Cropland Management Changes Affect Climate Change

The sign and magnitude of possible impacts of past and future crop management practices on climate change have been recently analysed by a group of American scientists. Current trends in crop management such as increased irrigation and crop productivity and less tillage of the land may have a profound effect on climate at the local and global scale.

Human activities such as burning of fossil fuel and land use activities are widely recognised as contributors to climate change. Previous studies had considered the effects of converting natural ecosystems such as forests into croplands (changes in land cover). Croplands generally reflect more sunlight than other land covers, and therefore tend to cool local temperatures. But past work had neglected other land use changes, not reflected in land cover, which can potentially affect climate, such as changes occurring within existing croplands. In particular, over the last 50 years, farmers have doubled irrigated areas, have more than doubled the crop yields, and have increased the number of crops grown in a field per year. These changes within existing croplands are expected to increase as food demand continues to grow. More information regarding the impacts of these management changes on climate is needed in order to foresee better the effects of future policy and management decisions.

To better understand the potential effects of various cropland management changes, a team of American scientists has recently simulated climate changes under extreme scenarios of irrigation, tillage and crop productivity. They used an atmospheric general circulation model coupled to an ocean/sea-ice model to predict the interaction between ocean, ice, and atmospheric temperatures resulting from current trends in crop management.

The results suggest that more irrigation, reduced tillage, and higher yielding crops tend to cool surface temperatures in cropland areas. Only irrigation and reduced tillage exhibited global climate effects. For example, the study found that extreme scenarios of irrigation change could cool local temperatures by as much as 1.3 °C and global average temperatures by 0.55 °. On the other hand, reduced tillage is likely to have cooling effects by indirectly raising the planetary reflection of sunlight. The study estimated that reduced tillage had roughly as much of a cooling effect on global climate as the increased soil carbon sequestration by the agriculture.

Moreover, the authors found that the models that included recent changes in agricultural practices predicted lower temperatures than models that ignored these factors. More realistic and complete data should be developed to understand better the role of crop management in climate change at the local and regional levels.

Even though the scenarios considered for the analysis were extreme and effects in the real world are likely to be smaller, the current study highlights the importance of considering different aspects of crop management in the analysis of climate trends, the development of climate models, and the design of policies aiming at mitigating climate change.


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Theme(s): Agriculture, climate change