Will Global Warming Harm Agriculture?

Dr. Madhav Khandekar, a member of the Friends of Science Scientific Advisory Board, was invited by Dr. Roger Pielke Sr. to post a weblog on his website Climate Science at: http://climatesci.org

Dr. Khandekar is an Environmental Consultant (extreme weather events) and worked for 25 years with Environment Canada in Meteorology. He was invited to provide his comment on this recent article published in Science:

Historical Warnings of Future Food Insecurity with Unprecedented Seasonal Heat

http://www.sciencemag.org/cgi/content/abstract/323/5911/240
David. S. Battisti and Rosamond L. Naylor Science 9 January 2009: 240-244.

The abstract of this article reads

"Higher growing season temperatures can have dramatic impacts on agricultural productivity, farm incomes, and food security. We used observational data and output from 23 global climate models to show a high probability (>90%) that growing season temperatures in the tropics and subtropics by the end of the 21st century will exceed the most extreme seasonal temperatures recorded from 1900 to 2006. In temperate regions, the hottest seasons on record will represent the future norm in many locations. We used historical examples to illustrate the magnitude of damage to food systems caused by extreme seasonal heat and show that these short-run events could become long-term trends without sufficient investments in adaptation."

Dr. Madhav Khandekar's weblog follows.

"I read the abstract and summary of David Battisti's article from Science and am very disappointed at his naive analysis of "hot" future climate and its possible adverse impact on world-wide and in particular tropical agriculture. I am afraid he (David) has NOT tried to understand or analyze in depth how agriculture has evolved in most tropical regions.

From my limited analysis of agricultural evolution over south Asia (where more than 60% of humanity lives today) most regions have substantially increased their grain & food (fruits, veggies etc) supply in the last 25 yrs. Increase in max temp (due to GW) alone is NOT necessarily deleterious to agriculture in Asia and tropical Africa. Reduced rainfall (seasonal, Monsoonal) can be more deleterious to agriculture and so far there is NO indication that Monsoon or seasonal rains over Asia & tropical Africa have declined in the last 25 yrs. Allow me to provide some numbers: For India (I have done extensive analysis of Monsoon and agriculture for India) the rice yield has increased from 25 M tonnes in 1950 to about 100 M tonnes in recent yrs and most of India's rice grows in the Peninsular India where mean temp has increased by about 1 C over the past 50 yrs. During the Monsoon months mean temp is about 32/35c (David refers to this as 'critical', which is NOT correct) but with good rains from Monsoon season, rice

can grow quite well there. In the northern Province of Punjab (India's wheat growing region) wheat grows due to winter rains (December-March, about 6-10 cm) plus excellent irrigation (perhaps best in the world) and today Punjab produces about 70 M tonnes of wheat, compared to about 15 M tonnes in the 1950s. Besides wheat & rice India also produces a variety of other grains like beans, sorghum, soya, barley etc. India has two agricultural seasons, Kharif the main Monsoon season, June-September, and Rabi, winter season December-February- this only for selected regions of Peninsular India and parts of central & north India where irrigation is well developed. The two seasons' total yield today can and does provide sufficient grains/fruits/veggies etc for 1.2 billion people of India, this represents about 20% of world's humanity!

Based on limited analysis, I can say that "there is plenty of food today for most people in India (there is NO starvation anywhere!). Admittedly, the prices of grains & veggies are yet NOT affordable to everyone. The Central Govt (in New Delhi) is doing its best to provide basic grains (rice & wheat) to many regions at subsidized prices. With general elections coming in the next three months or about, the ruling Govt in New Delhi will try its best to provide adequate food/grains to everyone so the next election will NOT be on "food shortage" issue, BUT most certainly on terrorism which is becoming the most talked about issue at present. Elsewhere in south Asia, food grains and fruits and veggies have registered increased yields in the last 25 yrs and most regions (including Burma OR Myanmar where there is strict Military rule) have adequate food supply.

In summary I completely disagree with David Battistie's analysis of "reduced grain yield" in a warmer world! This issue is very poorly analyzed. Battistie gives example of the Sahel region, which is a poor example in my opinion. Battistie should know that the Sahel is NOT the grain basket for Africa. It produces a measly few M tonnes of peanuts, so why worry about possible depletion of few M tonnes of peanuts, while completely ignoring hundreds of M tonnes of grain being produced elsewhere? To give some more numbers: For the year May 2007 thru April 2008, India's total grain yield, per an article I read in May 2008, was estimated at about 230 M tonnes, possibly largest yield in the last ten years. During an election in July/August 2008 in one of the southern Provinces in India, the New Delhi Govt was promising people there that "rice will be made available at Rs 20 per Kilo-this translates to about 50 cents (US) per kilo!" (Delhi Govt has purchased large quantities of wheat & rice for distribution at subsidized rates).

I visited two major cities of India New Delhi (lat 30N Population ~ 11 M) and Hyderabad (lat ~13N Population ~8 M) in the last year and was impressed to see both these cities full of vegetation and big shady trees providing a nice "green look" despite the fact that both these cities have hot summer climate with max temp reaching 42-45 C at least ten days during the pre-monsoon months March-May. In New Delhi, India's capital city, there is an area in Central Delhi (close to the India Met Dept main office) called The Lodi Gardens, which is about 2 Sq Km area with lots of large trees providing excellent shade during hot summer days. These well-

known Lodi Gardens were established by the Lodi Family which ruled New Delhi around 1000-1100 AD. It is interesting to note that these Gardens and the trees have survived the relatively cooler climate of the LIA (Little Ice Age) and are thriving well, even during the hot summer days of New Delhi. I recall New Delhi recording max temp of 50 C for about two weeks in June 1998, the so-called 'hottest' year as designated by the IPCC.

Both New Delhi & Hyderabad have Monsoonal climate where summer (June-September) rains provide the annual moisture (about 20-25 inches of rains both places). New Delhi does get few cm of winter (December-March) rains, while Hyderabad only occasionally gets some winter precipitation via Easterly Waves from the bay of Bengal (in the east) of about 3-5 cm.

Even the State of Rajasthan (in Northwest India) which has a desert climate can and does support fair amount of greenery and large trees dotted along 'old' dried rivers as well as elsewhere in the State. Northwest India has experienced an interesting climate change over the last two thousand years (recall Late Prof Reid Bryson's study of the 1960s on 'dust & climate") and there are numerous stories in the Hindu Mythology about the vanishing River Saraswati (Goddess of Knowledge) which was full of water some 1500 years ago and is completely dry at present. There are plans at present to revive the old dry river bed to make it green again!

When one closely analyzes the climate of India and south Asia, Battisti's present study in Science seems deeply flawed.

p.s. I met Battistie at a CMOS (Can Met & Oceanogr Soc) Annual Meeting in Kelowna British Columbia in 1995. He is a good modeler and I had good discussion with him. I am afraid he puts "too much" faith in his models."

An excellent weblog by Pat Michaels on this Science paper is also worth reading

http://www.worldclimatereport.com/index.php/2009/01/08/science-fiction-down-on-the-farm/