

## Editorial

### Food security, climate change and biofuels: integrative plant biology is now in the spotlight

It is a chastening experience to watch the two clocks on the International Rice Research Institute's homepage; with the population clock counting up (6.7 billion people, with half of this number predominantly dependent on rice), while the productive arable land clock is counting down. Everywhere we look in the media at present, we see reports of a global crisis occurring in the food supply system. Global food prices are soaring, with rice prices increasing 100% since December 2007. For the South East Asian population spending 40% or more of their income on rice, this is a calamity. For sub-Saharan Africans, who switched to growing cash crops and buying food when grain prices reached an all time low in the 1980s (at around \$100 per tonne), there is immediate hardship. Why have we swung from an EU grain mountain and 'set aside' where farmers were paid not to grow food, to the current situation where global grain reserves will last barely a season? According to Robert Ziegler, the Director General of the International Rice Research Institute, the reasons are complex. This crisis has been driven by declining areas of arable land (often due to the relentless march of golf courses and urbanisation rather than desertification), stalling of progress in improving cereal yields due to disinvestment in agricultural research, demand for biofuel, rising fuel and fertiliser prices and the overarching shadow of climate change, drought and unpredictable weather patterns. Norman Borlaug, the father of the first Green Revolution through the adoption of semi-dwarf wheat, has suggested we achieved too much in those early days of booming yields, creating a research environment of complacency where there was less need to increase yields further or to invest in future food security. It is a pity that memories are short because until the Green Revolution, food prices fluctuated wildly and were often higher than they are today in real terms.

There is nothing that plant biologists can do to halt population growth and dwindling arable land areas. However, there will be an increasing expectation that plant biology will provide the answers we need for the 'second green revolution' to feed our population and our biofuel industries. Are we up to the task? According to FAO figures, annual yield progress in global wheat and rice breeding has dropped from more than 2% per annum in the period from 1967 to 1997 to well below 1% thereafter. There is also evidence that we have reached the 'harvest index limit' and can only improve yields by increasing photosynthetic capacity, a problem that has proved intractable for plant biochemists over the last 25 years. It is time to bring our disparate disciplines in plant biology together in an integrated approach to solving these global issues. Call it Plant Phenomics, Integrative Plant Biology or just 'old-fashioned' Plant Physiology, it doesn't matter. To make a meaningful contribution, we need to focus our attention on cross-disciplinary connections from cell to leaf to whole plant to crop and canopy, for the future of our planet.

To this end, *Functional Plant Biology* is supporting an international meeting in Canberra entitled 'Plant Phenomics: from Gene to Form and Function', on 21–24 April 2009. This 3-day symposium will bring together leading researchers from Australia, Europe and North America. It will span screening techniques and analytical approaches for assessing biotic and abiotic stress, growth and yield, and ecosystem dynamics and climate change. Research papers from the symposium will be published in a special issue of *Functional Plant Biology*. This meeting will coincide with the opening of the Canberra node of the Australian Plant Phenomics Facility, the first publicly funded facility of its kind. Further information can be obtained from the conference organisers at [www.plantphenomics.org.au](http://www.plantphenomics.org.au).

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