

A new paradigm for assessing the role of agriculture in the climate system and in climate change

Roger A. Pielke Sr.^{a,*}, Jimmy O. Adegoke^{b,1}, Thomas N. Chase^{c,2},
Curtis H. Marshall^{d,3}, Toshihisa Matsui^{a,4}, Dev Niyogi^{e,f,5}

^a *University of Colorado, CIRES, Boulder, CO 80309, United States*

^b *Laboratory for Climate Analysis & Modeling (LCAM), Department of Geosciences, 420K Robert H. Flarsheim Hall, 5100 Rockhill Road, University of Missouri-Kansas City, Kansas City, MO 64110-2499, United States*

^c *Cooperative Institute for Research in Environmental Sciences (CIRES), Department of Geography, Campus Box 216, University of Colorado, Boulder, CO 80309, United States*

^d *Board on Atmospheric Sciences and Climate, The National Academies—National Research Council, 500 Fifth Street, NW, Room 631, Washington, DC 20001, United States*

^e *Department of Agronomy, Purdue University, West Lafayette, IN 47907-2054, United States*

^f *Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, IN 47907-2054, United States*

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Abstract

This paper discusses the diverse climate forcings that impact agricultural systems, and contrasts the current paradigm of using global models downscaled to agricultural areas (a top-down approach) with a new paradigm that first assesses the vulnerability of agricultural activities to the spectrum of environmental risk including climate (a bottom-up approach). To illustrate the wide spectrum of climate forcings, regional climate forcings are presented including land-use/land-cover change and the influence of aerosols on radiative and biogeochemical fluxes and cloud/precipitation processes, as well as how these effects can be teleconnected globally. Examples are presented of the vulnerability perspective, along with a small survey of the perceived drought impacts in a local area, in which a wide range of impacts for the same precipitation deficits are found. This example illustrates why agricultural assessments of risk to climate change and variability and of other environmental risks should start with a bottom-up perspective. © 2006 Elsevier B.V. All rights reserved.

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* Corresponding author. Tel.: +1 970 491 8293; fax: +1 970 491 3314.

E-mail addresses: pielkesr@cires.colorado.edu (R.A. Pielke Sr.), adegokey@umkc.edu (J.O. Adegoke), tchase@cires.colorado.edu (T.N. Chase), cmarshall@nas.edu (C.H. Marshall), climate@purdue.edu (D. Niyogi).

¹ Tel.: +1 816 235 2978; fax: +1 816 235 5535.

² Tel.: +1 303 492 1274; fax: +1 303 492 5070.

³ Tel.: +1 202 334 3533; fax: +1 202 334 3825.

⁴ Tel.: +1 303 492 2770; fax: +1 303 492 3524.

⁵ Tel.: +1 765 494 6574; fax: +1 765 496 2926.

1. Introduction—the current paradigm

The approach generally used to investigate the role of agriculture in climate is to view climate as an external forcing. Crops respond to weather averages and extremes as represented by temperature and precipitation. This perspective views climate as long-term weather statistics. Farmers use quantities such as growing degree days and length of growing season to translate this weather information to information that they can act on.