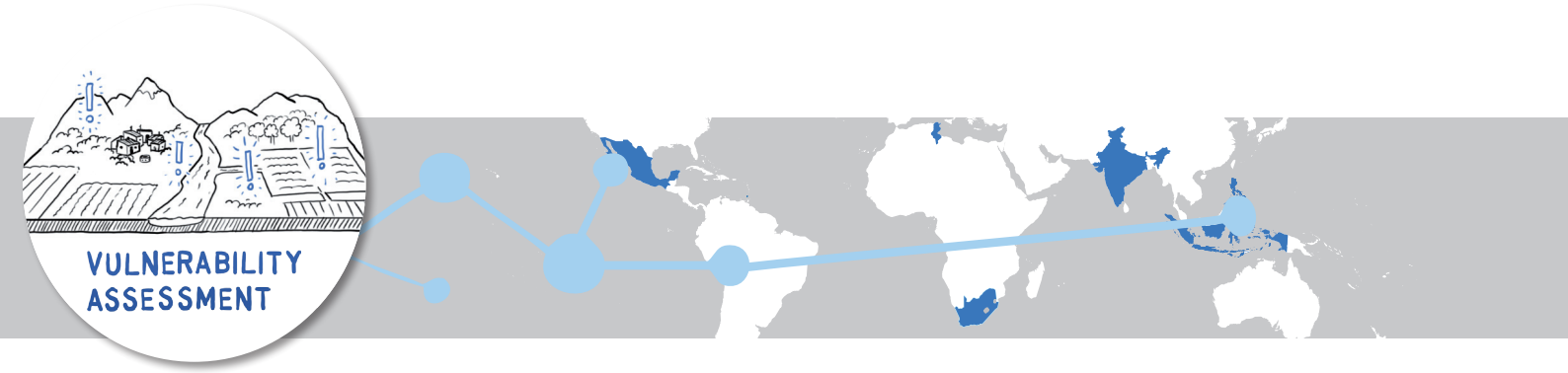

Impact chain

Climate change impact chain for sorghum and millet

Weather is a key factor in agricultural productivity, despite many technological advances. Climate change, however, is leading to changes in global and regional climates and more extreme weather events which have severe impacts on the growth of key crops such as rice, maize, millet, sorghum, and coffee as well as on socio-economic activities associated with agriculture and distribution of food.

In view of this, the impact chain approach analyses and highlights the consequences induced by climate stimuli (see climate stimuli chart). In a second step, it shows the related biophysical and socio-economic impacts and identifies key adaptation measures to counteract the relevant stimuli (see impact chain).

The climate stimuli chart below shows which climate stimulus is most critical at which production stage. For **millet and sorghum**, high temperature rise in the growing season, droughts and strong winds cause major biophysical impacts. Sorghum is sensitive to flooding especially during 30 days after emergence.

Climate stimuli chart millet and sorghum

Climatic stimuli	Production phase			
	Germination	Growth/flowering/ fruit setting	Ripening	Harvest
Temperature	Grain yield, pollen viability, and seed-set can be affected if temperatures are too high			
Rainfall	Reduction with less rainfall			
Drought				
Flooding	[not much information]			
Tropical ozone	[not much information]			
Salinization	Growth parameters and plant nutrient contents become decreased, and can depend on the cultivar			
CO_2 concentration	Small positive effect as it is a C_4 crop			

How to use the tables

The table lists, for each crop, a number of climatic stimuli and how they impact the crop in various development stages (biophysical impacts) as well as socio-economic impacts.

- **Red** high negative impact
- **Yellow** medium negative impact
- **Green** low or no negative impact
- **Dark green** positive impact
- **Blue** impact disputed
- **Grey** seems not to be very relevant
- **White** if no information present

Apart from presenting an overview of the impacts of climate stimuli on sorghum and millet, the **impact chain approach** provides decision-makers with a first indication of where climate impacts may be felt earliest, and where interventions will be needed. The table below shows adaptation measures for the most relevant biophysical and socio-economic impacts on **millet and sorghum**.

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On behalf of

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

Millet and Sorghum impact chain			
Climatic stimuli	**Biophysical impacts**	**Socio-economic impacts**	**Adaptation measures**
Temperature	Low temperature causes germination inhibition, leading to growth and yield depression. Can tolerate higher temperatures during the life cycle. If temperatures are too high seed set can be affected negatively.	In general, the different climatic stimuli cause lower yields which lead to lower production and therefore contribute to food insecurity, as well as reduced income for farmers. This might also mean that farmers have to shift from this traditional crop and change their consumption patterns as well as to consider other another income sources, such as livestock production. The use of more climate resilient traditional varieties instead of higher yielding but more vulnerable varieties might also signify a trade-off between intensification and resilience to climate change. Increased demand for millet and sorghum causing higher prices at local markets.	• Use of heat tolerant cultivars (region specific). • Use of photoperiod-sensitive traditional cultivars.
Rainfall	High-intensity rains can cause increased erosion. Millet has a higher drought tolerance than sorghum: absence of rainfall for long periods causes delay in germination and reduced growth. Absence of rainfall during fruit formation causes reduced yield.		• In case of high rainfall, adopt erosion protection measures. • Increasing soil water infiltration rates through soil improvement measures (e.g. increasing the organic matter content, crop rotation with deep rooting plants). • If possible additional irrigation during fruit formation throughout dry spells.
Flooding	Millet can withstand short periods of water logging; Sorghum is more sensitive especially during 30 days after emergence: prolonged flooding leads to yield reductions.		• Change of fields for growing millet and sorghum in case of repeated flooding, application of soil amelioration measures (e.g. improved drainage). • Flood and erosion protection measures.
Tropical Ozone (especially near urban centres)	Reduced yield due to high ozone concentration.		No measures applicable
Salinization	Millet is a salt tolerant annual crop while sorghum is less salt tolerant and higher salt concentrations in the soil reduce the yield drastically.		• Use of salt tolerant varieties (region specific). • Soil improvement measures (before, plantation flooding of fields helps washing out salts), plantation of soil extracting plants (region specific) as alternative crops.
Tropical storms	Damage due to the layering of crop, especially for Sorghum, at ripening and harvesting stages.		Establishment of wind protection belts.

Get the full report with a detailed analysis on rice, coffee and maize here or on AdaptationCommunity.net > Knowledge > Vulnerability Assessment > Further Reading.

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