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Adaptation of Agriculture to Climate Change: A Scoping Review

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Abstract

Since agricultural productivity is weather and climate-related and fundamentally depends on climate stability, climate change poses many diverse challenges to agricultural activities. The objective of this study is to review adaptation strategies and interventions in countries around the world proposed for implementation to reduce the impact of climate change on agricultural development and production at various spatial scales. A literature search was conducted in JuneAugust 2023 using electronic databases Google Scholar and Scientific Electronic Library eLibrary.RU, seeking the key words climate, climate change, and agriculture adaptation. Sixty-five studies were identified and selected for the review. The negative impacts of climate change are expressed in terms of reduced crop yields and crop area, impacts on biotic and abiotic factors, economic losses, increased labor, and equipment costs. Strategies and actions for agricultural adaptation that can be emphasized at local and regional levels are: crop varieties and management, including land use change and innovative breeding techniques; water and soil management, including agronomic practices; farmer training and knowledge transfer; at regional and national levels: financial schemes, insurance, migration, and culture; agricultural and meteorological services; and R&D, including the development of early warning systems. Adaptation strategies depend on the local context, region, or country; limiting the discussion of options and measures to only one type of approach"top-down or bottom-upmay lead to unsatisfactory solutions for those areas most affected by climate change but with few resources to adapt to it. Biodiversity-based, or ecologically intensive agriculture, and climate-smart agriculture are low-impact strategies with strong ecological modernization of agriculture, aiming to sustainably increase agricultural productivity and incomes while addressing the interrelated challenges of climate change and food security. Some adaptation measures taken in response to climate change may not be sufficient and may even increase vulnerability to climate change. Future research should focus on adaptation options to explore the readiness of farmers and society to adopt new adaptation strategies and the constraints they face, as well as the main factors affecting them, in order to detect maladaptation before it occurs.

Keywords: climate change adaptation, agriculture, crop yield, climate-smart agriculture, maladaptation, climat

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