Institutional context of soil information in Kenya

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Abbreviations and Acronyms

AFC- Agricultural Finance Corporation

AGRA- Alliance for a Green Revolution in Africa

AIRC-Agricultural Information Resource Centre

ASDS- Agricultural Sector Development Strategy

CAADP (Comprehensive Africa Agriculture Development Program

CBO- Community Based Organization

CEED-Center for Entrepreneurship and Enterprise Develop.

CIAT- International Centre for Tropical Agriculture

CRF- Coffee Research Foundation

DANIDA-Danish Development Assistance

FADECO-Family Alliance for Development and Cooperation

FAO-Food and Agriculture Organization of the United Nations

FBO- Faith Based Organization

GEF-Global Environmental Facility

HIVOS-Humanistic Institute for Cooperation with Developing Countries

ICIPE-International Centre for Insect Physiology and Ecology

ICRAF- International Centre for Research in Agro forestry

IFOAM-International Federation of Organic Movements

ISFM-Integrated Soil Fertility Management

KAFU-Kenya Association of Forest Users

KALRO-Kenya Agricultural and Livestock Research Institute

KEPHIS- Kenya Plant Health Inspectorate Service

KFA- Kenya Farmers Association

KGGCU-Kenya Grain Growers Cooperative Union

KIOF-Kenya Institute of Organic Farming

KJAS-Kenya Joint Assistance Strategy

KNTC-Kenya National Trading Cooperation

KOAN- Kenya Organic Agriculture Network

KOAN-Kenya Organic Agriculture Network

KSRF-Kenya Sugar Research Foundation

KSS- Kenya Soils Survey

MDG- Millenium Development Goal

MTIP-Medium Term Investment Plan

NAEP-National Agricultural Extension Policy

NASEP-National Agricultural Sector Extension Policy

NCPB-National Cereals and Produce Board

NEP- National Extension Program

PAN-Pesticide Action Network

PELUM-Participatory Ecological Land Use Management

SACDEP-Sustainable Agriculture Community Development Program

SIDA- Swedish International Development Cooperation

SRA-Strategy for Revitalizing Agriculture

TNC-The Nature Conservancy

TRFK- Tea Research Foundation of Kenya

TSBF-Tropical Soil Biology and Fertility Institute

UON- University of Nairobi

Background

Agriculture is the economic mainstay of Kenya and it contributes approximately 25% of the GDP, employing 75% of the national labour force (Republic of Kenya 2005). Research indicates that over 80% of the Kenyan population derive their livelihoods directly/indirectly from agriculture (FAO 2006, KIPPRA 2013). While Kenyans depend on agriculture not just for their livelihood, but also for their nutritional needs; agricultural productivity is said to be stagnating even as the population is increasing. This has posed challenges to food security in a country where two to four million people receive food aid annually[1]; statistics from the Food and Agriculture Organization, put this figure at 1.6million (FAO 2010). Much of the problem of food production in sub-Saharan African and in Kenya specifically, is as a result of soil-fertility depletion in smallholder farms (Sanchez 2002, Graffenried 2006, Kamau et al 2013). This depletion is attributable to multiple factors, and those that have been identified in different studies include: cultivation without adequate replenishment of plant nutrients in soil, and lack of access to sufficient quantities of quality inputs, compounded by the adverse effects of climate change and variability (Graffenried 2006, KIPPRA 2014).

To address the challenge of food security, various initiatives have been launched to improve soil health. To this end the government of Kenya through the Ministry of Agriculture, along with various stakeholders have initiated some processes which include: use of organic manure in combination with inorganic fertilizers (AGRA soil health programmes), Crop Diversification – mixed/inter cropping, Promotion of water & soil management measures, Water harvesting & supplementary irrigation, Green house farming, ISFM Programmes (KALRO, MoA, Tropical Soil, Biology and Fertility Institute (TSBF), Contour and Conservation Agriculture farming Agroforestry (VI-AFP and ICRAF) in Western Kenya. It is notable that despite these efforts, poor soil health still remains a challenge much more needs to be done.

The purpose of this paper is to provide research and analysis that will support rollout and implementation of large-scale soil rehabilitation efforts within German bilateral programs. To this end, this paper focusses on the institutional context that soils research and investment takes

[1] Country Profile Kenya http://www.feedthefuture.gov/country/kenya Accessed online 28/10/2015

place. The paper posits that farmers have significant and often sophisticated knowledge regarding soil quality in their own fields but lack access to the means to improve their soils. Consequently, they are constrained from applying new knowledge and techniques by: cost, a distrust of the promoted products, or the perception that ultimately these products will not help their soils. Accordingly, there are significant institutional challenges surrounding access to knowledge and inputs, but also delivery of quality products.

Methodology

The paper's methodological approach combines a qualitative analysis of the policy context as well as, grey literature, online articles sourced through Google Scholar, and Google web-based search engines. The references covered journal papers, academic and non-academic reports, government documents, donor reports, contents of web pages, policy documents and strategy papers. Data collection also included semi-structured interviews where face-to-face interviews were held with technocrats in the ministries, parastatals and institutions. The expected outcomes from these interviews are: an understanding of policy and law issues on soils, as well as, finding existing opportunities and weaknesses in the policy environment. Institutional studies were carried out in Nairobi district and these included: government ministries, non-governmental organizations, universities, and private firms dealing with soil health.

Literature Review

There has been some effort to address soil health by the Ministry of Agriculture and this has been mainly through donor funded programs. However, as noted from the interviews, donor funded initiatives are limited because, the program visions are not owned by the government rendering them unsustainable. Key informants revealed that the initiatives driven by donors were abandoned once donors withdrew funding. The reasons given for lack of follow through were varied, but the predominant one was lack of budgets.

The mode of funding notwithstanding, soil health interventions mainly take place through promotion of programs targeting soil erosion, promotion of agroforestry, and riverbank protection. Apart from donor initiated programs, other attempts to address soil health issues are demonstrable at the policy level. These have mainly been through: The Agriculture policy, Fertilizers and Soil Fertility Policy, The Sessional Paper on Soil fertility, Draft Bill on Fertilizers & Soil Conditioners (Spear headed by the Kenya Plant Health Inspectorate Services (KEPHIS). For example, the Draft Bill on Fertilizers & Soil Conditioners is envisaged to form the main

reference point for regulation of importation, exportation, manufacture and sale of fertilizers and soil conditioners. (The specific policies and their institutional context are discussed in a separate section in the paper.) In general, the policy formulation approach is multi-sectoral, and mostly centralized, with devolved structures provided for local implementation only. More recently, there has been devolution of responsibilities to the counties as part of the implementation process of county governance beginning 2013. This has specific transitional challenges since it is a radical shift away from the centralized structure that was in place previously. Indeed key informants revealed some of these challenges in as far as dissemination of extension services is concerned, as well as, planning and financing of specific county initiatives.

Overall, it can be argued that the approaches to address the soil health problem have been marginally effective especially at the policy formulation/implementation level and at the institutional level. This could be for varied reasons, but literature highlights the fact that there has been little inclusion of soil management in the Legal and policy framework in Kenya (see Achieng et al 2011). To this end, Achieng rightly argues that where policies have been in place, the same have been fragmented and not coordinated across sectors with similar mandates. Moreover, there is no routine policy analysis cycle in Kenya, nor is there a local core of experts available to undertake policy formulation and analysis (Yatich et al 2007). This problem has been compounded by transitional challenges from central government to county government, as there are teething problems and a disconnection between the two bodies. More than these reasons, there is poor use of information in the policy documents by planners (in the government) and quality data still remains a constraint since the national databases are few with little data to support the policy formulation process (ibid).

Besides policies, the institutions that support soils also remain central in soil health, because they are the bodies that disseminate knowledge to farmers and are also important because of the dual function in bridging blocked channels between scientists and farmers (Anderson 2008). It is true that the institutions themselves make little sense without the people that create and disseminate soil specific knowledge. The problem with institutions in the context of soil in Kenya, is that they are hardly effective since there is minimal interaction between extension officers, scientists and farmers. Effective teaching and successful extension delivery of soil fertility management practices lies with the competency of extension officers (Kimaru-Muchai et al 2013). There is limited interaction between farmers, extension officers, and research officers to enhance effective knowledge transfer. A better interaction between

scientists, extension officers and farmers would improve soil health since improved access to information is envisaged to increase adoption of soil fertility management practices (Kimaru-Muchai et al 2013). Presently, Kenya lacks suitable mechanisms for transferring the available knowledge from researchers to extension officers and ultimately to farmers'.

The existing extension system is argued to be part of a gradual evolution which has seen entry of the private sector, civil society organizations, NGOs and donors. These changes have shaped the management of extension services even though it is noted in this paper that the changes were nonlinear and were as a result of different events in the social, economic and political context of Kenya. Extension services mainly took place through training and visits because this approach gave more detailed information and personal advice such as advising on the optimal type and quantity of fertilizer for local soil conditions (Gautam 2000). It is observable that, 'Training and Visit' was the strategy used in the first phase of the National Extension Project I (NEP I) approved in 1983, and later in 1991 the National Extension Project II (NEP II) was introduced. The main objectives of these projects was institutional development of extension service delivery and increasing agricultural productivity. Public training institutions in the country offer services to the agricultural sector. They include universities, middle-level colleges and institutes, and farmer and pastoral training centers.

In Kenya, there are three basic models identified by NASEP even though these are basic categories that do not explain the related features and course content of different extension types. These are: one, free public extension services mostly to smallholder farmers engaged in growing staple foods and minor cash crops across all the agro-ecological zones, two, partial cost-shared provision of extension services, mostly within the public sector where limited commercialization has taken place and the third model is fully commercialized and mostly involving the private sector (e.g. private companies and cooperatives) and quasi-public organizations mainly for specific commodities such as tea, coffee, sugar, pyrethrum barley, tobacco, horticulture and dairy. Under this system, extension services are usually embedded in agricultural services (NASEP 2011). Extension services have staffing challenges since research highlights inadequacy in capacity building given that the human resource required to offer advisory services stands at 1:2000 beyond the recommended international ratio of 1:400 (NASEP 2011). The extension services offered, are discussed at a later section of the paper.

National Level Strategy Papers and Policy

Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management and Development

The goal related to soil conservation in the Sessional paper is, judicious use of resources through effective management of river basins that fully recognizes the contribution of forests and soil conservation innovations. This paper participatory approach to address the problem of poverty as per the poverty reduction strategy paper. The policy recognizes increased human activity in catchment areas as well as inappropriate land use within farmlands adjacent to forested areas. The policy seeks judicious use of resources through effective management of river basins so as to conserve soils and forests. The paper does not explicitly address soil health, rather, it seeks to address soil conservation.

The Agriculture Act, Cap. 318

The Agriculture Act, Cap. 318 of 1986 (revised) is the principal agricultural law with the primary objective of promoting agriculture. Section 14 of the act mandates, the Ministry of Agriculture to deal with issues of soil health management. Therefore, the Ministry prohibits land use that results to soil erosion. The Agriculture act (the principal agricultural law) mandates the Ministry of Agriculture to deal with issues of soil health management, giving the ministry the authority to prohibit land use systems that contribute to soil erosion. The structure of the Ministry of Agriculture seems fairly good. However, it is notable that even as there is a fairly good structural framework to implement the policy, this is never effective as there is lack of resources to monitor and implement sanctions on violations of land uses (Mumma 2003). Moreover, the Ministry can be criticized for a stronger focus on land use than soil health per se. The Agricultural Act is argued to be the single most authoritative land use legal document, since the framework of the act is on controls of land use (Odhiambo and Nyangito 2002). The Agricultural Appeals Tribunal established under the Agricultural act arbitrates conflicts on land preservation and land development order. Other institutions are the District Land Control Boards, the Provincial Land Control Appeals Board and the Central Land Control Appeals Board. Other relevant organizations in enforcement of agricultural law, and not necessarily within the auspices of boards or tribunal, are the Agricultural Finance Corporation (AFC) and the Director of Agriculture (ibid).

In as far as the budget is concerned, the figure below gives a snapshot of Kenya's investment in agriculture. The figure was adapted from the MAFAP report 2014.

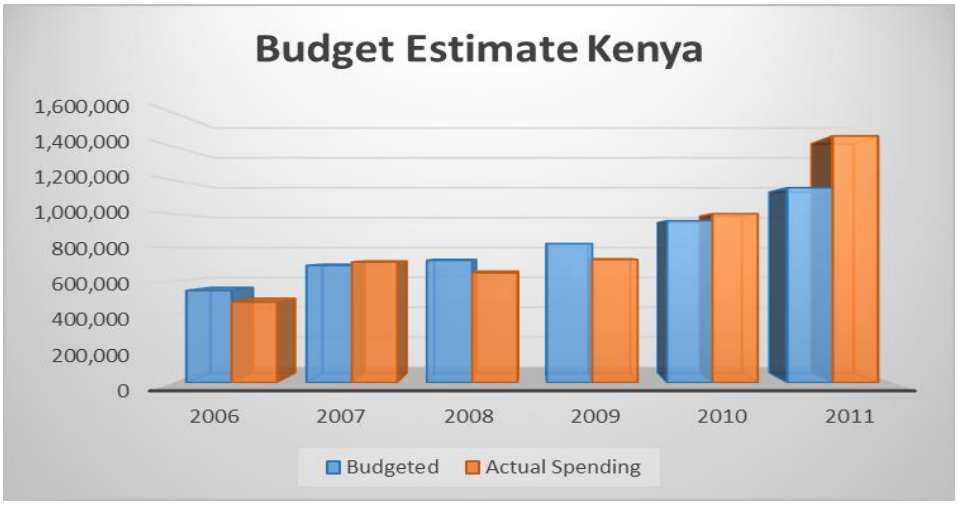

Figure 1: Budget estimate versus expenditure

Budget allocation most of the time is less than the expenditure except for 2009, this has been explained in part, by the 2007/8 election related disruption of food production and supply. This made it necessary to increase allocation and expenditure so as to ensure food availability. Agriculture-specific expenditures accounted for approximately 60 percent of total expenditure in support of food and agriculture sector development for the 2006/2007-2012/2013 period (MAFAP 2014).

The following figure was adapted from the MAFAP report 2014.

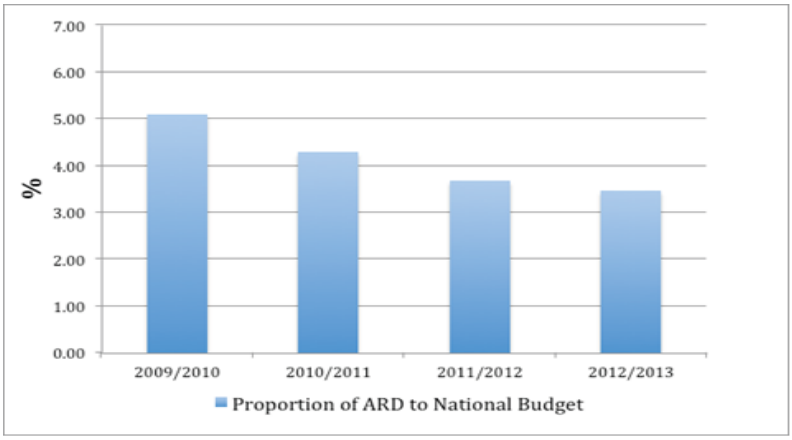

Figure 1: Agriculture Budget as a Share of National Budget

Over the 2009/10-2012/13 period, Kenya's total budget increased by 131% reaching Ksh 1,459.9 billion in 2012/13 from Ksh 634 billion. Over the same period, the total budget of the ARD sector only rose by 56.6% to reach Ksh 50.4 billion in 2013. But despite the growth of the ARD budget, as a ratio of the total budget it declined considerably from 5.1% in 2009/10 to 3.5% in 2012/13. Kenya falls short of meeting the Maputo declaration of allocating 10% of its budget to the agricultural sector. This is also contrary to policy reports and declarations that consider agriculture as Kenya's economic mainstay (ibid)

The Medium Term Investment Plan (MTIP)

The MTIP came out of an extensive participatory national consultation process coordinated by the Agricultural Sector Coordination Unit. Premised on Vision 2030, it extends the strategy papers developed over the previous years for example: the 2004 Strategy for Revitalizing Agriculture, the 2010 Agricultural Sector Development Strategy, and the CAADP (Comprehensive Africa Agriculture Development Programme) 2010. Overall, it is a reflection of the government's sector wide approach to agricultural and food security enhancement. Its critical pillars for investment include: increasing productivity, commercialization and competitiveness, promoting private sector participation, promoting sustainable land and natural resources management, reforming delivery of agricultural services, increasing market access and trade, and ensuring effective coordination and implementation. It encapsulates integration of infrastructure and management practices for climate proofing and resilience (which also includes soil restoration and conservation) that is prioritized in the ASDS and CAADP Compact.)

The first pillar seeks to increase productivity, commercialization and competitiveness whereas its rationale and prioritization criteria focuses on activities that feature strategic combination of technical advances with institutional innovations. This has been done with the aim of building robust technologies in specific areas such as soil and water management. The other related pillar is the investment pillar that seeks to promote sustainable land and natural resource management. Notably, the pillar seeks to support activities that promote sustainable management of land and other agriculture-related natural resources that are under growing population pressure, and these include: soil improvement, new crop and livestock varieties and farmer collective action in value chains.

The MTIP identifies challenges and opportunities that cut across the six investment pillars and these are: policy and institutional reform, gender, food security and nutrition, the role

of the private sector, research and extension, climate change adaptation, and capacity development. Soil is mentioned in regard to its restoration and conservation as a part of the climate adaptation framework to address the challenge of climate change. It is noteworthy that issues on soil health are not addressed exclusively even though soil conservation is mentioned in the plan. Overall the investment plan seems like a useful approach that provides the road map to execute written policy. However, it still remains questionable to what level this platform is being leveraged.

Early Initiatives to Address Soil Health

The Ministry of Agriculture and Rural Development developed a comprehensive National Soil and Water Conservation Program which started on an experimental basis in 1974, the program lasted up to the year 2000. Originally funded by Swedish International Development Agency (SIDA), its activities focused on water catchments and other degraded areas this included development of soil conservation structures in sloppy and degraded areas. During this time much focus was on the Arid and Semi-Arid Lands.

In as far as other initiative are concerned; these are, capacity building for agricultural extension services personnel. Specific intervention measures were also undertaken for degraded lands outside the designated catchment for rehabilitation, and this included the Integrated Soil and Water Conservation Component of the Lake Victoria Environmental Management Program which dealt with environmental management of the Lake Victoria catchments. The program relied significantly on the agricultural extension services with the specific role of disseminating technology and improving land husbandry practices. The core of the project was to improve arable land through building terraces, a technique dabbed “fanya juu” (Mutisya 2010). This ‘fanya juu’ initiative was later replaced with more focus towards agroforestry. Overall, the program was argued to have been successful in communicating simple extension messages that were easily understood by farmers. Its major undoing its unsustainability since it provided free farm tools and inputs and these could only be supplied for a limited period.

Regarding policy initiatives, although Kenya has numerous legislation governing land use and management, there is no concise national policy framework that governs the health of soil in as far as soil content is concerned. To this end there is neither provision of subsidy to farmers nor mandate for them to conduct soil tests and analyses. Nevertheless, a number of Policy and bills are under preparation, of importance are the: Fertilizers and Soil Fertility Policy, through

development of a Sessional Paper on Soil fertility and a draft Bill on Fertilizers & Soil Conditioners, these have the aim of, regulating importation, exportation, manufacture and sale of fertilizers and soil conditioners.

Institutional Framework

To understand the institutional context within which soils research and investment takes place it is important to understand the socio-political context in which the institutional context is embedded. The diversity of tenure regimes in Kenya has had major implications on soil health since these regimes have shaped various forms of farming which could include: ranching, plantation agriculture, family farms, communal farming, contract farming. In return, each of these forms of farming has different effects on how soil is used, managed and conserved. Understanding the political context helps in appreciating the institutional challenges that surround policy development and implementation. The current agricultural policies remain connected to established historical narratives. In written records, the history of soil conservation in Kenya dates back to colonial eviction of the local people as The British settled into fertile lands and introduced new crops such as maize, beans, coffee, tea, cotton, tobacco, and pyrethrum (Mutisya 2010). The shifts in sectorial policies and the institutions around soil can be classified in three phases. The first phase was between 1898 and 1963. During this period policies and laws were made with the view of enhancing production, preserving soils and wildlife. It is also good to note that these policies were observed to the letter through direct rule by the British Colonialists. The next phase from 1963 to 1983, when Kenya gained independence and adopted the rules that were previously governing the country. British authorities sold most of the farms in the white highlands to the new Government which later sold them to native farmers through a native's settlement scheme. The government availed loans to the natives to purchase the farms and start intensive commercial agriculture. Post 1983, the government adopted the institutional framework that was in place, and this generally shaped the present framework. Smith et al (2004) in their study examining the political context in which policies are embedded in Kenya and to this end, posit that influence of the patrimonial system of politics meant concentration of power in the presidency. This meant that policy formulation and implementation were dependent on presidential approval. Presently, despite changes in the constitution, the presidency still has significant powers to influence policy formulation and implementation. For example, despite establishment of regional development authorities, there are no guidelines to operationalize any recommendations. The regional development authorities

still draw their mandates from respective Acts of Parliament (ASDS 2010). More than this, ethnicity which largely shapes the political landscape has molded agricultural policy. This ethnicization of agriculture is a result of the historical linkages which have been significant in shaping agricultural policy (Smith et al 2004).

Apart from ethnicity, the processes and the procedures in policy development and implementation are seen to have issues on governance since they are bureaucratic and serve personal interests. Nyangito and Okello (2006) highlight the fact that the institutional framework is influenced by a political elite, who have stake in public institutions and resources and they use this influence to serve their private interests. The implication is increased corruption and poverty with declining public institutions. With these governance issues there has been reluctance to embrace change in the agricultural sector. Indeed in looking at the political context of Kenya it is evident that policies are not neutral and are "...the product of the interested actions of private parties who bring their resources to bear upon politically ambitious politicians and the political process" (Bates, 1989: 5). Key informants have highlighted corruption as a hindrance to development of policies that served farmers. One example of how corruption in the political context shapes the implementation of policies is the, 'Shamba System' which was introduced in Kenya in the 1900s. The system seen as the best approach of plantation development was initially supported by politicians, however, with time politicians began using it strategically to allocate land to family and clan (see Yatich et al 2007).

Even as agricultural policy has been shaped by the local politics in Kenya, external influence cannot be ignored. Developments in the international scenario have contributed to shaping the agricultural policy, for example the onset of neoliberal policies. There is less government support for institutions and at the same time there is significant entry by private firms who venture into soil health for profit purposes. Besides this, the present institutional framework lacks a strong consumer driven regulatory framework that ensures quality of soil inputs at competitive pricing. Because of inefficiencies in the market, prices are raised upward thus excluding poorer farmers from purchasing (policy brief 2014). As well, most of the soil inputs are adulterated because of limited quality checks. Beyond this, the country lacks organic fertilizer processing plants and there are no policies in place to establish these plants (ibid).

Institutional Challenges

Institutional challenges exist in as far as the following are concerned: capacity to train in emerging areas such as husbandry of indigenous animals and plants, organic farming and advanced bio-technology, as well as soils. In as far as extension services are concerned, there is limited employment opportunities in the public and private sectors and these have been attributed to the low overall enrolment in agricultural training institutions. It is noteworthy that there are very few females enrolling compared to men. Improving the skills and scope of knowledge also remains a challenge. The legal and regulatory framework remain a challenge to the development of the agricultural sector as there are adulterated soil inputs in the market (Agricultural Development Sector 2010).

The main institutional constraints in research development, include: low dissemination and decreasing investment in agricultural research by both public and private sectors, ineffective institutional mechanisms to address weaknesses in research–extension– client linkages; including ineffective knowledge transfer mechanisms, ineffective coordination of technology development institutions, and inadequate documentation facilities and information dissemination at all levels (NASEP 2011). Conventional knowledge transfer approaches are based on the linear approach of scientist – extension – farmer linkage, which neglects scaling-up/out of research results to other players in the soil health context. At the national level, there is no forum to provide technical knowledge and guidance to policy makers on the best approaches to disseminate ISFM Knowledge or innovations as is the case with crop breeder.

In its bid to enhance policy effectiveness, the government established a National Integrated Monitoring and Evaluation System which has the objectives of measuring efficiency of governments and effectiveness of its policies. Its usefulness remains is yet to be seen.

Strategy for Revitalization of Agriculture

The Government developed and launched the SRA in March 2004 with the objective of transforming agriculture into a profitable activity. The paper highlighted a shift from subsistence agriculture to agriculture as a business that is profitable and commercially oriented. It also gave policy direction and actions that needed to be taken in each agricultural subsector to achieve the vision. The paper was later revised to the Agricultural Sector Development Strategy.

Agricultural Sector Development Strategy

The agricultural sector strategy was developed with the purpose of positioning agriculture as the key driver for delivering annual economic growth as envisaged in the Vision 2030. The document was developed as a revision of the Strategy for Revitalizing Agriculture (SRA). The overriding goal of the strategy is to achieve progressive reduction in unemployment, poverty, and food security. The strategy outlines the agricultural policies, institutional reforms, and programs and projects that the Government will implement in the short and long term to achieve this goal. Soil health is not mentioned much in this strategy document, in the few instances that soil is mentioned, erosion is highlighted as a major constraint. For example, soil erosion is considered a constraint in implementing the national climate change response strategy, and on conserving river banks, water bodies and catchments. The proposal to address these challenges include: formulating and implementing appropriate policy and legal frameworks, improving agribusiness and market access, strengthening research, extension and training, improving land use and crop development, enhancing farmer access to affordable inputs and credit and enhancing institutional efficiency and effectiveness in implementation and service delivery. Improving land use and crop production seeks to enhance land management through promoting development and adoption of soil and water conservation measures.

Existing Policy Initiatives

The Agriculture Policy

Policies have considerable impact on the practices employed by farmers, either encouraging or hampering investment in sound soil health strategies. The agricultural policy is complex as encompasses different subsectors. Under the old Constitution agriculture was managed under about 10 different subsectors: food and industrial crops, horticulture, livestock, fisheries, land, water, cooperatives and marketing, environment and natural resources, regional development, and development of arid and semi-arid lands (KIPPRA 2013). The main objective of the policy is to increase productivity and income for smallholders, enhance food security and equity, increase irrigation to introduce stability in agricultural output, commercialize and intensify production and enhance environmental sustainability. The key areas of concern for the policy are: increasing agricultural productivity and incomes especially for small-holder farmers, its emphasis is on irrigation to reduce over-reliance on rain-fed agriculture in the face of limited high potential agricultural land, it encourages diversification into non-traditional agricultural commodities and value addition to reduce vulnerability, enhance food security and a reduction

in the number of those suffering from hunger and hence the achievement of MDGs, it encourages private-sector-led development of the sector, ensuring environmental sustainability. The critical concerns that the policy addresses includes: Declining agricultural performance, Limited high potential agricultural land and over-reliance on rain fed agriculture, Limited diversification of Agricultural production, Poor and inadequate rural infrastructure, Inadequate and declining research in agriculture, Agricultural sector financing and related activities, Limited development and exploitation of the livestock sector, Lack of a comprehensive land use policy. The policy does not explicitly focus much on soil, in fact, it has been criticized to have an over emphasis on the protection of property rights with little provision for the regulation of the rights in the interest of soil conservation (see Nyangito and Okello 2006).

National Environment Policy

The process of formulating the National environmental formulation process started in 2007 but slowed down towards the end of 2008 after thorough stakeholder consultations. The promulgation of The Constitution of Kenya 2010 and the emergence of issues like climate change brought a new push not only to align the policy with the Constitution but also to address such emerging issues[2].

A wide range of individuals and institutions in the private sector, academia, civil society and government agencies have participated in the process. In as far as soil is concerned, the policy identifies poor soil and water management practices as an activity that contributes to environmental degradation. The policy statements regarding soil conservation and management include:

- Develop and implement a National Soil Conservation Policy (it is noted that this is in progress 2015)
- Promote and support eco and organic farming so as to maintain soil fertility.
- Ensure the protection of wetlands, riverbanks, hilltops and slopes from unsustainable practices to prevent soil erosion and environmental degradation.

[2] The National Environment Policy 2013

- Promote good soil management practices to avert landslides, mudslides, floods and other disasters that are preventable.
- Involve and empower communities in soil conservation

The document outlines an implementation strategy

- Institutionalize cooperative governance and integrated approach to the management of the environment and natural resources by explicitly identifying and integrating environmental considerations in relevant sectoral and cross sectoral policies, laws, planning and development process.
- Ensure synergies between National and County Development planning processes.
- Institutionalize strategic environmental assessments approaches to all policies, programs and plans.
- Ensure that all significant development projects are subjected to Environmental Impact Assessment and regular environmental audits

The policy is comprehensive as it outlines key statements as well as an implementation framework. However, since soil is subsumed in the discourse of natural resource management, it remains a challenge to see how soil health can be addressed by this specific policy.

Land Policy

The National Land Policy was developed through a consultative process and its vision is to, “guide the country towards efficient, sustainable and equitable use of land for prosperity and posterity”. Stakeholders from public, private and civil society contributed towards the policy formulation through thematic groups based discussions, regional workshops and written submission. The policy paper focusses on land ownership, land use, administration and management. In as far as land use management is concerned, the policy stipulates that it shall restore environmental integrity of land and facilitate sustainable management of land based resources, to this end it shall:

- Introduce incentives to encourage the use of technology and scientific methods for soil conservation

- Encourage use of traditional land conservation methods
- Establish measures to control degradation of land through abuse of inputs and inappropriate land use practices
- Establish institutional mechanisms for conservation of quality of land for environmental conservation purposes.

The land policy regulated under the Environmental Management and Coordination Act of 1999, is an integrated approach to management of land, policies, regulations and laws that deal with natural resources (soils is incorporated in this). It establishes appropriate legal and institutional mechanisms for the management of the environment. It provides for improved legal and administrative co-ordination of the diverse sectoral initiatives in order to improve the national capacity for the management of the environment. This is in view of the fact that the environment constitutes the foundation of national economic, social, cultural and spiritual advancement. This is compounded by the lack of a well-coordinated land management policy with respect to various land uses. The act, highlights specific actions to be taken so as to conserve soil. It stipulates that each district have a District Environment Committee that is responsible for management of land and soil. The Minister is also mandated in consultation with the relevant lead agencies, to develop, issue and implement regulations, procedures, guidelines and measures for the sustainable use of hill sides, hill tops, mountain areas and forests and such regulations, guidelines, procedures and measures shall control the harvesting of forests and any natural resources located in or on a hill side, hill top or mountain areas so as to protect water catchment areas, prevent soil erosion and regulate human settlement

Fertilizer Market Policy

Before 1990 the main input agencies were KGGCU (Kenya Grain Growers Cooperative Union), KFA (Kenya Farmers Association) and the KNTC (Kenya National Trading Cooperation). During this period, government control was heavy with imports being poorly coordinated hence leading to deficits and in some cases surplus of fertilizer. After 1992, during the neo liberal era when Kenya adopted the Structural Adjustment Programs and liberalized its markets to including the foreign exchange regime. During this liberalization period, state and donor imports declined significantly. In 2008, the market was characterized by high world prices for fertilizers and the food crisis was further worsened by the postelection violence that happened in the country. The government (National Cereals and Produce Board) responded to this crisis through distributing

subsidized fertilizer. It also led policies on fertilizer to enhance fertilizer use to support smallholder farmers and to increase private-sector investment in fertilizer retailing. It is notable that this policy focusses more on control of the market than on soil health in particular.

The ministry realized 6 Policies and 4 Acts of Parliament between late 2011 and early 2013. The overall aim of these legislations is to create a more business-oriented and efficient sector to boost food security interventions (MAFAP 2014)

Table 1: Policies and Acts of Parliament

Policy	**Year**
National Agriculture Sector Extension Policy	2012
National Seed Policy	2011
National Horticulture Policy	2012
National Food and Nutrition Security Policy	2012
National Agribusiness Strategy	2012
National Agricultural Research System Policy	2012
Acts of Parliament	
Agricultural, Fisheries and Food Authority (AFFA) Act	2013
Crops Act	2013
Kenya Agricultural and Livestock Research Act	2013
KEPHIS Act	2012

Source- MAFAP (2014)

Other Initiatives to Soil Health

Soil Cares

Soils care is an initiative by a private organization that supports: individuals, cooperatives, agricultural entrepreneurs, to improve their agricultural production through soil analysis. According to their mission statement, they want to empower clients to take good care of their soils to enhance production. It is part of Dutch Sprouts an Investment fund founded by the former owner of BLGG Group, one of the leading agricultural laboratory in the Netherlands. It

mostly caters to large producers since most small scale farmers are unable to afford their services.

KEPHIS- Is a government parastatal whose responsibility is to assure the quality of agricultural inputs and produce to prevent adverse impact on the economy, the environment and human health. In regard to soil, the institute conducts soil analysis for fertility evaluation and fertilizer use recommendations. It also undertakes manure and organic compost analyses.

CROPNuts-Is an agricultural testing laboratory that offers a wide range of laboratory services which include:

- Soil testing and soil fertility correction with fertilizer recommendations
- Soil Mapping and Variable rate prescriptions- grid sampling of soil for creation of pH nutrient maps
- Pre-planting available nitrogen-topsoil and subsoil sampling
- Training programs on soil health

The laboratory works with forty agents to increase their reach. However, being a private organization that is for profit, it may not reach the smallholder farmers who cannot afford the services they offer.

KALRO- Comprises semi-autonomous institutes established under the Kenya Agricultural and Livestock Research Act of 2013. This Act empowers the Cabinet secretary, in consultation with the KALRO Board to establish research institutes that may be necessary for the performance of KALRO's functions under the Act. The Act also recognizes the role of public universities in agricultural research and provides for partnerships with them as associate research institutes. Currently, sixteen research institutes have been established. Soil research is conducted in the Arid and Range Lands Research Institute. The Institute provides laboratory analysis for soil and fertilizer, it also does farm visits and training.

KENYA SOIL HEALTH CONSORTIUM- Was established by AGRA and KALRO among other stakeholders. It is an initiative of key agricultural actors to solve the problem of food insecurity and poverty through bringing together all the professionals, industrial actors and market players in the agricultural value chain to consolidate, synthesize and develop effective messages key in revolutionizing agricultural production in Africa.

The consortium seeks to:

I. Improve access by smallholder farmers and other stakeholders to ISFM innovations

Through

- Establishing a one stop ISFM repository
- Establishing and maintaining links with closely related programs and initiatives
- Establishing and formalizing a stakeholder forum
- Undertaking a synthesis study to document specific constraints to farmer adopting ISFM practices

II. Enhancing generation and dissemination of ISFM innovations

Through

- Building capacity of ISFM specialists in NARS and development programs to consolidate and harmonize ISFM KITs or innovations
- Harmonizing ISFM innovations (approaches, recommendations and protocols)
- Publishing harmonized ISFM innovations through publication of Content specific flyers and technical briefs Develop a biannual Digest of ISFM activities in the country

III. Advancing the dissemination of ISFM innovations by developing and hosting the national ISFM database and appropriate knowledge products

Through

- Collecting and compiling existing ISFM knowledge products for end users
- Building capacity of ISFM innovation generators (research) and disseminators (extension) to develop harmonized knowledge products
- Preparing harmonized ISFM knowledge products
- Publishing knowledge products for end users.

AGRA- Supports soil health through its program the Soil Health Program funded by Bill and Melinda Gates Foundation. The main objective of the program is to promote ISFM among smallholder farms. Established in 2008, the main aim of the program was to:

- Create physical and financial access to appropriate soil nutrients and fertilizers for about 4.1 million smallholder farmers in Africa.
- Improve access to locally appropriate ISFM knowledge agronomic practices and technology packages to targeted African smallholder farmers in an efficient, equitable and sustainable manner.
- Influence a national policy environment for countries to invest in fertilizer and ISFM.
- Strengthen capacity of national institutions.

The Four thematic sub-groups are:

- ISFM scale-out-Dissemination of ISFM technologies and scaling up adoption- leverage field days, demonstration plots to reach out to farmers
- Extension and Advisory- Supporting of extension services into AGRA programs
- Fertilizer supply and policy – Expansion of agro dealer networks that improve farmer access to fertilizer, fertilizer quality control systems improved and port operations. Work with national governments and development partners to identify, prioritize and address critical soil health policy bottlenecks that limit the supply and use of fertilizer and other integrated soil fertility management technologies.
- Training and Education- strengthening human capital for soil health research and extension activities primarily by supporting postgraduate degree training as well as vocational training for lab technicians.

Its engagement in the soils and institutions context is fairly extensive even though its support is not extended to government extension workers. This is a gap that could be filled by stakeholders.

KSS-Kenya Soils Survey

The Kenya Soils Survey (KSS) undertakes research on soil fertility and it collaborates with international institutions. It mainly conducts research on land resources (soils and land use)

even though it is believed to have no clear coordination mechanisms among partners and soil information is not easily accessible. (African Conservation Tillage Network)

The Private Sector

Soil fertility and management have also been supported by the private sector. For example, the initiative undertaken by Kenya Electricity Generating Company Limited (KenGen), East African Brewers, Coca Cola and the Nairobi Water Company through the Nairobi Waterfund Project. The project is being implemented through a public-private partnership led by The Nature Conservancy (TNC), which has its headquarters in the United States. In February, 2015, Safaricom partnered with the Ministry of Agriculture, Livestock and Fisheries and developed the E-Fertilizer Subsidy that is an electronic platform used to distribute fertilizer to farmers. Farmers are expected to receive electronic vouchers on their cell phones and these are to be redeemed appointed stockiest at a discounted rate. Toyota Tsusho Corporation is expected to construct a fertilizer plant in the country.

Extension Services

The role of extension services are wide-ranging and in the case of Kenya, they are diverse. They include: sharing various forms of knowledge, technology and agricultural information, and linking farmers to researchers and new forms of agricultural knowledge. Agricultural extension services in Kenya go as far back as the early 1900s when Kenya was a British Colony. Its notable success was on the dissemination of high breed maize technology in the late 1960s and the 1970s[3]. It was initially dominated by the public sector but this changed after Kenya gained independence and was much more prominent after implementation of ne0-liberal policies.

At its inception, extension services were implemented through an approach that was coercive. However, after independence, this developed into a more persuasive and educational approach (NASEP 2011). During the period of 1980s Kenya received support from the World Bank to implement Structural Adjustment Programs to address its structural weaknesses in the economy. It was during this neoliberal era that, (the period that saw declined staffing levels as well as reduced facilitation of public sector extension), the government was under pressure to

[3] Agricultural Extension and Advisory Services Worldwide, http://www.worldwide-extension.org/africa/kenya/s-kenya

scale down funding towards extension services, meaning less support for extension services. Indeed up the 1980s extension service was well staffed up to the sub-location level, and adequately facilitated to perform its duties, and the last years have seen a significant decline (ibid).This lack of support is still evident as staffing and funding remains low. The ratio of frontline extension worker to farmers is about1:1000 compared to the desired level of 1:400 (NASEP 2011). Partnerships with the private sector have not been strengthened, and in the absence of effective private sector operations to fill the vacuum, the situation has led to reduced spatial coverage. Gautam (2000) rightly observes that in the Kenyan communities, extension services does not reach the areas where services are inadequate—mostly low-potential and poorer area. Subsequently, while NGOs are active in these areas, extension services remain unreachable. Apart from this, some of these NGOs charge a fee, although indirectly, as a membership fee for a group (p.11). Extension services are sporadic and irregular especially among the poor (ibid). It also notable that the objectives of private extension are not always aligned with those of the public extension system since private extension services are always geared towards respective priorities in different organizations (Muyanga and Jayne 2006).

Apart from being affected by neoliberal policies, the extension system has structural challenges, regarding its top down, paternalistic and bureaucratic management system (Muyanga and Jayne 2006). Generally, extension services are not formally guided as there is not code of ethics and working standards for extension service providers. In a bid to counter this, the National Agricultural Extension Policy (NAEP) was developed with the idea that, it was the basis for all extension work within the government and its interaction with other stakeholders in agricultural research and development. The policy was put in place in 2001 and it was premised on demand driven extension services (services provided were based on what farmers needed). It was operationalized through National Agricultural and Livestock Extension Program and its Implementation Framework. While the approach attempted to include the interest of farmers in extension services, it has been criticized for lacking clarity in the roles of different stakeholders.

In regard to how extension services meet demand, Kenya has three major types of extension systems: one focusing on mainly food crops, the second one on commodity based systems run by government parastatals, out grower companies, and cooperatives and the third one is privatized agricultural extension initiatives provided by private companies, non-governmental organizations (NGOs), community-based organizations (CBOs), and faith-based

organizations (FBOs). Their focus remains broad depending on what the particular organization is pushing for. It is notable that there are no specific extension services dealing with soil health. Soil is still considered as a natural resource related issue, and as such, while extension officers are trained on soil and water conservation there is no specific delivery mode for knowledge on soil health.

In regards to operations, public extension services are operated through a centralized, hierarchical, and bureaucratic framework. Moreover, funding remains a challenge since public extension services are mainly funded through donors (Muyanga and Jayne 2006). By contrast, private extension services are mainly operationalized through conveying information about the respective technologies and products that a specific company is promoting. A good example is the Dutch Sponsored Soil Cares and CropNuts- there are also private non-commercial extension providers who rely on the government research institution such as KALRO for technologies, some have established links with other private companies as well as international research centers such as International Centre for Research in Agro forestry (ICRAF) and International Centre for Insect Physiology and Ecology (ICIPE) (ibid).

In as far as the public sector is concerned, some of the major institutions that are involved in extensions services include: the Ministry of Agriculture, Kenya Agricultural and Livestock Research Organization, Kenya Sugar Research Foundation, Coffee Research Foundation (CRF), Tea Research Foundation of Kenya (TRFK), Kenyatta University, Nairobi University, Center for Entrepreneurship and Enterprise Develop.

In as far as International/donor Organizations are concerned, the following have been involved: International Livestock Research Institute, and GIZ – Promotion of Private Sector Development. The NGO's involved include: Care – Kenya, Sacred Africa, World Vision, Catholic Relief Services and Winrock International Institute for Agricultural Development

The extension services that have been used include:

- Focal area and farmer field schools
- Face to face extension
- On farm demonstrations
- Agricultural shows

- Field days
- Film shows
- Adaptive on- farm trials and
- Mobile training units

Below is a table demonstrating the education levels of extension officers in Nairobi.

Table 2: Human Resources in Public Extension Service

Major Categories of Extension Staff	Secondary School diploma		2-3 yr. Ag diploma		B.Sc. degree		M.Sc./IngAgr. degree		Ph.D. degree	
Gender	F	M	F	M	F	M	F	M	F	M
Senior Management Staff					246	553	48	59		4
Subject Matter Specialists (SMS)					1023	2063				
Field Level Extension Staff			472	992						
Information, Communications & Technology (ICT) Support Staff				10						
In-Service Training Staff										
Total Extension Staff: 5470			472	1002	1269	2616	48	59		4

Source: IFPRI/FAO/IICA Worldwide Extension Study, 2011

Majority of extension workers have minimal training at the Diploma level, most have training at the Undergraduate degree level with very few males at the Masters level and no women at this level. In all the levels it is notable that there are more men compared to women. The trend in gender disparity is not surprising as literature review demonstrated the same. The ratio of

extension workers to farmers is inadequate, giving room to maneuver to collaborate with the government and train more extension officers.

Some of the challenges in extension services specific to the public sector include: Declining human capital and financial resources for public extension without a corresponding private sector input, uncoordinated pluralistic extension service delivery, and poor linkages with extension facilitating factors[4].

Overall, based on the interviews with key informants and extension workers in the Ministry of Agriculture, the main impediment is choice of an appropriate and dynamic approach that is context specific and considers the farmers local context in as far as the use of natural resources, and the social environment is concerned.

Donor Involvement in Extension Services

After Kenya's independence, donors were still interested in supporting the agricultural sector. SIDA was involved in agricultural extension along other donors including GIZ, and DANIDA. However, information from key informants revealed that the objectives of each donor were not well aligned and there was need to streamline objectives and minimize duplication. The tensions that arose from these relationships led to the formation of the Kenya Joint Assistance (KJAS). It consists of 17 development partners who meet among themselves each month in the Development Coordination Group, chaired by the World Bank. The Harmonization, Alignment, and Coordination Group, which includes the Ministry of Finance and the Ministry of Planning and National Development, actively promotes the aid effectiveness agenda. KJAS partners are supporting interventions in the six priority areas of the Strategy for Revitalizing Agriculture and those of concern to this paper include:

- Reform of the legal and regulatory framework
- Support reform of Kenya's research and extension services to strengthen the link between farmers' demands and supply of improved technology and advice. Emphasis will be placed on promoting environmentally-sound technologies that enhance soil quality and improve the management of water resources
- Improving research and extension services

[4] National Agricultural Sector Extension Policy

- Support reform of Kenya's research and extension services to strengthen the link between farmers' demands and
- Supply of improved technology and advice
- Increasing access to inputs and financial services
- Enhancing food security, and strengthening access to markets.
- Significantly reducing corruption, improving public financial management, and reforming the public administration.

In as far as soils in concerned; KJAS support the government's efforts to promote sound management of land and soils through, the Global Environmental Facility (GEF).

NASEP

The National Agricultural Sector Extension Policy was developed by key sector ministries with the objective of making extension services more effective and efficient. Its focus was on participatory driven extension services aimed at reducing the top down regulation of extension services and including the farmers' voice. The policy was officially launched in 2012 and its framework has been harmonized with the provisions of the Constitution of Kenya 2010. Kenya Vision 2030, and the ASDS 2010-2020.The critical focus areas include: Training of extension officers, developing information system networks, implementing participatory M&E in extension, and strengthening inter-sectoral planning. In the policy document, soil is considered under Sustainable environment and natural resources management where soil is to be taken care of through "good practices… on soil" even though it is not articulated what it means to take care of soil through good practices. The approaches espoused in the policy document include: promotion of stakeholder participation, clear accountability, taking into account indigenous knowledge, addressing agro-ecological diversity.

The policy implementation process is coordinated by the Agricultural Sector Coordination Unit and is guided by the National Agriculture Sector Extension Policy Implementation Framework (NASEP-IF) which also shapes content and choice of extension messages. Extension services have focused more on production aspects with little regard to marketing, value addition and quality and standard of inputs and generally soil health. This has been in part, because of lack of expertise among extension agents as well as weak as an uncoordinated extension approach at the grassroots level.

In general, the present system could be improved, since the current extension system is not entirely effective and efficient in delivering the needed services to farmers since the institutional design lacks focus on active farmer participation. Beyond this, the extension system lacks adequate operational funding, there is no attention paid the quality of the relationship between field extension workers and farmers, and the service delivery is uncoordinated.

Training

The level of technical support in key training institutes and in rural extensions agents throughout the country, is limited as there are only two tertiary colleges that exclusively support agricultural extension services, namely: The Bukura Agricultural College (based in Kakamega and the Kenya School of Agriculture (based in Nyeri). Bukura Agricultural College is a middle level training college with the mandate to offer diplomas in agricultural education and related fields. The Diplomas offered are divided in different sections and they include: Agriculture and Biotechnology, Animal Production and Health Management, Agricultural Extension and Community Development, Agribusiness Management and Marketing. Agricultural Irrigation and Drainage Engineering, Horticulture, Food Science and Nutrition (see annex one for the full curriculum). Soil health and fertility does not have its section as it is subsumed in Agriculture. An overview of the course content of the Agricultural Extension and Community Development Section reveals that while there are many taught courses, soil health and fertility is not a standalone course.

Apart from these institutions, training is also supported by the other bodies like the private sector and NGO's. An example of an NGO is the Kenya Institute of Organic Farming. The institute offers training on soils and agricultural extensions. It offers certificates in Organic Soil Maintenance, Diplomas in Organic Soil Fertility Management. It operates in Kenya and East Africa, and was established on 1986. It aims to train and promote organic farming methods, mainly among smallholder farmers. More recently, it liaised with the Jomo Kenyatta University of Agriculture and Technology's department of Horticulture, and are offering a diploma in Organic Agriculture. When it comes to training of farmers, it encourages optimal production through soil tillage techniques amongst other farming systems. It works with partnership with NGOs, government departments and research institutions in most of its initiatives. Some of its partners include: Kenya Organic Agriculture Network (KOAN), Participatory Ecological Land Use Management (PELUM), Kenya Association of Forest Users (KAFUWorld), Sustainable Agriculture Community Development Program (SACDEP), Agricultural Information Resource

Centre (AIRC), Family Alliance for Development and Cooperation (FADECO), International Federation of Organic Movements (IFOAM), Humanistic Institute for Cooperation with Developing Countries (HIVOS), Food and Agriculture Organization of the United Nations (FAO), Pesticide Action Network (PAN/OISAT).

KIOF also teaches farmers directly, offering taught causes and training through demonstrations. The Course Content taught to include: Soil and water conservation using an A-frame to determine the contour lines along which cultivation and traces are done, Compost making to improve and maintain soil fertility, Making of liquid manure and plant teas for top dressing, crop rotation to release nutrients and manage pests and diseases, mixed cropping to discourage pest build-up and improve soil cover, making of natural pesticide sprays, using plant weeds and herbs with known pesticide properties, fertility Management, and introduction to animal husbandry.[5]

As regards public training institutes, there is KOAN which the national coordinating body for organic agricultural activities in Kenya. It offers a variety of services but critical to this paper are its provision of Extension and information exchange, its policy and advocacy activities. Its formation is on a membership basis with members across the country including producers, exporters, traders, and NGOs promoting Organic Agriculture in Kenya. The organization represents over 35,000 farmers and works with partner organizations throughout the country[6]. Another public training institute is The University of Nairobi which offers undergraduate courses in agriculture, range management and management of agroecosystems & Environment through its Land Resource Management & Agricultural Technology, referred to as LARMAT. It offers masters degrees and PhDs in Soil science.

Discussion

The agricultural sector faces many challenges which include: low and declining soil fertility, inadequate budgetary allocations, reduced effectiveness of extension services, low absorption of modern technology, high costs and increased adulteration of key inputs, limited investment capital and poor access to affordable credit, heavy crop and livestock losses due to diseases and pests, an inappropriate legal and regulatory framework, adequate disaster preparedness and response. When Key informants were asked how soil fertility is addressed at the Ministerial

[5] Course Content http://www.kiof.net/?p=163 (Accessed 15th July 2015)

[6] http://www.koan.co.ke/about/index.php (Accessed 15th July 2015)

level, they reported that it is addressed through promoting programs targeting soil erosion, agroforestry, and riverbank protection. They are mainly funded by donors and have minimal budget of their own. The informants reported that soil was neglected and there was lack of adequate information on soils. As well, they reported that soil testing was expensive and out of reach for majority of smallholder farmers that they engage with. In regards to challenges faced in policy formulation, they reported that that the power dynamics in the policy formulation process was such that it was difficult to include marginal voices. Their observations can be corroborated with literature review, where policy formulation is argued to be top down (See Kinyanjui 2000 et. al). The existing policy initiatives, is that they provide a blanket approach that may not be applicable in all sites. Key informants reported that the strategy for soil fertilization should be site specific and recommendation should not be a one-size-fits-all approach, rather, recommendations should be specific to the site. More than this, the time it took to review policies was considered too long. Thus the informants argued that, the bottom up approach was largely unsuccessful since there was no platform to include marginalized voices (there was no stipulated framework that would guide this process). Because the bottom up approach was unsuccessful, the Crops Act, a successor to the previous regulatory institutions was developed. The act is administered by the Agriculture Fisheries and Food Authority (AFFA), whose mandate include:

- Administer the Crops Act, and the Fisheries Act in accordance with the provisions of these Acts
- Promote best practices and regulate, the production, processing and marketing of agricultural and aquatic products
- Collect, collate data and maintain a database on agricultural and aquatic products;
- Determine the research priorities in agriculture and aquaculture
- Advise the national government and the county governments on agricultural levies for purposes of planning, enhancing harmony and equity in the sector.

The Crops Act

The Crops act is an Act of Parliament aimed at consolidating and repealing various statutes relating to crops and to provide for the growth and development of agricultural crops and for

connected purposes. Soil is in the periphery of this act, rarely is it overtly mentioned, but it is part of what has been referred to as 'relating to crops'. Indeed the only section it is explicitly mentioned in the act, is to the extent that it is conserved along with water. To this end, it stipulates that respective counties provide for:

- Measures of maintaining soil fertility including soil testing and regulation of soil salination, chemical degradation and toxic levels in plants
- Developing guidelines for public education on safe use of agrochemical

Apart from challenges with policies, the informants reported that even as extension services have been devolved, there is no enabling environment. This is attributed to transitional challenges which include transfer of funds and articulation of roles. It still remains unclear how better transition can take place, as the national extensions services are left with the institutional knowledge that they are unclear on how to disseminate to counties. Apart from this, they reported that extension officers were not in a position to reach farmers widely. Presently, the ratio of extension worker to farmer is 1:1000 way below the recommended ratio of 1:400. The counties also have challenges of funding and politicization of development projects, such that funding of projects is pegged on political advantage. The extension officers also lack equipment and facilities to execute their duties.

When asked whether soils were integrated in agricultural policy, most of the key informants were of the opinion that this was the case and the best way to manage soil health was to: conduct more soil surveys and collect more soil samples for analysis, prevent soil erosion- as a physical measure, and address discharge from physical structures. In the literature review, and from the policy documents, it was notable that this was the main approach to soil conservation. The other recommendation made was strengthening Soil Conservation Networks- A good example is the Cheranganyi falls. The Ministry of Environment and Natural Resources in a bid to conserve the Cheranganyi water towers also targets supplies of water essential for soil fertility. It is noteworthy that the Ministry is in a joint strategy with the European Union and is in collaboration with the Kenya Forest Service, the Kenya Water Towers Agency and the Kenya Wildlife Service, there is not collaboration with a soils institute so the impact on soil health could be minimal. The informants also mentioned other initiatives, for example the water harvesting and management branch- of SIDA which started a program of training engineers- this is still ongoing.

When asked the main problem with agriculture in the country particularly in relation to policy, some of the responses were that the policies have taken too long to review. It emerged from the informants that some of the ways that soil fertility could be enhanced would be to embrace technology. For example, prior to introduction of county governance, the government had embarked on an e-extension services program. This approach works through the use of text messaging, WhatsApp (applies for photo messaging), and Twitter-extension (this approach began roughly two years ago). Indeed other initiatives that are tech-specific include those driven by FAO and (CIARD-Open Agricultural Knowledge for Development) – and include institutes like KALRO, JKUAT, Moi University, AIRC- how it works id that these institutes create portals and each has a database that is accessible to other users. The main idea behind this collaboration, is to promote open access to agricultural knowledge, and developing tools and resources for sharing. An interesting initiative is the Advance farmers' blog which is a platform that promotes knowledge sharing and is useful to communicate to multiple users. Information services like the National Farmers Information Service (NAFIS) - developed by NALEP is an information service for farmers, needs; farmers can get information through browsing the net or calling a given NAFIS number.

Regarding the understanding of ISFM, the informants understood it to be a method that combines all aspects of soil management that also incorporates farmers' local knowledge, it was viewed as a useful strategy in light of this. On the question on soil fertility, they pointed out the fact that it was complex since it was not just the physical context that soils are embedded in. They argued that soil exists in a social context, people relate with it, interpret it, and use it in varied ways. As one aptly put it, *"You can't deal with the physical and not social or the livelihoods…*" he argued that since soil was critical to people's security, and livelihoods systems, soil health cannot be addressed without taking this into consideration. He reiterated that people will talk about soil fertility and productivity only to the level they see it addresses their needs. For this reason, interventions must be contextualized and unpacked to the level of the personal.

There is some positive direction towards addressing this as can be see with NALEP through initiatives like: addressing the challenge of HIV and Aids among extension officers and farmers, addressing gender inequality in program activities. Such an initiative has seen women of different social classes (such as widows) forming part of the farmer groups, while it is commendable that NALEP promotes an approach that provides better representation of women and other marginalized groups; it is also true that equality requires more than including women and marginalized groups.

From the interviews it emerged that there weren't enough conversations to improve dialogue on knowledge and information flow since tacit/indigenous knowledge was not incorporated in the curriculum for training extension officers. Moreover, the key informants observed that there was no way of tapping tacit knowledge since there wasn't a known system to incorporate this local knowledge.

The key informants reported that the main problem of Agriculture Soil Conservation, included continuous mining of the soil without replenishing the soils, hence low soil fertility. Chemical fertilizers are the ones that are mostly promoted, e.g. The National fertilizer subsidy program targeting resource poor farmers (1bag of DAP and 1bag of CAN). These fertilizers are stocked through the National Cereals and Produce Board depots stationed countrywide and farmers are informed through public media. At the sub division offices, the officers will verify the specific "status" of farmer to distribute the fertilizers to. One posited that "*People just use DAP and CAN year in year out",* this point came out consistently, with informants arguing that some soils did not require these inputs for soil health.

In as far as extension service delivery is concerned, the Ministry of Agriculture trains the extension officers with information they get from national research institutions and this is what is disseminated to the extension officers. This information is relayed to farmers during field days, chief barazas, demonstration plots, radio, and TV programs. The advice includes: how to prepare land, what seed to plant, the type of crop to be grown, and fertilizer to be used. While this mode of dissemination seems effective, some informants reported that the process of disseminating information is not always straight forward. For example, as much as KALRO does the research, the process of disseminating this information to extension officers is never clear cut because of poor coordination between the KALRO staff and extension officers. It is possible that the problem in dissemination of information could be as a result of the perceptions researchers have on extension officers and the perception of the extension officers on the farmers. During the interviews, it was observable that farmers in large part are viewed as passive without the agency to think and make the decisions for themselves. For example, one key informant posited that*, "Our job is to change their mindsets so that they can embrace technology",* the informant further observed that, the education system that farmers have is based on *'past teaching'* and there is resistance to new technology. This perception of farmers is problematic in many ways: it assumes that knowledge is found only in specific sites therefore obscuring the fact that knowledge is multiple and is found in different forms. This kind of thinking also creates the illusory divide between farmers and extension officers, casting the two

in the binary of modernity and traditional. The challenge with this form of perception is that, it closes out opportunity for dialogue on knowledge and information between the farmer and the extension officer. To this end, it is argued that extension services should be offered to farmers in a manner that allows interaction and exchange of information and knowledge. Such should be the case between researchers and extension officers, or researchers and farmers.

It emerged from the discussions that the main constraints to development of more efficient soil management approaches include- farmers not being able to afford fertilizer, because of the middlemen and cartels who increase prices and as a result exploit farmers. It also emerged that the quality of the fertilizer is questionable as there have been cases of adulteration. There are also cases of interference by politicians, with fertilizer being used *'strategically'* for political mileage. Fertilizer subsidies rightly attract political interest who compete for votes by offering ever more generous and indiscriminate subsidies. Finally, in as far as extension services are concerned, the linkage between the Ministry of Agriculture and Universities is poor, and in some cases there is contradiction between what is taught in the university and what the latest research reveals, e.g. the tension between minimum tillage and land should being ploughed twice before planting.

Conclusion and Recommendations

From discussions with key informants and a review of available policies and literature, it was evident that there has been little inclusion of soil management (specifically in respect to soil content) in the legal and policy framework in Kenya. Indeed where policies have been in place, these are fragmented and not coordinated across sectors with similar mandates. The main strategy applied by the Ministry of Agriculture addresses soil fertility through promoting programs targeting soil erosion, agroforestry, riverbank protection. Besides the promotion of fertilizers, there is no specific support to farmers to encourage soil testing and analysis. It was noted that the Ministry relies significantly on donor support and while this approach gets funding for soil conservation, it remains unsustainable if the government does not financially commit to soil health. In as far a policy is concerned, the government has made efforts to address declining soil health. Some of the policies formulated include: Agriculture policy, Fertilizers and Soil Fertility Policy, Sessional Paper on Soil fertility, Draft Bill on Fertilizers & Soil Conditioners (Spear headed by the Kenya Plant Health Inspectorate Services (KEPHIS). Although Kenya has numerous legislation governing land use and management, there is no concise national policy framework that governs the health of soil in as far as soil content is concerned. To this end there

is neither provision of subsidy to farmers nor mandate for them to conduct soil tests and analyses. For example, in the MTIP, Soil is mentioned in regard to its restoration and conservation as a part of the climate adaptation framework to address the challenge of climate change. It is notable that issues on soil health are not addressed exclusively even though soil conservation is mentioned in the plan. A number of Policy and bills are under preparation, of importance are the: Fertilizers and Soil Fertility Policy, through development of a Sessional Paper on Soil fertility and a draft Bill on Fertilizers & Soil Conditioners, these have the aim of, regulating importation, exportation, manufacture and sale of fertilizers and soil conditioners.

Beyond the gaps in policy, the present institutional framework lacks a strong consumer driven regulatory framework that ensures quality of soil inputs. Indeed the reports from key informants reveal that most of the soil inputs are adulterated because of limited quality checks. Beyond this, the country lacks organic fertilizer processing plants and there are no policies in place to establish these plants. The institutional framework is influenced by a political elite, who have stake in public institutions and resources and they use this influence to serve their private interests. The main institutional constraints in research development, include: low dissemination and decreasing investment in agricultural research by both public and private sectors, ineffective institutional mechanisms to address weaknesses in research–extension-farmer linkage.

It was noted that the private sector has some interest in soil health and some of the initiatives they have taken can be used as an opportunity to expand the scope and scale of the kind of soil health issues they deal with. For example, the –subsidy provided by Safaricom, could be an opportunity to use the mobile platform to engage farmers on knowledge from research on soil health. Partnerships with the private sector has not been strengthened, and in the absence of effective private sector operations to fill the vacuum, the situation has led to reduced spatial coverage. This reduced spatial coverage is also evident in extension services since these are sporadic and irregular especially among the poor. It also notable that the objectives of private extension are not always aligned with those of the public extension system since private extension services are always geared towards respective priorities in different organizations.

In general, the present system could be improved, since the current extension system is not entirely effective and efficient in delivering the needed services to farmers since the institutional design lacks focus on active farmer participation. One of the ways this can be done is through

having interventions that are contextualized and unpacked to the level of the smallholder. Because dialogue on information and knowledge remains a big challenge- there is need to improve dialogue on knowledge and information flow as tacit/indigenous knowledge was not incorporated in the curriculum for training extension.

Kenya's national and local institutional and organizational structures have perpetuated the problem of decreasing soil fertility since there is lack of capacity in the administrative structures implementing policies. To this end, this paper makes the following recommendations:

- To build the capacity of both the farmers and that of the extension officers- one of the ways this can be achieved is to leverage some of the existing platforms. For example the recent development of e-extension services.

- A much more nuanced approach to delivery of extension services is required since, the institutional context is complex given the multiple stakeholders involved and their diverse interests

- The government should own the process, so that the approaches proposed are tenable and sustainable over a period of time. This could mean financing programs that promote soil health, partnering with private organizations to strengthen extension services and creating the legal framework to support soil health, harmonizing and prioritizing the objectives of the stakeholders in soil private, public and international organizations Soil testing was viewed as expensive and out of reach for smallholder farmers.

- There is need to increase funding for soil health research for development and extension situation has led to reduced spatial coverage

- Improve dialogue on knowledge and information flow as tacit/indigenous knowledge was not incorporated in the curriculum for training extension.

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Annex 1: Comprehensive List Of All Courses Offered At Bukura Agricultural College.

Bukura Agricultural College Courses: Certificate Courses

Agriculture & Communication Development

Bridging Courses in Maths, Biology, English & Physics

Computer Applications Certificate

Community Development

Electrical & Electronics Engineering

Entrepreneurship and Agricultural Marketing

Mushrooms Production Techniques

Bukura Agricultural College Courses: Diploma Courses

Agribusiness Management & Marketing

Agricultural & Biotechnology

Agricultural Education & Extension

Agricultural Extension & Community Development

Agricultural & Home Economics

Agricultural irrigation & Drainage Engineering

Animal Production & Health Management

Applied Biology

Community Development

Farm Management

Horticulture

Project Planning & Management

Bukura Agricultural College Courses: Undergraduate Degree Courses

Science, Agriculture & Biotechnology

Science, Agricultural Economics & Resource Management

Science, Agricultural Education & Extension

Science, Animal Production

Science, Botany

Science, Hotel & Restaurant Management

Science, Horticulture

Science, Zoology

Bukura Agricultural College Courses: Masters Courses

Science, Agricultural Economics & Resource Management

Science, Agricultural Education & Extension

Science, Agronomy

Science, Crop Production