

BY INVITATION

OPINION

Four scientists challenge the credibility of a previous *Farmer's Weekly* article and argue that there is irrefutable evidence of human-induced global warming and increased carbon dioxide emissions. There are early signs of climatic changes that can cause damage, notably in agriculture, and which already threaten human lives, they say.

IN *FARMER'S Weekly* of 26 August an article by Emeritus Professor Will Alexander and Roelof Bezuidenhout was published entitled "Climate change – fact or fiction?", and provocatively advertised on the cover as "Is climate change a hoax?". Ironically, the article promoted only fictions, making no apparent attempt to establish the facts. It accused the climate change research community of "nonsense", "intrigues", "deliberate suppression of information" and "alarmism". We present arguments that will allow readers to make a more informed judgement.

Nobody needs to remind farmers that they are critically dependent on the vagaries of the climate. Therefore, when strong evidence emerges, by global consensus among thousands of scientists, that the Earth's climate is changing as a result of human activities, it would be irresponsible of South African researchers, policy makers and farmers to ignore it. The consequences of being "alarmist" in the face of some remain-

'Climate change: no trivial threat'

ing uncertainty are much less serious than failing to recognise or respond to a real and dangerous situation. An analogy to the dispute in South Africa over whether HIV causes Aids is very apt. Despite this being among the most intensively researched topics in human medical history, and despite overwhelming evidence that the disease is caused by the virus, there remain some dissenting voices. That, in itself, is simply a sign of healthy scientific debate. But when *policy* is driven by the fringe views of denialists rather than the tested evidence of the vast majority of experts, the outcome is often a great deal of human suffering.

People are now suffering in the southern US in a heart-breaking situation – might the ravages of hurricane Katrina have been reduced if early warnings of increased storm intensity had encouraged authorities to strengthen their flood defences?

The scientific case has been made

The scientific case for a detectible human influence on the global climate system is now beyond credible dispute, even while certain details remain unclear – as outlined in the *Third Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC), published in 2001. The underlying processes are, however, well known and quantified. Climate change trends have been published after thorough review in the most respected scientific journals in the world. The Earth in year 2005 is on average warmer than at any time in the last thousand years. The carbon dioxide concentration of the atmosphere, one of the main trace gases responsible for global warming, is now higher than at any time over the past 750 000 years, at least. Glaciers are melting worldwide and ice caps are thinning. There has been a rise in hurricane intensity in the Caribbean, with the graphic impact of Katrina being a shocking reminder of its overwhelming force.

The heat wave that engulfed Europe in 2003 was so extreme that its likelihood of occurrence in the absence of climate change has been calculated as roughly once in 46 000 years, and it resulted in widespread damage, running into the billions of Euros. Climate change can and is caus-

ing damage, notably in agriculture, and is already threatening people's lives.

Tilting at the wrong windmills

Prof Alexander observes that "computer programs must be calibrated with real-world data and be able to reproduce historical trends". We absolutely agree, and wish that his own claims were subject to the degree and rigour of scientific scrutiny to which global climate models are exposed. Far from being concealed, the models – there are many of them, not just one – are described in detail in hundreds of scientific papers, and their outputs are checked against historical data and published on open websites. Global climate modelling (GCM) is one of the scientific triumphs of the late twentieth century. It does some things better than others. GCMs accurately reproduce regional and seasonal temperatures, winds and pressure, giving us great confidence in projecting the general trends in these factors for the coming century. GCMs do a poor job on clouds and local rainfall – this is an intrinsically hard problem to solve. Great leaps in computing power are helping, but irreducible uncertainty will probably remain.

Prof Alexander is vague about whether he acknowledges the reality of rising global temperatures. He is flat wrong when he asserts that there is no general increase in temperature over South Africa. A valid analysis at this scale must proceed region by region, and season by season, if the signal is to be apparent among the natural variation. Recent studies have shown that significant warming has been occurring over the past 60 years across the African subcontinent. The trend in many areas is more than double the global average reported by the IPCC. The projections regarding deciduous fruit farming, which he finds alarmist, are based on temperature, not rainfall. Growing conditions for some varieties have been deteriorating. A dramatic drop in chilling units, as well as increasing heat stress, has made export apple production a very difficult endeavour. Wine farmers, too, have been noticing impacts on grape quality in some areas. Prof Alexander may wish to discuss his sweeping statement that "adverse effects of climate change are not taking place" with the affected farmers, as some of us have done.

Scientifically baseless arguments

Prof Alexander argues that because the day-to-night temperature range in the Karoo is large, the projected increases due to global warming will be trivial. This view is ignorant of the fact that increasing



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