

Workshop Report

22 September 2011

Global Food Demand and Supply to 2050: Workshop Summary

Purpose

The fourth roundtable series, hosted by Future Directions International's Global Food and Water Crises Research Programme, examined the issue of global food supply to 2050. Meetings took place in Sydney, Canberra and Melbourne in July 2011.

The meetings sought to answer the following question: "What are the issues that the world faces and what threats and opportunities exist for countries like Australia."

Further workshops are to take place, which will examine the role that science and technology can play and the potential for conflict. A final series of workshops will consider how Australia will be affected by the global crisis and what role it might play in ameliorating this situation.

The results of the global food workshops are summarised in this document. They are grouped under the headings of supply and demand. The Key Points highlight the major conclusions. A final paper will be published on FDI's website, after this paper has been considered by those who attended the roundtables.

A number of Strategic Analysis Papers will follow that will examine in greater detail the conclusions reached.

The list of attendees is below. They represent a variety of backgrounds. This paper captures their responses and is indicative of the complex nature of global food security.

Attendees

All roundtables

- Major General John Hartley AO (Retd), CEO and Institute Director, Future Directions International, Roundtable Chairman.
- Alyson Clarke, FDI Executive Officer
- Gary Kleyn, Manager, FDI Global Food and Water Crises Research Programme

Sydney

- Dr Paul De Barro, senior principal research scientist, CSIRO Ecosystem Sciences.
- Prof Bill Bellotti, Vincent Fairfax Chair in Sustainable Agriculture and Rural Development, School of Natural Sciences, University of Western Sydney.
- Dr Monika Barthwal-Datta, Food Security Programme Leader, Centre for International Security Studies, University of Sydney.
- Colin Richardson, Adjunct Professor, Centre for International Security Studies, University of Sydney.
- Ben Shepherd, PhD Candidate in the Food Security Programme, University of Sydney Centre for International Security Studies.

Melbourne

- Robin Batterham, Kernot Professor of Engineering, School of Engineering, Melbourne University, former Australian Chief Scientist.
- Patrick Francis, editor of the Australian Farm Journal, which is part of Rural Press Limited.
- Jennifer Hawkins, Nuffield Scholar
- CMDR Warren Kemp RFD RANR, President, Royal United Services Institute of Victoria.
- Andrew Lang, farmer near Lismore and also manages 130ha of farm forestry woodlots on the family 2200ha wool, wood and cropping property. Chairman of SMARTtimbers Cooperative, one of Australia's leading farm forestry organisations. Board member of the World Bioenergy Association, representing the Australasia-Oceania region.
- Sue Marriott, director, Secretariat for International Landcare Inc.

Canberra

- Neil Andrews, Principal Economist, ABARES
- Dr Matt Barton, Strategic Horizon, Defence Intelligence Organisation.
- Dr Denis Blight, executive director, Crawford Fund.
- Julian Cribb, Science Alert, author of "The Coming Famine".
- Don McDonagh, Outcomes Australia.
- Dr Simon Hearn, principal advisor, Australian Centre for International Agricultural Research.
- Simon Winter, senior research manager, global challenges program, Rural Industries Research and Development Corporation (RIRDC).

Major Challenges

Two fundamental challenges were noted with regard to understanding the global food crisis:

- a. Unless more food is produced and distributed more efficiently and equitably, there is the potential for a catastrophic crisis, affecting, directly or indirectly, several billion people.
- b. A global realisation that the world faces such a crisis is yet to be achieved. The people who will suffer the most are unlikely to be able to afford the food. They will rely on support from wealthier countries. As yet, the public and many leaders and policy makers in richer countries are not prepared to accept these facts, or choose to ignore them on the basis that others will deal with them.

Key Points

Demand

- a. World population will increase from about 7 billion today to over 9 billion by 2050.
- b. Global urban population will increase from 49 percent to around 70 percent, or 6.3 billion people.
- c. The demand for higher quality food will rise. By 2050, global meat demand per year will rise by an estimated 180 million tonnes, to reach 465 million tonnes.
- d. Demand for food is likely to increase by 70 percent between now and 2050, equalling twice the amount of additional food that is currently available to consumers.

Supply

- a. Improved national, regional and global governance is needed if food is to be made available to those who most need it, including reviews of trade barriers and subsidies.
- b. Food wastage, both at the pre-harvest and post-harvest stages that presently accounts for up to 50 per cent of production in developing countries, must be reduced.
- c. Food logistics, involving transport and storage, must be improved.
- d. Available fresh water must be husbanded and further sources developed, while solutions must be found to deal with the competing water demands farmers face from cities and the resources sector.
- e. Arable and grazing land must be protected and degraded land restored to productivity.
- f. The potential impact of climate change on the world food supply must be considered and suitable adaptations urgently adopted in all countries.
- g. Development of agriculture is required, to make mega-cities more food secure.
- h. Scientific and technological innovation needs to be revitalised.
- i. Education and training of food producers needs to be dramatically increased.
- j. Farmers need a more assured and higher return for their produce.

- k. Aquaculture and other food sources offer new opportunities but are unlikely to significantly increase food production. Fish stocks peaked in 2004, meaning that wild catches of fish are also liable to decrease globally.
- l. Future conflict and refugee crises could increase substantially as a result of food and water crises.

Demand

World population

The basic starting point in any discussion is to determine the future demand for food by 2050. Demand will be driven, in part, by the increasing population. It is estimated that the global population will then be around 9.1 billion people. Almost all population growth will occur in developing nations, particularly in Africa and South Asia. This will be at a much slower rate of growth than the one seen in the past four decades, during which population grew by 3.3 billion, or more than 90 per cent.

World economic growth is forecast to continue to average around 2.9 per cent per annum, while incomes will triple globally and quintuple in developing nations.

Urban population

By 2050 around 70 per cent of the global population will be based in urban areas, compared with 49 per cent currently. Projections indicate that by 2050 Asia's urban population will increase by 1.8 billion, Africa by 900 million and Latin America and the Caribbean by 200 million. Other estimates indicate that there will be around 30 mega-cities with populations of between 10 and 40 million people by 2050, compared to about 20 today. Urbanisation can be partially attributed to agriculture becoming less labour intensive and to better employment, living and education prospects in cities; as well as a result of declining farm profitability, water supply problems and soil erosion.

Food quality

Despite population growth, more people will be able to afford to eat better quality, high energy food as incomes rise in the developing countries. The middle class will continue to expand in relatively high population countries such as Indonesia, China and India. Demand for food products that are more responsive to higher incomes in developing countries (meat and dairy products, fish and aquaculture products, vegetable oils), will grow faster than the demand for cereals.

To meet the increased consumption of meat, annual global meat production will need to rise by over 200 million tonnes, to reach 470 million tonnes. Additionally, fish consumption will rise by 100 million tonnes. This will require an additional three billion tonnes of grain to feed livestock – equivalent to the annual harvest of three North Americas

Overall, meat consumption in developing countries is expected to account for 82 per cent of projected global growth in the agricultural sector in the next decade. Much of this expansion

will take place in Asia and the Pacific region, especially in China and in Latin America, led by Brazil, and is expected to outpace growth in OECD countries by a factor of 2:1 in the next decade.

Meat consumption per capita per year will rise globally, from 41 kilograms at present, to 52 kilograms in 2050. In developing countries, forecasts suggest that meat consumption will rise from 30 to 44 kilograms. Australia's population consumes meat at levels well above the international average. It is estimated that each Australian consumes around 100-110 kilograms per person per year. If the rest of the world were to consume at rates equal to Australia, it would place significant pressure on the agricultural sector and the demand for agricultural inputs, such as water, fertiliser, pesticides and land. What could occur, however, is that meat consumption may decline, as people realise the health costs of meat-rich diets.

The question of future food supply must also take into account different levels of consumption. Currently it takes 14.5 hectares to support an average Western Australian, in contrast to the one hectare that is required to support a Somalian. This poses not just a logistical question, but also one of social justice. The rapid expansion of the middle class and growing lifestyle expectations, will place further strain on existing resources and necessitate greater efficiencies in production and greater yields per hectare. This is particularly true for meat consumption and the demand for meat, which has historically increased with rising standards of living.

Many scientists and governments are now calling for the modernisation and intensification of agriculture. If implemented this will inevitably displace around 80% or 1.5 billion of the world's 1.8 billion farmers (as it already has in advanced farming countries like Australia and the USA). Putting 1 in 5 of the world's people out of work and out of their home is not an issue that has been much considered, nor have its implications for government failure and regime change. For this reason, some voices are urging greater emphasis on improving smallholder agriculture, rather than industrial agriculture alone.

The rhetoric of food supply, however, remains largely one of grains. This is a result of their role as dietary staples and as a necessary input in other industries, such as biofuels, or as feedstock for livestock.

It is one thing to accept as inevitable that food demands will change as incomes in the developing world rise. This does not, however, preclude governments and health organisations from educating people, particularly in the developed world, to eat less meat and other foods with high energy and water demands.

Changing consumption and demand projections are illustrated in Appendixes 1 and 2 below.

Food Demand in 2050

Projections show that feeding 9.1 billion people in 2050, would require raising overall effective food production by some 70 per cent from 2005/07 levels. To achieve this, production in developing countries would need to almost double. In terms of demand, this represents an additional billion tonnes of cereal and 200 million tonnes of meat to be produced annually by 2050.

Demand for cereals for both human consumption and animal feed is projected to reach three billion tonnes by 2050, up from today's 2.1 billion tonnes. This figure could be even higher, depending on the uptake of biofuel technology and the consequent increase in demand for grain.

Net cereal imports in developing countries will increase almost threefold, to reach nearly 300 million tonnes by 2050. This would account for 14 per cent of cereal consumption (up from 9.2 per cent in 2006/8).

Supply

Governance

Work must be done to address the systemic and political factors that are impeding supply, as well as work on capacity-building in developing nations. Roundtable participants acknowledged that each country has short-term domestic policy issues that can curtail them when they negotiate at multilateral meetings, such as the G20 Agricultural Ministers Meeting in June 2011. This meeting was the first-ever official meeting of Agricultural Ministers of the G20 group of nations, giving at least some indication of the new level of concern for global food security and its potential impact on global security. Meaningful outcomes, however, can remain elusive, as each country, regardless of its political system, has other, more pressing, internal issues to deal with.

Governance also relates to stability and confidence within a country. Monika Barthwal-Datta believes people need to be confident that they can get food. If people become concerned about their food security, they tend to hoard food and this can lead to riots and localised famines.

Dr Barthwal-Datta said governance is a major issue in developing countries where the majority of the population still lives in rural areas. Deeply entrenched poverty, high levels of corruption and a massive gap between the urban elite and those living in poverty, are some of the dynamics that have to be considered.

She said food security is still handled very much at the national level, which is why government policies, restrictions, tariffs and other interference in the agricultural market occur. Among South East Asian countries, ASEAN has started thinking about it at a regional level, by introducing a rice reserve. Food is one of those issues that is transnational by nature, so a regional approach is better.

Colin Richardson said that subsidies in Europe and the USA have been responsible for converting many developing countries that were self-sufficient and net exporters in the 1960s, into net importers. He said the Common Agricultural Policy turned Europe from being a net importer into a net exporter. This has meant the developing world cannot compete and so are forced off their land to join the urban underclass.

FDI Roundtable participants had differing views on the governance structure that can deliver the best outcome. Countries with similar political systems can have different outcomes in achieving food security. For example, Vietnam has had more success than neighbouring

Cambodia or Burma in lifting yields and farmer profitability, even though they could all be loosely described as one-party states.

Wastage and pre-harvest losses

Pre-and post-harvest losses, including wastage, represents a significant problem for optimising food supply. Currently, in the developing world up to 50 per cent of food is wasted. In the developing world, insufficient infrastructure is responsible for food spoilage. Food wastage is partly the result of the current business model of food production, which fails to recognise the significance of food as a global commodity. In both rich and poor countries, it is estimated that between 30-50 per cent of food produced is uneaten. This adds to the considerable pre-harvest (26 to 40 per cent of staples) and post-harvest (up to 40 per cent across staples, fruit and vegetables) losses.

Dr Paul De Barro said many developing countries not only have difficulty producing the food but also have considerable losses once it has been produced. So losses at the post-harvest stage compound the losses during the pre-harvest stage of agriculture production.

“Even if you got a 10 per cent increase in yield, that can be discounted by pre-harvest losses of 30-40 per cent. By the time it gets to the consumer you have lost a further proportion that could amount to another 20-40 per cent of the potential yield gains,” Dr De Barro said.

“Not only is the food lost but also the inputs that are used to produce the food are lost. Inputs such as water, nutrients, oil, fertiliser, pesticides and herbicides are lost along with the food. It is not just about growing more, it is about keeping more of what we grow and getting it to the people that eat it. If you total that up you probably don’t need that much more water or land. It is just making better use of what you have got.”

It is estimated that Vietnam, which has made significant progress in rice production, still loses 20-25 per cent of rice, post-harvest. Both Thailand and the Philippines are said to lose between 9 and 42 per cent of the rice they produce, 28 per cent of the fruit and 42 per cent of the vegetables; while India loses between 3 and 40 per cent of rice and 20 to 40 per cent of fruit and vegetables each year.

Across Asia, approximately 5 per cent of the rice harvest is lost to rats each year – enough to feed Indonesia’s 240 million people for a year. Dr Barthwal-Datta said that in many cases rice grain was left rotting out in the open, because there were not enough storage facilities. Providing those facilities could be achieved by the private sector if it is profitable. Reducing pre-harvest losses requires no additional land, water or other inputs such as fertiliser.

Logistics

Dr De Barro believes that having access to storage facilities and transport is a key to ensuring that food goes to the areas where it is needed. Often the supply chain, however, is riddled with corruption, which creates leakages from the supply system. Providing better roads and lines of communication is a necessity for improving food security. If yields are increased, the storage and transport infrastructure must be able to cope with the increased volumes, so simply increasing yield without addressing the logistics, will not necessarily see an

improvement in food security. Better roads, warehousing, and market information are needed in the developed world to increase efficiency. The food must also be equitably distributed. Per capita food supply is sufficient, yet people still go hungry.

Water Availability

Water is a fundamental need when seeking to achieve food security. Many of the areas with the most acute water problems, and hence agricultural deficits, are those countries with large populations. According to a FDI Strategic Analysis Paper, written by Nicole Bosveld in April 2011, by 2050 predictions indicate that 15 per cent of the world's countries will be experiencing water deficiency; most of those countries are in the Middle East and North Africa.

By 2030, farmers are expected to need 45 per cent more water, which they are unlikely to receive. Cities are the second-largest users of water after agriculture and they are growing exponentially.

The Middle East, for example, is currently undergoing a water crisis, which has led Saudi Arabia to consider terminating all of its wheat production and investing in production in other countries, to ensure its food security.

She writes: "A prediction from the Special Report on Emission Scenarios published in 2001 by the IPCC, says that by 2050, 34 countries, or 15 per cent of the globe's countries, will be experiencing water deficiency – five more water deficit countries than there are presently

"On top of that, an additional five countries could be considered vulnerable or borderline because they will have 1,300 to 1,700 cubic metres per person per annum."¹

Arable Land

Some 2.7 billion hectares of land, capable of crop production, remain uncultivated in South and Central America and Sub-Saharan Africa.

FDI Research Intern, Prue Campbell, recommended in a 19 May 2011 FDI Strategic Analysis Paper a three-fold solution to addressing the availability of arable land: the production of more arable land; an increase in the productive capacity of existing arable land; and the conservation of arable land to prevent degradation.

As with water distribution, arable land is not distributed equitably across the globe.

Ms Campbell writes: "Arable land is not always found in the places where it is required. An estimated 1.8 billion hectares of potential crop land is located in developing countries, where rapid projected population growth means that demand pressures in the future will be significant. Yet 90 per cent of that 1.8 billion is in Latin America and Sub-Saharan Africa and half of the total is concentrated in just seven countries (Brazil, Democratic Republic of

¹ Bosveld, N., Water Surplus Countries, Strategic Analysis Paper, Future Directions International, 11 April 2011.

Congo, Angola, Sudan, Argentina, Colombia and Bolivia). There is virtually no spare land available for expansion in South Asia, the Near East and North Africa.”²

Climate change

Fluctuations in climate remain a mystery. It is still uncertain as to what benefits or costs there will be as climate fluctuates. Nevertheless, it is a variable that needs to be taken into account when planning for future agricultural production. More research will be needed to try to determine what future climate patterns may look like.

Feeding the Cities

By 2050 around 70 per cent of the global population will be based in urban areas, compared with 49 per cent currently.

Author Julian Cribb believes that it will be necessary to reinvent the cities to make them more food secure. This is particularly the case for mega-cities of more than 20-40 million residents, which are vulnerable because the food they need has to come into the city each day.

Professor Bill Bellotti said people were leaving the rural areas for the cities thereby creating a shortage of men to work on the farms. This is because they earn more in the city. The city holds attractions, such as health, education and job prospects. The side effect of this is that in the rural areas it creates lower population density and larger farm sizes. This provides the means for farms to develop economies of scale, where the input costs fall per output as the size of the farm increases. In western China this is already occurring, opening up opportunities for new technology.

Opinions were divided at the roundtable over whether the introduction of technology was a good development for people’s livelihoods. One view expressed was that it was causing unemployment among farmers while others saw the shift of farmers to cities as a positive, because they can earn more in the cities, something which should not be denied them.

Mr Richardson believes that reducing labour on farms is the last thing that is required, because it will reduce the income of people in rural areas. “Farmers are getting less cash because of the western agribusiness technologies coming in, and people in the ‘west’ say they are getting cheap food but it is destroying their livelihood and stopping them from getting any cash in order to buy the cheap imports,” Mr Richardson said. There are two views of the push-pull drivers of the rural to urban migration. One view is that a lack of land, water, credit, work and food in rural areas is pushing people into the cities. As farms are becoming less sustainable, people are forced off their land into the cities. The other view is that the attraction of higher wages, better education prospects and better living standards, are pulling people into the cities.

Dr Simon Hearn noted that in China there were many people going into the cities to work, who came back seasonally to grow their crops or lease the land out to neighbouring farmers.

² The Future Prospects for Global Arable Land, Strategic Analysis Paper, Future Directions International, 19 May 2011.

This consolidation provides benefits, as farmers are able to introduce new technologies that are better suited to larger land holdings and more economically profitable.

In turn, Mr Cribb believes this intensification and adoption of advanced systems will mean that, potentially, 1.5 billion farmers could be put out of work. He sees this labour sector as providing a significant opportunity to get them working in urban agricultural systems, in reinvented, self-sufficient, cities.

Education and Training

Capital building, or investing in education for farming communities, could be a priority for the developed world. Such information sharing could be of benefit to both parties and not only to the recipient countries. When identifying training, it is useful to adopt the language of the Food and Agricultural Organization. They distinguish between capacity building and capacity development. The first refers to developing capacity from nothing, the latter refers to the maintenance or development of capacity once it is in place.

Simon Winter believes that more money needs to be invested in research and development in the agricultural sector. “If we want to solve food security problems we are going to have to ramp up research and development investment and that needs to be facilitated by government.” Mr Winter said.

Neil Andrews concurred: “We’ve lost 20 years because of the decline in research and development investment. Now we have to catch up.”

He said there is a long lead time from starting research to the time when that research can be adopted.

What is clear is that more needs to be done to get a better appreciation of the linkages between food supply, energy, fertiliser prices, arable land and government policies, and their influence on food supply, or for that matter, food demand. A holistic approach is required, which recommends the fundamental importance of food security to maintaining global, regional and national security.

The point was made by a number of participants that it was important to speak to those in the developing countries to get an appreciation of the problems that they face - as they see it. It is also important to visit those countries to determine their needs and to make sure that the knowledge shared is suited to the individual circumstances in the subject country.

It is also important to have a “whole-of-system” approach to training. This refers to the need to find the balance between science and technology, identifying the practical application of science.

Increase farmer returns

The potential to raise crop yields, even with the existing technologies, seems considerable. Provided the appropriate socio-economic incentives are in place, there are still ample bridgeable ‘gaps’ that can be explored. Similarly, there is considerable scope for narrowing performance gaps in livestock production.

Ben Shepherd said that increasing productivity is only part of the story.

“The Green Revolution failed in that it has not lifted the income level of the farmers,” he said. “They are still in poverty. A new green revolution has to do two things: It has to lift productivity so that there is more food available, but it also has to lift these poor people out of poverty so that they have the income to go and buy other things.”

Jennifer Hawkins said that one way of improving yields was to consider ways to lift carbon rates in the soil. By improving the carbon rates the soil has a greater capacity to hold and absorb water.

Sue Marriott said new carbon accounting was available and being used by farmers, which can indicate if farms are sequestering carbon or are putting carbon into the atmosphere.

A repeated concern raised at the roundtables was that farming needed to become more profitable. Australian Farm Journal editor Patrick Francis said that this was an area that has largely been ignored in the discussion but lifting profitability will also lift production levels.

Aquaculture and other new food sources

Aquaculture, the fastest growing food production system, offers new opportunities. Other solutions to be explored to meet increasing future demand include changing eating habits, a reduced emphasis on biofuels, and new scientific and technological innovation. At least in the foreseeable future, however, the main food staples will not change significantly.

Our reliance on food that farmers have learnt to cultivate at high yields relative to inputs, means that it is unlikely that new food sources will satisfy the needs of the growing global population. That said, plants in Australia used traditionally by the first Australians and largely ignored by scientists until now, may hold some unlocked potential in providing for nutritional needs. Other countries may also hold unknown sources of food, which could be developed into a wholesale food.

Future conflict

FDI Associate Aric Bendorf highlighted some of the concerns about future conflicts in a 2010 FDI Paper. He wrote: “Populations in developing countries such as Afghanistan, Bangladesh, Egypt, Nigeria and Pakistan are, on average, predicted to more than double between now and 2050. As these countries already struggle with high rates of unemployment, poor education opportunities and poverty, their rapidly increasing populations will place further burdens on their already scarce resources, disaffecting even larger numbers of their populations. The threat to security from civil unrest and terrorism in these conditions is likely to rise substantially.”³

³ Bendorf, A., World Population Trends Towards 2050 and Beyond, Strategic Analysis Paper, Future Directions International, 24 February 2010.

AUSTRALIA IN 2050

Population: 35.9 million by 2050

Food production

Australia currently produces about 1.1 per cent of the world's food, nearly 3 per cent of all food that is traded and between 5 and 9 per cent of the international trade in commodities such as cereals and meat. Australia was the 14th largest exporter of food in 2009/10.

Australia is the world's seventh largest producer of wheat, with nearly 3 per cent of total world wheat production. Australia is also the third largest exporter of wheat, after the USA and Canada.

Australia produces 93 per cent of its food requirements. Because of a preoccupation with export markets, however, projections indicate that Australia will become a net importer of food. Precisely when this will occur is open to debate with some suggesting Australia will be a net food importer within the next decade, while others believe it will be by the middle of this century.

By 2050, climate change alone has the potential to constrain Australian wheat production by 13 per cent, beef production by 19 per cent and dairy production by 18 per cent.

Expectations are that an extra 10 million tonnes of grain will be required annually by 2050. This means that over 45 per cent of Australia's current grain production would be required to supply internal food requirements, whereas currently only around 20 per cent of grain is used domestically. The CSIRO says that by 2050 Australia could be a net wheat importer.

Land use in Australia: Current land use is illustrated in Figure 1 and 2.

Figure 1. Key statistics in Australian land use - Present

Agricultural land (% of land area)	55.4%
Arable* land (ha per person)	2.1
Arable* land (ha)	44 180 000
Arable* land (% of land area)	5.8%

*Arable land includes land defined by the FAO as land under temporary crops, temporary meadows for mowing or pasture, land under market or kitchen gardens and land temporarily fallow. Land abandoned as a result of shifting cultivations is not included.

Courtesy of World Bank Indicators 2008

Figure 2 Areas of land use in Australia

Land use description	Total extent ('000 hectares)	Total extent (%)
No data	187.4	0
Nature conservation	49881.3	6.5
Other protected areas (including Indigenous use)	102631.2	13.4
Minimal use	120812.3	15.7
Livestock grazing	430100.8	56.0
Forestry	15187.0	2.0
Dryland agriculture	40310.8	5.2
Irrigated agriculture	2170.3	0.3
Built environment	2242.4	0.3
Waterbodies not elsewhere classified	4993.7	0.6

Courtesy of the Australian Land Atlas [accessed 15 June 2010]

Comparatively, Australia is in an enviable position to the rest of the world in terms of available arable land, as illustrated by Figure 3. Australia is currently ranked highest in the world in terms of agricultural land per caput, ahead of Russia and Iceland. However future Australian land use and the availability of arable land will depend on a variety of factors, including degradation, population growth and urban sprawl, innovations in science and technology and climate change. Australian soils can be nutrient poor, meaning that they are highly vulnerable to global movements in fertiliser prices and supply.

Figure 3. Comparative land statistics

Country	Pop'n*	Arable land per caput (sq km per 1000 ppl)	Arable land ('000 ha)	Arable & permanent croplands ('000 ha)
Australia	21 766 710	21 8972.4	49 402	50 600
Canada	34 030 589		45 660	45 700
China	1 336 718 015		103 397	135 557
India	1 189 172 906	1 646.1	159 650	169 700
US	313 232 044	13 993.36	174 448	179 000
<i>Int'l weighted ave.</i>	<i>28 851 640</i>	<i>10 282.8</i>	<i>6 860</i>	<i>9 838</i>

*2011 data, *Courtesy of World Development Indicators, 2005*

Conclusion

The findings from the roundtable were both complex and conflicting. It appears that while the awareness of the importance of food security exists in governments in the developed world, more clearly needs to be done to bring about necessary changes to avoid future crises. The renewed interest in food security could be due, in part, to the food price hikes that occurred in 2008. Those increases led to several food riots as well as the more recent Arab Spring uprisings, which were 'fed' by food shortages and inflationary food prices. It is an encouraging sign that the G20 group of nations held its first official agriculture ministers meeting in June 2011 to discuss food security. The agreement that came from this meeting is

expected to feature strongly in the G20 heads of government meeting, to be held in the second half of 2011.

So the awareness appears to be there. Just how to tackle the problem, however, is still open for debate. It is apparent that failure to act may cause significant problems globally, as well as for Australia. Former Australian chief scientist and Kernot Professor of Engineering at the School of Engineering, Melbourne University, Robin Batterham, believes that if the prices of agricultural inputs continue to rise and food prices rise in Indonesia, we could see economic refugees leaving that country for Australia.

Mr Cribb warns that major food shortages in the Indo-Gangetic region, the North China Plain, North Africa or the Middle East, could lead to massive waves of economic migration and refugeeism, and probably also to local and regional conflicts. Hungry people do not respect national borders and the refugee numbers, already in the tens of millions, will only increase if adequate measures are not put in place to give food to those that can often not afford it. The warnings from Robin Batterham and Julian Cribb need to be heeded to prevent the political and social turmoil that could plague the globe in the next decades. The whole agribusiness system needs to be harnessed to address food security. Farm-based solutions are only part of the solution; banking, transport and other sectors of the economy also play a fundamental role. Part of the problem is that, traditionally, analysts have focused on production levels, instead of the capability of the system to deliver. Issues such as the high wastage of food and logistical problems have not been adequately addressed, but they can be part of the solution. Policy connections between production, agribusiness systems, food security, foreign policy and defence policy, must be developed if Australia and other countries are to tackle the food security problems of the future.

Appendix 1. Changes in the commodity composition of food by major country groups

World

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	148.7	160.1	171.0	165.4	165	162
Cereals, all uses	302.8	325.0	329.3	308.7	331	339
Roots and tubers	83.7	73.4	64.5	69.4	75	75
Sugar (raw sugar equivalent)	22.4	23.4	23.3	23.6	26	27
Pulses, dry	7.6	6.5	6.2	5.9	6	6
Vegetable oils, oil seed and products	6.8	8.3	10.3	12.0	16	17
Meat (carcass weights)	26.1	29.5	33.0	37.4	47	52
Meat and dairy, excl. butter (fresh milk eq.)	75.3	76.5	76.9	78.3	92	100

Other food	216	224	241	289	325	340
Total food (kcal/person/ day)	2411	2549	2704	2789	3040	3130

Developing countries

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	146.3	161.7	173.7	165.7	166	163
Cereals, all uses	191.8	219.2	238.6	238.0	268	279
Roots and tubers	78.8	69.6	60.1	67.0	75	77
Developing, minus China	61.8	59.0	58.4	62.8	76	80
Sugar (raw sugar equivalent)	14.7	17.5	19.2	20.7	25	26
Pulses, dry	9.2	7.8	7.3	6.7	7	7
Vegetable oils, oil seed and products	4.9	6.5	8.6	10.4	14	16
Meat (carcass weights)	10.7	13.7	18.2	26.7	38	44
Developing, minus China & Brazil	10.7	12.5	13.6	15.9	26	32
Meat and dairy, excl. butter (fresh milk eq.)	28.6	34.0	38.1	45.2	67	78
Other food	123	140	171	242	285	300
Total food kcal/person/day	2111	2308	2520	2654	2960	3070

Industrial countries

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	132.3	139.4	154.4	162.4	159	156
Cereals, all uses	531.1	542.0	543.7	591.8	641	665
Roots and tubers	74.2	67.7	69.4	66.7	61	57
Sugar (raw sugar equivalent)	40.5	36.7	32.6	33.1	32	32
Pulses, dry	3.4	2.8	3.2	3.6	4	4
Vegetable oils, oil seed and products	13.2	15.7	18.5	21.5	24	24
Meat (carcass weights)	69.7	78.5	84.3	90.2	99	103
Meat and dairy, excl.	189.1	201.0	211.2	214.0	223	227

butter (fresh milk eq.)						
Other food	486	500	521	525	565	580
Total food (kcal/person/day)	3046	3133	3292	3446	3520	3540

Transition countries

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	200.5	189.2	179.1	168.7	164	158
Cereals, all uses	653.0	777.6	767.8	499.1	618	688
Roots and tubers	140.2	118.4	97.1	103.3	99	94
Sugar (raw sugar equivalent)	41.9	45.9	43.4	36.5	39	41
Pulses, dry	4.1	3.1	2.3	1.6	2	2
Vegetable oils, oil seed and products	7.4	9.2	10.2	10.1	15	18
Meat (carcass weights)	49.5	62.9	70.7	44.4	59	68
Meat and dairy, excl. butter (fresh milk eq.)	185.7	181.3	177.2	160.2	179	193
Other food	331	372	333	317	365	390
Total food (kcal/person/day)	3323	3389	3280	2900	3150	3270

Source: FAO, *World Agriculture towards 2050: Interim Report, 2006*

*Cereals consumption includes the grain equivalent of beer consumption and of corn sweeteners

Appendix 2. Changes in the commodity composition of food, developing regions

Sub-Saharan Africa

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	115.3	114.3	118.8	123.3	142	155
Roots and tubers	193.0	175.0	184.3	191.2	211	205
Sub-Sah. Afr. minus Nigeria & Ghana	184.3	182.6	179.5	165.9	194	191
Sugar (raw sugar equivalent)	7.8	9.8	8.6	10.0	12	15
Pulses, dry	11.0	9.7	8.9	9.8	12	14

Vegetable oils, oil seed and products	8.0	8.4	8.5	8.9	12	13
Meat (carcass weights)	10.2	10.5	9.8	9.5	14	18
Meat and dairy, excl. butter (fresh milk eq.)	29.6	33.7	29.8	28.3	34	38
Other food	139	141	130	128	170	185
Total food (kcal/person/day)	<i>2100</i>	<i>2078</i>	<i>2106</i>	<i>2194</i>	<i>2600</i>	<i>2830</i>

Near East/North Africa

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	179.3	199.7	211.8	203.5	199	193
Roots and tubers	16.6	26.5	31.8	33.7	33	33
Sugar (raw sugar equivalent)	20.4	28.0	28.2	27.7	29	30
Pulses, dry	6.2	6.3	8.0	6.6	7	7
Vegetable oils, oil seed and products	7.5	10.9	12.5	12.1	14	15
Meat (carcass weights)	12.6	17.3	19.6	21.7	35	43
Meat and dairy, excl. butter (fresh milk eq.)	68.1	84.1	75.0	73.2	90	101
Other food	224	277	298	333	370	385
Total food (kcal/person/day)	<i>2382</i>	<i>2834</i>	<i>3011</i>	<i>2974</i>	<i>3130</i>	<i>3190</i>

Latin America and Caribbean

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	118.7	130.1	130.1	132.6	140	139
Roots and tubers	94.1	74.3	63.9	63.3	62	58
Sugar (raw sugar equivalent)	40.5	48.1	46.0	48.5	49	47
Pulses, dry	14.2	12.6	10.5	11.2	11	10
Vegetable oils, oil seed and products	6.8	10.1	12.1	11.8	15	16

Meat (carcass weights)	33.5	40.5	42.8	58.5	79	90
Meat and dairy, excl. butter (fresh milk eq.)	84.0	96.9	94.5	108.8	136	150
Other food	240	246	258	272	310	330
Total food (kcal/person/day)	2465	2698	2689	2836	3120	3200

South Asia

	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	150.4	151.1	164.3	157.1	167	169
Roots and tubers	16.9	19.9	18.7	23.5	31	36
Sugar (raw sugar equivalent)	20.3	20.6	23.7	25.6	30	32
Pulses, dry	14.5	11.3	12.3	10.1	8	7
Vegetable oils, oil seed and products	4.6	5.8	7.2	9.7	15	18
Meat (carcass weights)	3.9	4.1	5.0	5.5	12	18
Meat and dairy, excl. butter (fresh milk eq.)	37.0	41.65	55.1	67.6	106	129
Other food	84	89	104	141	180	200
Total food (kcal/person/day)	2066	2084	2329	2392	2790	2980

East Asia

Kg/person/year	1969/71	1979/81	1989/91	1999/01	2030	2050
Cereals, food*	152.2	181.4	199.5	186.7	176	162
Roots and tubers	96.6	80.8	57.1	65.8	61	53
Sugar (raw sugar equivalent)	5.7	8.0	10.5	11.6	17	20
Pulses, dry	4.8	4.3	2.6	2.0	2	2
Vegetable oils, oil seed and products	3.5	4.7	7.8	10.6	15	17
Meat (carcass	9.2	13.2	22.6	39.8	62	73

weights)						
Meat and dairy, excl. butter (fresh milk eq.)	3.7	5.0	7.4	11.3	21	24
Other food	98	121	179	322	405	440
Total food (kcal/person/day)	2012	2317	2625	2875	3190	3230

Source: *FAO, World Agriculture towards 2050: Interim Report, 2006*

*Cereals consumption includes the grain equivalent of beer consumption and of corn sweeteners

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

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