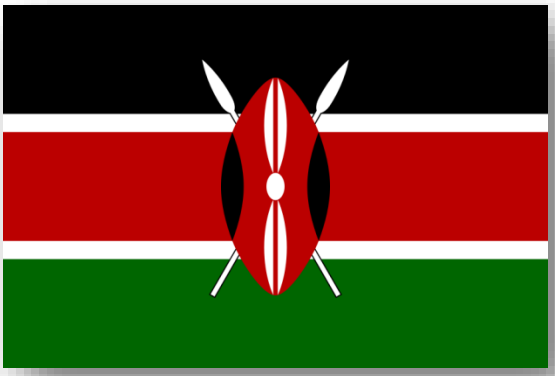
QUICK SCAN KENYA

June 2014



Netherlands Space Office

The Quick Scan for Kenya is commissioned by the Netherlands Space Office (NSO) within the framework of the Geodata for Agriculture and Water (G4AW) program. The following organizations have contributed to this document

TABLE OF CONTENTS

INTRODUCTION

Within the framework of food security policy, the Ministry of Foreign Affairs of The Netherlands is implementing the programme 'Geodata for Agriculture and Water (G4AW) Facility'. The G4AW Facility aims to increase the agricultural sector output in G4AW partner countries. This is achieved by providing food producers with relevant information, advice and/or (financial) products through operational information chains using satellite data.

In the summer of 2014, a new call for tenders will be opened. In this call, the Ministry of Foreign Affairs of The Netherlands calls for good quality project proposals from viable partnerships.

Goal of the Quick Scan

The Quick Scan serves as input for preparing the country visit and the G4AW information and matchmaking workshop in Kenya. In the workshop the local context, constraints and challenges in agriculture will be discussed. Furthermore, the background and details of the G4AW Facility is provided and the development of partnerships is promoted.

This Quick Scan provides an up-to-date information assessment on agricultural and associated activities. It provides information from different perspectives and in a wider context (climate, water management). Additional, stakeholders from different types of organizations are identified and reported. The document is initially supporting the country visits and workshop, but the provided information can also contribute to the development of partnerships that are intending to bring forward a proposal in the second call of the G4AW Facility.

1. Assessment of Kenya with a focus on agricultural issues

Pressure on the agro-eco production systems caused by increased (overpopulation), climate changes and extreme weather conditions lead to a lack of natural local resilience. In this section, the most important challenges in the agro-eco systems in Uganda are given as well as an overview of (governmental) efforts to address the food security situation.

1.1 Main challenges in Kenyan agro-eco systems

Out of Kenya's total land mass of 575,000 km² only 92,000 km² (16% of the total land) are of high and medium agricultural potential with adequate and reliable rainfall. This arable land is dominated by commercial agriculture with crop land occupying 31%, grazing land 30% and forests 22%. The remaining percentage is distributed among other land uses. The remaining 84% of total landmass is semi-arid or arid and suitability of rain fed farming is minimal. The country is divided into seven ecological zones: Tropical Alpine, Upper Highland, Lower Highland, Upper Midland, Lower Midland, Lowland and Coastal Lowland. It can divided into three main production zones. The high-rainfall zone receives more than 1000 mm of rainfall annually, occupies less than 20 per cent of the productive agricultural land and carries approximately 50 per cent of the country's population. Most of the food and cash crops as well as livestock are produced in this zone under semi-intensive and intensive systems. The zone accounts for all the tea, pyrethrum, potato, coffee, vegetables and nearly 75 per cent of milk production. The medium-rainfall zone receives between 750 mm and 1000 mm of rainfall annually and occupies between 30 and 35 per cent of the country's land area. It is home to about 30 per cent of the population. Farmers keep cattle and small stock and grow drought-tolerant crops. There is significant migration of the population from the densely populated high-rainfall zone to the medium-rainfall zone. Low-rainfall areas receive 200–750 mm of rainfall annually. These areas are home to about 20 per cent of the population, 80 per cent of the country's livestock and 65 per cent of the wildlife. Agriculture is the mainstay of Kenya's economy, with 80% of Kenya's population deriving their livelihoods from production, processing and marketing of crops, livestock, fisheries and other sector related products. The agricultural sector generates 18% of formal and 60% of informal employment, and contributes 24% of Kenyan GDP directly, and 27% if agro-processing is included, with a value of about Ksh 342 billion (US$ 4.6 billion). The sector also accounts for about 65% of total exports.

More than 93% of agriculture in Kenya is rain fed. Irrigation agriculture is predominantly carried out in government supported irrigation schemes and in large-scale schemes. Large scale farmers' account for 40% of irrigated land, smallholders for 42% and government-managed schemes account for the remaining 18%. The majority of farmers in Kenya are smallholders with 0.2 to 3 ha of land sizes. Smallholders account for 75% of the total agricultural output and 70% of marketed agricultural produce.

Agriculture is exposed to a broad range of challenges and risks. These include rapid population growth putting pressure on arable land and leading to degradation of soil and deforestation; over reliance on rain fed agriculture which increases exposure to climatic risks; dwindling land sizes; limited diversification in agricultural production; market challenges; poor and inadequate physical infrastructure; limited financing for small holder agricultural activities; limited development and exploitation of the livestock sector, among others

1.2 GOVERNMENTAL EFFORTS AND POLICY ON FOOD SECURITY

Government efforts to address agriculture and food security are anchored in several policies. These policies aim at overall development and growth of the sector through increasing productivity, commercialization and competitiveness of the agricultural commodities and enterprises and; developing and managing key factors of production. The policy documents addressing agriculture, climate change and water issues nationally include the National Climate Change Response Strategy 2010; Kenya National Climate Change Action Plan 2013-2017; Agriculture Sector Development Strategy 2010-2020; Vision 2030; National Seed Policy 2011; National Food Nutrition and Security Policy 2011; National Dairy Development Policy; National Agricultural Sector Extension Policy 2012; National Water Policy 2012 and the Cooperatives Policy. Examples of programs include Njaa Marufuku; Kenya Agricultural Productivity and Agri-business Project; KAPP Sustainable Land Management program; East African Productivity Project orphaned crops program.

The achievement of national food security is a key objective of the agricultural sector and the government responds to food security through three major policy interventions i.e.

Supply, prices and income related policies - Subsidy on farm inputs; improvement of research and extension services and improving their linkages through establishment of research-extension liaison offices; provision of rural credit for farming - Kilimo Biashara Initiative; improvement of the management and use of natural resources, especially water for irrigation; promotion of drought resilient crops e.t.c

Price related policies- Involvement of the National Cereals and Produce Board in the purchase of produce from farmers at prices higher than market prices to provide incentive to producers; funding livestock offtake during stress periods such as drought.

Income related policies - The devolution of government planning and financial resources to the county level and the Constituency Development Fund allows prioritization of interventions in specific localities.

2 ASSESSMENT OF STATUS AND PROBLEMS OF INFORMATION SUPPLY IN THE AGRICULTURAL SECTOR

For food (and water) security programs, actual and accurate (spatial) information is crucial for land and crop production systems to provide quick indicators on the context (e.g. water availability), status (e.g. biomass, crop type, acreage, etc.) and trends (within and in between seasons, years) of local farming practices/performance. In this section, the main challenges in information supply in Uganda are summarized as well as the institutional capacity to support viable information services.

2.1 MAIN CHALLENGES IN INFORMATION SUPPLY ENCOUNTERED IN AGRICULTURAL ACTIVITIES

There are many challenges in the use of geo-spatial data in Kenya, which include lack of partnerships leading to data duplication and wastage of resources; there is quite a lot of spatial data but it's not geo-referenced limiting its use; some data not in digital format – hard copy distribution hence less data accessed over internet; administrative challenges on sharing of data; lack of policy on data sharing – no systematic way of access and sharing between the various players or data producers; limited awareness on data availability – most data holders have it for their own benefit; limited updates on available data – linked to methodology and purpose of initial data collection; available datasets are in various formats (analogue) and standards, making data integration difficult and time-consuming; most data are scattered and not connected - data and information are available but scattered in various formats among several ministries, local agencies, research institutes and universities; there is no central repository or access point; low level of web connectivity and IT infrastructures, and human capital index; other problems include shortage of data for specific regions and non-existence of metadata. In Kenya, sharing of spatial data presupposes the existence of the relationships among individuals, organizations and/or governmental units but in practice, informal sharing is more predominant than formalized spatial data sharing.

Challenges in the agricultural sector

Sector / Problems	Crop agriculture	Horticulture	Livestock	Aquaculture
Climatic	Droughts – economic loses and resource depletion; increased variability in rainfall – onset and cessation, changes in temperature patterns, floods; uncertainty in climatic conditions; limited site specific information dissemination on seasonal changes; limited access to weather; low coverage of weather stations – low data credibility for planning purposes	Droughts, increased variability in rainfall – onset and cessation, changes in temperature patterns, floods; dwindling water resources; uncertainty in climatic conditions; limited access to weather info; low coverage of weather stations – low data credibility for planning purposes	Droughts – loss of production or reduced productivity; increase variability in temperatures – affects productivity; potential contribution to GHG emissions; uncertainty in climatic conditions; limited site specific information dissemination on seasonal changes; climatic sensitive production systems	
Soils	Declining soil fertility; limited knowledge of soil fertility levels; variable soil moisture levels; toxicity; limited knowledge on suitable fertilizer; limited knowledge on soil suitability; soil degradation	For small scale farmers - Declining soil fertility; limited knowledge of soil fertility levels; soil toxicity due to overuse of fertilizers; limited knowledge on soil suitability;	Reduction in pasture seed banks – low pasture regeneration; soil degradation – poor land management and increase in land uses	
Water resources	Increased pressure on water resources – human use vs agriculture, extensive livestock production vs crop production, government drive to expand irrigation; Inefficient irrigation methods – wastage if water; dwindling water resources – deforestation, ecosystem	Dwindling water resources due to over use of the ground water sources – weak water resources management, high economic returns in horti investments; dwindling water resources – deforestation, ecosystem degradation; high returns on investments have opened up	Dwindling water resources – competition of uses; water stress in extensive livestock production areas – ASALs – climatic conditions and limited water harvesting/storage investments or groundwater development – most water drains away; increased livestock numbers –	Increased competition with other users pressure – crop, livestock production and human use; dwindling water resources - catchment degradation

	degradation; floods; low investments in water harvesting – storm water in urban areas	marginal land with irrigation – more pressure on water resources	increased demand on water for production of livestock feed and watering;	
Production	High cost of production – inputs like seeds, fertilizers, pesticides; poor production methods or land management; limited information on expected yields; limited advice on proper and effective agronomic practices	High cost of production – small scale producers because of limited investments in technology; limited information on expected yields;	High cost of production – inputs like feeds, vet drugs, pesticides; competition for land with other production systems – dwindling pasture lands; poor production methods – limits market penetration	High cost of production; Weak research – not demand driven; inadequate training programs and inefficiency of technology transfer;
Disease and pests	Emergence of new diseases – crop losses; limited early disease detection – low technical capacity;	Limited investments in disease and pest surveillance; large tracts of land underutilized because of tsetse flies – pressure on remaining land	Emergence of new pests and diseases – increased cost on livestock health; limited investments in diseases and pest surveillance – limits product competitiveness in international markets;	Increased water pollution;
Post-harvest	Increased post-harvest losses due to many factors e.g. climatic changes; limited information on expected yield – for planning input purchase and credit facilities	High costs of post-harvest handling – related to high perishability; logistical challenges – great losses	High post-harvest losses to small scale farmers – poor physical infrastructural development; limited information on livestock value chain; poor access to markets – poor state of roads, low market information	Poor access to markets – poor state of roads, low market information; high product loss
Marketing	Limited information on terminal markets, prices; Inefficiency in the marketing chains - too many middlemen, traders and brokers earning relatively high margins;	Need for traceability – favours commercial farmers; price volatility;	Poor market information and organization – information flow among small scale producers; Inefficiency in the marketing chains - too many middlemen,	Poor market information and organization – information flow among small scale producers

			traders and brokers earning relatively high margins; overpriced products	
Other factors	Dwindling land sizes against government efforts to increase food production; limited appropriate data for planning for risk mitigation e.g. weather data for insurance, contract farming; limited investments in information management systems – for value chain enhancement	Dwindling land sizes; challenges on information flow between various players along the chain – the small scale farmers seem to be locked out;	Dwindling land sizes; unreliable data on national herd numbers, productivity, slaughter numbers and prices, livestock weights and consumption levels per capita	Dwindling land sizes

TABLE 1: CHALLENGES IN THE AGRICULTURAL SECTOR OF KENYA

2.2 Institutional capacity to support viable information services

2.2.1 General information suppliers active in agriculture domain

In Kenya there are various sources of agri-spatial data being provided by different stakeholders, at different levels and this includes agro climatic information i.e. seasonal rainfall forecasts, 5-day forecasts, monthly forecasts; weather data; national crop production forecasts specifically for maize and beans; information of crop seeds for different agro-ecological zones; fertilizer prices and suitability; drought early warning; agro-ecological zones; soil map; crop markets information – prices and buyers; dairy livestock health and production indices; water distribution and demand indices; value addition stakeholders etc. This information is accessed through various mediums including radio, television, internet or web based and print-media. However considering the limited human capacity and financial resources in Kenya, there is a limited culture of using geospatial information in agriculture. The country also doesn't have a policy to support use spatial data, with the Kenya National Spatial Data Infrastructure seeming to have stalled. The table below shows some of the key players in agriculture nationally and the type of information they supply.

Supplier	**Type of agri-information**
Kenya Meteorological Service, IGAD Climate Prediction and Application Centre, Regional Centre for Mapping Resources for Development	Agro climatic information – seasonal forecasts, 5-day forecasts, monthly forecasts
Ministry of Agriculture Livestock and Fisheries Development – National Farmers Information Service	Market information; Seed information, supply and pricing information; plant agronomic practices; extension services
Kenya Meteorological Service	Weather data – rainfall, radiation, temperatures, wind, evapotranspiration rates etc.; crop parameters like crop variety grown, stage of development attained, general assessment of crop performance, damage by pests, diseases and adverse weather, state of weeding in the farm, plant density and soil moisture; GIS data
Department of Remote Sensing and Resource Surveys	Interpretation of NDVI data; National crop production forecasts; Drought Early Warning; agro-ecological zones
Kenya Plant Health Inspectorate Service	Information on plant health, seed certification
Input suppliers e.g. Farm Chem, Kenya Seed Company, Syngenta	Information of crop seeds for different agro-ecological zones; fertilizer prices and suitability;
ETC East Africa	Focus in the areas of agro-ecology and food and nutrition security and health
National Drought Management Authority	National crop production forecasts; Drought Early Warning systems;
Famine Early Warning System Network	Seasonal weather forecasts and impact on food security
Syngenta – Kilimo Salama	Insurance products tailored at cushioning against climatic risks
Arid Lands Information Network	Knowledge on marketing; climatic issues and crop production through Maarifa Centres – community ICT centers and *Sokopepe* online platform

Green Dreams TECH Ltd - iCOW	Dairy livestock health and production indices
M-Farm	Market information; link farmers to buyers and current agricultural trends
International Livestock Research Institute	Weather based livestock insurance services; SMART livestock production practices; GIS data sets related to livestock - population density, climate, infrastructure, distribution, health, production.
Media houses – KBC, Citizen, Nation, KTN, K24, Radios e.g. Farmer Voice Radio	Various programs on agricultural production; value addition; marketing; agricultural innovations
Regional Centre for Mapping Resources for Development	Through the SERVIR regional visualization and monitoring platform improved scientific knowledge and decision-making in agricultural activities ; GIS dates in various agricultural aspects
Kenya Agricultural Research Institute	Agricultural production information and research products – from production to value addition
Agricultural Information Resource Centre	Agricultural information in production, marketing, networking with other agricultural stakeholders; Collecting, repackaging and disseminating Agricultural Information through mass media; GIS database
Kenya Open data	Avails core government development, demographic, statistical and expenditure data in digital format for researchers, policymakers, ICT developers and the general public
Ministry of Environment Water and Natural Resources	Water use regulations; irrigation
Kenya Rain Water Harvesting	Water resources harvesting status and use
Airtel Kilimo'	Production related information for maize, banana, mango, rice and beans farming; weather updates and marketing pricing information
Kenya National Farmers Federation	Farmer mobilization and capacity building on agricultural production; market development and marketing; value addition
Kenya Agricultural Commodity Exchange	Agricultural information exchange through rural based Market Information Points (MIPs), Market Information Centers (MICs), mobile phone Short Messaging Service (SMS), Interactive Voice Response (IVR) service, internet based Regional Commodity Trade and Information system (RECOTIS) and a Website www.kacekenya.com
KIMI	Farmer Voice Radio information along the agricultural value chains
Africa Soil Information Service (AfSIS)	Provision of continent-wide digital soil maps for sub-Saharan Africa; use of GIS and spatial data for soil mapping, land cover change detection and estimation of landscape carbon stocks.

Universities	Research products; capacity building
Upande	GIS data on water in Kenya; data and GIS services and applications
AcleCops and Furahia Mobile	SMS based agricultural information; radio and TV shows
CORDAID	Market linkages in livestock sector and support to agricultural micro-enterprises
SNV	Supports and enhances linkages for livestock and horticultural produce markets
USAID	Funding and capacity building various agricultural value chains
FARM africa	Capacity building on climate resilient farming
Fintrac Consulting	Local and international markets linkages in horticulture

TABLE 2: OVERVIEW OF KEY PLAYERS IN THE AGRICULTURAL SECTOR

2.2.2 SPECIFIC AGRI-SECTOR INFORMATION SUPPLY AND CURRENT MECHANISMS

There are various actors providing specific agri-sector information through various channels. The table below shows the various actors and the type of information provided:

Type of agri-information	**Mechanisms of supply**
Climatic information – seasonal forecasts, monthly forecasts	Print media; internet portal; radio stations
Seed supply and pricing information	Radio stations; print media; mobile phone
Climatic/Weather data	Purchased from KMS; Internet portal – open access
Soils data	Field extension agents; web based platforms
NDVI data	Purchase/Internet
National crop production forecasts; drought early warning; flood early warning	Print media; internet portal
Seasonal weather forecasts and impact on food security	Print media; internet portal; through partners; field extension services
Insurance products tailored at cushioning against climatic risks	Print media; internet; field extension staff
Knowledge on crop production	Print media; internet portal; through partners; field extension services
Dairy livestock health and production indices	Mobile phone SMS service; internet
Market information; link farmers to buyers and current agricultural trends	Mobile phone SMS service; internet; Radio stations; print media
Agricultural Extension services to the farmer	Mobile phone SMS and voice service; internet

TABLE 3: OVERVIEW OF ACTORS PROVIDING AGRICULTURAL INFORMATION IN KENYA

2.2.3 Other sectors (and role of information) important for the Agricultural sector

Other sectors that have an influence on the agricultural sector information supply and use are detailed in the table below:-

Sector	**Type of agri-information/support**
Telecom operators - Telkom Kenya, Airtel, Safaricom	Platforms for information supply; mobile banking services; financial transactions
Insurance firms – UAP, Jubilee	Risk minimization, transfer and mitigation -insurance products
Financial Institutions – Equity bank, Cooperative Bank of Kenya, K-Rep bank etc.	Agricultural loans; Agricultural Insurance Services
Agri-Pro Focus	Multi-stakeholder platform that brings together institutions and professionals in agriculture and agribusiness.
Technoserve	Support to strengthen specific value chains
Oakar Services Eastern Africa	Provision of GIS services

Table 4: Other sectors influencing the agricultural sector in Kenya

Opportunity exists in the use of geo-spatial data in Kenya in the agricultural sector. There are efforts but at a lower scale and with challenges on the use of geo-spatial data. The need to combine GPS, GIS and remote sensing technology in Kenya cannot be overemphasized. GPS for actual geo-referencing of the various factors or enterprises in agriculture since most data is not geo-referenced. Combining time series and cross-section data is important and remote sensing is key. This can be used to fill the gaps in land use detection; real time weather condition - essential for site characterisation and consequent site selection for farming; disease and pest surveillance and detection; spatial distribution of plant status; yield forecasting - daily global satellite imagery, improved long-range weather projections, and biologically realistic crop growth and yield models offer powerful new means that exceed the limits of conventional yield forecast methods; soil moisture levels; crop identification; crop acreage estimation; crop vigour; crop density; crop maturity; actual yield; soil fertility status; effects of fertilisers; soil toxicity; water quality; irrigation requirement; water distribution; location of canals; vegetation and soil types; plant stress; condition of range; livestock carrying capacity; pasture quality and quantity which can in turn be used to forecast milk yield; distribution of products, production rate, location of markets and market capacity; understanding of market penetration, the demand of specific products in different region in different times etc. Geodata can be used to model changing government subsidies, biotechnology, and intense global competition and advice stakeholders on agricultural decisions at national and farmer level.

Satellites are used for monitoring and recording data on a wide variety of parameters such as rainfall, temperatures, crop variables, and soil and water parameters which is useful for Kenya, where little infrastructure is available to collect all the information by land-based methods. This can then be calibrated and validated with ground data is essential for reliable and realistic correlation between the Remote Sensing (RS) signal and the actual parameter of interest. In this way the challenge of data scarcity for decisions on agricultural related enterprises will be addressed. As an example, managing the spatial and temporal distribution of feed resources will help match

availability with demand and managing systems so as to conserve water resources. Research related to livestock–water interactions to ensure that livestock production in the future contributes to sustainable and productive use of water resources needs specific geo-spatial information. Using GIS spatial models various products can be generated e.g. soil fertility maps; productivity potential (expected yield maps); location of markets and price indices; vulnerability or risk maps or factors that will help in developing insurance products; early warning systems – to aid in decision making; water distribution and potential for agriculture etc. Increasing climate variability will undoubtedly increase livestock production risks as well as reduce the ability of farmers to manage these risks.

There is increased interest in the agricultural sector along the value chain. The banking and insurance sector has shown great interests in agricultural investments, with various products ranging from financial loans to insurance products. Index based insurance has low demand as well as concern that supply is blocked by technology, data, and infrastructure limitations. Absence of comprehensive rainfall and crop data remains a key constraint in scaling insurance, since data is needed for index design and determining pay-outs. Index insurance is not scalable if it only works in areas covered by existing rain gauges with long histories. Hence with increased access to geo-spatial data, more agricultural producers will be reached with the insurance products. This will also enhance investigations on fraudulent claims for compensation.

Private investors, expertise and innovators are building and advising on spatial data portals, converting plain data into needed information e.g. M-FARM. Timely information availability and accessibility for decision making has been a major challenge in the agricultural sector, especially for the small scale farmer. Though efforts are already in place to address this, they are hampered by limited and timely credible data and expertise. It's very important to transfer capacity in the design, use and adaptation of applications to different users, to allow for these innovative technologies to be fully exploited in a sustainable manner locally. These initiatives may be up scaled and become more robust with up-to-date spatial data.

Challenges identified which are water related and relevant to agriculture:

Extensive agriculture like cattle and dairy sector put pressure on the landuse and availability of Cattle and dairy sector intensification (more local farms) put pressure on water supply (milk production, staple crops). Ambition agriculture policy is to increase irrigated area with a factor 5 in the coming decade; which puts enormeous pressure on the available water (policy document agriculture ministry available). To solve the available (ground) water problem in the future (development of drought/salt resistent crop varieties), water buffering techniques, acquifer techniques, waterharvesting, irrigation, water use efficiency, etc. Improvement of Water resources management (distribution of water); e.g. through upstream deforestation, ecosystems are unbalanced and cause runoff and erosion problems in extreme situations (rainfall) or bad landmanagement.

Use of sweet water reservoirs (like lakes, acquifers) for various sectors industry or drinking water in various counties give pressure on available water systems. Current activities of Dutch embassy is more focused on WASH issues (sanitation, drinking water, health) than on Water Resources and management. The WASH activities also put their own pressure on water reservoirs (especially in urban areas)

Horticulture in Kenya is a very important sector (90% of region Lake Naivasha); Lake Naivasha is a very important source of sweet water due to the unique situation that water in the lake is not salified in time like most of the other lakes

At mount Kenya horticulture is situated more upstream. Here intensive systems are developed on recycling mechanisms in aquaculture or hydroponics; water use and nutrient recycliing is well organised.

In general water availability is regarded as a public issue and not enough as a commercial good however in Lake Naivasha there is a unique plan under development on Catchment Management (IWRM), where water is seen as an intrinsic business pre-requisite. In general the agricultural sector recognizes IWRM as their own corporate responsibility but also as commercial boundary condition to have guaranteed and sustainable production conditions.

'Payment of environmental services' initiative: which farmers follow the right sustainable measures on landmanagement (e.g. contour ploughing for reducing erosion, fallow, crop-rotations, etc) and have a right on special subsidies or funds to improve their business.[1]

Eg Greenfarming [2] initiative is such a cooperation of companies with a joint programme on agriculture improvement (Eijkelkamp, DLV-Plant, etc) in Lake Naivasha area.

[1] Study of London school of Economics, 2012; willingness to pay of farmers in Lake Naivasha

[2] http://www.greenfarming.nl/

3 NEEDS ASSESSMENT OF IMPROVED ICT & INFORMATION SUPPLY IN THE AGRI SECTOR

In this section, an inventory of specific needs and problems in the information supply (and demand) in the Colombia agri sector is provided. The most important local stakeholders represented in the identified problem domains are selected (short list). Furthermore, additional stakeholders in related domains need to be selected (e.g. water domain, nature, industry, etc.).

3.1 NEEDS ASSESSMENT WITH A FOCUS ON POTENTIAL USE OF SPATIALLY BASED INFORMATION SERVICES

Needs assessment in the agricultural sector with a focus on the use of spatial data can be classified under 3 sub-sections in the value chain:-

Input: Input suppliers need reliable information on weather patterns e.g. credible seasonal forecasts to aid in planning of input supplies and insurance service products. Other information needed include type of crop or agricultural enterprises. Financial institutions will need this information for making decisions on viability of financial investments.

Production: Data needed timely dissemination of rainfall data – onset and cessation – to aid in planning of the agricultural enterprise calendar e.g. planting and harvesting dates. This information is majorly provided by KMS through the seasonal forecast and can be accessed through the radio, print media and internet. KMS also provides information on evapotranspiration rates and soil moisture content but only through online platform, limiting accessibility by end users. It should be noted that the data is very course with few synoptic stations used to make inference to large regions. Daily weather data is not available for public consumption. Though there is a national soils map through African Soil Information Service at 1km resolution, it still needs verification on the ground. Most information on soils is demanded from the National Agricultural Research Laboratories, which has a huge database on soil properties nationally but it's not digitized, hence offers a challenge in generating a current crops suitability map. Soil fertility levels, pest and disease incidences, and water availability – in the case of irrigation, can only be accessed on need basis from various service providers. Spatial data on how much water is available for irrigation, where this can be found and the potential it has in agricultural production is still lacking. This may partly be because of limited physical infrastructure in geo-spatial data collection and analysis. Long-term weather and production data is lacking in most regions, which impacts of insurance products. Spatial coverage of enterprises (e.g. crop hectarage) is still lacking, with estimates being used instead. This makes it difficult to give crop yield estimates.

Markets and marketing: Stakeholders involved in marketing require information on expected crop yield forecasts; anticipated harvesting time; volumes of product supply from different agro-climatic zones; niche markets – locally and internationally; market contacts; market preferences; indicative market prices; long-term or historical price data; processors need information on production volumes; produce markets; seasonal production calendars; consumer references etc. This is partially done, for example crop yield forecasts are sometimes based on acreage under crop apart from other parameters. This may not be the true reflection at harvest time because other factors come into play. Market information can be accessed via SMS and other sources like internet and radio programs. The challenge has been the location of some markets vis-à-vis the point of production, attracting middlemen who exploit producers. Most markets and market players are not geo-referenced making it difficult for product traceability. Suppliers of market information include FARM Force, NAFIS, KACE, HCDA, among other platforms. Spatial data on seasonal production and markets is still missing.

3.2 PUBLIC AND PRIVATE PROBLEM STAKEHOLDERS AND INTERNATIONAL ORGANIZATIONS IN THE DOMAIN OF G4AW

No	Stakeholder name	Category of stakeholder	Role related to geodata
	Regional Centre for Mapping Resources for Development	Regional	Provides technical support to the region with spatial data in various agricultural aspects
	Department of Remote Sensing and Resource Surveys	Government	Interpretation of NDVI data; prepares national crop production forecasts; drought Early Warning using weather data
	Ministry of Agriculture Livestock and Fisheries Development – National Farmers Information Service	Government	Agricultural Extension services to the farmer on markets, commodity prices
	Ministry of Environment Water and Natural Resources - National Irrigation Board	Government	Water resources management
	Arid Lands Information Network	Local NGO	Shares knowledge on markets and climatic issues through Maarifa Centres – community ICT centers and *Sokopepe* online platform
	Food and Agricultural Organization	International	Has a spatial database on agricultural value chain with national nodes
	Telcom providers – Safaricom, Airtel	Public/private	Provides platform for sharing of spatial data
	Insurance agencies – UAP, Jubilee, Equity Bank	Public/private	Utilizes weather data in making their insurance products and effecting premium payments
	Financial Institutions – Equity bank, Cooperative Bank, K-Rep Bank, Agricultural Finance Corporation	Public/private	Provides financial services to agricultural stakeholders
	Kenya National Farmers Federation	National	Links small holders farmers to terminal markets
	M-Farm	National	Linking produce farmers to potential buyers
	Upande	International	Develops mobile phone applications for deploying spatial data e.g. mWater application
	Syngenta	International	Through its innovations – FARM Force and Kilimo Salama, utilizes spatial data to track harvest and growing activities; locate markets; input suppliers; create product traceability; provide agricultural

			insurance products
	International Livestock Research Institute	International	Utilizes weather data and NDVI maps to calculate premiums in the Index Based Livestock Insurance scheme
	Fintrac	International	Spatializing mango production in Kenya – markets, production, farm sizes etc.
	TraceSoft Solutions	National	Linking farmers to markets and spatial data solutions for traceability
	iCOW	National	Connecting dairy animal farmers to production data

TABLE 5: OVERVIEW OF THE MAIN STAKEHOLDERS

3.3 ONGOING G4AW RELEVANT ACTIVITIES AND/OR PROJECTS IN KENYA

There are several ongoing initiatives relevant to G4AW within the country. Some of the initiatives are donor funded and some are private stakeholder initiatives. These include:

- Ministry of Agriculture Livestock and Fisheries Development World Bank funded project on Agro Weather Advisory tools development in Kenya.
- Ministry of Agriculture Livestock and Fisheries Development National Farmers Information Services
- KAINet – the Kenya Agricultural Information Network
- iCOW – mobile based application that tracks dairy cows production performance and provides advisories to maximize returns.
- DFID funded The Arid Lands Support Programme (ASP): Building resilient and adaptive livelihoods in Kenya's arid lands with a focus of strengthening livestock insurance schemes.
- M-Farm – market information dynamics
- ILRI Index Based Livestock Insurance scheme
- Syngenta Kilimo Salama initiative for agricultural input and product insurance
- USAID funded Kenya – Resilience and Economic Growth in the Arid Lands–Accelerated Growth project
- UNDP funded Mainstreaming Sustainable Land Management (SLM) in Agro-Pastoral Production Systems of Kenya
- M-Kilimo – internet based farmers helpline
- KACE – Kenya Agricultural Commodity Exchange
- FARM Africa Climate Resilient Farming project
- ALIN – Reaching out to the agricultural communities through Maarifa Centres – community ICT centres and *Sokopepe* online platform.
- DFID funded Strengthening Adaptation and Resilience to Climate Change in Kenya Plus (StARCK+) – partly focuses on water management and weather forecasting.
- USAID Kenya Agricultural Value Chain Enterprises (KAVES) – mapping and spatializing the whole mango chain.

3.4 REFERENCES TO PUBLIC DOMAIN PUBLICATIONS

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4 INVENTORY OF POTENTIAL (CHAIN) SOLUTIONS DIRECTIONS USING GEO-ICT IN LOCAL AGRICULTURE ISSUES

4.1 BASE SOLUTION DIRECTIONS IN KENYA TAILORED TO LOCAL AGRICULTURAL PRACTICES

4.1.1 ACTUAL AGRI-SPATIAL INFORMATION SERVICES

National, there exists spatial services on production information including soil types (though at a course scale); soil drainage; weather data – seasonal forecasts; estimation of crop yields (nationally for major crops like maize and beans only); soil fertility; input suppliers; soil moisture; incidence of pests and diseases; agricultural production zones and land use. Apart from weather data with is provided by KMS to all stakeholders, all the other services can be accessed through various stakeholders either public or private and there is no centralized system for the data. Data on markets include terminal markets; commodity prices and market players is provided though through different stakeholders and this information is not geo-referenced. Data on financial institutions, there locations and the products they offer are available through various platforms.

4.1.2 FARM INSURANCE AND RISK PREVENTION STRATEGIES

Risk and uncertainty are ubiquitous in agriculture, have numerous sources and can be grouped into three. Production risks e.g. bad weather, pests and diseases, fire, soil erosion etc. These risks have a direct, immediate impact on local agricultural production and their effects are transmitted from the farm all along the supply chain. Market risks e.g. volatile prices of agricultural commodities, inputs etc. These risks usually emanate from market actors (such as traders and exporters), and their effects are transmitted back to the farm. Enabling environment risks can include political risks, institutional collapse, and other major risks that lead to financial losses for stakeholders all along agricultural supply chains. Agricultural stakeholders make decisions based on their evaluation of risks and the resources at their disposal. The management strategies can be classified into three categories:

Risk mitigation. These actions prevent events from occurring, limit their occurrence, or reduce the severity of the resulting losses. Examples include pest and disease management strategies, crop diversification, and extension advice. Current examples of this include iCow, M-Farmer, Radio programs on agricultural production.

Risk transfer. These actions transfer risk to a willing third party, at a cost. Financial transfer mechanisms trigger compensation or reduce losses generated by a given risk, and they can include insurance, reinsurance, and financial hedging tools. Current examples are the ILRI Index Based Livestock Insurance and Syngenta Kilimo Salama. Transferring risk through insurance has several important benefits. Insurance stabilizes asset accumulation by reducing the negative impact of weather shocks. Insurance also fosters investment, because it reduces the uncertainty of returns.

Risk coping. These actions help the victims of a risky event (a shock such as a drought, flood, or pest epidemic) cope with the losses it causes. Current examples include livestock off take programs during drought, subsidies on seeds and fertilizers, food aid or relief.

4.2 Differentiation of spatial solutions tailored to agricultural practices/sector in Kenya

The various spatial data sets or solutions needed in the agricultural sector can be categorized under production and marketing as detailed below:-

Production

In production spatial data sets of importance are natural pasture conditions; climatic data – temperature, seasonal rainfall patterns (beginning and cessation) and potential evapotranspiration; soils – texture, organic matter, drainage, soil depth; land preparation – land suitability, soil fertility indices, soil moisture levels, seasonal rainfall outlook, topography – slope, contour, aspect; crop cultivation - soil fertility indices, soil moisture levels, seasonal rainfall outlook, suitable crop types; crop management - soil moisture levels, seasonal rainfall outlook, incidences of pests and diseases, crop harvest time/maturity status; anticipated production volumes; post-harvest management; agricultural facilities distribution; land use types – over the years; land cover – over the years; socio-economic indicators; financial transfers and payments; input supplies – providers and prices.

Marketing – processors and exporters

In marketing spatial datasets include product markets – key product markets distribution; market prices – terminal market prices; agricultural facilities – agro shops, extension offices, post-harvest infrastructure, weather stations, financial institutions, agri mechanization centers, key market centers; virtual markets and financial transfers and payments.

5 PARTNERSHIPS BETWEEN STAKEHOLDERS IN KENYA AND DUTCH SECTOR

There are various partnerships between various stakeholders within the country and the Dutch sector. The Dutch government bilateral cooperation program with Kenya is focused on, among other sectors, agriculture, food security and water. The Netherlands closely cooperates with the government of Kenya, but financial support flows via NGOs and UN organizations. There are partnerships and great successful developments in areas of horticulture, dairy livestock industry, the extensive livestock production systems, and floriculture and water sector. Examples of key partnerships in the agriculture and water sectors is summarized under 4 sub-themes below.

1. **Financial stakeholders**

- **CORDAid** – support to microfinance institutions in East Africa; development of livestock markets; disaster risk reduction activities.
- **The Green Forest Social Investment Initiative (GFSI)** – supports strengthening of the agribusiness value chains to stimulate profitability and competitiveness and to improve economic performance of the small holder farmers, by alleviating constraints related to investment, production, efficiency, value-addition, product branding and product promotion.
- **African Enterprise Fund** - challenge fund capitalized by multilateral and bilateral donors (the AECF donors) to stimulate private sector entrepreneurs in Africa to innovate and find profitable ways of improving access to markets and the way markets function for the poor, particularly in rural areas. The Fund focuses on innovative business ideas in agriculture, agribusiness, renewable energy, adaptation to climate change and access to information and financial services.
- **Solidaridad** – focus on strengthening producer organizations to access markets and credit for investments.
- **FMO (Dutch Bank) through Family Bank** finances companies throughout the agribusiness value chain – farm inputs seeds and fertilizers; primary production and farming; infrastructure - storage/warehouses, irrigation; commodity and food processing; trade and distribution (wholesale/retail).
- **Netherland Enterprise Fund - Match Making Facility** - The Matchmaking Facility assists private businesses in emerging markets to establish links with Dutch companies with a view to the establishment of a lasting business relationship.
- **Netherland Enterprise Fund -** The Facility for Sustainable Entrepreneurship and Food Security - FDOV (part of the Public-Private Partnership facility) stimulates public/private partnerships within the sphere of food security and private sector development in developing countries.

2. **Solution stakeholders**

- **SNV** focuses on agriculture to foster economic development through a well-developed pro-poor value chain development approach:- *Livestock* - support to dairy business to promote commercialization of the sector; livestock feed conservation and development; dairy value chain governance; enhancement of livestock and livestock products markets access through links with external markets; promotion of Public Private Partnership to increase marketing infrastructure investments in the sector. *Horticulture value chain* – improvement of productivity and income through reduced post-harvest losses; improved local and international market linkages and increased investment in the horticulture sector.
- **CORDAid** – support to microfinance institutions in East Africa; development of livestock markets; disaster risk reduction activities.

- **Kenya Flower Council** - Against this background the KFC has become a common platform for industry representation, promotion and compliance to pertinent local and international standards, deemed necessary to secure markets.
- **Government of Kenya is working with SNV** for the development of horticulture and livestock value chains through the National Agricultural and Livestock Extension Programme and the Micro Enterprise Support Programme Trust[3].
- **OXFAM** - Women's Empowerment Mainstreaming And Networking – WEMAN aimed at strengthening livelihoods for the most vulnerable men and women.
- **DFID and Adam Smith International in partnership with SNV** and the Kenya Gatsby Fund is implementing the Kenya Market Assistance Programme (MAP)[4].
- **Agri-ProFocus** is a Dutch rooted multi-stakeholder platform that brings together institutions and professionals in agriculture and agribusiness. Established in 2005, Agri-ProFocus network has expanded to fourteen country agri-hubs in Africa and Indonesia. The key mandate of Agri-ProFocus is to promote knowledge sharing and co-creation in order to trigger innovative farming enterprises. The Agri-ProFocus Kenya agri-Hub is part of the global Agri-ProFocus network. Agri-ProFocus Kenya has a membership of 110 organizations drawn from Development sector, Private sector, Research, public institutions and farmer based institutions. Agri-ProFocus Kenya has strategically placed itself as a neutral platform where institutions from various backgrounds converge and share experiences. Their mission is to facilitate coordination, broker and create spaces and opportunities for multi–stakeholder action, learning and debate.

3. ICT and knowledge partners or stakeholders

- **ETC East Africa** – technical expertise focusing in the areas of agro-ecology and food and nutrition security and health. Support to PROLINNOVA.
- **Agriterra** supports farmers' economic development through expert support to farmers' organizations.
- **PUM (Manager Deployment Program),** Netherlands Senior Experts, support to various agricultural sector stakeholders with expert knowledge along the value chain.

4. Partners in the water sector

- **SNV** - *Water* - promotes analysis, design and implementation of integrated approaches that combine sustainable and efficient water services delivery and management mechanisms. Partners include regional water services boards and water resources management authorities, sub-catchment area water resource users associations, and water service providers in all secondary town and rural areas.
- **Netherlands Water Partnership** – consortium of Dutch water expertise from private companies, government, knowledge institutes and NGOs, and focuses on water expertise, policy developments and market opportunities. They also initiates, coordinates and executes projects.
- **UNICEF is working with SNV** to improve access to water and sanitation in rural areas and schools.
- **World Wide Fund for Nature (WWF) is working with SNV** to improve water and sanitation access for residents of the Lake Naivasha basin.
- **Vitens-Evides are working with SNV** to support water service providers to increase water and sanitation coverage in Kenya.

[3] Source: http://www.snvworld.org/en/countries/kenya/client

[4] Source : http://www.snvworld.org/en/regions/africa/news/snv-and-the-kenya-market-trust-to-work-together-to-improve-access-to-clean

- **WWF –** Mau Mara Serengeti (MaMaSe) Sustainable Water Initiative - consortium of Water Resources Management Authority (WRMA), Kenya Water Towers Agency (KWTA), Universities and NGOs for conservation of the basin's world-renowned ecosystems. Also strengthen management of community based natural resources.

Other stakeholders which could be relevant:

- Delamare estates (dairy): nomadic cattlemanagement (insurance potential? Location of grazing areas)
- Partners in Fodder monitoring (providing information to the sector for food/inputs for cattle)
- RABO bank stakeholder in horticulture: Kenia (Pieter Niekus – Rabo)
- IFC (finance strategies in agriculture)
- Chase Bank (Agriculture knowledge)
- WorldBank programmes in Agriculture
- Insurance sector (local and big partners) like Re-Insurance (SwissRe)
- Dutch consortium: Lake Naivasha: Greenfarming (horticulture rose growers, Brewers like Heineken, Eijkelkamp (zij zijn onderdeel van (Francis Hoogerwerf, DLV plant) consortium), NL 15 companies
- NGO's are very important for sustainable agri-mechanisms, like Solidaridad (more focus on (food) agri-chains in agriculture)
- WNF has relevant projects in agriculture in Kenia
- In the Netherlands: EZ RVO Kenia country contact Michel de Zwart : who is investing in Kenya agric sector (list)
- Donor country coordinator on agriculture (and related to that water) at Dutch embassy on agriculture (rik)
- Crisis & natural disaster organisations (and their relation to agricultural sector)
- issues are effecting the foodproduction: Groundwater, spatial planning, soil and natural fertility, post harvest losses,storage, logistics & transport, etc.

Other important players to explore:

- Commodities sector in agric (grain sector)
- Unilever en UTZ (Fredrik de Vries) reducing waterfootprint (in this case coffee and tea)
- Inputs industry (NL spelers)
- UTZ; Koffie en thee
- Sugarcane
- Rice
- Foodprocessing: (NL spelers); DSM, Unilever, Campina
- Cluster Dairy and their impact on water and land (Jurjen Draaijer (SNV, in Kenia), WUR (Simone van Vucht), NABC (Netherlands Agri busines center) on the area of poultry en dairy (nomads-sedentary agric., grazing conflicts, intensification and better management of inputs, fodder, etc.), 2togehter, Bob vd Bijl who is director or NABC colleague on Kenya Lars Kramer)

Relevant Issues contacts and documents important for matchmaking:

- Kenya has targets on increasing water storage capacity per capita fivefold from 526m3 in 2010
- Flood mitigation, including Nairobi and Mombassa (stormwater)

- Water for energy
- Fivefold increase in area under irrigated agriculture from 120,000 ha to 1 mio ha by 2030 (+40,000 ha per year) Refer to attached docs and also to WorldBank 'Water Security and Climate Resilience Project for Kenya' started mid 2013
- Contact: Gustavo Saltiel World Bank (Program Manager) <gsaltiel@worldbank.org> // Robinson Gaita-Director, Irrigation and Water Storage at Ministry of Environment, Water and Natural Resource <rgaita@water.go.ke>
- Green Farming - Nl consortium horticulture active in Kenya Francis Hoogerwerf - <francis.hoogerwerf@greenfarming.nl> African Business Council: dairy and poultry programme in Kenya; with overall broad understanding of Kenya
- Bob van der Bijl - Director NABC - b.vanderbijl@nabc.nl Simone van Vugt (WUR, active in NABC - Dairy): <simone.vanvugt@wur.nl>
- Richard Fox - Chairman Lake Naivasha Growers Group (LNGG)/Sustainability Director, Finlays Horticulture Kenya Ltd. : investigated PES around 2005. <richard.fox@finlays.net>
- Christian Benard - Director Indu Farm (horticulture supply Ahold) -cbenard@indu-farm.com Willem Dolleman - Long time and influential resident in Kenya. Entrepreneur, active in horticulture and wind farms (Lake Turkana Wind Power Project) <willem.dolleman@agrico.co.ke>
- Jane Karuku - President AGRA - Alliance for a Green Africa. Important. <jkaruku@agra.org>
- Maimbo M. Malesu - Regional Co-ordinator - CGIAR - GWP Associated Programme - SEARNET (Water Harvesting). <m.malesu@cgiar.org>
- Rabo bank: Peter Niekus <peter.niekus@rabobank.com>
- RVO NL: Michel de Zwart - PSD Coach Kenya <michel.dezwart@rvo.nl>
- Overall to contact - organisations well positioned for info: ministries/district offices, banks (Chase; K-Rep/Interested in theme water; Equity Bank), insurance, branch organisations (e.g. KEPSA), donor-coordination; financial/multilateral organisations (IFC, WB, EU).