficiency leads to a nutritional deficiency that triggers stunted growth in children. Stunted growth hitherto impacts life-long learning outcomes a severe bottleneck for attaining a child’s maximum potential. Moreover, the Agriculture value added per worker was lowest in Sub-Saharan Africa compared to all the other developing regions refer figure 3-Agriculture value added per worker outlining the fact that value addition was minimal and impacts negatively the terms of trade of Sub-Saharan Africa. Africa has immense opportunities to capitalize on its natural endowments to feed its people and be a bread basket of the World. Inter alia, African agriculture has to surmount a myriad of challenges in order to realize this noble objective. The objective of this study was to critically review multiple studies and develop strategies that may improve the practice as well as the outcomes of African agriculture.
Figure 1: Agricultural Land Area (% of land area)
Source: (World Bank, 2015)  (Figure 1: Ligate)

Figure 2: Agriculture Land Area (Sqkm.)
(Figure 2: Ligate)
This study examined small scale agriculture in Africa during pre-colonialism, colonialism and present-day to understand the main drivers and how it was practiced. This formed the background of the study. The literature review comprised a stringent review of 100 peer review articles that identified major constraints facing small scale agriculture. The results section comprised, Table 1 that synthesized the major constraints that faced small scale agriculture. The key constraints were regrouped in components that form the agriculture value chain using Porter’s value chain model. A SWOT/TOWS analysis was used to map the strategies that were proposed to improve small scale agriculture. Finally, conclusions and recommendations were discussed.

Agriculture in Africa – Early Beginnings

We cannot make a meaningful discussion of our future without incisive analysis of our past. Thus we embarked on how indigenous agriculture was practiced during the pre-, during and post-colonial eras, followed by present day agriculture in Africa.

Indigenous agriculture (Pre-colonial era)

Mats Widgren had mapped how crops, farming technologies, agrarian landscapes changed over time during the precolonial era in Africa (Austin, 2016). From 1500 to 1800 there was evidence of terraced landscapes, paddy rice cultivation, intensive maize and cassava cultivation

Figure 3: Agriculture Value added per Worker in SSA is lowest compared to other regions.
Source: World Bank, 2015 (Figure 3: Ligate)
using manure, irrigation and other mixed farming methodologies. Such advanced methodologies were influenced by the establishment of Portuguese trading posts and the transatlantic slave trade (Kjekshus, 1977:29-48; Koponen, 1988).

Specific examples of such agricultural systems where the Rice intensification along the upper Guinea coast in now Senegal and Niger used long-handed flat blade spade shovel an innovative tool developed before 1500 (Carney, 2001; Hawthorne, 2003; Fields-Black, 2008).

Mande-speaking people of Senegambia controlled iron trade and also controlled rice cultivation because they had the technology for making tools. Intensification was also noted in the Congo basin (1500-1800) co-existing with extensive agriculture. Cassava and maize were found along the slave trade routes from the hinterland to the coastal areas (Vansina, 1990).

Moreover, the Nyanga area in Mozambique bordering Zimbabwe and the Bokoni area in South Africa all show archaeological evidence of terracing and ridging (Austin, 2016).

Figure 4: Rice Intensification along Upper Guinea Coast before 1500 - Source: Carney 2001

(Figure 4: Ligate)

Key: Cross-hatched: expansion of labor-intensive rice paddy cultivation
Stifled: Infield-Outfield systems
Shaded: Intensive terraced farming mainly in highlands
It can be argued that during the pre-colonial era, many parts of Africa applied both extensive and intensive agricultural systems that were influenced by the Portuguese trade posts and the trans-Atlantic slave trade whereby the demand for foods as well as the exchange of food for other products were key drivers.

During colonialism

The colonialists introduced cash crops like Tea, Cotton, Coffee, Sisal and Tobacco, raw-materials to feed the insatiable appetite of the industrial revolution. Indigenous small scale farmers had to abandon their traditional staple foods of Sorghum, maize, cassava and Millet to cultivate cash crops in order to pay taxes to their colonial masters. In Northern Rhodesia, a hut tax was introduced that caused many adult males to migrate to mines to seek employment. These developments systematically weakened the gains in terms of skills and knowledge accrued during the pre-colonial era, reducing the output of staple foods and making labor shortage one of the main constraints in agricultural development (Lukanty & Wood, 1990).

The oppression and exploitation of the small holder farmers in various forms outlined above caused what was later known as “Winds of Change” that triggered the liberation movements that ushered African country's independence (Olukoshi, 2013).
Colonialism systematically weakened indigenous agriculture practice and knowledge and is the foundation of the current world trade system whereby Africa produces what it does not consume (raw materials) and consumes what it does not produce (finished products).

African agriculture (Post-colonial era)

A typical African small holder’s farmer owns at least two hectares of land. 70% of the African population engages in Agriculture that’s why agriculture is central to the economic growth of Africa. Africa is made up of 54 countries, thousands of ethnic groups living in divergent ecosystems.

To maintain soil fertility, the small holder’s used shift cultivation, crop rotation, manuring, limited tillage, ridging, terracing, composting organic matter, intercropping to allow renewal of soil nutrients. Animal husbandry, hunting and fishing were adopted by several tribes (Netting, 1993).

Depending on the circumstances, when one compares the energy invested in small holder agriculture and large scale agriculture, the small holder for each calorie of energy invested produces five to fifty calories of food (Steinhart and Steinhart, 1975). On the other hand, large scale agriculture that constitutes usance of fossil fuels, pesticides, machinery consumes five to ten calories of energy in order to produce one food calorie additionally emitting greenhouse emissions (Schusky 1989; Steinhart and Steinhart, 1975). This outlines the increased energy intensity of large scale farming that result in significant stressors on the land and driving adverse effects of climate change.

The Case of Small scale Agriculture versus large Scale Agriculture

(Netting 1993; Lappe et al., 1998) present several reasons that Small scale farming is expanded both in output as well as for sustainability.

Small scale agriculture is efficient, productive and contributes bounteous to economic development compared to large scale farming. Small scale agriculture combines intercropping whereby in a miniscule parcel of land a variety of crops were grown together. While, large scale agriculture implemented mono-culture whereby a single crop is grown in large tracts of land using heavy machinery, large amount of pesticides, herbicides, fossil fuels to drive the machinery during planting, weeding, and harvesting. Small scale agriculture weeds were suffocated of space to grow hence the application of chemicals in the form of pesticides and environmental impacts were minimal.

Larger farmers may leave parts of their land idle while small farmers cultivate all their land growing multiple crops, animal husbandry and even aquaculture, planting multifold during a year while large scale farming has fewer planting seasons. Small
holders tend to use their land most efficiently.

Labor quality and intensity is another factor whereby, small farmers employ family members as a source of labor that had a large stake in the success of the project compared to hired labor in the case of large scale farming.

Large farms were less committed to conserve forests and aquatic sources and frequently were driven by profit motive exemplified by acquiring large tracts of land for commercial production. Small scale farmers ensure that the land is conserved by reason of land may be bequeathed from one generation to another and has high sentiments.

(Mbilinyi, 2012) have stated how agribusinesses in the guise of the green revolution appropriated large swathes of land for monoculture and biofuel production in Tanzania, Ethiopia and Mozambique. In effect, the allocation of these lands has caused considerable conflict between the small holders and investors, causing landlessness of the small holders and increased rural poverty. Large scale land acquisitions were not confined to these countries alone, subsequent to the 2008 food and energy commodity boom, investors acquired over 40 million hectares of land over 75% was located in sub-Saharan Africa (World Bank, 2010). These investments were routinely packaged by the investors as poverty reducing ventures not only increasing food or energy supply but also increasing employment for African youth.

Proponents of large scale agriculture consider that increased investments may spur growth, fiscal revenues, employment, technology transfer, local incomes; however as a word of caution, large scale projects mirror a high probability of domestic conflicts. Conflicts arise mostly in view of African land is “customary land” and is transferred from generation to generation without any legal underpinning. Moreover, the transfer of land rights to investors may deny the small holder of her only livelihood. The World Bank in its report “Rising Global Interest in Farmland” put across the following as a potential code of conduct guiding optimum large scale land transactions:

- Respect land and resource rights.
- Ensure food security.
- Ensure transparency, good governance and a proper enabling environment.
- Consultation and participation of small holders.
- Responsible agro-enterprise investing.
- Social sustainability
- Environmental sustainability

One will argue that complementarity was fundamental, instead of the investor buying land outright or leasing large tracts of land for long periods and causing conflicts with small holders. Some investors
avail innovative models like contract farming whereby an investor provides high value inputs including special variety seed, fertilizer, herbicides, training and a guaranteed market for the small holder’s produce resulting in a win-win situation and reducing considerably the probability of conflict (Arsenault, 2015).

**Methodology**

100 peer reviewed journal articles were reviewed using the ProQuest and Google Scholar search engines based on the Key words “Problems African Agriculture” Tables 1 captured and summarized the recurring fundamental problems identified as contributing to the constraints in African small scale agriculture. The constraints were synthesized into groups matching the Key components of Small scale Agriculture value chain that comprised the Enabling Environment, Inputs, On-Farm activities, and Off-farm activities using Porter’s value chain model. SWOT (Strength, Weaknesses, Opportunities and Threats) analysis was employed to regroup the Constraints facing small scale farmers’ key components in a SWOT analysis. SWOT analysis is understood as an entity’s internal strength and weaknesses and its opportunities and threats posed by the external environment. It was employed as a precursor for brainstorming and a decision making tool (Johnson et al. 1989; Bartol et al. 1991). After rearranging the Agriculture components in the relevant SWOT groupings a TOWS (Threats, Opportunities, Weaknesses and Strengths) analysis that provided action plans that can be implemented in strategic planning for improving small scale agriculture in Africa. The TOWS analysis was grouped into the following individual strategies: Strengths/Opportunities, Strengths/Threats, Weaknesses/Opportunities, Weaknesses/Threats. Other scholars, including (Proctor 2000; Zhu 2007; Kerr 2003) have adopted a cross matrix with TOWS to determine how the micro, macro and internal environments may impact decision-making and thus forming robust execution plans.

**Table 1:** Constraints facing small scale agriculture in Africa Source: Google scholar and ProQuest (Table 1: Ligate)

<table>
<thead>
<tr>
<th>Article</th>
<th>Constraints</th>
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<tbody>
<tr>
<td>Agricultural Crisis in SSA: Development constraints and Policy problems (Morgan &amp; Solarz, 1993)</td>
<td>Fall in food production due to conflict and drought; limited mechanization; land tenure problems; lack of capital to purchase inputs; lack of government financial support; high taxation of food crops; low food prices; cheap food imports; food aid; world recession; declining agriculture terms of trade</td>
</tr>
<tr>
<td>Agribusiness in Africa (Dinham &amp; Hines, 1984)</td>
<td>Capital intensive and unaffordable to African farmer; Small holder depends on the farm as the only source of income; low level of education and skills; Multinationals own and control both backward and forward linkages and value</td>
</tr>
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profit maximization rather than welfare of the small holder; lack of value addition
of crops causing declining terms of trade; cheap imports depressing locally
produced crops

Patterns and Trends in Food
Staples Markets in Eastern and
Southern Africa (Jayne et al.,
2010)
Shrinking agriculture size as population increases; low technology agriculture;
rain fed agriculture unpredictable due to climate change; dependence on a single
growing season; lack of infrastructure and market information reducing bargaining
power of small holders

Realizing the Potential of
African Agriculture (Rockefeller a,
2013)
Lack of access to finance; perishability of crops before reaching markets; Farmers
are scattered and difficult to provide extension services; lack of roads from farms
to markets; import cartels oppose local value addition

Realizing the Potential of
African Agriculture: Plenary
of ministers (Rockefeller b,
2013)
Lack of financing to purchase inputs; corruption in allocation of inputs by
governments; lack of infrastructure to support agriculture; lack of value addition
hence obtaining lower prices; waste of food due to lack of processing;
standardization and quality imposed by external markets crowd out small holders
due to lack of technology; lack of rural electrification; lack of marketing; lack of
research investment

Linking Agribusiness and
small scale farmers in
developing countries: Is there
a new role for contract farming
(Kirsten & Sartorius, 2002)
Perishability of food due to unaffordable refrigerated and processing facilities;
Lack of R & D to support development of the small holder farmer; lack of
extension services

African Green Revolution
Needn’t be a mirage (Ejeta,
2010)
Lack of indigenous developed technologies for staple foods- Cassava, Maize,
Sorghum and Millet; Lack of human and institutional capacity; Lack of good
national policies and leadership; lack of culture of adopting research findings for
agriculture; insufficient private and public technology transfer institutions; Nature
based constraints including – drought, diverse agro-ecologies, poor soil fertility,
unique pest and diseases impacting crops; African higher learning institutions lack
enough qualified faculty and infrastructure to produce high quality graduates;
overreliance on donor funding and neglecting home grown initiatives; frequently
changes in donor support cause false start-offs; overlapping roles of agricultural
institutions causing inefficiency and waste

Challenges of Agro-food
standards conformity: Lessons
from East Africa and Policy
implications (Bolwig et al.,
2013)
Quality standards imposed by the Western world pose conformity challenges to
the small holders and bar them from lucrative markets

Contexts and Procedures for
Farmland Acquisitions in
Africa: What outcomes for
local People? (Lorenzo & Vermeulen,
2011)
Lack of transparency in land allocation to investors encouraging corrupt practices;
local communities interest not considered during land acquisitions; Government
officials rent-seeking practices side with investors interests; Investment agencies
appraised by the quantity rather than quality of projects; Land tenure insecurity
due to weak reinforcement; Lack of proper policies for land management.

Development hegemony and
the development crisis in
Africa: The importance of
Indigenous knowledge and
practices in the making of food
policy (Okolie, 2003)
Lack of participation of indigenous small scale farmers in policy formulations,
imposition of donor agenda for cultivation of export crops in favor of staple crops
to satisfy foreign markets; Foreign aid causing dependency rather than sufficiency;
lack of domestic revenue generation for agricultural development; Lack of access
to finance for small holders; African leaders institutionalize western models in
favor of home grown strategies

Farmers perceptions and
Adaptation to climate change
in SSA: A Synthesis of
Adverse effect on climate change leading to loss of agricultural production, loss in
GDP due to climatic changes; loss of water resources; changes in rainfall patterns;
decrease in fish due to rising temperatures; increase in vector borne diseases;
<table>
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<tr>
<th>Topic</th>
<th>Description</th>
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<tbody>
<tr>
<td>Empirical studies and implications for public policy in African agriculture (Juana et al., 2013)</td>
<td>Rising sea levels causing floods in low-lying areas; decline in income/consumption rates impacting households livelihood; insecure property rights; lack of credit to adopt climate mitigating strategies and information on adaptation techniques.</td>
</tr>
<tr>
<td>Is Value chain financing a solution to the problems and challenges of access to finance of small scale farmers in Rwanda (Kopparthi, 2012)</td>
<td>Poor management of cooperatives; poor negotiation skills by cooperatives with other parties; lack of trust amongst members; high interest rates for value chain financing due to asymmetrical information; lack of collateral, storage facilities not secured well for theft and fire; Insufficient loans for value addition.</td>
</tr>
<tr>
<td>Lessons from the Old green revolution for the New: Social, environmental and nutritional issues for agricultural change in Africa (Kerr, 2012)</td>
<td>Policies must consider gender relations to ensure nutrition improvement for mother and children; education and healthcare are other factors leading to better nutritional outcomes; land tenure systems should be effective; overuse of fertilizers and irrigation leads to excessive nutrient loading in water systems; groundwater depletion, salinization, increase use of fossil fuels have negative environmental effects.</td>
</tr>
<tr>
<td>Sustaining agricultural production and food security in Southern Africa: An improved role of climate protection? (Archer et al., 2007)</td>
<td>Lack of early warning systems to predict climate change effects that may impact livelihoods and food security; measure of intra-seasonal rainfall distribution needed as critical indicator; language and terminology for warning system in English pose a barrier to some who do not speak English language; dissemination of communication channels for broadcasting weather conditions restricted to capital cities radio rather than rural areas; low human capacity on climate information and applications; weak coordination between different national and regional bodies that predict climate; Lack of data due to few meteorological stations; lack of spatial data to monitor and react to climate change; climate information is presented too late for planting decisions.</td>
</tr>
<tr>
<td>Empowering Women: A labor rights based approach: Case studies from East African Horticultural Farms (Brahic &amp; Jacobs, 2013)</td>
<td>Lack of unionization in horticultural farms in East Africa; lack of women empowerment; lack of safety and protective gear when handling chemicals; lack of reproductive health education, lack of career progression and leadership progression; low wages resulting in low standard of living; lack of maternity health coverage; fear of joining unions that may jeopardize career; sexual harassment; women have lack of time for leadership as they have to take care of families;</td>
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<tr>
<td>Gender discrimination and its impact on income, productivity and technical efficiency: Evidence from Benin (Medagbe et al., 2010)</td>
<td>Women discriminated in allocation of quality and quantity land in the irrigation project; allocation of equipment are given last to women groups hence delay in second season planting and harvesting hence losing income; women groups have more members and are fewer than men hence incomes of women are four times less than men; women do not inherit land and cultivate land that belongs to husbands or male relatives; lack of effective mechanism in reinforcing laws that remove gender inequalities.</td>
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<tr>
<td>Agroecology, small farms and food sovereignty (Altieri, 2009)</td>
<td>Alliance for a Green Revolution in Africa (AGRA) initiatives may increase crop production but also increase dependency of foreign inputs, patented crop varieties, industrial agriculture that have negative impact on the environment, health, food quality, disruption of rural livelihoods and increased rural poverty.</td>
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The constraints in Table 1 can be disaggregated in the four (4) major components of the agriculture value chain as outlined in Figure 5 below.
Porter’s Value Chain

Porter’s value chain views organizations as a system, made up of sub-systems each with inputs, transformation activities and outputs. How these individual activities create value determines costs and *ipso facto* profits. Based on Porter’s ideology figure 5 (Value chain components of African agriculture) was designed by the author whereby the country agricultural system was the system. The Enabling environment was synonymous to Porter’s supporting activities. These supporting activities supported the primary activities which were inputs, on-farm and off-farm activities (Porter, 1985).

Enabling environment

Enabling environment was synonymous to Support activities as described by Porter’s model that support the primary activities (Porter, 1985). These were government led interventions, policies and activities that may foster agricultural growth and development especially the primary activities Inputs, On- farm and Off- farm. Several of these interventions were created for an ease of doing business for investors, forming and sustaining strong institutions that may finance, capacity build, build necessary infrastructure from rural electrification, railways, roads to and from farms to markets. Moreover, the government role was to create policies that can facilitate potential public – private partnerships and especially de-risking the value chain that is fundamental to agriculture growth. Furthermore, regional integration initiatives
akin to Tripartite Free Trade Area (FTA) comprising (COMESA, SADC and EAC) and the Continental Free Trade Area (CFTA) will galvanize intra-African trade (ICTSD, 2012). The following were impediments that the small holder’s farmer in Africa faced due to a lack of a satisfactory enabling environment: Lack of sufficient government support, land tenure problems due to lack of a regulatory and legislative framework (Morgan & Solarz, 1993); Monopoly of multinationals in agribusiness that control both forward and backward linkages suffocating any indigenous growth in sub-sector (Dinham & Hines, 1984); lack of infrastructure and market information reducing bargaining power of small holders (Jayne et al., 2010); lack of roads to/from farms increasing the cost of inputs(seeds, fertilizers etc.), Import cartels oppose local value addition (Rockefeller a, 2013); lack of financing to purchase inputs, corruption in allocating inputs by governments, lack of research investment by governments, lack of rural electrification may be a disincentive for youth to work in farms and consequently migrating to urban areas (Rockefeller b, 2013); lack of indigenous developed technologies for staple foods, lack of human

Inputs

Inputs were agriculture production inputs that were both on- farm and off-farm inputs that include manure, crop cover,ertilizers, herbicides, seeds, tractors, farming technologies, agribusiness training and pesticides these were synonymous to Inbound logistical activities. Inbound logistical activities according to Porter (1985) were receiving, storing and distributing inputs. This study had included other necessary inputs as research and development (R &D) of improved and institutional capacity from researchers to research institutions that are well funded, lack of good national policies and leadership, lack of adopting findings for agriculture, insufficient private and public technology transfer institutions, overlapping roles of agriculture development institutions causing waste and inefficiency (Ejeta, 2010); lack of transparency in land acquisition contracts with investors fueling corruption, rent-seeking behavior of government officials who align with the investor’s interests rather than small holder’s, investment promotion agencies appraised by the quantity of projects rather than the quality of projects start-offs, lack of proper policies in land management (Cotula & Vermeulen, 2011) Lack of involvement of indigenous small holders in policy formulations, imposition of donor agenda in cultivation of export crops in favor of staple foods, foreign aid causing dependency rather than self-sufficiency, African leaders institutionalize western models in favor of home-grown strategies (Okolie, 2003); Governments must create and support policies promoting women rights (Kerr, 2012; Brahic & Jacobs, 2013; Medgabe et al., 2010).

agriculture inputs to improve agricultural productivity. Other important inputs where extension services, capacity building from scientists, government officials and small holders towards best practices, small and medium enterprise financing for small holders to purchase inputs and indigenous knowledge sharing and promotion. The following constraints that were related to lack of inputs described in figure 5. Lack of funding to purchase inputs, lack of sufficient government budgetary support for
agriculture (Morgan & Solarz; Rockefeller b, 2013; Okolie, 2003); low levels of education and skills of small holders (Dinham & Hines, 1984); Low use of technology especially the use of hand hoe and rain fed agriculture (Jayne et al., 2010); Farmers are scattered and difficult to locate to provide extension services (Rockefeller a, 2013); Corruption in allocation of subsidized inputs by the government (Rockefeller b, 2013); Lack of Research and Development (R & D) to support the small holder, lack of extension services (Kirsten & Sartorius, 2002); lack of indigenous developed technologies to improve staple foods such as Cassava, Millet and Sorghum (Ejeta, 2010); lack of credit and information to adopt climate mitigation strategies (Okolie, 2003).

On-Farm activities

On-Farm activities were the activities that occur on the farm ranging from clearing the field, ploughing, putting inputs on the farm (seeds, fertilizers, herbicides and pesticides), harvesting and irrigation naming a few. These On-farm activities were synonymous to operations as defined by Porter, which were the transformation activities that transform inputs to outputs. The constraints that the small scale farmer faced during on-farm activities were limited mechanization especially use of the hand hoe and rain fed agriculture tend to have lower productivity and much variation depending on the vagaries of climate change (Morgan & Solarz, 1993; Jayne et al., 2010); low level of education and skills to apply best practices (Dinham & Hines, 1984); Lack of R & D to support higher quality crop varieties, lack of extension services (Kirsten & Sartorius, 2002); Lack of indigenous developed technologies for staple foods- Cassava, Millet and Sorghum; poor soil fertility, unique pests and diseases impacting crops (Ejeta, 2010); loss of water resources for farming due to vicissitude in rainfall patterns and climate change (Juana et al., 2013).

Off-Farm activities

These are activities that are not undertaken on the farm, but can be used to supplement farm income and used to purchase farm requirements including inputs or/and extension services. Some of off-farm activities involved value addition including marketing of farm produce, processing of crops for example, processing of maize to maize flour using milling operation, adding fortified nutrients and packaging and selling maize meal in retail outlets. The Off-farm activities were synonymous to Out-bound activities as per Porter, whereby activities related to collection, storage, distribution, marketing and processing crops.

Several constraints were listed: Crops were sold in raw form and lacked value addition resulting in low profit...
margins for the small holder, Perishability of crops due to lack of processing including refrigeration, high quality standards imposed by external markets crowd out small holders due to lack of technologies, lack of rural electrification limit processing of crops, lack of marketing information, lack of roads from and to farms (Rockefeller b, 2013; Bolwig et al., 2013); High interest rates for value chain financing, storage facilities for crops not secured against theft and fire, not enough warehouses, insufficient loans for value addition (Kopparthi, 2012).

Table 2: SWOT analysis for Small scale agriculture in Africa

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td><strong>Enabling environment</strong></td>
<td><strong>Enabling environment</strong></td>
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<tr>
<td>AU-CAADP African agricultural policy framework</td>
<td>Some African countries failed to reach targets for CAADP i.e. 10% of domestic budget for Agriculture</td>
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<tr>
<td>Regional integration increasing Intra-African trade e.g. Tripartite, CFTA</td>
<td>Some countries maintain soft barriers like non-tariff barriers hampering integration efforts</td>
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<tr>
<td>Robust national agricultural policy domestcating CAADP framework</td>
<td>Lack of infrastructure – energy, roads, railway networks to facilitate intra-trade</td>
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<tr>
<td>Some countries like Rwanda have put in place robust Land tenure laws that give equal access to women</td>
<td>Land tenure laws that disfavor small holders especially women</td>
</tr>
<tr>
<td>AWARD (African Women in Research and Development) invests in scientific and leadership skills development for Agricultural scientists.</td>
<td>Weak institutional framework for Agriculture management</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td><strong>Inputs</strong></td>
</tr>
<tr>
<td>Formation of Agricultural Development banks/Microfinance to finance Inputs for small holders.</td>
<td>Small holders lack sufficient financing</td>
</tr>
<tr>
<td>Contract farming(small holders loaned inputs and pays after selling produce)</td>
<td>African farmer uses less inputs compared to other regions adversely impacting productivity.</td>
</tr>
<tr>
<td>More fertilizer plants in Africa- domestic and FDI investments</td>
<td>Low technology agriculture dependent on rain and hand-hoe.</td>
</tr>
<tr>
<td>Collaboration of African Agricultural Universities/Governments/Private sector better technologies and inputs</td>
<td>Common seed lack effectiveness in fighting diseases that impact crops especially due to high price and unavailability of special improved seed variety.</td>
</tr>
<tr>
<td>Government subsidizing small holders for purchase of inputs and extension services.</td>
<td><strong>On-Farm activities</strong></td>
</tr>
<tr>
<td>More tractors assembly plants in Africa supporting mechanization</td>
<td>Low levels of skills and knowledge to adopt new technologies</td>
</tr>
<tr>
<td>Private sector increased involvement in large scale agriculture and supporting out-growers in capacity building, inputs and extension</td>
<td>Limited funding to support local agricultural research for seed varieties</td>
</tr>
<tr>
<td>Sustainable agriculture is promoted by development partners and funding is linked to environmentally friendly practices.</td>
<td>Loss of water resources for farming due to change in rainfall patterns and climate change as agriculture is rain-fed.</td>
</tr>
<tr>
<td><strong>Off-farm activities</strong></td>
<td><strong>Climate change increased droughts and floods</strong></td>
</tr>
<tr>
<td>Regional Economic Communities (RECs) collaborating with partners in building joint infrastructure to facilitate regional integration increase in accessibility to markets.</td>
<td><strong>Off-farm activities</strong></td>
</tr>
<tr>
<td>Local and foreign agribusiness industries sector is growing in Africa</td>
<td>Lack of rural infrastructure – roads, railways, electricity, warehousing</td>
</tr>
<tr>
<td>Warehousing voucher system allows small holders to store crops yields and may sell them whenever prices are most favorable or to obtain a loan.</td>
<td>Lack of knowhow to add value to raw crops technologies, industries, machinery</td>
</tr>
<tr>
<td>More commodities exchanges in Africa to give small holders market platform.</td>
<td>Lack of market information hence lower prices</td>
</tr>
<tr>
<td>Value addition is promoted at continental level and cascaded to regional and national levels</td>
<td>Perishability of crops due to no value addition</td>
</tr>
<tr>
<td></td>
<td>Declining terms of trade for small holder</td>
</tr>
<tr>
<td></td>
<td>High rate of interest for value chain financing</td>
</tr>
</tbody>
</table>
Opportunities
- Increase in rural-urban population in Africa is a good opportunity for engaging youth in Agribusiness and employment growth.
- Land titles issued to small holders may act as collateral for funding the small holders’ inputs, extension and mechanization.
- Global climate change efforts are driving sustainable agriculture financing and best practices promotion and scaling up.
- African industrialization based on agriculture playing a central role.
- Regional integration resulting in increased intra-African trade
- Catalytic financing from African government de-risk private sector financing
- Regional production and processing belts based on comparative advantages including climatic conditions to optimally use scarce resources e.g. SAGCOT in Tanzania.
- Harmonization of laws and regulations across African countries borders to facilitate trade in agricultural products supporting food security and nutrition outcomes.

Threats
- Disingenuous political will in agricultural transformation by some African leaders.
- Extractives discovery results in Dutch disease which tends to neglect agricultural development in favor of extractives.
- Lack of employment of youth and population increases may result in conflict and a boon to terrorism e.g. Boko Haram
- Alienation of land in a massive scale in Africa may further impoverish the small holder.
- Civil Society Organization(CSO) suppressed by African governments in agricultural policy-making
- Multiple non-state actors influence African agriculture policy moving the interest from the small holder
- Lack of incentives to small holders ranging from lack of financing, rural infrastructure, research, extension, market information.

Table 3: TOWS MATRIX (Table 3:Ligate)

<table>
<thead>
<tr>
<th>Threats</th>
<th>Opportunities</th>
<th>Weaknesses</th>
<th>Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1: Some countries failed to reach CAADP goals</td>
<td>O1: Demographic increase in youth</td>
<td>O5 to W2: More Intra-African trade</td>
<td>S1: CAADP Implementation shown positive results</td>
</tr>
<tr>
<td>W2: Importation of food from outside continent</td>
<td>O2: Most arable land in Africa and potential for more productivity</td>
<td>O5 to W5: Barriers hindering intra African trade</td>
<td>S2: Free trade areas/RECs fostering intra-African trade</td>
</tr>
<tr>
<td>W3: Lack of hard and soft infrastructure</td>
<td>O3: More demand for commodities due to increased population</td>
<td>W6: Lack of knowhow, financing and available technologies to facilitate sustainable agriculture</td>
<td>S3: Formation of Agricultural banks/MFIs provisions of loans and training in sustainable agriculture</td>
</tr>
<tr>
<td>W4: Land tenure laws gender biased and foster inequality</td>
<td>O4: Climate change initiatives and financing for sustainable agriculture</td>
<td></td>
<td>S4: Sustainable agriculture is a global agenda during United Nations Climate Change Conference(COP 21) in Dec. 2015</td>
</tr>
<tr>
<td>W5: Barriers hindering intra African trade</td>
<td>O5: Harmonizing laws and regulations for Intra-African trade</td>
<td></td>
<td>S5: PPP for joint infrastructure intra/inter countries</td>
</tr>
<tr>
<td>W6: Lack of knowhow, financing and available technologies to facilitate sustainable agriculture</td>
<td>O6: Adopting green agricultural technologies</td>
<td></td>
<td>S6: Indigenous agricultural skills and knowledge can be shared and promoted</td>
</tr>
<tr>
<td></td>
<td>O7: Reduce inequality and increase growth by unleashing opportunities for women</td>
<td></td>
<td>S7: Mobile technology solutions for example, Mpesa, Mfarm cutoff the middle man and increase profitability for small holders</td>
</tr>
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<td></td>
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</tr>
</tbody>
</table>
**Threats**

| T1 | Disingenuous political will from some African leaders |
| T2 | Climate change reducing yields and production |
| T3 | Land grabs further impoverish small holders |
| T4 | Lack of employment of youth results in fertile environment for recruitment with terrorists like Boko Haram, Al-Shabaab |
| T5 | Lack of incentives for small holders resulting into abandonment of small-scale agriculture and migrate to urban areas for alternative employment. |

**ST: Maxi-Mini**

| S1 to T1 | CAADP country success stories may present lessons learned to other countries and create political will. |
| S5 to T5 | Joint Infrastructure (PPP) for example, rural electrification, roads may facilitate a seamless value proposition for small scale farmers from “farm to plate”, inter/intra country this may reduce the disincentives for small holders. |

**S2 to T4** | Free trade area can expand markets and youth employment opportunities for youth |

**S3 to T4, T5** | Formation of more agricultural banks encourages value addition for agribusinesses and youth employment. |

**WT: Mini-Mini**

| W1 to T1 | Lack of political will failed to achieve CAADP goals. |
| W4 to T3 | Lack of land tenure laws and institutional framework encourage land grabs and impoverish small holders. |

**W5 to T4** | Tariff and Non-tariff barriers may limit intra-African trade resulting in continued youth unemployment and can be recruited with terrorists like Boko Haram |

**W2 to T4** | Lack of import substitution may increase unemployment of youth and increase conflicts. |

**Results**

**Maxi-Maxi strategies (Strength-Opportunities)**

These strategies put forward the existing strengths in place that can be adopted to capitalize on the available opportunities. For example, S1, S2 to O2 means the combination of the best practices adopted by countries that achieved S1: Comprehensive Africa Agriculture Development Program (CAADP) goals can be scaled up through S2: Regional Economic Communities (RECs) and culminating in O2: increased agricultural productivity and food security.

**S1, S2 to O2 (S1: Countries that have achieved CAADP goals; S2: free trade Area/RECS to O2: More arable land resulting in higher productivity)**

- According to (AU, 2015), CAADP was endorsed by African heads of state as a New Partnership for Africa’s Development (NEPAD) program in July 2003. The overarching goal of CAADP was to ensure African economic growth was led through agriculture. CAADP has 4 pillars: Pillar 1- Extending the area under sustainable land management and reliable water control systems; Pillar 2- Improving rural infrastructure and trade related capacities for market access; Pillar 3- Increasing food supply, reducing hunger and improving responses to food emergency crises and Pillar 4- Improving agriculture research, technology dissemination and adoption.

- Countries that have achieved CAADP goals of spending at least 10% of GDP on agricultural development and 6% annual agricultural sector growth best practices can be replicated in other countries and scaled up to increase
food productivity and security (AU, 2015).

S2, S5 to O2 (S2: Free trade area/RECs; S5: Private-Public Partnerships (then after PPP) joint infrastructure projects facilitate intra-African trade to O2: Harmonizing laws and regulations across countries)

- PPP can be capitalized to finance joint infrastructural projects including railways, roads, bridges and geospatial technology infrastructure that can connect countries and increase inter-country and intra-African trade. However, harmonizing laws and regulations is essential amongst trading countries to attract investment and economies of scale.

S4, S3 to O4 (S4: Sustainable agriculture as a global agenda, S3: Formation of agricultural banks/MFIs to O4 Increased financing for small scale farmers best practices in sustainability)

- Climate change as a global agenda can create increased funding for sustainable small holders, for example, United Nations Conference on Climate Change, Conference on Parties (COP 21) in Paris, France in December, 2015 intends to solicit USD100Bn per annum for developing countries from states, international organizations and private sector effective 2020. This funding will be available for sustainable agriculture, however developing countries should partner with developing countries in implementing programs that should have a component of educating and incentivizing the small holder to embrace sustainable agriculture, for example, a micro-finance company known as F3 Life in Kenya provides green loans to farmers if they agree to be trained to conserve their land and interest rate of the loan is lowered if the farmer succeeds in conserving their land (VOA, 2015); (COP, 2015).

S6 to O6 (S6: Indigenous agricultural skills and knowledge coupled with O6: modern green agricultural technologies)

- Reduction of climate changes adverse effects congeneric to droughts, floods and erratic rainfall patterns can be mitigated in the long run if indigenous agricultural skills and technologies are complemented with modern green sustainable agricultural practices.

S7 to O1, O2 (S7: Mobile telephony solutions including Mpesa and Mfarm to O1: Capitalize on demographic increase of youth in Africa; O2: larger arable land and potential for increased agricultural productivity)
Mobile telephony for instance, Mpesa, Mfarm can provide valuable market information, especially the market selling prices, hence increasing the profit margin and cutting off the middle man. Furthermore, mobile telephony tools Mpesa, Mfarm mobile technologies can facilitate payments directly using mobile phones to the small holder’s bank account reducing significantly the transaction costs that may involve going back and forth to banks especially due to lack of prime roads in rural areas. (Mpesa, 2015).

Innovative mobile telephone solutions also provide agricultural best practices, including weather forecast, fertilizer choice and application and other relevant information that a small holder may access using her mobile phone (Mfarm, 2015).

Youth can use advances in mobile phone technology and the large availability of mobile handsets in Africa to start their own companies that leverage mobile technology hence increasing employment (Ligate, 2015).

The importance of Science, Technology, Engineering and Mathematics or STEM to be taught in all levels of education is crucial for effective application of technology in business.

Maxi-Mini strategies (Strength-Threats)

These strategies use the current strengths that can counter threats in the environment.

**S1 to T1 (S1: Countries that achieved CAADP goals to T1: Can transfer best practices and learn lessons that may influence other African leaders to embrace best practices and better agricultural outcomes)**

- Best practices can be replicated and transferred from countries that had the political will and achieved CAADP goals, to countries that did not fare wholesome in terms of CAADP goals. The CAADP goals of spending at least 10% of GDP on agricultural development and hence achieving 6% annual agricultural growth rate is needed to create wealth in rural communities to prosper.

**S5 to T5 (S5: PPP should be encouraged to build infrastructure that will put in place effective value chains to T5: Remove the threat of the lack of incentives that currently face small holders thus migrating to urban centers for prospects for alternative employment)**

- Once governments provide an enabling environment for attracting private capital investment for instance, de-risking infrastructure projects by the provision of catalytic
financing, and reduction in excessive bureaucracy from incorporating to liquidating a business, allowing capital to be repatriated these are some areas that may incentivize foreign direct investment. The foreign direct investments in the form of agri-business may support effective value chains financing including loans for inputs, research, extension services as well as off – farm processing and marketing. For small scale agriculture to be successful the value chain from the “farm to the plate” should be capitalized seamlessly otherwise, youth will migrate to urban centers prospecting for informal employment and agriculture will lack the sufficient labor force and productivity will further decline.

S2 to T4 (S2: Free trade areas/RECs can facilitate intra-African trade to T4: Create employment for youth)

- The Tripartite free trade COMESA-EAC-SADC and the proposed Continental Free Trade Area (CFTA) not only can facilitate free movement of people when issued with a common passport but also trade without barriers hence reducing youth unemployment conversely if unaddressed may fuel potential conflicts that may be driven by youth unemployment.

S3 to T4, T5 (S3: Formation of Agricultural banks and MFIs that may provide value chain financing and training to T4: Provide youth employment; T5: Provide incentives for youth to pursue agri-business careers)

- Financial institutions, including Agricultural banks and Microfinance institutions may provide value chain financing that will incentivize youth to engage in agri-business rather than migrating to urban centers to solicit alternative employment depriving valuable labor force for agriculture and agri-business.

Mini-Maxi Strategies (Weakness-Opportunities)

Mini-Maxi Strategies are strategies that address how weaknesses once overcome can capitalize on opportunities.

O5 to W2 (O5: Harmonizing laws and regulations to facilitate intra-African trade to W2: Reduce importation of food from outside the African continent)

- Harmonizing laws and regulations to facilitate intra-African trade in commodities will reduce the need to import food from outside the continent and thus will create employment within the African continent for the bulging youth population in agri-businesses and small and medium enterprises.
O4 to W3 (O4: Climate change which is the global agenda can rally W3: financing for Public/Private sector for soft and hard infrastructure that is lacking)

- During United Nations Conference for Climate Change (COP 21) meeting to be held in December 2015 in Paris, France, the objective of the meeting is to reduce greenhouse gas emissions to not exceed 2°C pre-industrial revolution level. This ambitious project will need extensive political will especially from developed countries who are the largest emitters of greenhouse gases to reduce emissions to agreed levels using green technologies. Another key objective is to mobilize USD 100Bn per year by 2020 by developed countries using public and private sources. This financing will enable developing countries to mitigate and adapt to adverse effects of climate change. The funding once disbursed can finance soft and hard infrastructure that can mitigate, monitor and transform small scale agriculture in Africa to greener technologies COP (2015).

O7 to W4 (O7: Reduce inequality and increase food security to W4: Land tenure laws that are gender biased; According to Food and Agriculture Organization (FAO), 60% of employed women work on Sub-Saharan Africa (SSA) and they form half of the sector’s workforce. However, women produce lower yields than men due to not having access to the same quantity of inputs as men. If women gain equal access of inputs than men then their yields will increase by 20-30% in overall terms increasing food security and African economic growth.

- Customary laws and practice in innumerable SSA countries have multiple and occasionally overlapping laws that prove insecure for women’s rights. One of the major impediments to gender inequality is gender biased land tenure laws that do not allow women to inherit and own land. Table 4, describes the Gender inequality index for Sub-Saharan Africa.
Based on Table 4, Gender inequality index for SSA, the African women are faced with hurdles that impede her economic and social development. For instance, due to maternal health deficiencies 510 deaths out of 100,000 births occur. 1 out of 10 girls give birth during adolescence thus denying them higher education impacting their lifetime earnings as well for the future of the children. The political representation is minimal at only approx. 22% of parliamentary seats. The population of women who have at least secondary education is also lower than men, a similar trend is noticed in labor force participation women at 63.6%, while men at 76.3%. Gender inequality should be addressed immediately and urgently if Africa will unleash the full potential of both men and women in the continent.

Mini-Mini Strategies (Weakness – Threats)

The objective of these strategies was to minimize both weaknesses and threats.

W1 to T1 (W1: Lack of political will on the part of African leaders; T1: failed to achieve CAADP goals)

- Lack of political will by a few African leaders to mobilize budgetary disbursement of at least 10% of GDP for agricultural development that may achieve an agricultural growth rate of at least 6% per annum. On the other hand, several nations disbursed exceeding the CAADP targets and have excess food for both domestic and for export. Rent-seeking behaviors and short-termism are issues that need to be immediately addressed if small scale agriculture will develop.

W4 to T3 (W4: Lack of land tenure laws and strong institutional framework encourage; T3: land grabs and impoverishes small holders)

- Land tenure laws and a strong institutional framework to handle land allocation and disputes could foster transparency and
accountability and limit corrupt practices that hinder large swathes of land (land grabs) being misappropriated from small holders and leased to investors. The small scale holders depend on their miniscule parcels of land for their livelihoods and if their land is leased without fair compensation and the mall holders are not involved in the negotiations they may be short-changed and thus impoverished (Mbilinyi, 2014).

W5 to T4 (W5: Tariff and Non-tariff barriers may limit T4:Intra-African trade resulting in continued youth unemployment)

- African countries continue to impose trade barriers in order to nourish nationalistic agenda in favor of the broader regional and continental agenda. These subtle barriers to trade include not allowing and creating red tape around free movement of people and goods through countries limit the growth of intra-African trade. The restriction of movement also reduces the possibility of providing increased employment to the teeming number of youth seeking employment.

W2 to T4 (W2: lack of import substitution for food may T4: increase unemployment of youth and increase conflicts)

- Due to food insufficiency, African countries import almost USD 45Bn worth of food as former Nigerian agriculture minister Akinwuni Adesina was quoted by CNBC Africa saying that importation of food is in essence creating employment in the exporting countries. Africa imports food by virtue of low productivity due to the numerous challenges faced by the small holders discussed in this study. Africa should tirelessly work in removing the obstacles facing these small holders and create a cadre of educated, empowered youthful entrepreneurs that can value add to the commodities and hence decrease the import bill and in the process increasing youth employment, reduce stunted growth and decreasing conflicts that may erupt as youth remain unemployed.

Conclusions

The small scale farmer in Africa is faced with a myriad of challenges that span the value chain from the farm to the plate. African governments need to intensify efforts to support the small holder to not only improve productivity and food security but also graduate to Agribusiness owners. These small holders need worthier access to inputs- improved seeds, fertilizers, herbicides, irrigation systems, rural electrification, road, distribution networks.
and market information for selling their produce. Much work has been done by governments and other stakeholders, still much more needs to be done to realize the full potential of African agriculture.

Women rights are property rights. Gender bias due to customary laws that bar women from owning land and access to inputs is counter-productive. Gender bias not only contributes to food insecurity, but also decreases the potential growth of African economies.

Several studies state that agriculture contributes 25\% of greenhouse emissions that cause climate changes i.e. floods, droughts, hurricanes and erratic rainfall. Therefore, it cannot be over-emphasized the need for sustainable agriculture in Africa. Sustainable agriculture can be achieved by combining Indigenous African agricultural practices that have been proven to be effective for teeming generations with modern green agricultural technologies, better known as Agroecology. One will note that these two practices have a great deal in common; owing to small scale agriculture had always flourished on conservation. Uttermost, developed countries should assist in the transfer of the skills and technologies to the African small farmer in order to be successful. United Nations Climate Change Conference to be held in Paris, France in December, 2015 will discuss amongst other things how to finance developing countries farmers to acquire access to green technologies in agriculture.

Regional integration remains a key strategy in achieving Africa growth potential. Continental Free trade Area (CFTA) negotiations are taking place, which is the flagship project of Agenda 2063 of the African Union. The free trade area will facilitate intra-African trade, especially in commodities and other diversified value added products. This will in turn reduce the significant food import bill for Africa that is a staggering USD 45 Bn. per annum and create employment in the African continent.

Areas of future studies

Climate change is the global agenda. It will be advantageous to study the interlinkages between African indigenous agricultural practices and modern agro-ecological practices and how the former can be complemented by the latter and vice versa.

References


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