Climate Change and Agriculture in Zambia

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Outline of Presentation

- World Agriculture and Zambia in Brief
- Background on Agriculture in Zambia
- Agriculture Production Statistics
- Climate Change and Impacts
- Conclusion/Recommendations

Introduction

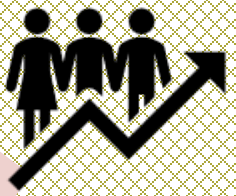
The foundation of human existence heavily relies on agricultural production and security, which is vulnerable to climate change and variability.

Climate change and variability not only lead to frequent extreme weather events, uneven precipitation, droughts, and floods, resulting in reduced crop yields, but also disrupt ecological balance and affect the prevention and control of crop pests and diseases.

Zambia experiences extreme climatic events related to rainfall distribution and temperature patterns, which are characterised by late rainfall onset, prolonged dry spells, and high temperatures.

Where are we in Agriculture…

Human earth habitation ~ 109,000 Years (started making tools)
Human population ~ 109 billion (ever-lived)
Still arrive: 8 billion (~7%)



Last Millennium

? Lost 300,000 yrs

Last century

Food and Health for Civilization

Day before yesterday

Agriculture production

~ Dawn of agriculture

Yesterday

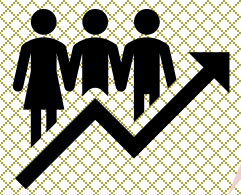
Biotechnology & cultivar development

~ Industrial Revolution

Today

Sustainable agriculture & quality environment

- Smart agriculture
- Digital agriculture
- Innovation
- Resilience

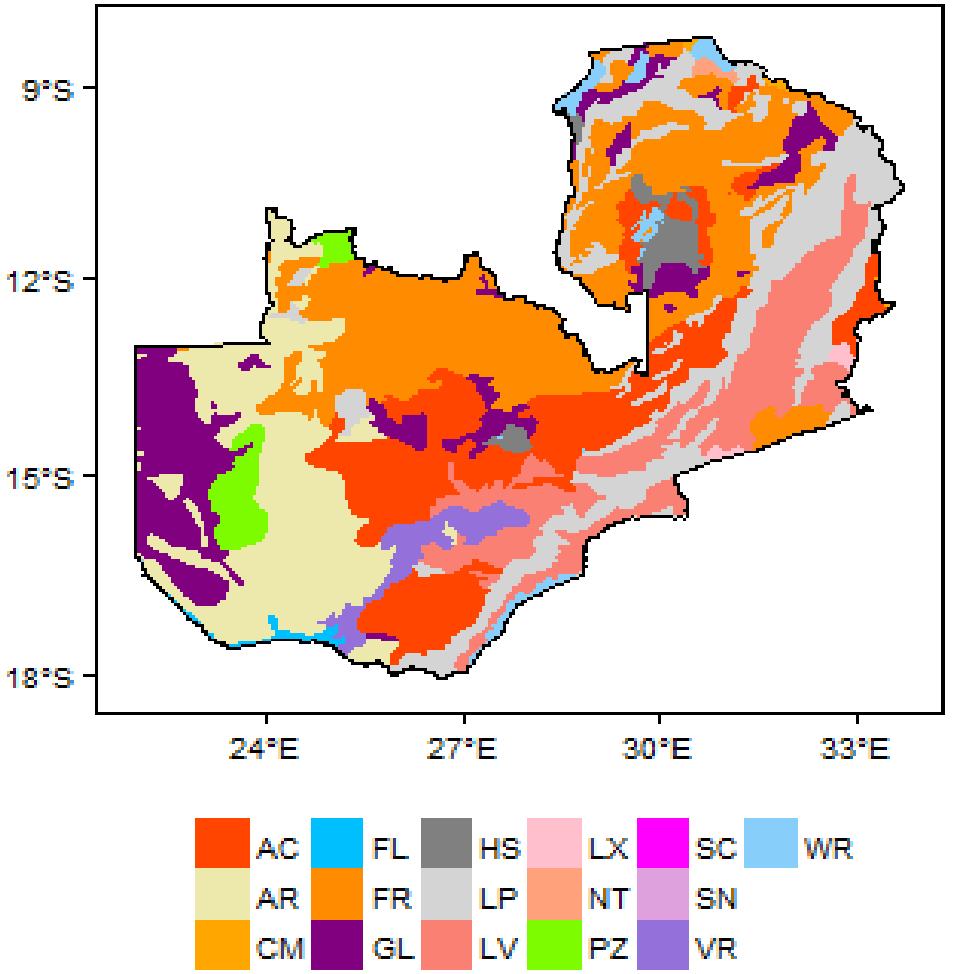


Zambia in Brief

- Total land area: 75.2 Million ha
  - Arable Land: 43 Million ha (58%)
  - Agriculture land: 27 Million ha
    - 3.6 Million ha (state land)
    - 23.4 Million ha (traditional land)
  - 95% under rainfed and 5% irrigated
- Irrigation potential ~3 million ha (8% of arable land) out of which about 156,000 hectares is currently under irrigation (predominately under sugarcane plantation) plus winter wheat

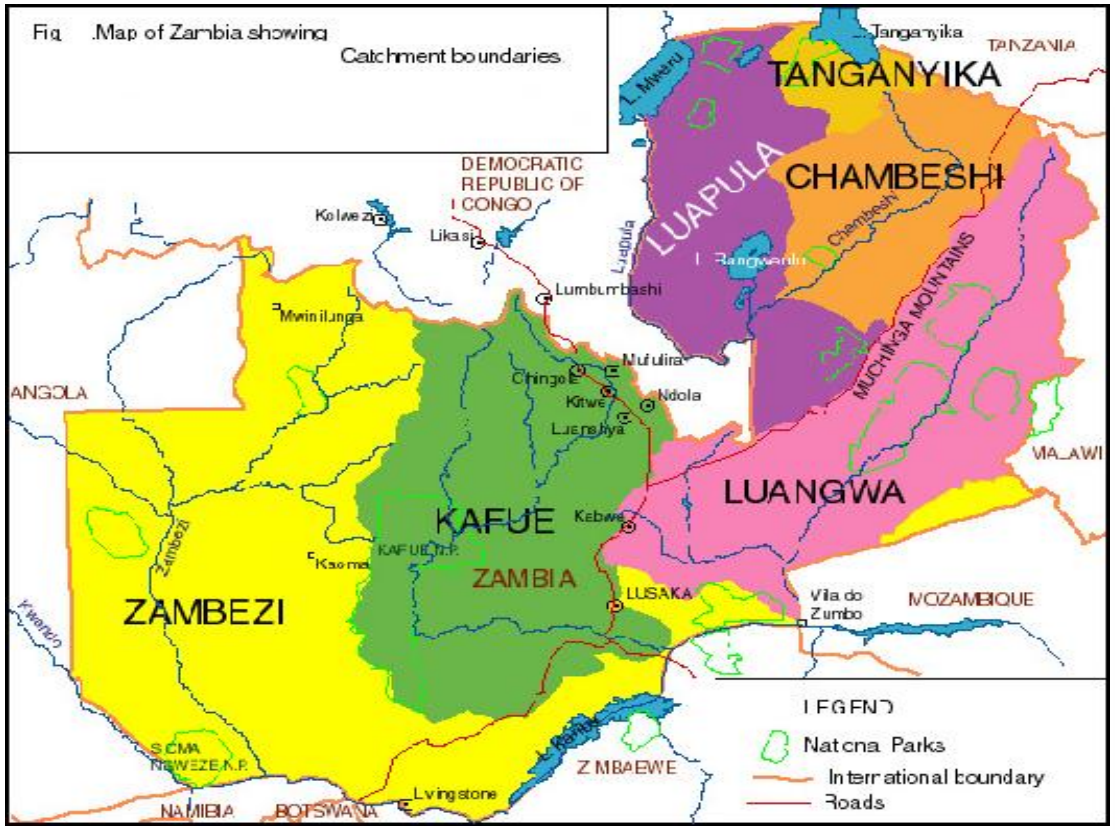
- Population: 21.0 Million (2024 est) and will reach 80.0 (2099 est)
- ~1.3 Million farm households

Soils of Zambia



	Name			Name			Name
AC	Acrisols		LP	Leptosols		WR	Water Body
AR	Arenosols		LV	Luvisols			
CM	Cambisols		LX	Lixisols			
FL	Fluvisols		NT	Nitisols			
FR	Ferrasols		PZ	Podzols			
GL	Gleysols		SN	Solonetz			
HS	Histosols		VR	Vertisol			

Water Resources, major river basins & irrigation potential

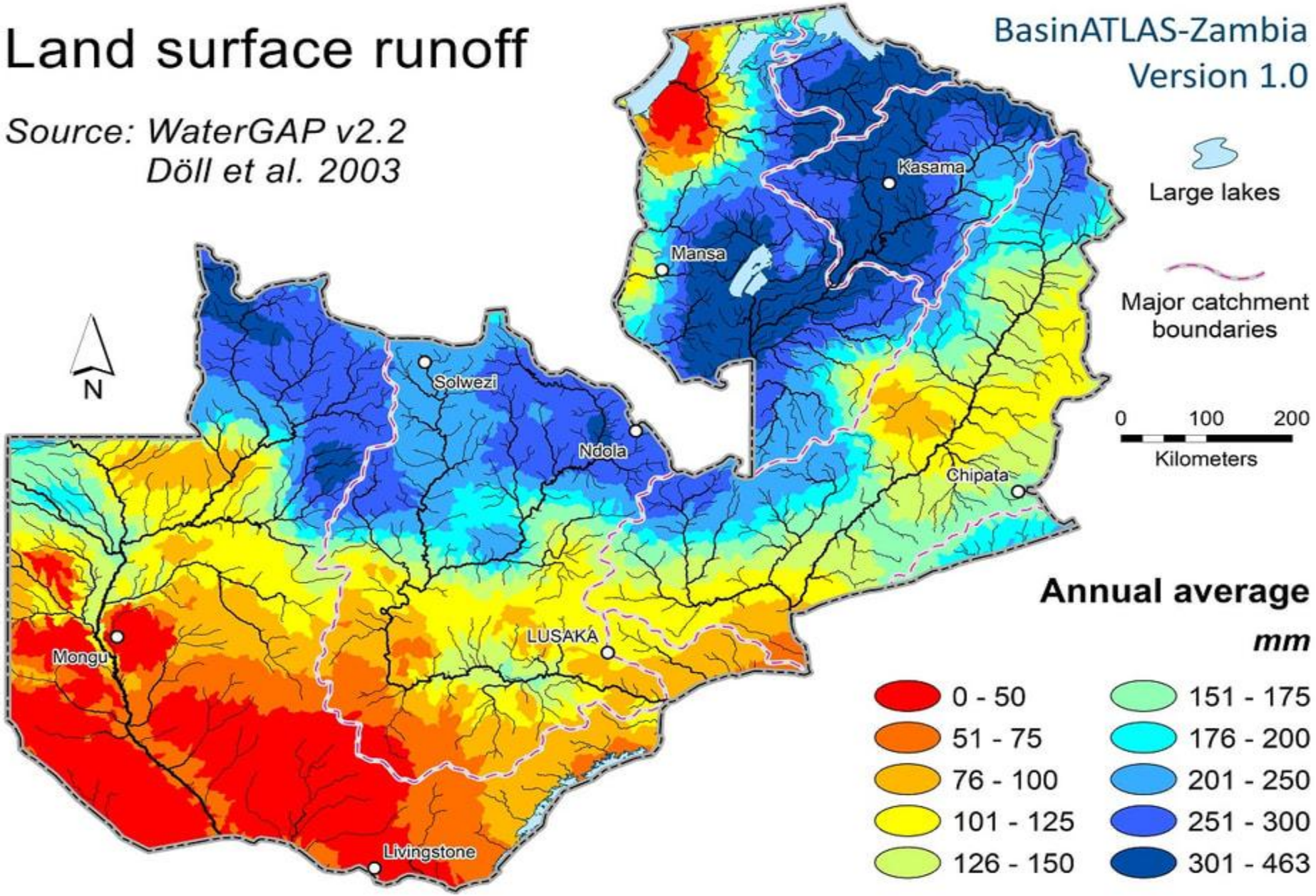


Current estimates of irrigated land

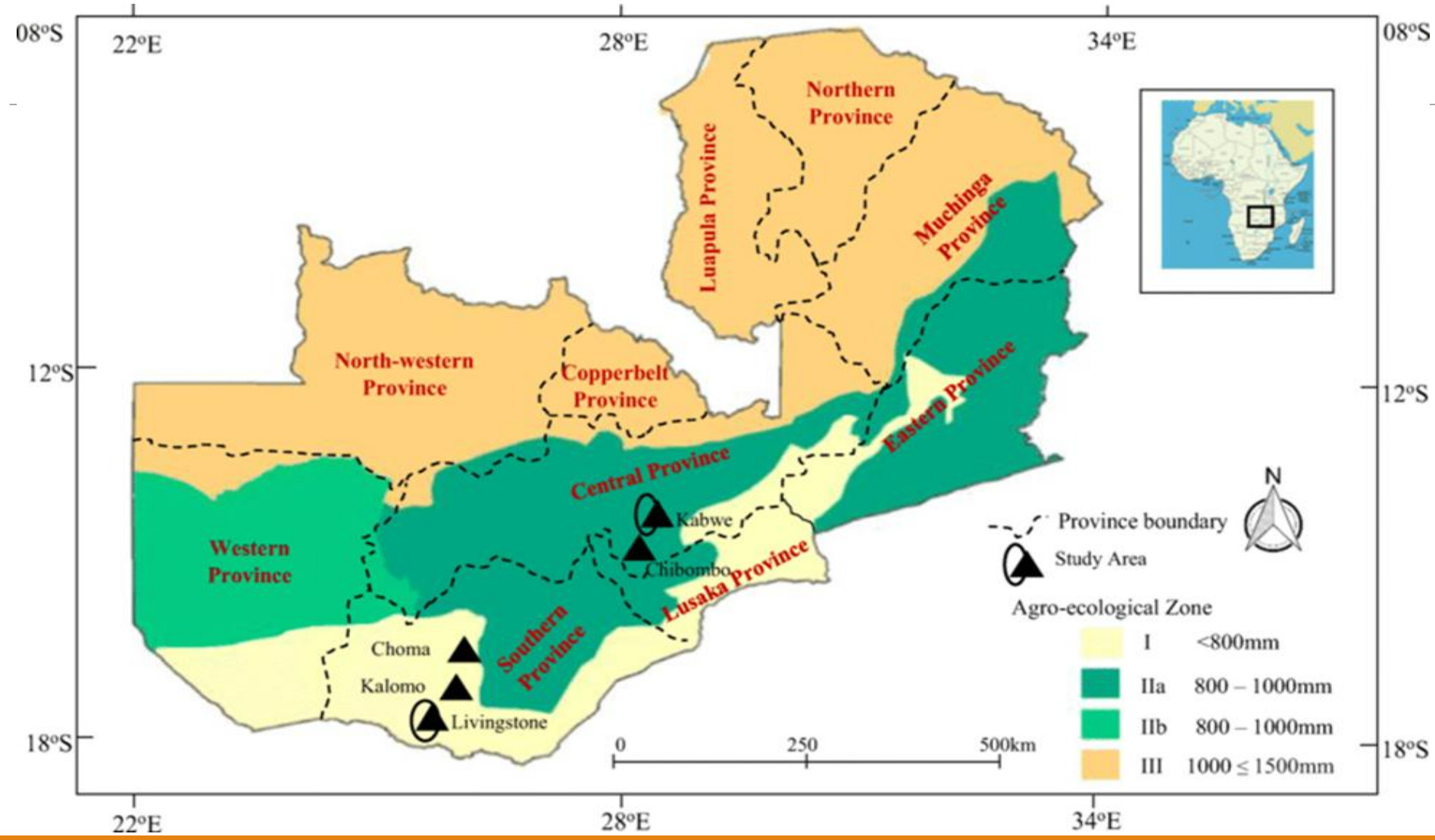
Land under AWM	ha
Irrigation potential	2,750,000
Surface irrigation	32,189
Sprinkler irrigation	17,570
Localized irrigation	5,628
Developed lowlands (equipped wetlands)	100,525
Total land under irrigation	**155,912**
Flood recession cropping area	100
Cultivated lowland	100,000
AWM area	**255,912**
Land under irrigation by source of water	**ha**
Groundwater	6,750
Surface water	149,162
Power irrigated area	38,630
Irrigation schemes by size	**ha**
Small irrigation schemes	111,525
Medium irrigation schemes	7,372
Large irrigation schemes	37,015

Land surface runoff

Source: WaterGAP v2.2
Döll et al. 2003



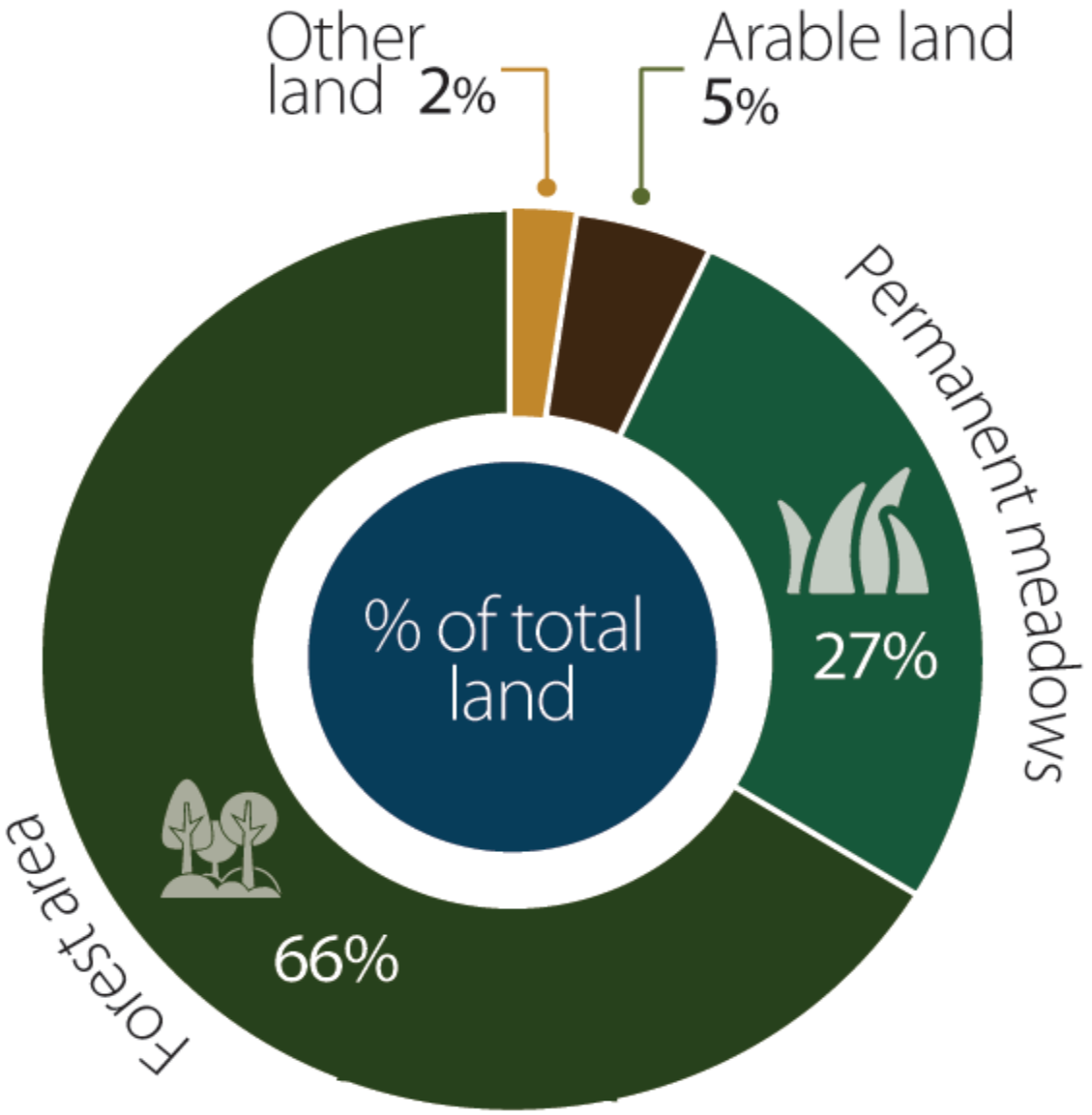
Agro-ecological Zones for Zambia



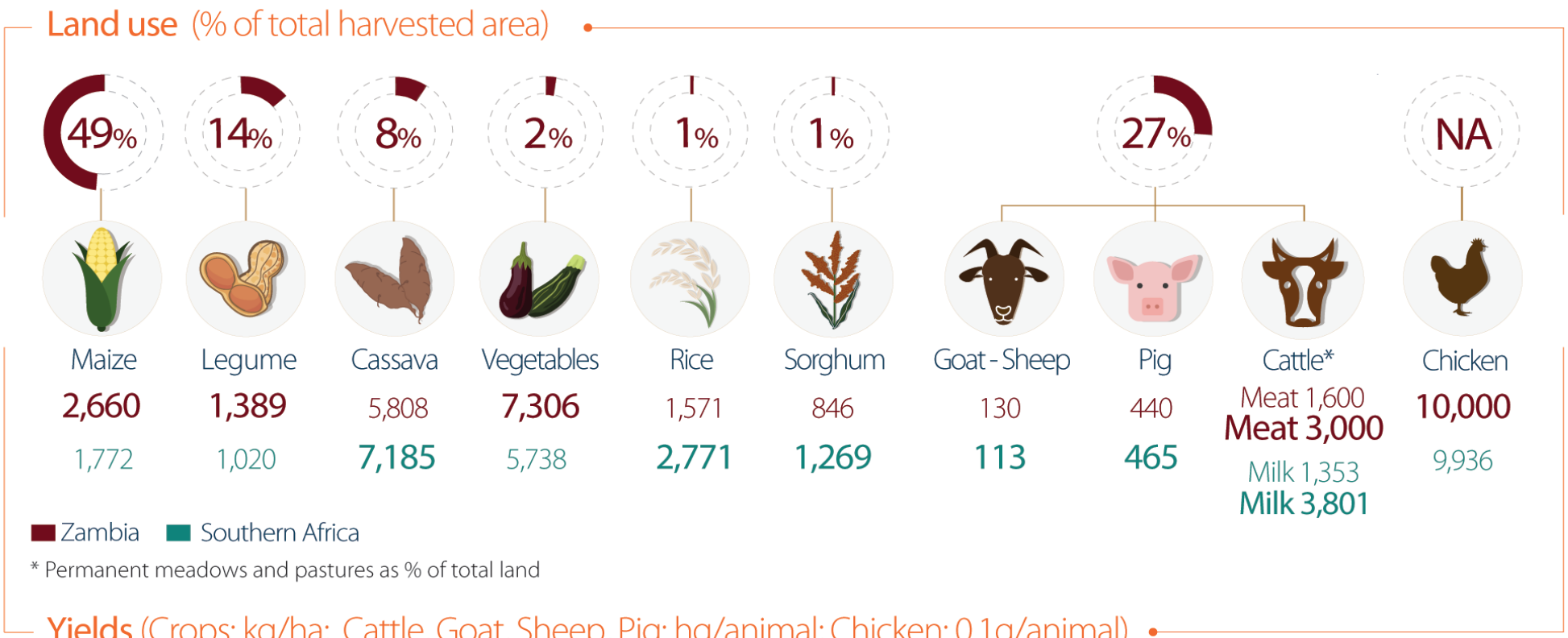
Agricultural area

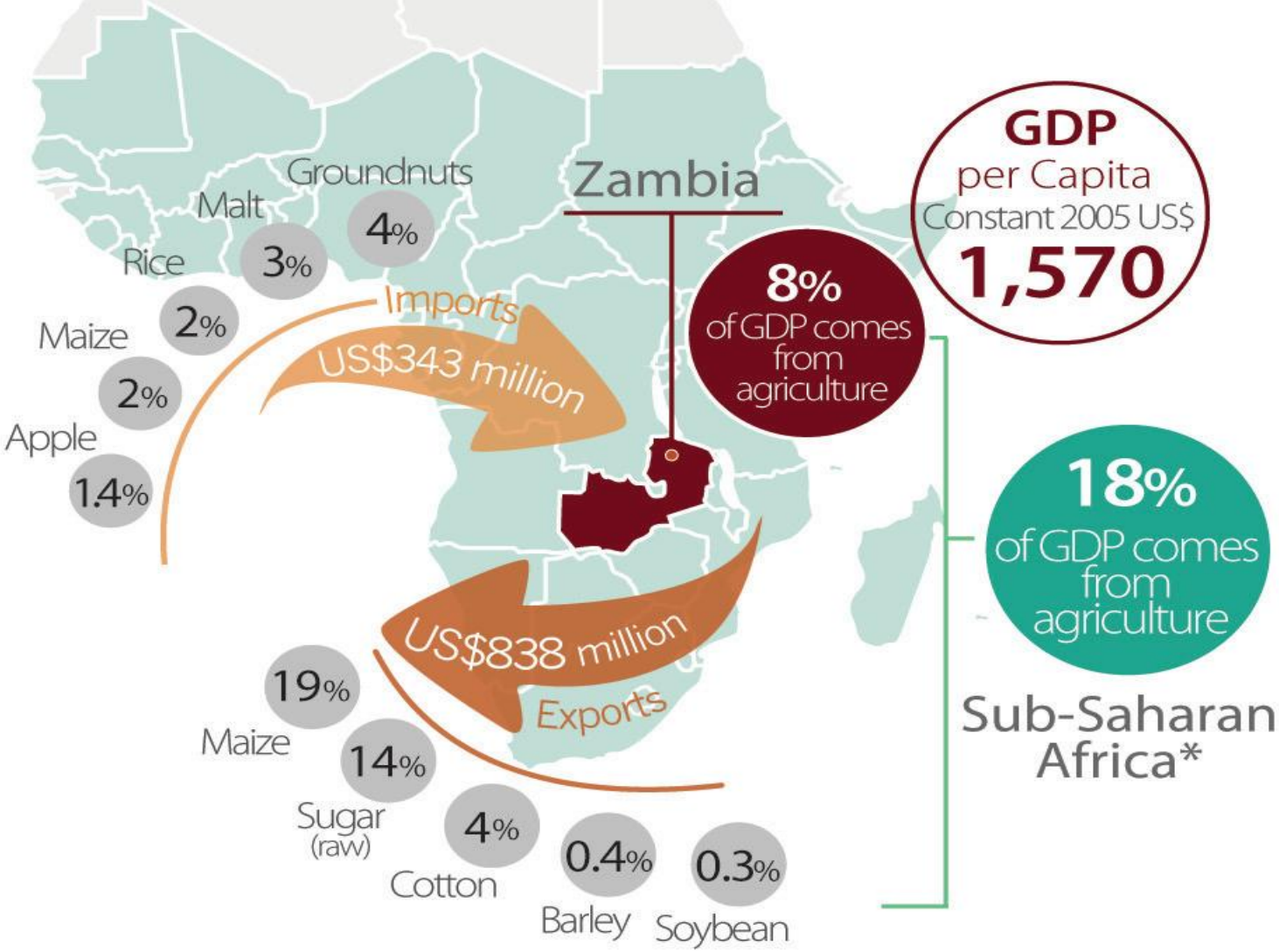
23,696,000 ha

=32% of total land area



Production Systems Key for Food Security in Zambia





*Sub-Saharan Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Brazzaville), Congo (Democratic Republic), Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Western Sahara, Zambia, Zimbabwe

Agricultural Production related Challenges

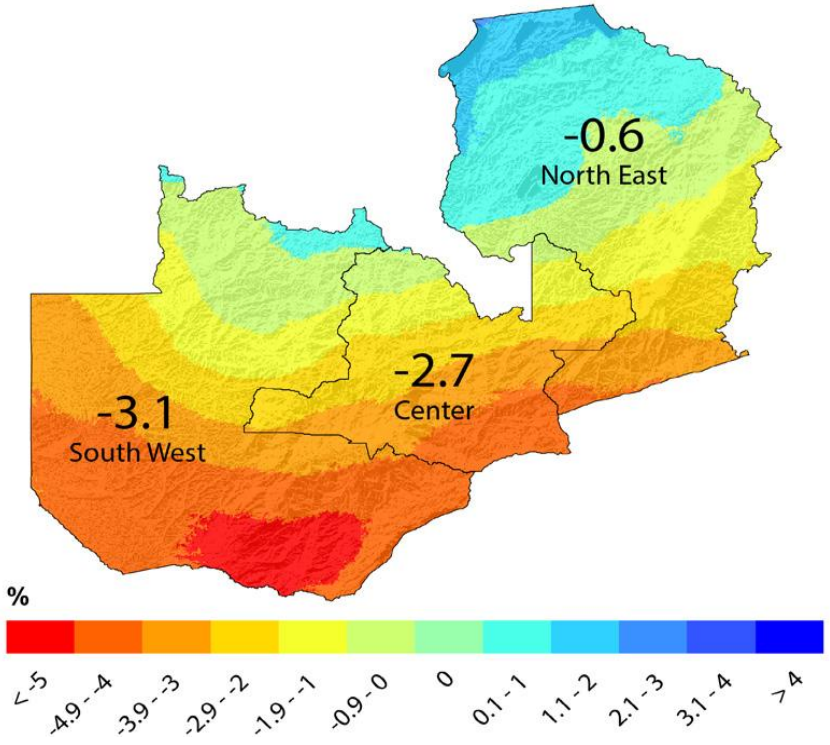
- LOW AGRICULTURAL PRODUCTIVITY-UNSUSTAINABLE FARMING SYSTEMS (TECHNOLOGIES?) <1 TON GRAIN/HA
- LAND DEGRADATION (SOIL EROSION, NUTRIENT MINING/SOIL FERTILITY LOSS)
- FOOD INSECURITY & POVERTY REDUCTION (>60% OF POPULATION) (QUANTITY/QUALITY?)
- UNDER-UTILIZATION OF AVAILABLE WATER RESOURCES (LOW IRRIGATION DEVELOPMENT; LOW ON-FIELD WATER USE EFFICIENCY)
- DEMOGRAPHIC PRESSURE ON LAND AND WATER RESOURCES
- NATURAL DISASTERS/CLIMATE CHANGES (DROUGHT, FLOOD, SHIFT OF AGRO-ECOLOGICAL ZONES ETC)

Climate Change and impacts

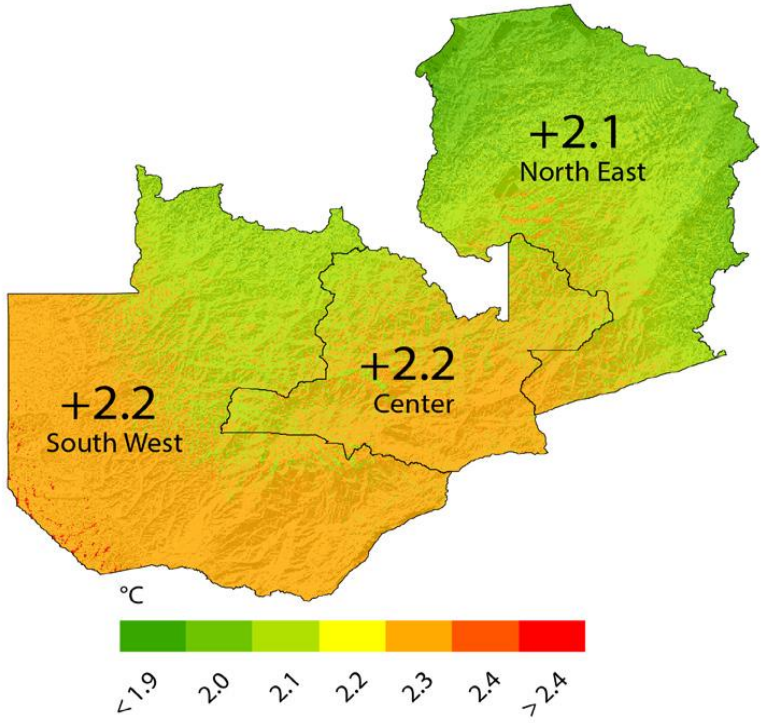
- Effects of climate change are hitting Zambia hard as reports indicates that Zambia's climate is highly variable.
- Over the last few decades Zambia has experienced a series of climatic extremes such as *droughts*, *seasonal floods* and *flash floods*, *extreme temperatures* and *dry spells*, with increased *frequency*, *intensity* and *magnitude*.

Projected Precipitation and Temperature by 2070

PRECIPITATION



TEMPERATURE



Climate Impacts during 2023/2024 Season

Zambia experienced a recent extreme climatic event during the 2023/2024 rainfall season

It was characterized by late rainfall onset, prolonged dry spells, and high temperatures

Over nine million were affected by the drought, resulting in total crop failure of 1 million hectares out of an estimated 2.3 million hectares under maize production.

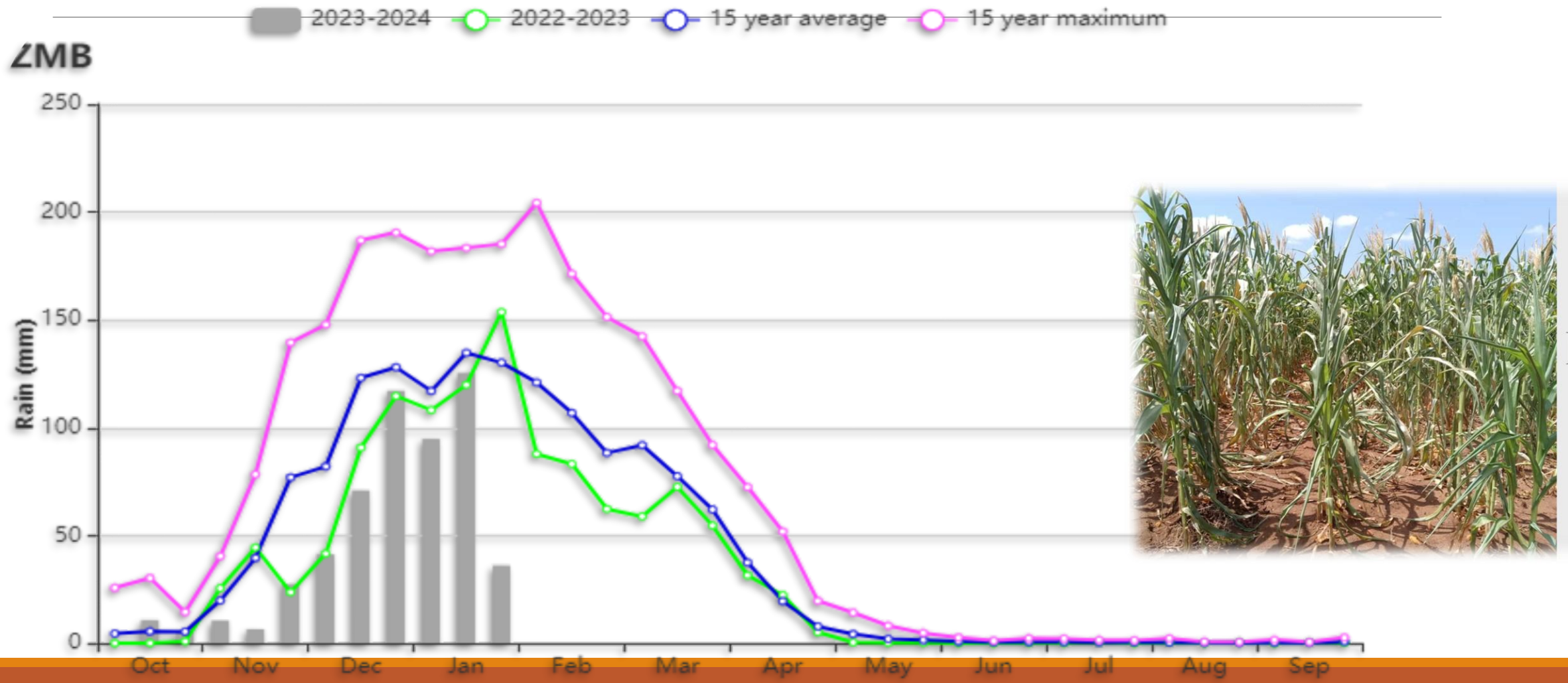
Grain production decreased by 54% in comparison with the previous agricultural season and remains the lowest ever recorded over a five-year average

Zambia declared a national disaster, requiring a wide range of interventions to ameliorate the impact.

Weather Condition for Zambia (Nov2023- Mar2024)

code	Province	RAIN Current (mm)	RAIN 15YA Depart (%)	TEMP Current (°C)	TEMP 15YA Depart (°C)	RADPAR Current (MJd_m2)	RADPAR 15YA Depart (%)	BIOMSS Current (gDMd_m2)	BIOMSS 15YA Depart (%)
ZMB_1	Central	437.4	-46.8	24.7	1.4	1440.1	6.1	1006.1	-17.1
ZMB_2	Copperbelt	612.4	-38.6	23.4	1.3	1306.5	2.5	1175.6	-10.1
ZMB_3	Eastern	548.0	-24.5	25.1	1.2	1347.8	-8.2	988.5	-14.4
ZMB_4	Luapula	874.5	-24.9	23.2	0.9	1273.0	1.9	1316.0	-3.3
ZMB_5	Lusaka	477.7	-47.0	25.7	1.4	1500.6	9.1	975.3	-18.1
ZMB_7	North_Western	649.0	-35.2	23.7	1.4	1328.8	5.7	1235.1	-9.6
ZMB_8	Northern & Muchinga	693.1	-17.6	23.2	1.2	1315.2	-8.7	1099.7	-9.0
ZMB_9	Southern	321.2	-55.6	26.1	1.4	1472.2	5.0	921.4	-22.3
ZMB_10	Western	419.7	-48.2	26.3	1.7	1368.6	2.5	1010.2	-20.5
	Country level	**546.3**	**-37.0**	**24.7**	**1.2**	**1373.9**	**3.8**	**1038.4**	**-15.2**

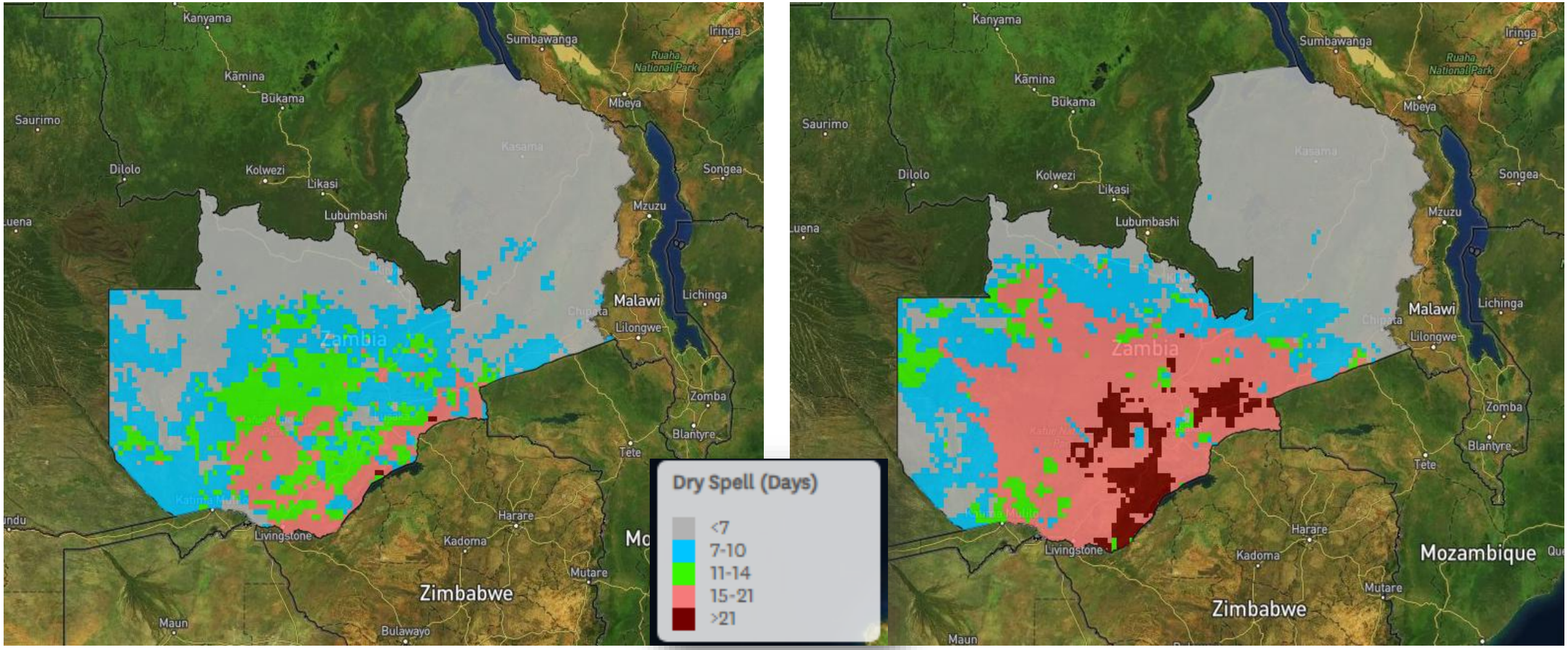
National Rainfall Time Series from Oct 2023 to Feb 2024



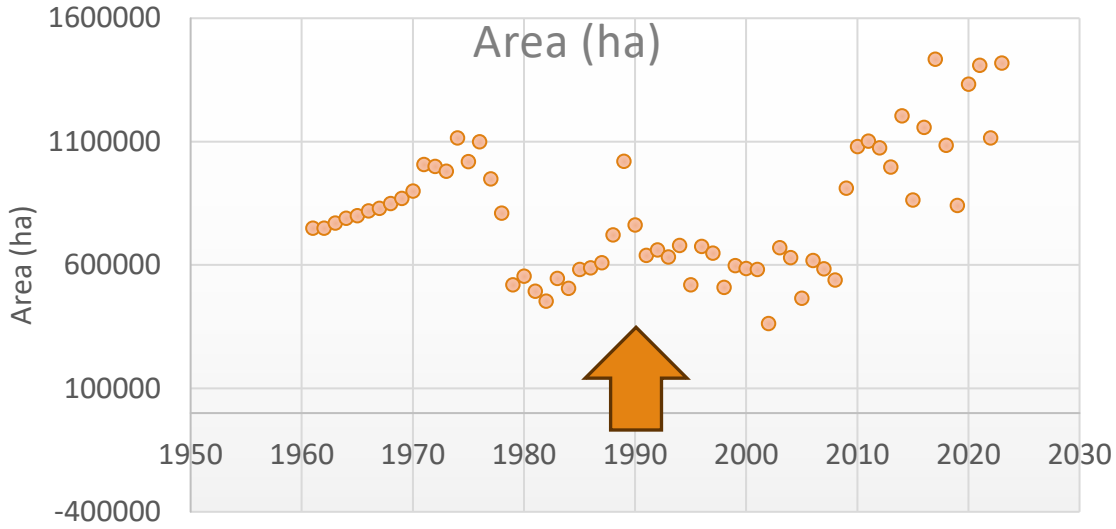
Drought Incidence in Zambia

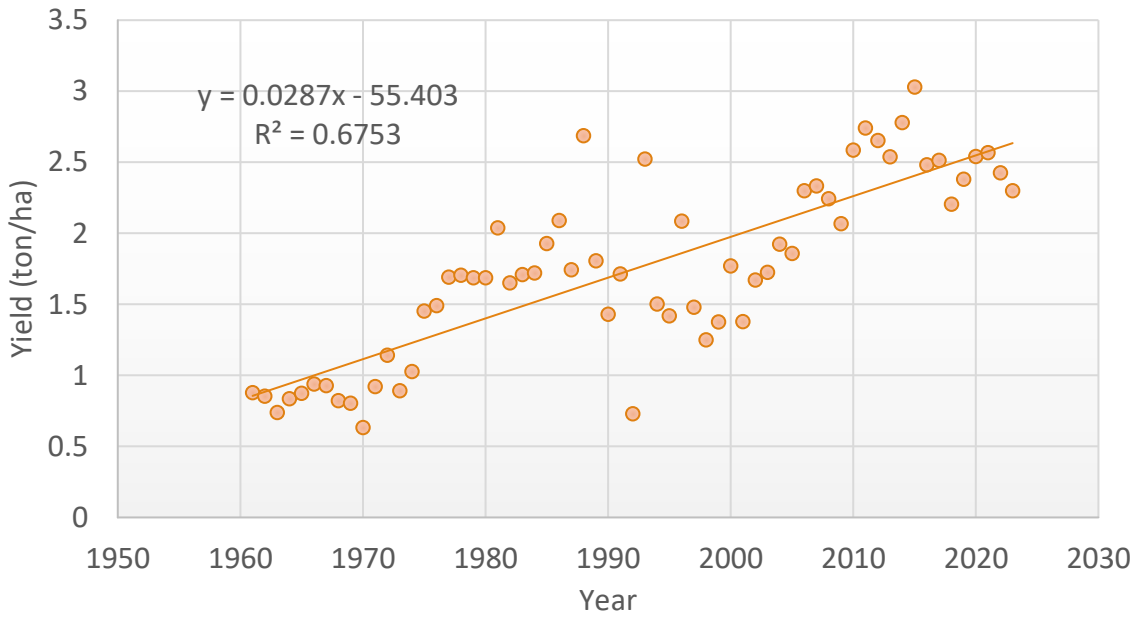
MARCH 2023

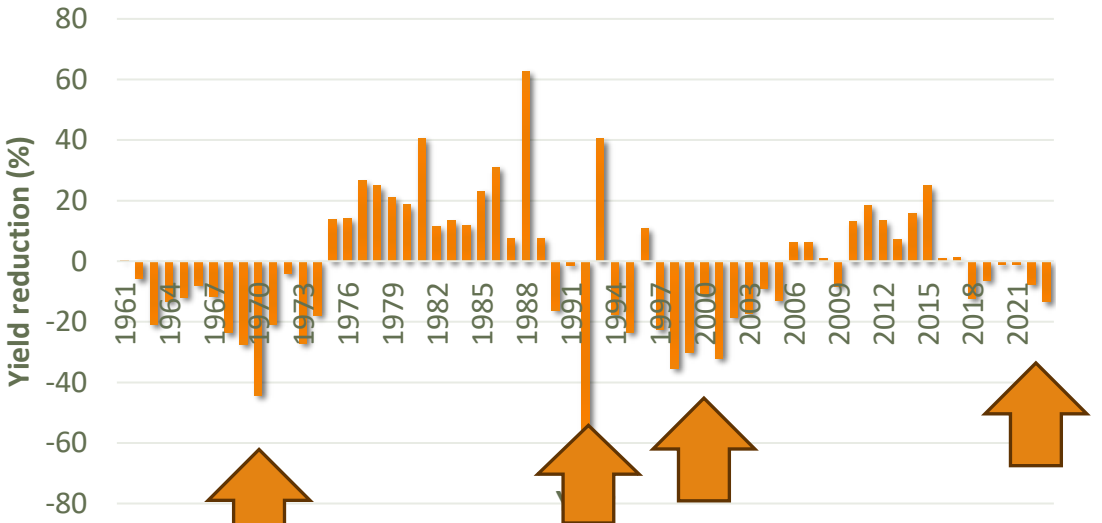
FEBRUARY 2024



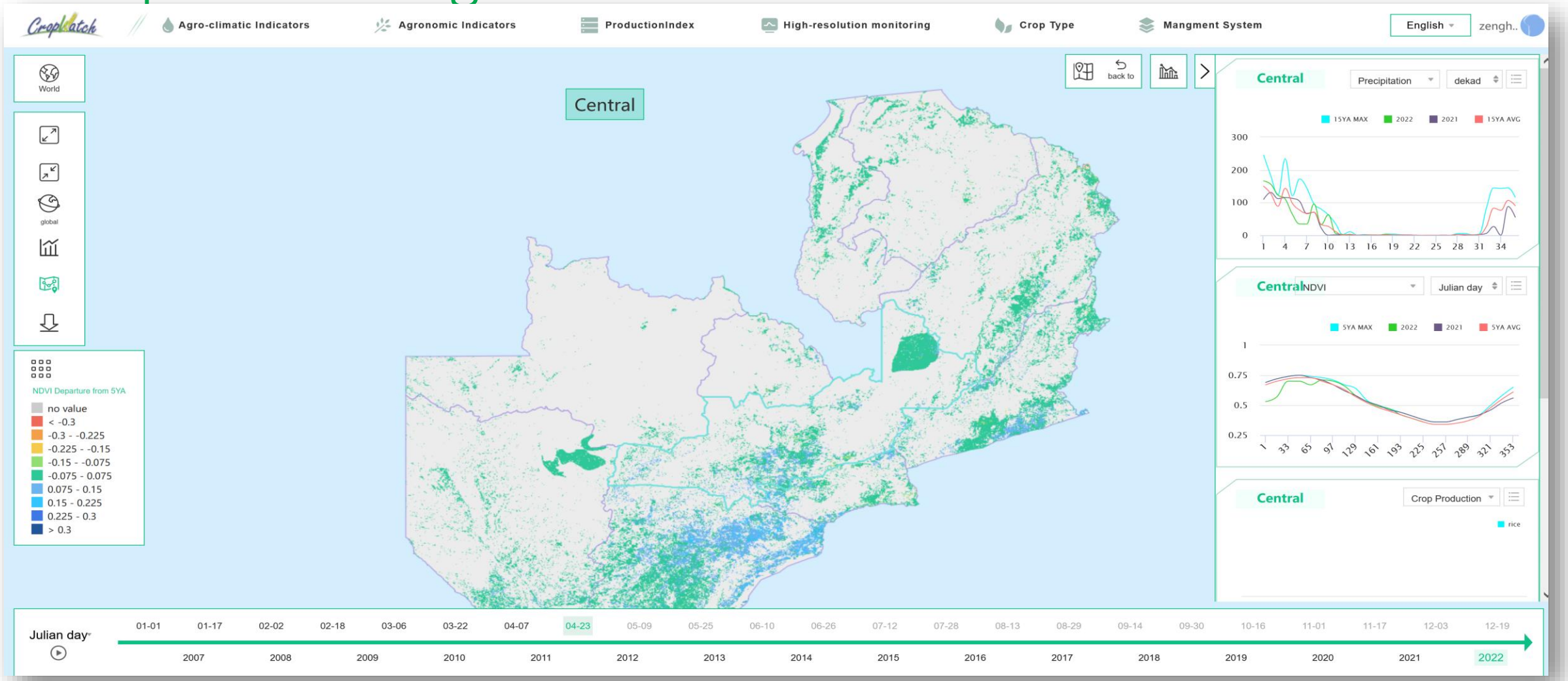
Maize production trends – and drought effects







Crop Monitoring for Zambia



Information of all CropWatch indicators are available at sub-national level for Zambia to support crop monitoring for each province

Climate Change Impacts

- Like other countries in the region, Zambia has been affected by climate change
- Climate change and variability have led to crop failure, livelihood losses, increased incidents of food insecurity, and a reduced contribution of agriculture to GDP in the country
- Adverse impacts of climate change include:
  - an increase in frequency and severity of seasonal droughts,
  - occasional dry spells,
  - increased temperatures in valleys,
  - flash floods and
  - changes in the growing season.

Conclusion/Recommendations

Some of Zambia's adaptation measures include:

- Promotion of irrigation and efficient use of water resources,
- Strengthening early warning systems and preparedness, and
- Using GIS/remote sensing in mapping of drought and flood-prone areas.
- Carrying out climate change data collection and monitoring.

Policy interventions

- Improving inter-ministerial and inter-institutional coordination
- Increasing public awareness of climate change and its potential impacts
- Developing clear and specific legal and policy frameworks for climate change

Thank you for your attention

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Thanks