Editorial[i]

More Science, Better Integration to Meet the Food Challenge

Maintaining adequate global food supplies at a time of rapidly rising population, significant economic growth, increasing food and stockfeed demand, changing climate, declining natural resources, trade liberalisation and regional disturbances is a critical issue for mankind.

To meet this life threatening challenge, we must adopt scientifically sound and sustainable agricultural practices.

Science plays a major role in feeding the world, as clearly demonstrated by the green revolution post 2nd World War. However, future food security challenges will increasingly require a multi-disciplinary approach, involving environmental, economic, social and political solutions.

World leaders increasingly realise that feeding the world with diminishing resources is a massive task and hence, greater co-operation between countries, governments and scientific disciplines is required.

Interestingly, while the need to have food on their plate is shared by all consumers, the more affluent are now demanding their food should also be clean, green and ethically and sustainably produced.

Alarmingly, this is happening as the stockpile of wheat and other major cereal grains has dropped recently to its lowest level since 1980. Food prices are soaring worldwide, while crude oil prices have doubled shipping and fertiliser costs. The UN's Food and Agriculture Organisation (FAO) estimates that by 2050, grain output has to rise 50% and meat output has to double.

Population growth, rising incomes, the declining rate of agricultural productivity trends, climate change, and the increased uses of grain and sugar cane for biofuel production are leading to a competitive surge in food commodity demand. This is occurring in an environment where land and water constraints will limit agricultural production growth. Total urban population will double, changing diets as well as overall demand, because urbanites tend to eat more meat products.

As every human is a net consumer of food, balancing the needs and merits of nutrition, bio-energy, the environment and livelihoods are global concerns. For these reasons, integrating whole aspects of agriculture and the food industry is important in the future.

Five Trends

I see five major trends in the global agriculture and food industry.

1. *Food production must be increased substantially* by the mid 21st century to feed a world population projected to increase from 7 to 9 billion. The challenge is to double world food production output by 2050 using less land and far less water and fewer nutrients, while watching the 'hovering cloud' of climate variability and change.

2. *Economic development is increasing faster than expected* in most countries. With economic growth comes a rapidly changing food preference, increasing purchasing power and greater demand for high standards of food quality. About 40% of the increase in the world's grain production comes from the increase in yields and 60% comes from allocating more land under cultivation. However, increased future food production must come from shrinking land, water and other natural resources, i.e. with increased productivity per unit of land.

3. *Impact* of *agriculture on the environment and our natural resources.* An example is the emerging global shortage of water for urban consumption, industrial use and agricultural purposes.

   The world's 1.5 billion farmers, as guardians of much of what is left of the natural landscape, hold the fate of thousands of threatened species and the world's remaining forests in their hands. Today, agriculture uses 75% of the world's fresh water and its runoff has degraded the earth's major rivers, estuaries and even seas.

4. *Escalating fossil fuel price and the growing popularity of biofuels* are driving demands for grain crops (corn and oil seeds) and sugar cane. Increasing fossil fuel prices further pose major risk to agriculture production and transportation costs, leading to increased price volatility. This presents a serious issue since it takes over arable land and diverts resources from food production. By 2020, we are likely to burn 400 million tonnes of grain a year just to keep our cars on the road – equal to the world's current rice crop.

   Meanwhile, billions of subsidy dollars have been poured into developing sugar and grain-based ethanol and biodiesel to help wean rich economies from their addiction to carbon-blenching fossil fuels, the overwhelming source of human-made global warming. As soaring prices for staples bring more of the planet's most vulnerable people face-to-face with starvation, the image of first generation biofuels has changed from climate saviour to misguided 'experiment'.

5. The fifth trend is *climate change and its impact on agriculture.* Potential changes in climate may reduce productivity and output in agricultural industries in major producing countries, in the medium to long terms. Several analyses indicate that future climate changes and associated declines in agricultural productivity and global economic activity may affect global production of key commodities. For example, global wheat, rice, beef, dairy and sugar productions could decline by 2 - 6% by 2030 and 5 – 11% by 2050.

   The agricultural sector must maintain strong productivity growth to cope with the pressures emerging from climate change and variability. Agriculture occupies 40% of the world's free land surface and is responsible for 30% of global greenhouse emissions.

More world-class scientists must be trained in agronomy/farming systems, environmental science, genetics, biotechnology and plant breeding. By instituting international agricultural training initiatives, we can positively address the global food crisis.

According to ACIAR CEO, Dr Nick Austin, “agricultural science can be a catalyst for lifting many of the world’s estimated 1.4 billion poor people from poverty”.

Addressing the annual Australian Bureau of Agricultural Resource Economics (ABARE) Conference, he said in the past 50 years, agricultural R&D had been pivotal in lifting gross world’s food production by 138%, from 1.84 billion tonnes to 4.38 billion tonnes.

At the moment, it is closer to a nightmare for those going to sleep at night with an empty stomach and this is something that is unpalatable to caring, thinking human beings with the capacity to make the changes necessary for everyone to be adequately fed and cared for.

Thus, we simply can’t claim global food security when one in seven people today still does not have access to sufficient food, while an equal number is over-fed.

Many of our global problems, such as food, water and energy shortages and climate change, are related and it is clear we can no longer take a linear path to a solution. I believe appropriately funded and strategic R&D has the capacity to drive agriculture and, in turn, global food production, to the point where food security can be more a reality than a dream.

Strong political leadership and social planning are also equally necessary to achieve these desired outcomes.

Winthrop Professor Dr Kadambot Siddique, AM FTSE, BSc. (Ag) Hons., MSc., PhD.
Chair in Agriculture and Director
The UWA Institute of Agriculture
The University of Western Australia
and
Associate Dean Research
Faculty of Natural and Agricultural Sciences
The University of Western Australia
Perth

kadambot.siddique@uwa.edu.au
http://www.uwa.edu.au/people/kadambot.siddique

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Professor Siddique has 26 years of experience in agricultural research, teaching and management in both Australia and overseas. He has developed a national and international reputation in the fields of farming systems, production agronomy, crop physiology, genetic resources, breeding and market research in cereal, grain and pasture legumes and oilseed crops. Professor Siddique's publications are considered as key papers in the above fields and are widely cited. His pioneering research on chickpea has contributed enormously to the Australian chickpea industry, which is currently valued at more than $250 million per annum.

In 2011, Professor Siddique was made Member of the Order of Australia (AM) in Queen's Birthday Honours List. The citation recognised his lifetime's work in advancing agricultural science as an academic and a researcher in the area of crop improvement and agronomy and through his contributions to professional associations. In 2005 he was elected as a Fellow of the Australian Academy of Technological Sciences and Engineering (FTSE).

Professor Siddique has published more than 200 scientific papers, review articles and book chapters. Professor Siddique is also on the Editorial Board of a number of international scientific journals. He has also trained numerous MSc and PhD students.

He has developed an extensive network of scientists within Australia and also established a diverse range of overseas (China, India, Turkey, Syria, Iraq, Iran, Saudi Arabia, Oman, Malaysia, East Timor, Nepal, Bangladesh, Pakistan, Europe, Canada, USA) collaborative research and educational projects. He holds a number of national and international committee positions, which mark an acknowledgment by the scientific community and industry of the contributions he has made.

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