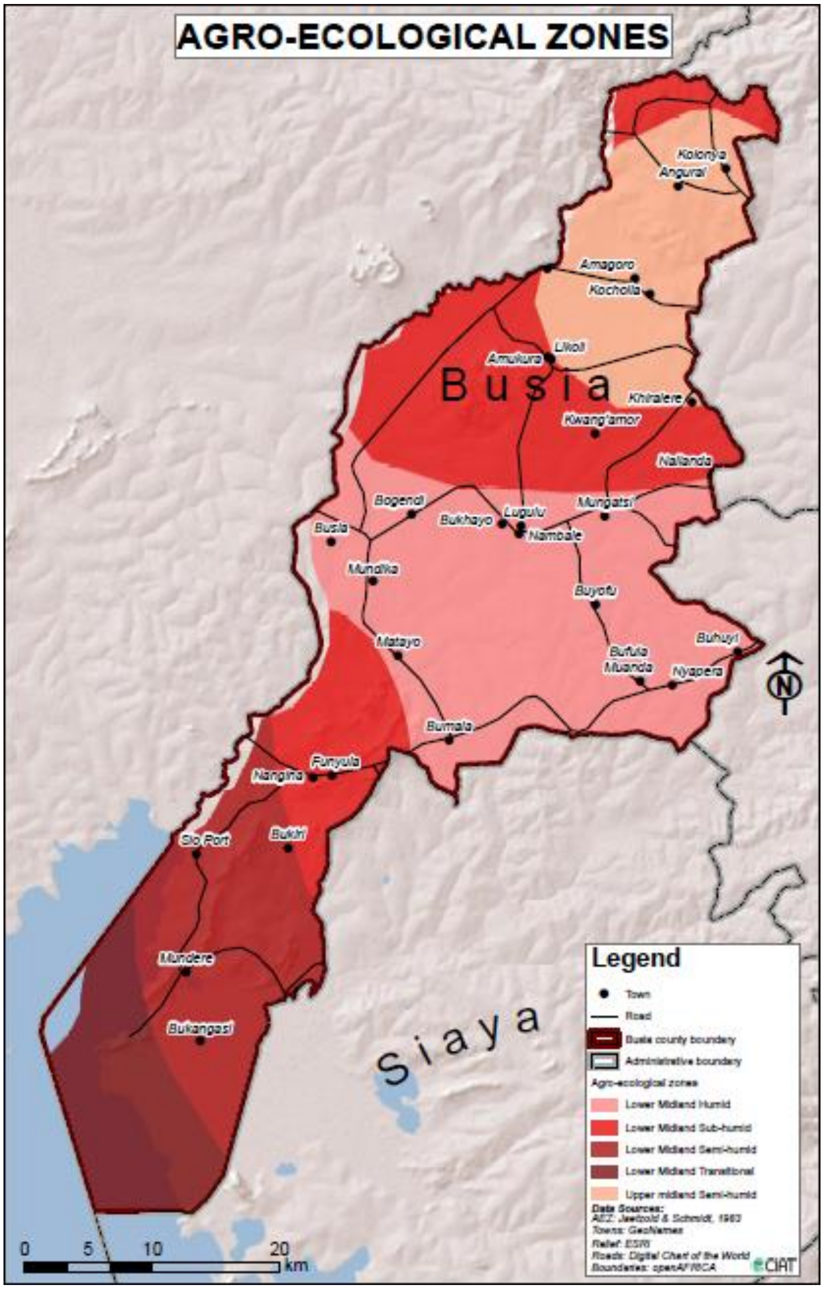
Kenya County Climate Risk Profile Annex: Busia County

Annex 1

Land division and value chain commodity details

Busia County is divided into seven sub-counties and approximately 5 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), 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: cassava, maize, local poultry (meat) and sorghum.

Table 1: Value Chain selection indicators

Indicator (units)	**Value Chain Commodity**			
	Cassava	**Maize**	**Local Poultry (Meat)**	**Sorghum**
Harvested Area (Ha)	20,614	46,096	182,400	3573
Production (90 Kg bags)**	2,811, 354	688,865	517,215	43,761
Value of production (US$) *	5,716,058,727	2,039,347,125	206,885,867	165,315,841
Dietary energy consumption (Kcal/ capita/ day)	0.39	76.14	2	2.25
Protein content (gr of protein/100 gr)	1.36	9.42	17.55	10.62
Vitamin A content (IU Vitamin A/100 gr)	13	214	178	0

*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 Busia 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
Cassava (kg/acre)	454		524.1		320		168.7	
Maize (Dry) (kg/acre)	298	269	314	328	273	210	250	310
Local poultry (meat)* (kg)	16		18		10		24	
Sorghum (kg/acre)	217	406	203	547	200	190	291	103

* Total weight of animals slaughtered on farm in the last 12 months
Note: Cassava 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.

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[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 Busia County, as identified in the ASDSP

Various adaptation strategies were identified by stakeholders and residents of Busia 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					
Tree planting	63.4	59.1	71	63.6	All	On-farm production	-Drought-tolerant varieties of tree seedlings	-Protected soils and soil water content -Improved soil nutrition -Additional source of food in the case of agroforestry with fruit trees	-Access to irrigation water for planting seedlings during dry seasons -Lack of information about appropriate trees -Limited range of tree seedlings available
Change crop type	55.5	40.9	45.2	51.5	Sorghum	On-farm production	-Improved or drought-tolerant varieties	- Improved harvest; higher food security and income (producers and throughout value chain)	- Slow adoption rates for new crops and varieties (resistance to change)
Soil-water conservation	36	31.8	51.6	37.2	Cassava, Maize, Sorghum	On-farm production	-Contour ploughing, mulching, planting cover crops	- Preservation of production environment -Increased soil nutrition - Improved soil water content during dry season	-High competition for county-owned tractors - High tractor hire fee
Staggered cropping	35.4	34.1	41.9	36	Cassava, Maize, Sorghum	On-farm production	-Fast-maturing varieties -Early harvesting	-Reduced crop losses from rotting during heavy rains	Lack of expertise on husbandry practices during periods of increased rainfall

On-farm diversification	23.8	18.2	32.3	23.8	All	On-farm production	-Multiple on-farm enterprises	- Secured food and income opportunities	-Small farm sizes - Limited expertise on managing multiple enterprises well
Water harvesting	23.2	18.2	22.6	22.2	All	On-farm production	-Water pans, water tanks	- Sustained food production and economic activities during dry seasons. - Lower food prices compared to dry seasons when irrigation is not practised	- Small farm sizes - Labour intensive construction needed (lack of financial resources)
Value addition	22.6	18.2	22.6	21.8	Cassava, Maize, Sorghum	Post-harvest	-Proper storage equipment and facilities, dryers, maize shellers	- Higher value products sold by producers -Lower post-harvest losses resulting in higher incomes and improved food security	- Lack of resources to purchase expensive equipment such as dryers - Lack of market knowledge on buyers of processed products
Seek employment	20.1	15.9	22.6	19.7	All	-	-Off-farm skills	-Improved incomes	-Loss of labour and management resources for on-farm activities -Loss of on-farm production skills over time
Feed conservation	15.9	2.3	19.4	13.8	Local poultry	On-farm production	-Storage facilities	-Sustained production during harsh climatic conditions -Lower costs of feed	-Lack of storage facilities (expensive to construct) - Need for produce or acquire other components make wholesome feeds
Change livestock type	14.6	9.1	9.7	13	Local poultry	On-farm production	-Improved stock	-Improved production during harsh climatic conditions -Reduced animal mortality	-Perceived high costs of Artificial Insemination (AI) - Difficulty in accessing AI practitioners within short notice
Food storage facilities	12.2	2.3	9.7	10	Cassava, Maize, Sorghum	Post-harvest	Proper storage equipment (bags, construction materials)	-Reduced losses – higher income and food security	- Improper drying resulting in losses or aflatoxin contamination
Irrigation	5.5	4.5	16.1	6.7	All	On-farm production	Pumps, pipes, large-scale/county-wide infrastructure	-Improved production during dry season - Sustained production – steady prices, continued economic activities	-Lack of high-level infrastructure for sustained irrigation - Overuse of underground water for irrigation

								throughout value chain	
Lease extra land	4.3	2.3	3.2	3.8	All	On-farm production	-Land, tractor/tools	- Improved production - Secured livelihoods of producers and value chain actors	-Limited land for agriculture - Increasing cost of land
Communal seed banks	1.2	0	6.5	1.7	Cassava, Maize, Sorghum	Input	-Seedlings	-Continued production throughout harsh climatic conditions -Improved production from use of varieties adapted to local conditions	-Access limited to membership in cooperative
Buy insurance	1.2	2.3	0	1.3	All	Off-farm service supporting on-farm production	-Capital and information	-Increased production by confident producers -Improved lending environment from establishment of financial investment/savings culture	- Perception of non-payment of claims in industry in general affects reputation

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