

EDITORIAL

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Agriculture and food security: fifth anniversary

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Fifth anniversary editorial

In our Launch Editorial [<https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-1-1>] we highlighted the problem defined by Norman Borlaug in 1970, when he accepted the Nobel Peace Prize for initiating the Green Revolution in Agriculture. He observed that “Most people still fail to comprehend the magnitude and menace of ‘the population monster’. If the world’s population continues to increase at the estimated present rate of two per cent a year it will reach 6.5 billion by the year 2000 unless man becomes more realistic about his impending doom”. He observed that “it is time that the tide of the battle against hunger was changed for the better—but ebb tide could soon set in if we become complacent”. The harsh reality of this warning was recognized in 2008 when the price of wheat and maize doubled and that of rice tripled, leading to food riots in twenty countries. The rate of increase in the world’s population has not been reduced and in June 2017 it reached 7.5 billion of whom some 800 million people are chronically undernourished, and over two billion suffer from micronutrient deficiencies (also known as hidden hunger). As the global population continues to rise we must confront the problem of feeding 10 billion people safely and sustainably before the end of this millennium. We will need to grow more food on less land, using less water, less labour and fewer agrochemicals while we confront global climate change and avoid further dramatic reductions in biodiversity [<https://www.omicsonline.org/proceedings/the-21st-century-challenge-to-feed-10-billion-people-safely-and-sustainably-44205.html>]. Norman Borlaug was in no doubt that the problems could be resolved so long as the whole range of scientific advances is deployed at the earliest opportunity; he was particularly concerned that the campaigns of “anti-science zealots” are causing

the potential benefits of molecular approaches to crop and animal improvement to be missed.

We celebrate the fact that, during our first 5 years, we have addressed these issues in 107 Original Research Papers, 33 Reviews, 10 Commentaries, 3 Editorials and 1 Opinion Piece along with Thematic series on Climate-Smart Agriculture (<https://www.biomedcentral.com/collections/climate-smartagriculture>), Climate Smart Agricultural Technologies in West Africa (<https://www.biomedcentral.com/collections/CSAWA>), Fisheries and Food Systems: Cross pollinations and synthesis (<https://www.biomedcentral.com/collections/fisheriesandfoodsystems>) and Cross journal collections on World Food Day 2013: sustainable food systems for food security and nutrition (<https://www.biomedcentral.com/collections/wfd13>) and Food for thought: safety in the global food chain (<https://www.biomedcentral.com/collections/fft>).

Our distinguished Section Editors, Editorial Board and Reviewers have seen merit in all of our publications, but I can highlight only a few of them. Borlaug spent his last years working under the auspices of the Sassakawa Africa Association to bring the benefits of the Green Revolution to the Continent of Africa. He had some success in this, but he was very conscious of the huge problems that persisted. Albert Sasson addressed the situation in “Food Security for Africa: an urgent global challenge” <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-1-2>. The matter of global climate change was constructively considered in “The role for scientists in tackling food insecurity and climate change” by John Beddington et al. <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-1-10>.

In his Nobel Lecture (http://www.nobelprize.org/nobel_prizes/peace/laureates/1970/borlaug-lecture.html), Borlaug observed, with reference to the next phase of development of agricultural science;

“In my dream I see green, vigorous, high-yielding fields of wheat, rice, maize, sorghums, and millets, which are obtaining, free of expense, 100 kilograms of nitrogen per

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hectare from nodule-forming, nitrogen-fixing bacteria. These mutant strains of *Rhizobium cerealis* were developed in 1990 by a massive mutation breeding program with strains of *Rhizobium* sp. obtained from roots of legumes and other nodule-bearing plants. This scientific discovery has revolutionized agricultural production for the hundreds of millions of humble farmers throughout the world; for they now receive much of the needed fertilizer for their crops directly from these little wondrous microbes that are taking nitrogen from the air and fixing it without cost in the roots of cereals, from which it is transformed into grain...”

Ted Cocking has been determined to bring this mission to fruition and his Review (with David Dent) “Establishing symbiotic nitrogen fixation in cereals and other non-legume crops: The Greener Nitrogen Revolution” <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-016-0084-2> describes the great progress that they have made.

As we remarked above, Borlaug was convinced that the twenty-first-century challenge (to feed 10 billion people, safely and sustainably) can be overcome if we use the whole range of scientific advances at the earliest opportunity; Borlaug was particularly enthusiastic about the potential role of genetically modified crops and Clive James/ISAAA followed the progress of GM crops from the time of their first commercial use in 1996. In 2012 Gurdev Khush reviewed the ISAAA data and concluded that “Genetically modified crops: the fastest adopted crop technology in the history of modern agriculture” <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-1-14>. Nevertheless, many of our writers are concerned that the campaigns of “anti-science zealots” are causing the potential benefits of molecular approaches to crop and animal improvement to be missed. I will mention only one of them. In her Review “Food in a future of 10 billion” <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-015-0031-7> Nina Fedoroff expressed her own grave concern about the wasted opportunities and observed that

It is the case of Golden Rice, genetically modified to produce the vitamin A precursor β -carotene, that provides the paradigmatic example of an opportunity foregone to use GM technology to address a major global malnutrition issue. Severe vitamin A deficiency results in blindness, and half of the roughly half-million children who are blinded by it annually die within a year. Vitamin A deficiency also compromises immune system function, exacer-

bating many kinds of illnesses. It is a disease of poverty and poor diet, responsible for 1.9–2.8 million preventable deaths annually, mostly of children aged less than 5 years and women.

Mindful of this outrageous situation I am delighted to introduce Adrian Dubock’s Review [1] in which he has assessed the current status of Golden Rice “An overview of agriculture, nutrition and fortification, supplementation and biofortification: Golden Rice as an example for enhancing micronutrient intake”. In the text you will read that “Vitamin A deficiency is responsible for around 4500 preventable child deaths daily, and Golden Rice, biofortified with provitamin A, has proven potential as a costless intervention where rice is the staple crop”. Dr. Dubock reveals how the opponents of GM foods have prevented Golden Rice from bringing its life-saving benefits to humankind until now, but at last the time is approaching when Golden Rice is expected to be available to the farmers who will grow it and enable it to help combat vitamin A deficiency in Developing Countries. In this cause Dr. Dubock has written the Methodology manuscript “Golden Rice—Instructions for Use” [2] for the populations of rice consuming countries where vitamin A deficiency is endemic. It follows the Review.

In our Launch Editorial we emphasized the fact that online open access publication of *Agriculture and Food Security* means that upon publication all articles are available worldwide, without charge, to anyone with a computer. Overall, as I write, the five articles cited above alone have been accessed 170,540 times. We look forward eagerly to publishing news of further progress towards safe, sustainable global food security.

Competing interests

The author declares that he has no competing interests.

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