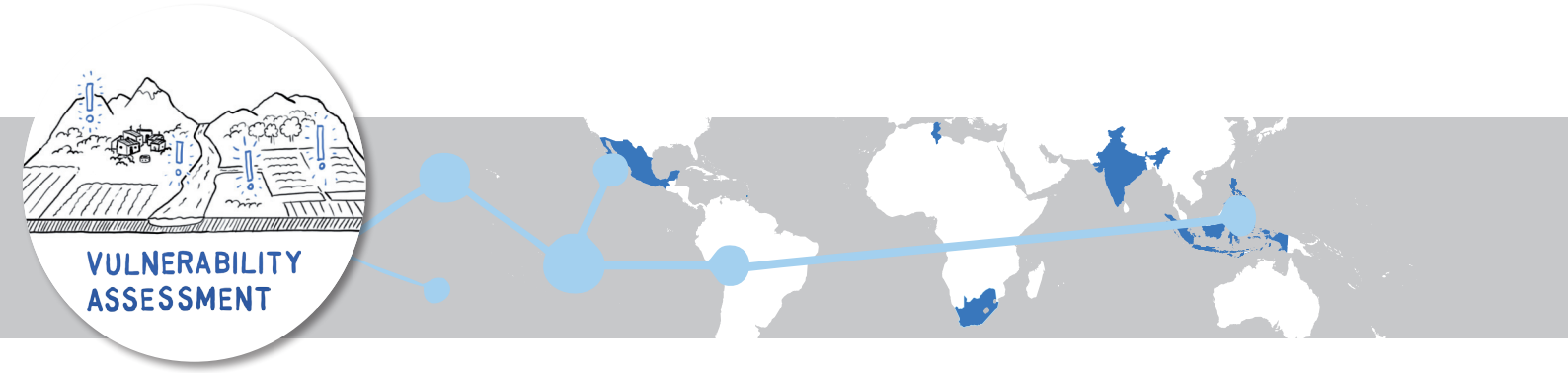

Impact chain

Climate change impact chain for maize

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 crop production stage. For **maize**, droughts and salinization during the ripening as well as extreme weather events, tropical storms and flooding cause major biophysical impacts.

Climate stimuli chart for maize

Climatic stimuli	Production phase				
	Germination	Growth/flowering/ fruit setting	Ripening	Harvest	Production/storage/ other factors
Temperature	Low temperature can be harmful	Decreases growth and grain yield			
Rainfall					
Drought		Affects grain filling			
Flooding	Damaging effect, but not well quantified				
Tropical ozone	Only few studies, found some decreases in yield				
Salinization	Good tolerance		Poor tolerance		
Tropical storms		Hurricanes can damage crop through high wind/heavy rain			
CO_2 concentration	Weak effect, as C_4 plant				

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 stadia (biophysical impacts) and 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 coffee, the **impact chain approach** provides decision-makers with a first indication of where climate impacts may be felt earliest, and where interventions might be needed. The chart below shows adaptation measures for the most relevant biophysical and socio-economic impacts on **maize** that were identified.

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

Maize impact chain			
Climatic stimuli	**Biophysical impacts**	**Socio-economic impacts**	**Adaptation measures**
Temperature	Low temperature causes germination inhibition, leading to growth and yield depression. High temperature: decreased growth and grain yield, increased pest pressure and damage.	In general, more extreme conditions as described on the left can cause: • Lower yield which leads to lower production. Lower production levels have several important socio-economic impacts: • Since maize is a main staple crop in many countries, lower production may cause food insecurity if no substitute is available. • Lower yields also lead to reduced income. • Continuing high demand together with lower production causes higher prices at local and international markets. • As a commodity that is also used in livestock production as fodder and as a main ingredient in many other foodstuffs, lower production and resulting higher prices might force producers to use substitutes or pay higher prices for the inputs.	• Use of heat tolerant cultivars.
Rainfall	High-intensity rains can cause increased erosion. Absence of rainfall or long dry periods between rainfalls causes delay in germination and reduced growth or growth failure. Absence of rainfall during grain formation causes reduced grain filling and 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). • Additional irrigation in case of absence of rain during germination and grain formation periods.
Flooding	Flooding during germination can cause reduced growth.		Change of field for growing maize in case of repeated flooding, application of soil amelioration measures (e.g. improved drainage).
Tropical Ozone (especially near urban centres)	Reduced yield due to high ozone concentration.		No measures applicable
Salinization	High tolerance for soil salinity during germination. However, damages occur later on during growth and ripening.		• Change of cropping field. • 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. • Use of irrigation water with low salt content.
Tropical storms	Damage due to the layering of crop at ripening and harvesting stages.		Establishment of wind protection belts.

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

Imprint

Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Inventory of Methods for Adaptation
to Climate Change – IMACC
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 6196 79-0
F +49 6196 79-1115
E info@giz.de
I www.giz.de

Contact
Michael Hoppe, GIZ
E michael.hoppe@giz.de
T +49 6196 79-2597
I www.giz.de/climate
adaptationcommunity.net

January 2014