Kenya County Climate Risk Profile Annex: Nakuru County

Annex 1

Agro-ecological Zones (AEZs) in Nakuru County

Nakuru County is divided into numerous sub-counties, with various agro-ecological zones (AEZs) that transect those administrative lines. The table below provides a detailed description of the sub-counties and AEZs in Nakuru County.

Table 1: Description of AEZs in Nakuru

AEZ	Sub-counties included in AEZ	Altitude (m.a.s.l)	Annual average rainfall (mm.pa)	Area (Km^2)
TA	Molo, Olenguruone and Njoro	2980-3050	1200-1900	31
UH1	Molo, Mau Narok, Bahati Forest, Olenguruone	2400-2970	1200-1900	282
UH2	Molo South, Mau Summit, Keringet, Olenguruone	2310-2580	1000-1400	756
UH3	Mau Narok, Olenguruone	2310-2400	950-1200	111
LH2	Kabazi, Ndundori, Mau Narok	2070-2400	850-1100	255
LH3	Njoro, Ngata, Menengai, Naivasha, Subukia	1890-2190	800-900	834
LH4	Rongai, Naivasha, Upper Gilgil	1890-2110	650-800	555
LH5	Gilgil, Naivasha, Karati	1840-2000	100-1200	582
UM3	Mbogoini, Bahati	1830-1950	300-1100	49
UM4	Weseges, Lower Solai, Kampi Ya Moto	1600-1950	700-950	662
UM5 & UM6	Lake Naivasha, Mbaruk, Longonot	1620-1820	550-700	1064
LM5& LM6	Mbogoini	1480-1550	650-900	9

Source: GoK, 2009.

Annex 2

Land tenure in Nakuru County

Land tenure is Nakuru County can better be understood when disaggregated by the gender and age of the head of household. The table below describes the common types of land tenure in Nakuru County with reference to head of household.

Table 2: Proportion (%) of land tenure system, by gender

Type of tenure	Household Head (%)			
	Male	**Female**	**Youth**	**Total**
Holds a formal title or allotment letter	64.3	68.8	51.1	61.8
Owns but no formal title	17	16	25.7	19
Lease/Rent	16.5	8.8	18.8	16.0
Has communal rights[1]	0.7	0.8	1.8	1.0
Use land never allocated (squatters)	1.5	5.6	2.3	2.2

Source: GoK (2014)

[1] Communal land rights include pastoral land, trust land, group land or ranch

Annex 3

Agricultural input use in Nakuru

Input use is low in Kenya, including in Nakuru County. The tables below provide further details regarding the use of inputs in crop and livestock production, disaggregated by the gender and age of the head of household.

Table 3: Proportion of households using inputs in annual crops production

Season	Input	Use of input, by head of household (%)			
		Male	Female	Youth	Total
Season 1	Herbicides	15.4	3.2	6.2	24.7
	Basal fertiliser	33.1	8.5	12.5	54.1
	Top dressing fertiliser	10.1	2.7	3.0	15.8
	Organic manure	11.4	3.2	3.0	17.6
	Foliar feed	11.5	2.4	4.0	18.0
	Irrigation water	0.9	0.1	0.3	1.3
	Pre-harvest pesticides (Field)	7.6	1.9	2.9	12.4
	Post-harvest pesticides (storage)	4.0	1.4	1.7	7.2
Season 2	Herbicides	13.8	3.7	5.6	23.2
	Basal fertiliser	42.4	10.0	17.0	69.5
	Top dressing fertiliser	14.1	4.2	6.2	24.5
	Organic manure	14.8	2.9	4.7	22.4
	Foliar feed	9.3	2.0	3.9	15.3
	Irrigation water	0.3	0.1	0.1	5.8
	Pre-harvest pesticides (Field)	5.0	1.0	2.9	8.9
	Post-harvest pesticides (storage)	9.6	2.0	3.7	15.5

Source: GoK, 2014

Table 4: Proportion of households using various inputs in livestock production

Input	**Use of input, by head of household** (%)			
	Male	**Female**	**Youth**	**Total**
Artificial Insemination (semen)	24.6	4.3	7.6	36.5
Concentrates/animal feeds	27.1	5.3	10.8	43.2
Acaricides	36.1	8.5	13.2	57.8
Mineral supplements	37.3	7.9	13.5	58.7
Dewormers	39.6	10.1	14.2	63.9
Vaccines	30.4	6.2	10.1	46.7
Fodder/ hay/ silage/ crop residue	18.6	3.6	8.6	30.8
Other veterinary drugs	28.5	5.9	10.8	45.2

Source: GoK, 2014

Annex 4

Selection of Value Chain Commodities in Nakuru

For the development of this County Climate Risk Profile, four major value chain commodities (VCCs) were selected for in-depth analysis, based on their contribution to food security, productivity characteristics and importance to the economy. These VCCs, validated by local stakeholders, have been selected from a list compiled from the above-mentioned documents, using the following prioritization indicators: harvested area (hectares), production (90 kg bags), variation in production (in the past five years), value of production (US$/bag), dietary energy consumption (Kcal/ capita/ day), protein content (g of protein/ 100 g of product), iron content (mg of iron / 100 g of product), zinc content (mg of zinc / 100 g of product), and Vitamin A content (IU Vitamin A / 100 g of product). The VCCs selected are: maize, Irish potatoes, cattle (dairy), and local poultry.

Table 5: Value chain selection indicators

Indicator	Value Chain Commodity			
	Maize	**Irish potatoes**	**Dairy cow**	**Local poultry**
Harvested Area (Ha)	86,504	34,744	N/A	N/A
Number	N/A	N/A	286,050	1,183,108
Production (90 kg bags-maize; tonnes-potatoes; litres-dairy cow; eggs-local poultry)	1,765,714	361,027	296,398,663	5,144,499
Yield (90 kg bags-maize; tonnes-potatoes; litres/day/cow-dairy cow[2]; eggs/hen/laying cycle -local poultry)	20.6	10.4	10.4	25
Dietary energy consumption (Kcal/ capita/ day) [3]	361	58	62	143
Protein content (gr of protein/100 gr)	6.93	2.57	3.21	12.56
Vitamin A content (IU Vitamin A/100 gr)	214	0	165	540

Sources: GoK, 2015; ASDSP, 2014, USDA and author compilation

[2] Average for litres/cow/day for season 1&2, exotic cattle: 10.4; cross breeds: 7.1; local breeds: 11.0.

[3] Value for egg; the value for meat are; Kcal/capita/day: 258, gr of protein/100gr: 17.55 and IU Vitamin A/100 gr: 178

Annex 5

Climate analysis

For the current study, past trends and future projections of precipitation- and temperature-related hazards such as flooding events (including flash floods) and drought during the growing season were analysed. A growing season was defined as follows: the first season (Season 1) is the 100-day wettest period during the months of January to June, while the second season (Season 2) is the 100-day wettest period during the months of July-December. In the case of floods, the focus was on heavy precipitation events during the first and second season, defined as the 95th percentile of daily precipitation. For each pixel, the 95th percentile of daily precipitation distribution consisting of 100 wettest days per season per year was calculated. Then we identified the 95 extreme percentile value, which was plotted in time series. Fluctuations in heavy precipitation events can have important consequences on water availability for agriculture by impacting drought and flood events.
To assess the degree of adequacy of rainfall and soil moisture to meet the potential water requirements for agriculture, the focus was on drought stress, represented by the maximum number of consecutive days in each season where the ratio of actual to potential evapotranspiration (ETa/ETp) is below 0.5. This was calculated for each pixel per season per year by evaluating the soil's water capacity and evapotranspiration in order to define the number of days that could undergo a level of stress.

Two Representative Concentration Pathways (RCPs), also known as the four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for its fifth Assessment Report (AR5) in 2014 were used. The two RCPs, RCP2.6 and RCP8.5, are named after a possible range of radiative forcing values in the year 2100 relative to pre-industrial values (+2.6 and +8.5 W/m^2, respectively). The pathways are used for climate modelling and research. They describe two possible climate futures, considered possible depending on how much greenhouse gases are emitted in the years to come. RCP 2.6 assumes that global annual GHG emissions (measured in CO_2-equivalents) peak between 2010 and 2020, with emissions declining substantially thereafter. In RCP 8.5, emissions continue to rise throughout the 21st century.

Annex 6

Adaptation options in Nakuru as identified in ASDSP

Various adaptation strategies were identified by stakeholders and residents of Nakuru County in the Government of Kenya's "Agricultural Sector Development Support Programme (ASDSP)" of 2014. The table below compiles these results and disaggregates them by percentage of the population using each practice, as well as percentage based on the gender and age of the head of the household.

Table 6: Adaptation to climate change and variability

Adaptation strategy	% Adoption, by Head of Household				Value Chains	Value Chain Activity	Inputs	Results	Challenges
	M	F	Y	All					
Tree planting (e.g. agroforestry)	42	43	42	42	All	Production	Seedlings	-Wind breaks - shade - livestock fodder	-Lack of political goodwill -marginalization of women due to land tenure issues -deforestation due to high fuel utilization & illegal settlement
Soil-water conservation (cover crops, intercrop, water harvesting, drainage channels, conservation agriculture)	34	28	36	34	All	Production	Seeds; Water tanks; Herbicides; Water pans	-Good water holding capacity - change in crop mixes -increased yields -reduced leaching and crusting -reduced distance to water sources	-High poverty levels -low farmer adoption -expensive equipment -siltation of dams
Change crop type (early maturing varieties)	31	26	30	30	Irish potato Maize	Production	Hybrid seeds; pesticides; fertilisers	-Increased yields -reduced use of inputs	-Low technology adoption -expensive inputs -counterfeit inputs
Staggered cropping	30	24	30	29	Irish potato Maize	Production	Seeds; Fertilisers; water	-Increased yields -reduced disease incidences	-Lack/expensive inputs -low technology adoption
Change livestock type (improved breeds)	17	10	14	15	Dairy cow Local poultry	Production	Hybrids; Vaccinations, AI	-Good animal quality -high production	-Social norms -expensive inputs
Feed conservation	14	9	12	13	Livestock	Production	Fodder; baler; storage facility	-Reduced disease incidences	- Lack of storage facilities -fodder crop failure -expensive equipment

							pulverizers	-efficient disease control -good animal quality -high production	
On-farm diversifica-tion	15	14	19	16	Livesto ck Crops	Production Marketing	Seeds; fertiliser; capital; entrepreneursh ip	-Increased income -better livelihoods -food security -reduced production and marketing risks	-Lack of inputs -lack of capital -low entrepreneurial capacity
Value addition (processing, cooling, grading, boiling, de-feather)					Livesto ck Crops	Marketing	Processors; transporter; packaging material	-High prices -increased shelf-life	-Low capacity -poor infrastructure -expensive equipment
Food storage facilities	17	13	17	16	Maize Wheat Irish potato	Post-harvest handling	Pesticides; storage facilities	-Food availability -post-harvest losses	-Low food production -post harvest loss
Seek employment (abandon agriculture)	14	15	16	15	Livesto ck Crop farmers	-	Skills; Education	-Stable incomes -urban migrations	-Congestion in urban areas
Irrigation	3	4	5	4	All	Production	Water pumps	-Reduced production risks -high yields -soil conservation	-Lack of capital -low agricultural productivity -water contamination -high production costs

Source: GoK (2014) and Author compilation