Conference synthesis

Professor Robyn Alders AO
The Crawford Fund

In this synthesis of today's conference I have been asked to address this question:

What are the best ways for agriculture and the food industry to promote healthy and sustainable diets? And what are the policy levers?

I think we can agree there has been some convergence of ideas in today's presentations. First, that we need to take a systems approach. Our individual disciplines have been focusing on agriculture, food, nutrition, health, and they all bundle up into our current food systems, which are complex and diverse. We do need to take a systems approach if we are going to really tackle the issues that are now dominant.

It was heartening to also hear the idea that nutrition and food are absolutely central to the Sustainable Development Goals.

I am a farmer as well as a researcher. I really appreciate farmers and the work that they do. In fact, we would have no civilisation without farmers. We can sit in cities because farmers produce excess to feed us. Everything that we do, all our achievements, are thanks to farmers and those who produce and deliver food to us. This is an achievement we should not forget. Farmers; agricultural researchers: you should take a bow.

How we got to the present situation

As we think about moving forward, perhaps it is wise to also reflect a little on history, and the important contributions that can be offered by historians and philosophers. We did hear a bit of history today, and it was contained in that really striking table that Dr Marco Wopereis presented (see page 64) where the cabbage looked so poor by comparison. As a sheep farmer I never thought I would want to defend the cabbage. However, that cabbage is the result of 'us': that is, it's the result of our selection pressures and farming practices.

If we look back to ancient varieties of cabbage they probably had a much better nutritional profile. Then, after the Second World War, when the (laudable) decision was made to achieve freedom from hunger, we turned our focus to increasing the production of staples, and agricultural researchers pursued research in line with market signals and systems to keep farmers financially sustainable.

Our work as agricultural researchers focused on those market signals, and they were, and are, largely about quantity, or volume. They are *not* about nutritional

This paper has been prepared from a transcript of the presentation.

quality. That poor cabbage was selected to grow fast and was probably grown on depleted soils, but this was done with the best of intentions. Farmers are squeezed because farmgate prices are unacceptably low, and agricultural researchers have done their best to keep their enterprises viable.

Nutritionists, we really need your help, though we also need to remember, at least here in Australia, that some farmers are a bit nervous about working with you. Remember cholesterol? Some of today's audience are young enough that you won't remember nutritionists telling us, 'Don't eat eggs. Cholesterol is bad for you.' Yet today, the egg is recommended as a superfood.

In defence of farmers, they are doing their best to get a product to market. In the case of livestock, abattoirs, the suppliers, are doing their best to get a sale price for all parts of the carcase. Inappropriate foods being sold to consumers, such as in the Pacific, are not being sold to them by the farmers. Here in Australia, somebody makes the decisions about which cuts of meat we consumers want to eat. Then other people try to find a market for the remainder of the carcase. There are inefficiencies in this approach. If we ate the whole carcase we would possibly have a more balanced diet. It would certainly be a more nutritious diet if we ate the fifth quarter: that is, the offal, the parts of the carcase that producers are not paid for.

Nutrition as a discipline also has been a little bit hijacked, and this is where I think agricultural scientists and plant and animal nutritionists have a strong role to play in discussions with human nutritionists. Much human nutrition research is done via biomedical science, using rodents. Rodents are cheap to keep, and you can generate a lot of research papers based on work with rodents. However, physiologically, people are *not completely like rats*. In terms of animal models, the pig is probably the closest to a human, but pigs are considered expensive to work with.

A very important factor differentiating humans is that, in relation to the female of the species, neither rodents nor pigs menstruate. Women of reproductive age have much higher iron needs because of menstruation. As we think about how we allocate scarce resources, consideration of groups with special requirements should be front and centre. It is almost unbelievable that recommended daily dietary intakes on food labels are commonly based on the needs of males in their 20s, not on other more nutritionally vulnerable groups in the population.

In summary, there is work to be done to adjust targets and foci for our food systems, and I trust that nutritionists will forgive us if sometimes we're a little slow simply because history has taught us to be cautious when moving forward.

In agricultural research we have also made mistakes, but, once again, with the best of intentions. We thought monocultures and an emphasis on cash crops were going to be the answers to solving world hunger. Certainly, farmers need to be able to sell products, and those products have to be valued in a way that's going to reward the farmers, to enable them to manage their land sustainably. However, it is now clear that we need much more complex targets.

Policy goals – not part of today's discussion

A challenge for agriculture and health is that these two disciplines report to different ministries within government structures, at least in Australia. Health has pride of place because human life is invaluable, so, in theory, no expense is spared. Agriculture tends to be linked to economics, and therefore the driving factors for policy are purely economic.

Until market signals, until economics, are overlain with human health indicators we are not going to achieve our nutritional and quantity goals, and farmers are not going to be rewarded fairly for their produce.

We have all the technology. It is possible to price food according to its nutrient density. I think the Sustainable Development Goals are going to help us do that.

Antimicrobial resistance – not discussed previously today

There was no time today to discuss antimicrobial resistance, a serious challenge confronting animal and human health, and one that is frequently blamed on agriculture because of antibiotic use in our intensified food systems, particularly for animal production.

Antibiotic use has been one way of dealing with the economics of farming, trying to keep farmers going, and trying to keep feedlot systems going. Concentrated cereal diets are not natural for pigs nor poultry nor ruminants, so antibiotics were introduced as a way to manage the microbial populations in intensively raised animals. We have similar problems with pesticide and insecticide use, with cumulative toxicities in individuals, and growing resistance problems as well.

Challenges that lie ahead

There are no Members of Parliament here at the moment because they are all required for voting in the chambers. Therefore, it is up to us here to respond to what we have heard today in relation to the completely inadequate investment in agricultural R&D. Our society depends on it.

We need to do better, and we need, as we've learnt, to look much more broadly than the 'Big 3': that is, maize, rice and wheat. We need to look at neglected plant varieties and livestock breeds, because we do not know what the future holds and which of them will fill a niche in the changing world that we are entering. We also need to match food with local circumstances. The reason there is such a beautiful variety of cuisines all the way around the world is that those cuisines developed in harmony with their locations and local produce.

Population trends were briefly mentioned today. Once again, food is central to population trends. To have a good education, we need full bellies to be able to concentrate and to learn. Metadata analysis tells us that women who are well-educated have fewer children, and when you have fewer children and you are sure that you can care for them, then your children are more likely to reach adulthood. These are really really critical aspects of life.

A key reason why we have focused our food systems on staple grains was simply because storage and transport were so much easier than for perishable vegetables, milk, eggs. Perishables need a supply chain that can maintain them in suitable conditions. This is where trans-disciplinary approaches could involve our engineering colleagues working with food scientists; it is very important that we find ways to preserve perishable food with minimal processing so that nutritional quality is maintained.

On that note, an opportunity for disciplinary networking is the International Congress on Engineering and Food* being held in Melbourne in September 2019. There is a session on humanitarian food science and technology. Ideally, many of us will participate, potentially to form new partnership models for nutrition.

Blended teams

We all know it is hard to work across disciplines, especially when it takes so much time to get trained in just our own disciplines and their associated technical languages. Today's range of presentations has covered an uncommonly wide range of disciplines, and we have heard that we need to embrace that challenge of learning different languages, different approaches – and that it is okay to make mistakes.

Today we have also heard about working with public health people, whose data frequently comes from randomised control trials. Such trials are very hard to do, but in my experience the thing I like about randomised control trials is that they force you to work with a random selection of the community.

In contrast, in agricultural research, certainly most of my work with communities has been with farmers who wanted to work with us and who were willing to take a chance on 'crazy foreigners' who had arrived with yet another great idea. When you do a randomised control trial you work with people from many different socioeconomic circumstances within a community, and therefore you have to face the hard reality that sometimes what you are proposing may not be a match for the most vulnerable. You can learn a great deal from that.

Another key area where interaction between agriculturalists and public health specialistis would likely be beneficial, is in relation to the care of mothers. Animal scientists know well that, with species that normally give birth to one individual at a time, if the mother does not eat enough the offspring will have a small birth weight. With optimal food for the mother, the young usually has an optimal birth weight, and if the mother eats too much she will likely have a large offspring that could lead to problems at birth.

In many parts of the world, human mothers' traditions and experiences are handed down from grandmother to mother to daughter, and that can include instruction to avoid certain foods. I believe part of the reason for that is that mothers are worried that eating food that may be too 'rich' (which usually means very nutritious food such as eggs) will lead to a large child which could be

* https://www.melbournecb.com.au/event/international-congress-on-engineering-and-food/conventions_1788/

a problem if she is to give birth in a place without adequate obstetrical care. It's referred to as 'eating down'. It's a tragic thing to have to think about. So if we want mothers to feel free to eat a good diet we must also be aware of the range of needs that they have, because for humans the size of a child's head in relation to the mother's bony birth canal can be a challenge.

Emerging thinking

That thinking – about mothers' diets in relation to birthing difficulties – is starting to appear in the literature.

In agriculture, soil stewarding is beginning to be mentioned, certainly in relation to linking soil health, plant and animal nutrition together, and focusing on nutrient recycling, so as not to deplete the soils. Engineers can help ensure that precious nutrients are not lost, by improving recycling of food, human and animal 'waste' back to the soil.

Sustainability is often considered in relation to ecosystems, but farmers' operations must be financially sustainable for them to stay in business. We have to recognise that the term 'sustainability' has that broader sense. It is important to work with farmers to make sure they get an adequate reward for producing foods they can be proud of while still reaching consumers at an affordable price, and that allows them to take care of their land in the process.

These are emerging ideas and wonderful challenges, and this conference has brought together the spectrum of people who can tackle them.

Summary

In summary, our speakers have eloquently explained the problems facing us. They have skilfully illustrated options for moving forward, for taking a food systems approach that will help countries to achieve their Sustainable Development Goals, and most importantly to improve individual, regional and global health and wellbeing.

We have focused on what nutrition can do for physical strength and wellbeing, and on what it can do for cognitive development. Research is also telling us that good food and a balanced diet will help to make us happy by improving our mental health. That is going to be good for everybody.

I look forward to watching developments emanating from this conference today.