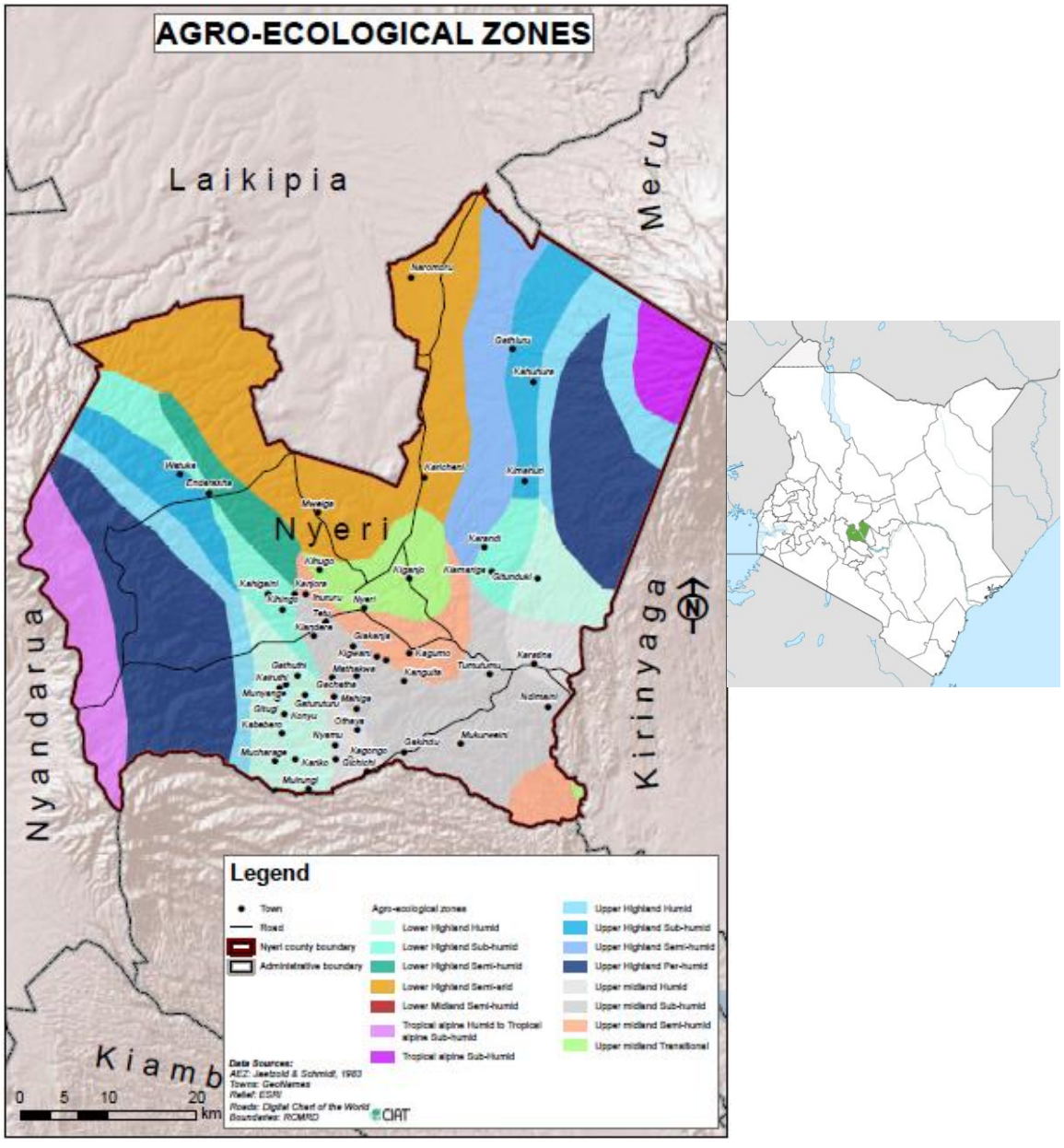
Kenya County Climate Risk Profile Annex: Nyeri County

Annex 1

Land division and value chain commodity details

Nyeri County is divided into eight sub-counties and approximately 15 AEZs. The figure below outlines the administrative and agro-ecological divisions of the county in detail.



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: Irish potatoes, local poultry (meat), bananas and dairy cattle (milk).

Table 1: Value Chain selection indicators

Indicator (units)	**Value Chain Commodity**			
	Irish potatoes	**Local Poultry (meat)**	**Bananas**	**Cattle (milk)**
Harvested Area (Ha)	7,651	335,700	N/A	335,700
Production (90 Kg bags)**	243,233	297,781	N/A	131,834,850
Value of production (US$) *	796,164,958	119,112,533	N/A	5,932,568,265
Dietary energy consumption (Kcal/ capita/ day)	49.15	2	26.17	163
Protein content (gr of protein/100 gr)	2.05	17.55	1.09	3.28
Vitamin A content (IU Vitamin A/100 gr)	2	178	64	138

*USD$ 1 was equivalent to KSh 90

** Local poultry (meat) is in absolute numbers.

Sources: Economic Review of Agriculture (2015), ASDSP's Household Baseline Survey Reports for Counties (2014), FAO and USDA.

Annex 2

Crop and livestock productivity in Nyeri County

Differences can be observed between the productivity of the prioritized value chains based upon both the gender and age of the head of the household, as well as the growing season in consideration. These differences are captured in the table below.

Table 2: Seasonal crop and livestock productivity by head of household

Crop or animal	**Head of Household**							
	Total		**Male**		**Female**		**Youth**	
Season	S1	S2	S1	S2	S1	S2	S1	S2
Irish potatoes (kg/acre)	1196	1909	1193	2259	1390	1220	728	904
Local poultry (meat)* (kg)	10		12		12		6	
Bananas (kg/acre)	408		424		285		375	
Cattle (milk)** (litres)	35.2	30.9	28.4	24.9	47	43.1	52.6	27.8

* Total weight of animals slaughtered on farm in the last 12 months
** Cattle consists of local, exotic and cross breeds
Note: For cattle, season 1 is the wet season, while season 2 is the dry season. Banana is a perennial crop (single season).
Source: ASDSP (2014)

Annex 3

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. The 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 95th extreme percentile value which was plotted in time series[1]. 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 [2] by evaluating the soil's water-holding capacity and evapotranspiration in order to define the number of days that could undergo a level of stress.

Two Representative Concentration Pathways (RCPs) were used, also known as the four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for its fifth Assessment Report (AR5) in 2014. 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.

[1] In this case, we only used precipitation as input file.
[2] In this case, as input files we used maximum temperature, minimum temperature, precipitation, solar radiation, and water capacity of soil.

Annex 4

Adaptation options in Nyeri County, as identified in the ASDSP

Various adaptation strategies were identified by stakeholders and residents of Nyeri 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 3: Adaptation strategies

Adaptation strategy	% Adoption, by Head of Household				Value Chain	Value Chain Activity	Inputs	Results	Challenges
	M	F	Y	All					
Value addition	30.6	26.1	35	30.5	Banana, cattle (milk)	Post-harvest	- Expertise on processing -Equipment such as coolers, culture	-Preservation of product, preventing losses - Increase in value of product sold (increased income) - Stabilisation of market prices from having consistent supply	-Unreliable electricity supply -High cost of electricity back-up equipment -Market dominance by few players (little advantage in value addition since prices are dictated by buyers
Soil-water conservation	14.3	13	5	12.8	All	On-farm production	- Training on soil and water conservation - Cover crops, mulching	-Improved production during dry season -Lower expenses from reducing need for irrigation and supporting structures for crops	-Hilly terrain (challenging to implement practices) - Densely populated land, small land sizes (limited intervention possible)
On-farm diversification	11.2	4.3	5	9.2	All	On-farm production	-Farm management skills -Seeds or animal stock	-Stabilised incomes -Stronger bargaining power of farmers resulting in better marketing terms	-Limited management skills to run multiple farm enterprises -Small land sizes
Seek employment	7.1	13	10	8.5	All	-	-Off-farm skills	-Stabilisation of household income -Reduced farm labour	-Competition with farming as a source of employment (challenge to intergenerational change in farm ownership)
Water harvesting	5.1	0	15	5.7	All	On-farm production	-Water pans, water tanks	-Sustained production during dry season -Reduced soil erosion from capturing of rainwater runoff	-Small-scale due to limited financial resources and skills

Irrigation	1	0	10	2.1	Banana, Potatoes	On-farm production	-Water pumps and pipes - Water reservoir	-Sustained production during dry season -Stable food prices -Potential overuse of ground and underground water sources	-Water scarcity --Lack of large scale irrigation infrastructure
Tree planting	0	8.7	5	2.1	All	On-farm production	-Tree seedlings -Skills seedling and tree management	-Soil and water conservation -Protection of crops against strong winds -Improved food security if fruit trees are grown	-Small farm sizes - High demand for firewood limits usefulness of trees on farm
Change livestock type	1	4.3	0	1.4	Cattle (milk), local poultry	On-farm production	-Improved stock or superior AI supplies - AI practitioner -Extensionist to advise on appropriate breeds	-Improved utilisation of feed (lower costs for comparable production) -Reduced mortality from sensitivity to weather and diseases	-Inexperience in rearing new breeds (inadequate skills) -Untested breeds in particular areas may discourage producers to take them up
Feed conservation	1	0	0	0.7	Cattle (milk), local poultry	On-farm production	-Skills in feed composition -Skills in pasture management	-Lower costs of feeds -Improved income through sale to manufacturers and neighbouring farmers	- Labour intensive process of preparing feeds -Lack of storage

Note: M, F and Y stands for Male- , female- and youth- headed households.
Source: ASDSP (2014) and author's compilation.