Climate information relevant for Agricultural and Pasture Systems

Agricultural and pasture systems encompass the food, fibre and animal products cultivated on farms and grasslands, which respond strongly to climate conditions around the world.
This fact sheet presents Sixth Assessment Report Working Group I (AR6 WGI) assessments for changes to climate factors connected to responses in agricultural and pasture systems, highlighting climate information and data needs that inform sectoral assessments and further actions for adaptation, mitigation and resilience planning.

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Impacts, adaptation and vulnerability *in agricultural and pasture systems are predominantly assessed in AR6 WGII Chapter 5.* ***Mitigation*** *options are assessed in AR6 WGIII Chapter 7.*

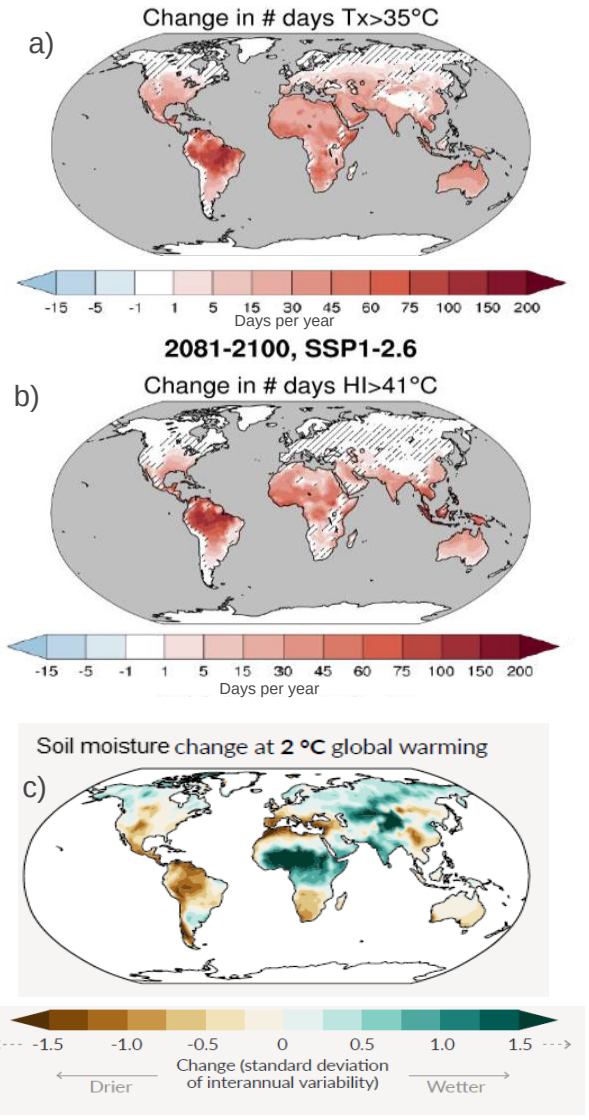

Figure 1: Projections of climate indices relevant for agriculture and pastures. Projections indicate an increase in days per year with (a) extreme temperature and (b) dangerous heat index {Figure 12.4} under a low emissions end-of-the-21st-century scenario, and regional shifts in (c) soil moisture change 2°C global warming. {Figure SPM.5}

HEAT AND COLD

- Agricultural and pasture systems are often selected to match expected seasonal temperatures. Relevant climate information includes, for example, the number of growing degree days and the length of the frost-free season. {12.3.1} Projections indicate increasing mean temperatures and reductions in frost days. {TS4.3}
- Extreme temperature thresholds can disrupt plant growth or damage crops, while conditions with high temperature and humidity can lead to heat stress for animals and agricultural workers {12.3.1}. The intensity and frequency of extreme heat has increased and will continue through the 21st century (*high confidence*), exceeding critical thresholds more frequently by the mid of the century with 2°C of global warming (*high confidence*). {TS.4.3} (**Figure 1a,b, Figure 2**)

WET AND DRY

- Agricultural systems depend on seasonal rainfall and may suffer from water stress during periods of drought affecting available soil and surface water. {12.3.2}
- Projections indicate future shifts in seasonal rainfall and an expansion of arid conditions and fire weather in many parts of the world (*medium confidence*). (**Figure 2**) {TS4.3, Box TS.13}
- Human-induced climate change has contributed to increases in aridity and agricultural droughts in some regions due to increased land evapotranspiration (*medium confidence*), with drought increasing in more regions under higher global warming levels (*medium confidence*). {TS4.3} (**Figure 1c, Figure 2, Figure 3**).
- River floods (*medium confidence*) and heavy precipitation extremes (*high confidence*) are projected to increase in many regions, which can threaten livestock and croplands exposed in flood plains. {TS4.3}

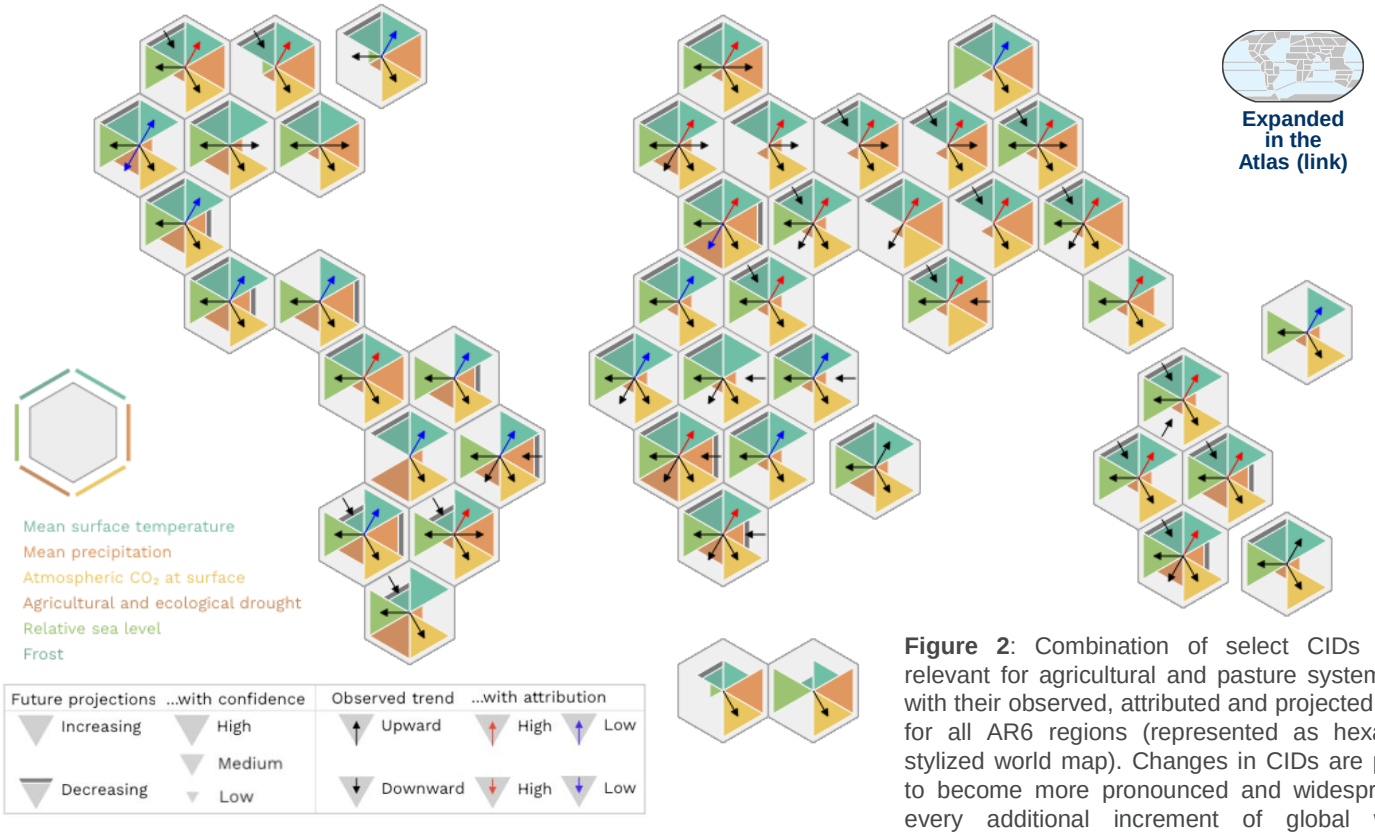

Figure 2: Combination of select CIDs that are relevant for agricultural and pasture systems, along with their observed, attributed and projected changes for all AR6 regions (represented as hexagons in stylized world map). Changes in CIDs are projected to become more pronounced and widespread with every additional increment of global warming. {SPM.B.2.2, SPM.C.2, Interactive Atlas}

SNOW AND ICE

- The duration of seasonal snowpack, which can be important for determining the length of the viable growing season some crops, is *virtually certain* to decrease in the Northern Hemisphere, with earlier spring meltwater also altering irrigation water supply seasonality. {TS2.6, TS4.3}

WIND

- Mid-latitude and tropical region agriculture systems are projected to face more intense severe storms and a higher proportion of intense tropical cyclones with higher rainfall rates (*medium confidence*). {TS4.3, 12.3}

COASTAL AND OCEANIC

- Relative sea level rise is *very likely* to *virtually certain* (depending on the region) to continue along the 21st century in regions with low-lying agricultural areas, increasing coastal flooding and the potential for salinity intrusion (*high confidence*). {TS4.3.1}

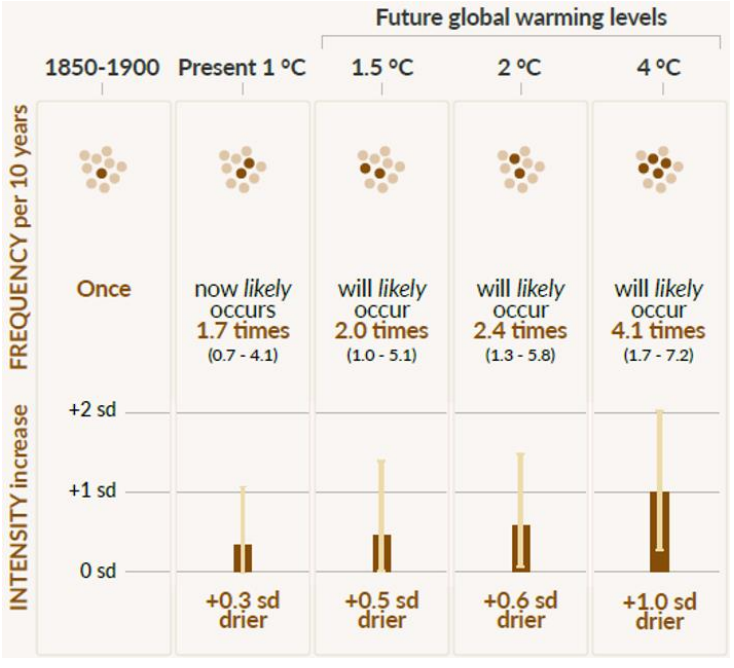

Figure 3: Agricultural drought has already increased in frequency and intensity, with larger changes with each increment of global warming. {Figure SPM.6}

ADDITIONAL RELEVANT CLIMATE CHANGES

- Increases in atmospheric carbon dioxide concentrations are associated with higher photosynthetic rates and improved water retention as well as reduced nutritional quality of crops (*high confidence*). {12.3.7, TS4.3}
- Many CIDs that are important to agriculture and livestock systems have only *low confidence* projections of regional changes. These include hail, dust and sand storms, ice storms and air pollution weather. {SPM.C}
- Major volcanic eruptions also have the potential to drive future food system hazards {SPM.C.1.4}.