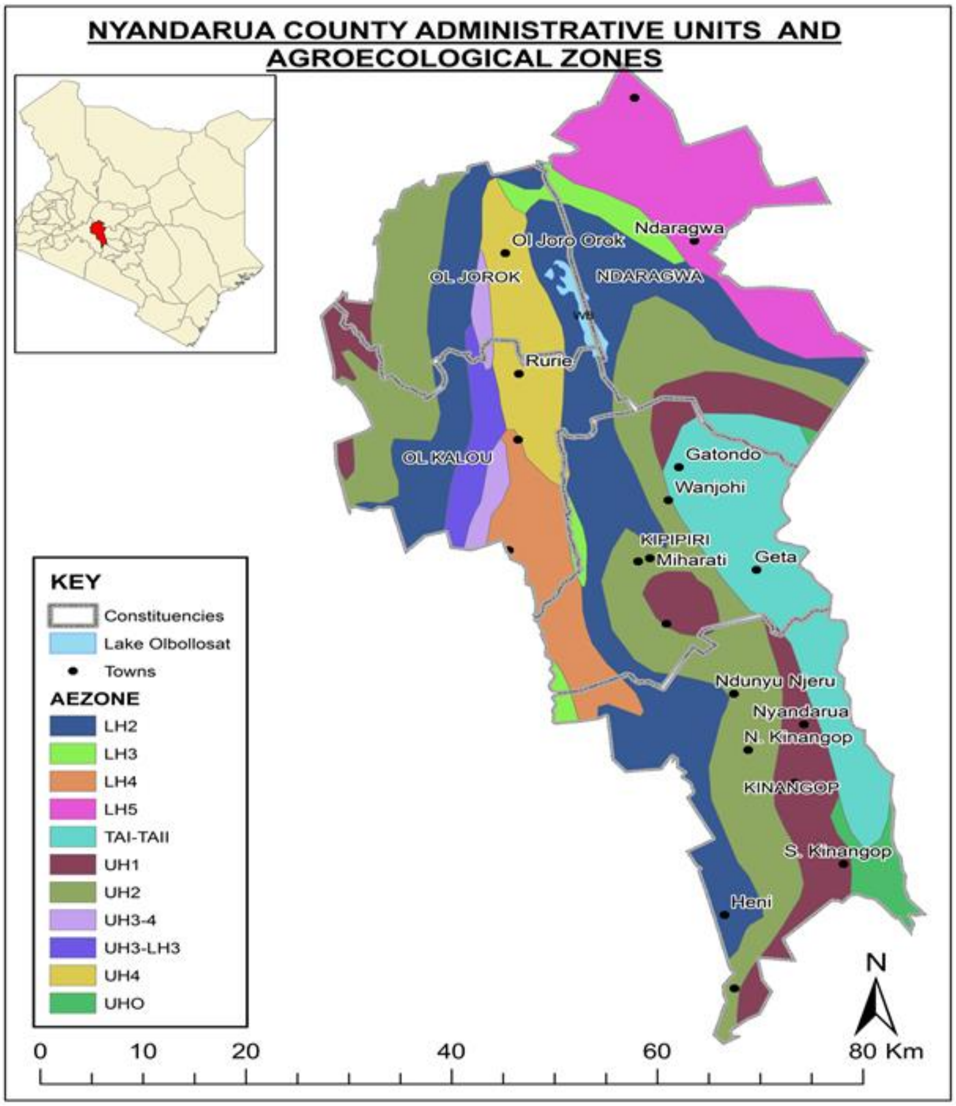
Kenya County Climate Risk Profile Annex: Nyandarua County

Annex 1

Administrative division of Nyandarua County

Nyandarua County is subdivided administratively into five sub-counties and ecologically into several transecting agro-ecological zones. The map below provides further detail of these divisions.

Figure 1: Administrative and Agro-ecological zone (AEZ) division in Nyandarua



Annex 2

Selection of Value Chain Commodities in Nyandarua

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, peas, local poultry and cattle (dairy).

Table 1: Value chain selection indicators

Indicator	**Value Chain Commodity**			
	Irish potato	**Peas**	**Local poultry**	**Dairy cow**
Harvested Area (Ha)	38,500	15,418	N/A	N/A
Production (90 Kg bags)**	6,650,000	57,965	208, 232	223,500,000
Variation in production	N/D	N/D	N/D	N/D
Value of production (US$) *	86,450,000	1,743,892	1,922,222	69,555,556
Dietary energy consumption (Kcal/ capita/day)	58	81	143[1]	62
Protein content (gr of protein/100 gr)	2.57	5.42	12.56	3.21
Vitamin A content (IU Vitamin A/100 gr)	0	765	540	165

* USD$ 1 was equivalent to KSh 90 ** Poultry meat was converted to 90 kg Units
Source: ERA 2015, FAO 2015

[1] 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 3

Crop productivity by gender

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 (unit)	Head of Household							
	Total		Male		Female		Youth	
Season	S1	S2	S1	S2	S1	S2	S1	S2
Irish Potato	2,937	1,309	3,034	1,095	2,479	1,536	2,930	1,291
Garden peas	794	231	986	205	380	360	80	N/A
Snow peas	714	571	816	669	510	600	514	571
Local cattle	5.8	7.3	5.6	6.9	6.4	8.6	6.3	8.3
Cross breed	7.4	9.4	8	10	4.5	6.5	7.3	9.3
Exotic cattle	9	11.8	9.3	12.3	7.4	9.1	8.7	11.7

Note: S1 is Season 1, 2012-2013; S2 is Season 2, 2013.
Source: ASDSP (2014)

Annex 4

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 analyzed. 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 95^{th} percentile of daily precipitation distribution conformed of 100 wettest days per season per year was calculated. Then we identified the 95 extreme percentile, value which was plotted in time series[2]. 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[3] by evaluating 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) 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/m2, 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 CO2-equivalents) peak between 2010 and 2020, with emissions declining substantially thereafter. In RCP 8.5, emissions continue to rise throughout the 21st century.

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

Annex 5

Adaptation options in Makueni County, as identified in the ASDSP

Various adaptation strategies were identified by stakeholders and residents of Nyandarua 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 Nyandarua County

Adaptation strategy	% Adoption, by Head of Household				Value Chain	Value Chain Activity	Inputs	Results	Challenges
	M	F	Y	All					
Tree planting -Agroforestry	76	33	73	71	All	Production	Seedlings	-Achieved 10% tree cover	-lack of political good will -marginalization of women due to land tenure issues -deforestation due to high fuel utilization
Soil-water conservation -cover crops -intercropping -water harvesting -drainage channels -conservation agriculture	49	67	50	51	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	43	14	46	40	Irish potato Peas	Production	Hybrid seeds; pesticides; fertilizers	-Increased yields -reduced use of inputs	-low technology adoption -expensive inputs -counterfeit inputs
Staggered cropping	45	48	39	44	Irish potato Peas	Production	Seeds; Fertilizers; water	-Increased yields -reduced disease incidences	-lack/expensive inputs -low technology adoption
Change livestock type -improved breeds	24	14	19	22	Dairy cow Local poultry	Production	Hybrids; vaccinations, artificial insemination (ai)	-Good animal quality -high production	-social norms -expensive inputs

Feed conservation	15	0	15	25	Livesto ck	Production	Fodder; Baler; Storage facility Pulverizer s	-Reduced disease incidences -efficient disease control -good animal quality -high production	- lack of storage facilities -fodder crop failure -expensive equipment
On-farm diversification	8	24	4	9	Livesto ck Crops	Production marketing	Seeds, fertilizer Capital Entrepren eurship	-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 -defeathering	23	19	8	20	Livesto ck Crops	Marketing	Processors transporter Packaging material	-High prices -increased shelf-life	-low capacity -poor infrastructure -expensive equipment
Food storage facilities	26	29	15	25	Maize Wheat Irish potato	Post-harvest handling	-Pesticides, -storage facilities	-Food availability -post-harvest losses	-low food production -post-harvest loss
Seek employment (abandoning agriculture)	22	10	27	22	Livesto ck Crop farmers	-	Skills; education	-Stable incomes -urban migrations	-congestion in urban areas
Irrigation	19	19	27	20	All	Production	-Water pumps	-Reduced production risks -high yields -soil conservation	-lack of capital -low agricultural productivity -water contamination -high production costs

Source: ASDSP (2013) and author's compilation