Kenya County Climate Risk Profile Annex: Kwale County

Annex 1

On-farm Income in Kwale County

Differences can be observed between the value in terms of income of the prioritized value chains based upon both the gender and age of the head of the household: these differences are captured in the table below.

Table 1: Source of On-Farm Income by Head of Household

Source of Income	Head of Household							
	Male		Female		Youth		Total	
	%, total income	KSh	%, total income	KSh	%, total income	KSh	%, total income	KSh
Crop	36.8	35,003	31.4	9,086	32.0	28,450	34.1	24,180
Livestock	32.9	31,304	68.6	19,836	14.0	12,430	29.9	21,190
Woodlot	3.2	3,000	-	-	-	-	1.4	1,000
Fishing	1.9	1,800	-	-	-	-	0.8	600
Pasture	2.1	2,000	-	-	-	-	0.9	667
Other	23.1	22,000	-	-	54	48,000	32.9	23,333
Total	**100%**	**95,107**	**100%**	**28,922**	**100%**	**88,880**	**100%**	**70,970**

Source: ASDSP (2014)

Annex 2

Crop and Livestock Indicators in Kwale County

The following graphs provide more detailed information about aspects of production ad productivity for some of the main value chain commodities considered in this profile.

Table 2: Maize production by year

Indicator	2012	2013	2014
Total Arable Land Area, Acres *and* Percentage (%)	97,582 (44%)	98,620 (45.2%)	90,549 (39.2%)
Production, Kilograms (kg) *and* Units (# of 90 kg bags)	13, 224,690 kg (146,941 bags)	13,245,210 kg (147,169 bags)	31,472,550 kg (349,695 bags)
Yield, Kilograms (kg/acre), (tons/ha) *and* Units (90 kg bag/acre)	135.5 kg/acre 0.369 tons/ha (1.5 bags/acre)	134.3 kg/acre 0.366 tons/ha (1.5 bags/acre)	347.6 kg/acre 0.947 tons/ha (3.9 bags/acre)

Source: ERA (2015)

Table 3: Maize yields by season

Indicator	Season 1 (08.12 - 02.13)	Season 2 (03.13 - 07.13)
Average area (acre)	5	3
Average yields male-headed households (kg/ acre)	513	243
Average yields female-headed households (kg/ acre)	448	31
Average yields youth-headed households (kg/ acre)	439	53

Source: ASDP (2014)

Table 4: Quantity of input used in maize production (kg)

Input (kg)	Head of Household							
	Male		Female		Youth		Total	
	Season 1	Season 2	Season 1	Season 2	Season 1	Season 2	Season 1	Season 2
Seed planting material	98.5	48.7	23.4	21.3	23.0	25.9	77.2	42.7
Herbicides	10.4	4.0	-	-	-	1.0	10.4	2.5
Basal Fertilizer	50.0	-	1015.0	-	50.0	100.0	532.5	100.0
Top dresser	102.0	-	-	50	-	-	102.0	50
Field Pesticides	4.1	3.2	4.1	3.6	2.5	2.7	3.9	3.2
Storage pesticides	34.8	1.5	-		5.0	100.5	32.5	23.5

Source: ASDSP (2014)

Table 5: Cowpea production by year

Indicator	2012	2013	2014
Total Arable Land Area, Acres *and* Percentage (%)	7,017 (3.2%)	7,937 (3.6)	11,414 (5.2)
Production, Kilograms (kg) *and* Units (# of 90 kg bags)	327,510 (3,639)	1,587,330 (17,637)	1,638,630 (18,207)
Yield, Kilograms (kg/acre) *and* Units (90 kg bag/acre)	46.7 (0.52)	5.5 (2.2)	3.9 (1.6)

Source: ERA (2015)

Table 6: Cowpea yields by season

Indicator	Season 1 Aug. 2012 - Feb. 2013		Season 2 March - July 2013	
	Grain	**Vegetable**	**Grain**	**Vegetable**
Average area (acres)	2.46	5.5	1.6	2
Average yields, male-headed households (kg/ acre)	78	50	155	95.1
Average yields female-headed households (kg/ acre)	31			34.6
Average yields youth-headed households (kg/ acre)	42	50	90	40.8

Source: ASDP (2014)

Table 7: Quantity of input used in cowpea production

Input	Head of Household							
	Male		**Female**		**Youth**		**Total**	
	Season 1	Season 2	Season 1	Season 2	Season 1	Season 2	Season 1	Season 2
Seed planting material	21.8	7.4	4.9	2.6	4.9	3.3	17.7	6.4
Organic Manure	206.1	225.4	120	145.1	120	68.8	181.5	181.1

Source: ASDP (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. 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 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 4

Observed Environmental Change

Farmers in Kwale County have observed the effect of climate change and climate variation in a number of ways. The table below details those changes, with the percentage of households that noticed such changes, disaggregated by the gender and ago of the head of household (which relates to the size and type of farm worked).

Table 10: Environmental changes noticed by proportion of household heads

Environmental Change	Head of Household (Percentage %)			
	Male	Female	Youth	Total
Soil degradation	30.7	24.1	48.3	32.3
Reduction of water volumes	32.1	24.1	31	30.8
Landslides	0.7	0	3.4	1
Drying of the wells and rivers	64.3	62.1	44.8	61.1
Deforestation	51.4	69	62.1	55.6
Disappearances of some plant and animals	2.9	10.3	3.4	4
Non-native/Invasive specie	1.4	6.9	0	2
Incidences of new diseases and pests	15.7	3.4	3.4	12.1
TOTAL	70.7	14.6	14.6	

Source: ASDSP (2014)

Annex 5

Adaptation options in Kwale, as identified in the ASDSP

Various adaptation strategies were identified by stakeholders and residents of Kwale 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 11: Adaptation to climate change and variability

Adapt-ation Strategy	Adoption Rate by Head of Household (%)				Description of the intervention				
	M	F	Y	All	Value Chain Link	Technical implement-ation	Inputs	Results Sought	Challenges or Difficulties
Value addition	34.5	48.3	20.0	34.3	Post-harvest	Processing	Processors, transporters, packaging material	Product diversification, income generation,	Exploitation by middlemen
Staggered cropping	29.7	58.6	23.3	32.8	Production	Training	Farm inputs (seeds, fertilizers, labour, land, etc.)	Improved yield	Prohibitive input prices
Food storage facilities	29.0	48.3	20.0	30.4	Post-harvest	Formation of cooperative such as Dzombo, Vanga and Shimba Hills	Storage fertilizers, traditional on farm granaries, NCPB	Food security	Inadequate food storage facilities; Weak and inadequate farmers cooperatives; Exploitation by middlemen.
Water harvesting	26.2	58.6	20.0	29.9	Production	Expertise, skills in water harvesting techniques	Water tanks, water pans	Improved, consistent yield	High price of water tanks
Change crop type	24.8	24.1	30.0	25.5	Production	Advisories and sensitization from relevant depts.	From maize to sorghum seeds	Income generation, stability	Cultural attachment to the maize than sorghum, with the belief that the latter is a poultry feed.

Soil and water conservation	20.7	37.9	20.0	23.0	Production	Training: minimum tillage, mulching, cover crops, crop rotation, planting pits, subsoiler use	Farm inputs (seeds, fertilizers, subsoiler, water pans, planting pits)	Improved yield; conservation	Subsoilers not readily available
Diversification of enterprises	17.9	20.7	16.7	18.1	Marketing	Women engage in other enterprises, e.g. selling mandazi	Capital, labour	Income generation	Starting capital
Seek employment	16.6	31.0	10.0	17.6	Marketing	Skills and expertise in non-agricultural sectors; training	Experience in other sectors (mining, hospitality, industry, public sector	Income generation	High illiteracy levels, especially for women
Tree planting	11.7	41.4	0.0	14.2	Production	Sensitisation, encouragement from KFS,NEMA	Nurseries for local/ indigenous trees; water	Sustainable natural resource management	Climate hazards; lack of community participation
Change livestock type	9.0	0.0	13.3	8.3	Production	Improved local breeds; artificial insemination	Husbandry materials	Income generation	"Cattle complex" Improved local breeds are expensive and may not cope well or may replace the original specie
Feed conservation and diversification	7.6	10.3	6.7	7.8	Production	Local poultry now feed on sorghum, crop residues	Feed bales in case of drought	Less of household income used on external inputs	Accessing the bales to some farmers is a challenge
Irrigation	6.2	13.8	0.0	6.4	Production	Nyalani irrigation scheme Drip irrigation	Small scale irrigation tanks; water	Improved vegetable production, nutrition	Most of the rivers are seasonal, not consistent
Lease land	0.0	3.4	0.0	0.5	Production	Where one has more than on parcel of land.	Leaser, lessee	Increased household income	Less than 2% of the household practice it.

Source: Compiled by author using ASDSP (2014)