Europe: losses in crop production - high adaptation

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| Summary of the assessed risk:  Risk of agriculture productivity loss, including crop failure and decrease in pasture quality, mainly driven by the increase in the likelihood of compound heat and dry conditions and extreme weather. This ember assumes high levels of implementation of multiple adaptation options (see the description of the transition). [13.10.2.2]  Database id: 139 ([link](https://climrisk.org/cree/ember/139)). Scenario: High adaptation.  This ember is found in the following figure(s): Figure 13.30 (a) of AR6-WGII-Chapter13;  (as a rule, summaries are not listed here)  The ember diagram included in this document is based on the assessment provided in the IPCC report and supplementary material listed below, but it does not come from the IPCC; all additional information is provided in view of helping to understand this diagram and is also based on, or reproduced from, the same IPCC sources. Please read the disclaimer notice at the end of this document. |  |

# Transition: undetectable to moderate

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| --- | --- | --- |
| min | 0.8 | *medium confidence* |
| max | 1.1 |

Under high adaptation, the use of irrigation can substantially reduce risks by both reducing canopy temperature and drought impacts. Water availability and competing uses are considered in the water scarcity ember (key risk 3, embers [141](https://climrisk.org/cree/ember/141) and [143](https://climrisk.org/cree/ember/143)). Where the ability to irrigate is limited by water availability, other adaptation options are insufficient to mitigate crop losses in some sub-regions, particularly at 3°C GWL and above, with an increase in risk from north to south and higher risk for late-season crops such as maize. [13.10.2.2 and Table SM13.28]

Changes in cultivars, sowing and harvest dates can reduce yield losses, but are insufficient to fully reduce losses projected at 3°C warming and above, with an increase of risk from north to south and for crops growing later in the season such as maize. Crop breeding for drought and heat tolerance can improve the sustainability of agricultural production under future climate. Mixed, diversified systems, agroforestry and agroecology contribute to adaptation, but they have long lead times due to farmer socio-economic and policy constraints. [Figure 13.30 and Table SM13.28]

# Supplementary information

Potential adaptation changes are summarised in SM13.28, figure 13.30 and section 13.10.2.2.

# Specific references

Table SM13.28

# Reference for the source data:

Bednar-Friedl., B., R. Biesbroek, D.N. Schmidt, P. Alexander, K Yngve Børsheim, J. Carnicer, E. Georgopoulou, M. Haasnoot, G Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D Piepenburg, L Whitmarsh, 2022: Europe. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* [Pörtner, H.-O., D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1817-1927. <https://doi.org/10.1017/9781009325844.015>  
Alternative direct download: [www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\_AR6\_WGII\_Chapter13.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter13.pdf)

Bednar-Friedl., B., R. Biesbroek, D.N. Schmidt, P. Alexander, K Yngve Børsheim, J. Carnicer, E. Georgopoulou, M. Haasnoot, G Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D Piepenburg, L Whitmarsh, 2022: Europe Supplementary Material. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* [Pörtner, H.-O., D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)], url: [www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\_AR6\_WGII\_Chapter13\_SM.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter13_SM.pdf)

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