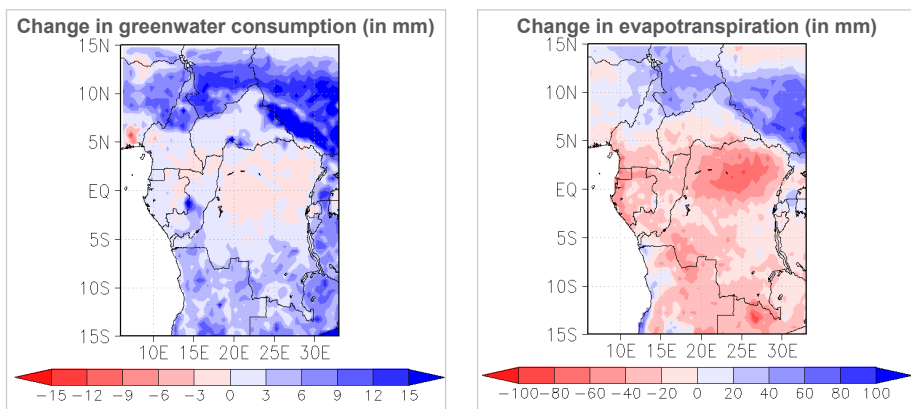


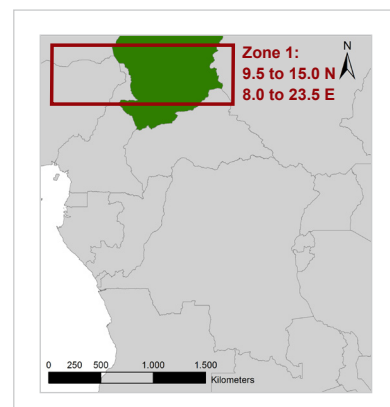
Fact-Sheet - Agriculture - Chad - Zone 1

Maps of projected changes - Maps show the projection of change over this century (mean of the period 2071-2100 compared to the mean of the period 1961-1990) under the "High" emission scenario. In the left panel, changes in greenwater consumption are shown and in the right panel, changes in evapotranspiration.



Definition of Zone 1 - The map below indicates the position of Zone 1 (red rectangle), representing the semi-arid Sahel zone region regions in the north of central Africa. All values presented in this fact-sheet are changes spatially averaged over the whole zone.

As the central part of Chad falls within Zone 1, projected changes for this zone are assumed to be representative for this part of the country.



List of projected changes - The tables show the mean of the projected changes in respectively the evapotranspiration, greenwater consumption and water stress (rounded values). Note that current land use is used in this study for all assessed time periods. Consequently all changes are caused by climate change alone.

| Parameters describing the water availability for agricultural production (in mm) | | Today 2000 | Projected changes | | | |
|--|------|---------------|-----------------------|-----------|------------------------|-----------|
| | | | Low emission scenario | | High emission scenario | |
| YEAR | | | till 2050 | till 2100 | till 2050 | till 2100 |
| Evapotranspiration | YEAR | 438 | +14 | +18 | +10 | +27 |
| | DJF | 26 | +1 | +1 | +1 | +2 |
| | MAM | 52 | +2 | +2 | -1 | +3 |
| | JJA | 218 | +8 | +9 | +5 | +10 |
| | SON | 142 | +4 | +7 | +5 | +13 |
| Green water consumption | | 2768 | +608 | +619 | +578 | +681 |
| Water stress | | -286 | +1 | +1 | +1 | +1 |

Note: Increasing values in the green water consumption indicate that more water becomes available for agricultural production. This may be caused by either increasing rainfall amounts, increasing CO₂ levels or a combination of both. The decreasing values in evapotranspiration indicate that the increasing CO₂ concentration has a stronger effect than the increasing temperatures.

Key findings for Zone 1

- Based on the analyzed ensemble of global climate projections under the assumption of a low and a high emission scenario it can be concluded that the rainy season is extended and the rainfall amount increases. The greenwater consumption increases whereas the changes in the waterstress are limited, which indicates that the agricultural production is less hampered by droughts and may increase in the wetter regions in this zone. The simulated biomass increases as well, which confirms this finding. The dryer regions in the north will continue to experience occasional droughts.

Further details can be found in the "Impacts Report" and the "Adaptation Report" in the report section of the final project document - also available online under www.giz.de and www.comifac.org

Data and method - The projected greenwater, evapotranspiration and water stress signals are based on the LPJ-mi Dynamic Global Vegetation model (DGVM) forced by the bias-corrected ECHAM global climate change projections. Projected changes in the climate are assessed for two different greenhouse gas emission scenarios: the "Low" scenario is based upon the SRES B1 (IPCC-AR4) scenario; the "High" scenario is based upon the SRES A2 (IPCC-AR4) scenario. We present the area-averaged mean change, based upon only one climate model, the ECHAM scenario, as this was the only one giving acceptable results. Land use changes up to 2006 have been used. Projections for the future land use depend on many unknown factors and are therefore difficult to incorporate. The data presented here reflect the changes that are only caused by the changing climate i.e. land use is kept constant. Increasing temperature and the rising atmospheric CO₂ concentration have an opposite effect on agricultural production. The increasing temperature results in an increasing soil evaporation whereas the rising CO₂ concentration reduces plant transpiration especially in the C₄-crops. Unfortunately little is known on the interaction of the rising CO₂ concentration, fertilizer inputs and increasing temperatures for tropical crops. More research in this direction is needed. Note that changing agricultural practises such as more inputs, new crop varieties etc. may have a strong positive effect on the future agricultural production and may compensate for the negative climate change impacts.

Key adaptation options

- Introduction of new varieties which are adapted the higher temperatures and heat stress
- Improved management of climate variability to ensure maximum yield during high rainfall years and minimum damage during dry years.
- To adapt to increased climate variability farming systems should become more diverse. This can be done for example by planting multiple crops and using different varieties.
- Improving drought management plans which prevent large scale food shortage during future droughts.