



Climate change impacts on key economic sectors: Agriculture (livestock, crops, rangeland)

Absalom Kahumba

University of Namibia-Neudamm Campus

Department of Animal Production, Agribusiness and economics

14th June 2021

Introduction



- Africa as continent is heavily reliant on rain-fed agriculture, with over 70% of the population living by farming, and 40% of all exports being agricultural products (WRI, 1996).
- Namibia is one of the driest countries in sub-Saharan Africa, and highly dependent on climate sensitive sectors.
- Primary sectors, consisting of natural resource based production like agriculture, fisheries and mining account for about 30% of the total GDP (Lange, 2003).
- Namibia is therefore potentially one of the most vulnerable countries to climate change.

Introduction cont...

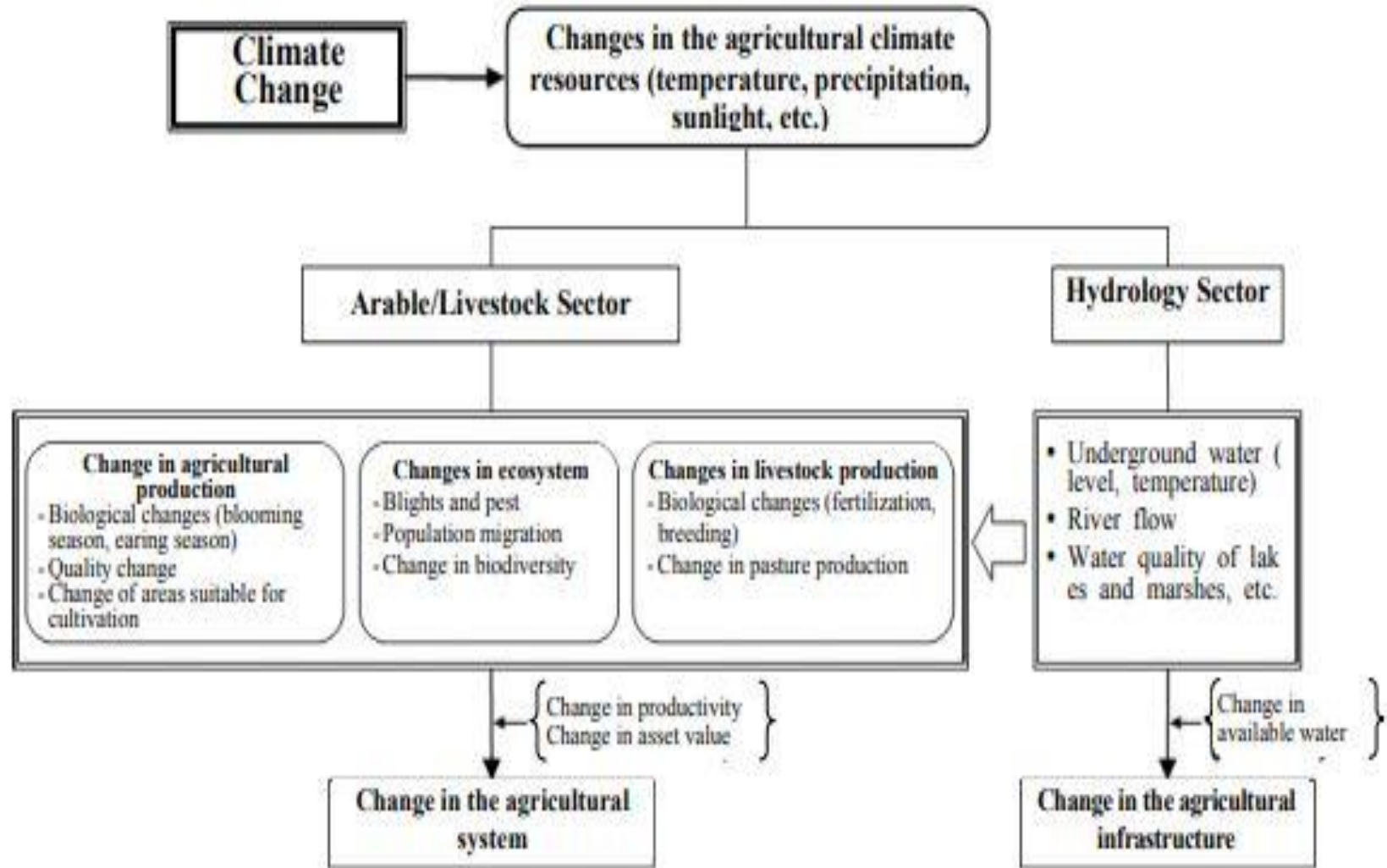


- Agricultural production is carried out through the selection of crops suitable for the climate of a specific region and application of proper farming methods.
- Therefore, agriculture is a climate-dependent bio-industry with notable regional characteristics.
- Climate change disturbs the agricultural ecosystem, resulting in the change in agricultural climatic elements, such as temperature, precipitation, and sunlight, while further influencing the arable, livestock, and hydrology sectors.

Introduction cont...

- The impacts of climate change on the arable and livestock sectors are made known by **biological changes** including the **change of flowering** and **harvesting seasons**, **quality change**, and **shift of areas suitable for cultivation**.
- Climate change affects the agricultural ecosystem, giving rise to diseases and pests and causing population movement and **change in biodiversity**.
- In the livestock sector, climate change brings about **biological changes** in areas such as fertilization and breeding and also affects the growing pattern of pastures/rangelands.

Flow of the climate change impact on the agricultural sector



Source: Kim, Chang-Gil and et al. (2009), p.36.

Livestock production



- The Namibian economy depends heavily on extensive ranching activities, both commercial and communal/subsistence, which are underpinned by the productivity of grassland, savanna and shrub-dominated ecosystems (Midgley *et al.* 2005).
- Reactivation of the Southern African desert dune systems due to climate change could mean that vegetation for grazing will become scarce, leading to disastrous for pastoral farmers (Thomas *et al.* 2005).

Livestock production cont...



- “Reductions in vegetation cover, increases of bare ground, and reductions in Net Primary Productivity reduced potential for vegetation to support rangeland activities, be it on a commercial or subsistence model” (Midgley *et al.* 2005).
- In Nama Karoo, for instance, a 20% reduction in mean annual rainfall leads to an average carrying capacity loss of about 2 kg per hectare, which is a loss of meat production of N\$18/ha (Brown 2017).

Impact of climate change on Agriculture: Crop production



- In Namibia, agricultural output is extremely sensitive to climatic conditions and with over 2/3 of Namibians practicing subsistence cropping and pastoralism, on communal land.
- Less than 10% of land is used for cropping, whilst about 75% is used for grazing (GRN, 2002).
- In total, agricultural activities contribute about 5% to GDP. Both subsistence cropping (Pearl millet), on which most rural households in the north of Namibia depend, and commercial cropping (maize) are likely to be negatively impacted by climate change (GRN, 2002).
- Much land used for agricultural purposes is already marginal, and changes in rainfall variability.

Impact of climate change on agriculture

Increased frequency of dry spells and drought

Changes in precipitations patterns

Increasing intensity of extreme weather events

Rising temperatures



Rising sea levels

All these effects have negative impacts on the productivity of crops, livestock, fisheries and forestry



Temperature variability

Activate Windows
Go to Settings to activate Windows

Agriculture main contributor to CC



Agriculture
sectors

**Total
emissions**

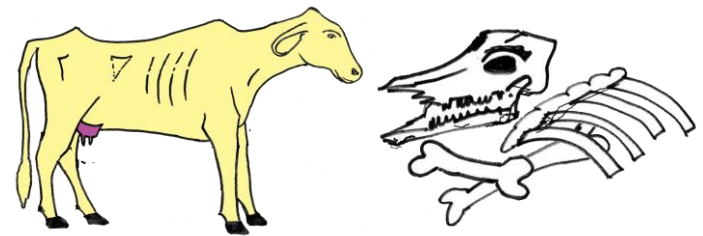
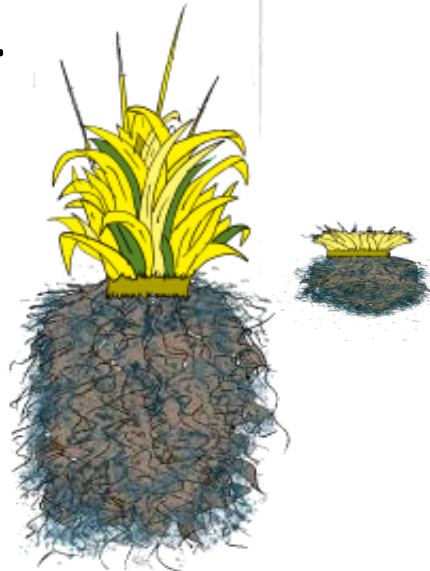
Taken together, agriculture, forestry and land-use account for at least 20% of total emissions, mainly from the conversion of forests to farmland and from livestock and crop production

Impact of cc on Rangeland-livestock

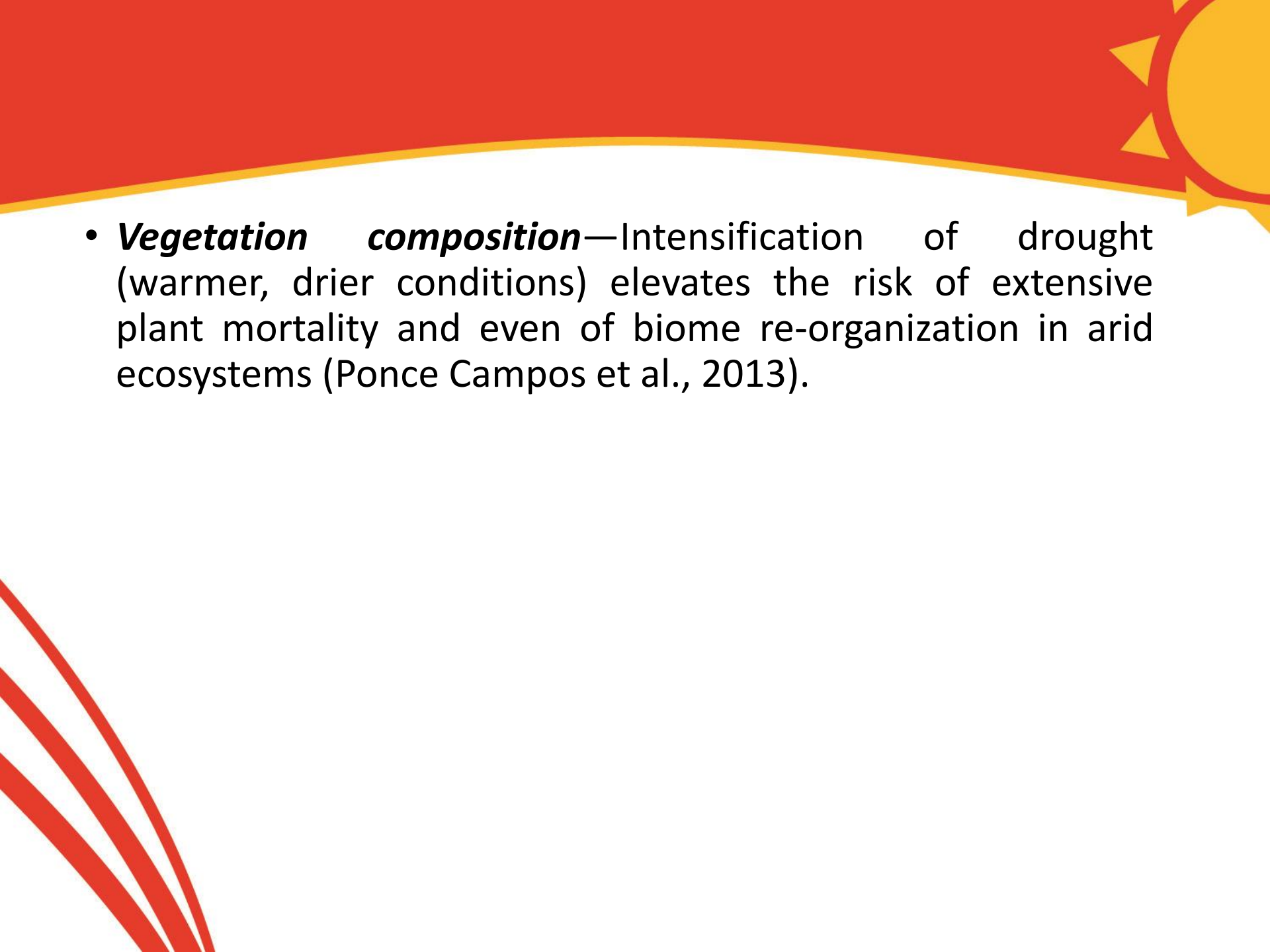


- ***Regional specificity***—Climate models project that warming will be accompanied by a decrease in precipitation in arid to semiarid rangelands of southern Africa (IPCC, 2007).
- Precipitation is projected to decrease by 10–20 % during winter and spring in southern Africa.
- ***NPP and forage quality***—Warming and drying will reduce soil water availability leading to a decrease in NPP on rangelands that are warm and dry (Xu et al., 2013).
- **Forage quality** declines in response to combined effects of CO₂ enrichment, warming and reduced precipitation.























- **Livestock production**—Warmer and potentially drier conditions reduce cattle production, resulting in fewer cattle operations.



- Farmers may be forced to change livestock species, by replacing cattle with sheep or goats which are better adapted to warm temperatures and drought (Kay, 1997).

- 
- ***Vegetation composition***—Intensification of drought (warmer, drier conditions) elevates the risk of extensive plant mortality and even of biome re-organization in arid ecosystems (Ponce Campos et al., 2013).

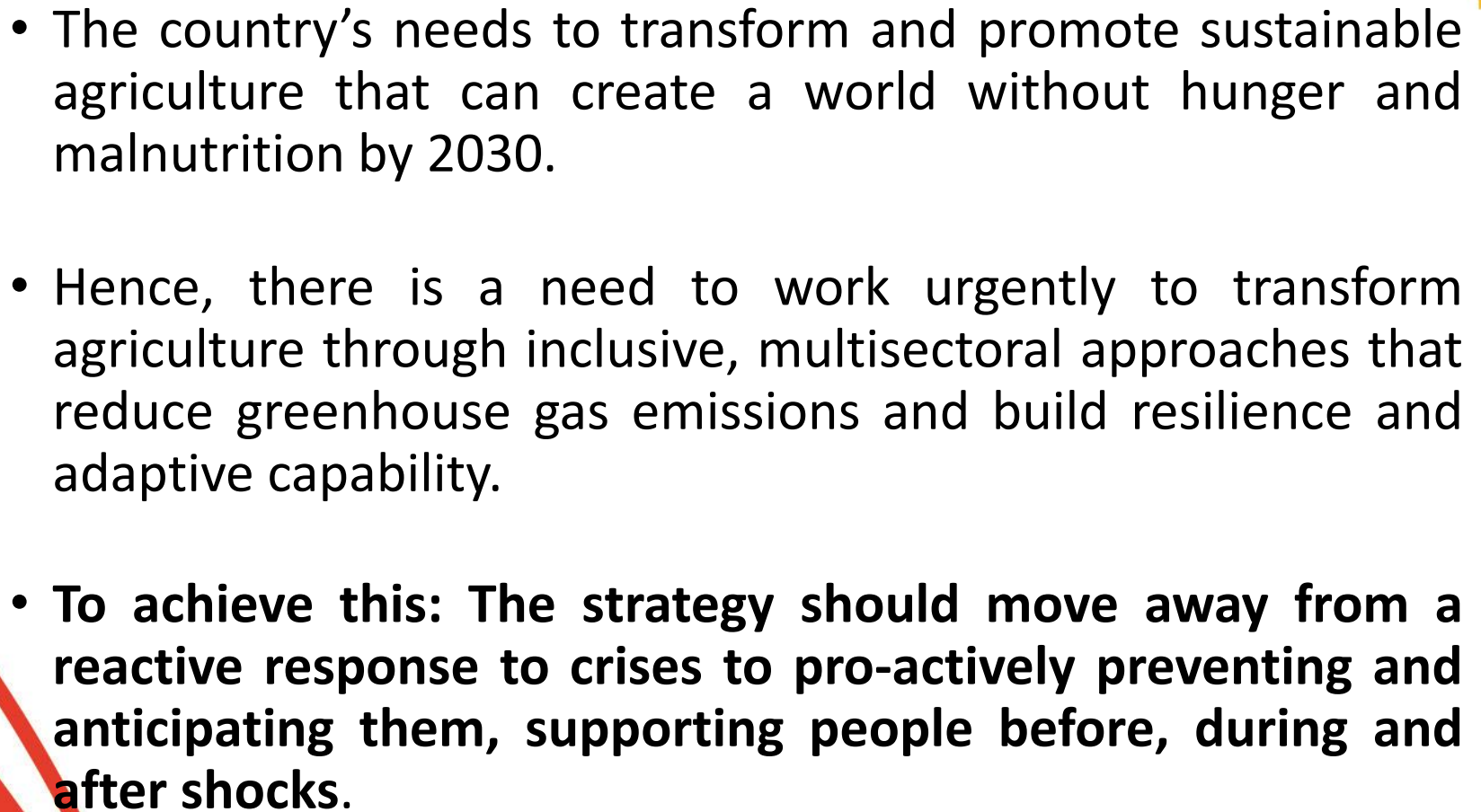
Key risks associated with climate change for rangelands (IPCC, 2007)

Climate-related drivers of ecosystems impacts					
					
Warming trend	Extreme temperature	Drying trend	Drought	Precipitation	Carbon dioxide fertilization
Climate drivers	Key risk			Risk potential	
    Warmer, drier	<ul style="list-style-type: none"> • Intensified H₂O limitation to plants and animals • Increased likelihood of overgrazing/degradation • Increased heat stress for animals 			Low High 2°C  4°C 	
   Warmer, wetter winters	<ul style="list-style-type: none"> • Increase in invasive or woody species • Late-season decline in forage quality/quantity • Increased heat stress/ectoparasite loads for animals 			Low High 2°C  4°C 	
   Warmer, wetter growing season	<ul style="list-style-type: none"> • Vegetation change, possibility to undesirable species • Late-season decline in forage quality • Increased heat stress for animals 			Low High 2°C  4°C 	

Transformation & adaptation to climate change



- AGRICULTURE AND FOOD SYSTEMS ARE A HUGE PART OF THE CLIMATE SOLUTION
 - Boost productivity and resource efficiency.
 - Reduce emissions, draw down carbon, and boost resilience and adaptation to the changing climate.
- CLIMATE-SMART LIVESTOCK APPROACH
 - Livestock breed distribution tool
- CONSERVING AND RESTORING SOILS/RANGELANDS
- LAND DEGRADATION ASSESSMENT IN DRYLANDS (LADA)
- IMPROVED CROP CULTIVARS

- 
- The country's needs to transform and promote sustainable agriculture that can create a world without hunger and malnutrition by 2030.
 - Hence, there is a need to work urgently to transform agriculture through inclusive, multisectoral approaches that reduce greenhouse gas emissions and build resilience and adaptive capability.
 - **To achieve this: The strategy should move away from a reactive response to crises to pro-actively preventing and anticipating them, supporting people before, during and after shocks.**



Thank you!