Full Length Research

A brief history of soybean production in Kenya

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Soybean is a very important crop in the world. Its economic, nutritional and functional importance warrants due attention in Kenya where over 30% of children are malnourished, unemployment rate is over 40% and fertilizer use is low. Soybean is a legume crop with ability to fix nitrogen. Having a high protein content of up to 40% and oil content of 20% that have essential amino acids and unsaturated oils respectively, soybean has been recommended by nutrition experts to deal with increasing lifestyle diseases and already high levels of undernourishment in the country. The crop is versatile, in terms of its both utilization and agronomical attributes. It is a crop that can grow in varied agronomical areas, convertible to many products e.g. tofu, soymilk, soy beverages, soy seasonings and soy meal and be an ingredient in many products such as bread, cakes and breakfast cereals. In its complete value chain, soybean can form a huge industrial base for such a developing country as Kenya. However, Soybean production in the country has remained low and has never picked up since the British colonialists introduced it in 1909. Unlike countries in the Northern hemisphere and the Americas who have embraced the crop and enjoyed its benefits, adoption of the crop has remained low. This paper attempts to trace the historical roots to the current situation and recommends ways of ameliorating the same. Soybean development policy need to be established and the crop considered for the important crop it is by all stakeholders.

Key words: Soybean, Kenya, history, malnutrition, soybean industry.

INTRODUCTION

Soybean was first domesticated in China between 2500-2300 B.C. (Hui and Chang, 2010). The crop has had its habitation within South and South East Asia following migration routes among local populations within that region until late 18th century when it was introduced in Europe, being grown as an ornamental crop in England and France (Hartman et al., 2011). Soybean quickly gained more relevance in the early 19th century, when it was grown as an animal feed in Yugoslavia. From Europe, the crop spread to other parts of the world through mostly British and French imperialism, missionary work and trade (Kolapo, 2010, Hartman et al., 2011). The crop’s current dominance as an oil crop was after its landing in the Americas particularly in Georgia, USA in the year 1765, as a raw material for making margarine for export. On discovery of its high protein content, palatability for animals and its storability, soybean transformed from human food to an important animal feed (Goldsmith 2010, Hartman et al, 2011). Soybean’s high oil content (20%) with low cholesterol levels and high polyunsaturated oil has made it the leading traded oil crop in the world (Chianu et al., 2008; Salvagiotti et al., 2008) with a trade worth US$ 270 billion in 2011 (FAO, 2011, Soyinfocenter, 2011). The British colonialists introduced soybean in Kenya in 1909, regarding it as promising (Bulletin of Imperial Institute, 1909).

Soybean’s main importance in the world currently is as a key ingredient for livestock feeds (Venter, 1999; Tinsley, 2009). Soybean is the single most important protein and oil source in dairy meals, dog meals and poultry feeds (Maingi et al., 2006). However, only two percent of the crop worldwide is used for human consumption with the rest being used as animal feed (FAO, 2008, Hartman et al., 2011).

As human food, Soybean has more protein than any pulses, fish, and meat combined (18% and 11%, respectively) (Malema et al., 2007) indicating that more
Soybean protein can be produced per unit of land using soybean rather than from other sources. Soybean has 100% more protein than other common crops (Rani et al., 2008) and yielding 5-10 times more protein per unit area than other crops. It is the only known viable substitute of animal and fish protein (Jooyandeh, 2006). Soybean has higher protein content per unit of dry weight than meat and egg combined having 40% compared to 18% and 11%, respectively (Malema, 2006; Rakasi, 2011). It has various uses as a blender with other cereal flour e.g. maize to better their nutritional value (Malema et al., 2007). Soybean derivatives have extensive uses. Soy flour adds proteins and improves the crust color and shelf life of baked goods. Soy isolates lack carbohydrates or fiber and so are used in many ready-to-eat products such as cheese, milk, non-dairy frozen desserts, coffee whiteners and meat products (Hartman et al., 2011).

Soybean concentrates constitute soup bases, are in gravies and have found uses in meat products because of their fats and high water absorption properties (Venter, 1999). The concentrates make extenders in ground meat products, in convenient foods, in pizza toppings and in dairy products (Venter, 1999). Soybean has been used as a first line nutritional component in humanitarian aid efforts dealing with hunger stricken masses in various calamities such as drought, floods, earthquake e.t.c. (Vandeplas et al., 2010) probably due to its high nutritional content per unit weight, international availability and its versatility in converting to various products (Agwu et al., 2009; Tinsley, 2009). Countries known to have a huge part of their diet containing soybean such as China, Japan and Korea have a long life expectancy and experience minimum cases of cancers (Venter, 1999; McCue and Shetty, 2004).

Soybean has wide industrial use, which is of economic value in spurring cottage and industrial functions. For example, soybean oil finds wider application in the manufacture of soaps, glycerine, printing inks, greases, lubricants, water proofing materials, oilcloth, linoleum, putty, resins, insecticides and disinfectants (Tao, 1994; Endres, 2001). Soya lecithin, an important product of oil industry, is used in food industries, cosmetics, pharmaceuticals, paint and plastic industries and in detergents (Tao, 1994). The crop is widely used in the production of antibiotics and adhesives (Endres, 2001). Soybean importance is widely felt in the feed production and vegetable oil industry where its value worldwide is in the tune of US $200 billion per year (FAO, 2012).

Is it that a crop that was introduced two centuries ago in Kenya has failed to take root as a dominant crop with these inherent nutritional, economic and industrial attributes compared to for example coffee, tea, pyrethrum and similar crops that were introduced later now play a dominant role in Kenya agricultural economy? Why did soybean in Kenya not follow the trajectory it took in USA and Latin America to be world's leading soybean growing regions? What made Kenya lag behind in Africa as a major soybean growing country as compared with other African country like Zimbabwe, Nigeria, South Africa, Egypt, Malawi and Uganda? What was different that this British colony did not have or not do compared to the other British colonies that succeeded? To attempt to answer some of the questions one would need to go back to the history of the crop to look at aspects that may have led to its present limbo.

**CURRENT SOYBEAN SITUATION IN THE COUNTRY**

Kenya's annual demand for soybean exceeds 100,000 MT (Wasike et al., 2009) the highest in the East African region. However annual soy production has never exceeded 5,000 MT (FAO, 2003, FAO, 2007, FAO, 2008, FAO, 2010, FAO, 2012) bringing a deficit of over 95%. This gap is filled through imports. Soybean grows in two key regions, The Western region comprising Kakamega, Vihiga, Busia, Bungoma, Transoia, Siaya, Homa Bay, Migori, Kisii and Nyamira counties and Central highlands region comprising Kirinyaga, Embu, Meru and Tharaka Nithi Counties. There is more production in the Western region than in the central highlands region. Kenya imports most of its soybean from Uganda (Tinsley, 2009), Malawi, Zambia, Zimbabwe, Argentina (Chianu et al., 2008), India and recently Brazil. A few soybean products come from USA and China. In 2008, Kenya spent a total of US $27.54 Million to import soybean and its products (FAO, 2008) an amount that is a significant drain on her scarce foreign exchange. This has a huge impact on the exchange rates and balance of trade affecting the macroeconomic stability of the country (World Bank Kenya Economic Outlook, 2013).

**SOYBEAN’S INTRODUCTION UNDER THE COLONIAL GOVERNMENT**

When the British colonial administration first introduced soybean in Kenya (Then East Africa Protectorate) in 1909, its ultimate purpose was to have a large-scale industrial crop that would help account for the rationale of establishing the colony, pay up the high costs of building the Kenya-Uganda Railway and as a raw material for the British industries (British Imperial institute, 1909; Thorpe, 1953 Tarus, 2004; Mark, 2010). Original intention was to have high plantation spanning thousands of hectares (Ministry of Agriculture Annual Report, 1943) but the trials done did not show remarkable adoptability (McDonald, 1935; Emery, 1958). The Colonial government’s research for a high yielding and climate adopting crops continued into the 1940s (Thorpe, 1953; Emery, 1958). Foreign companies were encouraged to invest in the crop. An American company in 1948 indicated its willingness to invest in 10,000 ha for the crop (Soybean Digest, 1948). Having tried to breed locally adapted cultivars and failed,
the colonial government sought Soybean seed for propagation from USA, China, South Africa and Uganda (Soybean Digest, 1957; Greenway, 1945). Initially, natives were not encouraged to grow the crop, as was the case with other intended cash crops like tea and coffee (Tarus, 2004). Crop utilization was also not encouraged among Africans until during and after WWII (World War II) when it was realized that the crop was a powerful tool for reducing malnutrition (Halcrow, 1939; Graham, 1943). Earliest records indicate soybean growth and trading by natives in colonial Kenya was continuing in 1920. The records show natives trading few consignments with Indians but not utilizing it (Greenway, 1945). Since WWII, there was deliberate effort to integrate the crop into bread by a ratio of 10% (Vegetarian Messenger and Health Review, 1946). Meanwhile efforts to improve the crop adaptability for large-scale mechanized commercial production by the settler community by the government breeder were not bearing fruits and the project was abandoned in 1950. Uganda continued to be the main source of soybean in the country.

The colonial government breeder then, attributed its failure to poor germination rates and inoculation, poor establishment, high shuttering, lack of uniformity in maturity and diseases. Further attempts at breeding the mechanization varieties were discontinued (Thorpe, 1953; Kolapo, 2011).

However soybean utilization continued, efforts were directed at more importation from Uganda and USA (Vegetarian Messenger and Health Review, 1946). By 1961, South Africa was the source of major soybean products to Kenya. Soybean became an important relief food throughout the colonial period, with one particular organization (Friendship Food for a Hungry World) from the USA reporting to have imported to Kenya several millions pounds of soybean from September 1943 to 1963 May (Meals for Millions, 1963).

Another source of failure of the crop’s establishment as a cash crop was political. The African farmer had already been slapped with the hut tax. He had been forced into hard labour, which disrupted his way of life (Tarus, 2004). He felt that the forced labor and the high tax burden imposed on him would continue if the crop was successful. The experience may have affected adoption of the crops by the natives (Tarus, 2004). The colonial government focused its growth to the white settlers and not the native population, fact that would later sustain its indifference among the general population after independence. As with most crops meant for the colonial objective of developing industrial outposts for growing raw materials (including labor) for the industries of European metropolitans and as markets for their finished products, the crop was under tight control of the government and white settlers (Thorpe, 1953). It was not introduced to the native population but was grown among the white settlers in the so-called ‘white highlands’. It was given serious attention by the colonial government agriculture department, and research institutions (Sampson, 1936; EAAFRO, 1964). The main purpose by the government on the crop was to identify its suitability in various agricultural regions of high potential where maize was grown and develop cultivars that would yield the highest, respond to inoculation while being tolerant to the harsh climatic conditions of the various areas identified (Weiss, 1967). White colonial settlers had come to make profits. With the profits not forthcoming, and the colonial government having difficulties in importing inputs such as tractors for large-scale production, the crop was neglected (Soybean Digest, 1948).

Later on, the colonial government nutritionists and extension officers and recommended soybean production to the natives, struggled hard to promote the crop and even identified cooking recipes for it (Seville and Wright, 1958; Graham, 1943). One report shows Nyanza being recommended as a good place for growing large yellow type soybean (Graham, 1943). This can probably explain why the crop is relatively successful in that region of the country compared to Eastern region and Central highland where the focus was in tea and coffee. Soybean research would continue in western region experimentation stations such as Kakamega experimental Station (now KARI Kakamega) and Eldoret then known as Eldoret Agricultural Research Experimental station and in Eastern Region, Mmea Irrigation Research Station (the present-day host of National Irrigation Board and Mwea rice scheme (Field Crop Abstracts, 1961).

SOYBEAN UNDER POST COLONIAL GOVERNMENT

There is no outright policy on soybean compared with settlers’ focused crops as such pyrethrum, sisal, cotton, tea and coffee. The then government of Kenyatta promoted cash crops following the inherited establishment with locals taking up from previously prohibited for an African farmer. The postcolonial government did not show commitment to improve soybean as it was with the other “white settlers’ crops”. The targeted crops continued to receive funding, institutions were established, cooperative movement mooted and loans conferred to promote these crops. Soybean however did not. Very little research was done on soybean after independence and the private sector was not encouraged to pursue the crop (Hocombe and Yates, 1963). Soybean continued to play a big role in food relief efforts. As far as first decade after independence, the country continued to face starvation and malnutrition with development agencies increasing distribution efforts to hunger stricken through soybean products. Kenya continued to receive relief food of soy products (Meals for Millions, 1963).

There were international efforts to promote the crop with organizations such as USAID sending delegates to
the USA and other international for trainings to establish soybean processing and utilization but still the government played lip service on the crop (Soybean Digest, 1964). Hardly any local businesses got involved with soybean processing. The potential of soybean to the Kenyan economy and business opportunities were picked up by foreign businesspersons who set up shop to process soy food such as tofu, importing the of raw materials. One such foreign businessman noted that the reception of the soy food by the local was not encouraging and that the problem was in crop management noting that as much as 20-30 % would be lost due to post harvest handling (soyinfocentre, 2009).

There were stringent regulations on the soybean quality that discouraged startups and soy industries but the government through the Ministry of Agriculture did not formulate equal measures (and still has not) to improve the production and post harvest handling of the crop.

It has been trial and error for farmers and the few that grow the crop did not meet the economic threshold for profitable undertaking and thus stopped production altogether. Local soybean processors were not encouraged. In 1988, Ken-Soya Foods limited became the first local company to manufacture processed soybean products making full-fat roasted soy flour, the earliest known commercial soy product made in Kenya. Meanwhile in 1989, officials at the Ministry of Agriculture were still working in a detailed plan to increase soy use in the country, a plan that has never materialized.

**SOYBEAN POLICIES IN KENYA**

Early policies on Soybean production were in 1920s. The 1st articulated policy probably on soybean as a cash crop was in 1961 (Brown, 1961) which had a production goal of 10,000 tons per year. This potential was not realized because of the difficulties mentioned above (Souza, 1969). Soybean trials were persistently pursued by the colonial government in identifying the most appropriate cultivars in the various agro ecological zones of the country (Weiss, 1967). Among the major areas where soybean research was heavily conducted was in Njoro, Kitale, Kisii, Kakamega, Soy, Turbo and Mwea (Field Crop Abstracts, 1961; Weiss, 1967; Souza, 1969). The target then was to improve yields to be comparable to those of either Tanganyika or USA with Kisii trials showing promise to reach there at 2,300 Kg/ha being reported in 1965 (Gray, 1967).

There seems to have been a neglect of the soybean by the consequent Kenyan African governments after independence, poor policy in its propagation and promotion, utilization messages with focus in maize as food crop and coffee, tea and pyrethrum as cash crops to the detriment of soybean. Other factors that affected soybean were diseases and suitable soybean strains. Kitale, a major soybean production area was converted to be a major maize growing area (Weiss, 1967; Souza, 1969; Bock, 1973). The colonial policy of integrating soybean with maize as a second crop on rotational basis was abandoned. Some attempts by the postcolonial government were taken establishing soy processing capabilities. Soybean processing was done on an experiment basis at the then East African Industrial Research Organization (Now KIRDI) in Nairobi in 1976 (ref). There were efforts on research in the country to increase soybean utilization as animal feeds. Feeding whole soy feeds to pigs were experimented at the Experimentation Station, Vet Lab Kabete In 1978 but importation kept increasing (Meals for Millions, 1963).

This poor policy on soybean development was demonstrated in 1989 by the removing of 40% import duty for soybean imports to Kenya dealing a big blow to the only local soybean processor in the country. The USA, a major exporter of soybean products in Kenya lauded the move led by American attaché (Soyinfocentre, 2009), at the same time the government through planning department of the Ministry of Agriculture the very year plans to have 128,000 hectares of soybean as a second crop after maize planting. These plans were not consummate to the policies being executed. The international market may have also contributed to the low adoption rates with USA having comparative advantages with economics of scale and agronomic efficiencies. The few industries available would rather import the crop than utilize the available or promote it (Altshul, 1969).

**CURRENT CHALLENGES**

Pests and diseases- soybean rust, peanut mottle disease, Xanthomonas leaf rust, nematodes, bean fly and dung beetle are the major pests and diseases of the crop in Kenya. Post harvest handling has also remained a challenge for many farmers with a high percentage of seeds being affected by aflatoxins thus reducing crop value. Production yields are not enough to encourage farmers although resent results are encouraging. There has been a declining hectarage under soybean (FAO, 2011; 2013). The main research effort being done is by KARI, Njoro that is mandated to undertake research on wheat also. More effort is seen on Wheat than on Soybean. The attitude to the crop though waning has also contributed to its low uptake as a human food. Reports of its negative effects on health, though erroneous, have continued to spread unabated. Strong opposition of soy use in the in the internet by some western intellectuals (such as Fallon and Enig, 2001), reverberates a scare to potential users of the crop. Few farmers are interested in growing the crop that is seen as an agenda that is pushed by the local NGOs and international bodies and foreign companies. Farmers have not seen the value of the crop in monetary sense. Soybean utilization as a human food has not picked up
as it is for example in Nigeria. The nutrition campaign has not been well articulated, the government has not been so keen to push its benefits and the potential consumers have found it to be hard to prepare compared to existing legumes like beans. The crop use as a human food is approximately 10% of the total soybean use. The other main uses have been as a soy meal and for production of soy oil. The dominance of other legumes like pigeon peas in Semi arid Eastern Kenya, beans in Western and Central Kenyan highlands, difficulties in cooking the seeds comparable to other legumes are the other important challenges affecting soybean industry in the country. Others include high requirement for preparation fuel, time required to prepare, conservative attitude towards food types (e.g. difference in the utilization of soybean in Kenya and its adaptation comparable to Nigeria is what Ruth Oniang’o terms as cultural specificity of the West African food culture compared to East Africans (Oniang’o et al., 2003). The West Africans have distinctive tastes and would try out on their recipes) poor nutritional extension, inadequate knowledge of the extension agents on soybean agronomy, utilization and storage, few and rudimentary soybean processing industries. Poor sensitization of the crop, poor policy directions on the crop, retrogressive popular beliefs (claims that it can make men have feminine features and become homosexuals, probably because its main propagators have been American NGOs and the government agencies like USAID which in some quarters is accused of propagating homosexualism in African countries. There is also lack of knowledge among the extension agents on the crop agronomy, economic potential and nutritional value, uncommitted government agenda on the crop, macroeconomic dynamics of the crop affecting the comparative crop prices affecting demand for the crop from local industries. These combined factors have increased risks. Production of soybean in Kenya has also been hampered by its farm-gate price, fetching around Ksh. 50 (0.60 US$) per kg compared to Ksh 80 (0.93 US$) per kg for common beans (Tinsley, 2009). For a farmer to benefit then there is need for value addition. By adding value to soybean, prices jump to Ksh. 150 (US$ 1.8) per kg when converted to soybean products (Vandeplas et al., 2010). In addition, processing and trading of the crop is providing employment opportunities to many, spurring a cottage industry in the rural areas grown or traded (Tinsley, 2009). There is poor seed distribution unlike it is for maize. Farmers are propagating own seeds from previous season. The climate change is challenging to the crop and farmers. Grace et al, 2006 note that the current situation of malnutrition will worsen with the climate change and increased drought episodes.

OPPORTUNITIES AND THE FUTURE OF SOYBEAN IN KENYA

The future of soybean in Kenya is bright. Soybean is suitable in over half the landmass of the country: West Kenya, Central highlands and the coastal region. The Kenya Nutrition Policy 2012-2017 reiterates the need to halve the current malnutrition levels in the country, which soybean propagation can help meet. The current high rates of malnutrition in the country (35%) makes it easy to convince policy makers on utilization of the crop as an ameliorating malnutrition and hence enhance its production and utilization, provide funding and increase research on its growth areas, utilization, marketing and production. Eastern region for example has the highest number of children who are stunted (44%) (Kenya National Nutrition Action Plan, 2012) yet it has the highest potential for growing soybean in the country. The new constitutional dispensation that has brought governance and resources to the grass root encourages flexibility in policy change to suit local needs and address pertinent issues such as malnutrition. Soybean as a crop with its attendant externalities can be promoted to local policy makers for propagation of its use and production. There also are plans to incorporate soybean as a second crop in Sugar Industry (Kenya Sugar Board, 2012) A few industries are being set up such as animals feeds concentrates like one at the Dominion farms Ltd. in Siaya County. Some religious organizations such as the Seventh Day Adventist Church are playing a big role in soybean consumption in Western Kenya. Since 1929, it has given mandate to the now Adventist Development and Relief Agency (ADRA) to include health foods such as soybean in their relief effort and utilization among its adherents. There is still a huge demand for soybean crop, a gap that can be filled by local production. There is also potential markets in war torn countries around the world which need relief foods that can be supplied by local soybean companies. We already have varieties that have been tested and identified for distribution from KARI Njoro, for dry areas. There are many institutions undertaking research on the crop in the country including CABI, N2Africa, IITA, TSBF-CIAT among others. The Realization that it is a cheap source of protein has gained currency among the with right packaging and marketing as is done by Nestle, Proctor and gamble and Promidor with Sossi® brand of soy chunks and chips being popular. Involvement of NGOs in utilization and growing of the crop especially for women groups and those involved in HIV/AIDS patients’ management offers a confounding opportunity. Women have been contracted to supply these NGOs with many of such groups responding well due to immediate markets, good price, Ksh. 200 per Kilo and consistency in payment by these NGOs. There is also religious fervor in Utilization of soybean on health grounds especially with the Seventh Day Adventist Church.

CONCLUSION AND RECOMMENDATION

There is need to for the national and county governments...
to allocate of more funds for promotion of the crop as a nutritional savior to the current malnutrition levels in Kenya as well as an avenue for encouraging soybean industry. The governments should also develop a soybean policy, on marketing awareness, research on the high yielding disease and drought tolerant varieties in various agro-ecological zones in the country, promotion of soybean utilization awareness, value chain development, supply side and demand side, regulation and policy. There is need to increase seed multiplication and involve companies like the Kenya Seed company for seed multiplication and distribution like it is for maize. Positive: Changing sensitivities on healthy foods and need for healthy foods in the backdrop of lifestyle diseases need to be encouraged and further promoted while retrogressive attitudes are checked through spirit

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The farmers can be helped to improve production efficiency to compete with low priced soybean meal and other soybean products imports (Kolapo, 2011, Soybean opportunity for Africa, 2011).

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