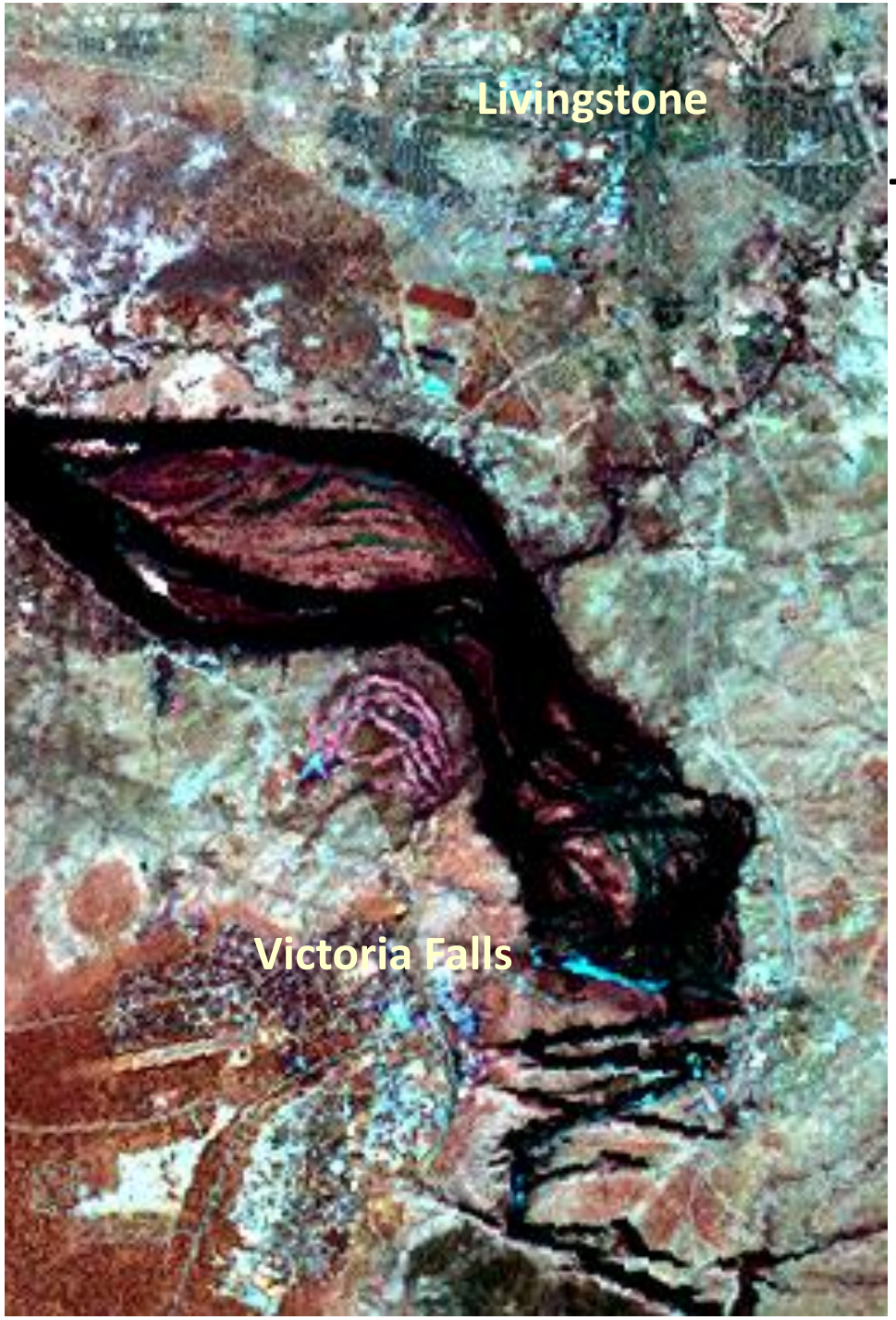

IPCC- Side Event
– CCDA-V, Victoria Falls

IPCC AR5-Africa Chapter

Impacts and Vulnerability

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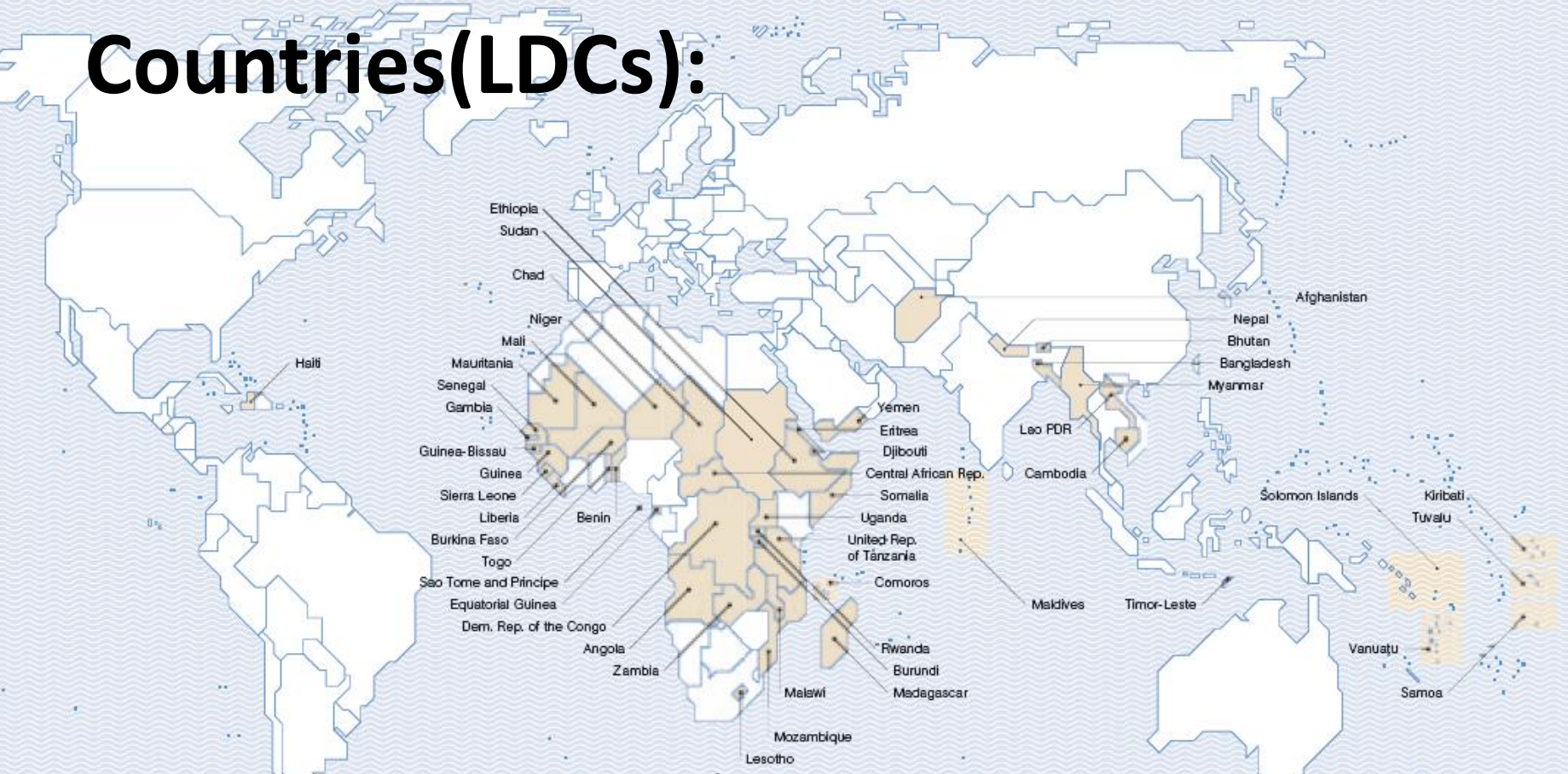
The distribution of Least Developed Countries(LDCs):

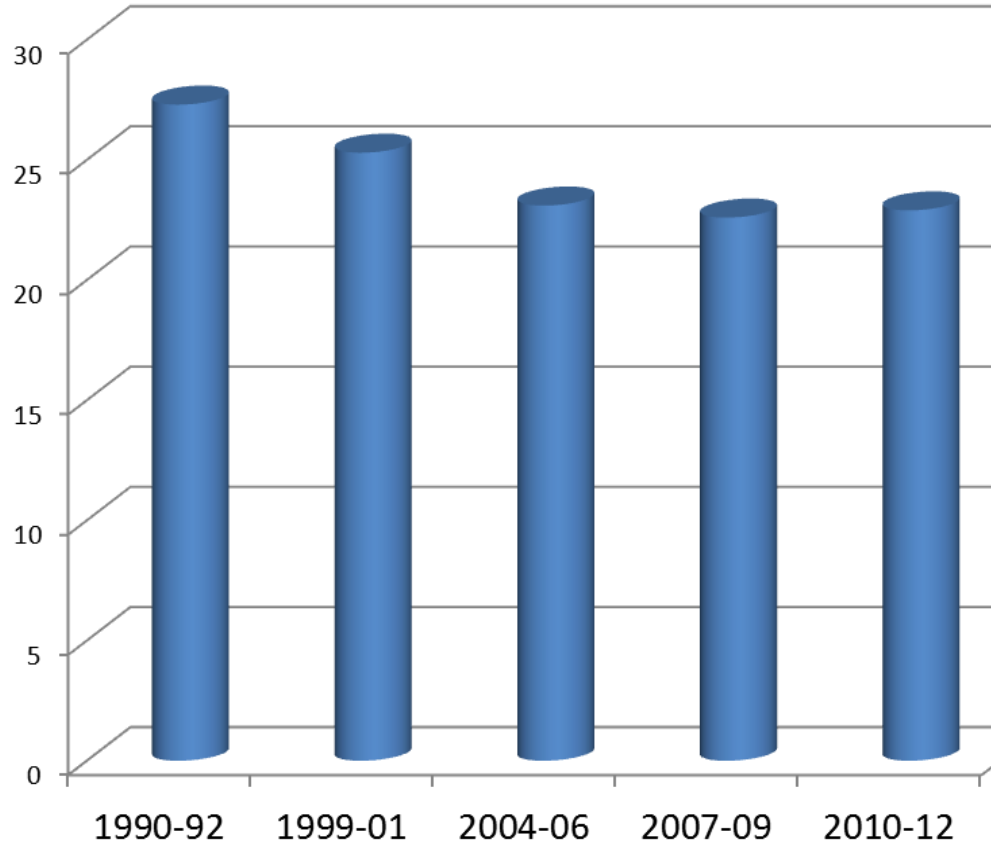


Poverty in sub-Saharan Africa rural areas - double the prevailing average in developing countries of other regions despite the recorded decline: 64.9% in 1998 to 61.6% in 2008

Meeting MDGs – remains a challenge despite noted progress

- Progress skewed in favor of higher-income groups and urban populations
- Use of improved sanitation low - 41% in 2010 compared to 36% in 1990
- Highly depended on rainfed agriculture

Undernourishment in Africa by % of the total population



African Cities and Towns: Highly vulnerable to impacts of climate change and variability

- Urban population projected to triple by2050
- Evolving unplanned cities - informal settlements, inadequate services - urban poverty

- Cities on mega-deltas and coastal areas – expose large population to flood risk and sea level rise

Some of the Projected Vulnerability in Cities

- **Kenya:** by 2030, 10,000 to 86,000 people would be affected
  - Losses ranging US$ 7 million to US$ 58 million (SEI, 2009).

- **Tanzania- Dar-es-Salaam:** By 2030 population at risk of 1 in 100-year return period extreme water levels ~ 30,300 and 110,000 inhabitants
  - Potential losses of US$ 35.6 million to US$ 404.1 million

- **High levels of vulnerability and low adaptive capacity in African cities:** **due to structural factors**, e.g. in-capacitated local governments

Water:

- **Already at risk:** Increasing demand, pollution, etc.
- Climate change will amplify these stress

- Regions projected to become drier- e.g. northern Africa and parts of southern Africa & are already water-stressed - will be most affected.

Ground Water

- Areas receiving between 200 and 500 mm rainfall per year - Sahel, Horn of Africa & Southern Africa - likely to experience a decline in groundwater recharge with climate change

- Coastal aquifers with high rates of groundwater extraction -saltwater intrusion, coupled with increased saltwater ingression from SLR are vulnerable

Ground water data in Africa are extremely limited

Terrestrial Ecosystems

- Under extensive pressure, e.g. fire, deforestation

Observed changes:

- A small expansion of desert conditions (LC).
- A large increase in human disturbances & decrease in the extent of natural vegetation *(HC)*
- Complex shifts in vegetation types:
  - **A net decrease in woody vegetation in western Africa**
  - **A net increase in woody vegetation in central, eastern, and southern Africa *(HC)***

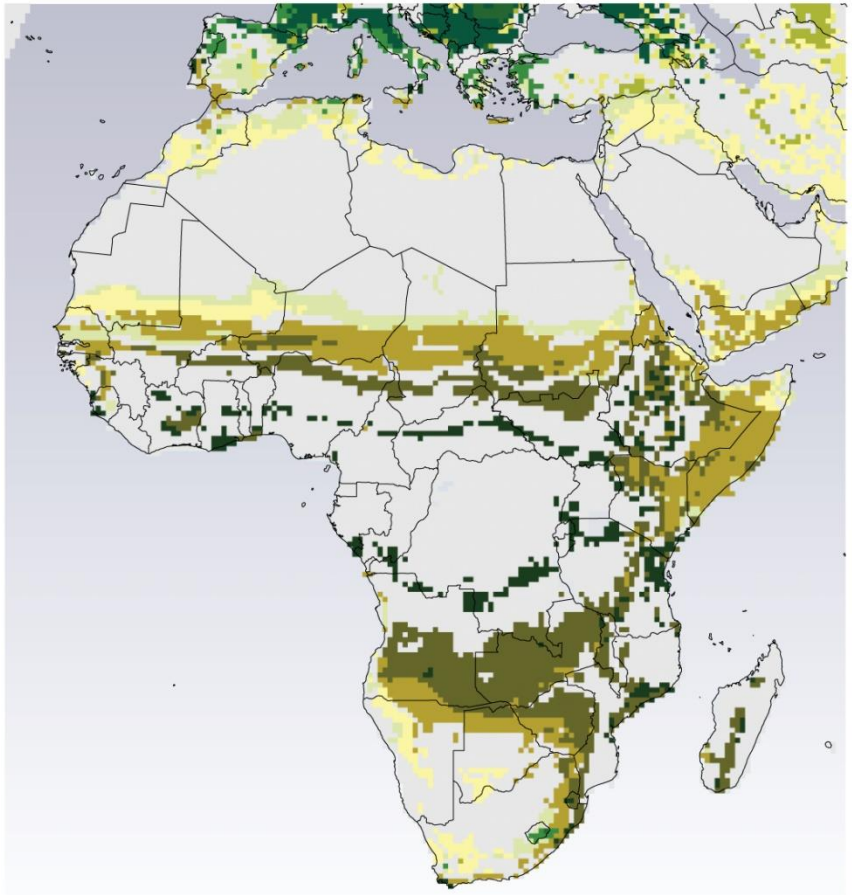
- **It is difficult to isolate the role of climate change from other drivers**

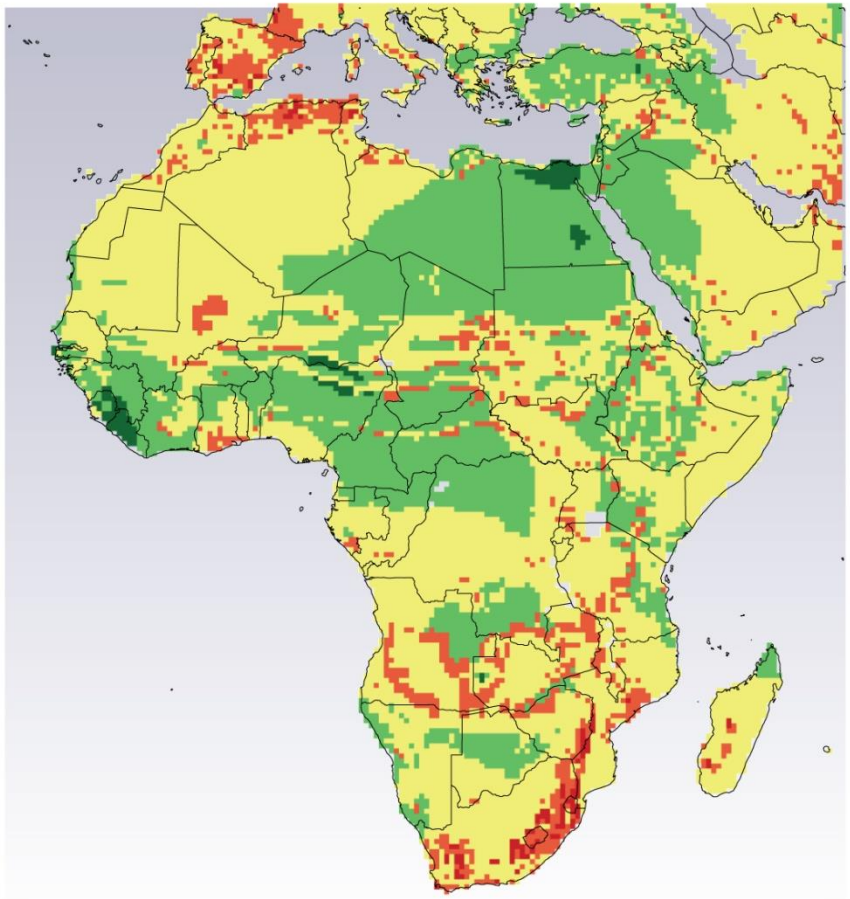
in the particular species or system. Confidence in the role of climate being a major driver of the change is based on the extent to which the detected change is consistent with that expected under climate change, and to which other confounding or interacting non-climate factors have been considered and found insufficient to explain the observed change.

Type of change and nature of evidence	Examples	Time scale of observations	Confidence in the detection of change	Potential climate change driver(s)	Confidence in the role of climate vs. other drivers
Changes in ecosystem types *Robust evidence*	Across sub-Saharan Africa, 57% increase in agricultural areas and 15% increase in barren (largely desert) areas was accompanied by 16% decrease in total forest cover and 5% decrease in total non-forest cover (Brink and Eva, 2009).	~25 years (1975–2000)	*Medium*	Increasing CO_2, changing precipitation patterns, increasing temperatures	*Low*
	On Mt. Kilimanjaro, increased vulnerability to anthropogenic fires has driven 9% decreases in montane forest and 83% decreases in subalpine forest (Hemp, 2009).	~25 years (1976–2000)	*High*	Increasing temperatures, decreasing precipitation	*Low*
	In the Democratic Republic of Congo, total forest cover declined by 2.3%, with most losses in secondary humid forest (Potapov et al., 2012).	~10 years (2000–2010)	*High*	None proposed	*Low*
	Dieback of seaward edge of mangroves in Cameroon at rates up to 3 m yr^{-1} (Ellison and Zouh, 2012)	~35 years (1975–2010)	*High*	Sea level rise	*Medium*
	Across western Africa, central Africa, and Madagascar, net deforestation was 0.28% yr^{-1} for 1990–2000 and 0.14% yr^{-1} for 2000–2010 (Mayaux et al., 2013).	~20 years (1990–2010)	*High*	None proposed	*Low*
Changes in ecosystem structure *Robust evidence*	Surveys of coral reefs in northern Tanzania indicate relative stability in the abundance and diversity of species, despite climate and non-climate stressors (McClanahan et al., 2009).	~9 years (1996–2005)	*High*	None proposed	*Low*
	Analysis of sediment cores from Lake Victoria indicates current community structure (i.e., dominated by cyanobacteria and invasive fish) was established rapidly, during the 1980s (Hecky et al., 2010).	~100 years (1900–2000)	*High*	Increasing temperatures	*Low*
	Long-term declines in density of trees and shrubs in the Sahel zone of Senegal (Vincke et al., 2010) and Mali (Ruelland et al., 2011)	~20–50 years (Senegal, 1976–1995; Mali, 1952–2003)	*High*	Drought stress induced by decreasing precipitation	*Low*
	Southward shift in the Sahel, Sudan, and Guinean savanna vegetation zones inferred from declines in tree density in Senegal and declines in tree species richness and changes in species composition in Mauritania, Mali, Burkina Faso, Niger, and Chad (Gonzalez et al., 2012)	~40–50 years (density, 1954–2002; diversity, 1960–2000)	*Medium*	Increasing temperatures, decreasing precipitation	*Medium*
	Long-term increase in shrub and tree cover across mesic savanna sites (700–1000 mm mean annual precipitation (MAP)) with contrasting land use histories in South Africa (Wigley et al., 2009; 2010)	~67 years (1937–2004)	*High*	Increasing CO_2	*Low*

(a) Projected biome change from the period 1961–1990 to 2071–2100

(b) Vulnerability of ecosystems to biome shifts based on historical climate (1901–2002) and projected vegetation (2071–2100)





Projected worst-case biome changes

Temperate
- Conifer forest
- Broadleaf forest
- Mixed forest
- Shrubland
- Grassland

Tropical
- Grassland
- Woodland
- Deciduous broadleaf forest
- Evergreen broadleaf forest

- Desert

Vulnerability to biome change

	Very low	*Low*	*Medium*	*High*	*Very high*
Confidence:	≤ 0.05	0.05–0.20	0.20–0.80	0.80–0.95	≥ 0.95

Confidence according to IPCC (2007) guidance

Food production

- **High temperatures to have negative effects on major cereal crops across Africa**

Estimated Losses:

Maize: 18% for southern Africa to **22%** aggregated across sub-Saharan Africa

Wheat: 35% by 2050

Sorghum: low- 2% but increases above 2^0 C will lead to greater losses also affecting millet e.g. West Africa

- **A Shift to livestock likely in regions of changing & shortened growing season e.g. W. African Sahel & parts of southeastern Africa**

Perennial crops

- Economically valued crops - tea, coffee, and cocoa:
- **Suitable agro-climatic zones estimated to significantly diminish due to rising temperatures.**

Perennial Crop Suitability Estimates

Coffee	**KENYA: Increased suitability at high latitudes; decreased suitability at low latitudes**
Tea	UGANDA: **Increased suitability at high latitudes**; KENYA: Decreased suitability at low altitudes
Cocoa	GHANA AND CÔTE D'IVOIRE: **Constant or increased suitability at high latitudes but** decreased suitability at low latitudes
Cashew	GHANA AND CÔTE D'IVOIRE: **Increased suitability**
Cotton	GHANA: Decreased suitability

It is not all negative:

- **Maize** production could benefit from warming at high elevation locations (A1FI scenario)
- **Cassava:**
- Eastern Africa - Cassava yields estimated to moderately increase up to the 2030s
- Suitability of cassava to increase in Central Africa
  - Cassava - a potential option – given its hardiness to higher temperatures and sporadic rainfall relative to many cereal crops
- Livestock rearing in highland areas of East Africa - could benefit from increased temperatures


Thank you all for your kind attention !!